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M4-PL02

Plenary Session: System Interventions to Foster Clinician Well-Being

Monday, Dec. 1 11:00AM - 12:00PM Room: ARIE CROWN THEATER

LEARNING OBJECTIVES

1) Discuss current evidence regarding physician distress and quality of care consequences for organizations. 2) Identify modifiable practice characteristics that influence physician well-being. 3) Recognize evidence-based organizational approaches to promote clinician well-being.

COURSE DESCRIPTION

Occupational distress is common among physicians and can have substantial personal and professional implications. An extensive body of research has demonstrated a strong link between physicians' personal well-being and the quality of care they provide. Recent research has identified characteristics of the work environment organizations can modify to improve clinician well-being and mitigate the associated risks. In this keynote lecture, Dr. Shanafelt will review current state of professional fulfillment and burnout among physicians, discuss data on the personal and professional repercussions, and review the evidence on specific actions organizational can take to promote physician well-being.

Sub-Events

M4-PL02A Plenary Session: System Interventions to Foster Clinician Well-Being

Tait Shanafelt, MD (*Presenter*) Nothing to Disclose

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M8-PL03

Image Interpretation Session

Monday, Dec. 1 4:30PM - 5:30PM Room: ARIE CROWN THEATER

Aya Kamaya, MD (*Moderator*) Other-Book royalties; Elsevier

LEARNING OBJECTIVES

1) Identify key abnormal findings on radiologic studies that are critical to making a specific diagnosis. 2) Construct a logical list of differential diagnoses based on the radiologic findings, focusing on the most probable differential diagnoses. 3) Determine which, if any, additional radiologic studies or procedures are needed in order to make a specific final diagnosis. 4) Choose the most likely diagnosis based on the clinical and the radiologic information. 5) Have fun achieving 1-4!

COURSE DESCRIPTION

5 experts in the field of radiology will be shown unknown cases from the generous contributions by radiologists throughout the United States and Canada. These experts will provide insight regarding how they analyze the images and develop a differential diagnosis including a favored diagnosis.

Sub-Events

M8-PL03B **GYN/GU Imaging**

Katherine E. Maturen, MD, MS (*Presenter*) Nothing to Disclose

M8-PL03C **Neuroradiology**

Meike W. Vernooij, MD, PhD (*Presenter*) Nothing to Disclose

M8-PL03D **Musculoskeletal Imaging**

Amelie M. Lutz, MD (*Presenter*) Nothing to Disclose

M8-PL03E **Gastrointestinal Imaging**

Victoria Chernyak, MD, MS (*Presenter*) Consultant; Bayer. Other-Member of the steering committee, paid lecturer; Medscape

M8-PL03F **Chest Imaging**

Elsie Nguyen, MD, FRCPC (*Presenter*) Nothing to Disclose

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S6-PL01

President's Address and Opening Session

Sunday, Nov. 30 4:00PM - 5:30PM Room: ARIE CROWN THEATER

Sub-Events

S6-PL01A President's Address: Imaging the Individual

Umar Mahmood, MD, PhD (*Presenter*) Stock/Shareholder; Cytosite Bio. Consultant; Cytosite Bio. Grant/Research Support; Cytosite Bio. Consultant; Ziteo Medical. Grant/Research Support; Siemens Healthineers

LEARNING OBJECTIVES

Medical advances have been a primary factor in the expanded life expectancy we experience today, which has more than doubled since 1900 worldwide. Radiology plays a fundamental role in this progress, providing information needed to best treat patients. In his President's Address, Umar Mahmood, MD, PhD, will explore how radiology and the science of imaging have driven progress in medicine, and how radiologists can further advance patient care by focusing on imaging the individual. In recent decades, medicine has rapidly and exponentially expanded understanding and strengthened the evidence of how cells work, how organs operate, and how the human body functions. Knowledge of disease is revealed with increasingly finer resolution, offering exciting opportunities to improve outcomes for patients. Therapies are increasingly optimized for each individual patient, with a framework referred to as precision medicine. A radiologically guided precision treatment path exists in all specialties, benefiting patients, allowing new approaches to generate specific information, and creating new opportunities to improve care and outcomes.

S6-PL01B Opening Session: The All of Us Research Program: Advancing Precision Medicine for the Nation

Geoffrey S. Ginsburg, MD, PhD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

The NIH All of Us Research Program aims to gather data from 1 million or more people in the United States to accelerate research and improve health. 864,000+ participants so far have shared health-related data including electronic health records(EHRs), biospecimens, data from wearable technologies, and self-reported surveys. All of Us data are housed in the cloud-based Researcher Workbench, which includes tools, support resources, sample data workbooks and more. 16,000+ researchers from around the world representing 1,120+institutions, including 100+ international organizations, have produced over950 peer-reviewed publications using the data. This talk will highlight future directions including expansion of the breadth of data available, and the scientific impact of the program to demonstrate how All of Us is enabling individualized disease prevention, treatment, and care for all.

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T3-PL04

RSNA/AAPM Symposium: Together We Can Make a Difference

Tuesday, Dec. 2 9:30AM - 10:30AM Room: E450A

James M. Kofler JR, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe how teamwork between the radiologists, medical physicists and technologists can lead to a productive research environment. 2)Illustrate the different contributions that team members make to the research enterprise. 3)Demonstrate that a team with collective responsibilities of clinical support and research productivity can produce a synergistic and satisfying environment in the academic setting.

COURSE DESCRIPTION

Breast imaging research at UC Davis began with our participation in the NIH-funded Digital Mammography Imaging Screening Trial (DMIST), conducted from 2001 to 2004. Our site made a significant contribution to the trial, and in the process, the breast imaging team gained valuable experience in efficiently managing clinical research. During this same period, our laboratory pioneered the development of a dedicated breast CT scanner, culminating in the first cone-beam breast CT scan on a volunteer in late 2004. Over the next two decades, more than 450 patients were imaged in UC Davis–based clinical trials using four successive prototype scanners. This sustained effort was only possible through the close collaboration of radiologists, physicists, technologists, and graduate students who worked together over 25 years. More recently, our group has developed multi–x-ray source array technology, a promising approach for breast tomosynthesis that eliminates mechanical source motion, shortens scan time, and enhances image quality through a stationary planar 22-source array. Our long-standing culture of collaboration and mutual respect has enabled us to be academically productive while making meaningful contributions to the development of 2.0D, 2.5D, and 3.0D breast imaging technologies. Together, we have made a difference—and we are committed to continuing that progress.

Sub-Events

T3-PL04B **Breast Cone-Beam CT**

John M. Boone, PhD (*Presenter*) Other-Shareholder, Co-founder and Board member; Izotropic Corporation

T3-PL04C **Breast Cone-Beam CT**

Shadi Aminololama-Shakeri, MD (*Presenter*) Consultant; BD. Consultant; Izotropic. Consultant; Siemens

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T4-PL05

Plenary Session: Everyone is Having the Wrong Nightmares: AI's True Threats

Tuesday, Dec. 2 11:00AM - 12:00PM Room: ARIE CROWN THEATER

Sub-Events

T4-PL05A **Everyone is Having the Wrong Nightmares: AI's True Threats**

Zeynep Tufekci, PhD,MA (*Presenter*) Nothing to Disclose

Abstract Archives of the RSNA, 2025

T6-PL06

Plenary Session: Remembering Tomorrow: A Bright Future in Imaging and Treating Neurodegeneration

Tuesday, Dec. 2 1:30PM - 2:30PM Room: ARIE CROWN THEATER

Sub-Events

T6-PL06A **Plenary Session: Remembering Tomorrow: A Bright Future in Imaging and Treating Neurodegeneration**

Alexander Drzezga, MD (*Presenter*) Grant/Research Support; Siemens Healthineers, Life Molecular Imaging, GE Healthcare, AVID Radiopharmaceuticals, Sofie, Eisai, Novartis/AAA, Ariceum Therapeutics. Consultant; Siemens Healthineers, Sanofi, GE Healthcare, Biogen, Novo Nordisk, Invicro, Novartis/AAA, Bayer Vital, Lilly, Peer View Institute for Medical Education, International Atomic Energy Agency. Speaker's Bureau; Siemens Healthineers, Sanofi, GE Healthcare, Biogen, Novo Nordisk, Invicro, Novartis/AAA, Bayer Vital, Lilly, Peer View Institute for Medical Education, International Atomic Energy Agency. Stock/Shareholder; Siemens Healthineers, Lantheus Holding, Lilly. Owner; Patent No.: EP3765097A1; Date of patent: Jan. 20, 2021. Other Financial or Material Support; Siemens Healthineers, Life Molecular Imaging, GE Healthcare, AVID Radiopharmaceuticals, Sofie, Eisai, Novartis/AAA, Ariceum Therapeutics

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W4-PL07

Plenary Session Game Show: The PACS and the Furious: An RSNA Family Feud

Wednesday, Dec. 3 11:00AM - 12:00PM Room: ARIE CROWN THEATER

Iain D. Kirkpatrick, MD, FRCPC (*Moderator*) Nothing to Disclose
Zahra Kassam, MD, FRCPC (*Moderator*) Grant/Research Support; Bayer Pharmaceuticals

LEARNING OBJECTIVES

1) Identify radiologic patterns of common and uncommon multisystem diseases across organ systems in an engaging game-show format. 2) Practice differential diagnoses and review the manifestations (and their frequency) for a number of multisystem pathologies. 3) Encourage interactive learning and camaraderie by gamifying radiologic knowledge, promoting global teamwork, and demonstrating how fun and fast learning can be when PACS meets play.

COURSE DESCRIPTION

Fasten your seatbelts and boot up your PACS—this high-octane radiology showdown pits two teams of diagnostic dynamos against each other in a Family Feud-style format that’s equal parts imaging, intellect, and improv. With categories spanning multisystem diseases and their radiologic manifestations, our contestants will race to name the top answers on the board—some based on survey data from radiologists around the world. Laughter? Guaranteed. Learning? Buckle up—it’s coming at 120 kVp. Whether you’re a resident revving up your knowledge or a seasoned pro with torque to spare, come join the diagnostic drag race and see which team earns ultimate bragging rights. It’s time for The PACS and the Furious: An RSNA Family Feud!

Sub-Events

W4-PL07C **Team 1**

Tristan Barrett, MBBS, MD (*Presenter*) Nothing to Disclose

W4-PL07D **Team 1**

Shaunagh McDermott, MBBCh (*Presenter*) Nothing to Disclose

W4-PL07E **Team 1**

Christopher F. Beaulieu, MD, PhD (*Presenter*) Nothing to Disclose

W4-PL07F **Team 1**

Ling Ling Chan, MBBS, FRCR (*Presenter*) Consultant; Heuron Pte., Ltd. Singapore

W4-PL07G **Team 1**

Baljendra S. Kapoor, MBBS (*Presenter*) Nothing to Disclose

W4-PL07H **Team 2**

Stefanie Weinstein, MD, MBA (*Presenter*) Nothing to Disclose

W4-PL07I **Team 2**

Jonathon A. Leipsic, MD (*Presenter*) Consultant; Heartflow. Consultant; Circle CVI. Speaker's Bureau; GE Healthcare. Speaker's Bureau; Philips . Grant/Research Support; Edwards, Medtronic, Abbott, Boston Scientific, PI Cardia. Grant/Research Support; GE Healthcare. Consultant; Arineta

W4-PL07J **Team 2**

Christine M. Rehwald, MD (*Presenter*) Nothing to Disclose

W4-PL07K **Team 2**

Sofie Van Cauter, MD, PhD (*Presenter*) Nothing to Disclose

W4-PL07L **Team 2**

Nevin de Korompay, MD (*Presenter*) Consultant; Penumbra . Consultant; Cook Medical

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M1-CAS02

Global Radiography Leaders Vision for the Future (Sponsored by the RSNA Associated Sciences Consortium)

Monday, Dec. 1 8:00AM - 9:00AM Room: N226

Charlotte Beardmore, MBA (*Moderator*) Nothing to Disclose
Meena Amlani, PhD, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key trends and challenges shaping the future of the radiographer/technologist profession across Canada, the United States, and the United Kingdom. 2) Discuss the strategic vision and priorities of the CAMRT, ASRT, and the Society and College of Radiographers regarding workforce development, education, and professional advancement. 3) Evaluate global perspectives on how the profession can adapt to emerging technologies, evolving healthcare systems, and changing patient needs.

COURSE DESCRIPTION

This session will feature a live panel discussion with three global leaders offering international insights into the future of the radiographer/technologist profession. Representatives from the CAMRT (Canada), ASRT (USA), and the Society and College of Radiographers (UK) will each share their organization's vision. The panel discussion will explore common themes and global trends looking at the perspectives emerging within each of the countries represented.

Sub-Events

M1-CAS02C **Global Radiography Leaders Vision for the Future**

Kelly Masotti (*Presenter*) Nothing to Disclose

M1-CAS02D **Global Radiography Leaders Vision for the Future**

Melissa B. Pergola, RT (*Presenter*) Nothing to Disclose

M1-CAS02E **Global Radiography Leaders Vision for the Future**

Richard Evans (*Presenter*) Nothing to Disclose

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M1-CBR03

Fundamental Screening Issues and Limitations in Under-Represented Populations

Monday, Dec. 1 8:00AM - 9:00AM Room: S406A

Anand K. Narayan, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe current disparities in breast cancer screening rates among underserved populations by race, ethnicity, rural status, and income. 2) Evaluate the effectiveness of individual, practice, and policy interventions to reduce breast cancer disparities. 3) Design proactive outreach and improvement plans to increase breast cancer screening percentages in underserved populations in your community.

COURSE DESCRIPTION

Mammography screening reduces breast cancer deaths, yet underserved populations face significant barriers to accessing these lifesaving services. This session will explore the social, economic, cultural, and systemic factors that contribute to breast cancer disparities in underserved groups. Through didactic sessions, case studies, and interactive discussions, learners will be equipped to examine and develop interventions to increase breast cancer screening percentages in underserved settings.

Sub-Events

M1-CBR03B USA Perspective

Anand K. Narayan, MD, PhD (*Presenter*) Nothing to Disclose

M1-CBR03C European Perspective

Maria Adele Marino, MD (*Presenter*) Consultant; Bayer

M1-CBR03D Transgender Perspective

Haydee Ojeda-Fournier, MD (*Presenter*) Consultant; ViewPoint Medical. Stock/Shareholder; CureMetrix. Other-honorarium, Course director, UCSD Breast Imaging and interventions course; ESI. Other-honorarium, Breast Care Imaging, on line CME course; Efficiency Learning Inc. Other-honorarium, Topics in mammography, on line CME course; Oakstone. Grant/Research Support; Prospective, Multicenter Confirmatory Clinical Evaluation of Novilase® Interstitial Laser Therapy for the Focal Destruction of Malignant Breast Tumors

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M1-CCA10

Cardiac CT Mentored Case Review: Imaging the Heart: Imaging Techniques, Anatomy, and Function

Monday, Dec. 1 8:00AM - 9:00AM Room: E353C

Jacobo Kirsch, MD, MBA (*Moderator*) Nothing to Disclose
Sandeep S. Hedgire, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify normal cardiac anatomy and recognize congenital coronary artery variants on cardiac CT. 2) Apply key technical principles to optimize image quality and ensure accurate coronary CT angiography. 3) Interpret non-coronary artery pathology, cardiac valve anatomy, and cardiac function, including chamber size assessment, using cardiac CT.

COURSE DESCRIPTION

This case-based educational session offers a comprehensive review of cardiac CT imaging, focusing on essential techniques, detailed cardiac anatomy, and functional assessment. Through expert-led lectures and mentored case discussions, participants will enhance their understanding and interpretation of cardiac CT studies in both routine and complex clinical scenarios. Topics include: Normal Anatomy and Congenital Coronary Artery Variants – Review the fundamentals of cardiac anatomy and recognize common and rare congenital coronary anomalies. Coronary CTA: Major Technical Aspects to Achieve a Successful Scan – Learn key protocols and optimization strategies to ensure high-quality coronary CT angiography. Non-CAD Coronary Artery Pathology – Identify a range of non-atherosclerotic coronary conditions, improving diagnostic confidence beyond traditional coronary artery disease. CT of Cardiac Valves and CT Cardiac Function – Gain insights into evaluating valvular structures and cardiac chamber function, including normal size parameters and functional metrics. This course is ideal for radiologists, cardiologists, and imaging specialists looking to refine their cardiac CT skills and apply them effectively in clinical practice.

Sub-Events

M1-CCA10C Normal Anatomy and Congenital Coronary Arteries Variants

Gilad Borisovsky, MD (*Presenter*) Nothing to Disclose

M1-CCA10D Coronary CTA: Major Technical Aspects to Achieve a Successful Scan

Cristina Fuss, MD, PhD (*Presenter*) Other-Speaker honorarium; Siemens. Other-Honorarium; Elsevier. Consultant; HeartFLow

M1-CCA10E Non-CAD Coronary Artery Pathology

Elsie Nguyen, MD, FRCPC (*Presenter*) Nothing to Disclose

M1-CCA10F CT of Cardiac Valves and CT Cardiac Function, Including Normal Cardiac Chamber Sizes

Gautham P. Reddy, MD, MPH (*Presenter*) Nothing to Disclose

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M1-CCH02

Updates on Imaging of Pulmonary Vascular Diseases

Monday, Dec. 1 8:00AM - 9:00AM Room: E451A

Sanjeev Bhalla, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Optimize CT pulmonary angiography (CTPA) performance and recognize diagnostic pitfalls when interpreting CTPA for acute pulmonary embolism. 2) Apply the newly developed Pulmonary Embolism Reporting and Data System. 3) Utilize appropriate imaging modalities and protocols in the evaluation of pulmonary hypertension in adult patients. 4) Recognize less common vascular diseases such as pulmonary artery sarcoma and pulmonary arteriovenous malformations.

COURSE DESCRIPTION

Pearls and pitfalls related to the performance of CT pulmonary angiography (CTPA) and interpretation of scans for acute pulmonary embolism will be discussed. The application of dual energy and photon-counting CT technology in the evaluation of acute pulmonary embolism will be reviewed. The rationales and salient features of newly developed Pulmonary Embolism Reporting and Data System (PE-RADS) will be explained. The course includes discussion of the latest guideline in the imaging evaluation of pulmonary hypertension in adults. The less common pulmonary vascular abnormalitis will be illustrated in a case-based format.

Sub-Events

M1-CCH02B **Imaging of Acute Pulmonary Embolism**

Jane P. Ko, MD (*Presenter*) Other-Editorial Honorarium; Elsevier. Consultant; NIH/NIAID via the Humanetics Corporation (research consultant, funds to be provided to department). ;

M1-CCH02C **Pulmonary Embolism: Interpretation and Reporting**

Lynne Hurwitz Koweek, MD (*Presenter*) Nothing to Disclose

M1-CCH02D **Imaging of Pulmonary Hypertension in Adults**

Martine J. Remy-Jardin, MD, PhD (*Presenter*) Nothing to Disclose

M1-CCH02E **Case Based Review of Less Common Pulmonary Vascular Diseases**

Seth J. Kligerman, MD, MS (*Presenter*) Speaker's Bureau; Boehringer Ingelheim. Other Financial or Material Support; Elsevier . Consultant; Riverain Technologies. Consultant; Bayer, inc

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M1-CER04

Non-Traumatic Thoracic Emergencies: Diagnostic Challenges

Monday, Dec. 1 8:00AM - 9:00AM Room: N228

Marianna Zagurovskaya, MD (*Moderator*) Nothing to Disclose
Nupur Verma, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review acute aortic syndrome beyond the diagnosis of dissection in patients with acute chest pain, presenting the spectrum of imaging findings and key components for the reporting and management. 2) Organize the radiologist's approach to the opacified lungs due to non-infectious lung injury, emphasizing imaging patterns, etiologies, and relevant pathologic substrates. 3) Learn common etiologies, imaging diagnostic strategy, and essential components of accurate radiologic interpretation related to acute and infectious complications following lung transplantation.

COURSE DESCRIPTION

Acute chest pain and respiratory distress are among the most common reasons for consultation in emergency care services and are linked to the broad spectrum of vascular and lung pathology. Using the format of concise lectures and case conundrums, this session will conceptualize key imaging features, clinically relevant reporting, and strategies to overcome diagnostic challenges and assist in the management of acute aortic syndrome, acute lung injury, and complications after lung transplantation.

Sub-Events

M1-CER04C **Acute Aorta, Beyond Dissection: Case Conundrums and Management**

Prachi P. Agarwal, MD (*Presenter*) Grant/Research Support; MyoKardia, Inc. Grant/Research Support; Cytokinetics. Grant/Research Support; Bristol-Myers Squibb Company. Grant/Research Support; Biosense Webster, Inc

M1-CER04D **"Opacified" Lung in the ED: Non -infectious Lung Injuries**

Tan-Lucien H. Mohammed, MD (*Presenter*) Nothing to Disclose

M1-CER04E **Acute and Infectious Complications in the Post Lung Transplant Patients: What the ED Radiologist Needs to Know**

Bruno Hochhegger, MD, PhD (*Presenter*) Nothing to Disclose

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M1-CGI03

Case-Based: Pancreaticobiliary

Monday, Dec. 1 8:00AM - 9:00AM Room: E451B

Zhen J. Wang, MD (*Moderator*) Stock/Shareholder; Nextrast, Inc

LEARNING OBJECTIVES

1) Recognize imaging features of malignant pancreatic masses as well as benign mimics. 2) Identify key imaging findings associated with acute and chronic pancreatitis, including common complications. 3) Describe the imaging diagnosis and staging of cholangiocarcinoma, and apply knowledge of biliary anatomy to accurately assess biliary system disorders.

COURSE DESCRIPTION

This course offers a focused review of key topics in pancreatic and biliary imaging. It will cover the imaging evaluation and differential diagnosis of pancreatic masses as well as the spectrum of findings in acute and chronic pancreatitis. The course will also review the imaging characteristics and staging of cholangiocarcinoma, along with a detailed review of biliary system anatomy and pathology.

Sub-Events

M1-CGI03B **Pancreatic Masses**

Zhen J. Wang, MD (*Presenter*) Stock/Shareholder; Nextrast, Inc

M1-CGI03C **Pancreatitis**

Kumaresan Sandrasegaran, MD (*Presenter*) Nothing to Disclose

M1-CGI03D **Cholangiocarcinoma**

Sreeharsha Tirumani, MD (*Presenter*) Nothing to Disclose

M1-CGI03E **Biliary System (Including Anatomic Variants)**

Jeff L. Fidler, MD (*Presenter*) Nothing to Disclose

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M1-CIN03

Improving Radiology Reporting: What Do Our Patients Want and How Do Standards and New Models Get Us There

Monday, Dec. 1 8:00AM - 9:00AM Room: E450B

Namita S. Gandhi, MD, MSc (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1)Through the lens of the patients, discuss current status or radiology reports, opportunities and challenges. 2) Discuss role of semantic standards like Radlex, common data elements, and IHE profiles to standardize radiology reports, enable interoperability, and drive downstream decision support for patient friendly reports. 3) Discuss recent advancements in generative AI and how it can be leveraged to bring more value to patients.

COURSE DESCRIPTION

Radiology reports are the primary mode of communication between a radiologist and the patients. With the 21st Century Cures act, patients have easy access to their reports. However, the radiology reports are primarily written for the ordering clinician, while the patient facing reading material should ideally be at 8th grade reading level. This session will focus on patient expectations from a radiology report and how can we can use semantic standards and generative AI to make radiology reports more understandable and valuable for the patients, in turn driving more patient engagement in their care.

Sub-Events

M1-CIN03B **Role of Standards Enabling Patient Friendly Reporting**

Namita S. Gandhi, MD, MSc (*Presenter*) Nothing to Disclose

M1-CIN03C **Value of Radiology Reports in Empowering Patients**

Jonathan A. Flug, MD, MBA (*Presenter*) Nothing to Disclose

M1-CIN03D **Role of Gen AI in Increasing Value of Radiology Reports for Patients**

Rajesh Bhayana, MD, FRCPC (*Presenter*) Owner; Navigating Radiology

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M1-CIR02

Evolving and Advanced Approaches in the Treatment of Hepatocellular Carcinoma

Monday, Dec. 1 8:00AM - 9:00AM Room: E351

Julius Chapiro, MD, PhD (*Moderator*) Consultant; AstraZeneca. Consultant; Guerbet . Consultant; Eisai. Consultant; Bayer
Riad Salem, MBA (*Moderator*) Consultant; Boston Scientific. Consultant; Cook. Consultant; Siemens. Consultant; Astrazeneca. Consultant; Genentech. Consultant; Bard. Consultant; Autem. Consultant; Incyte

Sub-Events

M1-CIR02C **Imaging Biomarkers of HCC and Relevance to Treatment**

Mishal Mendiratta-Lala, MD (*Presenter*) Nothing to Disclose

M1-CIR02D **Five Practical Steps to Optimize TACE Outcomes**

Toshihiro Tanaka, MD, PhD (*Presenter*) Speaker's Bureau; Eisai. Grant/Research Support; Canon Medical Systems. Speaker's Bureau; Stryker Japan . Consultant; Toray

M1-CIR02E **State of the Art TARE in 2025**

Edward Kim, MD (*Presenter*) Consultant; AstraZeneca. Consultant; Boston Scientific. Consultant; Eisai/Merck. Consultant; Genentech/Roche

M1-CIR02F **Impact of Emerald-1 and LEAP-012 in Clinical Practice**

Irene Bargellini, MD (*Presenter*) Consultant; Terumo Europe. Consultant; Astrazeneca. Consultant; EISAI. Consultant; Roche. Consultant; Boston Scientific. Consultant; Microbot Medical. Consultant; Guerbet. Consultant; Sirtex

M1-CIR02G **Present and Future of Combination Therapies**

Riad Salem, MBA (*Presenter*) Consultant; Boston Scientific. Consultant; Cook. Consultant; Siemens. Consultant; Astrazeneca. Consultant; Genentech. Consultant; Bard. Consultant; Autem. Consultant; Incyte

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M1-CMK11

Sports Imaging of the Elbow

Monday, Dec. 1 8:00AM - 9:00AM Room: E450A

Reto Sutter, MD (*Moderator*) Other-Planned patent submission; Siemens Healthineers

LEARNING OBJECTIVES

1) Identify traumatic and chronic elbow injuries in athletes on different imaging modalities. 2) Describe the imaging findings seen in injuries to the distal biceps tendon as well as the common flexor and extensor tendons at the epicondyles. 3) Explain the imaging hallmarks of elbow instability in athletes.

COURSE DESCRIPTION

This session offers an in-depth exploration of elbow imaging in sports-related injuries, with focused lectures by expert musculoskeletal radiologists. Participants will gain insights into evaluating elbow fractures, tendon abnormalities of the humeral epicondyles and the distal biceps tendon, imaging of elbow instability as well as pediatric elbow imaging in athletes. After this session, the participants will be equipped with a comprehensive understanding of elbow sports injuries, enabling reporting of imaging studies that directly impacts clinical management.

Sub-Events

M1-CMK11B Radiographic Evaluation of Elbow Fractures

Jade A. Anderson, MD (*Presenter*) Nothing to Disclose

M1-CMK11C Acute and Chronic Tendon Injuries of the Humeral Epicondyles

Jan Fritz, MD (*Presenter*) Grant/Research Support; Siemens Healthcare, GE Healthcare. Other-Payment or honoraria for lectures and educational events; Siemens Healthcare, GE Healthcare. Other-Participation on Advisory Board; Siemens AG, SyntheticMR, GE Healthcare, QED, ImageBiopsy Lab, Boston Scientific, Mirata Pharma, and Guerbet. Other-Receipt of equipment, materials, and services; GE Healthcare, Siemens AG, QED, SyntheticMR. Other-Leadership or fiduciary role in other board, society, committee or advocacy group, paid or unpaid; RSNA, ISMRM, ARRS, ESSR, SSR. Other-Patents; Siemens Healthcare, Johns Hopkins University, and New York University

M1-CMK11D Imaging of Elbow Instability

Reto Sutter, MD (*Presenter*) Other-Planned patent submission; Siemens Healthineers

M1-CMK11E Imaging Assessment of Distal Biceps Tendon Insertion

Lynne S. Steinbach, MD (*Presenter*) Nothing to Disclose

M1-CMK11F Pediatric Imaging of the Elbow

Nele Herregods, MD, PhD (*Presenter*) Nothing to Disclose

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M1-CMS05

What Modality is the Right Choice: CEUS vs MRI

Monday, Dec. 1 8:00AM - 9:00AM Room: N227B

Margarita V. Revzin, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss pros and cons of CEUS versus MRI in evaluation of liver neoplasms. 2) Discuss pros and cons of CEUS versus MRI in evaluation of pediatric pathologies. 3) Discuss pros and cons of CEUS versus MRI in the evaluation of vascular and abdominal/pelvic pathological processes, including but not limited to aorta and post EVAR, kidney neoplasms, solid organ transplants, organs of reproduction and more.

COURSE DESCRIPTION

The session provides a review of various applications of CEUS vs MRI in a point counterpoint format, where the speakers have a chance to debate about the benefits and limitations of each of these modalities when applied to a specific organ assessment. Discussion will involve comparison of CEUS vs MRI in evaluation of liver and renal lesions, solid organ transplants, gastrointestinal tract, gyn, pediatrics, and vascular systems with emphasis on ease to perform these studies, skill set needed for interpretation of the findings, associated reimbursement issues, as well as sensitivity and accuracy of these modalities in making a correct diagnosis.

Sub-Events

M1-CMS05B Principles and Techniques of Ultrasound and MRI Elastography

Richard L. Ehman, MD (*Presenter*) Stock/Shareholder; Resoundant Inc.. Grant/Research Support; Resoundant Inc.. Other-Intellectual property rights.; Resoundant Inc.

M1-CMS05C MRI vs CEUS in GI and Liver Diseases

Mark E. Lockhart, MD, MPH (*Presenter*) Other-Book royalties; Elsevier. Other-Book Royalties; JayPee Brothers Medical Publishers. Other-Deputy Editor Salary; Journal of Ultrasound in Medicine. Other-Special Governmental Employee (Panel Member); US FDA Medical Devices Panel

M1-CMS05D Role of CEUS in GU System

John S. Pellerito, MD (*Presenter*) Nothing to Disclose

M1-CMS05E CEUS or MRI: When is CEUS Preferred in Pediatric Imaging?

Harriet J. Paltiel, MD (*Presenter*) Nothing to Disclose

M1-CMS05F MRI vs CEUS in the Abdomen

Corinne Deurdulian, MD (*Presenter*) Other-Book Royalties; Elsevier. Other-Book Royalties; Jaypee Bros. Publishing

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M1-CMS09

RSNA Hands-On Lab: Ultrasound Contrast Training for Beginners and Experts (Registration Fee Required)

Monday, Dec. 1 8:30AM - 10:30AM Room: S504CD

Richard G. Barr, MD, PhD (*Moderator*) Grant/Research Support; Philips Ultrasound. Grant/Research Support; Samsung. Other-Royalties ; Thieme Publishers. Other-Royalties; Elsever Publishers. Grant/Research Support; SuperSonic Imagine. Speaker's Bureau; Samsung. Grant/Research Support; SonoScape. Speaker's Bureau; Philips Ultrasound. Grant/Research Support; Siemens Ultrasound. Speaker's Bureau; Siemens Ultrasound. Grant/Research Support; Canon Medical Systems. Speaker's Bureau; Canon Medical Systems. Grant/Research Support; Mindray . Grant/Research Support; Hologic . Speaker's Bureau; Hologic

LEARNING OBJECTIVES

1) Learn how to develop a CEUS program. 2) Learn what patients are appropriate for CEUS. 3) Review organs where CEUS can be used. 4) Discuss how to optimize CEUS imaging. 5) Review how to interpret CEUS studies.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. This course will provide information on how to develop and optimize a CEUS program. A didactic lecture will provide an overview of which patients are appropriate for CEUS, review of safety, general guidelines on performing CEUS. Live cases will be performed via zoom for discussion. Following the live cases the class will move to the hands-on room where vendors will demonstrate their features using phantoms and case studies. Experts in CEUS will be available to answer questions and discuss how to optimize your CEUS program.

Sub-Events

M1-CMS09B **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Stephanie R. Wilson, MD (*Presenter*) Speaker's Bureau; Philips. Consultant; Lantheus. Other-Equipment support as part of a research agreement; Siemens . Other-Equipment support; Philips . Other-Equipment support; Samsung

M1-CMS09C **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Dirk-Andre Clevert, MD (*Presenter*) Nothing to Disclose

M1-CMS09D **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Nitin G. Chaubal, MD (*Presenter*) Nothing to Disclose

M1-CMS09E **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Rajas N. Chaubal, MBBS, MD (*Presenter*) Nothing to Disclose

M1-CMS09F **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Chander Lulla, MD, MBBS (*Presenter*) Nothing to Disclose

M1-CMS09G **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Vito Cantisani, MD, PhD (*Presenter*) Other-Speaker fee; Bracco. Other-Speaker fer; Samsung. Other-Speaker fee; Mindray. Other-Speaker fee; Siemens. Other-Speaker fee; Canon

M1-CMS09H **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Maija Radzina, MD, PhD (*Presenter*) Speaker's Bureau; Medtronic. Speaker's Bureau; Canon. Speaker's Bureau; Mindray. Consultant; Philips

M1-CMS09I **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

David T. Fetzer, MD (*Presenter*) Consultant; GE HealthCare. Grant/Research Support; GE HealthCare. Consultant; Philips Healthcare. Grant/Research Support; Philips Healthcare. Grant/Research Support; Siemens Healthineers. Speaker's Bureau; Siemens Healthineers. Consultant; Bracco Diagnostics. Speaker's Bureau; GE HealthCare

M1-CMS09J **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Michelle L. Robbin, MD, MS (*Presenter*) Grant/Research Support; Philips Medical

M1-CMS09K **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Adrian K. Lim, MD, FRCR (*Presenter*) Nothing to Disclose

M1-CMS09L **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Louis Mazzarelli, MS (*Presenter*) Consultant; Bracco Diagnostics. Speaker's Bureau; Philips Ultrasound. Speaker's Bureau; Blue Earth

M1-CMS09M **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Paul S. Sidhu, BSc, FRCR (*Presenter*) Speaker's Bureau; Bracco SpA. Speaker's Bureau; Philips Inc. Speaker's Bureau; Samsung Medison. Consultant; Itreas Inc. Other-Paid position, Elsevier; Ultrasound in Medicine and Biology, Editor. Other-Non-paid; Associate Editor Radiology. Grant/Research Support; Siemens

M1-CMS09N **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Yuko Kono, MD, PhD (*Presenter*) Grant/Research Support; cannon medica systems co. Grant/Research Support; Bracco diagnostics

M1-CMS09O **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Pal Novak Kaposi, MD, PhD (*Presenter*) Grant/Research Support; Samsung Medison Co. Ltd.

M1-CMS09P **RSNA Hands-on Lab: Ultrasound Contrast Training for Beginners and Experts**

Vasileios Rafailidis, MD, MSc (*Presenter*) Grant/Research Support; GE HEalthcare. Grant/Research Support; Leriva Imaging

M1-CMS09Q **RSNA Hands-On Lab: Ultrasound Contrast Training for Beginners and Experts**

Rachel Lange (*Presenter*) Nothing to Disclose

M1-CMS09R **RSNA Hands-On Lab: Ultrasound Contrast Training for Beginners and Experts**

Alyx Escamillaa (*Presenter*) Nothing to Disclose

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M1-CNPM08

International Perspectives on Impacts of Remote Radiology

Monday, Dec. 1 8:00AM - 9:00AM Room: S402

Jay R. Parikh, MD, FRCPC (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the potential impact remote radiology may have on patient care. 2) Describe the potential impact remote radiology may have on radiologists. 3) Describe the pros and cons of remote radiology from a practice leadership perspective.

COURSE DESCRIPTION

Internationally, there is increasing penetration of remote radiology. In this session, a panel of international radiologists will describe the use of remote radiology in their countries. The potential impact of remote radiology upon patients, radiologists and practices will be presented from international perspectives.

Sub-Events

M1-CNPM08B Impact of Remote Radiology on Patients - Pros/Cons

Niketa Chotai, MD, FRCR (*Presenter*) Nothing to Disclose

M1-CNPM08C Impact of Remote Radiology on Radiologists - Pros/Cons

Jean M. Seely, MD, FRCPC (*Presenter*) Speaker's Bureau; BD. Inc.

M1-CNPM08D Impact of Remote Radiology From a Practice Leadership Perspective - Pros/Cons

John P. Slavotinek, FRANZCR, MBBS (*Presenter*) Nothing to Disclose

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M1-CNR10

Pediatric Intracranial Emergencies

Monday, Dec. 1 8:00AM - 9:00AM Room: S406B

William T. O'Brien Sr, DO (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify distinguishing imaging features between pediatric stroke and common stroke mimics. 2) Recognize imaging findings associated with fetal and neonatal emergent injuries. 3) Understand imaging features and diagnostic work-up for non-traumatic causes of intracranial hemorrhage in children. 4) Review characteristic imaging manifestations of common acute intracranial infectious and inflammatory processes in children.

COURSE DESCRIPTION

This high-yield session will focus on distinguishing imaging features, critical imaging findings, and management of common emergent neurological conditions in children, to include pediatric stroke and its mimics, fetal and neonatal neurological emergencies, non-traumatic intracranial hemorrhage, and acute infectious and inflammatory processes. Engaging speakers with image-rich talks and countless clinical pearls make this a session you most certainly do NOT want to miss.

Sub-Events

M1-CNR10B **It's All About the Flow: Pediatric Stroke & Stroke Mimics**

Leandro T. Lucato, MD, PhD (*Presenter*) Speaker's Bureau; Eli Lilly Company

M1-CNR10C **Tiny Lives, Big Emergencies: Fetal and Neonatal Neuroimaging Emergencies**

Elka Miller, MD, FRCPC (*Presenter*) Nothing to Disclose

M1-CNR10D **You're Giving Me a Headache: Non-Traumatic Intracranial Hemorrhage in Kids**

Anant Krishnan, MD (*Presenter*) Stock/Shareholder; Abbvie

M1-CNR10E **Brain Ablaze: Acute Pediatric Infectious & Inflammatory Processes**

Alexandra M. Foust, DO (*Presenter*) Nothing to Disclose

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M1-COB05

Acute Pelvic Pain in a Reproductive Age Female (Non-Pregnant)

Monday, Dec. 1 8:00AM - 9:00AM Room: E353A

Loretta M. Strachowski, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the sonographic characteristics of adnexal torsion and remember them through the application of 7 easy to recall helpful alliterations. 2) Differentiate the phases of pelvic inflammatory disease to direct appropriate treatment. 3) Recognize non-adnexal etiologies of acute pelvic pain such as prolapsing and necrotic uterine myomas and misplaced intrauterine devices.

COURSE DESCRIPTION

Acute pelvic pain is a common presentation in the emergency department and often poses a diagnostic dilemma to the treating care provider due to the myriad of possible etiologies. Imaging plays an essential role, and it is the responsibility of the radiologist to become familiar with the imaging appearance of the most common diagnoses to expedite patient care. This refresher course will review the most common etiologies of acute pelvic pain in patients of reproductive age (excluding ectopic pregnancy) including adnexal torsion, pelvic inflammatory disease, ovarian hyperstimulation syndrome, prolapsing submucosal myomas, etc.

Sub-Events

M1-COB05B **Adnexal Torsion: 7 Tips to Tell It's Twisted**

Loretta M. Strachowski, MD (*Presenter*) Nothing to Disclose

M1-COB05C **Pelvic Pain: Adnexal Etiologies Other Than Torsion**

Dorothy J. Shum, MD (*Presenter*) Nothing to Disclose

M1-COB05D **Pelvic Pain: Non-Adnexal Etiologies**

Mindy M. Horrow, MD (*Presenter*) Nothing to Disclose

M1-COB05E **South American Perspective**

Alice Cristina C. Brandao Salomao, MD (*Presenter*) Nothing to Disclose

M1-COB05F **European Perspective**

Lucia Manganaro, MD (*Presenter*) Nothing to Disclose

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M1-CPH05

Now You Have a Photon Counting Detector CT: Best Practices for Maximizing Image Quality and Clinical Benefits

Monday, Dec. 1 8:00AM - 9:00AM Room: S404

Cynthia H. McCollough, PhD (*Moderator*) Grant/Research Support; Siemens Healthineers

LEARNING OBJECTIVES

1) Understand the current status and clinical deployment of PCD-CT. 2) Gain insights into the clinical benefits of PCD-CT. 3) Learn strategies to optimize image quality and reduce radiation dose in PCD-CT. 4) Discover best practices for streamlining workflow with PCD-CT systems.

COURSE DESCRIPTION

Photon-counting detector CT (PCD-CT) has transitioned from a research tool to a cutting-edge clinical device that is being increasingly adopted by hospitals and imaging centers. As an advanced imaging modality, its clinical benefits are maximized when radiologists, medical physicists, and technologists collaborate effectively to use the system to its fullest potential. This course will provide an overview of the current status of PCD-CT technologies and the theoretical and established clinical advantages of PCD-CT over conventional energy-integrating detector CT (EID-CT). Participants will learn essential strategies for optimizing PCD-CT performance, including methods to enhance image quality and reduce radiation dose. The course will also cover best practices for streamlining clinical workflows. A moderated discussion session will provide an opportunity for participants to have an in-depth discussion with the panel and share experiences, address challenges, and explore practical solutions to maximize the clinical value of PCD-CT across diverse applications.

Sub-Events

M1-CPH05B Clinical Value and Adoption of PCD-CT

Ricardo P. Budde, MD, PhD (*Presenter*) Grant/Research Support; Siemens, Payment to Erasmus MC.. Grant/Research Support; Heartflow, Payment to Erasmus MC.. Speaker's Bureau; Siemens, Payment to Erasmus MC.. Speaker's Bureau; Bayer, Payment to Erasmus MC.. Grant/Research Support; Bracco, Payment to Erasmus MC.

M1-CPH05C Performance Characterization of Commercial and Prototype PCD-CT Systems

Ke Li, PhD (*Presenter*) Consultant; Pulmera Inc.

M1-CPH05D Protocol and Clinical Workflow Optimization, and How to Maximize Image Quality and Clinical Benefits of PCD-CT

Shuai Leng, PhD (*Presenter*) Other-Mayo Clinic owns intellectual properties for some technologies presented that I am an inventor and licensed to Siemens Healthineers. ;; Siemens Healthineers. Consultant; HeartFlow

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M1-CRO08

Multidisciplinary Masterclass: Learn What Your Clinicians Need to Know for Their Head and Neck Cancer Patients

Monday, Dec. 1 8:00AM - 9:00AM Room: S401

Suresh K. Mukherji, MD, MBA (*Moderator*) Consultant; CARPLAI

LEARNING OBJECTIVES

1) Review a variety of head and neck tumors. 2) Describe the characteristic imaging findings. 3) Provide a list of "Key Elements" that you should include in your report that will make a difference in staging, treatment, and outcome.

COURSE DESCRIPTION

This is multidisciplinary head and neck tumor of experts who will replicate an actual head & neck tumor board. This is an interactive "Masterclass" for Head and Neck Oncologic Imaging which will provide the attendess to review common head and neck neoplasms, discuss their characteristic appearance and recommende key elements thay should include in their report that will affect staging treatment and outcome. This is an audience reponse format and audience questions will be encouraged.

Sub-Events

M1-CRO08B **Multidisciplinary Case-Based Review: Learn What Your Clinicians Need to Know for Their Head & Neck Cancer Patients**

Alice Tang, MD (*Presenter*) Other Financial or Material Support; Johnson and Johnson

M1-CRO08C **Multidisciplinary Case-Based Review: Learn What Your Clinicians Need to Know for Their Head & Neck Cancer Patients**

Sung Kim, MD (*Presenter*) Nothing to Disclose

M1-CRO08D **Multidisciplinary Case-Based Review: Learn What Your Clinicians Need to Know for Their Head & Neck Cancer Patients**

Francis P. Worden, MD (*Presenter*) Other-Advisory Board; Coherus. Other-Advisory Board; Adlai;. Other-consultant; Eisai;. Grant/Research Support; Bayer. Other-Advisory Board ; EMD Serno. Other-Advisory Board and steering committee; Exelexis. Other-Advisory Board; Merck. Grant/Research Support; Merck. Other-Advisory Board; Replimune;. Other-steering committee for Odomzo; Sun Pharma ;. Grant/Research Support; Eli Lilly;. Grant/Research Support; Loxo;

M1-CRO08E **Multidisciplinary Case-Based Review: Learn What Your Clinicians Need to Know for Their Head & Neck Cancer Patients**

Ann D. King, MD (*Presenter*) Nothing to Disclose

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M1-CVA01

Aortic Imaging: A Multi-Disciplinary Team Approach

Monday, Dec. 1 8:00AM - 9:00AM Room: E352

Cristina Fuss, MD, PhD (*Moderator*) Other-Speaker honorarium; Siemens. Other-Honorarium; Elsevier. Consultant; HeartFLow
Nicholas S. Burris, MD (*Moderator*) Other-Entitled to royalties related to licensure of intellectual property; Imbio Inc/4D Medical

LEARNING OBJECTIVES

1) Identify key imaging protocols and findings essential to guiding both surgical and endovascular management of aortic disease. 2) Describe how imaging contributes beyond measurement to risk stratification, procedural planning, and longitudinal surveillance. 3) Recognize the value of interdisciplinary collaboration in achieving high-quality, patient-centered aortic care.

COURSE DESCRIPTION

This session highlights the critical role of imaging in the multidisciplinary management of aortic disease, from diagnosis through intervention and follow-up. Experts in surgery as well as diagnostic and interventional radiology, will discuss how advanced imaging techniques inform clinical decision-making and enhance outcomes across the spectrum of aortic care.

Sub-Events

M1-CVA01C **The Role of Imaging in Aortic Surgical Practice**

Barbara Hamilton, MD, MS (*Presenter*) Nothing to Disclose

M1-CVA01D **High Quality Aortic Imaging: More Than Just Some Measurements**

Nicholas S. Burris, MD (*Presenter*) Other-Entitled to royalties related to licensure of intellectual property; Imbio Inc/4D Medical

M1-CVA01E **The Central Role of Imaging in Endovascular Aortic Repair**

William M. Sherk, MD (*Presenter*) Nothing to Disclose

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M1-DLL04

RSNA Deep Learning Lab: Quantifying Uncertainty in Deep Learning (Advanced) (Registration Fee Required)

Monday, Dec. 1 8:00AM - 9:00AM Room: RADIOLOGY LEARNING LAB

Bradley J. Erickson, MD, PhD (*Moderator*) Stock/Shareholder; FlowSIGMA, Inc. Stock/Shareholder; Yunu, Inc.. Stock/Shareholder; Enquanta.io. Stock/Shareholder; HOPPR.ai. Stock/Shareholder; FinMedTech, Inc DBA MedAgentix, Inc

LEARNING OBJECTIVES

1) Describe the difference between the raw output of an AI tool, a calibrated output, and the uncertainty of a prediction. 2) Describe ways to estimate the uncertainty of an AI prediction. 3) Understand how uncertainty quantification can help with user acceptance and understanding of AI tools.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. In this course we will describe what uncertainty quantification (UQ) is and contrast it with the output value of a network, a probability, and calibration. The hands-on portion will then allow users to apply methods of calculating UQ to various networks and compare UQ methods.

Sub-Events

M1-DLL04B **RSNA Deep Learning Lab: Quantifying Uncertainty in Deep Learning**

Shahriar Faghani, MD (*Presenter*) Nothing to Disclose

M1-DLL04C **RSNA Deep Learning Lab: Quantifying Uncertainty in Deep Learning**

Mana Moassefi, MD, MD (*Presenter*) Nothing to Disclose

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M1-RCP31

Rapid Fire Cases for Residents: MSK, Neuro, Body (Sponsored by the RSNA Resident and Fellow Committee)

Monday, Dec. 1 8:00AM - 9:00AM Room: E350

Brandon K.K. Fields, MD (*Moderator*) Consultant; Mendaera
Megan K. Mercer, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Each case will include a multiple-choice question styled similarly to CORE exam items. 2) Audience members will have 30 seconds to submit answers via PollEV. 3) Each case will be followed by a concise, 90-second explanation with accompanying explanatory slides.

COURSE DESCRIPTION

This 60-minute session will feature three expert speakers specializing in musculoskeletal radiology, neuroradiology, and body imaging. Each speaker will present nine cases in a rapid-fire format to highlight key imaging findings and clinical concepts. This dynamic, interactive approach will help attendees hone their diagnostic skills, reinforce core imaging concepts, and prepare for high-stakes certification examinations in a stimulating and engaging environment.

Sub-Events

M1-RCP31C Neuro Cases

Brian J. Burkett, MD, MPH (*Presenter*) Grant/Research Support; GE HealthCare. Consultant; Clario

M1-RCP31D MSK Cases

Thomas M. Link, MD, PhD (*Presenter*) Grant/Research Support; GE HealthCare. Grant/Research Support; Siemens Healthineers

M1-RCP31E Body Cases

Vinay Prabhu, MD, MS (*Presenter*) Stock/Shareholder; Moderna. Stock/Shareholder; Abbvie. Stock/Shareholder; Repligen. Stock/Shareholder; Teladoc. Stock/Shareholder; Sanofi S.A.. Consultant; Canon. Consultant; WCG Clinical. Speaker's Bureau; American Urological Association. Consultant; Centaur Diagnostics, Inc.

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M1-RCP34

Building a Brighter Future in Radiology: Collaborative Solutions for Efficiency, Patient Care, and Workforce Growth

Monday, Dec. 1 8:00AM - 9:00AM Room: S405

Zi Zhang, MD, MSc (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the unique strategies employed by academic radiology, private practice, and teleradiology to address the radiologist shortage. 2) Gain insights into retention and recruitment strategies tailored to different practice environments. 3) Understand the key components needed to build sustainable infrastructure for AI adoption and innovation in radiology practice.

COURSE DESCRIPTION

Radiologist shortage is an ongoing challenge that demands innovative solutions to ensure operational efficiency, patient safety, and workforce sustainability. This course series brings together leaders from academic radiology, private practice, and teleradiology companies to share comprehensive strategies addressing these key areas. A dedicated session on artificial intelligence (AI) will further explore strategies for validating, integrating, and monitoring AI solutions within clinical workflows. Attendees will benefit from actionable insights and collaborative learning to tackle the workforce shortage across diverse practice settings. This course comprises four lectures addressing critical challenges and opportunities in radiology, followed by a brief panel discussion on academic incentives to foster faculty engagement and innovation, private equity's impact on recruitment and retention, and the role of remote work in supporting radiologists across different career stages. Below is an outline of the topics: 1. Leading the Way: Addressing the Radiologist Shortage in Academic Medicine – Efficiency, Safety, and Workforce Strategies. This session will focus on streamlining workflows and operational efficiency in academic radiology settings. It will also address strategies for maintaining patient safety amidst increasing workloads. Additionally, attendees will explore innovations in recruitment and retention, emphasizing mentorship, career development, and institutional support tailored to the needs of academic radiologists. 2. Optimizing Private Practice: Innovative Solutions for Efficiency, Patient Safety, and Talent Retention. In this session, participants will examine operational solutions for private practices, including technology integration and practice restructuring. The discussion will highlight methods for ensuring high-quality patient care while optimizing efficiency. Creative retention and recruitment strategies, such as work-life balance initiatives and partnership opportunities, will also be explored to support sustainable growth in private practice. 3. Scalable Solutions: How Teleradiology Addresses Radiologist Shortages While Ensuring Quality Care. This session will provide insights into scalable models for workflow optimization and efficiency in teleradiology. The focus will be on maintaining high patient safety standards in remote practice environments. Strategies for retention and recruitment of radiologists at various stages of their careers will be discussed, including flexibility and diversity initiatives designed to attract and retain top talent in teleradiology. 4. AI as a Partner: Revolutionizing Radiology Efficiency and Workforce Support. AI has the potential to transform radiology workflows and support the workforce, but its success depends on strong infrastructure. This session will focus on building the systems, teams, and processes needed to support sustainable AI innovation and adoption. In addition to strategies for clinical validation, integration of external tools, and monitoring, the session will explore the value of developing institution-led AI solutions that are designed, trained, and continuously improved using local data to ensure long-term clinical relevance and scalability.

Sub-Events

M1-RCP34B **Leading the Way: Addressing the Radiologist Shortage in Academic Medicine - Efficiency, Safety, and Workforce Strategies**

Michael P. Recht, MD (*Presenter*) Nothing to Disclose

M1-RCP34C **Optimizing Private Practice: Innovative Solutions for Efficiency, Patient Safety, and Talent Retention**

Chirag R. Parghi, MD, MBA (*Presenter*) Nothing to Disclose

M1-RCP34D **Scalable Solutions: How Teleradiology Addresses Radiologist Shortages While Ensuring Quality Care**

James W. Backstrom, MD (*Presenter*) Consultant; Spin Tech MRI. Consultant; CHART Insurance

M1-RCP34E **AI as a Partner: Revolutionizing Radiology Efficiency and Workforce Support**

Zi Zhang, MD, MSc (*Presenter*) Nothing to Disclose

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M3-CAS07

AI in the Education Space (Sponsored by the RSNA Associated Sciences Consortium)

Monday, Dec. 1 9:30AM - 10:30AM Room: N226

Meredith Gammons, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Examine the advantages of integrating AI/ML concepts into radiologic sciences education, including enhanced training, resource development, and funding strategies. 2) Evaluate the current state of AI educational provisions and the level of knowledge among educators regarding AI and ML concepts within the radiologic sciences. 3) Identify how clinical workflows, decision-making processes, and dose optimization can be adapted to incorporate AI and ML features effectively in educational settings. 4) Analyze the findings from the 2023 ASRT Artificial Intelligence Educator Survey, highlighting perceived challenges and important factors for future advancements in AI education in the radiologic sciences.

COURSE DESCRIPTION

This presentation will focus on the 2023 ASRT Artificial Intelligence Educator Survey results, aiming to understand the transformative effects of artificial intelligence (AI) and machine learning (ML) on the radiologic sciences classroom. We will first explore the potential advantages of incorporating AI and ML into education, including insights into training and guidance, strategies for educators to develop resources, and methods for securing funding and institutional support. Next, we will examine how clinical workflows, decision-making, dose optimization, and various tasks can be adjusted to integrate AI and ML features in the classroom. We will review the current state of AI educational provisions, the knowledge base of educators regarding AI and ML concepts, and the perceived challenges surrounding AI education. Finally, we will analyze the survey results, which will provide valuable insights into the factors influencing future advancements in AI education and the opportunities available for enhancing teaching practices in the radiologic sciences.

Sub-Events

M3-CAS07C **AI in the Education Space**

Melissa Culp, MEd (*Presenter*) Nothing to Disclose

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M3-CBR09

BI-RADS Final Update Before Publication: The Reveal

Monday, Dec. 1 9:30AM - 10:30AM Room: S406A

Stamatia V. Destounis, MD (*Moderator*) Grant/Research Support; Hologic, Inc.. Other-Medical Advisory Board; Hologic, Inc.. Other-Medical Advisory Board; iCAD, Inc.

LEARNING OBJECTIVES

1) Review the final updates prior to publication of the Atlas 6th edition in mammography, ultrasound, MRI and audit and outcomes sections. 2) Become familiar with descriptor changes in the 6th edition.

COURSE DESCRIPTION

Discuss final updates, revisions and changes for the BI-RADS 6th Edition Atlas in Mammography, Ultrasound, MRI and Audit and Outcomes with meaningful examples of the latest changes.

Sub-Events

M3-CBR09B Mammography

Stamatia V. Destounis, MD (*Presenter*) Grant/Research Support; Hologic, Inc.. Other-Medical Advisory Board; Hologic, Inc.. Other-Medical Advisory Board; iCAD, Inc.

M3-CBR09C Ultrasound

Jessica W. Leung, MD (*Presenter*) Stock/Shareholder; Subtle Medical. Consultant; Beekley. Consultant; Fuji. Consultant; Hologic

M3-CBR09D MRI

Wendy B. Demartini, MD (*Presenter*) Grant/Research Support; whiterabbit.ai

M3-CBR09E Audit

Peter R. Eby, MD (*Presenter*) Nothing to Disclose

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M3-CCA12

Cardiac CT Mentored Case Review: Imaging of Post Coronary and Valvular Surgical and Trans Vascular Interventions

Monday, Dec. 1 9:30AM - 10:30AM Room: E353C

Candace M. Howard-Claudio, MD, PhD (*Moderator*) Nothing to Disclose
Kate Hanneman, MD, MPH (*Moderator*) Other-Honoraria; Sanofi Genzyme. Other-Honoraria; Medscape. Other-Honoraria; MRI Online. Other-Honoraria; Bayer

LEARNING OBJECTIVES

1) Describe pre- and post-TAVR imaging. 2) Describe pre- and post-TMVR and TTVR imaging. 3) Discuss an approach to imaging coronary artery stents and CABG.

COURSE DESCRIPTION

Case based review of cardiac imaging including pre and post TAVR, TMVR and TTVR imaging and imaging of coronary artery stents and CABG

Sub-Events

M3-CCA12C Pre-TAVR Imaging

Geoffrey D. Rubin, MD, MBA (*Presenter*) Stock/Shareholder; Heartflow. Consultant; Bayer. Stock/Shareholder; NanoX. Other-Advisor; 3DR Labs

M3-CCA12D Post-TAVR Imaging

Prachi P. Agarwal, MD (*Presenter*) Grant/Research Support; MyoKardia, Inc. Grant/Research Support; Cytokinetics. Grant/Research Support; Bristol-Myers Squibb Company. Grant/Research Support; Biosense Webster, Inc

M3-CCA12E Pre- and Post-TMVR, TTVR Imaging

Eric E. Williamson, MD (*Presenter*) Nothing to Disclose

M3-CCA12F Approach to Assessment of Coronary Stents/CABG Patency

Rodrigo A. Salgado, MD, PhD (*Presenter*) Nothing to Disclose

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M3-CER05

Core Concepts in Abdominopelvic Trauma: Imaging Strategies and Advances

Monday, Dec. 1 9:30AM - 10:30AM Room: E450A

Carrie N. Hoff, MD (*Moderator*) Nothing to Disclose
Sameer B. Raniga, MD, FRCR (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Optimize MDCT protocols and interpretation techniques for abdominopelvic trauma imaging. 2) Identify key imaging features of solid organ, pelvic ring, bowel/mesentery, and urinary tract injuries. 3) Integrate imaging findings with clinical decision-making pathways, guiding non-operative, interventional, or surgical management. 4) Recognize common diagnostic pitfalls and apply strategies to avoid misinterpretation.

COURSE DESCRIPTION

This interactive, case-based session will provide a comprehensive overview of the most critical and commonly encountered abdominopelvic injuries, including solid organ trauma (liver and spleen), pelvic ring disruptions, bowel and mesenteric injuries, and urinary tract trauma. This course will emphasize current best practices in MDCT interpretation, key diagnostic pitfalls, and strategies to enhance communication with trauma teams. It will also focus on practical, case-based insights that connect radiologic findings with clinical management. This session is ideal for radiologists involved in trauma imaging who wish to boost their diagnostic confidence and reporting accuracy. Educational Format: Didactic lecture with case-based review (Interactive).

Sub-Events

M3-CER05C **Solid Visceral Injuries: Liver and Spleen: Cracking the Code**

Arjun Kalyanpur, MD (*Presenter*) Owner; Telerad Group

M3-CER05D **Pelvic Ring Injuries: Core Concepts Revisited**

Sameer B. Raniga, MD, FRCR (*Presenter*) Nothing to Disclose

M3-CER05E **Decoding Bowel and Mesenteric Injuries: MDCT Insights and Pitfalls**

Ana Blanco, MD (*Presenter*) Nothing to Disclose

M3-CER05F **Urinary Tract Injuries Uncovered: A Simplified Imaging Approach**

Elizabeth A. Dick, MD, FRCR (*Presenter*) Other-Speaker on webinar programme (for honorarium) on ad hoc basis. Also hosted for one month in the Sydney office in Oct 2024; Everlight Radiology

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M3-CGU08

CT and MR Contrast Media: Controversies and Conundrums

Monday, Dec. 1 9:30AM - 10:30AM Room: E353B

Helen C. Addley, FRCR, BMBCh (*Moderator*) Nothing to Disclose
Matthew S. Davenport, MD, MBA (*Moderator*) Consultant; Roche. Other-Royalties; Wolters Kluwer. Consultant; Covera Health

LEARNING OBJECTIVES

1) Explain new guidelines for use of contrast media by the American College of Radiology and other societies. 2) Identify opportunities to safely withhold contrast media at MRI.

COURSE DESCRIPTION

This course will summarize important and practice-changing updates to the safe use of contrast media as described by the American College of Radiology and other societies. It will include a debate designed to highlight opportunities for performing MRI for genitourinary indications without contrast material.

Sub-Events

M3-CGU08C Updates on CT Contrast

Carolyn L. Wang, MD (*Presenter*) Grant/Research Support; GE Healthcare

M3-CGU08D Updates on MRI Contrast (Current Guidelines and Novel Media)

Mustafa R. Bashir, MD (*Presenter*) Consultant; Rectify Pharma. Grant/Research Support; Siemens Healthineers. Grant/Research Support; Bayer Healthcare. Grant/Research Support; Madrigal Pharmaceuticals. Grant/Research Support; Carmot Therapeutics. Grant/Research Support; Corcept Therapeutics. Grant/Research Support; NGM Biopharmaceuticals. Consultant; United Therapeutics

M3-CGU08E Difficult Contrast Questions in the Reading Room

Kerry L. Thomas, MD (*Presenter*) Stock/Shareholder; United Healthcare. Stock/Shareholder; AbbieVie. Stock/Shareholder; AmGen. Stock/Shareholder; MedTronic. Stock/Shareholder; Boston Scientific. Stock/Shareholder; Johnson & Johnson. Stock/Shareholder; Thermo Fisher

M3-CGU08F Debate: Do We Need Gadolinium for GU Protocols?

Helen C. Addley, FRCR, BMBCh (*Presenter*) Nothing to Disclose

M3-CGU08G Debate: Do We Need Gadolinium for GU Protocols?

Matthew S. Davenport, MD, MBA (*Presenter*) Consultant; Roche. Other-Royalties; Wolters Kluwer. Consultant; Covera Health

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M3-CHN03

Imaging of the Orbit and Visual System

Monday, Dec. 1 9:30AM - 10:30AM Room: E352

Karen Moeller, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand clinical symptoms that involve the orbit and visual system. 2) Identify specific imaging findings seen in the setting of diplopia, Horner's syndrome, and vision loss. 3) Recognize the imaging features of pediatric orbital lesions.

COURSE DESCRIPTION

This session includes four educational lectures that will focus on imaging of the orbit and visual pathway in adult and pediatric patients. There will be a detailed focus on specific clinical symptoms and their corresponding imaging findings. This approach will help the radiologist develop a targeted search pattern in various clinical scenarios. The imaging of pediatric orbital lesions will also be discussed, as early recognition of these lesions by the radiologist is important for treatment planning.

Sub-Events

M3-CHN03B **Diplopia**

Asim F. Choudhri, MD (*Presenter*) Nothing to Disclose

M3-CHN03C **Imaging in Horner's Syndrome**

Hillary R. Kelly, MD (*Presenter*) Stock/Shareholder; Adaptive Biotech. Stock/Shareholder; Annecy Bio

M3-CHN03D **Imaging of Vision Loss**

Mari Hagiwara, MD (*Presenter*) Speaker's Bureau; Siemens

M3-CHN03E **Pediatric Orbital Lesions**

Rupa Radhakrishnan, MD, MS (*Presenter*) Nothing to Disclose

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M3-CIR03

Interventional Oncological Approaches for Metastatic Colorectal Carcinoma: Embolization, Ablation, and Combinations

Monday, Dec. 1 9:30AM - 10:30AM Room: E351

Robert J. Lewandowski, MD (*Moderator*) Consultant; BD. Consultant; Boston Scientific. Consultant; Sirtex. Consultant; Trisalus

LEARNING OBJECTIVES

1) Describe the role and comparative effectiveness of portal and hepatic vein embolization techniques in inducing liver hypertrophy to optimize surgical candidacy in patients with CRLM. 2) Evaluate current ablation modalities for liver and pulmonary metastases, including the indications, limitations, and outcomes associated with each technique. 3) Differentiate among trans-arterial therapies such as hepatic arterial infusion chemotherapy (HAIC) and Yttrium-90 (Y90) radioembolization and identify appropriate clinical scenarios for their application. 4) Formulate combination treatment strategies that bridge patients with CRLM to curative resection, incorporating multimodality approaches to expand eligibility for surgery. 5) Apply recent consensus guidelines and interpret landmark clinical trials to inform evidence-based practice in interventional oncology for CRLM.

COURSE DESCRIPTION

This session explores cutting-edge interventional oncology strategies for the management of colorectal liver metastases (CRLM). Expert faculty will present a comprehensive overview of techniques including portal and hepatic vein embolization, ablation for liver and lung metastases, and transarterial therapies such as HAIC and Y90. Emphasis will be placed on patient selection, timing, and the integration of therapies to optimize outcomes. The course will also review current consensus guidelines and pivotal clinical trials shaping practice. Attendees will gain practical insights into multidisciplinary approaches that expand resection candidacy and improve patient care in CRLM.

Sub-Events

M3-CIR03B Portal and Hepatic Vein Embolization for Liver Hypertrophy in CRLM: Techniques, Timing, and Predictors of Surgical Success

Peter Minko, MD (*Presenter*) Consultant; Merit Medical. Grant/Research Support; Cook Medical. Consultant; Nano4Imaging

M3-CIR03C Ablation Techniques for Liver and Pulmonary Metastases: What Works Best and When?

Bruno C. Odisio, MD, PhD (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; Ethicon. Consultant; IO Life Sciences. Other-Licensing agreement between MD Anderson Cancer Center and Raysearch Labs; Licensing agreement

M3-CIR03D Transarterial Therapies for CRLM: From HAIC to Y90

Miyuki Sone, MD (*Presenter*) Speaker's Bureau; GE Healthcare. Speaker's Bureau; Chugai Pharmaceutical. Speaker's Bureau; Boston Scientific Japan. Consultant; Rakuten Medical. Speaker's Bureau; Covidien Japan. Speaker's Bureau; Guerbet Europe. Consultant; Boston Scientific. Speaker's Bureau; CANON MEDICAL SYSTEMS. Speaker's Bureau; Astra Zeneca. Speaker's Bureau; Cardinal Health. Grant/Research Support; CANON MEDICAL SYSTEMS. Speaker's Bureau; S&G BIOTECH

M3-CIR03E Bridging to Resection in CRLM: Combination Concepts to Expand Surgical Candidates

Suvranu Ganguli, MD (*Presenter*) Consultant; Sirtex. Consultant; Boston Scientific. Consultant; Medtronic. Consultant; Instylla. Consultant; ABK Medical

M3-CIR03F Consensus Guidelines and Recent Landmark Trials in Interventional Oncology for CRLM

Willie M. Ludemann, MD (*Presenter*) Nothing to Disclose

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M3-CMK05

Knee Imaging: The Fundamentals

Monday, Dec. 1 9:30AM - 10:30AM Room: N228

Erin F. Alaia, MD (*Moderator*) Consultant; Biorez, Inc

LEARNING OBJECTIVES

1) Review fundamental anatomy and common injury patterns seen on knee MRI, with a focus on the meniscus, the cruciate and collateral ligaments, the posterolateral corner, and the extensor mechanism.

COURSE DESCRIPTION

This lecture-based course will cover topics which are considered fundamental to the interpretation of routine knee MRIs. Lectures will cover meniscal injury, injury of the cruciate and collateral ligaments, the posterolateral corner, and the extensor mechanism. Following this session, attendees will have a greater understanding of high-yield, common pathology and important injury patterns on knee MRI.

Sub-Events

M3-CMK05B Meniscal Tears: Patterns and Pitfalls

Dana Lin, MD (*Presenter*) Grant/Research Support; Siemens Medical Solutions USA, Inc.. Grant/Research Support; GE Healthcare. Grant/Research Support; Philips

M3-CMK05C Imaging the Posterolateral Corner

Daniel M. Walz, MD (*Presenter*) Nothing to Disclose

M3-CMK05D Collateral Ligament Anatomy and Patterns of Injury

Ara Kassarjian, MD, FRCPC (*Presenter*) Other-Advisor; Siemens Healthineers. Other-Advisor; Gleamer

M3-CMK05E Extensor Mechanism: Imaging and Intervention

Kenneth S. Lee, MD, MBA (*Presenter*) Grant/Research Support; NFL. Other-Book Royalty; Elsevier. Consultant; RemedyLogic

M3-CMK05F Cruciate Ligament Injury and Associated Findings

Erin F. Alaia, MD (*Presenter*) Consultant; Biorez, Inc

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M3-CNMMI03

Update in Nuclear Medicine for Breast Cancer Imaging

Monday, Dec. 1 9:30AM - 10:30AM Room: S405

Elizabeth H. Dibble, MD (*Moderator*) Nothing to Disclose

Sub-Events

M3-CNMMI03B **Overview of PET/CT and Molecular Imaging for Breast Cancer**

Elizabeth H. Dibble, MD (*Presenter*) Nothing to Disclose

M3-CNMMI03C **FES PET/CT: Appropriate Use Criteria and Focus on ILC**

Sophia R. O'Brien, MD, MEd (*Presenter*) Consultant; GE

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M3-CNPM07

Unintended Consequences of Screening and How to Mitigate Them (Sponsored by the RSNA Public Information Committee)

Monday, Dec. 1 9:30AM - 10:30AM Room: S402

Ruth C. Carlos, MD, MS (*Moderator*) Other-Salary support as JACR EIC; ACR . Other-Travel and lodging as GERRAF board chair; GERRAF. Other-Travel and lodging as Academy Board; Academy of Radiology and Biomedical Imaging Research. Other-Honorarium for moderating education session on lung screening; Canon Medical

LEARNING OBJECTIVES

1) Compare benefits and limitations of novel screening technologies. 2) Determine downstream impact of implementing novel screening technologies. 3) Develop potential practice approaches to novel imaging technologies.

COURSE DESCRIPTION

In this didactic course, we will discuss the benefits and pitfalls of novel screening technologies including whole body MRI and multi-cancer detection. We will compare these technologies to standard screening techniques and discuss downstream consequences of implementation of these technologies.

Sub-Events

M3-CNPM07B Limitations of Standardized Screening Programs -- Impacts and How to Improve

Ashley E. Prosper, MD (*Presenter*) Consultant; MedQIA. Speaker's Bureau; Canon Medical. Grant/Research Support; Bristol Myers Squibb Foundation. Grant/Research Support; Siemens Medical Solutions. Consultant; Bayer

M3-CNPM07C Impacts of New Whole Body Screening Technologies: Whole Body MRI and Multicancer Early Detection

Saurabh Jha, MBBS, MS (*Presenter*) Nothing to Disclose

M3-CNPM07D Unintended Consequences of Financial Toxicity With Imaging

Ruth C. Carlos, MD, MS (*Presenter*) Other-Salary support as JACR EIC; ACR . Other-Travel and lodging as GERRAF board chair; GERRAF. Other-Travel and lodging as Academy Board; Academy of Radiology and Biomedical Imaging Research. Other-Honorarium for moderating education session on lung screening; Canon Medical

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M3-CPD03

It IS up for Debate: Pros and Cons of Different Modality Choices for Common Pediatric GI/GU Conditions

Monday, Dec. 1 9:30AM - 10:30AM Room: S502

Amy R. Mehollin-Ray, MD (*Moderator*) Nothing to Disclose
Smyrna P. Tuburan, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe several imaging features found with MRI to diagnose inflammatory bowel disease (both intestinal and extra-intestinal) and identify key features of inflammatory bowel disease on ultrasound. 2) Explain the value of MR urography and review practical points in the diagnosis of urinary tract obstruction and describe the complementary roles of renal scintigraphy and ultrasound in the evaluation of urinary tract obstruction, including their indications, strengths, and limitations. 3) Discuss common pitfalls and limitations of upper GI fluoroscopy and strategies to avoid misdiagnosis and explain the role of ultrasound in diagnosing midgut volvulus and midgut malrotation.

COURSE DESCRIPTION

This session explores the diagnostic challenges in pediatric GI and GU imaging, highlighting the unique strengths of each modality. Through engaging discussion, learn how to navigate choices between MR enterography or ultrasound for inflammatory bowel disease, MR urography, scintigraphy or contrast-enhanced ultrasound for urinary tract obstruction, and fluoroscopy or ultrasound for midgut volvulus.

Sub-Events

M3-CPD03C **Inflammatory Bowel Disease - Role of MR Enterography**

Sabah Servaes, MD (*Presenter*) Nothing to Disclose

M3-CPD03D **Inflammatory Bowel Disease - Role of Bowel Ultrasound**

Ami Gokli, MD (*Presenter*) Nothing to Disclose

M3-CPD03E **Urinary Tract Obstruction - Role of MR Urography**

Maddy Artunduaga, MD (*Presenter*) Nothing to Disclose

M3-CPD03F **Urinary Tract Obstruction - Role of Scintigraphy/Ultrasound (CEUS)**

Jeannie K. Kwon, MD, MBA (*Presenter*) Grant/Research Support; Siemens

M3-CPD03G **Midgut Volvulus - Role of Fluoroscopic Upper GI**

Catalina Le Cacheux (*Presenter*) Nothing to Disclose

M3-CPD03H **Midgut Volvulus - Role of Abdominal Ultrasound**

Alex El-Ali, MD (*Presenter*) Nothing to Disclose

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M3-DLL03

RSNA Deep Learning Lab: Data Extraction from Radiology Reports With LLMs (Beginner Friendly) (Registration Fee Required)

Monday, Dec. 1 9:30AM - 10:30AM Room: RADIOLOGY LEARNING LAB

Walter F. Wiggins, MD, PhD (*Moderator*) Consultant; Qure.ai

LEARNING OBJECTIVES

1) Describe how large language models process text using tokenization and embeddings, and explain how these concepts relate to prompt engineering. 2) Use prompt-based methods with a pre-trained LLM and Python library to classify chest x-ray reports by clinical findings, without training or fine-tuning a model.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. This interactive course introduces participants to information extraction from radiology reports using large language models (LLMs) and prompt engineering, with minimal reliance on traditional model training or fine-tuning. Participants will work through a hands-on example using chest x-ray reports from a public dataset to classify reports as positive or negative for specific findings. The session will emphasize how to craft effective prompts for LLMs and evaluate their outputs, while also introducing key concepts like tokenization and embeddings as background knowledge. A user-friendly Python library will be used to abstract away lower-level details, allowing learners to focus on high-level reasoning and practical applications. No prior coding or machine learning experience is required.

Sub-Events

M3-DLL03B **RSNA Deep Learning Lab: Data Extraction from Radiology Reports With LLMs**

Walter F. Wiggins, MD, PhD (*Presenter*) Consultant; Qure.ai

M3-DLL03C **RSNA Deep Learning Lab: Data Extraction from Radiology Reports With LLMs**

Mindy L. Yang, MD (*Presenter*) Consultant; iCAD. Consultant; Myriad Genetics. Consultant; Shoreline. Consultant; RadAI. Employee; Rad Partners

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M3-RCP33

Best of Radiology: Artificial Intelligence, Cardiothoracic, Imaging Cancer, and Advances: Editor Picks From the RSNA Suite Journals

Monday, Dec. 1 9:30AM - 10:30AM Room: E451A

Charles E. Kahn JR, MD, MS (*Moderator*) Other-Travel support, Radiology Advisory Panel; Sectra USA
Gary D. Luker, MD (*Moderator*) Nothing to Disclose
Susanna I. Lee, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the highlights of the research published in the past year in Radiology Advances, Radiology Artificial Intelligence, Radiology Imaging Cancer, and Radiology Cardiothoracic Imaging. 2) Describe the latest scanners, tracers, databases, software, and workflow innovations reported in these journals. 3) Understand the rationale for selection of these articles and why these innovations are likely to disseminate widely.

COURSE DESCRIPTION

Editors of the RSNA subspecialty journals will present a brief (~12 minute) presentation of the articles curated as most likely to impact on the practice of radiology. These will include pre-clinical, translational, cohort and prospective trials. Sample topics include photon counting CT, new PET and other molecular tracers, low- and high-field MRI scanners, and AI tools for image reconstruction, interpretation, and workflow enhancement. In addition, the panel discussion with audience Q & A will focus on the editorial process and future directions of each of the journals.

Sub-Events

M3-RCP33D **Radiology Imaging Cancer Editor Pick**

Xiaoyang Liu, MD, PhD (*Presenter*) Nothing to Disclose

M3-RCP33E **Radiology Advances Editor Picks**

Luke A. Ginocchio, MD (*Presenter*) Nothing to Disclose

M3-RCP33F **Radiology AI Editor Picks**

Mahsa Mayeli, MD, MPH (*Presenter*) Nothing to Disclose

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M3-RCP42

Douglas W. MacEwan Rising Star Track: From a Rising Star to a Seasoned Pro

Monday, Dec. 1 9:30AM - 10:30AM Room: E255

Kristen Olinger, MD (*Moderator*) Nothing to Disclose
Monika Radike, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Help early career radiologists with an interest in academia continue to develop their vocation. 2) Give early career radiologists effective strategies for achieving success in career promotion. 3) Guide participants in aligning their mid-career goals with a good work-life balance.

COURSE DESCRIPTION

Small group format, each group assigned to at least one early career and one mid to late career radiologist ("small group mentoring committee") to organize 5 scenarios that an early career radiologist might encounter related to: 1) Finding the perfect job in academia 2) Discovering the ideal mentor and/or mentorship committee 3) Issues/hurdles one might encounter in the promotions process 4) Carving out an academic path in the non-academic setting 5)Balancing alignment between mid-career goals and work-life balance. Small groups will discuss the scenario, personal experiences and identify one person within the group to present the groups talking points to the larger group, with a full audience Q & A.

Sub-Events

M3-RCP42C **Issues/Hurdles One Might Encounter in the Promotions Process**

Anu Obaro, MBBS, PhD (*Presenter*) Nothing to Disclose

M3-RCP42D **Issues/Hurdles One Might Encounter in the Promotions Process**

Maite Urizar Gorosarri, MD (*Presenter*) Nothing to Disclose

M3-RCP42E **Carving Out an Academic Path in the Non-Academic Setting**

Geraldine B. McGinty, MD, MBA (*Presenter*) Stock/Shareholder; NextGen Healthcare. Other-Board Member; NextGen Healthcare. Other-Board Member; 4D Medical. Stock/Shareholder; 4D Medical

M3-RCP42F **Carving Out an Academic Path in the Non-Academic Setting**

Mariaelena Occhipinti, MD, PhD (*Presenter*) Consultant; Radiomics.bio

M3-RCP42G **Balancing Alignment Between Mid-Career Goals and Work-Life Balance**

Laura Oleaga, MD, PhD (*Presenter*) Nothing to Disclose

M3-RCP42H **Balancing Alignment Between Mid-Career Goals and Work-Life Balance**

Richard B. Gunderman, MD, PhD (*Presenter*) Nothing to Disclose

M3-RCP42I **Discovering the Ideal Mentor and/or Mentorship Committee**

Frank J. Lexa, MD, MBA (*Presenter*) Consultant; HaloDX

M3-RCP42J **Discovering the Ideal Mentor and/or Mentorship Committee**

Ruben Eduardo Pacios Blanco, MD, PhD (*Presenter*) Nothing to Disclose

M3-RCP42K **Finding the Perfect Job in Academia**

Jonathan Weir-McCall, FRCR (*Presenter*) Speaker's Bureau; Bayer

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M4-CAS03

Legal Considerations of and for AI: Positive Quality Impacts, Case Studies (Sponsored by the RSNA Associated Sciences Consortium)

Monday, Dec. 1 11:00AM - 12:00PM Room: N226

Keith Chew, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) The Importance of an AI Governance Plan will be presented. 2) How adherence to the HIPAA 1557 requirements for/relating to bias can have legal/risk impacts. 3) General contract provisions which are necessary to protect the hospital/system/practice when engaging AI.

Sub-Events

M4-CAS03B **Legal Considerations of and for AI - Positive Quality Impacts, Case Studies**

Keith Chew, PhD (*Presenter*) Nothing to Disclose

M4-CAS03C **Legal Considerations of and for AI - Positive Quality Impacts, Case Studies**

Darren Skyles (*Presenter*) Nothing to Disclose

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M4-CIN04

Evolution of Large Language Models (LLMs): Early Foundation to Era of Multimodal Models

Monday, Dec. 1 11:00AM - 12:00PM Room: E450B

Yifan Peng, PhD, MEng (*Moderator*) Nothing to Disclose

Sub-Events

M4-CIN04B **LLMs for Radiology AI Development: From 2D to 3D**

Ronald M. Summers, MD, PhD (*Presenter*) Other-licenses; iCAD, Philips, ScanMed, Translation Holdings, PingAn, MGB. Grant/Research Support; PingAn

M4-CIN04C **LLMs for Information Extraction**

Lisa C. Adams, MD, PhD (*Presenter*) Nothing to Disclose

M4-CIN04D **LLM Benchmarking for Radiology**

George L. Shih, MD, MS (*Presenter*) Other-Consultant and Shareholder;Board of Directors; MD.ai. Other-Unpaid Advisor; OpenAI. Other-Board of Directors; SIIM

M4-CIN04E **Limits of Radiology Foundation Models in Real-World Generalization**

Yuzhe Yang (*Presenter*) Nothing to Disclose

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M6-CAS01

Futureproofing Radiology Departments: Exploring How AI and Embedded Radiology Will Influence New Designs (Sponsored by the RSNA Associated Sciences Consortium)

Monday, Dec. 1 1:30PM - 2:30PM Room: N226

Catherine Gunn, MBA, RT (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify specific architectural and planning principles that can be applied to new construction and major renovation of imaging departments to accommodate AI and embedded radiology. 2) Understand the role of centralized and decentralized Intelligence Collaboration Centers in supporting seamless care across inpatient, outpatient, and remote environments. 3) Learn how innovative designs can enhance patient-centered care, streamline workflow, and improve integration across specialties.

COURSE DESCRIPTION

Artificial intelligence (AI) and the emergence of embedded radiology—where imaging is decentralized and seamlessly integrated across all specialties—are redefining the way radiology departments are planned, programmed, and designed. While much has been written about AI's impact on image interpretation and workflow optimization, far less attention has been given to how these forces will reshape the physical and operational form of future imaging environments. This lecture will offer a forward-looking and pragmatic view into how radiology departments must evolve in response to these paradigm shifts. From enterprise-wide imaging ecosystems to AI-enabled collaboration hubs and hybrid procedural platforms, we will explore the architectural and technological frameworks that will support the next generation of radiology practice.

Sub-Events

M6-CAS01B **Futureproofing Radiology Departments - Exploring How AI and Embedded Radiology Will Influence New Designs**

Elizabeth C. Beckmann, BSc (*Presenter*) Nothing to Disclose

M6-CAS01C **Futureproofing Radiology Departments - Exploring How AI and Embedded Radiology Will Influence New Designs**

Carlos L. Amato, MArch (*Presenter*) Nothing to Disclose

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M6-CBR04

AI in Mammography and Digital Breast Tomosynthesis: Real-World Applications and Impact (Advanced)

Monday, Dec. 1 1:30PM - 2:30PM Room: S406A

Ritse M. Mann, MD, PhD (*Moderator*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; Bayer healthcare. Grant/Research Support; Becton & Dickinson. Grant/Research Support; Koning. Grant/Research Support; ScreenPoint Medical. Grant/Research Support; Lunit. Grant/Research Support; PA Imaging

LEARNING OBJECTIVES

1) Learn what the current possibilties are of AI for mammography and DBT. 2) Understand where AI is heading, and which new avenues beyond lesion detection may transform the way we screen women and select women for supplemental screening. 3) Learn methods to overcome implementation barriers for actual use of AI in clinical practice.

Sub-Events

M6-CBR04B Real World-application: What Have we Learned so Far?

Ritse M. Mann, MD, PhD (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; Bayer healthcare. Grant/Research Support; Becton & Dickinson. Grant/Research Support; Koning. Grant/Research Support; ScreenPoint Medical. Grant/Research Support; Lunit. Grant/Research Support; PA Imaging

M6-CBR04C Real World-application: Where are we Heading?

Constance D. Lehman, MD, PhD (*Presenter*) Grant/Research Support; GE Healthcare. Grant/Research Support; Hologic. Other-Co-founder and consultant; Clairity

M6-CBR04D Barriers and Facilitators of Implementation of AI in MG/DBT

Sarah M. Friedewald, MD (*Presenter*) Grant/Research Support; google. Speaker's Bureau; hologic

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M6-CCA11

Cardiac CT Mentored Case Review: Coronary Atherosclerotic Disease: From Straightforward to Most Complicated

Monday, Dec. 1 1:30PM - 2:30PM Room: E353C

Jill E. Jacobs, MD (*Moderator*) Nothing to Disclose
Jonathan Weir-McCall, FRCR (*Moderator*) Speaker's Bureau; Bayer

LEARNING OBJECTIVES

1) Develop a structured approach to the assessment and reporting of coronary stenosis and plaque. 2) Build a framework for integrating functional assessment of coronary artery disease into these clinical reports with awareness of both CT-FFR and CT perfusion assessment.

COURSE DESCRIPTION

This case based session - led by a team of world experts and past presidents of international cardiac imaging societies - will explore the many facets of coronary artery disease assessment using cardiac CT. Starting with cardiac calcifications, we will progress through the bread and butter of stenosis assessment, into the nuances of atherosclerotic plaque assessment. A structured and standardised approach to reporting cardiac CT will be explicated, before finishing with a discourse on the use of functional cardiac CT techniques including both CT-FFR and perfusion imaging.

Sub-Events

M6-CCA11C **All You Need to Know About Cardiac Calcifications**

Rozemarijn Vliegenthart, MD, PhD (*Presenter*) Grant/Research Support; Siemens Healthineers. Speaker's Bureau; Siemens Healthineers. Speaker's Bureau; Bayer Healthcare. Speaker's Bureau; Wiley. Speaker's Bureau; Keya

M6-CCA11D **Coronary Atherosclerosis I: Approach to Atherosclerotic Plaque Analysis and Severity of Stenosis Assessment**

Phillip M. Young, MD (*Presenter*) Nothing to Disclose

M6-CCA11E **Coronary Atherosclerosis II: CAD-RAD System**

Cristina Fuss, MD, PhD (*Presenter*) Other-Speaker honorarium; Siemens. Other-Honorarium; Elsevier. Consultant; HeartFLow

M6-CCA11F **Coronary Atherosclerosis III: How do I Use CT FFR and CT Myocardial Perfusion to Assess CAD**

Suhny Abbara, MD (*Presenter*) Other-Royalties for textbooks/authoring; Elsevier

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M6-CCH12

Imaging of Pleural and Mediastinal Abnormalities: Fundamentals and Advances

Monday, Dec. 1 1:30PM - 2:30PM Room: E451A

Mylene T. Truong, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the classic imaging findings of malignant and benign pleural abnormalities including mesothelioma, pleural effusion, and pneumothorax. 2) Identify and characterize mediastinal neoplasm using multimodality imaging. 3) Recognizing PET/CT applications and pitfalls in the mediastinum.

COURSE DESCRIPTION

This course offers comprehensive exploration of imaging evaluation of pleural and mediastinal diseases. Designed for radiology trainees, practicing radiologists and well as researchers, it provides balanced information of classical imaging findings as well as the latest updates to foster proficiency in detecting and interpretating pleural and mediastinal abnormalities on imaging.

Sub-Events

M6-CCH12B Updates on Imaging of Mesothelioma

Ritu R. Gill, MBBS, MPH (*Presenter*) Consultant; Imbio Inc.. Grant/Research Support; Cannon Inc.. Grant/Research Support; NIH . Consultant; Icon CRO. Consultant; Median Inc .

M6-CCH12C Pneumothorax, Pleural Effusion, and Other Pleural Abnormalities

Laura E. Heyneman, MD (*Presenter*) Other-author; Elsevier

M6-CCH12D Thymic Neoplasms

Edith M. Marom, MD (*Presenter*) Other-Honorarium for a talk; Boehringer Ingelheim . Other-Honorarium for a talk; Merck Sharp & Dohme;. Other-Honorarium for a talk; AstraZeneca

M6-CCH12E PET/CT of Mediastinum

David M. Naeger, MD (*Presenter*) Nothing to Disclose

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M6-CER08

Pediatric Trauma: Insights Through Case-Based Learning

Monday, Dec. 1 1:30PM - 2:30PM Room: N228

Esther Ro, MD (*Moderator*) Nothing to Disclose
Summer L. Kaplan, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) List ways to spare radiation in pediatric imaging. 2) Discuss differences in adult and pediatric injury patterns in the head, abdomen, and musculoskeletal system. 3) Describe features suggestive of non-accidental trauma.

COURSE DESCRIPTION

This course covers aspects of trauma imaging that warrant special considerations in children, including protocol selection, clinical decision support, and unique injury patterns. Speakers will discuss both accidental and non-accidental trauma imaging using a case-based approach.

Sub-Events

M6-CER08C **Abdominal Trauma**

Michael R. Aquino, MD, MS (*Presenter*) Other Financial or Material Support; Elsevier

M6-CER08D **Musculoskeletal Trauma**

Summer L. Kaplan, MD, MS (*Presenter*) Nothing to Disclose

M6-CER08E **Neurological Trauma**

Arabinda K. Choudhary, MD, MBA (*Presenter*) Nothing to Disclose

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M6-CGI12

The View From Abroad: Interesting Gastrointestinal Cases From Around the World

Monday, Dec. 1 1:30PM - 2:30PM Room: E451B

Stephanie Nougaret, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize characteristic imaging findings of uncommon gastrointestinal conditions from diverse global regions. 2) Describe diagnostic strategies for infection, trauma, tumor, congenital, and hepatobiliary gastrointestinal cases using cross-sectional imaging. 3) Integrate international perspectives into clinical radiologic practice to enhance diagnostic accuracy in complex gastrointestinal presentations.

COURSE DESCRIPTION

This dynamic, case-based lecture session will showcase unique and challenging gastrointestinal imaging cases from around the world, presented by expert radiologists with international perspectives. Covering a spectrum of pathologies—including infection, trauma, tumor, congenital anomalies, and hepatobiliary disease—this session highlights regional variations in disease presentation and imaging patterns. By exploring these real-world examples, attendees will gain valuable diagnostic insights and broaden their differential diagnoses. The format includes focused lectures followed by interactive discussion, designed to enhance cross-sectional imaging interpretation skills. This session is ideal for radiologists seeking to expand their global diagnostic acumen and apply nuanced imaging strategies in daily practice.

Sub-Events

M6-CGI12B **Infection**

Se Hyung Kim, MD, PhD (*Presenter*) Nothing to Disclose

M6-CGI12C **Tumor**

Stephanie Nougaret, MD, PhD (*Presenter*) Nothing to Disclose

M6-CGI12D **Trauma**

Luis Curvo-Semedo, MD, PhD (*Presenter*) Nothing to Disclose

M6-CGI12E **Congenital**

Rudolf V. Kuhn, MD (*Presenter*) Nothing to Disclose

M6-CGI12F **Hepatobiliary**

Antonio Luna, MD, PhD (*Presenter*) Speaker's Bureau; GE. Other-Digital Oncology advisory board member;; Siemens Healthiners. Owner; Cells-IA. Other-Lecturer; Siemens Healthineers. Speaker's Bureau; United Imaging. Other-MEDICAL ADVISORY BOARD MEMBER ; Olea Medical. Other-Lecture fee; Bayer

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M6-CGU10

RSNA Hands-On Lab: Prostate MRI: 2 (Registration Fee Required) (Supported by an Unrestricted Educational Grant from Bayer HealthCare Pharmaceuticals Inc.)

Monday, Dec. 1 1:30PM - 3:00PM Room: RADIOLOGY LEARNING LAB

Tharakeswara K. Bathala, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Optimize prostate MRI protocols for diverse clinical applications, including active surveillance, biopsy guidance, staging, focal therapy planning, and post-treatment evaluation. 2) Apply interpretation skills beyond standard PI-RADS assessment to evaluate active surveillance cases, distinguish post-treatment changes from recurrent disease, and assess treatment response. 3) Integrate multiparametric prostate MRI findings with clinical context to provide structured reporting that supports multidisciplinary treatment planning and patient management decisions.

COURSE DESCRIPTION

This comprehensive hands-on prostate MRI course addresses the evolving educational needs in contemporary prostate cancer care, where clinical applications have expanded far beyond traditional PI-RADS interpretation for initial diagnosis. As prostate MRI becomes increasingly integral to patient management across the entire cancer care continuum—from screening and active surveillance to treatment planning and response assessment—radiologists require specialized skills in both technical optimization and advanced interpretation. The course tackles critical knowledge gaps in technical protocol optimization for diverse clinical scenarios, specialized interpretation skills for complex cases including post-treatment imaging and active surveillance, and the integration of emerging technologies such as deep learning algorithms. These skills are essential as healthcare systems increasingly rely on prostate MRI for precision medicine approaches including focal therapy planning, targeted biopsy guidance, and personalized treatment monitoring. The program combines focused didactic presentations with extensive hands-on learning experiences. Following instructor-led lectures on core concepts, participants engage in case-review sessions using DICOM viewers on their devices. Interactive case discussions and real-time faculty guidance enhance collaborative learning, concluding with independent case interpretation and immediate performance feedback. This is a Bring Your Own Device (BYOD) session. In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited.

Sub-Events

M6-CGU10B **RSNA Hands-On Lab: Prostate MRI - 2**

Sungmin Woo, MD, PhD (*Presenter*) Nothing to Disclose

M6-CGU10C **RSNA Hands-On Lab: Prostate MRI - 2**

Varaha Tammisetti, MBBS, MD (*Presenter*) Nothing to Disclose

M6-CGU10D **RSNA Hands-On Lab: Prostate MRI - 2**

Silvia D. Chang, MD, FRCPC (*Presenter*) Other-Speaker honorarium; Bayer Healthcare. Other-Advisory Board; Bayer Healthcare

M6-CGU10E **RSNA Hands-On Lab: Prostate MRI - 2**

Angela Tong, MD (*Presenter*) Other-Research support in the form of software and hardware ; Siemens Healthineers. Other-One time Honorarium for Speaking at a Siemens conference Innovations 2024 (5/22-23/2024; Siemens Healthineers

M6-CGU10F **RSNA Hands-On Lab: Prostate MRI - 2**

Fiona M. Fennessy, MBBCh, PhD (*Presenter*) Nothing to Disclose

M6-CGU10G **RSNA Hands-On Lab: Prostate MRI - 2**

Sadhna Verma, MD, MBA (*Presenter*) Nothing to Disclose

M6-CGU10H **RSNA Hands-On Lab: Prostate MRI - 2**

Devaki Shilpa S. Surasi, MD (*Presenter*) Grant/Research Support; Blue Earth Diagnostics. Grant/Research Support; Blue Earth Therapeutics. Consultant; Novartis. Consultant; Amgen

M6-CGU10I **RSNA Hands-On Lab: Prostate MRI - 2**

Andrei S. Purysko, MD (*Presenter*) Consultant; Koelis. Grant/Research Support; Blue Earth Medical. Grant/Research Support; American College of Radiology. Grant/Research Support; Lantheus. Grant/Research Support; Siemens Healthineers

M6-CGU10J **RSNA Hands-On Lab: Prostate MRI - 2**

Leonardo K. Bittencourt, MD, PhD (*Presenter*) Speaker's Bureau; Guerbet USA. Speaker's Bureau; Guerbet LatAm. Consultant; AIDOC. Consultant; Quibim. Stock/Shareholder; ANA Health. Stock/Shareholder; Remote Radtech

M6-CGU10K **RSNA Hands-On Lab: Prostate MRI - 2**

Ken-Pin Hwang, PhD (*Presenter*) Grant/Research Support; Siemens Healthineers

M6-CGU10L **RSNA Hands-On Lab: Prostate MRI - 2**

Sandeep S. Arora, MBBS (*Presenter*) Consultant; Profound Medical. Grant/Research Support; Profound Medical. Other-Clinical trial; Histosonics

M6-CGU10M **RSNA Hands-On Lab: Prostate MRI - 2**

Sreeharsha Tirumani, MD (*Presenter*) Nothing to Disclose

M6-CGU10N **RSNA Hands-On Lab: Prostate MRI - 2**

Adriano Basso Dias, MD, MSc (*Presenter*) Nothing to Disclose

M6-CGU10O **RSNA Hands-On Lab: Prostate MRI: 2**

David O. Henriquez Ticas, MD (*Presenter*) Nothing to Disclose

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M6-CIN05

Vision Language Model for Radiology Application (Advanced)

Monday, Dec. 1 1:30PM - 2:30PM Room: E450B

Amara Tariq, PhD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn fundamental concepts of VLM design and development. 2) Identify potential applications for VLMs in the field of radiology.

COURSE DESCRIPTION

The course is designed to introduce the audience to the applications of vision-language models (VLM) in radiology. VLMs are large foundational models with capabilities to jointly process imaging and textual data. Radiology-focused VLMs are becoming increasingly popular to meet challenges in the field of radiology such as image/report generation, information retrieval, as well as image only tasks like detection and segmentation. With the knowledge learned from both images and text during training, VLMs tend to outperform image-only or text-only models. Domain-expert speakers will present the fundamentals of VLM development as well as their latest applications in radiology.

Sub-Events

M6-CIN05B **Vision Language Model in Radiology from Report Generation to Model Auditing Agent**

Kayhan Batmanghelich, PhD (*Presenter*) Stock/Shareholder; READE.ai

M6-CIN05C **Generative AI in Medical Imaging**

Laleh Seyyed-Kalantari (*Presenter*) Nothing to Disclose

M6-CIN05D **Current Advances in Vision-Language Model Training and Evaluation**

Akshay Chaudhari, PhD (*Presenter*) Grant/Research Support; GE Healthcare. Grant/Research Support; Microsoft. Grant/Research Support; Stability.ai. Owner; Cognita Imaging Inc.. Grant/Research Support; Philips. Consultant; Subtle Medical. Stock/Shareholder; Brain Key. Stock/Shareholder; LVIS Corp. Other-Scientific Advisory Board; Chondrometrics GmbH. Consultant; Patient Square Capital. Consultant; Elucid Bioimaging. Grant/Research Support; Amazon

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M6-CMK16

RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm (Registration Fee Required)

Monday, Dec. 1 2:00PM - 3:30PM Room: S504CD

Laxshmi Veda Avula (*Moderator*) Nothing to Disclose
Linda Probyn, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review anatomy and ultrasound imaging techniques for evaluation of the elbow and forearm. 2) Describe useful imaging techniques to enhance assessment of the elbow and forearm highlighting dynamic assessment. 3) Discuss ultrasound imaging of common pathologic musculoskeletal conditions at the elbow and forearm that are commonly encountered in daily activities.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. This session will review an approach to ultrasound of the Elbow and Forearm. Part 1 (35 minutes): There will be a hands-on demonstration by an instructor showing an approach to ultrasound examination of the elbow and forearm. This will include assessment of the anterior elbow (joint effusion, brachialis tendon, biceps tendon, median nerve), medial elbow (common flexor tendons, medial ligaments, ulnar nerve), lateral elbow (common extensor tendons, lateral ligaments, radial nerve) and posterior elbow (triceps tendon, bursa). Course of the Median, Ulnar and Radial nerves will be followed into the forearm along with their relationship with muscles and tendons to the level of the wrist. Dynamic assessment will be reviewed that will assist in diagnostic assessment. (20 minutes) This will be followed by a brief presentation highlighting common pathologic musculoskeletal conditions about the elbow and forearm seen on ultrasound. This includes but not limited to, joint effusion, tendon and ligament pathology, bursitis, neurovascular injury. Pearls and pitfalls will be discussed along with dynamic evaluation to enhance diagnostic accuracy. (15 minutes) Time will be allocated for questions and answers. Part 2 (45 minutes): The participants will be divided into small groups and will practice an approach to ultrasound of the elbow and forearm on a model with an instructor teaching the participants. Proper patient positioning will be shown. Tips on how to optimize ultrasound imaging to best evaluate the area of concern will be reviewed and discussed. Participants will have an opportunity to practice these skills and techniques.

Sub-Events

M6-CMK16C **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Emma L. Rowbotham, FRCR (*Presenter*) Nothing to Disclose

M6-CMK16D **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Andrew J. Grainger, MD (*Presenter*) Nothing to Disclose

M6-CMK16E **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Meghan Jardon, MD (*Presenter*) Nothing to Disclose

M6-CMK16F **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Robert S. Campbell, MBChB, FRCR (*Presenter*) Nothing to Disclose

M6-CMK16G **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Jon A. Jacobson, MD (*Presenter*) Other-Book royalties; Elsevier. Consultant; BioClinica. Consultant; Samsung

M6-CMK16H **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Benjamin D. Levine, MD (*Presenter*) Consultant; Beckton Dickenson BD

M6-CMK16I **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Humberto G. Rosas, MD (*Presenter*) Speaker's Bureau; General Electric

M6-CMK16J **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Joseph G. Craig, MBChB (*Presenter*) Nothing to Disclose

M6-CMK16K **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Andrew B. Ross, MD, MPH (*Presenter*) Nothing to Disclose

M6-CMK16L **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Dyan V. Flores, MD (*Presenter*) Nothing to Disclose

M6-CMK16M **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Christopher F. Beaulieu, MD, PhD (*Presenter*) Nothing to Disclose

M6-CMK16N **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Mark Cresswell, MBBCh, BSc (*Presenter*) Consultant; Philips Healthcare ultrasound

M6-CMK16O **RSNA Hands-On Lab: Musculoskeletal Ultrasound: Approach to Ultrasound Assessment of the Elbow and Forearm**

Marnix T. Van Holsbeeck, MD (*Presenter*) Stock/Shareholder; General Electric. Other-Royalties; Jaypee Brothers. Other-Royalties; Ibooks. Owner; Point of Care Imaging Institute . Owner; MedEd3D. Owner; DTI

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M6-CNR05

Stroke and Neurovascular Imaging: Pearls for Practice

Monday, Dec. 1 1:30PM - 2:30PM Room: S406B

Vivek Yedavalli, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key imaging features that distinguish true strokes from stroke mimics using perfusion imaging in everyday clinical scenarios. 2) Recognize and avoid common pitfalls encountered in CT angiography when evaluating patients with suspected stroke. 3) Summarize recent advancements and clinical implications from large core trials in imaging large vessel occlusion strokes. 4) Assess the role of imaging in the detection and prognosis of medium vessel strokes, including emerging techniques and prognostic indicators. 5) Apply practical pearls and strategies to enhance confidence and accuracy in neurovascular imaging, regardless of practice environment or experience level.

COURSE DESCRIPTION

Stroke and Neurovascular Imaging: Pearls for Practice is a comprehensive session designed for radiologists and healthcare professionals involved in the diagnosis and management of stroke. This course emphasizes practical, case-based learning to address common challenges in neurovascular imaging, including stroke mimics, pitfalls in CT angiography, and the latest advances in imaging large and medium vessel occlusions. Through expert-led presentations, attendees will gain actionable insights to improve diagnostic accuracy and patient outcomes across diverse clinical settings.

Sub-Events

M6-CNR05B **Stuck in the Middle - Detection and Prognosis with Medium Vessel Stroke Imaging**

Vivek Yedavalli, MD, MS (*Presenter*) Nothing to Disclose

M6-CNR05C **Can Bigger Get Better? - Imaging Updates on Large Core Trials in Large Vessel Occlusion Stroke**

Vincent M. Timpone, MD (*Presenter*) Consultant; iSchemaView, Inc

M6-CNR05D **When My Eyes Deceive Me - Pitfalls of CT Angiography in the Setting of Stroke**

Lily L. Wang, MBBS, MPH (*Presenter*) Consultant; Roche. Grant/Research Support; Johnson & Johnson

M6-CNR05E **The Illusion with Perfusion - A Case-Based Approach of Stroke Mimics**

Vivek Yedavalli, MD, MS (*Presenter*) Nothing to Disclose

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M6-COB01

Endometriosis: Get It Right the First Time

Monday, Dec. 1 1:30PM - 2:30PM Room: E353B

Myra K. Feldman, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the clinical scope of endometriosis, impact of underdiagnosis and role of the radiologist in diagnosis. 2) Recognize endometriosis on routine pelvic ultrasound for early detection. 3) Interpret MRI findings in the context of surgical outcomes. 4) Identify common imaging pitfalls and mimics to avoid diagnostic errors.

COURSE DESCRIPTION

This comprehensive session brings together leading experts to address the diagnostic imaging challenges of endometriosis with a focus on early detection and accuracy. Participants will gain insights into this underrecognized, clinically impactful disease through focused discussion on early detection with ultrasound, MRI interpretation with surgical correlation, and common diagnostic pitfalls.

Sub-Events

M6-COB01B **Endometriosis: Underestimation of the Problem**

Myra K. Feldman, MD (*Presenter*) Nothing to Disclose

M6-COB01C **SRU Consensus for Endometriosis Detection**

Scott W. Young, MD (*Presenter*) Nothing to Disclose

M6-COB01D **MRI for Endometriosis With Surgical Correlation**

Wendaline M. VanBuren, MD (*Presenter*) Nothing to Disclose

M6-COB01E **Pitfalls and Mimics of Endometriosis**

Luciana P. Chamie, MD, PhD (*Presenter*) Nothing to Disclose

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M6-CPH03

MRI Acceleration Techniques to Reduce Scan Time: A Practical Course of Radiologists and Clinical Physicists

Monday, Dec. 1 1:30PM - 2:30PM Room: S404

Kazim Gumus, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain the principles fundamental MRI acceleration techniques, including Partial Fourier, SENSE, and GRAPPA, and identify their advantages and limitations in clinical practice. 2) Understand the principles of CAIPIRINHA, Compressed Sensing and Multi-band (Simultaneous Multi-Slice) techniques, their advantages and limitations on scan time reduction, image quality, and implementation in different MRI protocols. 3) Recognize different AI-based technologies in MRI reconstruction and acceleration, their advantages and limitations, and implementation on different MRI sequences.

COURSE DESCRIPTION

This course will consist of three lectures. It is designed to equip both radiologists and clinical physicists with fundamental knowledge of various MRI acceleration techniques, including, partial Fourier, GRAPPA, SENSE, SMS, CAIPIRINHA, and AI technologies. By understanding the underlying physics and mastering the protocols of these acceleration techniques, the course participants can optimize MRI scans, reduce scan time, and improve patient care.

Sub-Events

M6-CPH03B **Partial Fourier, SENSE, and GRAPPA Techniques**

Kazim Gumus, PhD (*Presenter*) Nothing to Disclose

M6-CPH03C **Compressed Sensing**

Ricardo Otazo, PhD (*Presenter*) Nothing to Disclose

M6-CPH03D **CAIPIRINHA, Multi-Band (Simultaneous Multi-Slice) and AI-Based MRI Acceleration Technologies**

Merry Mani, PhD (*Presenter*) Nothing to Disclose

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M6-CPH15

AAPM/RSNA Basic Physics Lecture for the RT

Monday, Dec. 1 1:30PM - 2:30PM Room: N227B

Marthony Robins, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the core principles of AI, including machine learning, deep learning, and their applications in medical imaging. 2) Understand AI-driven technologies' capabilities, benefits, and limitations for image acquisition, interpretation, and workflow optimization. 3) Identify key challenges such as bias, validation, regulatory compliance, and ethical considerations when implementing AI in radiology.

COURSE DESCRIPTION

This lecture explores the real-world applications of Artificial Intelligence (AI) in radiology, focusing on how AI enhances image acquisition, interpretation, and workflow efficiency. Designed for radiation technologists, radiologists, and medical physicists, it covers key AI technologies, including deep learning, image segmentation, and computer-aided detection. Participants will gain insights into AI-driven tools for diagnosis, quality control, and dose optimization while addressing challenges like bias, validation, and regulatory considerations. By the end of the course, attendees will understand AI's role in improving diagnostic accuracy, efficiency, and patient care while ensuring safe and effective integration into clinical practice. Case studies and interactive discussions will provide practical insights for real-world implementation.

Sub-Events

M6-CPH15C **Data-Driven Diagnosis: Applications of AI in Radiology Part 1**

Daniel Vergara, MS (*Presenter*) Nothing to Disclose

M6-CPH15D **Data-Driven Diagnosis: Applications of AI in Radiology Part 2**

Xuan V. Nguyen, MD, PhD (*Presenter*) Stock/Shareholder; Publicly traded companies providing artificial intelligence services/products and/or active in medical AI: Alphabet, Amazon, AMD, Apple, Microsoft, and Nvidia.;

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M6-RCP04

Artificial Intelligence and Radiomics: Experiences in Our Region (CIR Session in Spanish) / Inteligencia Artificial y Radiómica: Experiencias en Nuestra región (Sesión del CIR en Español)

Monday, Dec. 1 1:30PM - 2:30PM Room: S401

Pablo Soffia, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the role of radiomics in the evaluation of abdominal tumors and its clinical relevance in oncology imaging. 2) Discuss how randomized controlled trials contribute to the evidence-based validation of AI tools in radiology. 3) Identify key challenges and opportunities for AI integration in radiology practice across Latin America.

COURSE DESCRIPTION

This session, presented in Spanish, offers a unique perspective on the integration of Artificial Intelligence (AI) and radiomics across Latin America. Through focused lectures expert speakers from Mexico, Canada, Argentina, and Venezuela will share their clinical experiences, research applications, and institutional strategies related to AI implementation. The session is particularly relevant for radiologists and imaging professionals interested in how emerging technologies. Participants will gain insight into the role of radiomics in abdominal oncology, the value of randomized controlled trials in AI validation, and real-world challenges and opportunities in Latin American radiology ecosystems. By the end of this course, attendees will better understand the current applications of AI and radiomics and will be equipped with examples that could inspire or guide local implementation.

Sub-Events

M6-RCP04B **Clinical Indications of Radiomics in Abdominal Tumours /Aplicaciones de la Radiómica en Tumores Abdominales**

Adrian A. Negreros-Osuna, MD (*Presenter*) Speaker's Bureau; Konica Minolta

M6-RCP04C **Patient Outcomes in Randomized Clinical Trials of AI in Radiology / Impacto en Ensayos Clínicos Aleatorizados de IA en Radiología**

Emmanuel Salinas SR, MD (*Presenter*) Nothing to Disclose

M6-RCP04D **Current Status, Opportunities and Challenges of AI: The Argentine Experience / Actualidad, Oportunidades y Desafíos de la IA: La Experiencia Argentina**

Vasco E. Galvez, MD (*Presenter*) Nothing to Disclose

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M6-RCP38

Doctors and Litigation: Time for a New Paradigm (Sponsored by the American Association for Women in Radiology)

Monday, Dec. 1 1:30PM - 2:30PM Room: E350

Catherine J. Everett, MD, MBA (*Moderator*) Owner; Eidetico PLLC. Consultant; MSN. Employee; Radiology Partners

LEARNING OBJECTIVES

1) Identify the origins of litigation stress in the physician defendant. 2) Recognize the ways in which litigation stress and fear of litigation drive career abandonment, burnout, and suicide in physicians. 3) Explore the role of effective peer support, coaching, and education in mitigating litigation stress.

COURSE DESCRIPTION

Many doctors are completely unprepared for malpractice litigation, even though the majority will experience it during their careers. The experience is shrouded in secrecy and shame, and the individual physician often suffers in isolation, sometimes with disastrous consequences. Presenter Gita Pensa, M.D., is a legal performance and well-being coach for medical defendants. Recounting the story of her own transformative journey through twelve years of grueling litigation, she will discuss the complexities of litigation stress in doctors, its impact beyond legal outcomes, and how education and more effective support strategies for defendants can mitigate its impact.

Sub-Events

M6-RCP38B Doctors and Litigation: Time for a New Paradigm

Gita Pensa, MD (*Presenter*) Nothing to Disclose

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M7-CAS05

Remote Imaging (Sponsored by the RSNA Associated Sciences Consortium)

Monday, Dec. 1 3:00PM - 4:00PM Room: N226

Brian Fox, MBA (*Moderator*) Nothing to Disclose
Charlotte Beardmore, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the current state of remote imaging in the industry through a review of recent organizational surveys and current workgroup activities designed to inform and guide healthcare organizations on key considerations. 2) Understand the structure, functionality, and integration of remote operations for CT and MR imaging within clinical workflows. 3) Evaluate the operational, clinical, and regulatory implications of implementing remote technologies, including cybersecurity, certification/accreditation, education/training and patient safety. 4) Apply best practices for remote scanner operation, communication, and quality assurance through real-world case studies and practical scenarios.

COURSE DESCRIPTION

This course introduces the concept and application of remote operations in CT and MR imaging—centralized, technology-enabled workstations that allow radiographers/radiologic technologists to operate scanners across multiple sites from a single location. As healthcare organizations seek to optimize resources, improve access for patients, and enhance workforce flexibility, remote solutions are emerging as a transformative innovation in diagnostic imaging. These evolving technologies require a thorough review and understanding of the regulatory landscape as well other key considerations around patient safety and staff education.

Sub-Events

M7-CAS05C **Remote Imaging**

Napapong Pongnapang, BSc, PhD (*Presenter*) Nothing to Disclose

M7-CAS05D **Remote Imaging**

Melody W. Mulaik, MS (*Presenter*) Nothing to Disclose

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M7-CCA13

Cardiac CT Mentored Case Review: Imaging of Cardiac and Pericardial Neoplasms, Adult Congenital Heart Disease, and Endocarditis

Monday, Dec. 1 3:00PM - 4:00PM Room: E353C

Daniel Ocazionez-Trujillo, MD (*Moderator*) Nothing to Disclose
Katherine A. Kaproth-Joslin, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify and describe cardiac and pericardial neoplasms commonly faced in cardiac imaging. 2) Become familiar with adult congenital heart disease and develop an approach to interpreting this complex imaging. 3) Understand the role of CT imaging in endocarditis evaluation, including complications that may be encountered.

COURSE DESCRIPTION

This is a mentored case-based review of Cardiac CT imaging. In this session, we will be reviewing imaging of cardiac and pericardial neoplasms, adult congenital heart disease and the imaging of endocarditis. This educational session is targeted to diagnostic radiologists and cardiothoracic imagers and is designed to improve knowledge and competence in the field of cardiac CT imaging.

Sub-Events

M7-CCA13C **Cardiac and Pericardial Neoplasms**

Smita Patel, MBBS, FRCR (*Presenter*) Nothing to Disclose

M7-CCA13D **Adult Congenital Heart Disease**

Linda B. Haramati, MD, MS (*Presenter*) Nothing to Disclose

M7-CCA13E **Imaging of Endocarditis**

Anna S. Bader, MD (*Presenter*) Nothing to Disclose

M7-CCA13F **Pre- and Post Ablation Atrial Imaging**

Sandeep S. Hedgire, MD (*Presenter*) Nothing to Disclose

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M7-CER10

Transforming Emergency Radiology With Artificial Intelligence in 2025

Monday, Dec. 1 3:00PM - 4:00PM Room: E350

Anjali Agrawal, MD (*Moderator*) Nothing to Disclose
Melissa A. Davis, MD, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the current state of the implementation of AI tools in the ED radiology setting. 2) Learn the potential impact of AI tools on radiologists in their midcareer and how to navigate change. 3) Learn about current developments in AI applicable to ED radiology.

COURSE DESCRIPTION

In this course participants will gain an understanding of current AI tool implementations in the ED radiology setting and their impacts on practice as well as a discussion on how the practicing radiologist should approach these emerging tools.

Sub-Events

M7-CER10C **AI Research and Development in Trauma/ER Radiology: Past, Present, and Future**

David Dreizin, MD (*Presenter*) Nothing to Disclose

M7-CER10D **Real World Implementation of AI in the Emergent Setting. Is the Hype Worth it?**

Melissa A. Davis, MD, MBA (*Presenter*) Nothing to Disclose

M7-CER10E **The Predicament of a Midcareer Radiologist in the Age of AI**

Anjali Agrawal, MD (*Presenter*) Nothing to Disclose

Printed on: 02/18/26

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M7-CGI05

Tips for Starting New GI Service Lines: Photon Counting CT, CT Colonography, Novel Contrast Agents, Contrast Enhanced Ultrasound

Monday, Dec. 1 3:00PM - 4:00PM Room: E451B

Bari Dane, MD (*Moderator*) Speaker's Bureau; Siemens Healthineers. Other-Advisory board; Olympus

Sub-Events

M7-CGI05B **Photon Counting CT**

Bari Dane, MD (*Presenter*) Speaker's Bureau; Siemens Healthineers. Other-Advisory board; Olympus

M7-CGI05C **Novel Contrast Agents**

Benjamin M. Yeh, MD (*Presenter*) Consultant; General Electric Healthcare. Consultant; Nextrast. Stock/Shareholder; Nextrast. Other-Book Royalties; Oxford University Press. Other-Patent royalties; UCSF. Other-Board member; Nextrast. Speaker's Bureau; Canon Healthcare. Speaker's Bureau; Philips Healthcare

M7-CGI05D **CT Colonography**

Cecelia Brewington, MD (*Presenter*) Nothing to Disclose

M7-CGI05E **Contrast Enhanced Ultrasound**

Stephanie R. Wilson, MD (*Presenter*) Speaker's Bureau; Philips. Consultant; Lantheus. Other-Equipment support as part of a research agreement; Siemens . Other-Equipment support; Philips . Other-Equipment support; Samsung

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M7-CGU03

GU Cased-Based Session: Fundamentals (Audience Participation)

Monday, Dec. 1 3:00PM - 4:00PM Room: E353B

Kerry L. Thomas, MD (*Moderator*) Stock/Shareholder; United Healthcare. Stock/Shareholder; AbbieVie. Stock/Shareholder; AmGen. Stock/Shareholder; MedTronic. Stock/Shareholder; Boston Scientific. Stock/Shareholder; Johnson & Johnson. Stock/Shareholder; Thermo Fisher
Sina Houshmand, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify and describe imaging characteristics and differential diagnosis of common entities of the kidneys, bladder, ureter, and adrenal glands. 2) Test knowledge via an audience participation, cased-based session. 3) Discuss key imaging findings that refine the differential diagnosis.

COURSE DESCRIPTION

This audience participation, cased-based, educational session will present learners with an opportunity to review common entities encountered in the GU system, specifically with concentration on kidneys, bladder, ureter and adrenal glands.

Sub-Events

M7-CGU03C **Kidney**

Gigin Lin, MD (*Presenter*) Nothing to Disclose

M7-CGU03D **Bladder/Ureter**

Lyndon Luk, MD (*Presenter*) Nothing to Disclose

M7-CGU03E **Adrenal**

Elaine M. Caoili, MD, MS (*Presenter*) Other-Steering Committee, Proceduralist network; ProKidney

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M7-CHN04

Temporal Bone Boot Camp

Monday, Dec. 1 3:00PM - 4:00PM Room: E352

Ian T. Mark, MD (*Moderator*) Grant/Research Support; GE Healthcare. Grant/Research Support; Lantheus

LEARNING OBJECTIVES

1) Identify and describe the key anatomical structures of the temporal bone. 2) Detect and characterize common and critical post-operative imaging appearances of the temporal bone. 3) Understand the unique anatomical and pathological considerations in pediatric temporal bone imaging. 4) Explore the principles and advantages of photon-counting detector CT in temporal bone imaging. 5) Review the imaging features of Meniere's disease and understand the role of delayed contrast-enhanced MRI.

COURSE DESCRIPTION

This lecture session is designed to equip radiologists with essential and advanced knowledge in temporal bone imaging. Through a series of focused, expert-led talks, attendees will gain a solid foundation in practical temporal bone anatomy, learn to confidently interpret post-operative imaging, and understand the nuances of pediatric temporal bone evaluation. The session will also explore cutting-edge developments in imaging technology, including photon counting detector-CT, and review the evolving role of MRI in diagnosing Meniere's disease. Ideal for radiologists at all levels, this boot camp blends core anatomical review with state-of-the-art imaging advances to enhance diagnostic accuracy and clinical collaboration.

Sub-Events

M7-CHN04B **Practical Temporal Bone Anatomy**

Ram Vaidhyanath, FRCR (*Presenter*) Nothing to Disclose

M7-CHN04C **Postoperative Imaging in the Temporal Bone**

Hugo Tames, MD (*Presenter*) Nothing to Disclose

M7-CHN04D **Pediatric Temporal Bone Imaging**

Joanne Rispoli, MD (*Presenter*) Nothing to Disclose

M7-CHN04E **Advances in Temporal Bone Imaging including PCCT and Imaging for Meniere's Disease**

Amy F. Juliano, MD (*Presenter*) Nothing to Disclose

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M7-CIN07

From Theory to Practice: GenAI Skills for Radiologists

Monday, Dec. 1 3:00PM - 4:00PM Room: E450B

Lisa C. Adams, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the foundational principles of generative AI and their specific applications in radiology. 2) Apply effective prompting techniques for large language models to support research and clinical workflows. 3) Assess practical strategies for translating diffusion models and other GenAI tools from research into routine radiological practice.

COURSE DESCRIPTION

Generative AI (GenAI) is rapidly entering radiology, yet many radiologists lack clear, practical guidance for its clinical use. This session is designed to provide a realistic overview of GenAI's applications and limitations in everyday radiology practice. Through focused lectures and live interaction using Poll Everywhere, participants will learn about the fundamentals of GenAI models, effective prompting strategies for large language models, and practical considerations for deploying diffusion models in clinical settings. By the end of the session, attendees will be better prepared to assess and incorporate GenAI tools into their research and clinical workflows.

Sub-Events

M7-CIN07B **GenAI in Radiology Explained**

Lisa C. Adams, MD, PhD (*Presenter*) Nothing to Disclose

M7-CIN07C **Laying the Foundation (Models)**

Isabel Molwitz, MD, MBA (*Presenter*) Other-As a speaker on one occasion.; Philips Healthcare

M7-CIN07D **How to Use LLMs: Prompting Hacks for Research and Clinic**

Keno K. Bressem, MD (*Presenter*) Nothing to Disclose

M7-CIN07E **Taking Diffusion Models from Bench to Bedside**

Anna Zapaishchykova, MSc (*Presenter*) Consultant; C10 Labs

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M7-CIR07

Lessons Learned From My Biggest Complications

Monday, Dec. 1 3:00PM - 4:00PM Room: E351

Anne M. Covey, MD (*Moderator*) Stock/Shareholder; Amgen. Other-Royalties; Oxford University Press. Consultant; Boston Scientific. Other-Section Editor; American Journal of Roentgenology

LEARNING OBJECTIVES

1) Assess patient-specific and condition-specific risk factors that increase the likelihood of complications. 2) Formulate appropriate management plans for the prevention and treatment of complications. 3) Evaluate strategies for reducing the incidence of complications.

COURSE DESCRIPTION

This course offers a discussion of complications related to common and challenging interventional procedures. A panel of experts will provide insights into the identification, prevention, and management of complications related to Y90, biliary intervention, venous stenting and pulmonary thrombectomy.

Sub-Events

M7-CIR07B Complications of Venous Stenting

Nariman Nezami, MD (*Presenter*) Other-Advistory Borad; CAPS Medical. Owner; Nezami LLC. Owner; IRAD Graphics. Owner; Informed Medical Solutions. Consultant; Boston Scientific. Other-Safety Monitor; Microbot Medical. Consultant; Medtronic. Owner; NextSight Consulting. Grant/Research Support; Guerbet Medical

M7-CIR07C Complications of Y90 Radioembolization

Kirema I. Garcia-Reyes, MD (*Presenter*) Consultant; Boston Scientific . Consultant; Cook Medical. Consultant; Astra Zeneca . Consultant; Neuwave. Consultant; Varian

M7-CIR07D Complications of PE Thrombectomy

Peiman Habibollahi, MD (*Presenter*) Consultant; Sirtex. Consultant; Varian. Speaker's Bureau; TriSalus. Speaker's Bureau; Sirtex

M7-CIR07E Complications of Biliary Interventions

William S. Rilling, MD (*Presenter*) Consultant; Boston Scientific. Consultant; Varian. Consultant; BD/ Bard. Consultant; Astra Zeneca. Consultant; Terumo. Other-Board Member; Society of Interventional Oncology. Consultant; Eisai

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M7-CMK13

Cartilage Imaging: From Fundamentals to Treatment Strategies

Monday, Dec. 1 3:00PM - 4:00PM Room: E450A

Christine B. Chung, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the MR imaging characteristics, anatomy, and pathogenesis of chondral, osteochondral, and subchondral injuries using standardized terminology. 2) Explain the role of imaging in the diagnosis and assessment of osteoarthritis, including its impact on treatment planning and disease monitoring. 3) Evaluate postoperative imaging findings following cartilage repair procedures, with an emphasis on MR imaging of the knee, to guide clinical decision-making.

COURSE DESCRIPTION

This lecture-based session provides a comprehensive overview of cartilage imaging, spanning foundational anatomy and injury mechanisms to advanced imaging techniques and postoperative assessment. Expert faculty will explore the MR imaging features of chondral, osteochondral, and subchondral lesions, the role of imaging in diagnosing and monitoring osteoarthritis, and the evaluation of cartilage repair procedures, with a focus on the knee. The session addresses the growing clinical demand for precise, standardized imaging in cartilage injury and repair. By the end of the session, learners will be better equipped to interpret cartilage imaging across the disease spectrum and contribute meaningfully to treatment planning and patient care.

Sub-Events

M7-CMK13B **Diagnosis of Osteoarthritis: What can Imaging Offer?**

Christine B. Chung, MD (*Presenter*) Nothing to Disclose

M7-CMK13C **Imaging after Cartilage Repair: Focus on the Knee**

David A. Rubin, MD (*Presenter*) Consultant; ImageBiopsy Lab. Stock/Shareholder; Johnson and Johnson. Stock/Shareholder; Pfizer. Consultant; Teledoc

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M7-CNPM06

The Future of Education: Advances in Evaluation and Intervention

Monday, Dec. 1 3:00PM - 4:00PM Room: S402

Jessica G. Fried, MD (*Moderator*) Nothing to Disclose
Laura L. Avery, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe innovative approaches to radiology education, including curriculum redesign, competency-based training, and AI-supported learning tools. 2) Compare international models of medical education with an emphasis on the UK's implementation of competency-based frameworks. 3) Identify effective coaching strategies to support struggling trainees and promote sustainable professional growth. 4) Apply principles of precision education to personalize resident teaching and assessment in real-time clinical settings. 5) Reflect on current challenges in educational evaluation and intervention and consider actionable steps to implement change within their own institutions.

COURSE DESCRIPTION

The way we train and evaluate radiology residents is rapidly evolving. This session will explore bold forward-thinking approaches that are reshaping the educational landscape. From reworking the traditional curriculum to tapping into the power of AI and personalized coaching, our panel of educators bring diverse experiences and fresh insights to the table.

Sub-Events

M7-CNPM06C Reworking the Traditional Radiology Curriculum

Scott A. Simpson, DO, MEd (*Presenter*) Nothing to Disclose

M7-CNPM06D Competency-Based Medical Education: The UK Experience

Meetal Shah, MBChB (*Presenter*) Other-Honoraria for speaking about imaging at study days on biliary tract cancer and HCC; Astra Zeneca

M7-CNPM06E Precision Education: AI-Driven Tools for Targeted Resident Education

Vinay Prabhu, MD, MS (*Presenter*) Stock/Shareholder; Moderna. Stock/Shareholder; Abbvie. Stock/Shareholder; Repligen. Stock/Shareholder; Teladoc. Stock/Shareholder; Sanofi S.A.. Consultant; Canon. Consultant; WCG Clinical. Speaker's Bureau; American Urological Association. Consultant; Centaur Diagnostics, Inc.

M7-CNPM06F How to Help Struggling Trainees Through Coaching

Sophia R. O'Brien, MD, MEd (*Presenter*) Consultant; GE

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M7-CPD04

Planning a Greener Future in Pediatric Radiology

Monday, Dec. 1 3:00PM - 4:00PM Room: N228

John B. Amodio III, MD (*Moderator*) Nothing to Disclose
Sumit Pruthi, MBBS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Inform radiologists of the various ways to use AI to enhance sustainability in pediatric radiology. 2) Explain the basic principles of photon counting CT and how it differs from conventional CT systems. 3) Discuss advantages and limitations of non-contrast and contrast-enhanced MRA techniques. 4) Reduce contrast volume and waste through creative strategies.

COURSE DESCRIPTION

This session will take a practical look at photon counting CT (PCCT) — what makes the technology different, and why it matters in everyday clinical practice. We'll start with a quick overview of how direct photon conversion and energy discrimination with PCCT can lead to sharper images and less noise, even at lower doses. There will also be discussion of use of AI to enhance sustainability in pediatric radiology and discussion of advantages and limitations of non-contrast and contrast-enhanced MRA techniques Review of common contrast agents used in radiology and their environmental impact across the life cycle—from procurement to disposal. We'll explore practical ways to reduce contrast use, avoid unnecessary administration, and minimize environmental waste.

Sub-Events

M7-CPD04C **How AI Can Enhance Sustainability in Radiology**

Andy Tsai, MD, PhD (*Presenter*) Nothing to Disclose

M7-CPD04D **MR Angiogram: When to Use Contrast**

Govind B. Chavhan, MD (*Presenter*) Nothing to Disclose

M7-CPD04E **Waste Not, Want Not: Eliminate Waste in the Radiology Department (CONTRAST PERSPECTIVE)**

Helen Hye Ryong Kim, MD (*Presenter*) Nothing to Disclose

M7-CPD04F **Seeing More With Less: The Advantages of Dose Reduction With Photon Counting CT**

Ashishkumar K. Parikh, MD (*Presenter*) Other-No financial relationship. Siemens has provided educational content for my talk.; Siemens

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M7-CPH02

Total Body PET/CT Imaging: Current and Future Status of This Technology Innovation

Monday, Dec. 1 3:00PM - 4:00PM Room: S404

Osama R. Mawlawi, PhD (*Moderator*) Grant/Research Support; GE HealthCare

LEARNING OBJECTIVES

1) Learn about the various commercial TB system offerings and their performance characteristics. 2) Learn about the potential clinical and research applications of TB PET/CT systems. 3) Develop an in-depth understanding of the advantages and challenges of TB PET/CT systems.

COURSE DESCRIPTION

Total body (TB) PET/CT is one of the major recent innovations in the field of PET imaging. This is evidenced by the introduction of several TB systems from various manufacturers such as General Electric, SIEMENS, and United imaging. With total body PET there are potential advantages of reduced scan duration, decreased patient radiation dose, new clinical/research applications and quantitative outcome measures. This session will discuss the design and performance characteristics of these various systems as well as their potential clinical and research applications in oncology. A moderated debate centered around the need for TB systems in nuclear medicine is also included in this session and will cover the advantages/need for these systems versus their challenges.

Sub-Events

M7-CPH02B **Commercial TB PET/CT Systems and Their Performance Characteristics**

Ciprian Catana, PhD, MD (*Presenter*) Nothing to Disclose

M7-CPH02C **Clinical and Research Applications of TB PET/CT Systems**

Kirsten Korsholm (*Presenter*) Other-Honoraria for presenting own research findings ; Siemens Healthineers

M7-CPH02D **Moderated Debate/Discussion: Should or Shouldn't We Buy a TB PET/CT System**

Osama R. Mawlawi, PhD (*Presenter*) Grant/Research Support; GE HealthCare

M7-CPH02E **Moderated Debate/Discussion: Should or Shouldn't We Buy a TB PET/CT System**

Ciprian Catana, PhD, MD (*Presenter*) Nothing to Disclose

M7-CPH02F **Moderated Debate/Discussion: Should or Shouldn't We Buy a TB PET/CT System**

Kirsten Korsholm (*Presenter*) Other-Honoraria for presenting own research findings ; Siemens Healthineers

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M7-CPH16

Best of AAPM Summer School: Chicago Fireside Chat: Best of AAPM Summer School: Workflow Optimization

Monday, Dec. 1 3:00PM - 4:00PM Room: N227B

Colleen Fox, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn selected operations management terms as they apply to radiation related workflows. 2) Gain exposure to individual and department-based approaches to improve productivity and reduce burnout. 3) Consider the pros and cons of the implementation and clinical-use of AI-based auto-contouring as an example workflow optimization effort. 4) Contemplate the undesirable or unintentional impact of workflow optimization on the professionals in that workflow.

COURSE DESCRIPTION

Over the last few years discussions on workforce shortages in the radiation professions have become common place. At the same time there are an increasing number of automation and AI solutions offering to improve workflow efficiency. Care needs to be taken to keep overall goals and the satisfaction of the staff in mind during improvement efforts. This session will explore some of the commonly held ideas around workflow optimization in a dynamic Q&A format with faculty from the AAPM 2024 Summer School on this topic. The course will touch on basic operations management terminology, potential impacts of workflow optimization efforts on the worker, and explore a few strategies that have been deployed in various radiation workflows.

Sub-Events

M7-CPH16B **Workflow Considerations for Implementation and Clinical-Use of AI-Based Auto-Contouring in RT**

Carlos E. Cardenas, PhD (*Presenter*) Nothing to Disclose

M7-CPH16C **Optimization: Beyond the Numbers**

Andrew Hope (*Presenter*) Grant/Research Support; Varian Medical Systems, Inc

M7-CPH16D **Work Day Optimization at the Personal and Departmental Level**

Leah Katz, MD, MPH (*Presenter*) Nothing to Disclose

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M7-CRO03

Breast Cancer Tumor Board

Monday, Dec. 1 3:00PM - 4:00PM Room: S401

Bethany L. Niell, MD, PhD (*Moderator*) Other-Hologic Inc furnished Moffitt Cancer Center with research loan equipment for an NIH/NCI funded multi-center trial (PI: Shepherd). I serve as the site PI for Moffitt. ; Hologic Inc. Other-panel vice-chair, no financial compensation except reimbursement for travel when required by the NCCN for in person panel meetings; National Comprehensive Cancer Network, breast cancer screening and diagnosis panel vice-chair

LEARNING OBJECTIVES

1) Describe the latest advances in breast cancer imaging before, during, and after treatment. 2) Facilitate a multidisciplinary approach to the diagnosis, management, and treatment of breast cancer.

COURSE DESCRIPTION

This course utilizes a case-based multi-disciplinary approach to discuss appropriate breast imaging examinations, available radiotherapy options, breast pathophysiology, as well as medical and surgical oncologic treatment planning in the setting of breast cancer.

Sub-Events

M7-CRO03B **Breast Cancer Tumor Board**

Avan Armaghani, MD (*Presenter*) Other-Advisory Board; Gilead

M7-CRO03C **Breast Cancer Tumor Board**

Lorena Gonzalez, MD (*Presenter*) Nothing to Disclose

M7-CRO03D **Breast Cancer Tumor Board**

Anna Shapiro, MD (*Presenter*) Nothing to Disclose

M7-CRO03E **Breast Cancer Tumor Board**

Rohin Mehta, MD (*Presenter*) Nothing to Disclose

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M7-CVA02

Vascular Imaging From Cardiac ICU to Clinic

Monday, Dec. 1 3:00PM - 4:00PM Room: S503

Minhaj S. Khaja, MD, MBA (*Moderator*) Grant/Research Support; Boston Scientific. Other-Speaking honoraria; Boston Scientific. Other-Speaking honoraria and non-compensated advisory board member-venous; Medtronic. Other-Speaking honoraria; Penumbra
Roberta Catania, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify cardiopulmonary support devices on imaging. 2) Describe acute and chronic considerations in endograft imaging. 3) Discuss expected and unexpected findings following surgical repair of the thoracic aorta.

COURSE DESCRIPTION

Core concepts related to vascular imaging will be highlighted in lectures focussing on identification of cardiac devices, expected findings after endovascular and surgical repair of the thoracic aorta, and post-intervention complications on imaging

Sub-Events

M7-CVA02C Cardiopulmonary Support Devices

Felipe A. Sanchez, MD (*Presenter*) Nothing to Disclose

M7-CVA02D Endograft Imaging: Acute and Chronic Considerations

Minhaj S. Khaja, MD, MBA (*Presenter*) Grant/Research Support; Boston Scientific. Other-Speaking honoraria; Boston Scientific. Other-Speaking honoraria and non-compensated advisory board member-venous; Medtronic. Other-Speaking honoraria; Penumbra

M7-CVA02E Graft Repair of the Thoracic Aorta: Expected and Unexpected Findings

Barbara Hamilton, MD, MS (*Presenter*) Nothing to Disclose

M7-CVA02F Imaging Complications of Aortic Surgery

Maria C. Ferrario, MD (*Presenter*) Speaker's Bureau; Boehringer ingelheim. Speaker's Bureau; Bayer

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M7-RCP01

Fast 5

Monday, Dec. 1 4:00PM - 4:30PM Room: ARIE CROWN THEATER

Amy K. Patel, MD (*Moderator*) Consultant; Hologic . Consultant; Bayer. Consultant; SuperSonic Image. Other-AE; Associate Editor, Digital Media, JACR. Other-content contributor; Modality. Speaker's Bureau; ACR RLI Speakers Bureau. Stock/Shareholder; Kheiron Medical

COURSE DESCRIPTION

Engaging, rapid-paced experience featuring 5 speakers each delivering a five-minute presentation accompanied by slides

Sub-Events

M7-RCP01B Decoding the Business of Radiology and Why We Must Own It

Mariam Moshiri, MD, MBA (*Presenter*) Consultant; Sonos Microsystem

M7-RCP01C The Home Field Advantage: Leveraging Sports to Build Patients' Trust

Matthew J. Miller, MD (*Presenter*) Consultant; Mammotome. Other-Associate Editor; Aquifer

M7-RCP01D Sustainable Imaging Sustainable Careers

Rachel F. Gerson, MD, MBA (*Presenter*) Other-Advisory board member. Limited stock options.; Agamon Health. Other-Participant in a one time 4 hour advisory board meeting. Received <$2500 in payment.; Bayer Pharamceuticals

M7-RCP01E Advocacy: From Behind the Screen to the Forefront of Change

Alexander C. Podlaski, MD (*Presenter*) Nothing to Disclose

M7-RCP01F Building Culture at Scale: How Shared Ownership Restores Our Individuality in Radiology

Andrew K. Moriarity, MD, MBA (*Presenter*) Nothing to Disclose

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M7-RCP23

Optimizing Radiologist Efficiency and Ergonomics: Informatics Solutions Leveraging AI/ML Workflows and Proactive Workstation Configurations (Sponsored by the RSNA Quality Improvement Committee)

Monday, Dec. 1 3:00PM - 4:00PM Room: E353A

Les R. Folio, DO, MPH (*Moderator*) Consultant; General Electric

LEARNING OBJECTIVES

1) Enhance wellbeing through time-tested basic ergonomic principles: three points of contact, 20-20-20 rule, and tailored, supportive workstation configuration adapting to high-volume imaging interpretation demands. 2) Understand structured hyponym-based dictation enhancing efficiency, clarity, consistency, and clinical relevance in radiology reports. 3) Streamline, simplify, and supercharge dictation with smart tools, AI auto-impressions, and workflow hacks.

COURSE DESCRIPTION

Our educational session is designed for all practicing radiologists, in addition to all imaging-centric clinical specialties — including pathologists, cardiologists, dermatologists and ophthalmologists — who are managing increasingly complex imaging data in dynamic work environments. We'll explore the full spectrum of the modern imaging workspace: from optimizing reading room environments and human-computer interactions to streamlining workflows with ergonomic hands-free, template-free hyponym dictation keeping our focus on the images, not a report template.We will further explore how radiology practices can leverage AI and IT solutions to enhance efficiency in ways that elevate both patient care and physician well-being. Participants will learn how to design and configure monitor workstations using evolving industry and practice standards, ergonomic best practices, and practical, affordable tools including articulating monitor arms, ergonomic dictation stands, and standard on-board memory gaming mouses.

Sub-Events

M7-RCP23B **Work Smarter, Not Harder: Designing an Efficient Practice Environment That Supports High-Quality - Individualized Care**

Katerina Dodelzon, MD (*Presenter*) Nothing to Disclose

M7-RCP23C **Smart Reporting in Action: How AI and Custom Workflow Tools Are Transforming Radiology Dictation**

Cyrillo R. Araujo, MD (*Presenter*) Owner; BioPen LLC. Owner; Biopsy Innovations LLC. Owner; Access Health LLC

M7-RCP23D **Comfort Meets Productivity: Engineering the Ultimate Workstation**

Les R. Folio, DO, MPH (*Presenter*) Consultant; General Electric

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M7-RCP29

Collaborative Translation of Theranostic Innovation From Bench to Commercialization to Clinical Practice (Sponsored by the RSNA Research Development Committee)

Monday, Dec. 1 3:00PM - 4:00PM Room: S502

David A. Mankoff, MD, PhD (*Moderator*) Consultant; GE Healthcare. Other-Scientific Advisory Board; Reflexion. Other-Scientific Advisory Board; ImaginAb. Stock/Shareholder; Trevarx. Consultant; Blue Earth Diagnostics
J. Brian Fowlkes, PhD (*Moderator*) Other-Equipment Support; Philips Healthcare. Other-Equipment Support; GE Healthcare. Consultant; Lantheus Medical Imaging
Shadi Abdar Esfahani, MD, MPH (*Moderator*) Grant/Research Support; SOFIE Biosciences . Consultant; Telix Pharmaceuticals. Grant/Research Support; Telix Pharmaceuticals. Grant/Research Support; Novartis Pharmaceuticals

LEARNING OBJECTIVES

1) Describe the translational pathway of PSMA-based theranostic agents, from discovery to commercialization. 2) Identify key scientific, clinical, and regulatory milestones in bringing radiopharmaceutical innovations to clinical practice. 3) Observe and learn how the challenges were addressed and overcome in different settings to reach a successful stage. 4) Recognize the importance of collaboration among basic scientists, clinicians, and industry in advancing cancer diagnostics and therapeutics. 5) Apply insights from case studies to facilitate translational efforts in their own research or clinical settings.

COURSE DESCRIPTION

This dynamic and interactive session focuses on the translational journey of PSMA-based theranostics—paired diagnostic and therapeutic radiopharmaceuticals—from laboratory discovery to clinical implementation and commercialization. Bringing together experts in basic science, clinical investigation, and industry, this course will provide a behind-the-scenes look at the collaborative process that enables innovative cancer management approaches to reach patients. With a special focus on prostate cancer, attendees will hear directly from leading figures involved in the development, clinical application, and commercial distribution of PSMA-targeted radiopharmaceuticals. This session is designed to appeal to radiologists, clinician-investigators, and industry professionals, and aligns with RSNA's mission to increase translational research content in its educational offerings.

Sub-Events

M7-RCP29D PSMA Origins

Martin G. Pomper, MD, PhD (*Presenter*) Other-I have equity and indirectly provides sponsored research to my department. I am also a paid consultant to them.; Z-Alpha. Owner; D&D Pharmatech and subsidiaries. Other Financial or Material Support; Lantheus Holdings. Other-Licensed technology; Novartis. Other Financial or Material Support; Intuitive Surgical

M7-RCP29E The Path to Biomarker-Informed Theranostics Clinical Trials

Amir Iravani, MD (*Presenter*) Grant/Research Support; Novartis . Consultant; Novartis . Consultant; ITM. Consultant; Lantheus. Consultant; Bayer

M7-RCP29F Commercialization Strategy: Industry's Role in Scaling and Delivering PSMA-Based Radiopharmaceuticals

Mary Jessel (*Presenter*) Nothing to Disclose

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M8-CAS06

Imaging Sites of Care and the Future of Technology/Equipment Planning (Sponsored by the RSNA Associated Sciences Consortium)

Monday, Dec. 1 4:30PM - 5:30PM Room: N226

Brian Fox, MBA (*Moderator*) Nothing to Disclose
Catherine Gunn, MBA, RT (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe evolving trends, shifting sites of care, and demand for imaging modalities. 2) Identify technology trends impacting imaging equipment selection and deployment. 3) Apply strategic frameworks for imaging capital planning across care sites. 4) Understand how to align equipment planning with patient access, quality, and cost-effectiveness.

COURSE DESCRIPTION

The healthcare imaging landscape is evolving rapidly, with shifting sites of care, new therapies, and technological advancements redefining how and where care is delivered. This session explores the forecasted imaging volumes by modality and site of care—from traditional hospital-based departments to outpatient centers, ambulatory surgery facilities, and even retail clinics. Attendees will gain insights into how these shifts are influencing technology adoption and equipment planning strategies. The course will address key trends in imaging utilization, the impact on technology investments, and how emerging technologies are enabling these dynamics in patient care.

Sub-Events

M8-CAS06C **Imaging Sites of Care & the Future of Technology/Equipment Planning**

Adam Fairbourn (*Presenter*) Nothing to Disclose

M8-CAS06D **Imaging Sites of Care & the Future of Technology/Equipment Planning**

Gurmeet Bawa, MS (*Presenter*) Nothing to Disclose

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M8-CBR05

Multimodality AI-Enhanced Breast Imaging: Transforming Detection and Diagnosis

Monday, Dec. 1 4:30PM - 5:30PM Room: S406A

Linda Moy, MD (*Moderator*) Grant/Research Support; Siemens Research Grant. Consultant; Lunit Inc. Consultant; iCAD. Consultant; Guerbet. Other-Meeting and Travel Expenses; British Society of Breast Radiology, European Society of Breast Imaging,. Other-DSMB; ACR DSMB

LEARNING OBJECTIVES

1) Identify the role of AI in the screening, triage, and detection of breast cancer. 2) Discuss strategies to use AI to enhance breast cancer prediction and prognosis. 3) Review multimodality risk-assessment.

COURSE DESCRIPTION

This course will discuss the increasing role of AI to assist with breast cancer detection and its role in predicting a woman's risk to develop a future breast cancer

Sub-Events

M8-CBR05B Screening, Triage and Detection

Linda Moy, MD (*Presenter*) Grant/Research Support; Siemens Research Grant. Consultant; Lunit Inc. Consultant; iCAD. Consultant; Guerbet. Other-Meeting and Travel Expenses; British Society of Breast Radiology, European Society of Breast Imaging,. Other-DSMB; ACR DSMB

M8-CBR05C Breast Cancer Prediction and Prognosis

Fernando Collado-Mesa, MD (*Presenter*) Nothing to Disclose

M8-CBR05D Multimodality Risk-Assessment

Elizabeth A. Morris, MD (*Presenter*) Speaker's Bureau; Guerbet. Speaker's Bureau; GE. Speaker's Bureau; Lunit. Stock/Shareholder; Reveal . Consultant; Bayer

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M8-CIN08

Agentic AI in Radiology: Definitions and Applications (Advanced)

Monday, Dec. 1 4:30PM - 5:30PM Room: E450B

Paulo E. Kuriki, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define the core principles and types of agentic AI and distinguish them from traditional AI systems. 2) Describe practical applications of agentic AI in current radiology workflows. 3) Identify challenges and future directions for adopting agentic AI in multidisciplinary clinical settings.

COURSE DESCRIPTION

This session explores the use of agentic artificial intelligence (AI) in radiology, focusing on interactive, autonomous AI agents that go beyond traditional task-based algorithms. Through foundational overviews and real-world case studies, attendees will understand how agentic AI is reshaping radiology workflows, improving clinical decision-making, and enabling patient-centric innovations. The session will feature expert-led lectures followed by a panel discussion, offering practical guidance for safely integrating these systems into clinical practice.

Sub-Events

M8-CIN08B **Future Directions and Perspectives for Agentic AI**

Paulo E. Kuriki, MD (*Presenter*) Nothing to Disclose

M8-CIN08C **Agentic AI: Foundations and Types**

Imon Banerjee, PhD (*Presenter*) Nothing to Disclose

M8-CIN08D **Real-World Use Cases of AI Agents in Radiology**

George L. Shih, MD, MS (*Presenter*) Other-Consultant and Shareholder;Board of Directors; MD.ai. Other-Unpaid Advisor; OpenAI. Other-Board of Directors; SIIM

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M8-CIR08

The Most Important Papers of the Year That You Must Know

Monday, Dec. 1 4:30PM - 5:30PM Room: E351

Bradford J. Wood, MD (*Moderator*) Grant/Research Support; Philips. Other Financial or Material Support; MediView. Other Financial or Material Support; Galvanize. Other Financial or Material Support; Medtronic. Other Financial or Material Support; Johnson & Johnson. Other Financial or Material Support; QT Imaging. Other Financial or Material Support; Clinical Laserthermia Systems CLS. Other-NCI CRADA not-PI; Alessa Therapeutics. Other-NCI CRADA not PI; Astra-Zeneca. Other Financial or Material Support; Theromics. Other Financial or Material Support; Combat Medical. Grant/Research Support; Siemens. Grant/Research Support; Varian. Other Financial or Material Support; Civco Medical. Other Financial or Material Support; Angiodynamics. Other Financial or Material Support; Profound Medical. Other-Devices, equipment, shared IP; ArciTrax. Other-data sharing; Exact Imaging. Grant/Research Support; Uro-1 . Other-Material Transfer Agreement; DeepSIght Technology. Grant/Research Support; ImmunoPhotonics. Other Financial or Material Support; Ankyra. Other-Intellectual Property Licensing Agreement and equipment support; Canon . Other-Part-time Employee with Stock / Shareholder; DeepSight Technology. Other-Advisor & Board of Directors;; Scope. Grant/Research Support; Celsion Corp / Immunon . Grant/Research Support; NVIDIA. Grant/Research Support; Promaxo Inc. Other-Patent Licensing Agreement with Royalties paid to NIH, who then shares a fraction of royalties directly with Dr. Wood; Philips. Grant/Research Support; Boston Scientific . Grant/Research Support; XAct Robotics

Sub-Events

M8-CIR08B **Combination Therapies**

Terence P. Gade, MD, PhD (*Presenter*) Grant/Research Support; Instylla LLC. Other-Scientific Advisory Board; Trisalus Life Sciences. Consultant; Astra Zeneca. Consultant; Eisai

M8-CIR08C **Liver Ablation**

Bruno C. Odisio, MD, PhD (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; Ethicon. Consultant; IO Life Sciences. Other-Licensing agreement between MD Anderson Cancer Center and Raysearch Labs; Licensing agreement

M8-CIR08D **Lung Ablation**

Matthew R. Callstrom, MD, PhD (*Presenter*) Consultant; AstraZeneca . Consultant; Boston Scientific

M8-CIR08E **Pulmonary Embolism**

Bernhard Gebauer, MD (*Presenter*) Consultant; Inari. Other-Honoraria for presentation; COOK Medical. Other-Honoraria for presentation; ELSAI. Consultant; CALYX. Consultant; ICON. Consultant; BAYER. Other-Honoraria for presentation; AstraZeneca. Other-Honoraria for presentation; Siemens. Consultant; Ewimed. Other-Honoraria for presentation; Boston. Other-Honoraria for presentation; SIRTEX Medical

M8-CIR08F **Benign Embolization**

Cristina Mosconi, MD (*Presenter*) Nothing to Disclose

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M8-CNMMI04

Improving the Quality of PET/CT Interpretation and Updates in Vascular Inflammation

Monday, Dec. 1 4:30PM - 5:30PM Room: S405

David A. Mankoff, MD, PhD (*Moderator*) Consultant; GE Healthcare. Other-Scientific Advisory Board; Reflexion. Other-Scientific Advisory Board; ImaginAb. Stock/Shareholder; Trevarx. Consultant; Blue Earth Diagnostics

LEARNING OBJECTIVES

1) Describe methods to ensure consistent qualitative PET interpretation. 2) List and define quantitative measures use for PET imaging. 3) Describe how these principles can be applied to the use of PET for the diagnosis of vasculitis.

COURSE DESCRIPTION

This session will focus on approaches to improve the quality and clinical utility of PET interpretations with a focus on quantitative PET measures and how best to report them and systematic approaches to qualitative interpretation and reporting. These principles will be reviewed and demonstrated using PET imaging of vasculitis as a specific example

Sub-Events

M8-CNMMI04B Importance of Quantitative Assessment for PET/CT

David A. Mankoff, MD, PhD (*Presenter*) Consultant; GE Healthcare. Other-Scientific Advisory Board; Reflexion. Other-Scientific Advisory Board; ImaginAb. Stock/Shareholder; Trevarx. Consultant; Blue Earth Diagnostics

M8-CNMMI04C Importance of Qualitative Assessment for PET/CT

Eric M. Rohren, MD, PhD (*Presenter*) Nothing to Disclose

M8-CNMMI04D PET-CT Evaluation of Vasculitis

Esma A. Akin, MD (*Presenter*) Nothing to Disclose

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M8-CNPM10

Beyond the Workstation: Non-Traditional Careers in Radiology (Sponsored by the RSNA Professionalism Committee)

Monday, Dec. 1 4:30PM - 5:30PM Room: S402

Mario F. Chirinos Gambarini, MD (*Moderator*) Nothing to Disclose
Monica M. Sheth, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify nontraditional career paths--recognize various alternative career opportunities available to radiology professionals, including roles in industry, administration, coaching, and international outreach. 2.)Assess transition preparation strategies--evaluate effective strategies and resources that can aid in preparing for a transition from clinical radiology to alternative career paths. 3) Set realistic expectations--discuss the anticipated challenges and benefits associated with nontraditional career paths, including potential changes in work-life balance, job satisfaction, and professional development. 4) Learn from real-world experiences--gain insights from the personal experiences of panelists who have successfully transitioned to nontraditional roles, understanding the realities versus initial expectations.

COURSE DESCRIPTION

Radiologists may pursue roles outside of traditional private practice and academic radiology, whether to seek greater community impact, achieve stronger alignment with professional goals or as an avenue to gain career flexibility and avoid burnout. Several career paths are available, ranging from opportunities in industry, regulatory, administration, coaching, and international outreach. However, radiologists may not be aware of these potential paths or understand how to navigate these career pivots. This course aims to provide an examination of potential career paths, motives, transition processes, expectations and realities of non-traditional careers using a round table discussion format.

Sub-Events

M8-CNPM10C Industry/Commercial Careers for Radiologists

A. Gregory Sorensen, MD (*Presenter*) Employee; DeepHealth, Inc. / RadNet Inc.. Employee; Konica Minolta, Inc.. Employee; Siemens Healthineers. Employee; IMRIS. Employee; Fresenius Medical Care

M8-CNPM10D Institutional Administration/Leadership Careers for Radiologists

Jocelyn D. Chertoff, MD, MS (*Presenter*) Other-Independent Director; Varex Imaging

M8-CNPM10E Career in Lifestyle Medicine Coaching/Counseling/Mentoring

Robyn F. Tiger, MD (*Presenter*) Nothing to Disclose

M8-CNPM10F Career in International Outreach

Arlene Richardson, MD (*Presenter*) Nothing to Disclose

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M8-CPH09

Dose Calculation Tools for Fluoroscopic Imaging: An Overview of Their Development, Accessibility, and What Role They Play in Communicating and Managing Patient Risk

Monday, Dec. 1 4:30PM - 5:30PM Room: S404

David Borrego, PhD (*Moderator*) Nothing to Disclose
Emily Marshall, PhD (*Moderator*) Consultant; Bayer, Radimetrics. Other-I am currently currently a project manager on a master research agreement between the University of Florida and Canon Medical Systems. No direct financial benefit exists and this is outside of the scope of this work. No other authors have disclosures to report.; Canon Medical

LEARNING OBJECTIVES

1) Generalize the tools and resources available for radiation dose assessment in fluoroscopic imaging. 2) Evaluate the various dose metrics available and how these may be useful within their clinical workflow in communicating with patients and managing their risk. 3) Discuss the current state and future needs of radiation dosimetry in the context of low-dose research studies and what role attendees may play as stakeholders in the field.

COURSE DESCRIPTION

There are several tools and resources available to estimate the amount of radiation delivered to patients during fluoroscopic imaging procedures. This session, with a special emphasis on pediatric fluoroscopic imaging, will provide an overview of the current state of radiation dosimetry, the challenges in estimating patient dose, opportunities for dose optimization using coefficients, and what role these tools may play in improving communication and the management of patient risk. Attendees will leave the course with a developed understanding of appropriate applications and limitations of radiation dose estimates and tools available for their own educational use. This course will provide practitioners the background needed to confidently produce, explain, and contextualize patient dose and risk following fluoroscopic imaging procedures.

Sub-Events

M8-CPH09C **A Comprehensive Discussion on Dose Coefficients and Dose Metrics: Their Development, Computation, and Appropriateness in Dose Estimation to the Patient**

Emily Marshall, PhD (*Presenter*) Consultant; Bayer, Radimetrics. Other-I am currently currently a project manager on a master research agreement between the University of Florida and Canon Medical Systems. No direct financial benefit exists and this is outside of the scope of this work. No other authors have disclosures to report.; Canon Medical

M8-CPH09D **Efforts by the ICRP to Develop Dose Coefficients for Common Imaging Examinations**

David Borrego, PhD (*Presenter*) Nothing to Disclose

M8-CPH09E **Patient-Care Driven Discussions on Dose and Risk for Pediatric Patients and their Caregivers**

Colin Brown, MD (*Presenter*) Nothing to Disclose

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R1-CCH11

Imaging of Pulmonary Infections

Thursday, Dec. 4 8:00AM - 9:00AM Room: E451A

Claudio Silva, MD, MSc (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify imaging findings of pulmonary infections in both immunocompetent and immunocompromised patients. 2) Explain and differentiate radiological patterns of various fungal pulmonary infections. 3) Present how emerging biomarkers in pneumonia integrate with imaging findings to achieve more precise diagnoses.

COURSE DESCRIPTION

This course will outline a systematic approach for characterizing imaging findings and establishing optimal diagnostic pathways for pulmonary infections in both immunocompetent and immunocompromised patients. We will explore the complexities of fungal infections, focusing on their unique radiological patterns and the implications for patient care. Additionally, the session will present the role of emerging biomarkers in pneumonia, discussing how these can be integrated with traditional imaging findings to facilitate more accurate diagnoses and guide treatment strategies, ultimately enhancing multidisciplinary patient management.

Sub-Events

R1-CCH11B **Approach to Pulmonary Infection in Immunocompetent Host**

Tomas C. Franquet, MD, PhD (*Presenter*) Nothing to Disclose

R1-CCH11C **Approach to Pulmonary Infection in Immunocompromised Host**

Kyongmin S. Beck, MD, PhD (*Presenter*) Nothing to Disclose

R1-CCH11D **Fungal Infection**

Jeffrey P. Kanne, MD (*Presenter*) Nothing to Disclose

R1-CCH11E **Biomarkers in Pneumonia- Towards a More Meaningful Diagnosis**

Santiago Martinez-Jimenez, MD (*Presenter*) Nothing to Disclose

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R1-CER14

Resilience and Wellness: Tools for Emergency Radiologists

Thursday, Dec. 4 8:00AM - 9:00AM Room: N228

Hao S. Lo, MD, MBA (*Moderator*) Nothing to Disclose
Krystal Archer-Arroyo, MD (*Moderator*) Consultant; Siemens Healthineers USA

LEARNING OBJECTIVES

1) Understand the scope and impact of workplace violence and safety in the healthcare setting. 2) Define and discuss burnout and wellness for the emergency radiologist. 3) Explain the details of a medicolegal lawsuit as it pertains to the emergency radiologist.

COURSE DESCRIPTION

This course addresses physician burnout as a major challenge in emergency radiology. We will explore three critical areas: workplace violence and safety, burnout itself, and medicolegal concerns. You will identify common causes of radiologist burnout and gain practical strategies and tools to enhance your resilience and overall well-being. We will examine these crucial considerations from the individual, leadership, and system perspectives.

Sub-Events

R1-CER14C **Workplace Violence and Safety**

Jamlik-Omari Johnson, MD (*Presenter*) Nothing to Disclose

R1-CER14D **Burnout from the Frontline Emergency Radiologist**

Hemang Kotecha, DO (*Presenter*) Nothing to Disclose

R1-CER14E **Help Me, I've Been Sued!**

Jonathan Mezrich, MD, JD (*Presenter*) Nothing to Disclose

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R1-CGI15

Advances in Focused and Abbreviated Abdominal and Pelvic MRI Protocols

Thursday, Dec. 4 8:00AM - 9:00AM Room: E451B

Hersh Chandarana, MD, MBA (*Moderator*) Speaker's Bureau; Siemens Healthineer. Other-Hardware and software research support under institutional Master Research Agreement as well as travel suport; Siemens Healthineer
Ivan Pedrosa, MD, PhD (*Moderator*) Consultant; Health Tech International

LEARNING OBJECTIVES

1) Describe and compare strengths and weaknesses of different methods for performing targeted MRI for hepatocellular carcinoma (HCC) screening. 2) Describe the current evidence for targeted protocols for pancreatic cyst surveillance. 3) Examine the latest technological advancements and innovations in Prostate MRI (such as AI-assisted image reconstruction /acquisition and intelligent scanning) that support the use of targeted and abbreviated protocols.

COURSE DESCRIPTION

With increasing healthcare costs and challenges with staffing and access to MR imaging, it is important to consider focused indication-based focused scanning and reporting MRI protocols to maximize efficiency and address the above-mentioned challenges. In this course, we will review current evidence for focused and abbreviated MRI protocol for liver cancer (hepatocellular carcinoma), pancreatic cysts, and prostate cancer as well as opportunities and challenges in implementing shortened focused protocols in busy clinical practice. Furthermore, we will have a lively panel discussion to dive deeper into opportunities and challenges and share experiences of how one can get started and measure the utility, efficacy, and cost savings with implementation of focused protocols.

Sub-Events

R1-CGI15C Evidence based Opportunities and Challenges for Abbreviated MRI Protocol in Hepatocellular Carcinoma (HCC)

Mustafa R. Bashir, MD (*Presenter*) Consultant; Rectify Pharma. Grant/Research Support; Siemens Healthineers. Grant/Research Support; Bayer Healthcare. Grant/Research Support; Madrigal Pharmaceuticals. Grant/Research Support; Carmot Therapeutics. Grant/Research Support; Corcept Therapeutics. Grant/Research Support; NGM Biopharmaceuticals. Consultant; United Therapeutics

R1-CGI15D Evidence based Opportunities and Challenges for Abbreviated MRI Protocol in Pancreatic Cysts

Zhen J. Wang, MD (*Presenter*) Stock/Shareholder; Nextrast, Inc

R1-CGI15E Evidence based Opportunities and Challenges for Abbreviated MRI Protocol in Prostate Cancer

Sadhna Verma, MD, MBA (*Presenter*) Nothing to Disclose

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R1-CIN17

Best Practices for AI Model Regulation

Thursday, Dec. 4 8:00AM - 9:00AM Room: E450B

Elizabeth O'Hare, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand how the FDA is approaching GenAI regulation within the medical device framework. 2) Explore vendor perspectives on regulatory flexibility and transparency in GenAI oversight. 3) Gain awareness of emerging AI-related policies at the federal and state level in the U.S. and international approaches to AI regulation.

COURSE DESCRIPTION

As generative AI (GenAI) technologies rapidly evolve, regulatory frameworks are under increasing pressure to keep pace—particularly in the medical device ecosystem. This session will explore how GenAI tools used in radiology and healthcare are being addressed by regulators in the United States and globally. The discussion will begin with an overview of how the U.S. Food and Drug Administration (FDA) is adapting its medical device regulatory system to address the unique challenges of GenAI. The session will then explore the broader U.S. legal and regulatory landscape, including emerging state-level AI policies and their implications for healthcare providers and vendors. Finally, the session will conclude with an international perspective, comparing how key jurisdictions outside the U.S.—including the EU, UK, and others—are approaching regulation of GenAI in medicine.

Sub-Events

R1-CIN17B Vendor Perspective of FDA GenAI Regulation and the PCCP

Demetri Giannikopoulos (*Presenter*) Stock/Shareholder; Aidoc. Employee; Rad AI. Other-Co development project with RSNA Ventures for DSC;; RSNA Ventures partnership

R1-CIN17C US Federal and State Regulation

Florence X. Doo, MD, MA (*Presenter*) Other-Cloud credits for research; Amazon Web Services. Other-Cloud credits for research; Google Cloud Products. Other-Cloud credits for research; Microsoft Azure. Grant/Research Support; GE Healthcare

R1-CIN17D AI Regulation Outside of the U.S.

Michail Klontzas, MD, PhD (*Presenter*) Nothing to Disclose

R1-CIN17E How Can the FDA Medical Device System Regulate GenAI?

Luciano M. Prevedello, MD, MPH (*Presenter*) Nothing to Disclose

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R1-CMK04

Spine Imaging: Pre and Post Op

Thursday, Dec. 4 8:00AM - 9:00AM Room: E450A

Winston J. Rennie, FRCR, MSc (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify crucial lesions in spinal MR and CT imaging of trauma, axSpA, infection, scoliosis, and post spinal surgery. 2) Standardise terminology and definitions to speak the clinicians language. 3) Produce actionable reports that are of value to requesting clinicians.

COURSE DESCRIPTION

The Spine can be challenging in analysis and report formulation.A series of lectures with the opportunity of Q&A, on varying aspect and key lesion identification using cross sectional CT and MR imaging in the assessment of the Spine. Conditions like axSpA, trauma, scoliosis infection and post surgical definitions, classifications and reporting will be discussed. A session not to be missed!

Sub-Events

R1-CMK04B **Spine Imaging in Suspected Spondyloarthritis**

Winston J. Rennie, FRCR, MSc (*Presenter*) Nothing to Disclose

R1-CMK04C **Imaging of Spine Infection**

Prudencia N. Tyrrell, MD, FRCR (*Presenter*) Nothing to Disclose

R1-CMK04D **Imaging after Spinal Decompression Surgery**

Mohammad M. Samim, MD, MRCS (*Presenter*) Nothing to Disclose

R1-CMK04E **Imaging after Scoliosis Surgery**

Benjamin Fritz, MD (*Presenter*) Nothing to Disclose

R1-CMK04F **Imaging of Spine Trauma**

Ferco H. Berger, MD, FRCPC (*Presenter*) Nothing to Disclose

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R1-CMS02

Practical Application of Photon Counting Imaging: Head to Toe

Thursday, Dec. 4 8:00AM - 9:00AM Room: E352

LEARNING OBJECTIVES

1) Describe the fundamental principles of photon-counting CT and how they differ from conventional CT technologies. 2) Identify clinical applications of photon-counting imaging across various anatomical regions, from head to toe. 3) Evaluate the practical benefits and current limitations of photon-counting CT in routine clinical workflows.

COURSE DESCRIPTION

This session will provide a practical overview of photon-counting CT (PCCT), a next-generation imaging technology poised to transform clinical radiology. Through a combination of lecture and case-based discussion, experts will explore how PCCT improves image quality, reduces radiation dose, and enables new diagnostic capabilities across a wide range of anatomical regions—from head to toe. Attendees will gain insights into real-world applications, implementation challenges, and workflow integration. By the end of the session, learners will understand how to evaluate and apply photon-counting CT in their clinical practice.

Sub-Events

R1-CMS02C **Clinical Applications of Photon Counting CT in Neuroradiology**

Alicia Chen, MD (*Presenter*) Nothing to Disclose

R1-CMS02D **Clinical Applications of Photon Counting CT in Cardiothoracic Imaging**

Kate Hanneman, MD, MPH (*Presenter*) Other-Honoraria; Sanofi Genzyme. Other-Honoraria; Medscape. Other-Honoraria; MRI Online. Other-Honoraria; Bayer

R1-CMS02E **Clinical Applications of Photon Counting CT in Abdominopelvic Imaging**

Fides Schwartz, MD (*Presenter*) Other-Speaker's honoraria for educational content; Siemens Healthineers. Other-Travel support (flight, hotel) to test photon-counting CT prototype; GE Medical Solutions

R1-CMS02F **Clinical Applications of Photon Counting CT in Musculoskeletal Imaging**

Francis I. Baffour, MD (*Presenter*) Nothing to Disclose

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R1-CNPM04

Case Studies in Advanced Enterprise-Level Imaging Decision-Making (Sponsored by the RSNA Research Development Committee)

Thursday, Dec. 4 8:00AM - 9:00AM Room: S402

Angelleen Peters-Lewis, PhD, RN (*Moderator*) Nothing to Disclose
Peter A. McCarthy, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the rationale behind the decision making process involved in running imaging services in challenging healthcare environments.

COURSE DESCRIPTION

This educational course uses real world case studies to illustrate how executive decisions are reached when deploying resources in healthcare settings, particularly when budgets are constrained and other demographic issues such as non-urban patient care environments must be taken into account. Attendees will hear a reasoned discussion on how scarce resources are deployed in these challenging settings.

Sub-Events

R1-CNPM04C **Breast Imaging: Rural Accessibility Versus Quality**

Soudabeh Fazeli, MD, MPH (*Presenter*) Nothing to Disclose

R1-CNPM04D **Tertiary Care Radiology in a Poor Access to Healthcare State**

Srini Tridandapani, MD, PhD (*Presenter*) Owner; Camerad Technologies, LLC

R1-CNPM04E **Independent Diagnostic Testing Facilities vs. Group Practice vs. Hospital Based Outpatient Imaging: The Trade-Offs**

Pamela K. Woodard, MD (*Presenter*) Grant/Research Support; Siemens Medical Systems

R1-CNPM04F **Interventional Radiology Staffing in a Multiple HSO Enterprise**

Daniel B. Brown, MD (*Presenter*) Nothing to Disclose

R1-CNPM04G **Managing a Multi HSO Community Imaging Practice Within Academia**

Andrew J. Bierhals, MD, MPH (*Presenter*) Nothing to Disclose

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R1-CNR12

Bridging the Gap: Imaging the Craniocervical Junction

Thursday, Dec. 4 8:00AM - 9:00AM Room: S406B

Roy Riascos, MD, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the developmental anatomy, biomechanics, and key imaging landmarks of the craniocervical junction across pediatric and adult populations. 2) Identify common and critical pathologies of the CCJ—including trauma, congenital anomalies, and degenerative conditions—using both conventional and advanced imaging techniques. 3) Apply structured imaging strategies and clinical insights to accurately evaluate and manage complex cases involving the craniocervical junction.

Sub-Events

R1-CNR12B **Growing Pains: Pediatric Craniocervical Junction Challenges**

Laura L. Hayes, MD (*Presenter*) Nothing to Disclose

R1-CNR12C **Cracking the Code: Advanced Imaging at the Craniocervical Junction**

Jason F. Talbott, MD, PhD (*Presenter*) Nothing to Disclose

R1-CNR12D **Crossroads of Complexity: Degenerative Disease and Intervention at the Craniocervical Junction**

Miriam Peckham, MD (*Presenter*) Nothing to Disclose

R1-CNR12E **On the Edge: Trauma Insights at the Craniocervical Junction**

Roy Riascos, MD, MBA (*Presenter*) Nothing to Disclose

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R1-CPD10

Small Parts, Big Stories: Painting the Picture of Pediatric Soft Tissue Imaging

Thursday, Dec. 4 8:00AM - 9:00AM Room: E350

Hee Mang Yoon, MD, PhD (*Moderator*) Nothing to Disclose
Teresa Chapman, MD, MA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Demonstrate emerging ultrasound applications in the pediatric neck, such as vocal cord motion and tonsillar pathology. 2) Update learners on pediatric thyroid nodule guidelines and provide imaging examples to differentiate benign from malignant. 3) Establish a management plan for palpable lumps and bumps based on sonographic appearance.

COURSE DESCRIPTION

This educational session with four case-based lectures focuses on the application of ultrasound to evaluate vocal cords and tonsillar pathology in children, sonographic assessment of superficial palpable lumps and bumps in children, and ultrasound evaluation for pediatric thyroid nodules with updates in management. The session will conclude with a talk describing atypical presentations of common pediatric lumps and bumps and will discuss the role of ultrasound and other imaging modalities in challenging cases of pediatric lumps and bumps. By the end of the session, audience members will have an increased confidence in their ability to diagnose these superficial abnormalities in children using ultrasound, with an improved awareness of recent innovations and current standards of care and reporting.

Sub-Events

R1-CPD10C **Ultrasound of the Neck: Innovations and Limitations**

Jeffrey J. Tutman, MD (*Presenter*) Nothing to Disclose

R1-CPD10D **Practical Approach to Pediatric Thyroid Nodules (Yes or No to TIRADS)**

Claudia M. Martinez Rios Arellano, MD (*Presenter*) Nothing to Disclose

R1-CPD10E **Pediatric Lumps and Bumps: When Watchful Waiting is the Right Plan**

Krista L. Birkemeier, MD (*Presenter*) Nothing to Disclose

R1-CPD10F **Challenging Cases of Lumps and Bumps**

Oscar M. Navarro, MD (*Presenter*) Nothing to Disclose

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R1-CPH08

Quality Measures in Radiology

Thursday, Dec. 4 8:00AM - 9:00AM Room: N227B

Ehsan Samei, PHD (*Moderator*) Grant/Research Support; GE. Grant/Research Support; Siemens. Owner; Metis. Consultant; Imalogix. Consultant; SunNuclear. Consultant; Nanox

LEARNING OBJECTIVES

1) Understand the need and role of quality measures in radiology across the diversity of its modalities. 2) Understand how the performance of imaging hardware and software including AI-based software, can be measured and tracked. 3) Appreciate the need and complexities of implementing quality measures in the context of global practice of radiology in the developing and developed settings.

Sub-Events

R1-CPH08B Motivation and Utility of Quality Measures in Radiology

Ehsan Samei, PHD (*Presenter*) Grant/Research Support; GE. Grant/Research Support; Siemens. Owner; Metis. Consultant; Imalogix. Consultant; SunNuclear. Consultant; Nanox

R1-CPH08C Hardware and Software Quality Measures in Radiology

Mika K. Kortesniemi, PhD (*Presenter*) Nothing to Disclose

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R3-CBR12

Imaging Response Assessment and Minimally Invasive Therapies in Breast Cancer Treatment

Thursday, Dec. 4 9:30AM - 10:30AM Room: S406A

Beatriz E. Adrada, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn the value of the different conventional and functional breast imaging modalities for determining response to neoadjuvant therapy in breast cancer treatment. 2) Provide a comprehensive review of the available imaging modalities for lymph node assessment in patients diagnosed with breast cancer. 3) Explore the indications, patient selection, procedural techniques, and potential limitations of cryoablation as a treatment option for breast cancer.

COURSE DESCRIPTION

This course will delve into how to breast imaging modalities can assess response to neoadjuvant therapy. It will discuss the specific advantages and limitations of each imaging modality for identifying responders versus non-responders, which is crucial for guiding further treatment decisions. It highlights the importance of lymph node assessment in a patient diagnosed with breast cancer. Finally, this course will explore novel minimally invasive techniques including cryoablation and its potential applications in breast cancer treatment.

Sub-Events

R3-CBR12B Response Assessment to Neoadjuvant Therapy

Beatriz E. Adrada, MD (*Presenter*) Nothing to Disclose

R3-CBR12C Lymph Node Assessment

Fleur Kilburn-Toppin, MBBChir, MA (*Presenter*) Consultant; Genesis Care

R3-CBR12D Cryotherapy in Early Stage Breast Cancer Evidence and Rationale

Janice Thai, MD (*Presenter*) Nothing to Disclose

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R3-CGU06

Prostate Cancer: PI-RADS, Post-treatment Assessment, and Practical Challenges

Thursday, Dec. 4 9:30AM - 10:30AM Room: E353B

Francesco Giganti, MD, PhD (*Moderator*) Consultant; DeepHealth. Consultant; Lucida. Consultant; Spectracure. Consultant; Procept
Sadhna Verma, MD, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand PI-RADS 3 criteria effectively in the interpretation and reporting of multiparametric prostate MRI. 2) Distinguish between expected post-treatment changes and recurrent or residual disease on prostate MRI following surgery, radiation, or focal therapy. 3) Formulate practical strategies to address common diagnostic challenges in prostate cancer imaging and reporting.

COURSE DESCRIPTION

This educational session provides a comprehensive overview of prostate cancer imaging across the disease continuum—from detection and risk stratification using PI-RADS to complex scenarios encountered in the post-treatment setting. As prostate MRI continues to evolve as a cornerstone of diagnosis and management, radiologists face increasing demands to accurately interpret pre- and post-treatment imaging while navigating pitfalls such as treatment-related changes, recurrent disease, and atypical lesion presentations.

Sub-Events

R3-CGU06C **Imaging of Treatment Naive PCa**

Silvia D. Chang, MD, FRCPC (*Presenter*) Other-Speaker honorarium; Bayer Healthcare. Other-Advisory Board; Bayer Healthcare

R3-CGU06D **Handling PI-RADS 3 Lesions?**

Mukesh G. Harisinghani, MD (*Presenter*) Nothing to Disclose

R3-CGU06E **MR Imaging of Recurrent Prostate Cancer**

Tharakeswara K. Bathala, MD, MS (*Presenter*) Nothing to Disclose

R3-CGU06F **Technical and Diagnostic Challenges in the Evaluation of Treatment Naive and Treated Prostate Cancer**

Kartik S. Jhaveri, MD, FRCPC (*Presenter*) Nothing to Disclose

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R3-CHN09

Head and Neck Radiology for the Boards: Rapid Review for Residents

Thursday, Dec. 4 9:30AM - 10:30AM Room: E352

Francis Deng, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize imaging anatomy of the head and neck region. 2) Recognize classic imaging features for common diagnoses in head and neck radiology. 3) Differentiate between similar lesions based on head and neck anatomic space and characteristics in CT, MRI, and ultrasound.

COURSE DESCRIPTION

This rapid-fire, case-based session delivers a high-yield review of head and neck radiology, specifically designed for residents preparing for board exams but also useful as a focused maintenance of certification refresher for practicing radiologists. Organized by anatomic subsite and using interactive audience response, the session reinforces core imaging findings, key differentials, and exam-ready pearls.

Sub-Events

R3-CHN09B **Rapid Fire Cases: Pharynx, Larynx, and Oral Cavity**

Surjith Vattoth, MD, FRCR (*Presenter*) Nothing to Disclose

R3-CHN09C **Rapid Fire Cases: Sinonasal Tract, Nasopharynx, Sella, and Orbit**

Elizabeth George, MD (*Presenter*) Nothing to Disclose

R3-CHN09D **Rapid Fire Cases: Cerebellopontine Angle, Temporal Bone, Facial Bones**

Sara G. Tedla, MD (*Presenter*) Nothing to Disclose

R3-CHN09E **Rapid Fire Cases: Glands, Nodes, and Spaces of the Neck**

Francis Deng, MD (*Presenter*) Nothing to Disclose

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R3-CIR01

Deep Venous Thrombosis: Pathophysiology and Management

Thursday, Dec. 4 9:30AM - 10:30AM Room: E353A

Gloria M. Salazar, MD (*Moderator*) Consultant; Medtronic;Boston Scientific ;TRisalus ;Optimed;Penumbra ;Cook. Speaker's Bureau; Medtronic;Boston Scientific;Cook;BD; Optimed;Penumbra
Minhaj S. Khaja, MD, MBA (*Moderator*) Grant/Research Support; Boston Scientific. Other-Speaking honoraria; Boston Scientific. Other-Speaking honoraria and non-compensated advisory board member-venous; Medtronic. Other-Speaking honoraria; Penumbra

Sub-Events

R3-CIR01C **Overview of Pathophysiology and Risk Factors for Lower Extremity DVT**

Minhaj S. Khaja, MD, MBA (*Presenter*) Grant/Research Support; Boston Scientific. Other-Speaking honoraria; Boston Scientific. Other-Speaking honoraria and non-compensated advisory board member-venous; Medtronic. Other-Speaking honoraria; Penumbra

R3-CIR01D **Upper Extremity DVT: Risk Factors and Management**

Marcelo S. Guimaraes, MD, MBA (*Presenter*) Consultant; Baylis Medical. Consultant; Terumo Medical . Consultant; Argon . Consultant; BD

R3-CIR01E **To Stent or Not Stent: When is Appropriate to use Stents in the Management of Acute DVT?**

Gloria M. Salazar, MD (*Presenter*) Consultant; Medtronic;Boston Scientific ;TRisalus ;Optimed;Penumbra ;Cook. Speaker's Bureau; Medtronic;Boston Scientific;Cook;BD; Optimed;Penumbra

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R3-CNMMI07

Updates in Cardiac Imaging and Optimizing PET/CT Protocols

Thursday, Dec. 4 9:30AM - 10:30AM Room: S405

Esma A. Akin, MD (*Moderator*) Nothing to Disclose

Sub-Events

R3-CNMMI07B Optimizing PET/CT Protocols

Terence Z. Wong, MD, PhD (*Presenter*) Consultant; GE Health. Consultant; Progenics/Lantheus Pharmaceuticals. Consultant; Novartis Pharmaceuticals. Consultant; Telix Pharmaceuticals

R3-CNMMI07C Infiltrative and Inflammatory Cardiac Conditions

Robert K. Zeman, MD (*Presenter*) Nothing to Disclose

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R3-CNPM14

Should AI Autonomously Interpret Radiographs? A Debate

Thursday, Dec. 4 9:30AM - 10:30AM Room: S402

Shah Islam, FRCR (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1)Learn about challenges of deploying financially sustainable AI within value-based healthcare systems. 2) Learn about the benefits of autonomous chest x-ray reading for patients, payers and providers. 3) Learn about the risk of autonomous chest x ray reading and what must be done before responsible AI can be deployed.

COURSE DESCRIPTION

This thought-provoking educational course discusses and debates the use of AI's earliest use cases- reading of chest x-rays. The session will aim to explore current attitudes to adoption of AI in interpreting chest x-rays and where the value really lies. The session will deliver talks from front line radiologists working in different health systems, followed by a no holds barred panel discussion.

Sub-Events

R3-CNPM14B **AI for Chest Radiographs: The National Health Service Experience**

Shah Islam, FRCR (*Presenter*) Nothing to Disclose

R3-CNPM14C **It's About Time! AI Should Report Chest X-Rays Autonomously**

Saurabh Jha, MBBS, MS (*Presenter*) Nothing to Disclose

R3-CNPM14D **Slow Down! AI is Not Ready to Be a Chest X-Ray Jedi Yet**

Warren B. Gefter, MD (*Presenter*) Grant/Research Support; Siemens Healthineers. Consultant; Siemens Healthineers

R3-CNPM14E **AI for Chest Radiographs: Who is right?**

Eun Kyoung Hong, MD, PhD (*Presenter*) Other-former employee; Kakaobrain

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R3-COB04

What Every Radiologist Should Know: First Trimester

Thursday, Dec. 4 9:30AM - 10:30AM Room: E351

Maitray D. Patel, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Use the new Society of Radiologists in Ultrasound (SRU) consensus lexicon to describe early pregnancy loss and ectopic pregnancy locations. 2) Understand expected and unexpected intrauterine sonographic observations following first trimester pregnancy loss or termination. 3) Recognize unusual adnexal sonographic observations that might be present in women in early pregnancy.

COURSE DESCRIPTION

Sociopolitical considerations have sharpened the need for radiologists to use precise terminology in describing normal and abnormal sonographic observations in the first trimester of pregnancy, spurring recent development of a consensus lexicon by the Society of Radiologists in Ultrasound (SRU). The SRU lexicon also addresses intrauterine and endometrial sonographic findings that can develop after cessation of a first trimester pregnancy. This educational session reviews the lexicon and highlights adnexal and intrauterine observations that radiologists might encounter to advance skills in interpretation of these sonographic studies.

Sub-Events

R3-COB04B **Review of Early Pregnancy Loss (New EPL and PUL Lexicon)**

Shuchi K. Rodgers, MD (*Presenter*) Other-Royalties; Elsevier

R3-COB04C **Ectopic Pregnancy: New Terms, Pearls and Pitfalls**

Maitray D. Patel, MD (*Presenter*) Nothing to Disclose

R3-COB04D **First Trimester Post Pregnancy: The Expected and the Unexpected**

Liina Poder, MD (*Presenter*) Nothing to Disclose

R3-COB04E **First Trimester: Don't Forget to Look at the Adnexa**

Christopher I. Fung, MD (*Presenter*) Grant/Research Support; Exact Imaging (co-investigator for clinical research trial)

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R3-CRO07

Sarcoma Case-Based Multi-Disciplinary Review

Thursday, Dec. 4 9:30AM - 10:30AM Room: S401

Meng X. Welliver, MD, PhD (*Moderator*) Nothing to Disclose

Sub-Events

R3-CRO07B **Sarcoma Case- Based Multi-Disciplinary Review**

Edward Y. Kim, MD (*Presenter*) Nothing to Disclose

R3-CRO07C **Sarcoma Case- Based Multi-Disciplinary Review**

Doris E. Wenger, MD (*Presenter*) Nothing to Disclose

R3-CRO07D **Sarcoma Case- Based Multi-Disciplinary Review**

Kevin Raskin, MD (*Presenter*) Consultant; Onkos Surgical

R3-CRO07E **Sarcoma Case- Based Multi-Disciplinary Review**

Josh Peterson, MD (*Presenter*) Nothing to Disclose

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R3-CVA07

Not the Usual Suspects: Vasculitis, Aortopathy and Arteriopathy

Thursday, Dec. 4 9:30AM - 10:30AM Room: S503

Ayaz Aghayev, MD (*Moderator*) Consultant; Elucid
Jacobo Kirsch, MD, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the key imaging features of inflammatory aortic disease, fibromuscular dysplasia, congenital vascular anomalies, and genetic aortopathies. 2) Differentiate between inflammatory and non-inflammatory arteriopathies using clinical context and imaging modalities such as CT, MRI, and ultrasound. 3) Apply a systematic imaging approach to diagnose uncommon large-vessel pathologies and guide clinical management.

COURSE DESCRIPTION

This lecture-based session explores a spectrum of uncommon yet clinically significant vascular diseases, including inflammatory, genetic, congenital, and non-inflammatory arteriopathies. Expert faculty will present real-world cases and current imaging strategies to identify and differentiate complex large-vessel abnormalities. Topics include vasculitis and aortic inflammation, fibromuscular dysplasia, congenital vascular anomalies in adults, and genetic aortopathies. The session is designed to enhance diagnostic confidence and accuracy among radiologists by addressing key imaging features, pathophysiologic mechanisms, and multimodality approaches. Learners will leave with a deeper understanding of how to approach challenging vascular cases that fall outside the scope of more common cardiovascular disease.

Sub-Events

R3-CVA07C **Vasculitis and Inflammatory Aortic Disease**

Jacobo Kirsch, MD, MBA (*Presenter*) Nothing to Disclose

R3-CVA07D **Fibromuscular Dysplasia and Related Non-Inflammatory Disorders**

Brian B. Ghoshhajra, MD, MBA (*Presenter*) Grant/Research Support; Siemens. Consultant; Siemens. Consultant; Philips . Consultant; 3DR Laboratories

R3-CVA07E **Congenital Large Vessel Abnormalities in Adults**

Rodrigo A. Salgado, MD, PhD (*Presenter*) Nothing to Disclose

R3-CVA07F **Approach to Imaging Genetic Aortopathy**

Caroline Robb, MD (*Presenter*) Nothing to Disclose

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R3-RCP13

RSNA 2025 Resident Competition (Hosted by the RadioGraphics Team)

Thursday, Dec. 4 9:30AM - 10:30AM Room: S406B

Heba Albasha, MD (*Moderator*) Nothing to Disclose
Maria Lucia Brun, MD (*Moderator*) Nothing to Disclose
Otavio Augusto Ferreira Dalla Pria, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Invite residents from across the world to compete against each other in a riveting case competition. 2) Foster team-building and friendly competition.

COURSE DESCRIPTION

Please join us for a friendly case competition between programs across the world! Form a team with your co-residents and prepare for multiple rounds of fun and challenging cases! Teams can have up to 6 residents each. In-person attendance is required to participate, and the competition will be hosted through Kahoot! using a mobile device. Only twenty teams can participate, but everyone is welcome to attend the show! Please use the following form to register your team:https://forms.gle/8W6TW5ohsRtATB1x9. Limited spots will be reserved for on-site team registration - please head to the Residents Lounge on Sunday, Monday or Tuesday of the meeting to register.

Sub-Events

R3-RCP13D **RSNA 2025 Resident Competition**

Venkata Subbaih Arunachalam, MD (*Presenter*) Nothing to Disclose

R3-RCP13E **RSNA 2025 Resident Competition**

Rui Dai, MD, PhD (*Presenter*) Nothing to Disclose

R3-RCP13F **RSNA 2025 Resident Competition**

Silvia Arora, MD (*Presenter*) Nothing to Disclose

R3-RCP13G **RSNA 2025 Resident Competition**

Yihan Cao, MD (*Presenter*) Nothing to Disclose

R3-RCP13H **RSNA 2025 Resident Competition**

Shakthi K. Ramasamy, MD (*Presenter*) Nothing to Disclose

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R4-CBR13

Navigating High-Risk Breast Lesions: A Global Perspective

Thursday, Dec. 4 11:00AM - 12:00PM Room: N228

Vilert A. Loving, MD, MMM (*Moderator*) Speaker's Bureau; BD

LEARNING OBJECTIVES

1) Discuss the diagnosis of high-risk breast lesions. 2) Learn to weigh the risks of undertreatment versus overtreatment for high-risk breast lesions. 3) Explore management strategies for high-risk breast lesions, comparing the United States, United Kingdom, and Brazil.

COURSE DESCRIPTION

Question: When high-risk lesions are diagnosed from core needle biopsy, should radiologists recommend excision, surveillance imaging, or age-appropriate screening? Answer: It depends! The management of high-risk breast lesions remains controversial and requires a balance: the potential of undertreating associated malignancies versus overtreating benign high-risk lesions. This session seeks to shed light on this diagnostic dilemma as we discuss management strategies for high-risk breast lesions. To foster the development of best practices, lectures will include viewpoints from representatives of different countries, including the United States, United Kingdom, and Brazil. Attendees will obtain high-risk lesion management strategies to implement or further explore at their institutions.

Sub-Events

R4-CBR13B USA Perspective

Vilert A. Loving, MD, MMM (*Presenter*) Speaker's Bureau; BD

R4-CBR13C Europe Perspective

Sarah J. Vinnicombe, FRCR, MRCP (*Presenter*) Consultant; Bayer . Consultant; Siemens. Grant/Research Support; Neonavia. Speaker's Bureau; AstraZeneca. Consultant; Siemens

R4-CBR13D Brazil Perspective

Almir Bitencourt, MD, PhD (*Presenter*) Speaker's Bureau; Bayer. Speaker's Bureau; Canon. Other-Advisor Board; Hologic. Other-Advisor Board; BD

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R4-CCA08

Fundamentals of Cardiac MRI

Thursday, Dec. 4 11:00AM - 12:00PM Room: E353C

Diana Ochoa, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the standard cardiac MRI planes and the key pulse sequences used for cardiac imaging. 2) Understand the principles of tissue characterization using late gadolinium enhancement and emerging non-contrast techniques. 3) Explain the basics of MR angiography and flow imaging, and identify the top clinical applications of cardiac MRI in routine practice.

COURSE DESCRIPTION

This course provides a comprehensive overview of the fundamental principles and clinical applications of cardiac MRI. Through a series of focused lectures, attendees will gain essential knowledge on cardiac imaging planes and sequences, tissue characterization techniques including late gadolinium enhancement, basics of MR angiography and flow imaging, and the most impactful clinical uses of cardiac MRI. The session is designed for radiologists, cardiologists, and trainees seeking to build a solid foundation in cardiac MRI for effective interpretation and clinical decision-making.

Sub-Events

R4-CCA08C **ABC of Cardiac Planes and Sequences**

Scott J. Adams, MD, PhD (*Presenter*) Nothing to Disclose

R4-CCA08D **Tissue Characterization: Late Gadolinium Enhancement and Beyond**

Felipe S. Torres, MD, PhD (*Presenter*) Other-No financial relationship exists. The company provides resources to research projects (partnership).; Altis Labs, Inc.. Other-Speaker fee; GE Healthcare

R4-CCA08E **Basic of MRA and Flow Imaging**

Vineeta Ojha, MD (*Presenter*) Nothing to Disclose

R4-CCA08F **Top 3 Cardiac MR Applications**

Luigia D'Errico, MD (*Presenter*) Nothing to Disclose

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R4-CCH10

Imaging of Airway Diseases

Thursday, Dec. 4 11:00AM - 12:00PM Room: E451A

Jo-Anne O. Shepard, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the various diseases affecting the large and small airways and understand the spectrum of imaging findings.

COURSE DESCRIPTION

Imaging of Airways Diseases consists of three comprehensive lectures that will highlight imaging findings in diseases of the large and small airways. The topics will include a state-of-the-art summary of focal and diffuse non-neoplastic diseases of the central airways as well as various benign and malignant neoplasms affecting the airways. Additionally, the spectrum of imaging findings in small airways diseases will be discussed in detail.

Sub-Events

R4-CCH10B **Non-Neoplastic Diseases of Central Airways**

Brent P. Little, MD (*Presenter*) Nothing to Disclose

R4-CCH10C **Small Airway Diseases**

Travis S. Henry, MD (*Presenter*) Nothing to Disclose

R4-CCH10D **Tracheobronchial Neoplasms**

Joanna G. Escalon, MD (*Presenter*) Nothing to Disclose

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R4-CER16

Advanced Insights in Blunt Splenic Trauma: Perspectives from Diagnostic Radiology, Interventional Radiology, and Trauma Surgery

Thursday, Dec. 4 11:00AM - 12:00PM Room: S406A

Christina A. LeBedis, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Categorize blunt splenic trauma using the 2018 AAST OIS scale with special attention to identifying vascular injuries. 2) Compare the CT imaging findings to their angiographic appearance and describe treatment options. 3) Recognize patient management implications and outcomes from a trauma surgeon's perspective.

COURSE DESCRIPTION

Advanced lectures and discussion of blunt splenic trauma from the perspectives of a diagnostic radiologist, interventional radiologist, and a AAST BST committee trauma surgeon

Sub-Events

R4-CER16B **Blunt Splenic Trauma - Diagnostic Radiology Viewpoint**

Christina A. LeBedis, MD, MS (*Presenter*) Nothing to Disclose

R4-CER16C **Blunt Splenic Trauma - Interventional Radiology Viewpoint**

Mohammad Bader, MD (*Presenter*) Consultant; Penumbra

R4-CER16D **AAST Blunt Splenic Trauma: Current Work and Future Direction**

Krista Kaups, MD, MSc (*Presenter*) Nothing to Disclose

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R4-CGI13

Case-Based: GI Emergencies

Thursday, Dec. 4 11:00AM - 12:00PM Room: E451B

Douglas S. Katz, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Demonstrate a series of cases demonstrating GI emergencies, including vascular, bowel, trauma, and miscellaneous abdominal conditions. 2) Briefly review the relevant literature on these disorders.

COURSE DESCRIPTION

Case-based review of a variety of abdominal emergencies, including vascular imaging, trauma, and bowel emergencies.

Sub-Events

R4-CGI13B **Trauma**

Krystal Archer-Arroyo, MD (*Presenter*) Consultant; Siemens Healthineers USA

R4-CGI13C **Abdominal Pain**

Douglas S. Katz, MD (*Presenter*) Nothing to Disclose

R4-CGI13D **Small Bowel Emergencies**

Sowmya Mahalingam, MD, MBBS (*Presenter*) Nothing to Disclose

R4-CGI13E **Vascular Emergencies**

Federica Vernuccio, MD (*Presenter*) Other-Speaker at ECR 2024; online educational material preparation; Bracco Suisse SA

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R4-CIN19

Best Practices for Human-AI Collaboration

Thursday, Dec. 4 11:00AM - 12:00PM Room: E450B

Bonnie Armstrong, PhD, MA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Gain practical knowledge of how to anticipate common biases in AI-assisted diagnosis and apply targeted solutions such as learning through simulation, interface design changes, and training approaches. 2) Learn how to evaluate and design AI tools that align with real-world clinical workflows, cognitive limitations, and the needs of diverse users. 3) Provide guidance on how to structure, frame, and time AI outputs in ways that enhance interpretability, trust, and utility.

COURSE DESCRIPTION

This session brings together experts in human factors, cognitive science, and clinical AI to explore how we can design, communicate, and implement AI tools in ways that support clinicians and patients. The session begins with a cognitive science framework that explains how variations in thinking styles and expertise can increase susceptibility to cognitive biases and diagnostic errors in AI-assisted radiology, and presents strategies to reduce these risks through debiasing methods and thoughtful interface design. Next, the session shifts to a human-factors perspective, drawing from research in healthcare and other high-risk industries to explore how AI tools can be developed with a deep understanding of user needs, workflows, and cognitive limitations. Building on these foundations, the third talk addresses best practices for contextualizing AI-generated results - focusing on how information can be structured, framed, and timed to improve clinical utility and ensure AI outputs are actionable for both physicians and patients. Finally, the session concludes with a series of real-world case examples highlighting what effective human-AI collaboration looks like in practice, with a focus on optimizing shared decision-making, reducing cognitive burden, and building sustainable AI workflows in radiology. This session will use a lecture format and will equip participants with interdisciplinary, evidence-based strategies to improve the safety, usability, and healthy skepticism of AI in clinical care.

Sub-Events

R4-CIN19B **Human Bias in AI-assisted Radiology and Strategies for Mitigation**

Bonnie Armstrong, PhD, MA (*Presenter*) Nothing to Disclose

R4-CIN19C **Human Centered Design Considerations for AI**

Patricia Trbovich (*Presenter*) Grant/Research Support; JOHNSON & JOHNSON MEDTECH, A DIVISION;OF JOHNSON & JOHNSON (CANADA), INC.

R4-CIN19D **Best Practices for Contextualizing AI Results for Physicians and Patients**

Grayson L. Baird, PhD, MS (*Presenter*) Other-Statistical analyses as a consultant through my LLC. Has nothing to do with my work in Radiology or AI. ; Incrediwear

R4-CIN19E **Optimizing Human-AI Collaboration - Examples in Practice**

Elizabeth A. Krupinski, PhD (*Presenter*) Nothing to Disclose

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R4-CMK07

Arthritis Imaging: Case-Based Fundamentals

Thursday, Dec. 4 11:00AM - 12:00PM Room: E450A

Hillary W. Garner, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key imaging features of inflammatory arthritic conditions in adults and children such as rheumatoid arthritis, axial spondyloarthritides, and crystal arthritides through case-based examples. 2) Interpret imaging findings in the context of clinical presentation to differentiate different types of inflammatory arthritis. 3) Review best practices for imaging protocols tailored to arthritis evaluation.

COURSE DESCRIPTION

This course will offer four high-yield 12-minute lectures on imaging of arthritis with a focus on key distinguishing imaging features of different arthritides in adults and children.

Sub-Events

R4-CMK07B **Crystal Clues: Imaging Findings of CPPD, Gout, and HADD**

Hillary W. Garner, MD (*Presenter*) Nothing to Disclose

R4-CMK07C **Rheumatoid Erosions on MRI: Tips for Accurate Diagnosis**

Jim S. Wu, MD (*Presenter*) Nothing to Disclose

R4-CMK07D **Growing Pains or Something More? Imaging Pediatric Arthropathies**

Vivek Kalia, MD, MPH (*Presenter*) Nothing to Disclose

R4-CMK07E **From Shadows to Clarity: Imaging Axial Spondyloarthritis**

Anne Cotten, MD (*Presenter*) Nothing to Disclose

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R4-CNPM13

Addressing Imaging Disparities in American Indian and Alaska Native Communities: Opportunities and Solutions (Sponsored by the RSNA Health Equity Committee) (Advanced)

Thursday, Dec. 4 11:00AM - 12:00PM Room: N227B

Marilyn A. Roubidoux, MD (*Moderator*) Nothing to Disclose
Vaz A. Zavaletta, MD, PhD (*Moderator*) Other-Royalties; Mayo Medical Ventures licenses software to Imbio and 4D Medical

LEARNING OBJECTIVES

1) Understand the ethical principles and cultural considerations necessary for conducting health equity research in Native American communities and the role of tribal institutional role boards (IRBs). 2) Examine the role of community-driven research models that prioritize community input, trust building, and tribal sovereignty in the design, implementation, and dissemination of research findings. 3) Identify health disparities and community priorities in American Indian and Alaska Native communities, including the effects of colonization, forced relocation, and cultural erasure. 4) Analyze successful case studies of health equity research conducted with American Indian and Alaska Native communities and evaluate how these models can apply to other contexts.

COURSE DESCRIPTION

This course explores the complex and multifaceted health disparities faced by American Indian and Alaska Native communities, focusing on radiology and its intersection with health equity. The health disparities in this population are quite diverse geographically, with significant differences between urban and rural communities as well as between regions such as Alaska and Arizona. By delving into the historical and ongoing impacts of colonization, forced relocation, and cultural erasure, participants will gain a nuanced understanding of the roots of health inequities and the priorities identified by Native communities. The course analyzes successful case studies and community-driven research models to highlight the importance of tribal sovereignty, trust-building, and active community input in designing and implementing equitable healthcare solutions. Practical strategies and transferable insights will empower participants to address imaging disparities and promote health equity in diverse contexts.

Sub-Events

R4-CNPM13C **Research, Representation, and Reluctance: Learning From the Past to Build Trust in Native Health Equity**

Marilyn A. Roubidoux, MD (*Presenter*) Nothing to Disclose

R4-CNPM13D **Radiologic Sovereignty: Indigenous Innovation, Access, and the Future of Imaging Science to Address Health Disparities**

Rodney C. Haring, PhD (*Presenter*) Grant/Research Support; Bristol Meyers Squibb Foundation. Grant/Research Support; Lilly USA, LLC

R4-CNPM13E **Barriers, Bridges, and Breakthroughs: Advancing Health Equity for Native Populations**

Elizabeth Hosselkus, MD (*Presenter*) Nothing to Disclose

R4-CNPM13F **Medicine in Harmony: Integrating Traditional Healing Practices into Allopathic Care for Native Communities**

Kevin Nicoll, MD (*Presenter*) Nothing to Disclose

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R4-CNR13

Quantitative Automated Tools in Neuroimaging: A Help or Hindrance? (Advanced)

Thursday, Dec. 4 11:00AM - 12:00PM Room: S406B

Amish H. Doshi, MD (*Moderator*) Consultant; Subtle Medical. Consultant; VizAI. Consultant; BD. Consultant; Bracco. Consultant; AIRS Medical

LEARNING OBJECTIVES

1) Evaluate the clinical utility and limitations of quantitative MRI techniques in the diagnosis and management of acute stroke, neurodegenerative diseases, and multiple sclerosis. 2) Identify current challenges in implementing quantitative MRI across different neurological disorders, including technical variability, standardization issues, and integration into clinical workflows. 3) Compare the perspectives of radiologists and neurologists on the added value of quantitative MRI in multiple sclerosis, and explore its role in patient care.

COURSE DESCRIPTION

This session will explore the evolving role of quantitative MRI in the evaluation and management of neurological disorders, with a focus on stroke, neurodegeneration, and multiple sclerosis. Expert speakers will discuss whether quantification translates into clinical value, highlight the technical and practical challenges of implementing quantitative imaging, and provide interdisciplinary perspectives—including that of a clinical neurologist—on its current and future applications. Attendees will gain insight into how quantitative MRI can enhance diagnostic interpretation, inform treatment decisions, and potentially improve patient outcomes, while also recognizing the limitations and barriers to its broader adoption.

Sub-Events

R4-CNR13B Stroke Imaging: Does Quantification Equal Value?

Achala S. Vagal, MD (*Presenter*) Consultant; Viz AI. Consultant; Nervive. Grant/Research Support; Cerenovus. Consultant; Cerebra AI

R4-CNR13C Challenges and Opportunities with Quantitative MRI in Neurodegenerative Disorders

Timothy M. Shepherd, MD, PhD (*Presenter*) Grant/Research Support; MICroStructure Imaging (MICSI). Stock/Shareholder; MICroStructure Imaging (MICSI). Other-Travel ; Siemens Healthcare. Other-Expert witness; Medicolegal testimony

R4-CNR13D Quantitative MRI in Multiple Sclerosis: Does it Add Value?

Amish H. Doshi, MD (*Presenter*) Consultant; Subtle Medical. Consultant; VizAI. Consultant; BD. Consultant; Bracco. Consultant; AIRS Medical

R4-CNR13E Quantitative MRI in Multiple Sclerosis: A Clinical Neurologist's Perspective

Stephen Krieger, MD (*Presenter*) Consultant; Baim Institute. Other-Non Promotional Lectures; EMD Serono. Other-Non Promotional Lectures; Genentech. Other-Non Promotional Lectures; TG Therapeutics. Grant/Research Support; Biogen. Grant/Research Support; BMS. Grant/Research Support; Novartis. Grant/Research Support; Sanofi. Consultant; Biogen. Consultant; Cycle. Consultant; EMD Serono. Consultant; Geentech. Consultant; MedRX. Consultant; Novartis . Consultant; Sanofi. Consultant; TG Therapeutics

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R4-CPD08

Pulse and Circumstance: Where Heart and Vascular Imaging Coincide

Thursday, Dec. 4 11:00AM - 12:00PM Room: E350

Christopher Z. Lam, MD (*Moderator*) Nothing to Disclose
Dilachew A. Adebo, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize key imaging features of common congenital and acquired pediatric cardiovascular diseases. 2) Analyze complex congenital and acquired cardiovascular anomalies in pediatric patients using advanced imaging modalities and emerging technologies. 3) Describe common CTPA pitfalls and mimics and the role of dual-energy CT and perfusion maps for acute pulmonary embolism. 4) Discuss the complementary roles of ultrasound and MRI in the diagnosis, treatment, planning, and follow-up of vascular malformations.

COURSE DESCRIPTION

This comprehensive educational session is designed to enhance diagnostic expertise in pediatric cardiovascular imaging. With a focus on real-world clinical application, this session addresses both foundational and advanced imaging challenges that imagers face during daily routine practice. This session is ideal for radiologists of all levels seeking to strengthen their diagnostic skills and stay current with evolving technologies in pediatric cardiovascular imaging.

Sub-Events

R4-CPD08C **Pediatric Cardiovascular Imaging: Common Diagnoses**

Christelle Ackermann, MMEd, PhD (*Presenter*) Nothing to Disclose

R4-CPD08D **Pediatric Cardiovascular Imaging: Advanced Know-How**

David M. Biko, MD, MBA (*Presenter*) Nothing to Disclose

R4-CPD08E **Acute Pulmonary Embolism: Approach and Pitfalls**

Sarv Priya, MD, MBBS (*Presenter*) Nothing to Disclose

R4-CPD08F **Ultrasound versus MRI for Assessment of Pediatric Vascular Malformations**

Marie-Helene Gagnon, MD (*Presenter*) Nothing to Disclose

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R4-CPH11

State-Of-The-Art and Future Advances in Breast Imaging

Thursday, Dec. 4 11:00AM - 12:00PM Room: S404

Ioannis Sechopoulos, PhD (*Moderator*) Grant/Research Support; Siemens Healthcare. Grant/Research Support; Canon Medical. Grant/Research Support; ScreenPoint Medical. Grant/Research Support; Volpara Healthcare. Grant/Research Support; Sectra Benelux. Grant/Research Support; Hologic Inc.. Grant/Research Support; iCAD. Grant/Research Support; Lunit. Other-Scientific Advisory Board member; Koning Corp.

LEARNING OBJECTIVES

1) Explore the emerging role of contrast-enhanced mammography (CEM) in breast cancer screening, diagnosis, and biopsy, and discuss considerations and hurdles to clinical implementation. 2) Discuss the latest developments in software and hardware technology in clinical and research digital breast tomosynthesis (DBT) systems and the emerging role of machine learning/AI on DBT workflow, computer-aided diagnosis, reconstruction, dose reduction, and risk prediction. 3) Describe the proven clinical utility of dedicated breast CT (bCT) for breast cancer diagnosis, the next-generation developments in bCT, and how they may further enhance clinical utility of this modality.

COURSE DESCRIPTION

Contrast-enhanced mammography (CEM) has been gaining traction as a potential screening alternative for dense breasts and high-risk patients, and many institutions are seeking to adopt this modality into their clinical practice. Design and capabilities of commercially available systems will be reviewed along with practical considerations for implementing this technology into the clinical workflow for existing and emerging indications. Digital breast tomosynthesis (DBT) is increasingly used globally as a primary screening modality for breast cancer. The technology is still changing and improving over time, including new detector technologies, faster scanning, and improved reconstruction and image processing. These developments, and the increasing use of AI and machine learning at nearly every stage of the DBT workflow, will be discussed. Numerous clinical studies demonstrating the clinical utility of dedicated breast CT (bCT) will be explained and summarized in the context of comparison to standard-of-care breast imaging techniques. Limitations of existing bCT technology will be reviewed, and next generation developments aimed at overcoming some of these challenges and expanding the utility of the modality will be presented.

Sub-Events

R4-CPH11B **Contrast-Enhanced Mammography: Current Status and Emerging Applications**

Katie Hulme, MS (*Presenter*) Nothing to Disclose

R4-CPH11C **Digital Breast Tomosynthesis: Trends and Innovations**

James G. Mainprize, PhD (*Presenter*) Grant/Research Support; GE Healthcare. Owner; Calavera Surgical Design Inc.

R4-CPH11D **Dedicated Breast CT: Proven Utility and Next-Generation Developments**

Andrew M. Hernandez, PhD (*Presenter*) Consultant; Izotropic Corporation

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R4-RCP11

Medical Imaging at the Nexus of Global Health: The IAEA Perspective

Thursday, Dec. 4 11:00AM - 12:00PM Room: N226

Diana Paez, MD, MEd (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize and strengthen the importance of a World Health Assembly resolution on medical imaging. 2) Identify current key global health initiatives where medical imaging plays a crucial role. 3) Identify global barriers to access, such as infrastructure, cost, and training.

Sub-Events

R4-RCP11B Strengthening Medical Imaging Capacity: A World Health Assembly Resolution

Hedvig Hricak, MD, PhD (*Presenter*) Nothing to Disclose

R4-RCP11C Global Initiatives in Health and the Essential Role of Imaging

John O. Prior, MD, PhD (*Presenter*) Nothing to Disclose

R4-RCP11D Availability of Medical Imaging: A Global Perspective

Satoshi Minoshima, MD, PhD (*Presenter*) Consultant; Hamamatsu Photonics. Consultant; Ziteo. Grant/Research Support; Hitachi. Grant/Research Support; Nihon Medi-physics. Consultant; Ceremark

R4-RCP11E Panel Discussion

Diana Paez, MD, MEd (*Presenter*) Nothing to Disclose

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R4-RCP25

QUIC Roadmap for Alzheimer Disease: Clinical Implementation of Amyloid PET Quantification (Sponsored by the RSNA Quantitative Imaging Committee)

Thursday, Dec. 4 11:00AM - 12:00PM Room: S401

Michelle Roytman, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify biomarkers of Alzheimer Disease. 2) Understand the role of Amyloid PET in diagnosing and managing Alzheimer Disease. 3) Identify the use of beta-amyloid burden quantification.

COURSE DESCRIPTION

This educational session consists of lectures highlighting Alzheimer Disease (AD), the most common cause of dementia. Attendees of this course will receive a comprehensive review of AD biomarkers, including amyloid PET and beta-amyloid burden quantification, with an emphasis on the role of radiologists in guiding diagnosis and management. Approaches to overcoming barriers to clinical implementation will be discussed.

Sub-Events

R4-RCP25B Alzheimer Disease Biomarkers - From Bench to Bedside

Gloria C. Chiang, MD (*Presenter*) Consultant; Life Molecular Imaging. Other-Honorarium to speak at CME; Efficient CME. Consultant; Alnylam Pharmaceuticals. Consultant; Minoryx Therapeutics. Other-Honorarium to speak at CME; Peerview CME

R4-RCP25C Role of Amyloid PET in Therapeutic Clinical Trials

Tammie S. Benzinger, MD, PhD (*Presenter*) Other-They provide precursors for radiopharmaceuticals and technology transfer for reserach studies at Washington University in which I am involved as an investigator.; Eli Lilly / Avid Radiopharmaceuticals. Other-They provide precursors for radiopharmaceuticals and technology transfer for reserach studies at Washington University in which I am involved as an investigator.; Cerveau / Lantheus. Consultant; Biogen. Consultant; Eisai. Grant/Research Support; Siemens. Other-Consultant, and also travel.; Lilly. Other-Travel; J&J

R4-RCP25D Quantifying Beta-amyloid Burden in Patients with Suspected Alzheimer Disease - Implications for Clinical Practice

Jana Ivanidze, MD, PhD (*Presenter*) Grant/Research Support; Novartis Pharmaceuticals . Grant/Research Support; GE Healthcare . Speaker's Bureau; Novartis Pharmaceuticals . Speaker's Bureau; GE Healthcare . Grant/Research Support; Curium US LLC

R4-RCP25E Multi-parameter PET Imaging in Patients with Suspected Alzheimer Disease - Quantifying Disease Biomarkers Beyond Beta-amyloid

Derek R. Johnson, MD (*Presenter*) Consultant; Telix. Consultant; Novartis. Consultant; Cellectar

R4-RCP25F Amyloid PET Quantification in Clinical Practice: Monitoring Treatment Response

Ana M. Franceschi, MD, PhD (*Presenter*) Consultant; Biogen. Speaker's Bureau; Genentech/Roche. Consultant; Life Molecular Imaging. Consultant; Cortechs. Consultant; Icometrix. Consultant; Eisai. Consultant; Blue Earth Diagnostics. Consultant; Siemens Healthineers

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R4-RCP39

MIDRC: Engaging the Cancer Imaging Research Community

Thursday, Dec. 4 11:00AM - 12:00PM Room: E353B

Maryellen L. Giger, PHD (*Moderator*) Stock/Shareholder; Hologic. Stock/Shareholder; Qview. Consultant; Genetech/Roche. Other Financial or Material Support; Various companies who license from the Polsky Center at the University of Chicago

LEARNING OBJECTIVES

1) Appreciate the various MIDRC tools that are open to all AI investigators. 2) Learn the potential role of large language models in routine clinical radiology practice and in benefitting patients' understanding. 3) Understand the role and need for data to advance the field of AI and enable translation to clinical use for the benefit of patient care.

COURSE DESCRIPTION

This session aims to acquaint the attendee with MIDRC, its data, and its tools. The various MIDRC tools are open to all AI investigators, whether they are developers, evaluators, or clinical users of AI. Examples will be given and related to routine clinical care. With one such example, attendees will learn the potential role of large language models in routine clinical radiology practice and in benefitting patients' understanding. The goal is to have AI benefit the radiological imaging exam as well as the patient in understanding the exam and its resulting findings. Ultimately, attendees will appreciate the role and need for data to advance the field of AI and enable translation to clinical use for the benefit of patient care.

Sub-Events

R4-RCP39B **MIDRC's Cancer Imaging Tool Box**

Karen Drukker, PHD (*Presenter*) Nothing to Disclose

R4-RCP39C **RadGPT: Using Large Language Models to Explain Radiology Reports to Patients**

Curtis P. Langlotz, MD, PhD (*Presenter*) Stock/Shareholder; Bunkerhill Health. Grant/Research Support; Clairity. Grant/Research Support; GE Healthcare. Grant/Research Support; Google Cloud. Grant/Research Support; IBM. Grant/Research Support; Kheiron. Grant/Research Support; Lambda. Grant/Research Support; Lunit. Grant/Research Support; Microsoft. Grant/Research Support; Stability.ai. Grant/Research Support; Subtle Medical. Stock/Shareholder; Whiterabbit.ai. Grant/Research Support; Vinbrain. Grant/Research Support; Whiterabbit.ai. Consultant; Sixth Street. Consultant; Gilmartin Capital. Grant/Research Support; Visiana. Stock/Shareholder; RadPartners. Other Financial or Material Support; annalise.ai. Stock/Shareholder; Turboradiology. Stock/Shareholder; Abxtract. Stock/Shareholder; GalileoCDS. Stock/Shareholder; Sirona Medical. Stock/Shareholder; Adra.ai. Stock/Shareholder; Kheiron. Grant/Research Support; Bunkerhill Health. Grant/Research Support; Carestream. Grant/Research Support; CARPL.ai

R4-RCP39D **Your Data and AI**

Samuel G. Armato III, PhD (*Presenter*) Nothing to Disclose

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R6-CHN10

Head and Neck After Dark: Case-Based Review of Emergency and On Call Imaging

Thursday, Dec. 4 1:30PM - 2:30PM Room: E352

Valeria Potigailo, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize critical imaging findings in head and neck emergencies: Learners will enhance their ability to identify key radiologic features across a range of urgent head and neck conditions, including facial trauma, temporal bone emergencies, non-traumatic neck emergencies, and pediatric head and neck emergencies. 2) Emphasis will be placed on high-yield and clinically relevant diagnoses frequently encountered during on-call and emergency imaging, as well as rare but critical "can't-miss" findings.

COURSE DESCRIPTION

This lecture-based session will provide a focused review of high-yield head and neck diagnoses that are essential for radiologists covering on-call and emergency imaging. Accurate and timely interpretation of these conditions can significantly impact patient care and outcomes. The session will highlight common pitfalls, critical diagnoses not to miss, and practical tips for efficient evaluation of head and neck pathology in the acute setting. Learners will improve their confidence and accuracy in identifying critical head and neck findings on emergency and after-hours imaging studies, leading to better-informed clinical decisions and patient management.

Sub-Events

R6-CHN10B **Facial Trauma**

Salman Qureshi, MBChB (*Presenter*) Nothing to Disclose

R6-CHN10C **Temporal Bone Emergencies**

Kevin D. Hiatt, MD (*Presenter*) Nothing to Disclose

R6-CHN10D **Non-traumatic Neck Emergencies**

Xin Wu, MD (*Presenter*) Other-blinded reader for Bayer sponsored trial; Bayer

R6-CHN10E **Pediatric Head & Neck Emergencies**

William T. O'Brien Sr, DO (*Presenter*) Nothing to Disclose

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R6-CIN20

Best Practices for AI Continuous Model Evaluation

Thursday, Dec. 4 1:30PM - 2:30PM Room: E450B

Akshay Chaudhari, PhD (*Moderator*) Grant/Research Support; GE Healthcare. Grant/Research Support; Microsoft. Grant/Research Support; Stability.ai. Owner; Cognita Imaging Inc.. Grant/Research Support; Philips. Consultant; Subtle Medical. Stock/Shareholder; Brain Key. Stock/Shareholder; LVIS Corp. Other-Scientific Advisory Board; Chondrometrics GmbH. Consultant; Patient Square Capital. Consultant; Elucid Bioimaging. Grant/Research Support; Amazon

LEARNING OBJECTIVES

1) Implement Evaluation Workflows: Outline the technical steps and best practices for performing continuous AI model evaluation, from initial deployment to large-scale monitoring. 2) Manage Data Shifts: Assess the clinical impact of distributional data shifts on AI model performance and identify practical methods for their detection. 3) Leverage Automated Tools: Discuss emerging methods that use large language models and computer vision to automate the performance evaluation of other radiology AI models.

COURSE DESCRIPTION

This session will present best practices for monitoring the performance of AI models that are deployed for use in conjunction with an overseeing radiologist. Given such human-AI collaborative settings where models are not deployed autonomously, this course will cover who the responsible parties could be for ongoing evaluation and how they can perform evaluation from initial deployment to large-scale monitoring. Experts will share lessons learned from real-world attempts at deploying continuous evaluation programs, providing updates on current best practices and the evolving regulatory landscape. Topics will cover change control planning, autonomous AI implications, regulatory clearance status, impact and detection of distributional shifts, and practical lessons learned from deployment and monitoring.

Sub-Events

R6-CIN20B Using LLMs to Automate Evaluation of AI Computer Vision Models

Jason A. Poff, MD (*Presenter*) Stock/Shareholder; Radiology Partners. Other-Consultant, with all proceeds donated to RSNA R&E Foundation.; aidoc

R6-CIN20C Using LLMs to Automate Evaluation of AI LLMs

Pranav Rajpurkar, PhD (*Presenter*) Owner; a2z Radiology AI

R6-CIN20D Using Computer Vision Models to Automate Evaluation of Computer Vision Models

Akshay Chaudhari, PhD (*Presenter*) Grant/Research Support; GE Healthcare. Grant/Research Support; Microsoft. Grant/Research Support; Stability.ai. Owner; Cognita Imaging Inc.. Grant/Research Support; Philips. Consultant; Subtle Medical. Stock/Shareholder; Brain Key. Stock/Shareholder; LVIS Corp. Other-Scientific Advisory Board; Chondrometrics GmbH. Consultant; Patient Square Capital. Consultant; Elucid Bioimaging. Grant/Research Support; Amazon

R6-CIN20E Detection and Impact Distribution Shifts on Radiology AI Models

McKell Woodland, PhD (*Presenter*) Nothing to Disclose

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R6-CRO09

Pediatric Malignancies: Multidisciplinary Masterclass

Thursday, Dec. 4 1:30PM - 2:30PM Room: S401

Camilo Jaimes Cobos, MD, MPH (*Moderator*) Nothing to Disclose
Hesham Elhalawani, MD, MSc (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Engage in a multidisciplinary discussion concerning three complex pediatric oncology cases, focusing on their clinical and imaging characteristics. 2) Present recommendations from the COG/SPR consensus papers pertaining to image acquisition and interpretation. 3) Examine the role of radiation therapy in these cases, emphasizing strategic planning and delivery considerations.

COURSE DESCRIPTION

This interactive panel discussion will delve into three complex pediatric oncology cases. The panel, composed of two pediatric radiologists, a radiation oncologist, and a medical oncologist, will guide the conversation. Suggested panel includes: - Camilo Jaimes Cobos (pediatric neuroradiology, Mass General Hospital, USA) cjaimescobos@mgb.org - Michael Gee (pediatric radiology, Mass General Hospital, USA) msgee@mgh.harvard.edu - Jessica Clymer (pediatric neuroradiology, NYU Langone Health, USA) jessica.clymer@nyulangone.org - Hesham Elhalawani (pediatric/AYA radiation oncology, Boston Children's/Brigham and Women's Hospital, USA) helhalawani@bwh.harvard.edu Each case will be introduced through its clinical presentation and initial imaging. The medical oncologist will provide insights into the biology of the tumor, its staging, and the standard medical management. Following this, the radiation oncologist will discuss treatment alternatives, intricacies of radiation planning, and crucial aspects of delivery. The discussion will emphasize key aspects of medical imaging for each case, drawing on the recent recommendations from the Children's Oncology Group (COG)/Society for Pediatric Radiology (SPR) guidelines.

Sub-Events

R6-CRO09C **Pediatric Malignancies- Multidisciplinary Masterclass**

Michael S. Gee, MD, PhD (*Presenter*) Consultant; Reveal Pharmaceuticals

R6-CRO09D **Pediatric Malignancies- Multidisciplinary Masterclass**

Jessica Clymer, MD (*Presenter*) Nothing to Disclose

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R6-CVA08

Aortic Dissection

Thursday, Dec. 4 1:30PM - 2:30PM Room: N227B

Daniel Vargas, MD (*Moderator*) Nothing to Disclose
Kacie Kuykendall, MD (*Moderator*) Nothing to Disclose

Sub-Events

R6-CVA08C **Imaging Acute Aortic Syndrome**

Erica Tirr, MD (*Presenter*) Nothing to Disclose

R6-CVA08D **Limited Tears and Ulcer-Like Aortic Lesions**

Kacie Kuykendall, MD (*Presenter*) Nothing to Disclose

R6-CVA08E **Imaging for Surgical and Intervention Planning in Aortic Dissection**

Dominik Fleischmann, MD (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; General Electric. Other-ownership interest, Stanford Startup with unknown value; Rapid AI, Inc. Other-ownership interest, Stanford Startup with unknown value; Segmed, Inc.

R6-CVA08F **Imaging Chronic Aortic Dissection**

Dominik Fleischmann, MD (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; General Electric. Other-ownership interest, Stanford Startup with unknown value; Rapid AI, Inc. Other-ownership interest, Stanford Startup with unknown value; Segmed, Inc.

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R6-RCP28

Collaborating Across Academia, Community Practice, and Data Science for Optimal Clinical Trial Outcomes and Patient Care (Sponsored by the RSNA Research Development Committee)

Thursday, Dec. 4 1:30PM - 2:30PM Room: S402

David A. Mankoff, MD, PhD (*Moderator*) Consultant; GE Healthcare. Other-Scientific Advisory Board; Reflexion. Other-Scientific Advisory Board; ImaginAb. Stock/Shareholder; Trevarx. Consultant; Blue Earth Diagnostics
Fiona M. Fennessy, MBBCh, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explore the contributions that community and academic radiologists provide to clinical trials. 2) Address the importance of diverse patient participation, emphasizing how AI algorithms rely on high-quality data from a diverse patient demographic.

COURSE DESCRIPTION

In this session, academic and community clinical trial partners and a data science expert will share how crucial their partnership is, outlining key advantages to a cooperative group setting such as enhanced clinical expertise, practical feedback on feasibility and workflow insights, technological diversity, faster recruitment and data collection, better buy-in from community physicians and broader acceptance of results.

Sub-Events

R6-RCP28C The Academic Medical Center Perspective

Heather Jacene, MD (*Presenter*) Grant/Research Support; Blue Earth Diagnostics. Grant/Research Support; Lantheus. Other-Royalties; Cambridge Publishing. Other-Honoraria; MedScape. Other-Honoraria; Elsevier. Other-Honoraria; inTouchCongress

R6-RCP28D The Community Practice Perspective

Antje L. Greenfield, MD, PhD (*Presenter*) Consultant; Trice Medical

R6-RCP28E The Data Science Perspective

Caroline Chung, MD, FRCPC (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; RaySearch Laboratories

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R7-CBR14

DCIS Demystified: Advances in Imaging and Management Strategies

Thursday, Dec. 4 3:00PM - 4:00PM Room: S406A

Nisha Sharma, MBChB, FRCR (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the latest imaging techniques to identify DCIS and challenges posed. 2) Understand the challenges in pathological diagnosis and helpful tips and tricks. 3) Updates on the management of DCIS from an oncological perspective.

COURSE DESCRIPTION

DCIS Demystified: Advances in Imaging and Management Strategies This session will focus on the current imaging and histological techniques available to aid diagnosis of DCIS and the challenges faced from an imaging and histological perspective. We will discuss the current oncological management of DCIS and how do we manage DCIS going forward in this era of minimising over-treatment.

Sub-Events

R7-CBR14B Advances in Imaging

Nisha Sharma, MBChB, FRCR (*Presenter*) Nothing to Disclose

R7-CBR14C Pathology Update

Husain Sattar, MD, BA (*Presenter*) Nothing to Disclose

R7-CBR14D Oncology Management Strategies

William J. Gradishar, MD (*Presenter*) Other-Steering Committee/Advisory board; Menarini/Stemline. Grant/Research Support; Breast Cancer Research Foundation. Other-Disease Monitoring Committee; Genentech/Roche. Other-Advisory board; AstraZeneca. Other-Advisory board; Daichi-Sanyo. Other-Disease Monitoring Committee; Eli Lilly. Other-Advisory board; Guardant. Other-Advisory board; Caris. Other-Advisory board; Sermonix. Other-Steering committee; Carrick

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R7-CCA09

AI as the New Normal In Cardiac Imaging

Thursday, Dec. 4 3:00PM - 4:00PM Room: E353C

Marly Van Assen, MSc, PhD (*Moderator*) Grant/Research Support; Siemens. Grant/Research Support; Cleerly. Grant/Research Support; Pfizer

LEARNING OBJECTIVES

1) Describe current real-life applications of AI in cardiac imaging, including workflow optimization, automated analysis and report generation. 2) Identify practical considerations for implementing AI tools in cardiac imaging. 3) Evaluate the impact of AI integration on clinical efficiency, diagnostic accuracy, and patient outcomes in cardiovascular imaging.

COURSE DESCRIPTION

This session explores practical applications of artificial intelligence across the cardiac imaging pipeline, from data acquisition to report generation. Experts will share real-world strategies for integrating AI into cardiac imaging workflows, discuss current capabilities and limitations, and demonstrate how AI tools are being used today to enhance efficiency, consistency, and diagnostic accuracy and any future perspectives. Attendees will gain actionable insights on leveraging AI in clinical practice to improve patient care.

Sub-Events

R7-CCA09C **AI Workflow Optimization in Real Life**

Eun Kyoung Hong, MD, PhD (*Presenter*) Other-former employee; Kakaobrain

R7-CCA09D **AI in Cardiac CT: How to Use it Today**

Damini Dey, PhD (*Presenter*) Other-Software royalties; Cedars-Sinai Medical Center. Stock/Shareholder; APQ Health Inc

R7-CCA09E **AI from Data to Report**

Maurice Pradella, MD (*Presenter*) Stock/Shareholder; General Electric. Other-Institutional Support (not personal); Siemens Healthineers

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R7-CCH14

Optimizing the Performance and Interpretation of Thoracic MRI (Advanced)

Thursday, Dec. 4 3:00PM - 4:00PM Room: E451A

Yoshiharu Ohno, MD, PhD (*Moderator*) Grant/Research Support; Canon Medical Systems Corporation. Grant/Research Support; Grant-in-Aid for Scientific Research from the Japanese Ministry of Education, Culture, Sports, Science and Technology. Grant/Research Support; Smoking Research Foundation. Grant/Research Support; LPIXEL Corporation. Grant/Research Support; Corelinesoft Corporation

LEARNING OBJECTIVES

1) Learn fundamental and state-of-the-art chest MR techniques for different chest diseases as having better clinical indications. 2) Explain current clinical evidence and future directions of MRI for different chest diseases with evidence-based clinical indications.

COURSE DESCRIPTION

This educational course provides fundamental and state-of-the art chest MR techniques and clinical relevance for different chest diseases with evidence-based clinical indications.

Sub-Events

R7-CCH14B **Chest MRI Protocol Optimization and Practical Considerations**

Elsie Nguyen, MD, FRCPC (*Presenter*) Nothing to Disclose

R7-CCH14C **Advances in Pulmonary Vascular MRI**

Mark L. Schiebler, MD (*Presenter*) Stock/Shareholder; Stemina Biomarker Discovery, Inc. Stock/Shareholder; Elucent Medical

R7-CCH14D **Advances in Lung MRI**

Jurgen Biederer, MD (*Presenter*) Other Financial or Material Support; Siemens;. Other Financial or Material Support; Bayer. Other-speaker honorarium at a symposium; Fuji;. Other-speaker honorarium at a symposium; Boehringer Ingelheim

R7-CCH14E **Advances in Mediastinal MRI**

Rachna Madan, MBBS, MD (*Presenter*) Nothing to Disclose

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R7-CER18

On-Call Emergency Radiology: Cases You Can't Afford to Miss

Thursday, Dec. 4 3:00PM - 4:00PM Room: E450B

Laura L. Avery, MD (*Moderator*) Nothing to Disclose
Polina Kanj, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key imaging findings in common and high-risk trauma scenarios, including cervical spine injuries, body trauma, and ballistic wounds. 2) Recognize common pitfalls and diagnostic blind spots in trauma imaging and develop strategies to avoid them in high-pressure clinical settings. 3) Apply structured approaches to trauma imaging that improve speed and accuracy of diagnosis across a range of emergent situations. 4) Correlate clinical context with imaging features to enhance interpretation and guide timely, effective patient care decisions.

COURSE DESCRIPTION

Nothing good happens after midnight. The only things open are 7-Eleven and trouble. The whole town’s out looking for fun and finding trauma. As the night float resident, you and the CT scanner are busier than the bartender five minutes before last call. In this fast-paced case-based session, you’ll sharpen your trauma imaging skills to increase your speed to diagnosis, improve accuracy, and sidestep common pitfalls when every second counts.

Sub-Events

R7-CER18C **Losing the Game of Chutes and Ladders: Cervical Spine Trauma**

Laura L. Avery, MD (*Presenter*) Nothing to Disclose

R7-CER18D **Drag Racing in a Prius: Body Trauma**

Polina Kanj, MD (*Presenter*) Nothing to Disclose

R7-CER18E **Band-Aids Don't Fix Bullet Holes: Ballistic Injuries**

Noah G. Ditkofsky, MD, FRCPC (*Presenter*) Nothing to Disclose

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R7-CGI14

Case-Based Potpourri (Liver, Spleen, Mesentery)

Thursday, Dec. 4 3:00PM - 4:00PM Room: E451B

Jeong Min Lee, MD, PhD (*Moderator*) Grant/Research Support; Bayer, Gerbet, Philips Healthcare, GE Healthcare, Samsung Medison, Clarify, Medical IP, Stardmed, RF Medical. Speaker's Bureau; Bayer, Samsung Medison, GE Healthcare, Clarify, Philps Healthcare, Starmed, Gerbet. Grant/Research Support; Central Medical Service, . Consultant; Samsung Medison

LEARNING OBJECTIVES

1) Demonstrate proficiency in identifying characteristic imaging features of hepatic, splenic, and mesenteric pathologies using multimodality approaches, including advanced MRI techniques and contrast-enhanced CT protocols. 2) Formulate comprehensive differential diagnoses for complex abdominal imaging findings and apply systematic diagnostic algorithms to challenging cases. 3) Recognize and mitigate common interpretation pitfalls in hepatic, splenic, and mesenteric imaging, implementing quality assurance strategies to reduce diagnostic errors.

COURSE DESCRIPTION

This comprehensive case-based session provides an in-depth review of hepatic, splenic, and mesenteric imaging pathology. Distinguished faculty will present challenging clinical cases encompassing both common and rare entities, emphasizing state-of-the-art imaging techniques and their clinical applications. The session will demonstrate optimal utilization of multimodality imaging (CT, MRI, ultrasound, and nuclear medicine when applicable) for accurate diagnosis and treatment planning. Interactive case discussions, real-time polling, and Q&A sessions will facilitate active learning and knowledge retention.

Sub-Events

R7-CGI14B Liver - Malignant

Jeong Min Lee, MD, PhD (*Presenter*) Grant/Research Support; Bayer, Gerbet, Philips Healthcare, GE Healthcare, Samsung Medison, Clarify, Medical IP, Stardmed, RF Medical. Speaker's Bureau; Bayer, Samsung Medison, GE Healthcare, Clarify, Philps Healthcare, Starmed, Gerbet. Grant/Research Support; Central Medical Service, . Consultant; Samsung Medison

R7-CGI14C Mesentery

Kristen Olinger, MD (*Presenter*) Nothing to Disclose

R7-CGI14D Spleen

Khaled M. Elsayes, MD, PhD (*Presenter*) Nothing to Disclose

R7-CGI14E Liver - Benign

Dow-Mu Koh, FRCR (*Presenter*) Grant/Research Support; Siemens Healthineers

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R7-CIN21

Best Practices for AI Education

Thursday, Dec. 4 3:00PM - 4:00PM Room: N228

Katherine P. Andriole, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Know why radiologists, whether in training or beyond, should have an understanding of Artificial Intelligence/Machine Learning (AI/ML) technologies at least at a high level. 2) Learn example curricula and ways in which radiologists and residents can be trained in AI/ML. 3) Become familiar with ways to educate care team members and patients about AI.

COURSE DESCRIPTION

Clinical Radiology will be practiced using Artificial Intelligence/Machine Learning (AI/ML) tools. Multiple steps are involved in developing and deploying machine learning models and artificial intelligence applications and clinical radiological expertise and input is required throughout the development and translation pipeline. In order to contribute to the process, Radiologists should have at a minimum, knowledge of AI/ML technology at a high level, understanding of technology limitations and recognition of error, the ability to converse and collaborate with a multidisciplinary team, capability to critically read the literature, and the ability to evaluate and properly use an AI/ML product or application. Example educational activities for residents are discussed. Other health care team members as end-users and patients as consumers must be educated as well. Methods for monitoring AI training will be discussed. This session will present best practices for educating each of these constituents.

Sub-Events

R7-CIN21B **An Example AI Educational Program: What Radiology Trainees and Staff Need to Know**

Katherine P. Andriole, PhD (*Presenter*) Nothing to Disclose

R7-CIN21C **An Inter-National Imaging Informatics Curriculum: The NIIC Course**

Ali S. Tejani, MD (*Presenter*) Nothing to Disclose

R7-CIN21D **Educating the Care Team and Our Patients About AI**

Ameena Elahi, MS, ARRT (*Presenter*) Nothing to Disclose

R7-CIN21E **Using Monitoring to Target AI Training**

Gina M. Constantine, MD (*Presenter*) Other-I am an equity holder in Radiology Partners, which has a minority interest in aidoc; aidoc. Other-I am an equity holder in Radiology Partners, which has an indirect minority interest in Rad AI; Rad AI

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R7-CMK12

MSK Infection: From Skin to Bone

Thursday, Dec. 4 3:00PM - 4:00PM Room: E450A

Kevin McGill, MD, MPH (*Moderator*) Consultant; Vitruvia. Grant/Research Support; Teleflex

LEARNING OBJECTIVES

1) Differentiate between the imaging characteristics of acute and chronic musculoskeletal infections, including joint infections, soft tissue infections, and osteomyelitis. 2) Interpret key imaging findings in pediatric musculoskeletal infections, understanding how they differ from adult presentations and influence diagnostic and management strategies. 3) Apply appropriate imaging modalities and protocols to effectively diagnose and monitor infections of the joints, bones, and soft tissues, with attention to clinical urgency and anatomical complexity.

COURSE DESCRIPTION

Musculoskeletal (MSK) infections are diagnostically challenging conditions that span a broad spectrum—from superficial soft tissue involvement to deep-seated osteomyelitis. This course is designed to enhance diagnostic accuracy and confidence in evaluating infectious processes across the musculoskeletal system. These high-yield lectures will cover acute and chronic joint infections, soft tissue infections, and osteomyelitis, with particular attention to pediatric-specific presentations. The course will emphasize imaging patterns, modality selection, and diagnostic pitfalls, providing tools to differentiate infection from mimics and to guide timely clinical intervention. This course is important because MSK infections can present subtly and evolve rapidly, with delays in diagnosis potentially leading to irreversible functional loss, systemic spread, or even death. Accurate image interpretation is central to early detection and treatment planning, especially in complex or atypical cases. This course addresses the clinical urgency, anatomic complexity, and age-specific considerations critical to optimal patient care. Many key issues will be addressed during the course including, differentiation of acute vs. chronic joint and bone infections, imaging strategies for evaluating soft tissue infections, including abscesses and necrotizing fasciitis, special diagnostic approaches for pediatric musculoskeletal infections, recognizing imaging findings that necessitate urgent surgical or medical management, and avoiding common diagnostic pitfalls and misinterpretations By the end of this session, participants will be able to select the most appropriate imaging modalities, recognize key diagnostic features across a spectrum of infections, and contribute effectively to multidisciplinary management.

Sub-Events

R7-CMK12B Infection of Joints: Acute and Chronic

Felix Gonzalez, MD (*Presenter*) Nothing to Disclose

R7-CMK12C Imaging of Acute Soft Tissue Infections: What's Important

William B. Morrison, MD (*Presenter*) Other-Co-founder, patent owner, Medical Director; Trace Orthopedics, LLC . Other-Patent owner, royalties ; Apriomed, Inc

R7-CMK12D Infection in the Pediatric Patient: What's Different?

Jie C. Nguyen, MD, MS (*Presenter*) Nothing to Disclose

R7-CMK12E Imaging of Acute Osteomyelitis

William B. Morrison, MD (*Presenter*) Other-Co-founder, patent owner, Medical Director; Trace Orthopedics, LLC . Other-Patent owner, royalties ; Apriomed, Inc

R7-CMK12F Imaging of Chronic Osteomyelitis

Matthew D. Bucknor, MD (*Presenter*) Nothing to Disclose

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R7-CMS08

Arthritis and Systemic Diseases with Dermatologic Manifestations

Thursday, Dec. 4 3:00PM - 4:00PM Room: E352

Megan K. Mills, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn the imaging findings of systemic arthritic diseases with dermatologic manifestations. 2) Review the radiologic manifestations of phacomatoses with dermatologic manifestations. 3) Discuss the imaging of soft tissue necrosis.

COURSE DESCRIPTION

Arthritis and Systemic Disease with Dermatologic Manifestations offers an up-to-date lecture-based review of imaging of soft tissue necrosis, systemic arthritides and phacomatoses with dermatologic, chest, and abdominal manifestations. Attendees will have the opportunity to learn about the latest multimodality findings of related disease process as well as relevant clinical and treatment details from content experts in the field.

Sub-Events

R7-CMS08B **Systemic Arthritic Diseases With Dermatologic Manifestations**

Clarissa C. Moraes Do Carmo, MD (*Presenter*) Nothing to Disclose

R7-CMS08C **Phacomatoses With Dermatologic Manifestations**

Majid Chalian, MD (*Presenter*) Nothing to Disclose

R7-CMS08D **Chest and Abdominal Manifestations in Systemic Arthridities and Phacomotoses**

Margarita V. Revzin, MD, MS (*Presenter*) Nothing to Disclose

R7-CMS08E **Imaging of Soft Tissue Necrosis**

Jack A. Porrino JR, MD (*Presenter*) Nothing to Disclose

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R7-CNMMI08

Updates in Diagnosis and Theranostics: Neuroendocrine Tumors and Lymphoma

Thursday, Dec. 4 3:00PM - 4:00PM Room: S405

Esma A. Akin, MD (*Moderator*) Nothing to Disclose

Sub-Events

R7-CNMMI08B Lymphoma Imaging Redefined: Biomarkers and the Future of Nuclear Medicine

Heather Jacene, MD (*Presenter*) Grant/Research Support; Blue Earth Diagnostics. Grant/Research Support; Lantheus. Other-Royalties; Cambridge Publishing. Other-Honoraria; MedScape. Other-Honoraria; Elsevier. Other-Honoraria; inTouchCongress

R7-CNMMI08C Dose Reduction in Pediatric Molecular Imaging and Theranostics

Andrew T. Trout, MD (*Presenter*) Grant/Research Support; GE Healthcare. Grant/Research Support; Siemens Healthineers. Consultant; GE Healthcare. Other-Institutional Research Support; Perspectum Inc.

R7-CNMMI08D PET Imaging Agents in the Era of Immunotherapy

Pedram Heidari, MD (*Presenter*) Other-Advisory board; Telix pharmaceutical . Grant/Research Support; Siemens Healthineers. Grant/Research Support; Sofie. Grant/Research Support; CytoSite Biopharma

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R7-CNPM16

Medicolegal Hot Topics

Thursday, Dec. 4 3:00PM - 4:00PM Room: S402

Avanti Gulhane, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss how state and federal laws including supreme court decisions can influence practices of radiology and adoption of new technologies such AI. 2) Understand how medical malpractice trials are adjudicated with respect to radiology including interpretation of radiographs. 3) Understand how financial compensation is determined in a malpractice trial.

COURSE DESCRIPTION

This course is targeted towards enabling radiologists understand how the malpractice trial proceedings work in a real-world setting. The presentations listed include a diverse range of topics that will equip the audience to understand how law influences the practice of radiology. Information will be provided regarding state and federal laws on the regulation of healthcare and technologies including artificial intelligence. Focused discussion will include the change in practice of radiology following the landmark supreme court decision to overturn Roe v. Wade in 2022 and delegate legislative decisions regarding abortion to individual states.

Sub-Events

R7-CNPM16B **Cost of a Malpractice Verdict - The Case of Missed Viral Myocarditis**

Ian Amber, MD (*Presenter*) Nothing to Disclose

R7-CNPM16C **Legal Hurdles Post-Dobbs**

Jonathan Mezrich, MD, JD (*Presenter*) Nothing to Disclose

R7-CNPM16D **Can States Ignore the FDA and Adopt AI?**

Sagar Kulkarni, MD (*Presenter*) Nothing to Disclose

R7-CNPM16E **How Courts View the Imperfection of Chest X-Rays**

Avanti Gulhane, MD (*Presenter*) Nothing to Disclose

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R7-CNR14

A New Era of Dementia Imaging: State-of-The-Art

Thursday, Dec. 4 3:00PM - 4:00PM Room: S406B

Gloria C. Chiang, MD (*Moderator*) Consultant; Life Molecular Imaging. Other-Honorarium to speak at CME; Efficient CME. Consultant; Alnylam Pharmaceuticals. Consultant; Minoryx Therapeutics. Other-Honorarium to speak at CME; Peerview CME

LEARNING OBJECTIVES

1) Identify the key findings of amyloid-related imaging abnormalities (ARIA) on MRI and what action needs to be taken by the radiologist, based on ARIA severity. 2) Be familiar with how positive versus negative amyloid PET scans look qualitatively and learn about quantitative tools that may aid visual interpretation. 3) Be familiar with imaging findings that would suggest either atypical Alzheimer's or non-Alzheimer's dementia.

COURSE DESCRIPTION

Alzheimer's disease neuroimaging has changed dramatically in the last few years, as anti-amyloid therapies have become widely prescribed in the U.S. Radiologists now play a crucial role in 1) accurately diagnosing Alzheimer's disease, which may involve a combination of MRI, FDG PET, amyloid PET, and/or lumbar puncture, and 2) monitoring for amyloid-related imaging abnormalities (ARIA) while patients are on therapy. These lectures will provide the necessary tools for radiologists to appropriately diagnose and manage these patients. In addition, the speakers will walk through real-life case examples, showing how findings from MR and PET can lead the radiologist to the correct diagnosis in both typical and atypical dementia cases. Finally, speakers will discuss the future of Alzheimer's management, including the recently FDA-approved blood test.

Sub-Events

R7-CNR14B Imaging of Dementia and ARIA: What Radiologists Need to Know

Priya Rajagopalan, MBBS, MPH (*Presenter*) Nothing to Disclose

R7-CNR14C Role of Amyloid and Tau PET Imaging

Ilya M. Nasrallah, MD, PhD (*Presenter*) Consultant; Eisai. Speaker's Bureau; Biogen. Consultant; Subtle Medical

R7-CNR14D Case-Based Imaging Review of Atypical AD and Non-AD Forms of Dementia

Gloria C. Chiang, MD (*Presenter*) Consultant; Life Molecular Imaging. Other-Honorarium to speak at CME; Efficient CME. Consultant; Alnylam Pharmaceuticals. Consultant; Minoryx Therapeutics. Other-Honorarium to speak at CME; Peerview CME

R7-CNR14E What Does the Future Hold: Novel Imaging and Fluid Biomarkers

Paul Edison, PhD, MD (*Presenter*) Grant/Research Support; Alzheimer's Research, UK, Alzheimer's Drug Discovery Foundation, Alzheimer's Society, UK, Medical Research Council, Alzheimer's Association US, Van-Geest foundation, and European Union . Consultant; Roche, Pfizer, Novo Nordisk and Neurocrine. Grant/Research Support; GE Healthcare, Novo Nordisk, Piramal Life Science/Life Molecular Imaging, Avid Radiopharmaceuticals and Eli Lilly

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R7-COB06

Imaging in Cervical and Endometrial Cancer: What Referring Physicians Need to Know

Thursday, Dec. 4 3:00PM - 4:00PM Room: E351

Jeanne M. Horowitz, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review how to optimize and interpret cervical cancer MRI and PET exams for staging, with interesting case examples. 2) Explain what radiologists need to know about the 2023 Endometrial Cancer FIGO Guidelines to add value in their reports for their ordering physicians, with practical take home points. 3) Learn pearls and pitfalls of imaging endometrial and cervical cancer after treatment featuring state of the art imaging.

COURSE DESCRIPTION

"Imaging in Cervical and Endometrial Cancer: What Referring Physicians Need to Know" will feature three lecturers using interactive imaging case examples and giving practical take home points focusing on the Endometrial Cancer with FIGO 2023 Guidelines, Cervical Cancer staging with MRI and PET, and Imaging of Endometrial and Cervical Cancer after treatment.

Sub-Events

R7-COB06B **Imaging Prior to and After Treatment of Endometrial and Cervical Cancer**

Jeanne M. Horowitz, MD (*Presenter*) Nothing to Disclose

R7-COB06C **Cervical Cancer: Staging Using MRI and PET**

Lauren A. Roller, MD (*Presenter*) Nothing to Disclose

R7-COB06D **Endometrial Cancer: What to Do in the Era of FIGO 2023**

Stephanie Nougaret, MD, PhD (*Presenter*) Nothing to Disclose

R7-COB06E **Follow Up Imaging and Patterns of Recurrence: Pearls and Pitfalls**

Aradhana Venkatesan, MD (*Presenter*) Nothing to Disclose

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R7-CPD11

Tracking Clues: Illuminating the Imaging Findings of Child Abuse

Thursday, Dec. 4 3:00PM - 4:00PM Room: N226

Edward J. Richer, MD (*Moderator*) Nothing to Disclose
Lynn A. Fordham, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key imaging features suggestive of Abusive Head Trauma in infants. 2) Distinguish radiographic findings of child abuse from those of common metabolic bone diseases. 3) Recognize actions to prepare for a child abuse court case that will make your testimony more efficient.

COURSE DESCRIPTION

Physical child abuse unfortunately remains all too common, and radiologists play an important role in the care of these patients through the use of imaging. Knowledge of characteristic imaging findings of child abuse, as well as potential mimics or alternatives, is essential to making an accurate diagnosis in these cases. Radiologists are also increasingly being called on to provide testimony when these cases end up in a courtroom. In this series of lectures, our experts will offer key insights into several aspects of this topic, including neuroimaging of abusive head trauma, distinguishing findings of abuse from metabolic bone disease on skeletal surveys, and how to prepare yourself when you receive a subpoena to testify.

Sub-Events

R7-CPD11C **Abdominal Injuries in Children: Accidental or Not?**

Ali Pourvaziri, MD, MPH (*Presenter*) Nothing to Disclose

R7-CPD11D **Abusive Head Trauma: Diagnostic Clues and the Role of Cranial Ultrasound**

Yoshino Tamaki Sameshima, MD (*Presenter*) Nothing to Disclose

R7-CPD11E **Skeletal Surveys: Differentiating Metabolic Bone Disease and Child Abuse**

Jeffrey P. Otjen, MD (*Presenter*) Nothing to Disclose

R7-CPD11F **Approach to Efficiently Testify for a Child Abuse Case in Court**

Peter J. Strouse, MD (*Presenter*) Nothing to Disclose

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R7-CPH12

Cone-Beam CT Image Quality and Dosimetry

Thursday, Dec. 4 3:00PM - 4:00PM Room: S404

Grace J. Gang, PhD (*Moderator*) Grant/Research Support; Siemens

LEARNING OBJECTIVES

1) Review factors affecting image quality in CBCT systems and methods of image quality measurement. 2) Review motion artifacts in CBCT and methods to correct or avoid them. 3) Review basics of CBCT dosimetry and recommended methods for CBCT dose measurements.

COURSE DESCRIPTION

Cone beam CT is widely used in diagnostic and interventional radiology applications. Materials in this session cover basic and advanced topics in CBCT image quality and dose.

Sub-Events

R7-CPH12B **Motion Artifacts and Approaches to Avoid or Correct for Them**

Marc Kachelriess, PhD (*Presenter*) Nothing to Disclose

R7-CPH12C **Image Quality Fundamentals for Cone-Beam CT**

Grace J. Gang, PhD (*Presenter*) Grant/Research Support; Siemens

R7-CPH12D **Cone Beam CT Dosimetry: Dose Index Measurement Options for Acceptance and Constancy Testing**

Mark P. Supanich, PhD (*Presenter*) Nothing to Disclose

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R7-RCP19

Championing Equity in Research: Recruitment to Results/ Equity in Health Delivery Science: Recruitment to Results (Sponsored by the RSNA Health Equity Committee and the RSNA Research Development Committee)

Thursday, Dec. 4 3:00PM - 4:00PM Room: N227B

Ashley E. Prosper, MD (*Moderator*) Consultant; MedQIA. Speaker's Bureau; Canon Medical. Grant/Research Support; Bristol Myers Squibb Foundation. Grant/Research Support; Siemens Medical Solutions. Consultant; Bayer
Janie M. Lee, MD, MSc (*Moderator*) Grant/Research Support; GE Healthcare

LEARNING OBJECTIVES

1) Build successful academic/community partnerships. 2) Learn mindful inclusion of equity in study design. 3) Learn strategies to recruit participants from underrepresented groups. 4) Deliver research results to community partners. 5) Engage these partners in evidence-based action plans stemming from research findings.

COURSE DESCRIPTION

This course aims to prepare researchers (at the trainee level and beyond) as well as radiology and research staff with the tools to be successful in building equity into their research programs from study design to result delivery.

Sub-Events

R7-RCP19C **Building Successful Community Partnerships in Radiology Research**

Efren J. Flores, MD (*Presenter*) Nothing to Disclose

R7-RCP19D **Establishing a Pediatric Health Equity, Diversity, and Inclusion Research Review Process**

Sabra L. Katz-Wise, PhD (*Presenter*) Nothing to Disclose

R7-RCP19E **Advancing Research with a Health Equity Lens**

Gelareh Sadigh, MD (*Presenter*) Nothing to Disclose

R7-RCP19F **The Importance of Variability in Clinical Trials: Real-world Evaluation of AI in Breast Cancer Screening**

Hannah Milch, MD (*Presenter*) Nothing to Disclose

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S1-CBR01

Fundamentals and Updates on Screening Practices Worldwide

Sunday, Nov. 30 9:00AM - 10:00AM Room: S406A

Georgia G. Spear, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Participants will understand the current state of breast screening in the United States, including how breast density affects screening decisions and the FDA mandate. 2) Attendees will be able to recognize and compare the different breast screening methods used in Europe and South Korea, and understand how these methods work in each country. 3) Participants will be able to identify and discuss the new trends in breast screening worldwide, and how advancements in technology and healthcare policies are shaping these practices.

Sub-Events

S1-CBR01B Breast Density, Screening and FDA Regulation (USA)

Georgia G. Spear, MD (*Presenter*) Nothing to Disclose

S1-CBR01C Supplemental Screening Techniques Europe Perspective

Thiemo van Nijnatten, MD, PhD (*Presenter*) Other-Institutional grant support, speaker's bureau and participation in medical advisory board meetings.; Bayer. Other-Institutional grant support, speaker's bureau and participation in medical advisory board meetings.; GE Healthcare. Other-Participation in medical advisory board meetings.; Screenpoint Medical

S1-CBR01D Supplemental Screening Techniques South Korea Perspective

Hee Jung Shin, MD, PhD (*Presenter*) Grant/Research Support; GE Healthcare

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S1-CCA01

Pre-Transcatheter Structural Heart Interventions: How to Do It

Sunday, Nov. 30 9:00AM - 10:00AM Room: E353C

Melany B. Atkins, MD (*Moderator*) Consultant; GE Heathcare. Speaker's Bureau; HeartFlow. Consultant; Arterys. Consultant; Bayer Healthcare CTEPH
Phillip M. Young, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key imaging protocols and techniques essential for planning transcatheter structural heart interventions, including TAVR, TMVR, TTVR, TPVR, and LAA closure.
2) Evaluate the imaging considerations unique to mitral, tricuspid, and pulmonary valve interventions, and apply this knowledge to support device selection, procedural planning, and complication avoidance.

COURSE DESCRIPTION

This lecture series provides a comprehensive overview of pre-procedure planning for transcatheter structural heart interventions. Experts will cover current best practices for pre-procedural assessment, with a focus on TMVR, tricuspid and pulmonary valve therapies, and LAA closure. Attendees will gain practical insights to support clinical decision-making and optimize procedural outcomes

Sub-Events

S1-CCA01C **TMVR: From Research to Prime Time**

Jeremy D. Collins, MD (*Presenter*) Consultant; Circle CVi. Other-Advisory Board; Varian Medical. Grant/Research Support; GE

S1-CCA01D **The Other Valves: TTVR and TPVR**

Prabhakar Rajiah, MD, FRCR (*Presenter*) Consultant; Circle CVI. Consultant; Heartflow. Other-Royalty; Elsevier. Consultant; Canon

S1-CCA01E **Plugs & Baskets: Imaging for LAA Closure**

Monika Radike, MD, PhD (*Presenter*) Nothing to Disclose

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S1-CER01

Emergent MSK Conditions: Diagnostic Challenges and Strategies

Sunday, Nov. 30 9:00AM - 10:00AM Room: N228

Claire K. Sandstrom, MD (*Moderator*) Nothing to Disclose
Manickam Kumaravel, MD, FRCR (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify easily missed or mischaracterized hip injuries. 2) Explain the clinical significance of subtle knee findings that portend more severe soft tissue injuries. 3) Appropriately describe intraarticular calcaneal fractures, reporting what the surgeons need to know.

COURSE DESCRIPTION

From these lectures, learners will about essential lower extremity musculoskeletal trauma. Easily missed hip injuries will be reviewed, with emphasis on detection of easily missed fractures and unusual dislocation patterns. Subtle knee findings that herald more severe underlying traumatic pathology will be discussed. Fractures of the calcaneus will be reviewed, with emphasis on detection and reporting surgically relevant findings. Ultimately, the learner will better understand the importance and nuances of hip, knee, and calcaneal post-traumatic imaging.

Sub-Events

S1-CER01C **Hip Injuries - What Not to Miss**

Claire K. Sandstrom, MD (*Presenter*) Nothing to Disclose

S1-CER01D **Knee Injuries - What not to Miss**

Vanessa M. Zayas-Colon, MD (*Presenter*) Nothing to Disclose

S1-CER01E **Calcaneal Fractures**

Manickam Kumaravel, MD, FRCR (*Presenter*) Nothing to Disclose

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S1-CGI01

GI/GU Jeopardy

Sunday, Nov. 30 9:00AM - 10:00AM Room: S406B

Adriano Basso Dias, MD, MSc (*Presenter*) Nothing to Disclose
Alice Schuch, MD (*Presenter*) Other-speaker fees from Bayer; Bayer
Anjali Agrawal, MD (*Presenter*) Nothing to Disclose
Christine O. Menias, MD (*Moderator*) Nothing to Disclose
David J. DiSantis, MD (*Moderator*) Nothing to Disclose
Federica Vernuccio, MD (*Presenter*) Other-Speaker at ECR 2024; online educational material preparation; Bracco Suisse SA
Marc Zins, MD (*Presenter*) Stock/Shareholder; Telediag. Stock/Shareholder; Mata
Olga R. Brook, MD, MBA (*Moderator*) Nothing to Disclose
Pankaj Gupta, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize imaging findings that reveal common and unusual gastrointestinal, genitourinary, and abdominal solid organ pathologies.

COURSE DESCRIPTION

This fast-paced game show-oriented session will highlight imaging findings that allow diagnosis of an eclectic array of abdominal pathologies.

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S1-CIN06

2025 Year in Review of AI Models in Radiology

Sunday, Nov. 30 9:00AM - 10:00AM Room: E450B

Imon Banerjee, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify and discuss the most impactful AI research papers published in leading radiology journals and conferences in 2025 - Radiology: AI, European Journal of Radiology, RadioGraphics, and MICCAI. 2) Evaluate key trends, methodological innovations, and clinical implications emerging from recent AI advancements in radiology. 3) Critically appraise how top-published works address challenges such as model generalizability, data diversity, interpretability, and regulatory alignment in radiology AI.

COURSE DESCRIPTION

This session offers a curated review of the most influential AI papers in radiology published in 2025. Moderated by Dr. Imon Banerjee, the session features expert insights from leading voices in the field: Dr. Charles Kahn will highlight top papers published in Radiology: AI; Dr. Pascal Baltzer will present standout research from the European Journal of Radiology; Dr. Kenneth Wang will showcase influential work from RadioGraphics; and Dr. Kayhan Batmanghelich will discuss the best AI papers presented at MICCAI 2025. Together, the speakers will provide a comprehensive overview of emerging trends, methodological innovations, and the clinical impact of AI in radiology. This session is designed for radiologists, researchers, and informatics professionals seeking to stay current with the rapidly advancing AI landscape in medical imaging.

Sub-Events

S1-CIN06B **Best AI Papers Published in Radiology AI**

Charles E. Kahn JR, MD, MS (*Presenter*) Other-Travel support, Radiology Advisory Panel; Sectra USA

S1-CIN06C **Best AI Papers Published in European Journal of Radiology**

Pascal A. Baltzer, MD (*Presenter*) Nothing to Disclose

S1-CIN06D **Best AI Papers Published in Radiographics**

Kenneth C. Wang, MD, PhD (*Presenter*) Nothing to Disclose

S1-CIN06E **Best Radiology AI Papers Published in MICCAI 25**

Kayhan Batmanghelich, PhD (*Presenter*) Stock/Shareholder; READE.ai

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S1-CMK08

Hand and Wrist: Approach to Multimodality Imaging

Sunday, Nov. 30 9:00AM - 10:00AM Room: E450A

Aline Serfaty Sr, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify and characterize common and complex tendon pathologies of the hand and wrist using ultrasound and MRI. 2) Describe the imaging appearance and clinical relevance of finger pulley injuries, and recognize high-performance athlete-specific patterns. 3) Differentiate metacarpal fractures that require operative treatment from those manageable with conservative therapy based on imaging features. 4) Evaluate intrinsic and extrinsic wrist ligament injuries using advanced imaging techniques, and understand their implications for wrist instability. 5) Interpret TFCC anatomy and pathology on imaging, correlating findings with patient symptoms to support accurate diagnosis and management decisions.

COURSE DESCRIPTION

This focused and dynamic session will provide a comprehensive review of key hand and wrist pathologies, highlighting a multimodality imaging approach. Expert faculty will cover tendon injuries, pulley system trauma, metacarpal fractures, ligamentous injuries of the wrist, and triangular fibrocartilage complex (TFCC) pathology. Emphasis will be placed on the role of MRI, ultrasound, and radiographs in diagnosis, and on differentiating injuries that require surgical intervention from those that can be managed conservatively. Radiologists will gain practical tools for accurate assessment and reporting, critical for guiding optimal clinical management.

Sub-Events

S1-CMK08B **Imaging of Tendon Pathologies in the Hand and Wrist**

Aline Serfaty Sr, MD, PhD (*Presenter*) Nothing to Disclose

S1-CMK08C **Mind the Gap: Finger Pulley Injuries**

Jeffrey J. Peterson, MD (*Presenter*) Nothing to Disclose

S1-CMK08D **Metacarpal Fractures: Differentiating Nonoperative vs Operative Injuries**

Tetyana A. Gorbachova, MD (*Presenter*) Nothing to Disclose

S1-CMK08E **Advanced Imaging of Intrinsic and Extrinsic Wrist Ligament Injuries**

Barry G. Hansford, MD (*Presenter*) Nothing to Disclose

S1-CMK08F **TFCC Revealed: Imaging and Insights**

Hilary R. Umans, MD (*Presenter*) Nothing to Disclose

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S1-CNPM17

Advanced Standardization and Certification for Safe, Efficient Remote MR Scanning: Ready for Prime Time

Sunday, Nov. 30 9:00AM - 10:00AM Room: S402

Emanuel Kanal, MD (*Moderator*) Consultant; Philips Healthcare

LEARNING OBJECTIVES

1) Identify common issues associated with starting a Remote MR service at your own institution. 2) Understand the specific medicolegal liabilities/responsibilities of those participating in remote MR operations. 3) Be familiar with new standardized titles, terms, job descriptions, responsibilities, unique chain of command, and unique certification potential associated with MR personnel that are specific to remote MR environments.

COURSE DESCRIPTION

Associated with a national and, in some areas, international severe shortage of MRI technologists/radiographers, there has been a rapidly growing and notable increasing interest in remote MR scanning, where the operator of the MR scanner is in a physical location that is remote to the location of the MR scanner being operated and patient being studied. Remote MR operations have generated the potential for unique safety concerns for both the patient and healthcare practitioners. Multiple remoter MR vendors have attempted to address these concerns in their own unique methods. However, to date, no consensus standardization has yet been defined for legal liability and/or methods of patient and site safety oversight for the unique environment associated with MR imaging. This course explains some common issues one can expect to confront when initiating remote MR scanning services; introduces and defines formal legal definitions and constructs for liabilities and responsibilities ascribed to and undertaken by those participating in remote MR scanning activities; introduces a standardized safety oversight structure unique to remote MR scanning environments; and introduces the American Board of MR Safety efforts at standardizing certification of those who will participate and operate in the unique environments and safety considerations generated by remote MR scanning operations.

Sub-Events

S1-CNPM17B **Standardization and Certification for Safe, Efficient, Remote MR Scanning: Ready for Prime Time**

Emanuel Kanal, MD (*Presenter*) Consultant; Philips Healthcare

S1-CNPM17C **Potential Pitfalls and Preparedness Planning for Launching Remote MR Imaging Services**

Sarah Lewis (*Presenter*) Nothing to Disclose

S1-CNPM17D **Potential Pitfalls and Preparedness Planning for Launching Remote MR Imaging Services**

Anat Hersch (*Presenter*) Employee; Philips Medical Systems Ltd.

S1-CNPM17E **Medicolegal Aspects of Remote MR Scanning: Understanding the Roles, Responsibilities, - and Liabilities - of the MR Technologist, the MR Safety Tech, and the Radiologist**

Craig E. Frischman (*Presenter*) Nothing to Disclose

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S1-CNR08

Advancing Knowledge in Functional Neurosurgery

Sunday, Nov. 30 9:00AM - 10:00AM Room: E351

Timothy J. Kaufmann, MD, MS (*Moderator*) Stock/Shareholder; SpineThera

LEARNING OBJECTIVES

1) Describe the basic pathophysiology of diseases treated by functional neurosurgical interventions. 2) Understand the goals and means of functional neurosurgical interventions. 3) Appreciate the importance of particular imaging which supports and enables these interventions.

COURSE DESCRIPTION

Functional Neurosurgery encompasses the surgical treatment of neurological disorders by targeting specific brain circuits or nuclei to modulate their function, such as through deep brain stimulation (DBS), lesioning including with high intensity focused ultrasound (HIFU), and the implantation of devices (e.g. vagal nerve stimulators/VNS, responsive neurostimulators/RNS, and spinal cord stimulators). Diseases treated with these interventions include epilepsy, movement disorders such as essential tremor and Parkinson disease, and chronic pain. This course will provide introductions to each of these above-mentioned interventions.

Sub-Events

S1-CNR08B **Tuning the Brain: VNS and RNS for Seizure**

Stephen E. Jones, MD, PhD (*Presenter*) Grant/Research Support; Siemens. Consultant; Monteris. Other Financial or Material Support; Siemens

S1-CNR08C **DBS for Seizure and Movement Disorders: The Essentials**

Alexandre Boutet, MD, PhD (*Presenter*) Other-Intellectual property; GE Healthcare

S1-CNR08D **Rewiring Pain: Understanding Spinal Cord Stimulation**

Lubdha M. Shah, MD, MSc (*Presenter*) Nothing to Disclose

S1-CNR08E **Understanding HIFUS: A Radiologist's Guide**

Timothy J. Kaufmann, MD, MS (*Presenter*) Stock/Shareholder; SpineThera

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S1-COB08

Ovarian Cancer: From Start to Finish

Sunday, Nov. 30 9:00AM - 10:00AM Room: E451B

Andrea G. Rockall, FRCR, MRCP (*Moderator*) Other-Advisory Board; RoClub

LEARNING OBJECTIVES

1) Explain the ways in which imaging adds value to the care pathway in women with suspected ovarian cancer. 2) Identify learning strategies to translate this into daily clinical practice during reporting.

COURSE DESCRIPTION

In this course, the role of imaging in the evaluation of patients with suspected or confirmed ovarian cancer will be developed, from incidental detection of adnexal masses, characterisation, staging and monitoring response to treatment. The course will focus on how imaging may add value to the diagnosis and care of patients with ovarian masses or ovarian cancer.

Sub-Events

S1-COB08B **How Radiologists Add Value: From Start to Finish**

Andrea G. Rockall, FRCR, MRCP (*Presenter*) Other-Advisory Board; RoClub

S1-COB08C **When Incidental Ovarian Lesions are Cancer and When They are NOT!**

Atul B. Shinagare, MD (*Presenter*) Consultant; Virtualscopics. Consultant; Imaging Endpoints

S1-COB08D **Pretreatment Imaging Evaluation of Ovarian Cancer (CT, MRI, PET)**

Yuliya Lakhman, MD (*Presenter*) Consultant; Perceptive

S1-COB08E **Ovarian Cancer: Assessing Treatment Response and Complications**

Stefania Rizzo, MD, PhD (*Presenter*) Nothing to Disclose

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S1-CPD13

RSNA Hands-On Lab: Pediatric MSK Ultrasound Course (Registration Fee Required)

Sunday, Nov. 30 9:30AM - 11:30AM Room: S504CD

Andrea S. Doria, MD, PhD (*Moderator*) Grant/Research Support; Baxalta-Shire. Grant/Research Support; Novo Nordisk. Grant/Research Support; Terry Fox Foundation . Grant/Research Support; Society of Pediatric Radiology . Grant/Research Support; Radiological Society of North America

LEARNING OBJECTIVES

1) Review the anatomy and ultrasound imaging techniques used to evaluate the ankle, digits, and brachial plexus. 2) Describe dynamic imaging techniques that enhance the assessment of ankle and digit pathology. 3) Discuss common MSK pathologies involving the ankle, digits, and brachial plexus, including key ultrasound findings and potential pitfalls.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. While ultrasound of the ankle and digits is commonly requested in musculoskeletal (MSK) imaging, evaluation of the brachial plexus requires advanced imaging expertise. Nevertheless, ultrasound has emerged as a valuable diagnostic tool in pediatric centers worldwide, particularly because it can be performed without general anesthesia in young patients and offers cost-effective imaging. This 120-min pediatric musculoskeletal hands-on session is targeted to general radiologists who aim to get an overview of technical and clinical application perspectives on ultrasound scanning and interpretation of pathology of ankles and digits, and/or expand their knowledge and learn more about scanning and interpretation of abnormalities in brachial plexus nerves of children and adolescents. This session has two parts, a 60-min hands-on part where pre-assigned radiologists scan teenager models' joints in real time and a second 60-min knowledge application part where the audience has the opportunity to scan models' joints by themselves.

Sub-Events

S1-CPD13B **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Carlo Martinoli, MD (*Presenter*) Consultant; Philips. Consultant; Canon. Grant/Research Support; Esaote

S1-CPD13C **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Ogonna K. Nwawka, MD (*Presenter*) Consultant; Samsung

S1-CPD13D **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Kathryn S. Milks, MD (*Presenter*) Nothing to Disclose

S1-CPD13E **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Jonathan D. Samet, MD (*Presenter*) Nothing to Disclose

S1-CPD13F **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Maria A. Bedoya-Velez, MD (*Presenter*) Nothing to Disclose

S1-CPD13G **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Jon A. Jacobson, MD (*Presenter*) Other-Book royalties; Elsevier. Consultant; BioClinica. Consultant; Samsung

S1-CPD13H **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Swati Patel, BS, RDMS (*Presenter*) Nothing to Disclose

S1-CPD13I **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Andrea S. Doria, MD, PhD (*Presenter*) Grant/Research Support; Baxalta-Shire. Grant/Research Support; Novo Nordisk. Grant/Research Support; Terry Fox Foundation . Grant/Research Support; Society of Pediatric Radiology . Grant/Research Support; Radiological Society of North America

S1-CPD13J **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Falguni Patel, RDMS, RVT (*Presenter*) Nothing to Disclose

S1-CPD13K **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Matthew R. Hammer, MD (*Presenter*) Nothing to Disclose

S1-CPD13L **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Sandra Taves (*Presenter*) Nothing to Disclose

S1-CPD13M **RSNA Hands-On Lab: Pediatric MSK Ultrasound Course**

Ayla Kljako, RDMS (*Presenter*) Nothing to Disclose

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S1-CRO02

Multidisciplinary Masterclass in GYN Cancer: A Case-Based Discussion

Sunday, Nov. 30 9:00AM - 10:00AM Room: S401

Madeleine Sertic, MBBCh (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the complementary roles of radiology, surgical oncology, and radiation oncology in the multidisciplinary management of gynecologic malignancies through case-based discussion. 2) Identify key imaging features that influence surgical planning, radiation therapy, and overall treatment strategy for gynecologic cancers. 3) Understand how to tailor radiology reports to highlight clinically actionable information.

COURSE DESCRIPTION

This case-based, multidisciplinary panel explores the role of imaging in the diagnosis and treatment of gynecologic malignancies. Experts in radiology, gynecologic oncology, and radiation oncology will discuss cases, highlighting how imaging guides clinical decisions. Attendees will learn how to optimize radiology reports for actionable, treatment-relevant communication.

Sub-Events

S1-CRO02B **Multidisciplinary Masterclass in GYN Cancer: A Case-Based Discussion**

Nicolette Taku, MD, MPH (*Presenter*) Nothing to Disclose

S1-CRO02C **Multidisciplinary Masterclass in GYN Cancer: A Case-Based Discussion**

Emily Hinchcliff, MD (*Presenter*) Speaker's Bureau; Abbvie

S1-CRO02D **Multidisciplinary Masterclass in GYN Cancer: A Case-Based Discussion**

Aileen O'Shea, MBBCh (*Presenter*) Other-Funding for conference attendance ; Novartis

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S1-CVA06

Interesting Cases in Vascular Imaging

Sunday, Nov. 30 9:00AM - 10:00AM Room: N227B

Arzu Canan, MD (*Moderator*) Nothing to Disclose
Elsie Nguyen, MD, FRCPC (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize key imaging features of malignancies affecting large vessels. 2) Identify congenital anomalies of the great vessels and understand their clinical implications. 3) Analyze challenging aortic imaging cases and apply problem-solving strategies to interpretation. 4) Evaluate imaging findings in non-aortic vascular diseases and differentiate them from mimics.

COURSE DESCRIPTION

This case-based session will explore a range of vascular imaging findings through discussion of complex and illustrative cases. Topics will include malignancies involving large vessels, congenital abnormalities of the great vessels, challenging aortic pathology, and non-aortic vascular diseases. The session is designed to highlight diagnostic pearls, imaging pitfalls, and multidisciplinary considerations relevant to vascular imaging.

Sub-Events

S1-CVA06C **Cancer May Be the Answer: Malignancies of the Large Vessels**

Carlos S. Restrepo, MD (*Presenter*) Nothing to Disclose

S1-CVA06D **Congenital Abnormalities of the Great Vessels**

Sarv Priya, MD, MBBS (*Presenter*) Nothing to Disclose

S1-CVA06E **Challenging Cases in Aortic Imaging**

Constantine A. Raptis, MD (*Presenter*) Nothing to Disclose

S1-CVA06F **Other (Non-Aortic) Vascular Diseases**

Arzu Canan, MD (*Presenter*) Nothing to Disclose

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S1-RCP12

The Kids Are Alright: Gen Z Perspectives on Learning, Career, Inclusivity and Wellness (Sponsored by the RSNA Professionalism Committee and by the RSNA Resident and Fellow Committee)

Sunday, Nov. 30 9:00AM - 10:00AM Room: N226

Brandon K.K. Fields, MD (*Moderator*) Consultant; Mendaera
Nadine Bayerl, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Analyze Gen Z's distinct learning styles, communication preferences, and professional expectations. 2) Implement effective strategies for mentoring, leading, and engaging Gen Z radiologists. 3) Develop practical methods to foster inclusivity, wellness, and career satisfaction tailored to Gen Z professionals.

COURSE DESCRIPTION

Gen Z is transforming radiology — reshaping how we teach, mentor and lead. This session provides essential insights into the values, expectations and unique needs of Gen Z through expert presentations and an engaging panel discussion. Attendees will gain practical strategies to create supportive, inclusive environments that boost career satisfaction and clinical excellence for the next generation of radiologists.

Sub-Events

S1-RCP12C **The New Frontier**

Gregory C. Postel, MD (*Presenter*) Nothing to Disclose

S1-RCP12D **It Takes One to Know One: The Gen Z Perspective**

Jenny Vo-Phamhi, MS (*Presenter*) Nothing to Disclose

S1-RCP12E **Evolving the Educational Experience**

Michel Eisenblaetter, MD, PhD (*Presenter*) Grant/Research Support; Siemens Healthineers. Speaker's Bureau; Bracco. Speaker's Bureau; Springer Nature. Grant/Research Support; Guerbet

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S1-RCP26

QUIC Roadmap for Clinical Implementation of Breast Density Quantification (Sponsored by the RSNA Quantitative Imaging Committee)

Sunday, Nov. 30 9:00AM - 10:00AM Room: E353A

Amy M. Fowler, MD, PhD (*Moderator*) Other Financial or Material Support; Elsevier, Inc. Other-Journal Associate Editor payment; BioMed Central Limited

LEARNING OBJECTIVES

1) Recognize the clinical impact of automated mammographic breast density quantification for breast cancer risk stratification and supplemental screening. 2) Understand the technical aspects of quantitative breast density assessment, software tools available, and potential for automated integration within the electronic medical record. 3) Identify the challenges, limitations, and barriers for implementing automated quantitative breast density in clinical practice.

COURSE DESCRIPTION

Breast density on mammography reports directly impacts clinical care by determining eligibility for supplemental breast cancer screening. Breast density assessment is by visual estimation by the interpreting radiologist which can be subjective with inter- and intra-reader variability. Current commercial tools for quantifying breast density are used variably in clinical practice. There is a need for standardization and automation of mammographic breast density quantification reporting. The purpose of this lecture-based educational session is to highlight the efforts of the RSNA Quantitative Imaging Committee (QUIC) in defining a roadmap for clinical implementation of breast density quantification. Key components that will be addressed include: motivation for clinical implementation, stakeholder involvement, technical considerations, implementation barriers, and informatics integration.

Sub-Events

S1-RCP26B **Introduction to QUIC and Breast Cancer Working Group**

Amy M. Fowler, MD, PhD (*Presenter*) Other Financial or Material Support; Elsevier, Inc. Other-Journal Associate Editor payment; BioMed Central Limited

S1-RCP26C **Breast Density Quantification Techniques with Tomosynthesis and other Emerging 3D Breast Imaging Modalities**

Despina Kontos, PhD (*Presenter*) Grant/Research Support; iCAD Inc.. Grant/Research Support; Genmab. Grant/Research Support; Calico LLC

S1-RCP26D **Clinical Impact of Automated Mammographic Breast Density Quantification for Breast Cancer Risk Stratification and Supplemental Screening**

James G. Mainprize, PhD (*Presenter*) Grant/Research Support; GE Healthcare. Owner; Calavera Surgical Design Inc.

S1-RCP26E **Informatics Considerations when Implementing Quantitative Breast Density Assessment**

Ryan W. Woods, MD, MPH (*Presenter*) Other-Create content for online education; MRI Online / Medality

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S1-RCP32

From the Editors of RADIOLOGY: New Research That Should Impact Your Practice

Sunday, Nov. 30 9:00AM - 10:00AM Room: E350

Linda Moy, MD (*Moderator*) Grant/Research Support; Siemens Research Grant. Consultant; Lunit Inc. Consultant; iCAD. Consultant; Guerbet. Other-Meeting and Travel Expenses; British Society of Breast Radiology, European Society of Breast Imaging,. Other-DSMB; ACR DSMB

LEARNING OBJECTIVES

1) Provide a digestible synopsis of articles in cutting-edge technologies that we published in 2025 in GI, GU, Thoracic and Neuroradiology. 2) Help sharpen the attendees' interpretive and diagnostic acumen. 3) Underscore the hot topics in medical imaging and how these examinations and/or techniques can improve patient care.

COURSE DESCRIPTION

Highlight the most influential articles that we have published Discuss the most impactful novel medical imaging techniques

Sub-Events

S1-RCP32B **Gastrointestinal Imaging: Research that Should Impact your Practice**

Kathryn J. Fowler, MD (*Presenter*) Speaker's Bureau; Bayer. Grant/Research Support; GE, Pfizer, Bayer, Median. Consultant; GE. Consultant; Ascelia Pharmaceuticals. Consultant; Guerbet

S1-RCP32C **New Research That Should Impact Your Practice Thoracic Imaging**

Mizuki Nishino, MD, MPH (*Presenter*) Grant/Research Support; Canon Medical Systems. Grant/Research Support; Konica Minolta

S1-RCP32D **Genitourinary Imaging: Research that Should Impact your Practice**

Vicky J. Goh, MBBChir, FRCR (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; Lunit

S1-RCP32E **Top Neuroradiology Imaging Papers That Should Impact Your Practice**

Sven Haller, MD, MSc (*Presenter*) Consultant; Spineart. Consultant; Wyss center. Consultant; HCK. Other Financial or Material Support; GUERBET. Other Financial or Material Support; Eli Lilly. Other-co-founder; BrainQuant

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S2-CCH01

Global Insights and Updates on Lung Cancer Screening (Advanced)

Sunday, Nov. 30 10:30AM - 11:30AM Room: E451A

Jared D. Christensen, MD, MBA (*Moderator*) Consultant; Riverain Inc

LEARNING OBJECTIVES

1) Compare the implementation strategies of lung cancer screening programs in the U.S., Europe, and Asia, including differences in eligibility criteria, infrastructure, and reporting models. 2) Identify regional variations in adherence and outcomes, exploring how program design and healthcare systems influence participation rates and mortality reduction. 3) Apply global insights to optimize clinical practice and policy development in lung cancer screening.

COURSE DESCRIPTION

Lung cancer screening (LCS) has emerged as a proven strategy to reduce lung cancer mortality, yet implementation and adoption vary widely across the globe. This session brings together leading experts from North America, Europe, and Asia to provide an in-depth look at the current status, unique challenges, and future directions of LCS in their respective regions. Through focused presentations and panel discussion, participants will gain comparative insights into screening eligibility criteria, reporting, infrastructure, reimbursement models, and public health outcomes.

Sub-Events

S2-CCH01B US Perspective: Current Status and Directions

Ella A. Kazerooni, MD, MS (*Presenter*) Nothing to Disclose

S2-CCH01C Asian Perspective: Current Status and Directions

Jin Mo Goo, MD, PhD (*Presenter*) Grant/Research Support; Coreline Soft. Grant/Research Support; Taejoon Pharm Co Ltd

S2-CCH01D European Perspective: Current Status and Directions

Mathias Prokop, MD, PhD (*Presenter*) Grant/Research Support; Canon Medical Systems. Speaker's Bureau; Siemens Healthineers, Canon Medical Systems and Bracco

S2-CCH01E Panel Discussion

Jared D. Christensen, MD, MBA (*Presenter*) Consultant; Riverain Inc

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S2-CER02

Spine Trauma Essentials: Imaging, Interpretation, and Innovation

Sunday, Nov. 30 10:30AM - 11:30AM Room: S404

Asim Z. Mian, MD (*Moderator*) Nothing to Disclose
Karen Buch, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify various types of spinal trauma. 2) Review challenging spine cases. 3) Add value to spine reports.

COURSE DESCRIPTION

This session reviews classification of spine trauma and challenging spine trauma cases. In addition, this session will provide tips on how to add value to your spine reports. The session will be in a lecture format.

Sub-Events

S2-CER02C **Lessons Learned from Misses on Spine Trauma Imaging**

Lubdha M. Shah, MD, MSc (*Presenter*) Nothing to Disclose

S2-CER02D **Adding Value in Spine Imaging Reports and Interesting Cases**

Aaron B. Paul, MD (*Presenter*) Nothing to Disclose

S2-CER02E **Rapid Review of Spine Injury Classification with the AO Spine Classification System: A Case Based Review**

Chad W. Farris, MD, PhD (*Presenter*) Consultant; Boston Imaging Core Lab, Inc.

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S2-CGI02

Case-Based: Alimentary Tract

Sunday, Nov. 30 10:30AM - 11:30AM Room: E451B

Shannon P. Sheedy, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize a new fluoroscopic finding at the lower esophageal sphincter and understand how it might cause destruction of the myenteric plexus. 2) Provide select case examples that will convey the relevance of upper GI fluoroscopy skills in contemporary radiology practice. 3) Identify key imaging features of on CT, MRI, and enterography studies using case-based examples. 4) Understand cross-sectional imaging patterns in inflammatory/infectious colitis and to learn about differential diagnoses in non-neoplastic colonic diseases.

COURSE DESCRIPTION

This four-part didactic lecture series offers a focused and practical exploration of gastrointestinal (GI) radiology, designed to enhance diagnostic accuracy and clinical confidence in both fluoroscopic and cross-sectional imaging. The series begins with a deep dive into esophageal motility and idiopathic achalasia, highlighting a novel fluoroscopic finding with potential implications for understanding disease pathogenesis. The second lecture emphasizes the enduring value of upper GI fluoroscopy through case-based teaching. The third session transitions to cross-sectional imaging of the small bowel, using case examples to illustrate the appearance and assessment of various small bowel tumors. The final lecture examines colonic pathology, concentrating on imaging patterns in inflammatory and infectious colitis and approaches to non-neoplastic disease. Together, these sessions provide learners with relevant and case-driven insights to sharpen interpretive skills across the GI tract.

Sub-Events

S2-CGI02B **Idiopathic Achalasia, New Fluoroscopic Observations and Theory of Etiology**

Francis J. Scholz, MD (*Presenter*) Nothing to Disclose

S2-CGI02C **Yes, You Still Need Some Upper GI Fluoro Skills, even beyond 2025**

David J. DiSantis, MD (*Presenter*) Nothing to Disclose

S2-CGI02D **Case Based Review of Small Bowel Tumors**

Shannon P. Sheedy, MD (*Presenter*) Nothing to Disclose

S2-CGI02E **Lights and Shadows in Colon Imaging**

Andrea Laghi, MD (*Presenter*) Speaker's Bureau; Bracco. Consultant; GE Healthcare, "Digital Enterprise Imaging". Speaker's Bureau; GE healthcare. Speaker's Bureau; Guerbet. Speaker's Bureau; Bayer

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S2-CGU04

GU Cased Based Session: Advanced (Audience Participation)

Sunday, Nov. 30 10:30AM - 11:30AM Room: E353B

Angela Tong, MD (*Moderator*) Other-Research support in the form of software and hardware ; Siemens Healthineers. Other-One time Honorarium for Speaking at a Siemens conference Innovations 2024 (5/22-23/2024; Siemens Healthineers
Shaun A. Wahab, MD (*Moderator*) Other-Served as an educational speaker on the imaging of endometrial cancer for the training of Eisai representatives. ; Eisai

LEARNING OBJECTIVES

1) Engage in a fast-paced audience participation session with a variety of genitourinary cases to challenge yourself and have fun while doing so. 2) Interpret common and uncommon GU cases from renal, ureters/bladder, prostate, and gynecologic imaging. 3) Identify pearls and pitfalls of challenging GU cases that will aid in making the correct diagnoses.

COURSE DESCRIPTION

Join us for an exciting interactive hour of challenging genitourinary cases moderated and presented by experts! Audience members will have the opportunity to join the fun and test their diagnostic skills with a variety of topics including renal, ureters/bladder, prostate, and gynecologic imaging.

Sub-Events

S2-CGU04C Prostate

Angela Tong, MD (*Presenter*) Other-Research support in the form of software and hardware ; Siemens Healthineers. Other-One time Honorarium for Speaking at a Siemens conference Innovations 2024 (5/22-23/2024; Siemens Healthineers

S2-CGU04D Kidney

Sung Yoon Park, MD, PhD (*Presenter*) Nothing to Disclose

S2-CGU04E Bladder/Ureter

Soleen Ghafoor, MD (*Presenter*) Nothing to Disclose

S2-CGU04F Gyn

Shaun A. Wahab, MD (*Presenter*) Other-Served as an educational speaker on the imaging of endometrial cancer for the training of Eisai representatives. ; Eisai

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S2-CIN09

The Reading Room of the Future: A Prediction Based on Recent AI and Other Technological Advancements

Sunday, Nov. 30 10:30AM - 11:30AM Room: E450B

Luciano M. Prevedello, MD, MPH (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify recent AI and technology advancements shaping radiology workflows and image interpretation. 2) Describe how AI can enhance reporting, decision-making, and diagnostic efficiency in the reading room. 3) Envision the future of the radiology reading room through integration of multimodal AI and smart workflows.

COURSE DESCRIPTION

This session explores recent advancements in artificial intelligence and other emerging technologies and their potential impact on the radiology reading room. Attendees will learn how AI-driven tools may reshape workflows, enhance diagnostic accuracy, and improve efficiency. By integrating current innovations with forward-looking insights, the session presents a vision of the reading room of the future based on ongoing research and technological progress.

Sub-Events

S2-CIN09B **Human + AI: Enhancing Radiologist Decision-Making in a Multimodal World**

Luciano M. Prevedello, MD, MPH (*Presenter*) Nothing to Disclose

S2-CIN09C **Beyond Detection: AI's Expanding Role in Image Interpretation**

Nancy Pham, MD (*Presenter*) Nothing to Disclose

S2-CIN09D **Standard-enabled Intelligence: Powering AI Workflows in the Smart Reading Room**

Katherine P. Andriole, PhD (*Presenter*) Nothing to Disclose

S2-CIN09E **Beyond Dictation: AI for Structured and Context-Aware Reports**

Tara A. Retson, MD, PhD (*Presenter*) Consultant; CureMetrix, Inc

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S2-CMK09

Nerve Imaging: Anatomy to Pathology

Sunday, Nov. 30 10:30AM - 11:30AM Room: E450A

Shivani Ahlawat, MD (*Moderator*) Speaker's Bureau; Alexion Pharmaceuticals. Grant/Research Support; Amgen Pharmaceuticals

LEARNING OBJECTIVES

1) Describe an approach to imaging peripheral nerve pathology. 2) Understand the unique anatomy and pathology of the brachial plexus and imaging features of peripheral nerve injury and entrapment in the upper and lower extremities. 3) Explain methods for performing perineural injections.

COURSE DESCRIPTION

This course is dedicated to state-of-the-art applications of MR imaging in evaluating the peripheral nervous system. Each speaker is a recognized expert in the field of peripheral nerve imaging and intervention, with abundant experience in the multidisciplinary care of patients with peripheral nerve pathology. As such, the lectures in this session provide a comprehensive framework by which MR neurography is understood as it relates to the various focal and diffuse peripheral nerve abnormalities encountered in clinical practice. In the final lecture, and approach to image-guided peripheral nerve interventions is discussed.

Sub-Events

S2-CMK09B How I Read MR Neurography

Shivani Ahlawat, MD (*Presenter*) Speaker's Bureau; Alexion Pharmaceuticals. Grant/Research Support; Amgen Pharmaceuticals

S2-CMK09C Brachial Plexus Imaging: Imaging Updates and Controversies

Darryl B. Sneag, MD (*Presenter*) Consultant; GE Healthcare. Grant/Research Support; GE Healthcare. Grant/Research Support; Siemens. Grant/Research Support; Medtronic, Inc.. Grant/Research Support; AMAG Pharmaceuticals. Consultant; RemedyLogic

S2-CMK09D Nerve Entrapments: Upper Extremity

Meghan Jardon, MD (*Presenter*) Nothing to Disclose

S2-CMK09E Nerve Entrapments: Lower Extremity

Meghan Jardon, MD (*Presenter*) Nothing to Disclose

S2-CMK09F Perineural Injections: When, How, Why?

Theodore T. Miller, MD (*Presenter*) Nothing to Disclose

S2-CMK09G Nerve Injections

Mark D. Murphey, MD (*Presenter*) Nothing to Disclose

S2-CMK09H Nerve Injections

Mark Cresswell, MBBCh, BSc (*Presenter*) Consultant; Philips Healthcare ultrasound

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S2-CMS06

Imaging Paraneoplastic Syndromes: The Last Differential Diagnosis

Sunday, Nov. 30 10:30AM - 11:30AM Room: N227B

Ichiro Ikuta, MD, MMedSc (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Integrate the clinical presentation, laboratory testing, and multi-system radiologic imaging to know when paraneoplastic syndrome is appropriate to include in the differential diagnosis. 2) Recommend appropriate follow-up with multi-system imaging, laboratory testing, and clinical examinations to distinguish paraneoplastic syndrome from other mimicking pathologies. 3) Optimize multi-system imaging for paraneoplastic syndrome evaluation and monitoring.

COURSE DESCRIPTION

Cancer, chemotherapy regimens, and immunotherapies are increasingly complex. Paraneoplastic syndromes are notoriously difficult to diagnose with variable manifestations throughout the body. Knowledge of pathophysiology and multi-system imaging characteristics have evolved to make radiologists integral in the diagnosis of paraneoplastic syndromes. A combination of case-based learning and didactic teachings will provide the latest insights and sharpen your clinical wisdom.

Sub-Events

S2-CMS06B **Paraneoplastic Neurological Syndromes: Clinical Presentations, Associations, & Workup**

Jason W. Allen, MD, PhD (*Presenter*) Nothing to Disclose

S2-CMS06C **Paraneoplastic Neurological Syndromes: Neuroradiology Imaging Findings**

David M. Yousem, MD, MBA (*Presenter*) Other-Royalties on 5 books; Elsevier. Consultant; Self-employed medicolegal consultant. Consultant; MRIOnline.com / Medality / TrueLearn. Speaker's Bureau; MRIonline.com / Medality / TrueLearn

S2-CMS06D **Paraneoplastic Syndromes in the Chest and Abdomen/Pelvis: Imaging Findings and Associations**

Matthew E. Maeder, MD (*Presenter*) Other-Scientific advisory meeting; Guerbet

S2-CMS06E **Structured Imaging-Based Differential Diagnosis Framework for Complex and Atypical Cases**

Mariam S. Aboian, MD, PhD (*Presenter*) Other-Non-paid research collaboration; Visage Imaging. Other-Site PI for clinical trials PURSUE and REVELATE; Blue Earth Diagnostics. Other-Non-paid research collaboration; NVIDIA

S2-CMS06F **Paraneoplastic Syndromes: Musculoskeletal/Rheumatologic**

Felix S. Chew, MD, MEd (*Presenter*) Nothing to Disclose

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S2-CNMMI01

Advances in Radiopharmaceutical Therapies: New Frontiers and Future Prospects

Sunday, Nov. 30 10:30AM - 11:30AM Room: S405

Pedram Heidari, MD (*Moderator*) Other-Advisory board; Telix pharmaceutical . Grant/Research Support; Siemens Healthineers. Grant/Research Support; Sofie. Grant/Research Support; CytoSite Biopharma

LEARNING OBJECTIVES

1) Describe the current state and future directions of theranostic strategies for neuroendocrine tumors, including clinically available agents and investigational compounds. 2) Identify emerging molecular targets for radiopharmaceutical therapy beyond PSMA and SSTR, and discuss their potential therapeutic relevance across tumor types. 3) Explain the principles and evolving methodologies of dosimetry in radiopharmaceutical therapy, and their role in personalizing treatment to improve efficacy and reduce toxicity. 4) Assess how innovations in radiopharmaceutical design, target selection, and patient-specific dosimetry are shaping the future of precision cancer care.

COURSE DESCRIPTION

This session, Advances in Radiopharmaceutical Therapies: New Frontiers and Future Prospects, will highlight the rapidly evolving landscape of targeted radiopharmaceutical therapies (RPTs) in oncology. Expert speakers will present emerging applications of theranostics in neuroendocrine tumors, the development of novel molecular targets beyond PSMA and SSTR, and cutting-edge approaches in dosimetry to enable personalized treatment planning. Attendees will gain insights into the scientific, clinical, and translational innovations driving the next generation of radiopharmaceutical therapies and their integration into precision oncology.

Sub-Events

S2-CNMMI01B Neuroendocrine Tumor Theranostics

Lisa Bodei, MD, PhD (*Presenter*) Other-non-remunerated consultant; AAA-Novartis. Other-non-remunerated consultant; Wren Laboratories. Consultant; Eli Lilly. Grant/Research Support; AAA-Novartis. Other-non-remunerated consultant; Ipsen. Other-non-remunerated consultant; ITM. Other-non-remunerated consultant; Point Biopharma. Other-non-remunerated consultant; RayzeBio. Other-non-remunerated consultant; Abdera. Other-non-remunerated consultant; SolveTx. Other-non-remunerated consultant; Fusion

S2-CNMMI01C Novel Targets for Radiopharmaceutical Therapies - Beyond PSMA and SSTR

Vikas Prasad, MD, PhD (*Presenter*) Other-Advisory Board; Telix. Consultant; Curium. Other-Advisory Board; ITM. Other-Advisory Board; ICPO

S2-CNMMI01D Dosimetry of Radiopharmaceutical Therapies - The Future of Personalized Patient Management

Alejandro Bertolet Reina, PhD (*Presenter*) Nothing to Disclose

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S2-CNPM18

Perspectives on Contract Review and Negotiation: What Lawyers Want Doctors to Know (Sponsored by the RSNA Resident and Fellow Committee)

Sunday, Nov. 30 10:30AM - 11:30AM Room: S402

Brandon K.K. Fields, MD (*Moderator*) Consultant; Mendaera
Divya M. Surabhi, MD, MPH (*Moderator*) Nothing to Disclose
Jacqueline Kunzelman, MD, MS (*Moderator*) Nothing to Disclose
Megan K. Mercer, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn what it is like to work with formal legal representation and the added value of enlisting formal legal services when negotiating a contract. 2) Learn common pitfalls encountered by physicians when negotiating contracts and best practices for working with formal legal representation.

COURSE DESCRIPTION

The ability to negotiate and understand contracts is one of the most challenging aspects of the job search. This session will provide participants at all career levels with tips and strategies for understanding and negotiating contracts. During this session, the various elements of a contract will be broken down and reviewed. In this process, the speakers will also explain common contract language. Additionally, the speaker(s) will describe the elements of a contract that may be negotiated and strategies for negotiation. Furthermore, options to add value to a contract with non-compensation-related benefits will be suggested.

Sub-Events

S2-CNPM18E Contract Essentials

Carrie A. Orlikowski, MD, JD (*Presenter*) Nothing to Disclose

S2-CNPM18F Why Us? The Role of Contract Lawyers in Negotiations

Marron Mahoney (*Presenter*) Nothing to Disclose

S2-CNPM18G What Contract Lawyers Want Doctors to Know

Marron Mahoney (*Presenter*) Nothing to Disclose

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S2-CNR02

Protocol Makeover: Neuro Edition

Sunday, Nov. 30 10:30AM - 11:30AM Room: E351

Ian T. Mark, MD (*Moderator*) Grant/Research Support; GE Healthcare. Grant/Research Support; Lantheus

LEARNING OBJECTIVES

1) Evaluate advanced MRI protocols for epilepsy to enhance lesion detection and improve diagnostic precision in pre-surgical planning. 2) Apply refined MRI techniques for spine trauma to better characterize injury patterns and guide clinical decision-making. 3) Differentiate optimized MRI protocols for orbital imaging to improve visualization of subtle pathologies and reduce diagnostic ambiguity. 4) Implement updated MRI protocols for pituitary imaging to increase diagnostic accuracy and confidence in detecting microadenomas and other sellar pathologies.

COURSE DESCRIPTION

In this dynamic and clinically focused session, neuroradiologists will explore cutting-edge MRI protocol enhancements designed to elevate diagnostic accuracy across key areas of neuroimaging. Through a series of expert-led presentations, attendees will gain practical insights into protocol optimization for epilepsy, spine trauma, orbital imaging, and pituitary evaluation. Each talk will highlight evidence-based refinements, technical considerations, and real-world applications that can be readily implemented in clinical practice. Whether you're looking to fine-tune your current protocols or adopt new strategies for challenging cases, this session offers a comprehensive makeover of essential neuro MRI techniques.

Sub-Events

S2-CNR02B **Breaking Through: Refined MRI Protocols for Spine Trauma**

Jennifer L. McCarty, MD (*Presenter*) Nothing to Disclose

S2-CNR02C **See the Difference: Optimized MRI Protocols for the Orbits**

Jessica L. Houk, MD (*Presenter*) Nothing to Disclose

S2-CNR02D **Pituitary Precision: Updated MRI Protocols for Accurate Diagnosis**

Ian T. Mark, MD (*Presenter*) Grant/Research Support; GE Healthcare. Grant/Research Support; Lantheus

S2-CNR02E **Epilepsy Unveiled: Advanced MRI Protocols for Precision Diagnosis**

Nuria Bargallo, MD, PhD (*Presenter*) Other-Educational ; Siemens. Other-Educational ; Eisai. Consultant; Lilly

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S2-CPH01

Radiation and Medical Imaging: Best Practices for Communicating Risk

Sunday, Nov. 30 10:30AM - 11:30AM Room: N228

Cynthia H. McCollough, PhD (*Moderator*) Grant/Research Support; Siemens Healthineers

LEARNING OBJECTIVES

1) Understand the difficulties in discussing radiation and identify strategies to help the audience hear the right message. 2) Describe message maps and review several examples related to the use of radiation in medical imaging. 3) Recognize best practices for communicating with the media. 4) Experience examples of effective risk communication.

COURSE DESCRIPTION

While medical imaging can provide lifesaving medical care, the transfer of energy into human tissue can be associated with some level of risk to the patient. Not only are healthcare providers responsible for balancing the benefits of medical imaging with the potential risks, but they must also be able to effectively exchange information about the benefits and risks of medical imaging with patients, their families, the public, and other health professionals. The American Association of Physicists in Medicine created a Radiation and Medical Imaging Communication Guide to assist healthcare providers with this essential task. The educational content and sample questions and answers provided in the guide are intended to provide health professionals with the tools necessary for effective risk communication about the use of ionizing radiation in medicine. This course will review the difficulties in discussing radiation and identify communication strategies that can help the audience hear the right message. Speakers will describe the use of message maps when communicating about risk and summarize best practices when communicating with the media. The session will conclude with a series of role plays to demonstrate effective communication about radiation and medical imaging.

Sub-Events

S2-CPH01B **Effective Risk Communication**

Cynthia H. McCollough, PhD (*Presenter*) Grant/Research Support; Siemens Healthineers

S2-CPH01C **Message Maps**

James M. Kofler JR, PhD (*Presenter*) Nothing to Disclose

S2-CPH01D **Best Practices for Communicating With Media**

Rebecca Milman, PhD (*Presenter*) Nothing to Disclose

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S2-DLL01

RSNA Deep Learning Lab: Basics of Natural Language Processing in Radiology (Beginner Friendly) (Registration Fee Required)

Sunday, Nov. 30 10:30AM - 11:30AM Room: RADIOLOGY LEARNING LAB

Jae Ho Sohn, MD, MS (*Moderator*) Grant/Research Support; Siemens Healthineers. Consultant; OnTact. Grant/Research Support; Cryptolab

LEARNING OBJECTIVES

1) Learn to build basic NLP models in radiology, discussing preprocessing and model architectures, forming the foundation for more advanced NLP courses involving transformers. 2) Learn evaluation metrics and strategies for radiological NLP models. 3) Learn various potential applications of NLP in clinical radiology with hands-on coding.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. This session will feature a lecture introducing the basic technical concepts and clinical applications of natural language processing (NLP), highlight potential uses for it in radiology. The goal is to introduce standard text preprocessing techniques, NLP model training approaches, and model evaluation strategies that would be widely applicable and would form the basis for studying more advanced courses that use neural network and/or transformer based methods. We will follow up the didactic portion with a hands-on Google Colab demo implementing discussed concepts for a text classification task. For best experience, we highly recommend attendees bring a laptop with a keyboard as well as have a Gmail account to access Google Colab.

Sub-Events

S2-DLL01B **RSNA Deep Learning Lab: Basics of Natural Language Processing in Radiology**

Timothy L. Chen, MD (*Presenter*) Nothing to Disclose

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S2-RCP14

Digital Twins in Medicine: Clinical Applications and the Fundamental Role of Imaging (Sponsored by the RSNA 3D Printing Special Interest Group)

Sunday, Nov. 30 10:30AM - 11:30AM Room: E352

Kenneth C. Wang, MD, PhD (*Moderator*) Nothing to Disclose
Summer J. Decker, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define digital twin technology and its relevance to clinical medicine. 2) Discuss the importance of radiologic imaging for digital twins. 3) Describe specific clinical applications related to cardiopulmonary disease and oncology.

COURSE DESCRIPTION

Digital twin technology, consisting of highly realistic simulation which incorporates measurement data, is transforming many industries. In clinical medicine, digital twins promise to improve the monitoring of health and disease, to better predict patient-specific treatment response, and to enhance the precision of medical care. Many clinical applications will depend critically on imaging, and radiologists, imaging scientists, technologists, allied health professionals, engineers, researchers and healthcare leaders will have opportunities to impact the development and adoption of digital twin technology. In this lecture-based educational session, two leading experts in the field will illustrate the power and potential of digital twins and the role of imaging, based on their extensive experience in specific clinical areas.

Sub-Events

S2-RCP14C **Imaging, Simulation and Cardiopulmonary Digital Twins: History, Evolution, Trends and Applications**

Charles Taylor, PhD (*Presenter*) Stock/Shareholder; HeartFlow, Inc

S2-RCP14D **Digital Twins in Oncology**

Caroline Chung, MD, FRCPC (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; RaySearch Laboratories

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S2-RCP43

Douglas W. MacEwan Rising Star Track: Shark Tank, Take a Bite Out of Your Future

Sunday, Nov. 30 10:30AM - 11:30AM Room: S406B

Benjamin Kwan, MD, FRCPC (*Moderator*) Nothing to Disclose
Chelsea R. Schmitt, MD, MPH (*Presenter*) Nothing to Disclose
Grace G. Zhu, MD (*Moderator*) Nothing to Disclose
Kristen Olinger, MD (*Moderator*) Nothing to Disclose
Pavan Brahmbhatt, MBBS, MD (*Presenter*) Nothing to Disclose
Sean P. Wagner, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Help trainees and practicing radiologists looking to make a career change figure out the best type of practice that may suit them. 2) Expose participants to the wide variety of practices available in radiology.

COURSE DESCRIPTION

This is an interactive discussion with invited panelists who will each pitch a different radiology practice type that they work at. Judges and audience members will vote for the best pitch.

Sub-Events

S2-RCP43G **VA/Military Pitch**

Catherine H. Pilson, DO (*Presenter*) Nothing to Disclose

S2-RCP43H **Academics Pitch**

Mariana R. Defreitas, MD (*Presenter*) Nothing to Disclose

S2-RCP43I **Private Practice Pitch**

Jacob D. Nelson, MD (*Presenter*) Nothing to Disclose

S2-RCP43J **Hybrid Pitch**

Ranjit S. Chima, MD (*Presenter*) Nothing to Disclose

S2-RCP43K **Teleradiology Pitch**

Eric J. Ledermann, DO (*Presenter*) Owner; Transparent Imaging PC

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S3-RCP10

NIH Grantsmanship Workshop (Sponsored by the RSNA Research Development Committee)

Sunday, Nov. 30 12:00PM - 3:30PM Room: S101

Gayle E. Woloschak, BS, PhD (*Moderator*) Nothing to Disclose

Sub-Events

S3-RCP10B **Preparing an R01 Research Application**

Maryellen L. Giger, PHD (*Presenter*) Stock/Shareholder; Hologic. Stock/Shareholder; Qview. Consultant; Genetech/Roche. Other Financial or Material Support; Various companies who license from the Polsky Center at the University of Chicago

S3-RCP10C **Preparing K Awards**

Ruth C. Carlos, MD, MS (*Presenter*) Other-Salary support as JACR EIC; ACR . Other-Travel and lodging as GERRAF board chair; GERRAF. Other-Travel and lodging as Academy Board; Academy of Radiology and Biomedical Imaging Research. Other-Honorarium for moderating education session on lung screening; Canon Medical

S3-RCP10D **Clinical Trials in Applications**

Michael W. Vannier, MD (*Presenter*) Nothing to Disclose

S3-RCP10E **Program Perspectives**

Rui Carlos Sa, PhD (*Presenter*) Nothing to Disclose

S3-RCP10F **Mock Study**

Ruth C. Carlos, MD, MS (*Presenter*) Other-Salary support as JACR EIC; ACR . Other-Travel and lodging as GERRAF board chair; GERRAF. Other-Travel and lodging as Academy Board; Academy of Radiology and Biomedical Imaging Research. Other-Honorarium for moderating education session on lung screening; Canon Medical

S3-RCP10G **Mock Study**

Elizabeth A. Krupinski, PhD (*Presenter*) Nothing to Disclose

S3-RCP10H **Mock Study**

David A. Mankoff, MD, PhD (*Presenter*) Consultant; GE Healthcare. Other-Scientific Advisory Board; Reflexion. Other-Scientific Advisory Board; ImaginAb. Stock/Shareholder; Trevarx. Consultant; Blue Earth Diagnostics

S3-RCP10I **Mock Study**

Michael W. Vannier, MD (*Presenter*) Nothing to Disclose

S3-RCP10J **Questions to the Faculty**

Gayle E. Woloschak, BS, PhD (*Presenter*) Nothing to Disclose

S3-RCP10K **Summary**

Gayle E. Woloschak, BS, PhD (*Presenter*) Nothing to Disclose

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S4-CBR02

Screening Guidelines: Ages to Initiate and Stop and Opportunistic Screening

Sunday, Nov. 30 1:00PM - 2:00PM Room: N228

Eric L. Rosen, MD (*Moderator*) Grant/Research Support; Whiterabbit

LEARNING OBJECTIVES

1) Identify guidelines for initiating and stopping breast cancer screening and how they differ between the United States, Canada, and Europe. 2) Explain how different guidelines affect breast cancer detection as well as the metrics used to assess screening effectiveness. 3) Understand the pros and cons of different approaches to screening and their implications, both on individuals and populations.

COURSE DESCRIPTION

Three presenters representing Canada, Europe and the United States discuss perspectives on when to initiate and stop opportunistic screening for breast cancer.

Sub-Events

S4-CBR02B **USA Perspective on Screening Guidelines**

Eric L. Rosen, MD (*Presenter*) Grant/Research Support; Whiterabbit

S4-CBR02C **European Perspective**

Simone Schiaffino, MD (*Presenter*) Nothing to Disclose

S4-CBR02D **Canadian Perspective**

Supriya R. Kulkarni, DMRD, FRCPC (*Presenter*) Nothing to Disclose

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S4-CCA02

An Imaging Library of Cardiac Devices: What You Need to Know

Sunday, Nov. 30 1:00PM - 2:00PM Room: S402

Daniel Vargas, MD (*Moderator*) Nothing to Disclose
Sung Min Ko, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the spectrum of cardiac devices commonly used in patients with left atrial fibrillation, ischemic or non-ischemic cardiomyopathy. 2) Understand the structural heart abnormalities that may influence device placement and lead to complications. 3) Identify imaging features of device-related complications using multimodality approaches, including chest X-ray, CT, and MRI. 4) Review safety considerations and protocol adjustments for CT and MRI in patients with implanted cardiac devices.

COURSE DESCRIPTION

Course Description: An Imaging Library of Cardiac Devices: What You Need to Know This session provides a practical overview of cardiac devices commonly encountered in patients with arrhythmia, dilated or ischemic cardiomyopathy, and infiltrative heart disease such as sarcoidosis. Through a series of focused lectures and expert-led discussions, attendees will explore how underlying structural heart disease may contribute to device-related complications. The session will highlight key imaging features of such complications using chest X-ray, CT and MRI, while also addressing safety considerations and protocol optimization of CT and MRI for imaging patients with implanted devices. Educational Format: Lecture-based session with moderated discussion. Why It Matters: As the use of cardiac devices continues to expand, radiologists must be equipped to identify device-related issues and understand their clinical context. This session aims to bridge the knowledge gap between device implantation, imaging safety, and complication recognition. Expected Outcome: Participants will gain the knowledge to confidently assess cardiac devices and associated complications, and to safely perform and interpret cardiac imaging in device-implanted patients.

Sub-Events

S4-CCA02C **Contemporary Cardiac Devices for Structural Heart Disease - Radiographic and CT Correlation**

Alessander Ramos, MD, FRCPC (*Presenter*) Nothing to Disclose

S4-CCA02D **CT and Chest Radiography in the Evaluation of Mechanical Circulatory Support Devices for Acute Heart Failure**

Suman T. Prabhakar, MD, FRCR (*Presenter*) Nothing to Disclose

S4-CCA02E **CT and MR in Patients with Cardiac Devices - Safety and Imaging Optimization Strategies**

Joao R. Inacio, MD (*Presenter*) Other-Lecture fee (Pulmonary Fibrosis); Boehringer Ingelheim Portugal, LDA

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S4-CER03

Thoracic Trauma Uncovered: Key Concepts for Emergency Radiology

Sunday, Nov. 30 1:00PM - 2:00PM Room: E450B

Scott D. Steenburg, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe common chest wall injury terminology, patterns, and complications in the setting of blunt trauma. 2) Describe the CT appearances of major and minor traumatic aortic injuries and management options. 3) Describe the principles of ballistic injuries as they apply to chest trauma.

COURSE DESCRIPTION

This session will focus on advanced imaging techniques in the evaluation of chest trauma, with a focus on blunt chest wall injuries, blunt aortic injuries, and penetrating thoracic injuries.

Sub-Events

S4-CER03B **Fight Club - Imaging of Penetrating Thoracic Injuries**

Felipe Munera, MD (*Presenter*) Nothing to Disclose

S4-CER03C **Chest Wall Trauma - More Than Just the Ribs**

Krystal Archer-Arroyo, MD (*Presenter*) Consultant; Siemens Healthineers USA

S4-CER03D **Aortic Injuries: Updates and What the Trauma Surgeon Wants to Know**

Scott D. Steenburg, MD (*Presenter*) Nothing to Disclose

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S4-CGI08

Inflammatory Bowel Disease: Multimodality Imaging & Clinical Perspective

Sunday, Nov. 30 1:00PM - 2:00PM Room: S401

Kristina T. Flicek, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Incorporate new updates about inflammatory bowel disease imaging, terminology and clinical perspectives into your practice. 2) Analyze the different roles ultrasound, CT enterography and MR enterography play in inflammatory bowel disease imaging.

COURSE DESCRIPTION

This course will be an overview of the use of ultrasound, CT and MRI in the setting of inflammatory bowel disease as well as clinical perspectives important to radiology interpretation.

Sub-Events

S4-CGI08B CT

Kristina T. Flicek, MD (*Presenter*) Nothing to Disclose

S4-CGI08C MR

Kathryn J. Fowler, MD (*Presenter*) Speaker's Bureau; Bayer. Grant/Research Support; GE, Pfizer, Bayer, Median. Consultant; GE. Consultant; Ascelia Pharmaceuticals. Consultant; Guerbet

S4-CGI08D Ultrasound

Rebecca Dennis, DO (*Presenter*) Nothing to Disclose

S4-CGI08E Clinical Perspective

Russell Cohen, MD (*Presenter*) Consultant; Abbvie. Consultant; Bausch Health. Consultant; BMS. Consultant; Eli Lilly. Consultant; Genentech. Consultant; Gilead Sciences. Consultant; Johnson & Johnson. Consultant; Pfizer. Consultant; Takeda

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S4-CGI16

RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment (Registration Fee Required)

Sunday, Nov. 30 1:30PM - 3:30PM Room: S504CD

Richard G. Barr, MD, PhD (*Moderator*) Grant/Research Support; Philips Ultrasound. Grant/Research Support; Samsung. Other-Royalties ; Thieme Publishers. Other-Royalties; Elsever Publishers. Grant/Research Support; SuperSonic Imagine. Speaker's Bureau; Samsung. Grant/Research Support; SonoScape. Speaker's Bureau; Philips Ultrasound. Grant/Research Support; Siemens Ultrasound. Speaker's Bureau; Siemens Ultrasound. Grant/Research Support; Canon Medical Systems. Speaker's Bureau; Canon Medical Systems. Grant/Research Support; Mindray . Grant/Research Support; Hologic . Speaker's Bureau; Hologic

LEARNING OBJECTIVES

1) Review the appropriate technique for performing SWE for liver stiffness. 2) Review the appropriate technique for performing liver fat estimation using quantitative ultrasound. 3) Review the literature on the accuracy of SWE and quantitative ultrasound for liver fat quantification. 4) Provide an overview of the basic science of both liver SWE and liver fat using ultrasound.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. This course will provide all the information needed to develop a quantitative ultrasound program for determination of liver stiffness determination and quantitative ultrasound for liver fat estimation. Didactic lecture will be presented providing how to perform the examination and interpret the examinations for both SWE and fat quantification. A review of the published guidelines will be presented. After the lecture(s) attendee will move to the hands-on room where each vendor will have models available to perform these examinations using their system. During the hands-on emphasis will be on providing instruction and demonstration how to perform the examinations accurately. Experts will be available to answer questions and discuss these technologies.

Sub-Events

S4-CGI16B **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Giovanna Ferraioli, MD (*Presenter*) Speaker's Bureau; Canon Medical Systems. Speaker's Bureau; Fujifilm Healthcare. Speaker's Bureau; Philips Medical Systems. Speaker's Bureau; Siemens Healthineers. Consultant; Philips Medical Systems. Other-Royalties; Elsevier Publisher. Speaker's Bureau; Mindray Medical Systems

S4-CGI16C **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Nitin G. Chaubal, MD (*Presenter*) Nothing to Disclose

S4-CGI16D **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Rajas N. Chaubal, MBBS, MD (*Presenter*) Nothing to Disclose

S4-CGI16E **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Chander Lulla, MD, MBBS (*Presenter*) Nothing to Disclose

S4-CGI16F **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Jonathan R. Dillman, MD, MSc (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; Philips Healthcare. Grant/Research Support; Motilent. Grant/Research Support; Perspectum. Grant/Research Support; GE HealthCare

S4-CGI16G **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Vito Cantisani, MD, PhD (*Presenter*) Other-Speaker fee; Bracco. Other-Speaker fer; Samsung. Other-Speaker fee; Mindray. Other-Speaker fee; Siemens. Other-Speaker fee; Canon

S4-CGI16H **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Maija Radzina, MD, PhD (*Presenter*) Speaker's Bureau; Medtronic. Speaker's Bureau; Canon. Speaker's Bureau; Mindray. Consultant; Philips

S4-CGI16I **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

David T. Fetzer, MD (*Presenter*) Consultant; GE HealthCare. Grant/Research Support; GE HealthCare. Consultant; Philips Healthcare. Grant/Research Support; Philips Healthcare. Grant/Research Support; Siemens Healthineers. Speaker's Bureau; Siemens Healthineers. Consultant; Bracco Diagnostics. Speaker's Bureau; GE HealthCare

S4-CGI16J **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Michelle L. Robbin, MD, MS (*Presenter*) Grant/Research Support; Philips Medical

S4-CGI16K **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Adrian K. Lim, MD, FRCR (*Presenter*) Nothing to Disclose

S4-CGI16L **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Arinc Ozturk, MD (*Presenter*) Consultant; AutonomUS Medical Technologies. Consultant; Novo Nordisk. Consultant; SmartAlpha. Employee; AutonomUS Medical Technologies

S4-CGI16M **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Pal Novak Kaposi, MD, PhD (*Presenter*) Grant/Research Support; Samsung Medison Co. Ltd.

S4-CGI16N **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Riccardo De Robertis, PhD, MD (*Presenter*) Other Financial or Material Support; Siemens Healthineers

S4-CGI16O **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Suna Oktar, MD (*Presenter*) Nothing to Disclose

S4-CGI16P **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Halit Nahit Sendur, MD (*Presenter*) Other-Speaker honorarium; Mindray

S4-CGI16Q **RSNA Hands-On Lab: Ultrasound Liver Stiffness and Quantitative Ultrasound for Liver Fat Assessment**

Niccolo Faccioli, MD (*Presenter*) Nothing to Disclose

Printed on: 02/18/26

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S4-CHN08

Horse or Zebra? Case-Based Review of Common and Very Rare Diagnoses in the Head and Neck

Sunday, Nov. 30 1:00PM - 2:00PM Room: N227B

Shweta Kumar, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize typical and atypical imaging features of HNSCC, skull base tumors, head and neck vascular malformations, and invasive fungal sinusitis. 2) Differentiate HNSCC, skull base tumors, head and neck vascular malformations, and invasive fungal sinusitis from mimics and rare entities.

COURSE DESCRIPTION

In this case-based Head and Neck session, attendees will be presented with common and uncommon imaging presentations of head and neck squamous cell carcinoma (HNSCC), skull base tumors, head and neck vascular malformations, and invasive fungal sinusitis. Speakers will emphasize imaging pearls that distinguish these diagnoses from the unusual and infrequent, as well as how not to get fooled by mimics and pitfalls. This session offers attendees the opportunity to refine their interpretation of complex head and neck imaging studies by incorporating tips from world experts.

Sub-Events

S4-CHN08B Is it HNSCC?

Paul M. Bunch, MD (*Presenter*) Grant/Research Support; GE HealthCare. Consultant; Guerbet

S4-CHN08C Is it a Skull Base Tumor?

Christine M. Glastonbury, MBBS (*Presenter*) Other-royalties from books/chapters written and/or edited >10 years ago [although they haven't paid me owed money for years]; elsevier-amirsys

S4-CHN08D Is it a Vascular Malformation?

Deborah R. Shatzkes, MD (*Presenter*) Nothing to Disclose

S4-CHN08E Is it Invasive Fungal Sinusitis?

Tabassum A. Kennedy, MD (*Presenter*) Nothing to Disclose

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S4-CMS04

Elastography: US or MRI, What is the Right Choice?

Sunday, Nov. 30 1:00PM - 2:00PM Room: S406A

John S. Pellerito, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Compare the clinical performance, strengths, and limitations of US and MRI elastography across various organ systems. 2) Identify appropriate clinical indications for the use of elastography and determine when to select US versus MRI based on diagnostic needs, patient factors, and institutional resources.

COURSE DESCRIPTION

Elastography: US or MRI, What is the Right Choice is an advanced educational session with lectures and discussion designed for radiologists and medical imaging professionals seeking to deepen their understanding of tissue stiffness evaluation using ultrasound (US) and magnetic resonance imaging (MRI)-based elastography. This course explores the principles, technical considerations and clinical applications of both modalities across organ systems including liver, breast and musculoskeletal structures. Through comparative analysis, participants will gain insights into the strengths, limitations, and appropriate indications for each technique, with emphasis on diagnostic accuracy, cost-effectiveness and workflow integration. Case-based discussions and current evidence will guide clinicians in selecting the most effective technique tailored to specific clinical scenarios.

Sub-Events

S4-CMS04B **Ups and Downs of US and MRI Elastography**

Arunark Kolipaka, PhD (*Presenter*) Nothing to Disclose

S4-CMS04C **MR Elastography in Abdominoplevic Imaging**

Richard L. Ehman, MD (*Presenter*) Stock/Shareholder; Resoundant Inc.. Grant/Research Support; Resoundant Inc.. Other-Intellectual property rights.; Resoundant Inc.

S4-CMS04D **MSK Elastography**

Mihra S. Taljanovic, MD, PhD (*Presenter*) Nothing to Disclose

S4-CMS04E **Any Applications for Elastography in Breast Imaging**

Faezeh Sodagari, MD (*Presenter*) Nothing to Disclose

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S4-CNPM01

Speak Up! An Introduction to Radiology Economics and Activities

Sunday, Nov. 30 1:00PM - 2:00PM Room: E353B

Andrew B. Rosenkrantz, MD (*Moderator*) Other-Payment to institution for role as Editor in Chief of AJR; ARRS
Richard E. Heller III, MD, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the present radiology reimbursement landscape, including challenges and opportunities with both commercial and governmental payers. 2) Describe approaches for getting involved in advocacy efforts. 3) Explore issues relating to payments for artificial intelligence tools in radiology.

COURSE DESCRIPTION

This session will explore hot topics in radiology economics, highlighting the importance of advocacy and identifying activities that radiologists and practices can undertake to help achieve success in the current payment environment. Through a series of didactic talks followed by Q&A, the session will provide insights into radiology reimbursement relevant to radiologists and trainees at all career stages and in all practice types.

Sub-Events

S4-CNPM01C Ctrl + Alt + Payment: Rebooting Radiology Economics

Richard E. Heller III, MD, MBA (*Presenter*) Nothing to Disclose

S4-CNPM01D Getting Involved Throughout Your Career (Through Societies and Your Practice)

Lauren P. Nicola, MD (*Presenter*) Other-Chief Medical Officer; RevealDx. Consultant; MediMaps. Owner; Triad Radiology Associates. Consultant; Bayer. Consultant; Quinsite

S4-CNPM01E Artificial Intelligence: Strategies for Getting Paid Today

Nina E. Kottler, MD, MS (*Presenter*) Other-Partner [Radiology Partners owns a minority interest in Aidoc medical and an indirect minority interest in Rad AI]; Radiology Partners. Other Financial or Material Support; Pennsylvania Bar Institute. Other Financial or Material Support; Rutgers University. Other-travel expenses for onsite RIC meetings covered; RSNA RIC. Consultant; AlphaSights. Consultant; Water Street Capital. Stock/Shareholder; Radiology Partners. Employee; Radiology Partners. Other Financial or Material Support; Texas Children's Hospital. Consultant; W.L. Gore & Associates, Inc. Consultant; Synapsica Healthcare Pvt Ltd. Other Financial or Material Support; Philips Healthcare. Other Financial or Material Support; Mayo Clinic. Other Financial or Material Support; Society of Cardiovascular MR

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S4-CPD01

Neurovision: Brain Waves, Vascular Twists, and Inflammatory Quirks

Sunday, Nov. 30 1:00PM - 2:00PM Room: E350

Michael J. Paldino, MD (*Moderator*) Nothing to Disclose
Patricia P. Rafful, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Summarize recent advances in neuroimaging techniques used to diagnose and manage pediatric stroke. 2) Discuss imaging findings to help localize seizure foci in pediatric epilepsy. 3) Describe the key features, imaging findings, and diagnostic challenges associated with major phakomatoses.

COURSE DESCRIPTION

This course offers a focused, in-depth look at complex neurological conditions in children through four interconnected lectures. This session explores cutting-edge developments in pediatric neuroimaging, seizure localization, infectious disease of the central nervous system, and the intricate world of phakomatoses. Participants will gain insights into how brain wave patterns, vascular anomalies, inflammatory responses, and genetic syndromes shape diagnosis and management in children. With a strong clinical and diagnostic emphasis, this course brings together innovation and nuance in tackling some of the most challenging pediatric neuroconditions.

Sub-Events

S4-CPD01C **Pediatric Stroke: Innovations and Updates in Imaging**

Sara R. Teixeira, MD, PhD (*Presenter*) Nothing to Disclose

S4-CPD01D **Pediatric CNS Infections: Name That Organism**

David M. Mirsky, MD (*Presenter*) Nothing to Disclose

S4-CPD01E **Phakomatoses: Looking Beneath the Surface**

David M. Mirsky, MD (*Presenter*) Nothing to Disclose

S4-CPD01F **Seizures in Children: Finding the Focus**

Pradeep Krishnan, MD (*Presenter*) Nothing to Disclose

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S4-CPH13

AAPM/RSNA Physics Tutorial 1

Sunday, Nov. 30 1:00PM - 2:00PM Room: N226

Frank Dong, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the basic physics of photon-counting detectors. 2) Provide an overview of available image types produced by PCCT. 3) Discuss impacts of PCCT on dose and image quality. 4) Provide a comparative overview of clinical applications and advantages of PCCT compared with conventional dual-energy spectral CT approaches. 5) Review current high-impact clinical applications of PCCT. 6) Discuss strategies and barriers to PCCT adoption in clinical practice.

COURSE DESCRIPTION

Photon counting CT (PCCT) has the potential to represent a revolutionary diagnostic imaging tool for cardiovascular, neurological, oncological as well as musculoskeletal diseases. The photon counting detector has the capability to count individual X-ray photons as compared to conventional energy-integrating detectors. The benefits of PCCT include improved spatial resolution, reduced electronic noise, and inherent spectral imaging, which enable improved iodine and soft tissue contrast and material decomposition /quantification. This course will teach the basic principles of PCCT and present the clinical applications benefiting from the technological advancements offered by PCCT.

Sub-Events

S4-CPH13B Photon Counting CT Tutorial: Basic Principles and Clinical Perspectives

Frank Dong, PhD (*Presenter*) Nothing to Disclose

S4-CPH13C Photon Counting CT - Basic Principles

Megan C. Jacobsen, PhD (*Presenter*) Nothing to Disclose

S4-CPH13D Photon Counting CT - Clinical Applications

Reza Forghani, MD, PhD (*Presenter*) Grant/Research Support; GE Healthcare. Other-Advisory Board, Stock or Stock Options; NeuroPacs Corp.. Other-Contributor to a patent Method and system of performing medical treatment outcome assessment or medical condition diagnostic (US11257210B2) issued ; Patent (US20190392579A1). Other-Co-editor, Book on Skull Base Cancer Imaging; Thieme Medical Publishers Inc.. Grant/Research Support; Nuance Communications/Microsoft Inc.. Grant/Research Support; Canon Medical Systems Inc.. Consultant; Nuance Communications/Microsoft Inc.. Consultant; Canon Medical Systems Inc.. Grant/Research Support; National Institutes of Health STTR grant subaward . Grant/Research Support; National Science Foundation grant. Owner; Forghani HealthTech LLC. Other-Advisory Board, Stock or Stock Options; PaxeraHealth Corp.

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S4-RCP46

Radiology AI at the Cutting Edge: Research from RSNA R&E Foundation Awardees

Sunday, Nov. 30 1:00PM - 2:00PM Room: S406B

Kate Hanneman, MD, MPH (*Moderator*) Other-Honoraria; Sanofi Genzyme. Other-Honoraria; Medscape. Other-Honoraria; MRI Online. Other-Honoraria; Bayer
Pamela K. Woodard, MD (*Moderator*) Grant/Research Support; Siemens Medical Systems

LEARNING OBJECTIVES

1) Describe recent advances in artificial intelligence research in radiology funded by the RSNA R&E Foundation. 2) Evaluate the methodological approaches and translational potential of AI applications ranging from predictive modeling to prospective deployment and clinical validation. 3) Recognize how R&E Foundation support enables early-stage, high-impact research that drives innovation in radiology and contributes to education, equity, and improved patient care.

COURSE DESCRIPTION

Explore the future of imaging in this inaugural RSNA session, featuring RSNA R&E Foundation awardees whose research is advancing the frontiers of artificial intelligence in radiology. Awardees will present their study results, highlighting innovative, impactful work supported by the Foundation. Attendees will gain insights into the diverse uses of AI in imaging research, from algorithm development to prospective clinical deployment, and learn how groundbreaking ideas funded today are shaping innovations of tomorrow.

Sub-Events

S4-RCP46C **Empowering Healthcare: Advancing Medical Imaging Education in LMICs through AI and Imaging Training Initiatives**

Udunna Anazodo, PhD (*Presenter*) Nothing to Disclose

S4-RCP46D **Prospective Deployment of Artificial Intelligence Software using Standard-of-Care CT Scans to Predict the Efficacy of Cancer Treatments**

Laurent Dercle, MD (*Presenter*) Nothing to Disclose

S4-RCP46E **Prediction of Occult Invasive Breast Cancer in Women with Ductal Carcinoma in Situ using Multitask Deep Learning**

Wenhui Zhou, MD, PhD (*Presenter*) Grant/Research Support; Phillip Healthcare. Grant/Research Support; GE Healthcare

S4-RCP46F **Optimizing Radiology Examination Scheduling through the Development and Implementation of a Deep Learning based Prediction Model of Patient Non Attendance**

Bruno Hochhegger, MD, PhD (*Presenter*) Nothing to Disclose

S4-RCP46G **Added Value of Quantitative MR Imaging to Radiologists and Deep Learning Based Computer Aided Detection of Prostate Cancer on Prostate MRI**

Angela Tong, MD (*Presenter*) Other-Research support in the form of software and hardware ; Siemens Healthineers. Other-One time Honorarium for Speaking at a Siemens conference Innovations 2024 (5/22-23/2024; Siemens Healthineers

S4-RCP46H **Deep Learning-based Prediction of Chronic Thromboembolic Pulmonary Hypertension**

Lewis D. Hahn, MD (*Presenter*) Nothing to Disclose

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S5-CCH03

What Every Radiologist Needs to Know: Thoracic Imaging Essentials

Sunday, Nov. 30 2:30PM - 3:30PM Room: E451A

Lydia Chelala, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify common locations for missed findings on radiographs and CTs. 2) Recognize key radiographic findings and distinctions of and between atelectasis, pneumonia, and pulmonary edema. 3) Apply correct Fleischner Society terminology to pulmonary pathology and recognize clinical helpful thoracic imaging signs.

COURSE DESCRIPTION

This session will cover fundamental concepts of thoracic imaging that are encountered daily in clinical practice in a didactic but case-rich format. Appropriate terminology, pitfalls and fundamental pathologies on radiography and computed tomography will be covered.

Sub-Events

S5-CCH03B **Blind Spots on Chest Radiograph and CT**

Gerald F. Abbott, MD (*Presenter*) Nothing to Disclose

S5-CCH03C **Atelectasis , Pneumonia, and Pulmonary Edema**

Melissa L. Rosado de Christenson, MD (*Presenter*) Nothing to Disclose

S5-CCH03D **Signs in Chest Radiology**

Mark S. Parker, MD (*Presenter*) Nothing to Disclose

S5-CCH03E **Fleischner Society: Glossary of Terms for Thoracic Imaging 2024 Nuts and Bolts**

Alexander A. Bankier, MD, PhD (*Presenter*) Consultant; Daiichi Pharmaceuticals. Consultant; AstraZeneka. Consultant; AbbVie. Consultant; Merck

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S5-CER13

Emergency Radiology in Disasters: A Gamechanger in Catastrophe

Sunday, Nov. 30 2:30PM - 3:30PM Room: E450B

Koenraad H. Nieboer, MD (*Moderator*) Other-Medical Advisory Board; GE HealthCare. Speaker's Bureau; GE HealthCare
Mehmet Ruhi Onur, MD, MD (*Moderator*) Consultant; Aselsan Health System. Other-Speaker at Africa Health Excon 2023; GE Healthcare

LEARNING OBJECTIVES

1) Assess the critical steps in preparing radiology departments for effective disaster response and continuity of care. 2) Interpret key imaging findings associated with disaster-related injuries, including those from earthquakes, bomb blasts, and fire-related trauma. 3) Analyze real-world radiologic case studies from the Turkey Earthquake to identify diagnostic challenges and solutions under extreme conditions. 4) Integrate radiology into multidisciplinary emergency management plans to optimize outcomes in mass casualty incidents.

COURSE DESCRIPTION

When catastrophe strikes —be it earthquake, explosion, or fire— radiology becomes a frontline responder. Do you believe your department is prepared to respond to a disaster? This high-impact lecture session brings together experts to share life-saving insights from real-world disaster scenarios. From hospital readiness to critical imaging of trauma in mass-casualty events, you'll gain practical strategies and clinical pearls to elevate your emergency response. Whether you're preparing your department for the unthinkable or seeking to understand the radiologic signatures of disasters, this session is an essential before your institute gets involved. Disaster-related injury patterns will be discussed with critical imaging findings in the session.

Sub-Events

S5-CER13C **Preparing Radiology Departments for Disasters**

Courtney P. Orsbon, MD, PhD (*Presenter*) Nothing to Disclose

S5-CER13D **Radiology in Turkey Earthquake**

Nursel Yurttutan, MD (*Presenter*) Nothing to Disclose

S5-CER13E **Imaging Findings in Disaster-related Injuries' - Including Injuries of Earthquake, Different Types of Bomb Blasts, and Fire**

Mehmet Ruhi Onur, MD, MD (*Presenter*) Consultant; Aselsan Health System. Other-Speaker at Africa Health Excon 2023; GE Healthcare

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S5-CIN01

Where Are All the Women Informaticists (Sponsored by the RSNA Committee on Diversity, Equity and Inclusion)

Sunday, Nov. 30 2:30PM - 3:30PM Room: N228

Maureen P. Kohi, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe key barriers and enablers impacting the recruitment, retention, and advancement of women in radiology informatics. 2) Illustrate diverse career trajectories and decision-making "pivot points" that have shaped women's pathways into and through radiology informatics. 3) Develop strategies to foster a more inclusive and supportive informatics community through mentorship, visibility, and structural change.

COURSE DESCRIPTION

This session explores the persistent gender gap in radiology informatics through a dynamic series of personal narratives and thought-provoking discussions. Despite the growing influence of informatics in shaping the future of radiology, women remain underrepresented in this critical subspecialty. Four speakers will share their unique journeys—including the challenges they've faced, the pivotal moments that shaped their careers, and the strategies that helped them succeed. Through lecture and interactive panel discussion, attendees will gain insight into the structural and cultural barriers impacting women in informatics, and leave with actionable strategies to foster inclusion, mentorship, and equity in their own institutions. The expected outcome is for attendees to be better equipped to recognize barriers to equity in radiology informatics, appreciate diverse career pathways, and actively contribute to a more inclusive and supportive professional environment.

Sub-Events

S5-CIN01B Jumping Hurdles and Smashing Glass Ceilings

Tessa S. Cook, MD, PhD (*Presenter*) Grant/Research Support; Independence Blue Cross. Other-Single honorarium for consulting about cardiac MRI software; relationship has ended, can't remember exactly when; Quattro Consulting. Grant/Research Support; ISMIE. Grant/Research Support; ACR. Consultant; Bayer. Consultant; Sectra

S5-CIN01C Pivot Points: My Unconventional Path to Radiology Informatics

Melissa A. Davis, MD, MBA (*Presenter*) Nothing to Disclose

S5-CIN01D Not- The Only One In the Room

Stacy D. O'Connor, MD, MPH (*Presenter*) Nothing to Disclose

S5-CIN01E Alone/Together

Lindsey A. Johnstone, MD, MS (*Presenter*) Nothing to Disclose

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S5-CIR04

Advanced Interventional Radiology Strategies in Trauma Patients

Sunday, Nov. 30 2:30PM - 3:30PM Room: E351

Bernhard Gebauer, MD (*Moderator*) Consultant; Inari. Other-Honoraria for presentation; COOK Medical. Other-Honoraria for presentation; ELSAI. Consultant; CALYX. Consultant; ICON. Consultant; BAYER. Other-Honoraria for presentation; AstraZeneca. Other-Honoraria for presentation; Siemens. Consultant; Ewimed. Other-Honoraria for presentation; Boston. Other-Honoraria for presentation; SIRTEX Medical

LEARNING OBJECTIVES

1) Identify indications for bleeding control IR therapies in trauma patients. 2) Explain the current IR techniques and results from the literature. 3) Learn how fast an IR should be in angio suite to perform damage control IR.

COURSE DESCRIPTION

IR plays an important role in bleeding control of trauma patients. The course will provide learners with the necessary IR techniques and success and complication rates from the literature.

Sub-Events

S5-CIR04B **Endovascular Solutions for Pelvic Fracture Hemorrhage: From REBOA to Superselective Embolization**

Anna Maria Ierardi, MD (*Presenter*) Nothing to Disclose

S5-CIR04C **Advanced Embolization in Abdominal Trauma: Organ Preservation and Hemostasis in Splenic and Hepatic Injuries**

Theresa M. Caridi, MD (*Presenter*) Employee; Employment with Varian

S5-CIR04D **IR in Thoracic Trauma: Navigating Endovascular and Percutaneous Strategies for Hemothorax and Vascular Injury**

David Y. Johnson, MD (*Presenter*) Nothing to Disclose

S5-CIR04E **Interventional Pain Management in Trauma: From Acute Crisis to Long-Term Recovery**

Dimitrios Filippiadis, MD, PhD (*Presenter*) Nothing to Disclose

S5-CIR04F **IR-Guided Management of Vascular Complications in Extremity Trauma: Limb Salvage and Hemorrhage Control**

Giovanni F. Torsello, MD, BA (*Presenter*) Grant/Research Support; Balt. Grant/Research Support; Boston Scientific. Grant/Research Support; Medtronic. Grant/Research Support; Penumbra. Grant/Research Support; Philips

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S5-CMK06

Shoulder Imaging: How I Report It

Sunday, Nov. 30 2:30PM - 3:30PM Room: E450A

Andrew J. Grainger, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Apply a structured approach to reviewing and reporting shoulder pathologies, ensuring clarity, completeness, and alignment with current radiological best practices. 2) Recognize common pitfalls and diagnostic challenges in shoulder imaging and develop strategies to improve diagnostic accuracy. 3) Where appropriate understand the advantages and disadvantages of MRI and ultrasound for imaging common shoulder complaints.

COURSE DESCRIPTION

This course offers a series of expert-led lectures addressing radiology reporting of the shoulder, tailored specifically for residents and doctors in training. Through short, focused lectures, experienced radiologists will present a "how I do it approach", highlighting their tips and tricks which will enable participants to gain practical insights into the interpretation and reporting of a wide range of shoulder pathologies. The course will focus on MRI and where applicable ultrasound, aiming to help attendees build confidence and accuracy in their reporting of the findings in common shoulder pathologies.

Sub-Events

S5-CMK06B **How I Report Rotator Cuff Injury**

Jon A. Jacobson, MD (*Presenter*) Other-Book royalties; Elsevier. Consultant; BioClinica. Consultant; Samsung

S5-CMK06C **Extrinsic Impingement: What I Look for and Report**

Andrew J. Grainger, MD (*Presenter*) Nothing to Disclose

S5-CMK06D **How I Report the Superior Labrum**

Michael J. Tuite, MD (*Presenter*) Consultant; GE Healthcare. Other-Book royalties; Elsevier

S5-CMK06E **How I Report Post Traumatic Instability**

P. Diana Afonso, MD, MD (*Presenter*) Nothing to Disclose

S5-CMK06F **Adhesive Capsulitis: What I Look for and Report**

Christine B. Chung, MD (*Presenter*) Nothing to Disclose

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S5-CNMMI02

Update on PSMA PET/CT and Theranostics in Latin America and United States

Sunday, Nov. 30 2:30PM - 3:30PM Room: S405

Don C. Yoo, MD (*Moderator*) Consultant; Invicro LLC. Consultant; Blue Earth Diagnostics

Sub-Events

S5-CNMMI02B **Update on PSMA PET/CT for Staging and Biochemical Recurrence**

Tara D. Barwick, FRCR, MSc (*Presenter*) Nothing to Disclose

S5-CNMMI02C **PSMA Theranostics in Latin America**

Paulo Henrique Rosado de Castro, MD, PhD (*Presenter*) Nothing to Disclose

S5-CNMMI02D **PSMA Theranostics in the United States**

Don C. Yoo, MD (*Presenter*) Consultant; Invicro LLC. Consultant; Blue Earth Diagnostics

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S5-CNPM03

Go vs No-Go: Evaluating New and Advanced Technologies for Clinical Adoption (Sponsored by the RSNA Research Development Committee)

Sunday, Nov. 30 2:30PM - 3:30PM Room: S402

Janie M. Lee, MD, MSc (*Moderator*) Grant/Research Support; GE Healthcare
Premal S. Trivedi, MD, MSc (*Moderator*) Consultant; Boston Scientific. Consultant; Cook Medical. Other-Advisory Board Member; Pneumonix

LEARNING OBJECTIVES

1) Understand common strategies to critically evaluate literature supporting new technologies. 2) Identify sources of bias impacting evaluation of new technologies, particularly artificial intelligence (AI).

COURSE DESCRIPTION

Technological innovation is foundational to both diagnostic and interventional radiology. As new technologies emerge in large volume with variable amounts of supporting evidence, deciding what to adopt and what to ignore can be challenging. Further confounding evaluation is industry sourcing of the underlying data and marketing materials, which can lead to bias. This session aims to empower frontline radiologists with a practical approach to evaluation of data supporting new technologies with the central guiding question: when is it good enough for clinical adoption?

Sub-Events

S5-CNPM03C The Good: An Effective Technology and the Evidence That Supported Adoption

Premal S. Trivedi, MD, MSc (*Presenter*) Consultant; Boston Scientific. Consultant; Cook Medical. Other-Advisory Board Member; Pneumonix

S5-CNPM03D The Bad: An Ineffective Technology and the Evidence That Supported Adoption

Christoph I. Lee, MD,MS (*Presenter*) Consultant; DeepHealth/RadNet, Inc.. Other-Textbook royalties; UpToDate, Inc.. Other-Textbook royalties; Oxford University Press. Other-Textbook royalties; McGraw Hill, Inc.. Other-Personal fees for journal editorial board work.; American College of Radiology

S5-CNPM03E The (Not So) Ugly: Beyond the Hype--Practical Tips for Assessing Radiologic Innovation

Florence X. Doo, MD, MA (*Presenter*) Other-Cloud credits for research; Amazon Web Services. Other-Cloud credits for research; Google Cloud Products. Other-Cloud credits for research; Microsoft Azure. Grant/Research Support; GE Healthcare

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S5-CNR01

Vertebral Augmentation: Cementing Your Understanding in Oncologic and Osteoporotic Disease

Sunday, Nov. 30 2:30PM - 3:30PM Room: N227B

Mehran Nasralla, MBChB, BMedSc (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand how to synthesize the key imaging findings from complex metastatic spinal imaging. 2) Learn about updates in spine augmentation which improve the health span in patients with metastatic disease. 3) Learn about the evolution of imaging and augmentation methods in the osteoporotic spine. 4) Understand patient selection and technical considerations in percutaneous sacroplasty.

COURSE DESCRIPTION

In this educational session we will explore the role of image guided spine intervention in the metastatic and osteoporotic patient cohorts. We will review the imaging findings in both patient groups and how we can successfully triage patients for intervention to improve their health span. The session will also include advances in spinal augmentation including patient selection and technical considerations.

Sub-Events

S5-CNR01B **Imaging of the Metastatic Spine: Pearls and Pitfalls in Synthesizing an Impactful Report**

Allison M. Grayev, MD (*Presenter*) Nothing to Disclose

S5-CNR01C **Augmentation of the Metastatic Spine to Improve Quality of Life**

Shah Islam, FRCR (*Presenter*) Nothing to Disclose

S5-CNR01D **Imaging and Augmentation of the Osteoporotic Spine: Past, Present and Future**

Majid A. Khan, MD (*Presenter*) Consultant; Stryker medical. Consultant; Hyprevention . Consultant; Medwaves Avecure. Consultant; Caerus medical. Consultant; CoHere Medical

S5-CNR01E **Perfecting the Pour: When, in Who and How Do to Perform Percutaneous Sacroplasty**

Mehran Nasralla, MBChB, BMedSc (*Presenter*) Nothing to Disclose

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S5-CPD02

STAT! Snap Judgments in Emergency Radiology

Sunday, Nov. 30 2:30PM - 3:30PM Room: E350

Kushaljit Singh S. Sodhi, MD, PhD (*Moderator*) Nothing to Disclose
Mariana L. Meyers, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify common pitfalls in pediatric neuroradiology and body emergency imaging, and apply practical tips to improve diagnostic accuracy during on-call situations. 2) Understand the imaging findings of gonadal torsion in pediatric patients and distinguish them from mimics to ensure timely diagnosis and intervention. 3) Recognize acute imaging findings of oncologic emergencies in pediatric cancer patients—including therapy-related complications and tumor-associated conditions—to guide urgent management.

COURSE DESCRIPTION

This case-based educational session will highlight critical imaging findings in pediatric emergency settings, with an emphasis on neuroradiology and body imaging. Talks will cover practical strategies for improving diagnostic accuracy during high-pressure on-call scenarios, including tips and tricks for interpreting complex neuro and body imaging cases. Additional presentations will explore the imaging appearance of gonadal torsion and its mimics and review acute oncologic emergencies in pediatric cancer patients, focusing on both tumor-related conditions and therapy-associated complications. This session shall equip the attendees to navigate common and high-stakes emergencies in pediatric imaging, apply decision-making strategies under pressure, and improve timely diagnosis and management in urgent care settings.

Sub-Events

S5-CPD02C **Tips and Tricks for the On-Call Pediatric Neuroradiologist**

Jessie Aw-Zoretic, MD (*Presenter*) Nothing to Disclose

S5-CPD02D **Tips and Tricks for the On-Call Pediatric Body Radiologist**

Francisco A. Perez, MD, PhD (*Presenter*) Nothing to Disclose

S5-CPD02E **Gonadal Torsion: Diagnosing the Twist**

Leann E. Linam, MD (*Presenter*) Nothing to Disclose

S5-CPD02F **Emergencies in the Pediatric Cancer Patient**

James Christopher Davis, MD (*Presenter*) Nothing to Disclose

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S5-CPH10

Advances in Ultrasound Imaging Through Technology and AI

Sunday, Nov. 30 2:30PM - 3:30PM Room: S404

Karen Drukker, PHD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe recent advances in ultrasound elastography for quantitative tissue characterization and relate these developments to complementary trends in MR and optical elastography. 2) Explain technical and clinical factors in developing and applying AI for quantifying pulmonary congestion using point-of-care ultrasound. 3) Summarize the principles of super-resolution ultrasound imaging and identify potential clinical applications across different organ systems.

COURSE DESCRIPTION

This lecture-based session will highlight emerging ultrasound technologies that enhance diagnostic and prognostic imaging in both acute and chronic disease. Topics include advances in ultrasound elastography for characterizing tissue viscoelasticity, point-of-care ultrasound combined with AI for quantifying pulmonary congestion in acute heart failure, and super-resolution ultrasound methods for visualizing microvascular structure and function. The session will emphasize clinically relevant applications while also addressing key technical innovations and translational considerations. Expected outcome: Attendees will be able to assess recent advances in ultrasound imaging, understand their clinical utility, and recognize opportunities for integration into practice or further investigation.

Sub-Events

S5-CPH10B **Quantifying Pulmonary Congestion in Acute Heart Failure Using Bedside Ultrasound and AI**

Tina Kapur, PhD, MSc (*Presenter*) Nothing to Disclose

S5-CPH10C **A New Era of Microvascular Imaging With Super-Resolution Ultrasound Imaging**

Pengfei Song, PhD (*Presenter*) Other Financial or Material Support; GE Healthcare. Other Financial or Material Support; Verasonics. Other Financial or Material Support; Mindray

S5-CPH10D **Advancements in Elastography: Emerging Technologies and Clinical Applications**

Kenneth Bader (*Presenter*) Other-Subcontract on an NIH grant; GE Healthcare. Grant/Research Support; Philips Medical

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S5-CPH14

AAPM/RSNA Physics Tutorial 2: "Un"risky Business: Easing the Uncomfortable Relationship Between Risk and Benefit in Medical Imaging

Sunday, Nov. 30 2:30PM - 3:30PM Room: N226

Ehsan Samei, PHD (*Moderator*) Grant/Research Support; GE. Grant/Research Support; Siemens. Owner; Metis. Consultant; Imalogix. Consultant; SunNuclear. Consultant; Nanox

LEARNING OBJECTIVES

1) Understand the relationship between radiation dose reduction and diagnostic performance – Learners will analyze how reducing x-ray exposure in radiology impacts image quality and diagnostic accuracy, including the risks of false negatives in screening programs. 2) Evaluate patient-specific risk factors in radiology – Learners will explore how age, sex, and race influence risk assessment and prognosis, and how these factors can be incorporated into clinical decision-making. 3) Apply risk-to-benefit assessment models in clinical practice – Learners will examine analytical models that quantify the trade-off between radiation risk and diagnostic benefit, which can assist in decision-making, using case studies to integrate theoretical knowledge into real-world radiological practice.

COURSE DESCRIPTION

As with many medical interventions, imaging examinations also carry associated risks, including those induced by X-ray exposure. It is estimated that 74 million computed tomography (CT) procedures are performed in the US each year, with the related radiation dose accounting for over 60% of the total patient medical radiation exposure. This has led, over the years, to a constant effort to reduce patient x-ray exposure. In particular, between 2006 and 2016, the estimated effective dose (E) per person in the U.S. population from diagnostic and interventional x-ray procedures dropped by 20%, from 2.92 mSv to 2.33 mSv. Since the amount of radiation used for a radiological examination is directly correlated with the quality of the diagnostic image, reducing radiation exposure can negatively impact diagnostic performance. As an example, excessive dose reduction can lead to false negatives in CT screening programs; currently reported 8% to 15% in lung cancer screening studies. To what extent radiation dose reduction can have a consequential impact on image quality and diagnostic performance remains unclear, a question of paramount priority in the radiological field. This tutorial will discuss how the informed practice of radiology can incorporate a comprehensive and holistic approach to radiation risk and benefit, including quantitative measures such as the likelihood of a correct diagnosis. This quantification has been a significant challenge as the risk and benefit rarely use comparable units. Moreover, the radiological risk, as well as the prognosis following a diagnosis, depend on patient age, sex, and race, thus adding other factors that should be considered in the justification and the proper performance of an examination. The speakers will introduce the problem of age-, sex-, and race-specific comprehensive risk estimations, as well as the recent introduction of mathematical models that describe the risk-to-benefit ratio of a CT study within a risk-to-risk framework. Specific clinical cases will be presented and discussed, providing both the medical physicist's and radiologist's points of view, encouraging attendee participation.

Sub-Events

S5-CPH14B **Theoretical Approach to Risk/Benefit Assessment**

Francesco Ria, PhD (*Presenter*) Consultant; METIS Health Analytics, LLC

S5-CPH14C **From a Physicist Perspective**

Annalisa Trianni (*Presenter*) Nothing to Disclose

S5-CPH14D **From a Radiologist Perspective**

Donald P. Frush, MD (*Presenter*) Nothing to Disclose

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S5-CRO10

Low Dose Radiation for Benign Musculoskeletal Disease - Therapeutic Approaches and Imaging Changes

Sunday, Nov. 30 2:30PM - 3:30PM Room: S401

Tarita O. Thomas, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1)Describe the role of radiation therapy in Benign disease: low dose – MSK diseases. 2)Describe the role of radiation therapy in Benign disease: high dose - tremor, depression. 3)Describe the imaging findings for benign diseases treated with radiation therapy: MRI imaging for arthritis and tendinopathy. 4) Describe the imaging findings for benign diseases treated with radiation therapy: MRI imaging for tremor, depression.

COURSE DESCRIPTION

Multidisciplinary presentation with data provided. Multidisciplinary presentation with case presentation

Sub-Events

S5-CRO10B **Low Dose Radiation for Benign Musculoskeletal Disease - Therapeutic Approaches and Imaging Changes**

Austin Kirschner, MD, PhD (*Presenter*) Consultant; Varian Medical Systems, Inc.

S5-CRO10C **Low Dose Radiation for Benign Musculoskeletal Disease - Therapeutic Approaches and Imaging Changes**

Aline Serfaty Sr, MD, PhD (*Presenter*) Nothing to Disclose

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S5-DLL02

RSNA Deep Learning Lab: ChatGPT - DICOM De-Identification Using ChatGPT (Beginner Friendly) (Registration Fee Required)

Sunday, Nov. 30 2:30PM - 3:30PM Room: RADIOLOGY LEARNING LAB

George L. Shih, MD, MS (*Moderator*) Other-Consultant and Shareholder;Board of Directors; MD.ai. Other-Unpaid Advisor; OpenAI. Other-Board of Directors; SIIM

LEARNING OBJECTIVES

1) Identify and explain PHI within DICOM metadata, pixel data, and radiology report text. 2) Evaluate the challenges and available tools for effective de-identification of imaging and report data. 3) Use large language models to de-identify both DICOM files and associated reports, addressing metadata, pixel-level data, and unstructured text.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. This hands-on learning lab introduces participants to the fundamentals of de-identifying both DICOM files and associated radiology reports, combining traditional methods with the power of large language models (LLMs) like ChatGPT. Attendees will gain practical experience using AI tools to remove Protected Health Information (PHI) from DICOM metadata, pixel data, and text reports, and will explore how LLMs can support and streamline the de-identification process. The session will cover: An introduction to DICOM metadata and report content, including common locations where PHI may be stored. Challenges and considerations in de-identifying DICOM files and radiology reports, with an overview of existing tools. Hands-on practice using AI tools such as GPT and LLMs for DICOM and report de-identification. Additional ways LLMs can assist in reviewing, verifying, or enhancing the DeID process. Techniques for identifying and removing PHI from DICOM pixel data (e.g., burned-in annotations). Leveraging open source LLMs for managing PHI.

Sub-Events

S5-DLL02B **RSNA Deep Learning Lab: ChatGPT - DICOM De-Identification Using ChatGPT**

Sonali Sharma, BSc (*Presenter*) Nothing to Disclose

S5-DLL02C **RSNA Deep Learning Lab: ChatCTP - DICOM De-identification using ChatGPT**

Errol Colak, MD (*Presenter*) Nothing to Disclose

S5-DLL02D **RSNA Deep Learning Lab: ChatCTP - DICOM De-Identification Using ChatGPT**

Lisa C. Adams, MD, PhD (*Presenter*) Nothing to Disclose

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S5-RCP21

Obesity: More than Meets the Eye: The Role of the Radiologist (Sponsored by the RSNA Public Information Committee)

Sunday, Nov. 30 2:30PM - 3:30PM Room: E353A

Hildo J. Lamb, MD, PhD (*Moderator*) Consultant; Royal Philips

LEARNING OBJECTIVES

1) Learn about state-of-the-art imaging techniques for evaluation of obesity and related complications. 2) Identify effective strategies how imaging can support obesity care. 3) Learn about the tight interconnection between multiple organs affected by obesity. 4) Learn about automated AI-based image analysis techniques to harvest imaging outcomes more than the human eye can see. 5) Identify imaging and post-processing strategies to implement "opportunistic screening" in your routine clinical imaging program.

COURSE DESCRIPTION

The prevalence of obesity is increasing rapidly worldwide. Obesity is linked to many diseases, including diabetes type 2, cardiovascular disease, liver disease and malignancies. In this educational session strategies will be discussed to detect obesity related complications and how to monitor disease progression and therapeutic effects. The first lecture will show how imaging can help overcome barriers to effective obesity care. The second overview will focus on multi-organ imaging for diagnosis and monitoring of obesity, based on data from the UK biobank. The final presentation aims to explain the concept of 'opportunistic screening', harvesting quantifiable metrics on obesity and related complications based on routine clinical imaging exams performed for general purposes.

Sub-Events

S5-RCP21B **How Imaging Can Help Overcome the Barriers to Effective Obesity Care**

Michele Pansini, MD (*Presenter*) Consultant; Perspectum Ltd. . Employee; Perspectum Ltd.

S5-RCP21C **Multiorgan System Imaging in Diagnosis and Monitoring of Obesity - UK Biobank Experience**

Louise Thomas, PhD (*Presenter*) Nothing to Disclose

S5-RCP21D **Quantifiable Metrics in the Treatment of Obesity - How do we Report and Follow. Should These be Mentioned in all Reports (Opportunistic?)"**

Hildo J. Lamb, MD, PhD (*Presenter*) Consultant; Royal Philips

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S5-RCP37

Jeopardy! Return of the Editors: Tips to Get Your AI Paper Published

Sunday, Nov. 30 2:30PM - 3:30PM Room: S406B

Ali S. Tejani, MD (*Moderator*) Nothing to Disclose
Charles E. Kahn JR, MD, MS (*Presenter*) Other-Travel support, Radiology Advisory Panel; Sectra USA
Linda Moy, MD (*Presenter*) Grant/Research Support; Siemens Research Grant. Consultant; Lunit Inc. Consultant; iCAD. Consultant; Guerbet. Other-Meeting and Travel Expenses; British Society of Breast Radiology, European Society of Breast Imaging,. Other-DSMB; ACR DSMB
Merel Huisman, MD, PhD (*Presenter*) Stock/Shareholder; xAID LLC. Speaker's Bureau; Canon. Speaker's Bureau; Abbvie. Speaker's Bureau; MedicalPhit consultancy
Tugba Akinci D'Antonoli, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the key elements of a manuscript on AI in imaging. 2) Apply components of the Checklist for Artificial Intelligence in Medical Imaging (CLAIM) 2024 Update for imaging AI manuscript submissions. 3) Identify and correct errors in example imaging AI manuscripts and abstracts. 4) Apply appropriate use of AI performance metrics.

COURSE DESCRIPTION

It can be daunting to draft a concise, yet detailed manuscript about radiology artificial intelligence (AI) projects. Manuscripts about radiology AI should incorporate key information that enables reviewers to determine the quality and reproducibility of the submitted work, as well as how the submitted work adds to a rapidly evolving field. This session will help attendees improve the quality of their AI manuscripts for submission to the RSNA Journal Suite and guide them as effective peer-reviewers for AI-related submissions. The session will follow a “game show” format based on “Jeopardy!” featuring a panel composed of editorial board members from Radiology and Radiology: Artificial Intelligence. Categories and questions will facilitate discussion on experiences from the editorial board members, including thoughts on best practices for AI-related submissions and frequently seen errors. Topics will include highlights from the CLAIM 2024 Update and general recommendations for effective medical writing. Questions will include examples inspired by manuscript submissions and common scenarios encountered by the editorial review board.

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T1-CAS04

Emerging Technologies in Interventional Radiology (Sponsored by the RSNA Associated Sciences Consortium)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: N226

Brandy J. Reed, MBA, RT (*Moderator*) Nothing to Disclose
Nancy McDonald, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the latest technological advancements in interventional radiology, including novel devices, techniques, imaging modalities, robotics, and AI-driven practice. 2) Evaluate the clinical applications and potential impact of these emerging technologies on procedural safety, efficiency, and patient outcomes. 3) Discuss future directions and challenges in integrating these technologies into daily practice, including training, cost-effectiveness, and regulatory considerations.

Sub-Events

T1-CAS04C **Emerging Technologies in Interventional Radiology**

Elie R. Balesh, MD (*Presenter*) Stock/Shareholder; Ferrum Health, Inc.. Owner; NoviRad, Inc.

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T1-CBR06

Emerging and Novel Technologies in Breast Imaging: MRI, DWI, and AI Innovations (Advanced)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: S406A

Christiane K. Kuhl, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) To improve knowledge on the different methodological approaches that exist under the heading "abbreviated breast MRI". 2) To list clinical applications of Diffusion Weighted Imaging for breast MRI,and describe technical challenges and pitfalls. 3) To describe new image acquisition methods for breast MRI, and name applications of AI in breast MRI.

Sub-Events

T1-CBR06B Abbreviated and Faster MRI

Christiane K. Kuhl, MD, PhD (*Presenter*) Nothing to Disclose

T1-CBR06C DWI

Savannah C. Partridge, PhD (*Presenter*) Grant/Research Support; Guerbet, LLC. Grant/Research Support; GE Healthcare. Grant/Research Support; Philips Healthcare

T1-CBR06D Novel MRI techniques and AI

Pascal A. Baltzer, MD (*Presenter*) Nothing to Disclose

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T1-CBR16

RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques (Registration Fee Required)

Tuesday, Dec. 2 8:30AM - 10:30AM Room: S504CD

Stamatia V. Destounis, MD (*Moderator*) Grant/Research Support; Hologic, Inc.. Other-Medical Advisory Board; Hologic, Inc.. Other-Medical Advisory Board; iCAD, Inc.

LEARNING OBJECTIVES

1) Become familiar with different biopsy, cyst aspiration, and needle aspiration devices and techniques. 2) Review techniques of spring loaded and vacuum biopsy device methods available today. 3) Practice biopsy techniques with the advice of expert faculty that will advise attendee on biopsy and US technique.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. A brief didactic session will occur fist to discuss techniques, and tricks of performing biopsy under US. Subsequently attendees will be able to rotate to multiple ultrasound stations with different types of biopsy devices and practice biopsy technique while faculty will be available to walk through each different biopsy procedure.

Sub-Events

T1-CBR16B **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Gary J. Whitman, MD (*Presenter*) Consultant; Siemens. Other-Editor; UpToDate

T1-CBR16C **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Michael N. Linver, MD (*Presenter*) Other-Medical Advisory Board member; Seno Medical. Other-Member of Expert Group; DetectedX. Other-Medical Advisory Board member; Three Palms Software

T1-CBR16D **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Richard G. Barr, MD, PhD (*Presenter*) Grant/Research Support; Philips Ultrasound. Grant/Research Support; Samsung. Other-Royalties ; Thieme Publishers. Other-Royalties; Elsever Publishers. Grant/Research Support; SuperSonic Imagine. Speaker's Bureau; Samsung. Grant/Research Support; SonoScape. Speaker's Bureau; Philips Ultrasound. Grant/Research Support; Siemens Ultrasound. Speaker's Bureau; Siemens Ultrasound. Grant/Research Support; Canon Medical Systems. Speaker's Bureau; Canon Medical Systems. Grant/Research Support; Mindray . Grant/Research Support; Hologic . Speaker's Bureau; Hologic

T1-CBR16E **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Cecilia L. Mercado, MD (*Presenter*) Nothing to Disclose

T1-CBR16F **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Jessica W. Leung, MD (*Presenter*) Stock/Shareholder; Subtle Medical. Consultant; Beekley. Consultant; Fuji. Consultant; Hologic

T1-CBR16G **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Erin I. Neuschler, MD (*Presenter*) Nothing to Disclose

T1-CBR16H **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Tanya W. Moseley, MD, PhD (*Presenter*) Nothing to Disclose

T1-CBR16I **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Sarah M. Pittman, MD, FRCPC (*Presenter*) Nothing to Disclose

T1-CBR16J **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Maria Helena S. Mendonca, MD, PhD (*Presenter*) Nothing to Disclose

T1-CBR16K **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Norran H. Said, MD, FRCR (*Presenter*) Nothing to Disclose

T1-CBR16L **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Beatriz E. Adrada, MD (*Presenter*) Nothing to Disclose

T1-CBR16M **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Asha Bhatt, MD (*Presenter*) Nothing to Disclose

T1-CBR16N **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Lizbel A. Arredondo, MD, MBA (*Presenter*) Nothing to Disclose

T1-CBR16O **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

David V. Schacht, MD (*Presenter*) Consultant; Bayer Inc. Speaker's Bureau; Bayer Inc

T1-CBR16P **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Marcio M. Saito, MD (*Presenter*) Other-Speaker; GE

T1-CBR16Q **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Georgia G. Spear, MD (*Presenter*) Nothing to Disclose

T1-CBR16R **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Stamatia V. Destounis, MD (*Presenter*) Grant/Research Support; Hologic, Inc.. Other-Medical Advisory Board; Hologic, Inc.. Other-Medical Advisory Board; iCAD, Inc.

T1-CBR16S **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Linda J. Warren, MD, FRCPC (*Presenter*) Nothing to Disclose

T1-CBR16T **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Andrea F. Stavros, MD (*Presenter*) Nothing to Disclose

T1-CBR16U **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Paula B. Gordon, MD, FRCPC (*Presenter*) Nothing to Disclose

T1-CBR16V **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Hiroyuki Abe, MD, PhD (*Presenter*) Nothing to Disclose

T1-CBR16W **RSNA Hands-On Lab: Breast Ultrasound Guided Biopsy Techniques**

Liane E. Philpotts, MD (*Presenter*) Nothing to Disclose

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T1-CCA03

Cardiac MRI Updates in 2025

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E353C

Elsie Nguyen, MD, FRCPC (*Moderator*) Nothing to Disclose
Tim Leiner, MD, PhD (*Moderator*) Consultant; Guerbet. Consultant; AI4Med. Grant/Research Support; Philips

Sub-Events

T1-CCA03C **Fast and Focused CMR Today - Practical Approach**

Karen G. Ordovas, MD, MS (*Presenter*) Stock/Shareholder; Sira Medical

T1-CCA03D **How to Get your Stress CMR Program Started Today**

Ming-Yen Ng, BMBS, FRCR (*Presenter*) Other-Speaker's Bureau & Educational Grant; Circle CVI. Other-Speaker's Bureau & Educational Grant; Bayer. Other-Speaker's Bureau & Educational Grant; GE Healthcare. Other Financial or Material Support; TeraRecon. Other Financial or Material Support; Arterys. Speaker's Bureau; Boerhinger Ingelheim. Speaker's Bureau; Phantomics

T1-CCA03E **Parametric Mapping - When and How**

Vanessa M. Ferreira, MD, DPhil (*Presenter*) Grant/Research Support; GE healthcare. Other-Speaker fees for CMR educational lectures/seminars; GE healthcare. Other-Speaker fees for CMR educational lectures/seminars; JCA Seminars. Other-Speaker fees for CMR educational lectures/seminars; Circle Cardiovascular Imaging

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T1-CER06

Gastrointestinal Emergencies: Bridging Core Knowledge and Advances

Tuesday, Dec. 2 8:00AM - 9:00AM Room: N228

James T. Lee, MD (*Moderator*) Nothing to Disclose
Paulina Cewe Jonsson, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Differentiate typical from atypical imaging presentations of adult intussusception, assess clinical significance including diagnostic complexities and prognostic factors, and identify common structural abnormalities that predispose to this condition. 2) Recognize imaging signs of biliary complications underlying post-cholecystectomy syndrome, analyze the full spectrum of early and delayed post-cholecystectomy complications with their corresponding imaging patterns, and compare the diagnostic utility and advantages of different imaging modalities. 3) Recognize classic imaging characteristics of acute appendicitis with particular focus on CT findings, distinguish atypical presentations from common mimics to avoid pitfalls, and gain insight into current literature and guidelines for imaging, diagnosis, and management.

COURSE DESCRIPTION

This lecture session explores three critical abdominal emergencies where imaging serves as the diagnostic cornerstone: adult colonic intussusception, highlighting that malignancy is not always the underlying cause; post-cholecystectomy biliary complications, with focus on identifying imaging features and advantages of different imaging modalities; and atypical acute appendicitis presentations, addressing prevalent mimics and diagnostic pitfalls. Participants will acquire key insights to enhance diagnostic precision in emergency abdominal imaging and strengthen their interpretive approach.

Sub-Events

T1-CER06C **Intussusception in Adults: Not Always Malignant!**

Dinesh D. Chinchure, FRCR, MBBS (*Presenter*) Nothing to Disclose

T1-CER06D **Atypical Appendiceal Emergencies on CT**

Douglas S. Katz, MD (*Presenter*) Nothing to Disclose

T1-CER06E **Complications after Cholecystectomy**

Carrie N. Hoff, MD (*Presenter*) Nothing to Disclose

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T1-CGU05

Everyday GU Reporting: Where Are We Now and Where Are We Headed?

Tuesday, Dec. 2 8:00AM - 9:00AM Room: N227B

Anugayathri Jawahar, MD (*Moderator*) Nothing to Disclose
Stuart G. Silverman, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Apply and assess current renal mass classification systems and the potential of a future KI-RADS. 2) Apply and assess VI-RADS following neoadjuvant therapy for bladder cancer. 3) Manage incidentally detected adrenal nodules.

COURSE DESCRIPTION

The ability of radiologists to detect, diagnose, and guide the management of imaging findings in the GU system has been buttressed by the development of evidence-based recommendations and guidelines that predict the likelihood of cancer in an incidental mass, stage tumors, and estimate response to treatment. This course's lectures focus on the care of patients with incidental renal masses (and include an introduction to KI-RADS), incidental adrenal masses, and bladder cancers that have undergone treatment. In addition to being practical and useful in everyday radiology reporting, the lectures will assess both the current state and future developments.

Sub-Events

T1-CGU05C **Report Card on the Bosniak Classification v2019**

Luyao Shen, MD (*Presenter*) Nothing to Disclose

T1-CGU05D **Is Clear Cell Likelihood Score Ready for Wide Spread Adoption?**

Melissa J. McGettigan, MD (*Presenter*) Nothing to Disclose

T1-CGU05E **Will KI-RADS Fly?**

Ivan Pedrosa, MD, PhD (*Presenter*) Consultant; Health Tech International

T1-CGU05F **VI-RADS in the Setting of Neoadjuvant Chemotherapy**

Valdair F. Muglia, MD, PhD (*Presenter*) Nothing to Disclose

T1-CGU05G **Management of the Incidental Adrenal Nodule**

Michael T. Corwin, MD (*Presenter*) Consultant; Corcept Therapeutics

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T1-CHN02

Head and Neck Radiology Around the World (Advanced)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E352

Jussi Hirvonen, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Analyze advanced CT and ultrasound techniques for the precise diagnosis of head and neck cancers. 2) Describe global clinical considerations for nasopharyngeal and laryngeal cancers. 3) Apply imaging strategies to unfamiliar disease presentations.

COURSE DESCRIPTION

Join leading head and neck radiology experts from around the world in this dynamic educational session, designed for imaging professionals seeking to enhance their expertise in imaging head and neck cancers. Through four didactic lectures, presenters will share their specialized knowledge on advanced CT imaging, nasopharyngeal carcinoma, head and neck ultrasound, and laryngeal cancer management. The session highlights unique disease processes and clinical considerations that may differ from North American practices, offering fresh perspectives on diagnosis and treatment. Interactive discussions will complement the lectures, fostering collaboration and practical application. By the end of the session, participants will be better equipped to integrate advanced imaging techniques into their practice, improving diagnostic accuracy and patient outcomes in diverse clinical settings.

Sub-Events

T1-CHN02B **Clinical Applications of Advanced CT Imaging in Head and Neck Cancer - The Japanese Experience**

Hirofumi Kuno, MD, PhD (*Presenter*) Grant/Research Support; Canon medical systems

T1-CHN02C **Expert Imaging of Nasopharyngeal Carcinoma**

Ann D. King, MD (*Presenter*) Nothing to Disclose

T1-CHN02D **Advanced Techniques in Head & Neck Ultrasound**

Andrew S. McQueen, MBBS, MRCP (*Presenter*) Speaker's Bureau; BVM Medical. Speaker's Bureau; GE Healthcare Ultrasound

T1-CHN02E **Laryngeal Cancer: Our Experience in Resource-constrained Setting**

Amal Saleh Nour, MD (*Presenter*) Nothing to Disclose

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T1-CIN11

Encoding Equity in AI Algorithms (Sponsored by the RSNA Health Equity Committee)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E450B

Martha G. Menchaca, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand limitations of AI radiology software. 2) Learn what a radiologist needs to know about AI algorithms and how to modify algorithms for equity. 3) Understand how neuroimaging AI algorithms were successfully used in a target population.

COURSE DESCRIPTION

This course will evaluate limitations that exist in commercially available AI radiology software and how these may disproportionately affect minoritized communities in the US. What any radiologist needs to know about race-based AI Algorithms. How to understand and be able to modifying Algorithms for Equity. Describe how neuroimaging AI algorithms have been used successfully in Sub-Saharan Africa successfully.

Sub-Events

T1-CIN11B **Limitations of Commercially Available AI Products**

Martha G. Menchaca, MD, PhD (*Presenter*) Nothing to Disclose

T1-CIN11C **Modifying Algorithms for Equity**

Antonio R. Porras Perez, PhD (*Presenter*) Other-Stock options for 0.5%; mGeneRX

T1-CIN11D **Race-based Algorithms - What Radiologists Need to Know**

Judy W. Gichoya, MBChB, MS (*Presenter*) Grant/Research Support; Clairity Consortium. Grant/Research Support; LUNIT. Grant/Research Support; Bunkerhill Foundation

T1-CIN11E **Lessons Learned: Neuroimaging AI Algorithms in Sub-Saharan Africa**

Udunna Anazodo, PhD (*Presenter*) Nothing to Disclose

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T1-CIR05

Thyroid Interventions

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E351

Juan C. Camacho Vasquez, MD (*Moderator*) Speaker's Bureau; Trisalus. Consultant; Trisalus, Pulse Biosciences. Grant/Research Support; Trisalus. Other Financial or Material Support; Wolters Kluwer, Simposium on Clinical Interventional Radiology, Society of Interventional Oncology

LEARNING OBJECTIVES

1) Review the role of Interventional radiology in the treatment of thyroid pathology from the perspective of dedicated endocrinologists and thyroid surgeons. 2) Discuss the current state of the percutaneous ablation and endovascular techniques for the management of benign and malignant thyroid nodules.

COURSE DESCRIPTION

The flow of patients with thyroid pathology in the USA usually goes from the endocrinologist first and then directed to the surgeon and interventional radiologist accordingly as needed. Familiarity with all available treatment options by these specialists is paramount to helping the patient make the personalized value based decision best for them. That is best accomplished by a complementary team of endocrinologists, surgeons and interventional radiologists who are focused in the care of patients with thyroid pathology. Through the eyes of nationwide experts in a short lecture format, we will share current surgical and endocrinology perspectives and we will review the state of the art of percutaneous and endovascular interventions to approach and treat benign and malignant thyroid nodules in a minimally invasive fashion.

Sub-Events

T1-CIR05B **The Role of Interventional Radiology in the Treatment of Thyroid Pathology: A Perspective from a Dedicated Thyroid and Parathyroid Surgeon**

Jonathon O. Russell, MD (*Presenter*) Other-advisory dinner; veracity

T1-CIR05C **Thermal Ablation of Thyroid Nodules: A Review of the Modalities from the Technical Perspective**

Chelsey K. Baldwin, MD (*Presenter*) Nothing to Disclose

T1-CIR05D **Thermal Ablation of Benign Thyroid Nodules: Current Guidelines and Limitations**

Alexander H. Lam, MD (*Presenter*) Nothing to Disclose

T1-CIR05E **Thermal Ablation of Thyroid Cancer Microcarcinoma: What is the Evidence?**

Fourat Ridouani, MD (*Presenter*) Nothing to Disclose

T1-CIR05F **Thyroid Embolization for Multinodular Goiter, Autonomous Nodules and in Combination with Ablation: Current Perspectives**

Juan C. Camacho Vasquez, MD (*Presenter*) Speaker's Bureau; Trisalus. Consultant; Trisalus, Pulse Biosciences. Grant/Research Support; Trisalus. Other Financial or Material Support; Wolters Kluwer, Simposium on Clinical Interventional Radiology, Society of Interventional Oncology

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T1-CMK01

Ankle and Foot Imaging: From Fundamentals to Advanced

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E450A

Dyan V. Flores, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review and compare basic and advanced imaging modalities (e.g., radiography, sonography, CT, MRI) used for diagnosing ankle and foot pathologies, highlighting their indications and limitations. 2) Recognize relevant imaging features and develop a reasonable differential diagnosis for sources of common ankle and foot symptoms.

COURSE DESCRIPTION

This series of lectures offers a high-yield focus on imaging of essential anatomic structures and related abnormalities in the ankle and foot, emphasizing both fundamental and advanced imaging techniques. Upon completion of this course, participants are expected to understand pertinent imaging features, pearls and pitfalls that may aid in formulating concise but meaningful radiology reports.

Sub-Events

T1-CMK01B **Stress Injuries of the Foot and Ankle**

Navid Faraji, MD (*Presenter*) Nothing to Disclose

T1-CMK01C **Beyond the Achilles: The Unsung Ankle Tendons**

Corrie M. Yablon, MD (*Presenter*) Nothing to Disclose

T1-CMK01D **Heel Pain: Causes and Findings**

Robert S. Campbell, MBChB, FRCR (*Presenter*) Nothing to Disclose

T1-CMK01E **Assessing the Lisfranc Joint: How I do it**

Jenny T. Bencardino, MD (*Presenter*) Nothing to Disclose

T1-CMK01F **Metatarsalgia: What I Look For**

Dyan V. Flores, MD (*Presenter*) Nothing to Disclose

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T1-CMS01

Comprehensive Review of IgG4-Related Disease

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E350

Margarita V. Revzin, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the characteristic imaging features of IgG4-related disease involving multiple organ systems. 2) Differentiate IgG4-related disease from mimics using multi-modality imaging. 3) Explore the role of emerging imaging techniques in the evaluation and management of IgG4-RD.

COURSE DESCRIPTION

This session provides a detailed discussion on imaging role and characteristic radiologic features related to immunoglobulin G4 (IgG4)–related disease including intracranial, head and neck, chest, and abdominal involvement, with emphasis on imaging findings that can help differentiate this disease from other inflammatory and neoplastic lesions. A short discussion of proposed pathogenesis and clinical presentation as well as management will also be reviewed.

Sub-Events

T1-CMS01B **Neuroradiology/Head and Neck**

Ichiro Ikuta, MD, MMedSc (*Presenter*) Nothing to Disclose

T1-CMS01C **Chest**

Cristina Fuss, MD, PhD (*Presenter*) Other-Speaker honorarium; Siemens. Other-Honorarium; Elsevier. Consultant; HeartFLow

T1-CMS01D **Abdomen and Pelvis**

Joseph H. Yacoub, MD (*Presenter*) Consultant; Microsoft-Nuance

T1-CMS01E **Endocrine**

Yashant Aswani, MD (*Presenter*) Nothing to Disclose

T1-CMS01F **New Imaging Modalities - Nuclear Medicine**

Delphine L. Chen, MD (*Presenter*) Grant/Research Support; Telix Pharmaceuticals. Consultant; GE Healthcare. Grant/Research Support; United Imaging. Grant/Research Support; Imaginab. Grant/Research Support; Astra Zeneca. Grant/Research Support; Novartis

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T1-CNMMI09

PET/CT: Dementia and Infection/Inflammation

Tuesday, Dec. 2 8:00AM - 9:00AM Room: S405

Cristina S. Matushita, MD, MSc (*Moderator*) Speaker's Bureau; TELIX. Speaker's Bureau; NOVARTIS. Speaker's Bureau; GE
Phillip H. Kuo, MD, PhD (*Moderator*) Other-Consultant, speaker, grant/research support; Blue Earth Diagnostics. Consultant; Attralus. Other-Consultant, Scientific Advisory Board; dGenThera. Consultant; Life Molecular Imaging. Consultant; Navidea. Consultant; Bayer. Consultant; United Imaging. Consultant; Chimerix. Consultant; Fusion Pharma. Other-Consultant, speaker, grant/research support; General Electric Healthcare. Other-Consultant, speaker, part-time employee ended October 2022; Invicro. Other-Consultant, speaker; Novartis. Consultant; Radionetics. Other-Consultant, speaker; Lilly. Consultant; Telix

LEARNING OBJECTIVES

1) Recognize the clinical utility of PET imaging in the assessment of neurodegenerative diseases. 2) Understand the role of PET/CT in evaluating CNS infections and inflammation. 3) Integrate PET findings into the diagnostic workup and management of neurologic conditions.

COURSE DESCRIPTION

This session provides an overview of the evolving role of PET/CT in neurological imaging. Topics will include the use of molecular imaging in neurodegenerative disorders and CNS infections, with an emphasis on clinical interpretation, integration with other imaging modalities, and practical relevance for patient care. Designed for imaging professionals, the session aims to enhance diagnostic confidence in complex neurologic cases.

Sub-Events

T1-CNMMI09C Amyloid and Tau PET for Dementia

Cristina S. Matushita, MD, MSc (*Presenter*) Speaker's Bureau; TELIX. Speaker's Bureau; NOVARTIS. Speaker's Bureau; GE

T1-CNMMI09D PET for Infection and Inflammation

Philipose G. Mulugeta, MD (*Presenter*) Nothing to Disclose

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T1-CNR03

Pick Your Poison: Medication, Drug and Substance Abuse Brain Injury

Tuesday, Dec. 2 8:00AM - 9:00AM Room: S406B

Carlos H. Torres, MD, FRCPC (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify typical imaging findings of drug and alcohol abuse affecting the CNS. 2) Discuss the differential diagnoses of CNS poisoning. 3) Recognize neurotoxicity findings secondary to cancer therapies.

COURSE DESCRIPTION

To review imaging abnormalities in the context of illicit drug use, alcohol abuse and CNS poisoning. This session will also focus on the common and rare imaging abnormalities affecting the central nervous system during and after cancer treatment.

Sub-Events

T1-CNR03B **Street Drugs: Imaging of Illicit Drug - Induced Brain Injury**

Carlos Zamora, MD, PhD (*Presenter*) Nothing to Disclose

T1-CNR03C **Neuroimaging Findings in Alcohol Abuse**

Carlos Zamora, MD, PhD (*Presenter*) Nothing to Disclose

T1-CNR03D **CNS Poisoning - Recognizing Usual and Rare Toxins**

Laurent Letourneau-Guillon, MD, MSc (*Presenter*) Nothing to Disclose

T1-CNR03E **Treatment-Induced Neurotoxicity: Chemo & Immunotherapy**

Carlos H. Torres, MD, FRCPC (*Presenter*) Nothing to Disclose

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T1-CRO04

Rapid Fire CNS Tumor Board Case Review

Tuesday, Dec. 2 8:00AM - 9:00AM Room: S401

Soonmee Cha, MD (*Moderator*) Nothing to Disclose

Sub-Events

T1-CRO04B **Neuro-Oncology Current Updates**

Roger Stupp, MD (*Presenter*) Consultant; Carthera. Consultant; Aimed Bio. Consultant; Varian Medical Systems. Consultant; Northwest Biotherapeutics. Grant/Research Support; Bristol Myers Squibb. Consultant; Cureteq. Consultant; Sapience Therapeutics. Consultant; Ipsen. Grant/Research Support; Carthera. Consultant; Alpheus Medical. Consultant; Hemispherian AS. Consultant; GT Medical. Consultant; AstraZeneca. Consultant; Boston Scientific. Consultant; Novartis. Speaker's Bureau; Zailab

T1-CRO04C **Neuro-Surgical Current Updates**

Clark C. Chen, PhD (*Presenter*) Nothing to Disclose

T1-CRO04D **Radiation Oncology Current Updates**

Christina I. Tsien, MD (*Presenter*) Speaker's Bureau; Novocure. Speaker's Bureau; Varian. Consultant; Zeiss. Speaker's Bureau; Servier

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T1-RCP16

Addressing Current Challenges in Representation: Regional and Global Perspectives (Sponsored by the RSNA Committee on Diversity, Equity and Inclusion)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E451A

Charlotte J. Yong-Hing, MD, FRCPC (*Moderator*) Nothing to Disclose
Cynthia S. Santillan, MD (*Moderator*) Consultant; Alimentiv Clinical Research. Consultant; Clario Clinical Research. Other-Service Agreement; GE Healthcare

LEARNING OBJECTIVES

1) Describe region-specific and global strategies to improve representation and inclusion in radiology. 2) Identify practical approaches to mentorship, sponsorship, and workforce development that support underrepresented groups. 3) Apply data-driven and culturally responsive methods to advance equity and track progress within radiology departments.

COURSE DESCRIPTION

This dynamic session brings together radiologists and healthcare leaders from diverse geographic regions to explore effective approaches to representation challenges in radiology. Our distinguished panel from the Midwest USA, Southern USA, Canada, and France will share region-specific insights while identifying universal principles that can be applied globally. Participants will gain practical strategies for: Building inclusive workplace cultures that attract and retain diverse talent Developing mentorship and sponsorship programs that support underrepresented groups Addressing systemic barriers to advancement within radiology departments Creating educational pathways to increase representation in the field Implementing data-driven approaches to measure progress and outcomes The session will highlight successful initiatives from different regions while acknowledging unique cultural contexts and regulatory environments. Through case studies, panel discussions, and audience engagement, attendees will leave with actionable insights to enhance representation efforts within their own institutions. Join us for this important conversation as we work together to strengthen our specialty through diverse perspectives and inclusive practices.

Sub-Events

T1-RCP16C **Addressing Current Challenges in Representation: A Midwest Perspective**

Anand K. Narayan, MD, PhD (*Presenter*) Nothing to Disclose

T1-RCP16D **Addressing Current Challenges in Representation: A French Perspective**

Marie-France Bellin, MD (*Presenter*) Nothing to Disclose

T1-RCP16E **Addressing Current Challenges in Representation: A Canadian Perspective**

Faisal Khosa, FRCPC, MBA (*Presenter*) Nothing to Disclose

T1-RCP16F **Addressing Current Challenges in Representation: A Southern Perspective**

Cecelia Brewington, MD (*Presenter*) Nothing to Disclose

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T1-RCP36

Coloring Outside the Lines: Non-Traditional Lifestyles of Traditional Radiologists (Sponsored by the American Association for Women in Radiology)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E353B

Catherine J. Everett, MD, MBA (*Moderator*) Owner; Eidetico PLLC. Consultant; MSN. Employee; Radiology Partners
Nikdokht Farid, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Appreciate the breadth and diversity of professional and personal pursuits available outside of the field of radiology. 2) Understand that personal fulfillment and success may be derived outside of the workplace. 3) Become excited about trying something new.

COURSE DESCRIPTION

Radiology, for many, is both a profession and a lifestyle. Many find it difficult to excel in both their career and enjoy outside interests. Join this group of exceptional women radiologists who have excelled in sports, dedicated themselves to service, and enjoyed foreign work experience while fostering their radiology careers.

Sub-Events

T1-RCP36C International Volunteer Work with RADAID

Arlene Richardson, MD (*Presenter*) Nothing to Disclose

T1-RCP36D Mid-Career: Yes You Can Work and Live in Europe

Rachel F. Gerson, MD, MBA (*Presenter*) Other-Advisory board member. Limited stock options.; Agamon Health. Other-Participant in a one time 4 hour advisory board meeting. Received <$2500 in payment.; Bayer Pharamceuticals

T1-RCP36E Radiologists: There is Something Else to See

Virginia J. Simmons, MD (*Presenter*) Nothing to Disclose

T1-RCP36F Coloring Outside the Lines by Running & Writing

Elizabeth K. Arleo, MD (*Presenter*) Other-Participant in the SCARD-GEHC LEAD program for 2024-205 academic year (ending September 2025); GE Healthcare. Other-Editor-in-Chief of radiology journal Clinical Imaging, a position paid by Elsevier; Elsevier

T1-RCP36G Fitness is Fun: Zumba and Competitive Badminton

Arthy Saravanan, MD (*Presenter*) Consultant; Delphinus Medical Technologies

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T2-CGU09

RSNA Hands-On Lab: Prostate MRI: 1 (Registration Fee Required) (Supported by an Unrestricted Educational Grant from Bayer HealthCare Pharmaceuticals Inc.)

Tuesday, Dec. 2 9:00AM - 10:30AM Room: RADIOLOGY LEARNING LAB

Tharakeswara K. Bathala, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Optimize prostate MRI protocols for diverse clinical applications, including active surveillance, biopsy guidance, staging, focal therapy planning, and post-treatment evaluation. 2) Apply interpretation skills beyond standard PI-RADS assessment to evaluate active surveillance cases, distinguish post-treatment changes from recurrent disease, and assess treatment response. 3) Integrate multiparametric prostate MRI findings with clinical context to provide structured reporting that supports multidisciplinary treatment planning and patient management decisions.

COURSE DESCRIPTION

This comprehensive hands-on prostate MRI course addresses the evolving educational needs in contemporary prostate cancer care, where clinical applications have expanded far beyond traditional PI-RADS interpretation for initial diagnosis. As prostate MRI becomes increasingly integral to patient management across the entire cancer care continuum—from screening and active surveillance to treatment planning and response assessment—radiologists require specialized skills in both technical optimization and advanced interpretation. The course tackles critical knowledge gaps in technical protocol optimization for diverse clinical scenarios, specialized interpretation skills for complex cases including post-treatment imaging and active surveillance, and the integration of emerging technologies such as deep learning algorithms. These skills are essential as healthcare systems increasingly rely on prostate MRI for precision medicine approaches including focal therapy planning, targeted biopsy guidance, and personalized treatment monitoring. The program combines focused didactic presentations with extensive hands-on learning experiences. Following instructor-led lectures on core concepts, participants engage in case-review sessions using DICOM viewers on their devices. Interactive case discussions and real-time faculty guidance enhance collaborative learning, concluding with independent case interpretation and immediate performance feedback. This is a Bring Your Own Device (BYOD) session. In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited.

Sub-Events

T2-CGU09B **RSNA Hands-On Lab: Prostate MRI - 1**

Sungmin Woo, MD, PhD (*Presenter*) Nothing to Disclose

T2-CGU09C **RSNA Hands-On Lab: Prostate MRI - 1**

Varaha Tammisetti, MBBS, MD (*Presenter*) Nothing to Disclose

T2-CGU09D **RSNA Hands-On Lab: Prostate MRI - 1**

Silvia D. Chang, MD, FRCPC (*Presenter*) Other-Speaker honorarium; Bayer Healthcare. Other-Advisory Board; Bayer Healthcare

T2-CGU09E **RSNA Hands-On Lab: Prostate MRI - 1**

Angela Tong, MD (*Presenter*) Other-Research support in the form of software and hardware ; Siemens Healthineers. Other-One time Honorarium for Speaking at a Siemens conference Innovations 2024 (5/22-23/2024; Siemens Healthineers

T2-CGU09F **RSNA Hands-On Lab: Prostate MRI - 1**

Fiona M. Fennessy, MBBCh, PhD (*Presenter*) Nothing to Disclose

T2-CGU09G **RSNA Hands-On Lab: Prostate MRI - 1**

Sadhna Verma, MD, MBA (*Presenter*) Nothing to Disclose

T2-CGU09H **RSNA Hands-On Lab: Prostate MRI - 1**

Devaki Shilpa S. Surasi, MD (*Presenter*) Grant/Research Support; Blue Earth Diagnostics. Grant/Research Support; Blue Earth Therapeutics. Consultant; Novartis. Consultant; Amgen

T2-CGU09I **RSNA Hands-On Lab: Prostate MRI - 1**

Andrei S. Purysko, MD (*Presenter*) Consultant; Koelis. Grant/Research Support; Blue Earth Medical. Grant/Research Support; American College of Radiology. Grant/Research Support; Lantheus. Grant/Research Support; Siemens Healthineers

T2-CGU09J **RSNA Hands-On Lab: Prostate MRI - 1**

Leonardo K. Bittencourt, MD, PhD (*Presenter*) Speaker's Bureau; Guerbet USA. Speaker's Bureau; Guerbet LatAm. Consultant; AIDOC. Consultant; Quibim. Stock/Shareholder; ANA Health. Stock/Shareholder; Remote Radtech

T2-CGU09K **RSNA Hands-On Lab: Prostate MRI - 1**

Ken-Pin Hwang, PhD (*Presenter*) Grant/Research Support; Siemens Healthineers

T2-CGU09L **RSNA Hands-On Lab: Prostate MRI: 1**

David O. Henriquez Ticas, MD (*Presenter*) Nothing to Disclose

T2-CGU09M **RSNA Hands-On Lab: Prostate MRI - 1**

Sandeep S. Arora, MBBS (*Presenter*) Consultant; Profound Medical. Grant/Research Support; Profound Medical. Other-Clinical trial; Histosonics

T2-CGU09N **RSNA Hands-On Lab: Prostate MRI - 1**

Sreeharsha Tirumani, MD (*Presenter*) Nothing to Disclose

T2-CGU09O **RSNA Hands-On Lab: Prostate MRI - 1**

Adriano Basso Dias, MD, MSc (*Presenter*) Nothing to Disclose

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T3-CAS08

Hard Conversations, Stronger Teams: Resolving Conflict With Purpose (Sponsored by the RSNA Associated Sciences Consortium)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: N226

Brian Fox, MBA (*Moderator*) Nothing to Disclose
Meredith Gammons, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key principles that support constructive and respectful dialogue in moments of conflict. 2) Apply at least two conflict resolution tools to real-world scenarios through guided collaboration and discussion. 3) Demonstrate increased confidence in initiating difficult conversations by using structured approaches shared during the session.

COURSE DESCRIPTION

Navigating conflict can be a difficult but necessary part of life. This interactive session will provide tools through collaboration which will empower each of us to tackle those difficult conversations with the goal of having as positive a resolution as possible. Having tools to navigate through conflict can empower us to approach challenging situations with confidence instead of avoiding them.

Sub-Events

T3-CAS08D **Hard Conversations, Stronger Teams: Resolving Conflict with Purpose**

Jennifer Clayton, MBA, RT (*Presenter*) Nothing to Disclose

T3-CAS08E **Hard Conversations, Stronger Teams: Resolving Conflict with Purpose**

Ashley Willner, RT, ARRT (*Presenter*) Nothing to Disclose

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T3-CCH08

Thoracic Imaging of Medical Devices

Tuesday, Dec. 2 9:30AM - 10:30AM Room: E451A

Linda B. Haramati, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify appropriate and inappropriate positioning of an array of medical devices on thoracic imaging. 2) Describe common and some uncommon thoracic imaging manifestations of complications of medical devices.

COURSE DESCRIPTION

This session addresses a topic of common clinical interest- chest imaging of medical devices. The series of lectures encompasses the breadth of venous access and airways devices as well as ventricular assist and other implantable devices. Device positioning, complications, usual and unusual radiographic and CT appearances will be highlighted.

Sub-Events

T3-CCH08B **Venous Access Catheters - Expected and Unexpected**

Girish S. Shroff, MD (*Presenter*) Consultant; Pulmotec

T3-CCH08C **Implantable Devices**

Daniel Vargas, MD (*Presenter*) Nothing to Disclose

T3-CCH08D **Airway Devices**

Maria D. Martin, MD (*Presenter*) Nothing to Disclose

T3-CCH08E **Ventricular Assist Devices**

Demetrios A. Raptis, MD (*Presenter*) Nothing to Disclose

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T3-CGI06

Imaging Cancer: Biomarkers, Immunotherapy, Update on Liver Directed Therapies

Tuesday, Dec. 2 9:30AM - 10:30AM Room: E451B

Leo L. Tsai, MD, PhD (*Moderator*) Other-Co-Founder, shareholder, and non-paid consultant; Agile Devices, Inc. . Consultant; Geurbet. Grant/Research Support; Geurbet. Consultant; ViTAA Medical

LEARNING OBJECTIVES

1) Describe the role of advanced imaging biomarkers in the diagnosis and monitoring of oncologic diseases. 2) Recognize common and emerging imaging manifestations of immunotherapy-related complications. 3) Evaluate the use of imaging in planning, guiding, and assessing response to liver-directed therapies.

COURSE DESCRIPTION

This educational session will provide a comprehensive overview of the latest treatment and related imaging in oncology, with lectures focused on imaging biomarkers, immunotherapy complications, and liver-directed therapies. Attendees will learn how to interpret imaging findings, understand the role of imaging in managing adverse effects from immunotherapy, and evaluate imaging strategies for guiding and assessing liver-directed treatments.

Sub-Events

T3-CGI06B Imaging Biomarkers

Vicky J. Goh, MBBChir, FRCR (*Presenter*) Grant/Research Support; Siemens Healthineers. Grant/Research Support; Lunit

T3-CGI06C Immunotherapy Complications

Ghaneh Fananapazir, MD (*Presenter*) Nothing to Disclose

T3-CGI06D Update on Liver Directed Therapies

Janice M. Newsome, MD (*Presenter*) Grant/Research Support; Boston Scientific. Grant/Research Support; CareStream . Other-Co - Editor ; TVIR. Consultant; Cook Medical

T3-CGI06E Imaging of Liver Directed Therapies

Leo L. Tsai, MD, PhD (*Presenter*) Other-Co-Founder, shareholder, and non-paid consultant; Agile Devices, Inc. . Consultant; Geurbet. Grant/Research Support; Geurbet. Consultant; ViTAA Medical

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T3-CIN02

Improving Radiologists Efficiency: What you Can Do While Waiting for AI (Sponsored by the RSNA Quality Improvement Committee)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: E450B

James V. Rawson, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explore existing potential tools to provide short-term improvement to radiologists' efficiency. 2) Improve radiologists' workflow to provide short-term improvement to radiologists' efficiency. 3) Optimize radiologist work environment to provide short-term improvement to radiologists' workflow and efficiency.

COURSE DESCRIPTION

It is possible to do more with less if we learn to work smarter, not harder. This session focuses on short-term tactics to improve the Radiologist’s workflow while we wait for long-term efficiencies to arrive. By identifying what currently wastes radiologists’ time and considering a few specific interventions radiologist can optimize their workflow and become more efficient. Interventions include the user interface to PACS (mouse), interruption management, reading room design and system level interventions.

Sub-Events

T3-CIN02B **What Wastes Radiologists Time?**

James V. Rawson, MD (*Presenter*) Nothing to Disclose

T3-CIN02C **Can Changing a Mouse Improve Radiologist's Efficiency?**

Shawn Lyo, MD (*Presenter*) Nothing to Disclose

T3-CIN02D **Interruption Management**

Alex Towbin, MD (*Presenter*) Other-Travel to speak at user conference; Merative. Consultant; Applied Radiology. Other-Author roaylties; Elsevier. Grant/Research Support; Bayer

T3-CIN02E **System Solutions to Improving Radiologist's Efficiency**

Marta E. Heilbrun, MD, MS (*Presenter*) Nothing to Disclose

T3-CIN02F **Improved Reading Room Design**

Stefanie A. Woodard, DO (*Presenter*) Grant/Research Support; BRACCO

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T3-CIR06

Advanced Musculoskeletal Interventions

Tuesday, Dec. 2 9:30AM - 10:30AM Room: N227B

Alda L. Tam, MD (*Moderator*) Grant/Research Support; Boston Scientific. Grant/Research Support; Johnson & Johnson. Consultant; Cook Medical

LEARNING OBJECTIVES

1) Identify appropriate indications for cement augmentation and osteosynthesis of pelvic lesions. 2) Describe two techniques used to mitigate complications associated with musculoskeletal interventions. 3) Discuss when to integrate musculoskeletal interventions into a multi-modality treatment plan that involves radiation.

COURSE DESCRIPTION

The Musculoskeletal Interventions course provides five lectures that focus on advanced cement augmentation and fixation therapies. Topics to be discussed include the periprocedural management of patients, technical tips, and how to handle the timing of the intervention along with other multi-modality treatments.

Sub-Events

T3-CIR06B **Point/Counterpoint: Ablation, Cementation +/- Fixation Should Occur Prior to Radiation**

Ernesto G. Santos Martin, MD (*Presenter*) Nothing to Disclose

T3-CIR06C **Point/Counterpoint: Ablation, Cementation +/- Fixation Should Occur After Radiation**

Divya Yerramilli, MD (*Presenter*) Nothing to Disclose

T3-CIR06E **Complications of MSK Interventions**

Alexios Kelekis, MD, PhD (*Presenter*) Speaker's Bureau; SPINA FX. Grant/Research Support; MEDTRONIC MEDICAL. Speaker's Bureau; VARIAN INTERVENTIONAL SYSTEMS

T3-CIR06F **Cement Augmentation and Osteosynthesis of the Pelvic Rim: Pre-procedural Considerations and Technical Tips**

Ernesto G. Santos Martin, MD (*Presenter*) Nothing to Disclose

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T3-CNMMI10

PET/CT: Genitourinary Malignancies

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S405

Aileen O'Shea, MBBCh (*Moderator*) Other-Funding for conference attendance ; Novartis
Ming Yang, MD (*Moderator*) Consultant; United Imaging Healthcare

LEARNING OBJECTIVES

1) Master the interpretation of PSMA-PET/CT imaging in prostate cancer. 2) Understand the advanced clinical theranostic approaches for prostate cancer.

COURSE DESCRIPTION

PSMA-PET has revolutionized the imaging of patients with prostate cancer and has become an essential component integrated into Lu177-Pluvicto Theranostic practice. In this session, experts in prostate cancer imaging and Theranostic practice will use clinical cases to demonstrate the best practices for PSMA-PET imaging interpretation and its role in targeted Lu177-Pluvicto treatment of PSMA-positive metastatic castration-resistant prostate cancer.

Sub-Events

T3-CNMMI10C Prostate Cancer Imaging

Aileen O'Shea, MBBCh (*Presenter*) Other-Funding for conference attendance ; Novartis

T3-CNMMI10D Prostate Cancer Theranostics

Phillip H. Kuo, MD, PhD (*Presenter*) Other-Consultant, speaker, grant/research support; Blue Earth Diagnostics. Consultant; Attralus. Other-Consultant, Scientific Advisory Board; dGenThera. Consultant; Life Molecular Imaging. Consultant; Navidea. Consultant; Bayer. Consultant; United Imaging. Consultant; Chimerix. Consultant; Fusion Pharma. Other-Consultant, speaker, grant/research support; General Electric Healthcare. Other-Consultant, speaker, part-time employee ended October 2022; Invicro. Other-Consultant, speaker; Novartis. Consultant; Radionetics. Other-Consultant, speaker; Lilly. Consultant; Telix

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T3-CNPM02

Finances for Personal and Professional Fulfillment (Sponsored by the RSNA Professionalism Committee)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S402

R. Paul Guillerman, MD (*Moderator*) Nothing to Disclose
Sherwin S. Chan, MD, PhD (*Moderator*) Consultant; Jazz pharmaceuticals . Grant/Research Support; Jazz pharmaceuticals. Grant/Research Support; Hyperfine Inc. Grant/Research Support; GE Healthcare . Consultant; Deepsight . Consultant; GE Healthcare

LEARNING OBJECTIVES

1) Learn how to align income and investment strategies with career and personal goals. 2) Learn about opportunities for income and career fulfillment outside of radiology clinical practice. 3) Understand the importance of retirement planning well in advance of retirement.

COURSE DESCRIPTION

Many radiologists struggle with work-life balance and are unable to translate their high income into a high net worth while also leaving time for family and personal pursuits. Factors including high student debt, poor financial literacy, lifestyle creep, and reliance on salaried income contribute to physician burnout and life dissatisfaction. Despite the importance of personal financial health, education on finances is absent from many radiology and medical school training programs. Radiologists who contribute enormously to clinical care, research, teaching, and administration may still neglect their personal finances and fail to adequately prepare for retirement. This course will feature lectures designed to improve the financial literacy of radiologists to better enable the fulfillment of professional and personal goals.

Sub-Events

T3-CNPM02C How Finances Interact with Goals and Personal and Professional Fulfillment

Greg D. Avey, MD (*Presenter*) Consultant; GE Healthcare

T3-CNPM02D Financial and Retirement Planning: The North American Perspective

Brendon L. Graeber, MD (*Presenter*) Nothing to Disclose

T3-CNPM02E Financial and Retirement Planning: The UK-European Perspective

Diana Rosof-Williams, MBBS, FRCR (*Presenter*) Nothing to Disclose

T3-CNPM02F How to Manage Finances Related to W-2, 1099, and Passive Income Sources

Christopher Walker, MD (*Presenter*) Speaker's Bureau; Boehringer Ingelheim. Other-Royalties for textbooks; Elsevier/Amirsys. Consultant; Qure.ai. Consultant; Astrazeneca. Consultant; Duality Biologics

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T3-CPD12

Fetal Imaging in Focus: A Practical Look at Chest and Abdominal Findings

Tuesday, Dec. 2 9:30AM - 10:30AM Room: E350

Dorothy J. Shum, MD (*Moderator*) Nothing to Disclose
Teresa Victoria, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify and characterize common and rare fetal chest masses and understand their implications for postnatal management and follow-up. 2) Recognize fetal cardiac masses and congenital cardiac anomalies and outline appropriate diagnostic pathways and treatment considerations. 3) Distinguish among subdiaphragmatic fetal anomalies, including abdominopelvic masses and abdominal wall defects, and evaluate their clinical significance and management strategies.

COURSE DESCRIPTION

This comprehensive fetal imaging program is designed to provide an in-depth review of both common and uncommon abnormalities of the fetal body. Emphasis will be placed on thoracic and cardiac anomalies, as well as subdiaphragmatic masses—including renal abnormalities, cystic and solid lesions, and defects of the fetal abdominal wall. Through a systematic and case-based approach, participants will develop the skills to analyze fetal body anatomy, distinguish normal from abnormal findings, and apply structured frameworks to evaluate complex anomalies. The program aims to enhance diagnostic confidence and consistency in interpreting fetal body pathology across a range of clinical scenarios.

Sub-Events

T3-CPD12C **Fetal Chest: Diagnoses and Interventions**

Ryne Didier, MD (*Presenter*) Nothing to Disclose

T3-CPD12D **Fetal Cardiac Masses and Congenital Cardiac Malformations with Postnatal Correlation**

Evan J. Zucker, MD (*Presenter*) Grant/Research Support; GE HealthCare

T3-CPD12E **Fetal Abdominal Wall Malformations**

Roya Sohaey, MD (*Presenter*) Nothing to Disclose

T3-CPD12F **Postnatal Imaging and Management of Congenital Abdominal Lesions**

Fernanda D. Braojos Braga, MD, PhD (*Presenter*) Nothing to Disclose

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T3-CVA05

Abdominopelvic Vascular Disease

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S503

Jeremy D. Collins, MD (*Moderator*) Consultant; Circle CVi. Other-Advisory Board; Varian Medical. Grant/Research Support; GE
Roberta Catania, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key imaging findings and diagnostic criteria for mesenteric ischemia, renal artery diseases, acute abdominal aortic pathology, and causes of gastrointestinal bleeding. 2) Understand the role of radiologists in the diagnosis of these conditions and how it can guide management. 3) Review imaging techniques for evaluating abdominopelvic vasculature and protocol optimization.

COURSE DESCRIPTION

This course provides a selection of high-yield topics focused on abdominopelvic vascular diseases. Given the overlap between vascular and abdominal subspecialties, these conditions can represent a challenge for many radiologists across subspecialties. Abdominal radiologists may have less experience with angiographic imaging, specific MR sequences and 3D post-processing, while vascular radiologists may be less familiar with interpreting visceral organ changes associated with these diseases. This session aims to bridge that gap focusing on both vascular and visceral findings that occur in a number of diseases, including mesenteric ischemia, renal artery disorders, acute abdominal aortic diseases and their mimics, and gastrointestinal bleeding. Imaging techniques, key findings and diagnostic criteria will be reviewed, along with the role of radiology in guiding the management of these conditions.

Sub-Events

T3-CVA05C **Mesenteric Ischemia**

Iain D. Kirkpatrick, MD, FRCPC (*Presenter*) Nothing to Disclose

T3-CVA05D **Renal Artery Imaging**

Roberta Catania, MD (*Presenter*) Nothing to Disclose

T3-CVA05E **Acute Abdominal Aortic Disease and Mimics**

Joseph R. Leach, MD, PhD (*Presenter*) Nothing to Disclose

T3-CVA05F **Imaging Approach to Patient With GI Bleeding**

Olga R. Brook, MD, MBA (*Presenter*) Nothing to Disclose

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T3-RCP02

United Arab Emirates (UAE) Presents: Radiology at the Forefront: Reflecting the Nation's Progress

Tuesday, Dec. 2 9:30AM - 10:30AM Room: E353B

Rashid Y. Al Sharhan, MBBS, FRCPC (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe key cultural, social, and professional aspects of living and working in the UAE, highlighting their impact on healthcare delivery. 2) Identify unique challenges and opportunities for life in the UAE. 3) Discuss how cultural competence influences the UAE's diverse population. 4) Explain the structure and regulatory framework of radiology practice in the UAE, including licensing and accreditation requirements. 5) Compare the operational models of radiology services in public versus private healthcare sectors in the UAE. 6) Evaluate the role of multidisciplinary collaboration in optimizing radiology workflows and patient outcomes in UAE healthcare settings. 7) Assess the effectiveness of AI tools currently implemented in breast screening programs in Dubai, focusing on sensitivity and specificity metrics. 8) Apply best practices for integrating AI into mammography workflows, based on Dubai's real-world implementation strategies. 9) Analyze challenges, such as data privacy and algorithm bias, in deploying AI for breast screening in Dubai, proposing at least one solution. 10) Identify key criteria for selecting AI solutions for tuberculosis (TB) screening, including diagnostic accuracy and scalability in Dubai's healthcare system. 11) Method was used to compare commercially available AI tools for TB screening, evaluating their suitability for Dubai's population and infrastructure. 12) Develop a framework for assessing the cost-effectiveness and clinical impact of AI solutions in TB screening programs. 13) Interpret complex neuroradiology cases from the UAE, identifying key imaging findings and differential diagnoses. 14) Apply advanced imaging techniques, such as perfusion MRI or dual-energy CT, to enhance diagnostic accuracy in neuroradiology cases. 15) Discuss the clinical implications of neuroradiology findings in the context of UAE's patient demographics and healthcare resources.

COURSE DESCRIPTION

This session highlights the UAE's rapid progress in radiology, showcasing advances in subspecialty services, AI integration, education, and international collaboration. Attendees will gain insight into how the UAE is shaping the future of imaging through innovation, strategy, and global partnerships.

Sub-Events

T3-RCP02B **Life in the UAE**

Abdulla I. Alremaithi, MD (*Presenter*) Nothing to Disclose

T3-RCP02C **Radiology Practice in UAE**

Taleb M. Al Mansoori, MD, FRCPC (*Presenter*) Nothing to Disclose

T3-RCP02D **Implementation of AI in Breast Screening in Dubai, UAE**

Usama M. Al Bastaki, MD (*Presenter*) Nothing to Disclose

T3-RCP02E **Choosing the Right AI Solution for TB Screening in Dubai**

Rashid Y. Al Sharhan, MBBS, FRCPC (*Presenter*) Nothing to Disclose

T3-RCP02F **My Best Neuroradiology Cases from UAE**

Manzoor Ahmed, MD (*Presenter*) Nothing to Disclose

T3-RCP02G **Closing Remarks**

Umar Mahmood, MD, PhD (*Presenter*) Stock/Shareholder; Cytosite Bio. Consultant; Cytosite Bio. Grant/Research Support; Cytosite Bio. Consultant; Ziteo Medical. Grant/Research Support; Siemens Healthineers

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T3-RCP17

The Critical Role of the NIH in Advancing Medical Imaging Research: Innovations, Impact, and Possible Consequences of Legislative Reform (Sponsored by the RSNA Government Relations Committee)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S404

Elizabeth O'Hare, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review existing NIH support mechanisms (i.e. grant programs, funding mechanisms, and collaborative initiatives) that have contributed to advancements in medical imaging. 2) Highlight key innovations and achievements in medical imaging and discuss emerging priorities for research and technological advancement. 3) Review recent NIH policy changes and other proposed reforms and understand the potential impact of these developments on medical imaging research.

COURSE DESCRIPTION

Medical imaging is a cornerstone of modern healthcare and advances in imaging technology and applications have unlocked transformations in disease diagnostics and treatment planning. These advances have been made possible by sustained U.S. federal investment in the National Institutes of Health (NIH), whose funding has been critical to driving innovation, supporting infrastructure, and seeding interdisciplinary collaborations. In 2025 the U.S. Congress and Trump Administration are considering a variety of proposals to reform the NIH, many of which, if enacted into law, would have significant impact on the agency's structure and function with important consequences for medical imaging and radiology research. This session will explore the NIH's multifaceted role in supporting medical imaging research, highlighting key technological advances and extant challenges, and will review the status and scope of recent NIH policy changes and reform proposals.

Sub-Events

T3-RCP17B **Key Breakthroughs in Medical Imaging and Radiology and their Implications for Enhancing Health and Well-being**

Pamela K. Woodard, MD (*Presenter*) Grant/Research Support; Siemens Medical Systems

T3-RCP17C **Understanding Potential Changes to the NIH's Structure and Function and Impacts on the Biomedical Research Ecosystem**

Carrie D. Wolinetz, PhD (*Presenter*) Nothing to Disclose

T3-RCP17D **The Role of the NIH in Supporting Medical Imaging R&D**

Pari V. Pandharipande, MD, MPH (*Presenter*) Nothing to Disclose

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T3-RCP40

Douglas W. MacEwan Rising Star Track: Cool Tools: GenAI/LLMs for Radiology

Tuesday, Dec. 2 9:30AM - 10:30AM Room: E353C

Benjamin Kwan, MD, FRCPC (*Moderator*) Nothing to Disclose
Satheesh Krishna, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the currently available GenAI/LLMs tools and their capabilities. 2) Learn practical ways these tools are being used for day-to-day radiology and in education. 3) Develop lifelong learning techniques for AI/LLMs.

COURSE DESCRIPTION

Discover practical generative AI tools beyond ChatGPT for radiology. This session explores creative uses, advanced research capabilities, coding assistants, and ways to keep up with rapidly changing AI developments. Resources referenced during the talk are available at: https://woojinkim.com/rsna-2025/

Sub-Events

T3-RCP40C AI Made Fun: How Radiologists Can Practically Leverage Generative AI

Woojin Kim, MD (*Presenter*) Other-CMIO, shareholder, advisor; Rad AI. Consultant; Inference Analytics. Consultant; ClariPi. Consultant; Alara Imaging. Other-CMO; American College of Radiology. Other-Chief Strategy Officer, CMIO, shareholder; HOPPR. Owner; Equium Intelligence. Consultant; Infiniti Medical. Consultant; Hyperfine Research. Consultant; Braid Health. Consultant; Luxsonic Technologies. Consultant; ImageBiopsy Lab. Consultant; Nuance/Microsoft. Consultant; Within Health

T3-RCP40D Cool Tools: GenAI/LLMs for Radiology

Rajesh Bhayana, MD, FRCPC (*Presenter*) Owner; Navigating Radiology

T3-RCP40E Cool Tools: GenAI/LLMs for Radiology

Satheesh Krishna, MD (*Presenter*) Nothing to Disclose

T3-RCP40F Cool Tools: Integrating AI for Radiology Medical Education

Benjamin Kwan, MD, FRCPC (*Presenter*) Nothing to Disclose

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T4-CIN12

Cybersecurity in Healthcare: Threat Landscape Beyond the Hospital

Tuesday, Dec. 2 11:00AM - 12:00PM Room: E450B

Benoit Desjardins, MD, PhD (*Moderator*) Nothing to Disclose
Dania Daye, MD,PhD (*Moderator*) Consultant; Medtronic. Consultant; Boston Scientific. Consultant; Sigilon. Grant/Research Support; Trisalus. Consultant; Cook Medical

LEARNING OBJECTIVES

1) Understand the threats emerging from third-party vendors and IoT devices. 2) Understand the risk assessment frameworks for evaluating third-party vendors. 3) Understand the security challenges specific to IoT devices in healthcare.

COURSE DESCRIPTION

2024 was THE year of third-party attacks with catastrophic impact on the US healthcare system. For example, the ransomware attack on Change Healthcare, one of the largest US healthcare technology providers, was a landmark event. The attack not only disrupted the operations of Change Healthcare itself but had widespread implications for the US healthcare system and the global economy, underscoring the vulnerabilities in the interconnections between healthcare organizations, third-party vendors, and Internet of Things (IoT) devices. Change Healthcare provides critical healthcare technology services, including electronic health records (EHR) systems, medical billing services, claims processing, and various other IT solutions for hospitals, physicians, and other healthcare providers. It serves more than 2,000 hospitals and 500,000 healthcare providers across the US. Change Healthcare has a direct line to large swaths of sensitive patient data, making it an attractive target for cybercriminals. On March 3, 2024, Change Healthcare became the victim of a sophisticated ransomware attack, which caused widespread disruption across its core platforms and services. The breach also caused immediate operational disruptions in hospitals, clinics, and healthcare facilities across the U.S. Many healthcare organizations were unable to process claims, update patient records, or communicate effectively due to the downed systems. The overall economic cost of the ransomware attack is estimated to be $4.6 billion. Many smaller hospitals and independent practices that relied on Change Healthcare's services found themselves without access to essential services for weeks. The incident prompted renewed focus on the interconnectedness of healthcare IT systems and third-party vendors. 1- The threat landscape beyond the hospital: After providing a quick overview of the latest attack vectors affecting systems outside the confines of the walls of hospitals, Dr Benoit Desjardins, a leader in cybersecurity, will discuss the devastating impacts that recent cyberattacks had on the entire US healthcare system in 2024. 2- Third party cybersecurity: Hospitals become collateral damage from an attack on a third party. This will be discussed by Richard Staynings, an industry leader in the protection of healthcare enterprises against cybercriminals. He will provide an overview of the interconnectedness of US hospitals with third-party companies, and as a result, the consequences on the entire US healthcare system of third-party attacks. By gaining access to a third-party's technology, they gain a digital pathway to infect multiple covered entities or to extract data. 3- Cybersecurity of the Internet of Things: Hospital networks grow their network interconnections to home for radiologists and to control IoT devices. This will be discussed by Axel Wirth, an industry leader in the protection of medical devices against cybercriminals. The second edition of his book just came out on October 31st, 2024 (Medical Device Cybersecurity: A Guide for Engineers and Manufacturers). He will provide many current examples of how IoT devices are affecting medical centers. This refresher course will bring the radiology community up to date on the latest issues related to the growing interconnectedness of healthcare institutions, including recent attacks, and techniques of defense. The course will be presented by radiologists and top cybersecurity experts. The information technology issues will be addressed at a technical level appropriate for the radiology community at large, to make the community aware of this growing era of digital warfare and its implications for radiology practices. Our refresher course will have practical, actionable suggestions that radiologists and IT administrators could act on now.

Sub-Events

T4-CIN12C Threat Landscape Beyond the Hospital

Benoit Desjardins, MD, PhD (*Presenter*) Nothing to Disclose

T4-CIN12D Third Party Cybersecurity

Richard Staynings, MS, MA (*Presenter*) Nothing to Disclose

T4-CIN12E Cybersecurity of the Internet of Things

Axel Wirth, MS (*Presenter*) Nothing to Disclose

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T4-CRT01

ASRT@RSNA: Medical Imaging Labor Shortage: Health Care Systems and Academic Entities Partnering for Solutions

Tuesday, Dec. 2 11:00AM - 12:00PM Room: N226

Melissa Culp, MEd (*Moderator*) Nothing to Disclose
Peter Rath (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify challenges facing health care systems regarding labor shortages in imaging services. 2) Examine strategies to enhance partnerships between health care systems and academic institutions to improve student throughput while maintaining high educational and clinical standards. 3) Discuss approaches to developing student skill sets that align with clinical workforce demands, ensuring graduates are prepared to transition into both clinical and mentoring roles. 4) Analyze the successes and challenges of collaborative initiatives and explore the past, present and ongoing efforts to sustain and strengthen workforce development in medical imaging.

COURSE DESCRIPTION

Labor shortages in medical imaging have become a safety, quality and financial burden on most health care systems across the United States. This interactive course — offered from both a health care system and an academic institution's perspective — explores the root causes of the shortage and proposes collaborative solutions. The speakers will emphasize strategies that increase the number of students graduating from local academic radiologic sciences programs while enhancing their skills. The long-term goal is cultivating future-ready, qualified clinical instructors.

Sub-Events

T4-CRT01C **Medical Imaging Labor Shortage - Health Care Systems and Academic Entities Partnering for Solutions**

Tim Scalise, MBA, RT (*Presenter*) Nothing to Disclose

T4-CRT01D **Medical Imaging Labor Shortage - Health Care Systems and Academic Entities Partnering for Solutions**

Tanya Nolan (*Presenter*) Nothing to Disclose

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T6-CBR07

Contrast-Enhanced Mammography: Screening vs. Diagnostic Indications and Expanding Access for Underserved Populations

Tuesday, Dec. 2 1:30PM - 2:30PM Room: S406A

Janice S. Sung, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the advantages and disadvantages of using CEM for breast cancer screening. 2) Discuss the potential use of CEM in the diagnostic setting including recalls from screening, preoperative staging, and response to neoadjuvant therapy. 3) Explore the potential of CEM to expand access to advanced imaging among underserved populations and barriers to implementation.

COURSE DESCRIPTION

Contrast-enhanced mammography (CEM) is an FDA-approved, vascular-based imaging technique that is increasingly recognized as a valuable alternative to both conventional breast imaging and breast MRI. This session will review current evidence supporting the use of CEM in both screening and diagnostic settings and explore its potential to expand access to advanced imaging—particularly among underserved populations who may face barriers to MRI.

Sub-Events

T6-CBR07B Screening CEM

Janice S. Sung, MD (*Presenter*) Nothing to Disclose

T6-CBR07C Diagnostic CEM

Thomas H. Helbich, MD, MBA (*Presenter*) Grant/Research Support; siemens. Grant/Research Support; guerbet. Grant/Research Support; hologic. Grant/Research Support; BD. Grant/Research Support; GE. Grant/Research Support; bracco. Grant/Research Support; novomed

T6-CBR07D Expanding Access

Jordana Phillips, MD (*Presenter*) Grant/Research Support; GE HEalthcare. Consultant; GE HEalthcare. Consultant; hologic. Consultant; endomag

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T6-CBR17

RSNA Hands-On Lab: MRI-Guided Breast Biopsy (Registration Fee Required)

Tuesday, Dec. 2 2:00PM - 4:00PM Room: S504CD

Roberta M. Strigel, MD, MS (*Moderator*) Grant/Research Support; General Electric

LEARNING OBJECTIVES

1) Define indications for MRI-guided breast biopsy and appropriate patient selection including relative and absolute contraindications to MRI-guided breast biopsy. 2) Describe and understand the steps of an MRI-guided breast biopsy procedure, including protocol and requirements for appropriate coil, needle, and approach selection. 3) Identify the benefits and limitations of MRI-guided breast biopsy and understand tips for handling challenging biopsy locations and patient anatomy.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. This course is intended to provide both didactic and hands-on experience performing MRI-guided breast biopsy. Those with and without experience with this procedure are welcome and will find this course beneficial. The course begins with a 45-minute lecture covering patient selection criteria, contraindications, appropriate biopsy positioning and troubleshooting, steps of the procedure, lesion targeting using both manual and computer aided techniques, post-biopsy care, radiologic/pathologic concordance, and potential challenges and strategies. The final 75-minutes is a hands-on workshop with 11 stations, each with a breast coil, targeting options (computer and manual), biopsy device and two expert faculty members to teach the performance of an MRI-guided biopsy with live coaching, tips, techniques, and advice, with opportunities for questions.

Sub-Events

T6-CBR17B **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Roberta M. Strigel, MD, MS (*Presenter*) Grant/Research Support; General Electric

T6-CBR17C **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Tabassum Ahmad, MD (*Presenter*) Nothing to Disclose

T6-CBR17D **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Rend Al-Khalili, MD (*Presenter*) Nothing to Disclose

T6-CBR17E **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Dana Ataya, MD (*Presenter*) Nothing to Disclose

T6-CBR17F **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Thomas Loduca, MD (*Presenter*) Consultant; MRI Online

T6-CBR17G **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Jessica H. Porembka, MD (*Presenter*) Nothing to Disclose

T6-CBR17H **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Beatriu Reig, MD, MPH (*Presenter*) Nothing to Disclose

T6-CBR17I **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Raman Verma, MD (*Presenter*) Consultant; BD

T6-CBR17J **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Uzma Waheed, MD (*Presenter*) Nothing to Disclose

T6-CBR17K **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Kathryn P. Lowry, MD (*Presenter*) Nothing to Disclose

T6-CBR17L **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Gaiane M. Rauch, MD, PhD (*Presenter*) Nothing to Disclose

T6-CBR17M **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Alyssa Cubbison, DO (*Presenter*) Nothing to Disclose

T6-CBR17N **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Jennifer R. Kohr, MD (*Presenter*) Nothing to Disclose

T6-CBR17O **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Katie S. Mason, MD (*Presenter*) Nothing to Disclose

T6-CBR17P **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Mitra Noroozian, MD (*Presenter*) Nothing to Disclose

T6-CBR17Q **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Wendi A. Owen, MD (*Presenter*) Nothing to Disclose

T6-CBR17R **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Jeffrey S. Reiner, MD (*Presenter*) Nothing to Disclose

T6-CBR17S **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Rifat A. Wahab, DO (*Presenter*) Nothing to Disclose

T6-CBR17T **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Christine E. Edmonds, MD (*Presenter*) Speaker's Bureau; Siemens Healthineers

T6-CBR17U **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Supriya R. Kulkarni, DMRD, FRCPC (*Presenter*) Nothing to Disclose

T6-CBR17V **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Georgia G. Spear, MD (*Presenter*) Nothing to Disclose

T6-CBR17W **RSNA Hands-on Lab: MRI-Guided Breast Biopsy**

Amy L. Kerger, DO (*Presenter*) Nothing to Disclose

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T6-CCA04

Cardiac Imaging in Private Practice: The Secrets for Success

Tuesday, Dec. 2 1:30PM - 2:30PM Room: E353C

Michael F. Morris, MD (*Moderator*) Speaker's Bureau; Medtronic. Speaker's Bureau; Heartflow

LEARNING OBJECTIVES

1) Identify strategies for creating a financially viable cardiac MRI and CT practice. 2) Learn how offloading post-processing to a 3D lab improves accuracy and productivity. 3) Discover important pearls for growing your cardiac imaging practice.

COURSE DESCRIPTION

Demand for cardiac CT and MRI are growing rapidly. This course provides key information how to create a financially viable cardiac imaging practice, how to maximize productivity by utilizing a 3D lab, and tips for how to grow your advanced imaging practice!

Sub-Events

T6-CCA04B Creating a Financially Viable Cardiac Imaging Practice

Melany B. Atkins, MD (*Presenter*) Consultant; GE Heathcare. Speaker's Bureau; HeartFlow. Consultant; Arterys. Consultant; Bayer Healthcare CTEPH

T6-CCA04C Using a 3D Lab to Maximize your Productivity

Richard L. Hallett II, MD (*Presenter*) Nothing to Disclose

T6-CCA04D How to Grow your Practice!

Praveen Ranganath, MD (*Presenter*) Nothing to Disclose

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T6-CER15

Imaging in Forensics: The Role of Radiology in Solving Mysteries

Tuesday, Dec. 2 1:30PM - 2:30PM Room: N228

Gary H. Danton, MD, PhD (*Moderator*) Nothing to Disclose
Summer J. Decker, PhD (*Moderator*) Nothing to Disclose

Sub-Events

T6-CER15C **What is Forensic Radiology?**

Summer J. Decker, PhD (*Presenter*) Nothing to Disclose

T6-CER15D **Primer on Postmortem CT & Teaching Forensic Radiology**

Julie R. Kaczmark, MD (*Presenter*) Nothing to Disclose

T6-CER15E **Creating Synergy between Trauma Surgery and Forensic Radiology**

Gary H. Danton, MD, PhD (*Presenter*) Nothing to Disclose

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T6-CGI04

Case-Based: GI Post-Operative (Including Transplant)

Tuesday, Dec. 2 1:30PM - 2:30PM Room: N227B

Lauren M. Burke, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify and interpret common and critical post-operative imaging findings in gastrointestinal (GI) surgery patients, including expected post-surgical anatomy and common complications such as leaks, obstructions, and abscesses. 2) Utilize a systematic, case-based diagnostic approach to complex post-operative GI imaging, correlating imaging findings with surgical techniques, timelines, and clinical presentation to optimize diagnostic confidence and reporting clarity.

COURSE DESCRIPTION

This case-based session is designed for radiologists seeking to enhance their diagnostic accuracy in evaluating post-operative gastrointestinal (GI) and transplant imaging. Through a series of curated, real-world cases, participants will review expected post-surgical anatomy and recognize common and high-risk complications following GI surgeries and abdominal organ transplants, including liver, pancreas, and small bowel. Emphasis will be placed on identifying subtle imaging findings, understanding the clinical and surgical context, and applying a systematic interpretive approach.

Sub-Events

T6-CGI04B Post Operative Liver Transplant

Reena C. Jha, MD (*Presenter*) Nothing to Disclose

T6-CGI04C Post-operative Hepatobiliary (Nontransplant)

Marc Zins, MD (*Presenter*) Stock/Shareholder; Telediag. Stock/Shareholder; Mata

T6-CGI04D Post Operative Small/Large Bowel

Lauren M. Burke, MD (*Presenter*) Nothing to Disclose

T6-CGI04E Post Operative Pancreas

Peter D. Poullos, MD (*Presenter*) Nothing to Disclose

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T6-CIN10

Nuts and Bolts: Building a Multi-Site Data Repository for Imaging Studies and AI Validation Tools (Sponsored by RSNA Research Development Committee) (Advanced)

Tuesday, Dec. 2 1:30PM - 2:30PM Room: E450B

Fiona M. Fennessy, MBBCh, PhD (*Moderator*) Nothing to Disclose
Janie M. Lee, MD, MSc (*Moderator*) Grant/Research Support; GE Healthcare

LEARNING OBJECTIVES

1) Highlight the steps and requirements for building a multi-site data repository and the challenges that may be faced and overcome. 2) Review the benefits and risks for participating sites. 3) Provide examples of types of studies that can reap the benefits of an imaging data repository.

COURSE DESCRIPTION

This session focuses on building and executing multisite retrospective imaging data repositories for imaging-based outcome studies or for validation of AI-algorithms.

Sub-Events

T6-CIN10C Research Benefits of Multisite Data Repositories

Maryellen L. Giger, PHD (*Presenter*) Stock/Shareholder; Hologic. Stock/Shareholder; Qview. Consultant; Genetech/Roche. Other Financial or Material Support; Various companies who license from the Polsky Center at the University of Chicago

T6-CIN10D Who Owns the Data? Data Transfer Agreements, IRBs & Legal Implications of Sharing Data

Curtis P. Langlotz, MD, PhD (*Presenter*) Stock/Shareholder; Bunkerhill Health. Grant/Research Support; Clairity. Grant/Research Support; GE Healthcare. Grant/Research Support; Google Cloud. Grant/Research Support; IBM. Grant/Research Support; Kheiron. Grant/Research Support; Lambda. Grant/Research Support; Lunit. Grant/Research Support; Microsoft. Grant/Research Support; Stability.ai. Grant/Research Support; Subtle Medical. Stock/Shareholder; Whiterabbit.ai. Grant/Research Support; Vinbrain. Grant/Research Support; Whiterabbit.ai. Consultant; Sixth Street. Consultant; Gilmartin Capital. Grant/Research Support; Visiana. Stock/Shareholder; RadPartners. Other Financial or Material Support; annalise.ai. Stock/Shareholder; Turboradiology. Stock/Shareholder; Abxtract. Stock/Shareholder; GalileoCDS. Stock/Shareholder; Sirona Medical. Stock/Shareholder; Adra.ai. Stock/Shareholder; Kheiron. Grant/Research Support; Bunkerhill Health. Grant/Research Support; Carestream. Grant/Research Support; CARPL.ai

T6-CIN10E Transferring Imaging Data & Metadata, and Linkage with Tumor Repositories

Fred W. Prior, PhD (*Presenter*) Nothing to Disclose

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T6-CMK10

Musculoskeletal Ultrasound: Normal Appearances, Pathologic Conditions and Hands-On Demo (peripheral nerves of the upper extremity, hip, ankle)

Tuesday, Dec. 2 1:30PM - 3:00PM Room: E450A

Mark Cresswell, MBBCh, BSc (*Moderator*) Consultant; Philips Healthcare ultrasound

LEARNING OBJECTIVES

1) Demonstrate normal peripheral nerve sonographic anatomy. 2) Explain common sites of neural compression and impingement.

COURSE DESCRIPTION

lectures and live demonstrations of sonographic technique to demonstrate normal peripheral nerve appearances and how to identify the anatomical markers at the sites of common neural impingement.

Sub-Events

T6-CMK10B **Didactic Cases (Peripheral Nerves, Hip or Ankle)**

Linda Probyn, MD (*Presenter*) Nothing to Disclose

T6-CMK10C **Didactic Cases (Peripheral Nerves, Hip or Ankle)**

Emma L. Rowbotham, FRCR (*Presenter*) Nothing to Disclose

T6-CMK10D **Didactic Cases (Peripheral Nerves, Hip or Ankle)**

Girish Gandikota, MD (*Presenter*) Nothing to Disclose

T6-CMK10E **Live Demonstration (Peripheral Nerves, Hip or Ankle)**

Ramy M. Mansour, MBBCh (*Presenter*) Nothing to Disclose

T6-CMK10F **Live Demonstration (Peripheral Nerves, Hip or Ankle)**

Jon A. Jacobson, MD (*Presenter*) Other-Book royalties; Elsevier. Consultant; BioClinica. Consultant; Samsung

T6-CMK10G **Live Demonstration (Peripheral Nerves, Hip or Ankle)**

Athena Plagou, MD, PhD (*Presenter*) Nothing to Disclose

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T6-CNMMI12

PET/CT: Lung Cancer and Lymphoma

Tuesday, Dec. 2 1:30PM - 2:30PM Room: S405

Esma A. Akin, MD (*Moderator*) Nothing to Disclose
Munir Ghesani, MD (*Moderator*) Speaker's Bureau; Siemens Healthineers. Speaker's Bureau; Lantheus. Speaker's Bureau; Telix. Consultant; Serac Lifesciences

LEARNING OBJECTIVES

1) Evaluate the contemporary role of FDG PET/CT in the initial staging and treatment planning of both non-small cell lung cancer. 2) Analyze the utility of FDG PET/CT for response assessment and surveillance in Hodgkin lymphoma and aggressive non-Hodgkin lymphoma, including understanding the Deauville score and its implications for clinical management. 3) Identify potential pitfalls and challenges in FDG PET/CT interpretation for lung cancer and lymphoma, such as inflammatory uptake, physiological variants, and artifacts, and discuss strategies to optimize image acquisition and interpretation for improved diagnostic accuracy.

COURSE DESCRIPTION

This comprehensive course will provide a thorough review of the current and evolving role of ^{18}F-FDG PET/CT in the diagnostic workup, staging, treatment response assessment, and surveillance of patients with lung cancer and lymphoma. Designed for practicing radiologists, nuclear medicine physicians, and trainees, the program will delve into both the established guidelines and the latest advancements in PET/CT imaging. Through a combination of didactic lectures, interactive case discussions, and practical insights, participants will gain a deeper understanding of the physiological principles of FDG uptake in these cancers, optimal imaging protocols, and the nuances of interpreting complex PET/CT studies. The course will address critical aspects such as differentiating benign from malignant lesions, assessing the extent of disease, monitoring therapeutic efficacy, and identifying recurrence. Special attention will be given to common pitfalls, technical considerations, and the impact of PET/CT findings on clinical decision-making, ultimately aiming to enhance diagnostic accuracy and improve patient outcomes.

Sub-Events

T6-CNMMI12C Lung Cancer

Munir Ghesani, MD (*Presenter*) Speaker's Bureau; Siemens Healthineers. Speaker's Bureau; Lantheus. Speaker's Bureau; Telix. Consultant; Serac Lifesciences

T6-CNMMI12D Lymphoma

Kathryn A. Morton, MD (*Presenter*) Nothing to Disclose

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T6-CNPM15

Advanced Quality Improvement Through AI: Automated Monitoring and Real-World Impact (Sponsored by the RSNA Quality Improvement Committee)

Tuesday, Dec. 2 1:30PM - 2:30PM Room: S402

Hari Trivedi, MD (*Moderator*) Owner; Lightbox AI. Consultant; Sirona Medical. Consultant; PMX. Consultant; Flatiron Health. Grant/Research Support; Clairity, Lunit, Nightingale Science. Consultant; Hoppr

LEARNING OBJECTIVES

1) Describe how AI can be used to extract and monitor quality improvement metrics from routine radiology workflows. 2) Identify implementation barriers and human factors that influence the real-world impact of AI tools, including automation bias. 3) Evaluate approaches for post-deployment monitoring and validation of AI tools to ensure ongoing clinical effectiveness and safety.

COURSE DESCRIPTION

Artificial intelligence (AI) tools are increasingly being deployed in clinical practice, but their impact on quality improvement (QI) efforts depends on robust implementation, monitoring, and adaptation in real-world environments. This session brings together experts in radiology, informatics, and AI to explore the role of automated systems in quality assurance, the challenges of clinical deployment, and the potential unintended consequences such as automation bias. Using a lecture and discussion-based format, attendees will gain practical insights into how AI can be leveraged to extract QI insights from large clinical datasets, measure and improve model performance post-deployment, and assess the impact of AI on radiologist behavior and patient outcomes. The session will also highlight tools and strategies for ongoing evaluation of AI models, aiming to help institutions maximize safety, reliability, and effectiveness in clinical settings.

Sub-Events

T6-CNPM15B **Data Gold Mine of QI**

Patricia Balthazar, MD, MPH (*Presenter*) Grant/Research Support; AUR Care and Equity in Radiology Research Academic Fellowship (CERRAF) Award

T6-CNPM15C **Addressing the Challenges of Implementing Artificial Intelligence Tools in Clinical Practice**

Bernardo C. Bizzo, MD, PhD (*Presenter*) Nothing to Disclose

T6-CNPM15D **The Role of Automation Bias in the Deployment of AI-Models in Radiology**

Thomas M. Dratsch, MD, PhD (*Presenter*) Nothing to Disclose

T6-CNPM15E **Prediction of Effects of AI Assistance on Radiologists**

Pranav Rajpurkar, PhD (*Presenter*) Owner; a2z Radiology AI

T6-CNPM15F **Post Deployment Monitoring and Real World Evaluation of Clinically Deployed AI Tools**

Theodorus Dapamede, MD, PhD (*Presenter*) Nothing to Disclose

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T6-CNR04

Red Flags: Acute Vascular Imaging Abnormalities Encountered in the Emergency Setting

Tuesday, Dec. 2 1:30PM - 2:30PM Room: S406B

Hediyeh Baradaran, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify non-stroke arterial pathologies that may present with acute neurologic symptoms. 2) Recognize emergent imaging findings in the intracranial venous system. 3) Describe acute vascular abnormalities of the spine and their imaging characteristics. 4) Evaluate the imaging appearance and complications of intracranial vascular malformations in the acute setting.

COURSE DESCRIPTION

This case-based, multi-speaker session highlights acute and emergent vascular conditions beyond typical ischemic stroke. Through focused lectures and real-world examples, expert faculty will review emergent non-ischemic arterial pathologies, intracranial venous emergencies, spinal vascular abnormalities, and vascular malformations. Attendees will improve their ability to recognize critical imaging findings, avoid diagnostic pitfalls, and guide timely clinical management.

Sub-Events

T6-CNR04B **It's Not a Stroke: What Else can Go Wrong with the Arterial Vasculature?**

Hediyeh Baradaran, MD, MS (*Presenter*) Nothing to Disclose

T6-CNR04C **Don't Forget the Veins: Emergent Findings in the Intracranial Venous System**

Andrew D. Schweitzer, MD (*Presenter*) Nothing to Disclose

T6-CNR04D **Acute Vascular Abnormalities in the Spine**

Anousheh Sayah, MD (*Presenter*) Nothing to Disclose

T6-CNR04E **Intracranial Vascular Malformations: Acute Imaging Findings and Complications**

Patrick Nicholson, MBBCh, FFR(RCSI) (*Presenter*) Consultant; Medtronic. Consultant; Stryker

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T6-COB02

Uterine Bleeding: Do You See What I See?

Tuesday, Dec. 2 1:30PM - 2:30PM Room: E351

Nancy Kim, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the role of imaging in evaluating abnormal uterine bleeding. 2) Review how to perform proper US and MRI imaging of the uterus. 3) Identify imaging findings of benign and malignant etiologies that may account for the patient's abnormal uterine bleeding.

COURSE DESCRIPTION

Abnormal uterine bleeding is a common gynecologic symptom that often leads to ultrasound imaging and sometimes MRI. The radiologists' role is to identify if there is a structural or anatomical cause of abnormal uterine bleeding. This course aims to review how imaging should be used to evaluate patients with abnormal uterine bleeding and to review imaging findings of benign and malignant pathologies.

Sub-Events

T6-COB02B **AUB and Uterine Malignancy: The Radiologist's Role**

Elizabeth A. Sadowski, MD (*Presenter*) Nothing to Disclose

T6-COB02C **Ultrasound of AUB and Uterine Pathologies**

Akshya Gupta, MD (*Presenter*) Nothing to Disclose

T6-COB02D **MRI of AUB and Uterine Pathologies**

Nishat Bharwani, MBBS, FRCR (*Presenter*) Nothing to Disclose

T6-COB02E **Test Your Knowledge: Benign or Malignant? (Audience Response)**

Nancy Kim, MD (*Presenter*) Nothing to Disclose

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T6-CPD05

Decoding Pediatric MSK: A Modality Playbook

Tuesday, Dec. 2 1:30PM - 2:30PM Room: E350

Amit Sura, MD (*Moderator*) Nothing to Disclose
Emilio Inarejos Clemente, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the classification system of pediatric soft tissue tumors (by tissue type). 2) Compare the advantages and limitations of CT and MRI in evaluating pediatric hip and pectus deformities. 3) Provide the necessary tools for proper neonatal hip and shoulder ultrasound performance and understanding, recognizing normal and pathological specific anatomy.

COURSE DESCRIPTION

This session offers four expert-led lectures focused on practical challenges in pediatric musculoskeletal imaging. Topics include imaging strategies for congenital foot deformities, neonatal shoulder and hip ultrasound, modality selection in soft tissue mass evaluation, and CT vs MRI for assessing pediatric hips and pectus deformities. Designed for general radiologists, pediatric radiologists, and residents, the session highlights when and how to use ultrasound, MRI, and CT effectively. Through concise lectures and interactive discussion, attendees will gain actionable insights to improve diagnostic accuracy and optimize clinical decision-making.

Sub-Events

T6-CPD05C **Congenital Foot Deformities: On Solid Ground**

Mahesh M. Thapa, MD, MEd (*Presenter*) Nothing to Disclose

T6-CPD05D **CT vs MRI for Pediatric Hip and Pectus Assessments**

Maria Navallas, MD (*Presenter*) Nothing to Disclose

T6-CPD05E **Pediatric Bone Tumors: Pearls & Pitfalls**

Andrea S. Doria, MD, PhD (*Presenter*) Grant/Research Support; Baxalta-Shire. Grant/Research Support; Novo Nordisk. Grant/Research Support; Terry Fox Foundation . Grant/Research Support; Society of Pediatric Radiology . Grant/Research Support; Radiological Society of North America

T6-CPD05F **Neonatal Musculoskeletal Ultrasound: Shoulder and Hip**

Patricia Nally (*Presenter*) Nothing to Disclose

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T6-CRT02

ASRT@RSNA: Internationalization of Medical Imaging Education and Practice: Current Trends

Tuesday, Dec. 2 1:30PM - 2:30PM Room: N226

Melissa Culp, MEd (*Moderator*) Nothing to Disclose
Peter Rath (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain the internationalization of higher education with a concentration on medical imaging education. 2) Describe the benefits of internationalization for higher education and medical imaging education and practice. 3) Discuss approaches, trends, and barriers to the internationalization of medical imaging education. 4) Illustrate possible avenues for the implementation of an internationalized medical imaging curriculum.

COURSE DESCRIPTION

Are today’s health care professionals equipped for globalization and international health issues? The health care industry continues to call for higher education to produce graduates who will offer a competitive advantage in the global marketplace. Health care delivery requires current and future health care professionals to demonstrate global learning, skills and competencies. An internationalized medical imaging curriculum provides a framework of values and practices for the skills and literacies of a changing world. Global and international education can teach the knowledge, skills and attitudes required to function effectively in an interconnected world. The goals of global and international education should be to prepare students to operate in a globally competitive workforce; increase students’ understanding of different cultures, religions and political systems; instill a globalized view of world events; and promote world peace. One approach to the internationalization of medical imaging education and practice is the provision of an internationalized curriculum that includes a clinical overseas attachment. This course discusses current trends in the internationalization of medical imaging education and practice.

Sub-Events

T6-CRT02C **Internationalization of Medical Imaging Education and Practice: Current Trends**

Sean Richardson, RT, PhD (*Presenter*) Nothing to Disclose

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T6-DLL05

RSNA Deep Learning Lab: Leveraging Pre-Trained Embeddings Models for Your Use Cases and Your Data (Advanced) (Registration Fee Required)

Tuesday, Dec. 2 1:30PM - 2:30PM Room: RADIOLOGY LEARNING LAB

Rory Pilgrim, BEng (*Moderator*) Employee; Google. Stock/Shareholder; EMvision Medical Devices Ltd

LEARNING OBJECTIVES

1) Demonstrate how to adapt and deploy open-weight, pre-trained radiology-specific AI models using public datasets and Colab notebooks. 2) Evaluate the impact of training data curation, validation strategies, and operating point selection on model performance and generalizability across clinical use cases.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. Interactive workshop showing how to use general-purpose, open weight, pre-trained radiology-specific models to build a specific AI application, with an emphasis on how the approach can be generalized to any arbitrary use-case. The session will be run via a Colab notebook and the application will be built via public data. Specific learning areas will be how to actually call and adapt the pre-trained model, the importance of training data curation, validation techniques, and operating point selection.

Sub-Events

T6-DLL05B **RSNA Deep Learning Lab: Leveraging Pre-Trained Embeddings Models for Your Use Cases and Your Data**

Sunny Virmani (*Presenter*) Nothing to Disclose

T6-DLL05C **RSNA Deep Learning Lab: Leveraging Pre-trained Embeddings Models for your use Cases and your Data**

Jason Klotzer (*Presenter*) Nothing to Disclose

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T7-CCH07

Fundamentals of Chest CT Interpretation

Tuesday, Dec. 2 3:00PM - 4:00PM Room: E451A

Mark M. Hammer, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn an approach to differential diagnosis of cystic lung diseases. 2) Classify micronodular patterns and explain their differential diagnoses. 3) Explain the differential diagnosis of septal thickening. 4) Learn how to identify the cause of mosaic attenuation and list differential diagnoses.

COURSE DESCRIPTION

This course will cover a number of basic topics in Chest CT, including cystic lung diseases, micronodular patterns, interlobular septal thickening, and mosaic attenuation.

Sub-Events

T7-CCH07B Approach to Cystic Lung Disease

Christopher Walker, MD (*Presenter*) Speaker's Bureau; Boehringer Ingelheim. Other-Royalties for textbooks; Elsevier/Amirsys. Consultant; Qure.ai. Consultant; Astrazeneca. Consultant; Duality Biologics

T7-CCH07C Approach to Pulmonary Nodules and Micronodules

James F. Gruden, MD (*Presenter*) Nothing to Disclose

T7-CCH07D Approach to Septal Line Thickening and Crazy Paving

Saurabh Agarwal, MD (*Presenter*) Nothing to Disclose

T7-CCH07E Approach to Mosaic Attenuation

Kimberly G. Kallianos, MD (*Presenter*) Nothing to Disclose

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T7-CHN05

Radiology in the ENT Clinic: Symptom-Based Imaging in the Ear, Nose and Throat

Tuesday, Dec. 2 3:00PM - 4:00PM Room: E352

Alok A. Bhatt, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the various pathologies that can cause anosmia, otalgia, hoarseness, and pulsatile tinnitus. 2) Identify appropriate imaging modalities and protocol depending on the clinical symptom. 3) Discuss key anatomic landmarks to interrogate when evaluating patients with a specific ENT symptom.

COURSE DESCRIPTION

Patients present to the ENT clinic with various symptoms for which imaging workup is necessary. Join us in this amazing whirlwind tour through the head and neck discussing imaging for anosmia, otalgia, hoarseness, and pulsatile tinnitus. Various pathologies and multimodality image rich examples as it relates to specific ENT symptoms are a guarantee during this session.

Sub-Events

T7-CHN05B **Imaging for Otalgia**

David Zander, MD (*Presenter*) Nothing to Disclose

T7-CHN05C **Imaging for Anosmia**

Alexandra R. Borges, MD (*Presenter*) Nothing to Disclose

T7-CHN05D **Imaging for Hoarseness**

Luke N. Ledbetter, MD (*Presenter*) Nothing to Disclose

T7-CHN05E **Imaging for Pulsatile Tinnitus**

Suehyb G. Alkhatib, MD, MS (*Presenter*) Nothing to Disclose

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T7-CNMMI11

PET/CT: CNS Tumors and Gastrointestinal Malignancies

Tuesday, Dec. 2 3:00PM - 4:00PM Room: S405

Emily S. Nia, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand best clinical practices for use and interpretation of PET for central nervous system tumors. 2) Understand best clinical practices for use and interpretation of PET for gastrointestinal malignancies.

COURSE DESCRIPTION

PET for gastrointestinal malignancies and CNS tumors is as complex and varied in presentation as the pathologies are. In this session, PET experts will use clinical cases to demonstrate fundamentals of interpretation, as well as pearls and pitfalls to help improve interpretation.

Sub-Events

T7-CNMMI11B PET for CNS Tumors

Jana Ivanidze, MD, PhD (*Presenter*) Grant/Research Support; Novartis Pharmaceuticals . Grant/Research Support; GE Healthcare . Speaker's Bureau; Novartis Pharmaceuticals . Speaker's Bureau; GE Healthcare . Grant/Research Support; Curium US LLC

T7-CNMMI11C Gastrointestinal Malignancies

Gabriel C. Fine, MD (*Presenter*) Owner; Site Therapeutics, LLC. Other-Intellectual property assigned to the University of Utah related to medical image synthesis for motion correction using generative adversarial networks and dynamic frame rate adjustments in digital subtraction angiography ; University of Utah

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T7-CRT03

ASRT@RSNA: Imaging Awareness: It's Not Always Straight Forward

Tuesday, Dec. 2 3:00PM - 4:00PM Room: N226

Melissa Culp, MEd (*Moderator*) Nothing to Disclose
Peter Rath (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the importance of providing respectful and appropriate imaging experiences for patient populations whose backgrounds or identities may differ from the provider's own. 2) Identify potential barriers patients may face when seeking or receiving care, including legal, anatomical, or personal considerations that may affect communication and imaging practices. 3) Explore strategies for educating health care team members on respectful and patient-centered care practices and fostering allyship. Consider initiatives such as employee resource groups to promote a supportive environment.

COURSE DESCRIPTION

Some patient communities face additional barriers when seeking health care. From scheduling to the final report, members of the health care imaging team can help facilitate positive health outcomes for vulnerable patients. This session will address some of the barriers to positive health outcomes and ways to overcome them in today's environment. Technologists who identify within these communities as both provider and patient will offer their perspectives.

Sub-Events

T7-CRT03C **Imaging Awareness: It's Not Always Straight Forward**

Timothy J. Blackburn, PHD (*Presenter*) Nothing to Disclose

T7-CRT03D **Imaging Awareness: It's Not Always Straight Forward**

Avril Spencer, RT, ARRT (*Presenter*) Nothing to Disclose

T7-CRT03E **Imaging Awareness: It's Not Always Straight Forward**

Shane Arrington, MBA, BMedSc (*Presenter*) Nothing to Disclose

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T7-CVA04

Peripheral Vascular Imaging

Tuesday, Dec. 2 3:00PM - 4:00PM Room: S503

Elizabeth M. Hecht, MD (*Moderator*) Nothing to Disclose
Sasan Partovi, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize characteristic imaging findings of thoracic outlet syndrome, thereby differentiating between neurogenic, venous, and arterial subtypes. 2) Identify appropriate imaging modalities and protocols for accurate diagnosis of thoracic outlet syndrome and guidance of patient management. 3) Learn the conventional and variant anatomy of upper and lower extremity CTA. 4) Utilize 3D reformats and curved planar reconstruction in upper and lower extremity CTA as well as illustration of pathologies via case-based review. 5) Learn the common indications and appropriate use of MRA and MR venography (MRV) for the evaluation of the upper and lower extremities. 6) Learn the essentials of contrast enhanced and non-contrast MRA and MRV techniques including applications of different protocols and troubleshooting. 7) Learn the role of cross sectional imaging for management of PAD patients. 8) Learn the current evidence and value of photon counting CTA in PAD.

COURSE DESCRIPTION

Imaging of the peripheral arterial tree is essential in daily clinical practice, supporting diagnosis, management, and pre-procedural planning of various vascular conditions. Upper extremity vascular imaging frequently addresses conditions such as thoracic outlet syndrome, vasculitis, trauma-related vascular injuries, embolic diseases and complications related to dialysis circuit vascular accesses. Lower extremity imaging predominantly focuses on peripheral artery disease (PAD) and acute limb ischemia. This course highlights advanced cross-sectional angiographic modalities, including computed tomography angiography (CTA), contrast-enhanced and non-contrast magnetic resonance angiography (MRA), as well as provocative maneuvers used in the evaluation of thoracic outlet syndrome. Additionally, emerging CTA technologies for PAD, notably photon-counting CT, will be discussed, focusing on their clinical utility and potential impact on patient care.

Sub-Events

T7-CVA04C **Thoracic Outlet Syndrome**

Dominika Sucha, MD, PhD (*Presenter*) Other-Institutional grant / research support to UMC Utrecht, NL.; Philips Healthcare

T7-CVA04D **Upper and Lower Extremity CTA**

Katherine A. Cheng, MD (*Presenter*) Nothing to Disclose

T7-CVA04E **Upper and Lower Extremity MRA**

Elizabeth M. Hecht, MD (*Presenter*) Nothing to Disclose

T7-CVA04F **CT Angiography in Peripheral Artery Disease: From Basics to Emerging Technologies**

Sasan Partovi, MD (*Presenter*) Nothing to Disclose

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T7-RCP03

France Presents: New Frontiers in Personalised and Integrated Oncological Approaches: The French Experience

Tuesday, Dec. 2 3:00PM - 4:00PM Room: E353B

Marie-France Bellin, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain the current applications of radiomics and radiology for stratifying patients with cancer. 2) Describe the early cardiac MRI features of immune checkpoint inhibitor (ICI)-induced myocarditis, a severe complication of ICI therapy in patients with cancer. 3) Explain the current clinical applications of robot-assisted innovative interventional procedures for treating abdominal malignancies.

COURSE DESCRIPTION

The objective of this session is to present the most recent and significant advances in oncological radiology in France. The lectures will address the field's primary challenges and illustrate complementary lines of research, emphasizing the importance of a personalized, integrated approach. The following topics will be discussed: the contributions of radiomics and personalized screening to lesion stratification and patient management; the early detection of immune checkpoint inhibitor (ICI)-induced myocarditis (a severe complication of immunotherapy for which imaging plays an important role); and the use of innovative, robot-assisted techniques for interventional radiology in abdominal oncology.

Sub-Events

T7-RCP03B Introduction to the Challenges of Radiology and Health Care in France

Marie-France Bellin, MD (*Presenter*) Nothing to Disclose

T7-RCP03C Personalized Screening and Stratification of Cancerous Lesions: Optimising the Early Management of Female Cancer Patients in France

Isabelle Thomassin-Naggara, MD (*Presenter*) Other-Board; Bayer. Other-Punctual remunerated lecture; GE. Other-Punctual remunerated lecture; Siemens. Other-Punctual remunerated lecture; Hologic. Other-Punctual remunerated lecture; Siemens. Other-Punctual remunerated lecture; BRACCO. Other-Punctual remunerated lecture; Siemens. Other-Board; Siemens. Other-Board; Bayer. Other-Punctual remunerated lecture; Lilly. Other-Punctual remunerated lecture; Siemens. Other-Particpation to a ponctual advisory board; GE. Other-Punctual remunerated lecture; Guerbet

T7-RCP03D Radiology and Radiomics for the Stratification of Cancer Patients: The French Experience

Laure S. Fournier, MD, PhD (*Presenter*) Speaker's Bureau; General Electric Healthcare. Speaker's Bureau; Median Technologies. Speaker's Bureau; Fujifilm. Grant/Research Support; Bristol Myers Squibb. Other-Research collaboration ; Dassault Systems

T7-RCP03E Risk Reduction after Cancer Treatment: Early Detection of Myocarditis in Patients Undergoing Immunotherapy

Alexis Jacquier, MD (*Presenter*) Consultant; Canon. Grant/Research Support; Medtronic. Stock/Shareholder; Anna healthcare

T7-RCP03F Advanced Interventional Radiology in Abdominal Malignancies: Robot-Assisted IR Innovations in Cancer Therapy

Laurent Milot, MD, PhD (*Presenter*) Consultant; Quantum Surgical

T7-RCP03G Conclusion on the Positioning of SFR

Alain Luciani, MD, PhD (*Presenter*) Grant/Research Support; BRACCO. Speaker's Bureau; BRACCO. Consultant; GE Healthcare

T7-RCP03H Closing Remarks

Umar Mahmood, MD, PhD (*Presenter*) Stock/Shareholder; Cytosite Bio. Consultant; Cytosite Bio. Grant/Research Support; Cytosite Bio. Consultant; Ziteo Medical. Grant/Research Support; Siemens Healthineers

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T7-RCP35

Climate Change and Radiology: High Impact Actions Toward Environmentally Sustainable Medical Imaging

Tuesday, Dec. 2 3:00PM - 4:00PM Room: N227B

Andrea G. Rockall, FRCR, MRCP (*Moderator*) Other-Advisory Board; RoClub
Kate Hanneman, MD, MPH (*Moderator*) Other-Honoraria; Sanofi Genzyme. Other-Honoraria; Medscape. Other-Honoraria; MRI Online. Other-Honoraria; Bayer

LEARNING OBJECTIVES

1) Discuss the impact of medical imaging on climate change and highlight opportunities for change including mitigation, adaptation, and resiliency. 2) Describe key actionable strategies to reduce energy use and waste in diagnostic radiology and improve environmental sustainability in interventional radiology. 3) Explore the impact of climate change on patient outcomes and the delivery of radiology services. 4) Implement resilience and adaptation strategies including infrastructure upgrades, disaster management protocols, and education on changing disease patterns.

COURSE DESCRIPTION

The purpose of this course is to discuss the impact of radiology on climate change and outline high-impact actionable steps we can take to address climate change in our professional lives including diagnostic and interventional radiology.

Sub-Events

T7-RCP35C **Radiology, Planetary Health and Climate Change**

Erin S. Schwartz, MD (*Presenter*) Other-Editor-in-Chief, Applied Radiology; Anderson Publishing, Ltd

T7-RCP35D **High Impact Actions to Reduce Greenhouse Gas Emissions in Diagnostic Radiology**

Benjamin E. Northrup, MD (*Presenter*) Nothing to Disclose

T7-RCP35E **High Impact Actions to Improve Environmental Sustainability in Interventional Radiology**

Jonathan Gross, MD (*Presenter*) Nothing to Disclose

T7-RCP35F **High Impact Sustainable Adaptation Strategies to Build Environmental Resiliency in Radiology**

Kate Hanneman, MD, MPH (*Presenter*) Other-Honoraria; Sanofi Genzyme. Other-Honoraria; Medscape. Other-Honoraria; MRI Online. Other-Honoraria; Bayer

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T8-CBR08

Contrast-Enhanced Mammography and MRI and Multimodality Interventions: Case-Based Review

Tuesday, Dec. 2 4:30PM - 5:30PM Room: S406A

Christopher E. Comstock, MD (*Moderator*) Consultant; Bayer Inc. Consultant; GE Medical. Consultant; Hologic. Consultant; Recentric Healthcare Technologies

LEARNING OBJECTIVES

1) Describe the techniques and methods used to perform contrast-enhanced mammography, breast MRI and interventional procedures. 2) Utilize the ACR BI-RADS lexicon for CEM and Breast MRI. 3) Understand strategies and approaches to improve CEM and Breast MRI interpretation accuracy. 4) Identify potential challenges and pitfalls of CEM, Breast MRI and biopsies.

COURSE DESCRIPTION

This educational session will highlight contrast-enhanced mammography (CEM), breast MRI and multimodality interventions. The course will review, through case-based lectures, basic techniques, interpretation, and pitfalls. This session will be informative to breast imaging radiologists who are just starting or currently performing contrast-enhanced mammography, breast MRI and biopsy procedures.

Sub-Events

T8-CBR08B CEM

Christopher E. Comstock, MD (*Presenter*) Consultant; Bayer Inc. Consultant; GE Medical. Consultant; Hologic. Consultant; Recentric Healthcare Technologies

T8-CBR08C MRI

Katja Pinker-Domenig, MD, PhD (*Presenter*) Consultant; AURA Health Technologies GmbH;FocusWest Health;Guerbet;Bayer. Grant/Research Support; * Digital Hybrid Breast PET/MRI for Enhanced Diagnosis of Breast Cancer (HYPMED) H2020 - Research and Innovation Framework Programme PHC-11-2015 # 667211-2;* A Body Scan for Cancer Detection using Quantum Technology (CANCERSCAN) H2020-FETOPEN # 828978;* Multiparametric 18F-Fluoroestradiol PET/MRI coupled with Radiomics Analysis and Machine Learning for Prediction and Assessment of Response to Neoadjuvant Endocrine Therapy in Patients with Hormone Receptor+/HER2- Invasive Breast Cancer Jubiläumsfonds of the Austrian National Bank # Nr: 18207;* Deciphering breast cancer heterogeneity and tackling the hypoxic tumor microenvironment challenge with PET/MRI, MSI and radiomics The Vienna Science and Technology Fund LS19-046;* MSKCC 2020 Molecularly Targeted Intra-Operative Imaging Award 07/2020-06/2021;* Breast Cancer Research Foundation 06/2019 - 05/2021 ;* NIH R01 Breast Cancer Intravoxel-Incoherent-Motion MRI Multisite (BRIMM) 09/01/2020-08/30/2025 ;* NIH R01 subaward: Abbreviated Non-Contrast-Enhanced MRI for Breast Cancer Screening 09/01/2023-08/31/2025;* NIH RO1: Deciphering the Acidic Tumor Environment: A Phase I/IIa Study of Pre-Operative Multiparametric MRI and pHLIP® ICG Intra-Operative Fluorescence Imaging of Primary Breast Cancer 03/01/2023-02/29/2024 . Grant/Research Support; Katja Pinker is supported in part through the ancer Centre Support Grant Award 5P30CA013696-49. Grant/Research Support; MSK has institutional financial interests relative to GRAIL.. Speaker's Bureau; Guerbet;Bayer

T8-CBR08D Problem-solving and Multimodality Biopsies

Maxine S. Jochelson, MD (*Presenter*) Nothing to Disclose

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T8-CCA05

Cardiac Rapid Fire: 60 Cases in 60 Minutes

Tuesday, Dec. 2 4:30PM - 5:30PM Room: E353C

Jean Jeudy JR, MD (*Moderator*) Nothing to Disclose
Liisa L. Bergmann, MD, MBA (*Moderator*) Nothing to Disclose

Sub-Events

T8-CCA05C **Cases 1-20 - Cardiac & Pericardial Masses**

Jean Jeudy JR, MD (*Presenter*) Nothing to Disclose

T8-CCA05D **Cases 21-40 - Valvular Disease**

Jordi Broncano, MD (*Presenter*) Nothing to Disclose

T8-CCA05E **Cases 41-60 - Congenital Heart Disease**

Liisa L. Bergmann, MD, MBA (*Presenter*) Nothing to Disclose

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T8-CCH04

Advances in Interstitial Lung Abnormality and Fibrosis

Tuesday, Dec. 2 4:30PM - 5:30PM Room: E451A

Chi Wan Koo, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define interstitial lung abnormalities (ILA), differentiate ILA from interstitial lung diseases (ILD), and understand the clinical significance and management of ILA. 2) Comprehend the progression and management strategies of fibrotic ILD, focusing on current clinical guidelines and therapeutic advancements. 3) Recognize the emerging role of artificial intelligence in the diagnosis, surveillance, and prognostication of ILD, including its potential impact on clinical decision-making and disease management.

COURSE DESCRIPTION

This advanced course provides a comprehensive exploration of the latest developments in the understanding, diagnosis, and management of interstitial lung abnormalities (ILA) and interstitial lung diseases (ILD). Through a series of expert-led presentations, participants will gain insights into definitions, radiological patterns, clinical significance and management of ILAs, with a focus on early detection and risk stratification. The course delves into the evolving landscape of progressive pulmonary fibrosis, discussing diagnostic criteria, prognostic indicators, and treatment. Participants will also explore current and emerging therapeutic strategies in fibrotic ILD, highlighting recent clinical trial outcomes and guideline updates. This forward-looking session will also examine the transformative role of artificial intelligence in the assessment of interstitial lung pathology, exploring beyond its potential to enhance diagnostic accuracy, prognostication, and treatment planning.

Sub-Events

T8-CCH04B **Interstitial Lung Abnormality - Definition, Patterns, Clinical Significance**

Andrea Oh, MD (*Presenter*) Consultant; Voiant Clinical

T8-CCH04C **Progressive Pulmonary Fibrosis**

Brett M. Elicker, MD (*Presenter*) Nothing to Disclose

T8-CCH04D **Role of Artificial Intelligence in the Assessment of Interstitial Lung Disease**

Chi Wan Koo, MD (*Presenter*) Nothing to Disclose

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T8-CER09

Musculoskeletal Trauma in the ED: Imaging Essentials

Tuesday, Dec. 2 4:30PM - 5:30PM Room: N228

Adnan M. Sheikh, MD (*Moderator*) Nothing to Disclose
Ashwin V. Asrani, MD (*Moderator*) Nothing to Disclose

Sub-Events

T8-CER09C **Wrist/Hand Trauma**

Ashwin V. Asrani, MD (*Presenter*) Nothing to Disclose

T8-CER09D **Shoulder/Elbow**

Susanna C. Spence, MD (*Presenter*) Nothing to Disclose

T8-CER09E **Foot/Ankle Trauma**

Adnan M. Sheikh, MD (*Presenter*) Nothing to Disclose

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T8-CGI07

Advances in Imaging of Diffuse Liver Disease

Tuesday, Dec. 2 4:30PM - 5:30PM Room: E451B

Sudhakar K. Venkatesh, MD, FRCR (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the principles and clinical applications of MR elastography and US elastography in evaluating liver fibrosis and diffuse liver diseases. 2) Recognize fat and iron quantification techniques in liver imaging to accurately assess and monitor hepatic steatosis and liver iron overload. 3) Familiarize with new CT quantitative parameters for chronic liver disease 4) Integrate these advanced imaging techniques into clinical practice to improve the diagnosis and management of patients with diffuse liver diseases.

COURSE DESCRIPTION

This educational session aims to provide participants with a comprehensive understanding of advanced imaging techniques for evaluating diffuse liver diseases, with a focus on MR fat and Iron quantification, MR elastography, US elastography, and CT quantification. The session will delve into the principles, clinical applications, advantages, and limitations of each technique, enabling radiologists (participants) to make informed decisions about their use in clinical practice.

Sub-Events

T8-CGI07B MR Fat/Iron Quant

Claude B. Sirlin, MD (*Presenter*) Grant/Research Support; ACR, Bayer, Foundation of NIH, GE, Gilead, Pfizer, Philips, Siemens, Butterfly. Other-Travel reimbursement; Educational symposia, Japanese Society of Radiology, Stanford, MD Anderson, CADI, University of Mississippi. Other Financial or Material Support; GE. Other-Lab service agreement; OrsoBio. Other Financial or Material Support; Mayo. Other Financial or Material Support; Siemens. Other Financial or Material Support; Bayer. Other-Data and Safety Monitoring Board (DSMB) member; NCI- National Cancer Institute funded Early Detection Research Network. Consultant; Altimmune, Boehringer, . Other-Lab service agreement; Enanta, Gilead, ICON, Intercept, Nusirt, Shire, Synageva, Takeda. Other-Institutional consultation representative; AMRA, BMS, Exact Sciences, IBM-Watson, Pfizer . Consultant; Altimmune, Ascelia Pharma AB, Blade, Boehringer, Epigenomics, Guerbet. Other-Advisory board member; Quantix Bio. Other-Principal Scientific Advisor; Livivos. Stock/Shareholder; Livivos. Other-Royalties; Medscape, Wolters Kluwer. Other-Payment for travel; Fundacion Santa Fe;Congreso Argentino de Diagnóstico por Imágenes;Stanford;Jornada Paulista de Radiologia;Ascelia Pharma AB;University of Cincinnati;RSNA;Sociedad Radiológica de Puerto Rico;Hospital Español Auxilio Mutuo, Puerto Rico;

T8-CGI07C MR Elastography

Sudhakar K. Venkatesh, MD, FRCR (*Presenter*) Nothing to Disclose

T8-CGI07D US Elastography

Richard G. Barr, MD, PhD (*Presenter*) Grant/Research Support; Philips Ultrasound. Grant/Research Support; Samsung. Other-Royalties ; Thieme Publishers. Other-Royalties; Elsever Publishers. Grant/Research Support; SuperSonic Imagine. Speaker's Bureau; Samsung. Grant/Research Support; SonoScape. Speaker's Bureau; Philips Ultrasound. Grant/Research Support; Siemens Ultrasound. Speaker's Bureau; Siemens Ultrasound. Grant/Research Support; Canon Medical Systems. Speaker's Bureau; Canon Medical Systems. Grant/Research Support; Mindray . Grant/Research Support; Hologic . Speaker's Bureau; Hologic

T8-CGI07E Noninvasive Quantitative CT

Ijin Joo, MD, PhD (*Presenter*) Nothing to Disclose

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T8-CGU01

Male Pelvis: Everything but the Prostate!

Tuesday, Dec. 2 4:30PM - 5:30PM Room: E353B

Akshay D. Baheti, MD, MD (*Moderator*) Nothing to Disclose
Gaiane M. Rauch, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the role of MRI and ultrasound in evaluating traumatic, infectious/inflammatory, and neoplastic penile conditions. 2) Recognize key imaging features of penile prostheses, including indications, normal anatomy, and common complications. 3) Overview of the various acute/chronic and neoplastic conditions of the testis and scrotum. 4) Identify acute male pelvic conditions in the emergency room.

COURSE DESCRIPTION

This course provides a comprehensive overview of various common and some uncommon pathologies affecting the male pelvis (except for prostate), including testicular, scrotal and penile pathologies. The focus will be on various challenges and pitfalls faced by the radiologist while reporting these conditions, including in the ED setting. Through case-based discussions and imaging pearls, attendees will gain a comprehensive approach to diagnosing various important male pelvic conditions and contributing to patient management.

Sub-Events

T8-CGU01C **Penile MR**

Meghan G. Lubner, MD (*Presenter*) Other-spouse, consultant; Elephas Bio

T8-CGU01D **Penile Implants and Complications of Penile Implant**

Yashant Aswani, MD (*Presenter*) Nothing to Disclose

T8-CGU01E **Testicular/Scrotal Imaging**

Lejla Aganovic, MD (*Presenter*) Nothing to Disclose

T8-CGU01F **Imaging of Male Pelvis in ER**

Oliver Hulson, MBChB,FRCR (*Presenter*) Nothing to Disclose

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T8-CHN07

I've Got a Lump in My Throat! Imaging Work-Up of Neck Masses

Tuesday, Dec. 2 4:30PM - 5:30PM Room: E352

Nikdokht Farid, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the imaging algorithm and search patterns for adult and pediatric patients presenting with a neck mass. 2) Understand the imaging algorithm, search patterns, and clinical management for thyroid and parathyroid lesions. 3) Review best practices for providing an image-guided biopsy service for lesions in the neck.

COURSE DESCRIPTION

In this Head and Neck session, attendees will review the imaging approach to adult and pediatric neck masses and will be presented with clinical case examples, with additional focus on work-up of thyroid and parathyroid lesions. Attendees will also review best practices for a radiology department-based image-guided neck biopsy service. Speakers will emphasize pearls for imaging evaluation including how to differentiate each entity from common mimics, pitfalls of interpretation to avoid, and relevant clinical management considerations with which radiologists should be familiar. This session offers attendees the opportunity to refine their interpretation of complex head and neck imaging studies by incorporating tips from world experts.

Sub-Events

T8-CHN07B **Imaging of Adult Neck Masses**

Barton F. Branstetter IV, MD (*Presenter*) Nothing to Disclose

T8-CHN07C **Imaging of Pediatric Neck Masses**

Jennifer A. Vaughn, MD (*Presenter*) Nothing to Disclose

T8-CHN07D **Imaging Work-up of Thyroid and Parathyroid Lesions**

C. Douglas Phillips, MD (*Presenter*) Nothing to Disclose

T8-CHN07E **Image-guided Neck Biopsy Service**

Ashley H. Aiken, MD (*Presenter*) Nothing to Disclose

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T8-CIN15

Payment in AI

Tuesday, Dec. 2 4:30PM - 5:30PM Room: E450B

Tugba Akinci D'Antonoli, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Assess the current reimbursement landscape for AI tools in radiology, including coding and regulatory considerations. 2) Evaluate the financial impact of AI implementation on clinical workflows, productivity, and downstream revenue. 3) Discuss strategic approaches to incorporating AI into radiology practice in a financially sustainable and compliant manner.

COURSE DESCRIPTION

As AI continues to reshape radiology, its financial implications remain an important but largely unexplored aspect. This session will explore current and emerging reimbursement models for AI applications in radiology. Participants will gain a deeper understanding of the intersection between innovation and financial viability of AI in radiology. This session is essential for radiologists, administrators, and other stakeholders seeking to align AI integration with sustainable business strategies.

Sub-Events

T8-CIN15B **AI in Radiology: Show Me the Money (and the Codes)!**

Eric M. Rubin, MD (*Presenter*) Nothing to Disclose

T8-CIN15C **AI in Radiology: Downstream Dollars or Just Drips?**

Hari Trivedi, MD (*Presenter*) Owner; Lightbox AI. Consultant; Sirona Medical. Consultant; PMX. Consultant; Flatiron Health. Grant/Research Support; Clairity, Lunit, Nightingale Science. Consultant; Hoppr

T8-CIN15D **AI in Radiology: Friend, Foe, or Time Thief?**

Patricia Balthazar, MD, MPH (*Presenter*) Grant/Research Support; AUR Care and Equity in Radiology Research Academic Fellowship (CERRAF) Award

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T8-CIR10

Emergent Techniques in Interventional Radiology

Tuesday, Dec. 2 4:30PM - 5:30PM Room: N227B

Charles Y. Kim, MD (*Moderator*) Consultant; Baylis Medical. Consultant; Boston Scientific. Consultant; Becton Dickinson. Consultant; ACI/Humacyte. Consultant; Kriya Therapeutics

Sub-Events

T8-CIR10B **Genicular Artery Embolization**

Joaquim M. Motta-Leal-Filho, MD, PhD (*Presenter*) Nothing to Disclose

T8-CIR10C **Hemorrhoidal Artery Embolization**

Priscila M. Falsarella, MD, PhD (*Presenter*) Nothing to Disclose

T8-CIR10D **CSF-venous Fistula Embolization for Spontaneous Intracranial Hypotension**

Nicholas T. Befera, MD (*Presenter*) Owner; Scanslated, Inc

T8-CIR10E **Histotripsy**

Mishal Mendiratta-Lala, MD (*Presenter*) Nothing to Disclose

T8-CIR10F **Hepatic Venous Deprivation**

Steven Y. Huang, MD (*Presenter*) Nothing to Disclose

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T8-CMK14

Advances in MSK imaging: Exploring Metal Imaging, AI Updates, Body Composition and Opportunistic Imaging

Tuesday, Dec. 2 4:30PM - 5:30PM Room: E450A

Robert D. Boutin, MD (*Moderator*) Grant/Research Support; GE Healthcare

LEARNING OBJECTIVES

1) Explain the current clinical applications of artificial intelligence (AI) to opportunistic imaging of bone and soft tissue imaging. 2) Identify potential benefits and drawbacks of AI impacting clinical practice.

COURSE DESCRIPTION

Participants will gain insights into the practical applications of AI in opportunistic imaging, learn to identify the benefits and limitations of AI in clinical settings, and understand the implications of body composition analysis in aging.

Sub-Events

T8-CMK14B **MR Imaging of Metallic Orthopedic Hardware**

Robert D. Boutin, MD (*Presenter*) Grant/Research Support; GE Healthcare

T8-CMK14C **Opportunistic Imaging: Current State in Bone and Soft Tissue Imaging**

Miriam A. Bredella, MD, MBA (*Presenter*) Nothing to Disclose

T8-CMK14D **Opportunistic Imaging: How Does it Impact our Clinical Work?**

Soterios Gyftopoulos, MD, MBA (*Presenter*) Nothing to Disclose

T8-CMK14E **Exploring Body Composition and Aging**

Leon Lenchik, MD (*Presenter*) Nothing to Disclose

T8-CMK14F **AI in Clinical Practice: Is it Worth it?**

Naveen Subhas, MD, MPH (*Presenter*) Grant/Research Support; Siemens Healthcare

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T8-CMS07

Dos and Don'ts of Whole Body MR: Evaluation of Oncologic and Congenital Diseases Versus Celebrity Screening

Tuesday, Dec. 2 4:30PM - 5:30PM Room: E351

Yuliya Lakhman, MD (*Moderator*) Consultant; Perceptive

LEARNING OBJECTIVES

1) Discuss the clinical applications of whole-body MRI (WB-MRI), including oncologic imaging and potential non-oncologic indications. 2) Highlight various systems to standardize the acquisition, interpretation, and reporting of WB-MRI. 3) Describe the current controversies and barriers to implementing WB-MRI in routine clinical practice.

COURSE DESCRIPTION

Discuss the role of whole-body MRI (WB-MRI) in both oncologic and non-oncologic imaging. Describe current recommendations for the acquisition, interpretation, and reporting of WB-MRI, and highlight key controversies and challenges to its implementation in clinical practice.

Sub-Events

T8-CMS07B **WB-MRI MRI in the Evaluation of Pediatric Cancer Patients**

Mary-Louise C. Greer, MBBS (*Presenter*) Grant/Research Support; AbbVie. Other-Research collaborator, non-financial; Alimentiv

T8-CMS07C **Whole-Body MRI for Cancer: Why and How in Familial Cancer Syndromes?**

Christina Messiou, MD, BMBS (*Presenter*) Other-speaker fee for educational course; sanofi

T8-CMS07D **Whole Body MRI in the Press & Social Media**

Judith A. Gadde, DO, MBA (*Presenter*) Nothing to Disclose

T8-CMS07E **WB-MRI in the Opportunistic Diagnosis of Cancer**

Anwar R. Padhani, MBBS, FRCR (*Presenter*) Grant/Research Support; Siemens Healthineers. Speaker's Bureau; Siemens Healthineers. Stock/Shareholder; Lucida. Consultant; Lucida. Speaker's Bureau; Bayer

T8-CMS07F **Whole Body MRI Incidental Findings**

Matthew S. Davenport, MD, MBA (*Presenter*) Consultant; Roche. Other-Royalties; Wolters Kluwer. Consultant; Covera Health

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T8-CNPM11

The Late Career Radiologist: Challenges and Opportunities for the Future Self and Future Generations (Sponsored by the RSNA Professionalism Committee)

Tuesday, Dec. 2 4:30PM - 5:30PM Room: S402

Carl C. Flink, MD (*Moderator*) Nothing to Disclose
Eva I. Rubio, MD, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Harness the power of the late career radiologist including their specialized knowledge base and wisdom of experience. 2) Extend fulfilling careers by tailoring clinical and educational responsibilities to individual stamina and desire as well as shifting away from stress at the workstation to areas such as research and trainee education. 3) Aid in retirement process by developing strategies to assess cognitive function, create succession plans, design rewarding golden years, and ensure financial stability.

COURSE DESCRIPTION

A significant portion of the radiology workforce qualifies as "late career" including at least 1/3 of radiology leadership. Additionally, 27% of physicians work past 71yrs of age while many others want to remain involved in the health care setting even after they retire from direct patient care. The challenge radiology and medicine in general faces is how to best help late career physicians maximize their golden years and transition to retirement. Late career radiologists bring a wealth of knowledge to the department including clinical, leadership, research and mentorship skills. Once they shut their workstation down for the last time they can find fulfillment outside the clinical realm through advocacy, administration, consulting etc. All the while balancing the variable effect of age on cognition and physical stamina. Although late career radiologists bring much to the department, including depth of knowledge, experience and psychological resilience/improved wellness compared to younger colleagues, they often feel undervalued. Unfortunately, many, if not most, institutions fail to engage late career radiologists in proactive and meaningful discussions regarding goals and functional abilities. It is crucial to proactively make adaptations for late career radiologists for them to shine in their roles for the mutual benefit of colleagues and patients.

Sub-Events

T8-CNPM11C Age is a Superpower

Michele H. Johnson, MD (*Presenter*) Nothing to Disclose

T8-CNPM11D Fulfillment Beyond Retirement

N. Reed Dunnick, MD (*Presenter*) Nothing to Disclose

T8-CNPM11E Challenges of the Late Career Phase

Susan D. John, MD (*Presenter*) Nothing to Disclose

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T8-CNR06

See Pro Flocks to Learn About CNS Infections

Tuesday, Dec. 2 4:30PM - 5:30PM Room: S406B

Mohit Agarwal, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review common and uncommon infections of the CNS including bacterial, mycobacterial, helminthic, protozoan, and viral. 2) Learn to tackle typical and atypical appearances of infections in the CNS.

COURSE DESCRIPTION

The world is becoming increasingly interconnected through the frequent and meaningful exchange of people and cultures. As a result, physicians are now tasked with understanding infections that have global relevance. In this session, featuring four presentations by distinguished international experts, we will explore central nervous system infections from diverse regions across the world.

Sub-Events

T8-CNR06B **Beware the Droplets and Fomites: Mycobacterial and Fungal Infections of the CNS**

Amal Saleh Nour, MD (*Presenter*) Nothing to Disclose

T8-CNR06C **Of Rods and Chains in Gram Stain: Bacterial Infections of the CNS**

Tilak Das, PhD, FRCR (*Presenter*) Consultant; Optum (previously Change Healthcare). Speaker's Bureau; GE healthcare

T8-CNR06D **The Music in My Brain - Is it a Worm?: Helminthic and Protozoal Infections of the CNS**

Alcino Alves Barbosa, MD (*Presenter*) Nothing to Disclose

T8-CNR06E **The System is Crashing: Viral Encephalitis and Prion Diseases**

Mohit Agarwal, MD (*Presenter*) Nothing to Disclose

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T8-CPD07

The Chest Files: From Pleural Puzzles to Lung MRI

Tuesday, Dec. 2 4:30PM - 5:30PM Room: E350

Kevin K. Fung, MBBS, FRCR (*Moderator*) Nothing to Disclose
Taylor Chung, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the current imaging approaches to pediatric pleural disease, vascular rings and slings, and acute pulmonary conditions. 2) Identify the clinical applications of chest MRI in children. 3) Apply appropriate strategies for image-guided management of pediatric pleural diseases.

COURSE DESCRIPTION

This course aims to provide practical updates on advanced imaging of the pediatric chest for the diagnosis of a potpourri of pathologies, including the use of MRI, and image-guided interventional management of pediatric pleural diseases

Sub-Events

T8-CPD07C **Pediatric Pleural Diseases, Diagnosis and Treatment - To Drain or Not**

Amir Olfat, DO (*Presenter*) Nothing to Disclose

T8-CPD07D **Vascular Rings and Slings: Imaging Tips and Tricks**

Carlos F. Ugas-Charcape, MD (*Presenter*) Nothing to Disclose

T8-CPD07E **Imaging Approach to Acute Lung Diseases**

Julien Aguet, MD (*Presenter*) Nothing to Disclose

T8-CPD07F **Applications for Chest MRI in the Child**

Pierluigi Ciet, MD, PhD (*Presenter*) Consultant; SIEMENS Healthineers. Grant/Research Support; GE Healthcare

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T8-CRO05

Prostate Cancer Case Based Multidisciplinary Review

Tuesday, Dec. 2 4:30PM - 5:30PM Room: S401

Tristan Barrett, MBBS, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the typical imaging findings of prostate cancer on mpMRI. 2) Assess the impact of MRI on staging prostate cancer in a multidisciplinary setting. 3) Assess the role of imaging in the diagnosis of prostate cancer through case examples.

COURSE DESCRIPTION

This course uses a case-based approach to diagnostic and management decision making in the work-up of patients presenting with prostate cancer. The panel includes radiologists, urologists and radiation oncologists.

Sub-Events

T8-CRO05B **Prostate Cancer Case Based Multidisciplinary Review**

Sophia C. Kamran, MD (*Presenter*) Nothing to Disclose

T8-CRO05C **Prostate Cancer Case Based Multidisciplinary Review**

Michael Leapman, MD (*Presenter*) Nothing to Disclose

T8-CRO05D **Prostate Cancer Case Based Multidisciplinary Review**

Tyler Seibert, MD, PhD (*Presenter*) Other-Research funding to institution and honoraria for consulting.; GE Healthcare. Consultant; Varian Medical Systems. Other-Scientific Advisory Board member and Consultant. Own stock options.; CorTechs Labs. Other-Honoraria and travel for non-branded CME presentations; Janssen. Grant/Research Support; Quibim. Other-Research funding to institution and one-time honorarium for consulting.; Blue Earth Diagnostics

T8-CRO05E **Prostate Cancer Case Based Multidisciplinary Review**

Giorgio Brembilla, MD, PhD (*Presenter*) Nothing to Disclose

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T8-DLL06

RSNA Deep Learning Lab: Patient-Centered Representations With Multi-Modal Graphs (Advanced) (Registration Fee Required)

Tuesday, Dec. 2 4:30PM - 5:30PM Room: RADIOLOGY LEARNING LAB

Dimitri Falco (*Moderator*) Employee; Quantivly

LEARNING OBJECTIVES

1) Explain how advanced Graph Neural Network architectures can model complex relationships across modalities. 2) Identify key data modalities relevant to radiology and describe strategies for integrating them into unified graph-based patient representations.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited.

Sub-Events

T8-DLL06B **RSNA Deep Learning Lab: Patient-Centered Representations with Multi-Modal Graphs**

Deborah A. Langman, PhD (*Presenter*) Employee; Quantivly

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T8-RCP15

Evolution of Advanced 3D Visualization: Choose Your Own Adventure (Sponsored by the RSNA 3D Printing Special Interest Group)

Tuesday, Dec. 2 4:30PM - 5:30PM Room: S404

David H. Ballard, MD (*Moderator*) Consultant; Merck. Consultant; Direct Biologics
Justin R. Ryan, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the current landscape and key trends in 3D visualization tools used in radiology, including clinical, educational, and research applications. 2) Compare different pathways for engagement with 3D visualization from user-level interaction to collaborative development and innovation. 3) Identify which types of 3D visualization tools align with their individual practice needs or professional goals. 4) Formulate a personalized plan for exploring or deepening their involvement with advanced visualization technologies. 5) Recognize opportunities for interdisciplinary collaboration, institutional support, and ongoing learning in this space.

COURSE DESCRIPTION

This interactive session examines the rapid evolution of advanced 3D visualization in medical imaging and explores how radiologists can engage meaningfully at various levels of involvement. Whether interested in clinical integration, research, education, or innovation, attendees will learn how to identify the right entry points aligned with their goals and skillsets. By highlighting flexible engagement models from plug-and-play tools to collaborative pipeline development. This session empowers radiologists to define their own path in shaping the future of 3D imaging. With technologies becoming increasingly accessible and impactful, there's never been a better time to get involved.

Sub-Events

T8-RCP15C **The Radiologist's Role in Advancing 3D Printing in Healthcare**

Lumarie Santiago, MD (*Presenter*) Nothing to Disclose

T8-RCP15D **Making 3D Data Accessible: Simplifying Integration for Clinicians**

Eric Braden, BS (*Presenter*) Nothing to Disclose

T8-RCP15E **Building a Comprehensive 3D Lab for Enterprise-wide Operations**

Beth A. Ripley, MD, PhD (*Presenter*) Nothing to Disclose

T8-RCP15F **Surface Mesh Applications and the Path to a Sustainable Future**

Benjamin E. Northrup, MD (*Presenter*) Nothing to Disclose

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T8-RCP18

Discussing the FDA's Approach to Regulating AI-Enabled Devices in Radiology: Challenges, Innovations, and Other Considerations (Sponsored by the RSNA Government Relations Committee)

Tuesday, Dec. 2 4:30PM - 5:30PM Room: N226

Elizabeth O'Hare, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand current FDA approaches and regulatory frameworks for AI-enabled devices in radiology. 2) Explore key regulatory challenges for AI-enabled devices in radiology. 3) Promote dialogue among panel members and with the audience on challenges and future considerations.

COURSE DESCRIPTION

Artificial Intelligence (AI) is transforming radiology, medicine, and healthcare with applications across diagnostics, treatment, and workflow management. The rapid development and integration of AI tools in radiology raises critical regulatory, ethical, and patient safety concerns. The U.S. Food and Drug Administration (FDA) plays a pivotal role in ensuring the safety and efficacy of AI-enabled medical devices. Featuring FDA staff, this session will examine the current regulatory framework for AI-enabled tools, highlight challenges in balancing innovation with patient safety and physician responsibilities, and provide a forum to discuss how regulatory and legislative frameworks can adapt to the rapidly evolving Health AI ecosystem while ensuring patient safety and ethical use.

Sub-Events

T8-RCP18B **FDA Risk-Based Considerations for Regulating Radiological AI-enabled Medical Devices**

Robert Ochs, PhD (*Presenter*) Nothing to Disclose

T8-RCP18C **Regulatory Science Tools for Accelerating the Development of AI-enabled Radiological Imaging Devices**

Aldo Badano, PhD (*Presenter*) Nothing to Disclose

T8-RCP18D **Approaches for Managing Changes to AI-enabled Medical Devices**

Krishna Juluru, MD (*Presenter*) Nothing to Disclose

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W1-CBR10

Breast Imaging Best Practices: Essentials for Clinical Excellence

Wednesday, Dec. 3 8:00AM - 9:00AM Room: S406A

Steven P. Poplack, MD (*Moderator*) Stock/Shareholder; Johnson and Johnson. Stock/Shareholder; Merck and Co

LEARNING OBJECTIVES

1) Recognize imaging features of mammographic architectural distortion that are predictive of benign and malignant outcomes. 2) Become familiar with the concept of multiparametric breast ultrasound. 3) Understand the practice standards for breast cancer screening with breast MRI.

COURSE DESCRIPTION

This is a case based interactive session highlighting 'best practices' to navigate common scenarios in breast imaging. The session is organized by breast imaging modality: mammography including digital breast tomosynthesis, ultrasound including elastography, and breast MRI, and is presented by content experts. Illustrative cases are intended to provide a framework for interpretation and rationale for image-based decision making.

Sub-Events

W1-CBR10B Mammography including DBT

Steven P. Poplack, MD (*Presenter*) Stock/Shareholder; Johnson and Johnson. Stock/Shareholder; Merck and Co

W1-CBR10C Ultrasound including Elastography

Alexandra Athanasiou, MD, MSc (*Presenter*) Nothing to Disclose

W1-CBR10D Breast MRI

Jocelyn A. Rapelyea, MD (*Presenter*) Nothing to Disclose

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W1-CCH05

Lung Cancer Imaging: Pearls, Pitfalls, and Recent Advances

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E451A

Michelle S. Ginsberg, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the current TNM classification system for lung cancer. 2) Become familiar with common pitfalls in lung cancer staging. 3) Introduction to radiomics imaging biomarkers and discuss the current role in metastatic and locally advanced lung cancer.

COURSE DESCRIPTION

This course provides a concise overview of the key updates in the 9th edition of the TNM staging system for lung cancer, with a focused discussion on T4 tumors. It will also cover imaging considerations in lung cancer patients following localized and systemic therapies. Updates to the N and M categories—central changes from TNM 8 to TNM 9—will be reviewed in detail. The course also includes an introduction to radiomics, highlighting current challenges in the clinical integration of radiomic imaging biomarkers and exploring future directions in this evolving field.

Sub-Events

W1-CCH05B TNM Staging of Lung Cancer

Helmut Prosch, MD (*Presenter*) Grant/Research Support; Siemens. Grant/Research Support; Astra Zeneca. Grant/Research Support; Boehringer Ingelheim. Speaker's Bureau; Astra Zeneca. Speaker's Bureau; Boehringer Ingelheim. Speaker's Bureau; MSD. Speaker's Bureau; Janssen. Speaker's Bureau; Sanofi. Speaker's Bureau; BMS

W1-CCH05C Imaging of Lung Cancer Patients Post Localized Therapy

Chad D. Strange, MD (*Presenter*) Nothing to Disclose

W1-CCH05D Imaging of Lung Cancer Patients Post Systemic Therapy

Ioannis Vlahos, MBBS, FRCR (*Presenter*) Nothing to Disclose

W1-CCH05E Radiomics and Imaging Biomakers in Lung Cancer

Anastasia Oikonomou, MD, PhD (*Presenter*) Other-I am the site PI in a multicenter clinical trial that SOPHIA GENETICS is sponsoring; SOPHIA GENETICS

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W1-CER07

Navigating GU Emergencies: Real Cases, Practical Insights

Wednesday, Dec. 3 8:00AM - 9:00AM Room: N228

Ana Blanco, MD (*Moderator*) Nothing to Disclose
Refky Nicola, MSc, DO (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand categories of urologic surgery and intervention and their indications. 2) Gain awareness of risk factors for surgical/interventional complications. 3) Recognize imaging features of surgical complications for rapid diagnosis. 4) Understand next steps in further imaging and management. 5) Provide useful information about the various postpartum uterine complications with tips and tricks to interpret them with practical advices. 6) Present interesting and tricky cases about post partum uterine complications in order to share the reasoning behind the interpretation of images combined with clinical information. 7) Identify surgical procedures of scrotum and penis that may lead to emergencies. 8) Select appropriate imaging techniques for evaluating post-operative penile and scrotal emergencies. 9) Interpret imaging findings of post-operative penile and scrotal emergency conditions.

COURSE DESCRIPTION

This lecture-based session is aimed to provide radiologists and trainees with practical skills for evaluating and managing acute genitourinary emergencies, including renal and bladder complications following procedures or surgery, postpartum uterine emergencies, and penile and scrotal surgical complications. Through practical case examples, expert faculty will discuss key imaging findings, offer practical interpretation tips, and highlight critical pitfalls to avoid in the acute setting. This session is ideal for those involved in emergency, urogenital, and gynecologic imaging who wish to enhance their diagnostic confidence and reporting accuracy.

Sub-Events

W1-CER07C **Renal and Bladder Emergencies: Post-procedure and Post-operative Complications**

Carolyn S. Dupuis, MD (*Presenter*) Nothing to Disclose

W1-CER07D **Postpartum Uterine Emergencies**

Camilla Panico, MD (*Presenter*) Nothing to Disclose

W1-CER07E **Penile and Scrotal Emergencies: Surgical Complications**

Mustafa Secil, MD (*Presenter*) Nothing to Disclose

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W1-CGI09

Colorectal Imaging: Rectal Cancer and CTC (Advanced)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E451B

Kevin J. Chang, MD (*Moderator*) Speaker's Bureau; Medality. Stock/Shareholder; Theromics, Inc.

Sub-Events

W1-CGI09B **CT Colonography - 2025 Update**

Kevin J. Chang, MD (*Presenter*) Speaker's Bureau; Medality. Stock/Shareholder; Theromics, Inc.

W1-CGI09C **Challenging CT Colonography Cases**

Judy Yee, MD (*Presenter*) Grant/Research Support; GE Healthcare

W1-CGI09D **Rectal Cancer Staging MR**

Mukesh G. Harisinghani, MD (*Presenter*) Nothing to Disclose

W1-CGI09E **Rectal Cancer Treatment Response**

Kartik S. Jhaveri, MD, FRCPC (*Presenter*) Nothing to Disclose

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W1-CGU02

Radiologist's Guide to GU Cancer Radiogenomics (Advanced)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E353B

Hebert Alberto Vargas, MD (*Moderator*) Nothing to Disclose
Katherine M. Krajewski, MD (*Moderator*) Consultant; Merck, Sharpe & Dohme, LLC

LEARNING OBJECTIVES

1) Describe the role of radiogenomics in identifying imaging biomarkers for renal, urothelial, and prostate cancers. 2) Evaluate how radiogenomic data can inform and optimize personalized cancer treatment strategies. 3) Apply radiogenomic principles to enhance diagnostic accuracy and precision imaging in oncologic radiology.

COURSE DESCRIPTION

This course explores the transformative potential of radiogenomics in advancing personalized imaging and cancer management. We open with a keynote on the integration of radiogenomics into personalized imaging, setting the stage for a deeper understanding of its clinical impact. Participants will examine the integration of radiogenomic techniques in renal cell carcinoma, focusing on the identification of novel biomarkers and their correlation with imaging features. The curriculum also covers strategies for enhancing the management of urothelial cancer through radiogenomic data, emphasizing personalized treatment planning. Additionally, the course highlights the application of radiogenomics in prostate MRI, showcasing its potential to refine diagnostic accuracy and guide targeted therapies. Together, these sessions underscore the growing impact of radiogenomics in transforming cancer imaging and individualized patient care.

Sub-Events

W1-CGU02C **Keynote: Personalized Imaging with Radiogenomics**

Katherine M. Krajewski, MD (*Presenter*) Consultant; Merck, Sharpe & Dohme, LLC

W1-CGU02D **RCC Radiogenomics**

Elizabeth A. Edney, MD (*Presenter*) Nothing to Disclose

W1-CGU02E **Optimizing Urothelial Cancer Management with Radiogenomics**

Francesco Alessandrino, MD (*Presenter*) Nothing to Disclose

W1-CGU02F **Precision Imaging: Role of Radiogenomics in Prostate MRI**

Aytekin Oto, MD (*Presenter*) Owner; QMIS LLC. Consultant; Profound Healthcare. Consultant; Akumin

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W1-CIN18

Best Practices for AI Model Selection and Deployment

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E450B

Hye Sun Na (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key considerations and common challenges in AI model selection and deployment, drawing from national-level data and institutional experiences. 2) Evaluate strategies for fostering effective AI vendor-client partnerships that support continuous model improvement and alignment with clinical needs. 3) Compare different approaches to clinical integration of AI tools, including customized workflows and the trade-offs between standalone versus platform-based solutions.

COURSE DESCRIPTION

This lecture format session offers practical insights and real-world experiences to guide institutions in evaluating AI models, managing vendor relationships, and integrating AI into clinical workflows. Presenters will share data-driven insights and best practices for implementing both standalone and platform-based AI systems, with a focus on clinical impact, workflow optimization, and scalable deployment strategies.

Sub-Events

W1-CIN18B AI Selection and Deployment Practices Across the US: Learnings to Date from ARCH-AI

David B. Larson, MD, MBA (*Presenter*) Grant/Research Support; Gordon and Betty Moore Foundation. Grant/Research Support; Siemens Healthineers. Stock/Shareholder; Bunkerhill Health

W1-CIN18C Improving AI Models through the AI Vendor-Client Partnership

Sriyesh Krishnan, MD (*Presenter*) Nothing to Disclose

W1-CIN18D Optimizing Clinical Integration of AI with Customized Workflows

Shlomit Goldberg-Stein, MD (*Presenter*) Nothing to Disclose

W1-CIN18E Integrating Standalone AI Systems vs. Platform-Based Solutions for Clinical Implementation

Leonardo K. Bittencourt, MD, PhD (*Presenter*) Speaker's Bureau; Guerbet USA. Speaker's Bureau; Guerbet LatAm. Consultant; AIDOC. Consultant; Quibim. Stock/Shareholder; ANA Health. Stock/Shareholder; Remote Radtech

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W1-CIN22

RSNA Hands-On Lab: Next-Gen Netter: Harnessing 3D Technology to Bring Anatomy to Life for Radiology Residents and Faculty (Registration Fee Required)

Wednesday, Dec. 3 8:00AM - 9:30AM Room: S504CD

Beth A. Ripley, MD, PhD (*Moderator*) Nothing to Disclose
Summer J. Decker, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the challenges of current anatomy education and the top areas of need in improving radiologists' understanding of complex anatomy. 2) Demonstrate hands-on experience with immersive anatomy tools including digital workstations, interactive 3D PDFs, 3D printed models, and extended reality technologies. 3) Identify and utilize educational materials and digital medical assets to enhance anatomy teaching, and engage in interdisciplinary networking with radiology educators globally.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. This hands-on seminar is designed to address the critical gaps in anatomy education for radiology residents and educators. Participants will gain insights into contemporary challenges in anatomy teaching and explore innovative solutions using technologies such as interactive 3D PDFs, 3D printed models, and extended reality. The course offers practical experience with these tools and access to valuable materials and digital assets for enhancing anatomy instruction. This session also provides an opportunity for networking with fellow radiology educators and professionals interested in medical innovation.

Sub-Events

W1-CIN22C **RSNA Hands-on Lab: Next-Gen Netter: Harnessing 3D Technology to Bring Anatomy to Life for Radiology Residents and Faculty**

Beth A. Ripley, MD, PhD (*Presenter*) Nothing to Disclose

W1-CIN22D **RSNA Hands-on Lab: Next-Gen Netter: Harnessing 3D Technology to Bring Anatomy to Life for Radiology Residents and Faculty**

Summer J. Decker, PhD (*Presenter*) Nothing to Disclose

W1-CIN22E **RSNA Hands-on Lab: Next-Gen Netter: Harnessing 3D Technology to Bring Anatomy to Life for Radiology Residents and Faculty**

Sam Mentzer, MS, BS (*Presenter*) Nothing to Disclose

W1-CIN22F **RSNA Hands-on Lab: Next-Gen Netter: Harnessing 3D Technology to Bring Anatomy to Life for Radiology Residents and Faculty**

Min Lang, MD, MSc (*Presenter*) Nothing to Disclose

W1-CIN22G **RSNA Hands-on Lab: Next-Gen Netter: Harnessing 3D Technology to Bring Anatomy to Life for Radiology Residents and Faculty**

Lumarie Santiago, MD (*Presenter*) Nothing to Disclose

W1-CIN22H **RSNA Hands-on Lab: Next-Gen Netter: Harnessing 3D Technology to Bring Anatomy to Life for Radiology Residents and Faculty**

Justin R. Ryan, PhD (*Presenter*) Nothing to Disclose

W1-CIN22I **RSNA Hands-on Lab: Next-Gen Netter: Harnessing 3D Technology to Bring Anatomy to Life for Radiology Residents and Faculty**

Kristi Wyatt (*Presenter*) Nothing to Disclose

W1-CIN22J **RSNA Hands-on Lab: Next-Gen Netter: Harnessing 3D Technology to Bring Anatomy to Life for Radiology Residents and Faculty**

Cynthia Gordon, PhD (*Presenter*) Nothing to Disclose

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W1-CIR11

Practice Building in Interventional Radiology

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E353A

Florian J. Fintelmann, MD (*Moderator*) Grant/Research Support; Pfizer. Speaker's Bureau; Boston Scientific. Consultant; Boston Scientific. Consultant; BD

LEARNING OBJECTIVES

1) Discuss five key practice building opportunities in interventional radiology. 2) Review lessons learned and identify opportunities for improvement to further clinical innovation.

COURSE DESCRIPTION

Learners will discover the ins and outs of five interventional radiology practice building opportunities (lymphatic, lung tumor ablation, vein clinic, prostate embolization, pulmonary arteriovenous malformations) through lectures from thought leaders focused on lessons learned. This session will enable practitioners to chart a path towards growing their own practice while furthering clinical innovation.

Sub-Events

W1-CIR11B **Lymphatic Interventions**

Gregory J. Nadolski II, MD (*Presenter*) Nothing to Disclose

W1-CIR11C **Lung Tumor Ablation**

Alda L. Tam, MD (*Presenter*) Grant/Research Support; Boston Scientific. Grant/Research Support; Johnson & Johnson. Consultant; Cook Medical

W1-CIR11D **Vein Clinic**

Peter D. Miller, MD (*Presenter*) Nothing to Disclose

W1-CIR11E **Prostate Embolization**

Lynn J. Savic, MD (*Presenter*) Grant/Research Support; Guerbet. Speaker's Bureau; Guerbet

W1-CIR11F **Pulmonary AVM Clinic**

Clifford R. Weiss, MD (*Presenter*) Consultant; Boston Scientific, Guerbet, Medtronic, Siemens Healthcare, COOK medical. Grant/Research Support; Boston Scientific, Guerbet, Medtronic, Siemens Healthcare. Other-Co-Founder; Shuriken Medical, Avasys Medical, . Other-Medical Advisory Board; PneumoNix, Raydiax

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W1-CMK02

Hip Imaging: Current Topics and Controversies

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E450A

William E. Palmer, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify hip abnormalities that can be challenging to diagnose. 2) Recognize extra-articular causes of hip pain.

COURSE DESCRIPTION

The lectures in this session address hip abnormalities that are important but challenging to diagnose. Topics focus on current concepts that may be controversial for radiologists and orthopedists. Lecturers provide information that can help in the reporting of imaging studies, the prioritization of imaging findings and the communication with referring providers.

Sub-Events

W1-CMK02B **"What is that?" Imaging of Aggressive Hip Processes**

Tony T. Wong, MD (*Presenter*) Nothing to Disclose

W1-CMK02C **Hip Arthroplasty: Interesting and Challenging Cases**

Yulia Melenevsky, MD (*Presenter*) Nothing to Disclose

W1-CMK02D **Abdominal Wall and Groin Injury Imaging: What you Need to Know**

Luis S. Beltran, MD (*Presenter*) Nothing to Disclose

W1-CMK02E **Hip Microinstability and FAI: Current Concepts**

William E. Palmer, MD (*Presenter*) Nothing to Disclose

W1-CMK02F **Sports-related Injuries of the Hamstrings: Imaging Update**

Angela Atinga, MBBChir, FRCPC (*Presenter*) Nothing to Disclose

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W1-CMS10

RSNA Hands-On Lab: Contrast Reaction Management (Registration Fee Required)

Wednesday, Dec. 3 8:30AM - 10:30AM Room: E265

Carolyn L. Wang, MD (*Moderator*) Grant/Research Support; GE Healthcare

LEARNING OBJECTIVES

1) Recognize various types of contrast reactions and the proper management of various types of contrast reactions through hands-on simulation-based training. 2) Learn with hands-on practice the proper administration of various routes of epinephrine as well as other medications to treat the more common hypersensitivity contrast reactions. 3) Recognize and manage a contrast reaction in a sedated patient and pediatric patient.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. Through hands-on high-fidelity simulation scenario training, learners will practice recognizing and managing various types of contrast reactions. Following a brief lecture, learners will rotate through multiple stations during the course to gain individual hands-on experience. To enhance the learner's experience and allow for more time in the hands-on stations, we ask all learners for the course to watch this short 15 minute video on contrast reaction management prior to the course https://www.youtube.com/watch?v=9r-_E8dmJ0A .

Sub-Events

W1-CMS10B **RSNA Hands-On Lab: Contrast Reaction Management**

Carina W. Yang, MD (*Presenter*) Consultant; Guerbet

W1-CMS10C **RSNA Hands-On Lab: Contrast Reaction Management**

Alisa Sumkin, DO (*Presenter*) Consultant; Mammotome. Grant/Research Support; Bayer. Speaker's Bureau; Siemens

W1-CMS10D **RSNA Hands-On Lab: Contrast Reaction Management**

Benjamin Mervak, MD (*Presenter*) Nothing to Disclose

W1-CMS10E **RSNA Hands-On Lab: Contrast Reaction Management**

Erik Soloff, MD (*Presenter*) Nothing to Disclose

W1-CMS10F **RSNA Hands-On Lab: Contrast Reaction Management**

Kirk G. Banerian, MD, BS (*Presenter*) Nothing to Disclose

W1-CMS10G **RSNA Hands-On Lab: Contrast Reaction Management**

Matthew A. Silbergleit, MD (*Presenter*) Nothing to Disclose

W1-CMS10H **RSNA Hands-On Lab: Contrast Reaction Management**

Anup J. Alexander, MD (*Presenter*) Nothing to Disclose

W1-CMS10I **RSNA Hands-On Lab: Contrast Reaction Management**

Stephen C. O'Connor, MD (*Presenter*) Nothing to Disclose

W1-CMS10J **RSNA Hands-On Lab: Contrast Reaction Management**

Linda C. Kelahan, MD (*Presenter*) Grant/Research Support; canon medical systems

W1-CMS10K **RSNA Hands-On Lab: Contrast Reaction Management**

Melissa M. Picard, MD (*Presenter*) Nothing to Disclose

W1-CMS10L **RSNA Hands-On Lab: Contrast Reaction Management**

Jennifer G. Schopp, MD (*Presenter*) Nothing to Disclose

W1-CMS10M **RSNA Hands-On Lab: Contrast Reaction Management**

Richard Silbergleit, MD, MBA (*Presenter*) Consultant; TestDynamics. Consultant; RemedyLogic. Consultant; Bracco

W1-CMS10N **RSNA Hands-On Lab: Contrast Reaction Management**

Adlai R. Grayson, MD (*Presenter*) Nothing to Disclose

W1-CMS10O **RSNA Hands-On Lab: Contrast Reaction Management**

Minal C. Jagtiani, FRCR, MD (*Presenter*) Nothing to Disclose

W1-CMS10P **RSNA Hands-On Lab: Contrast Reaction Management**

George Wang, MD (*Presenter*) Nothing to Disclose

W1-CMS10Q **RSNA Hands-On Lab: Contrast Reaction Management**

Gerges Abdelsayed (*Presenter*) Nothing to Disclose

W1-CMS10R **RSNA Hands-On Lab: Contrast Reaction Management**

Ahmed Gabr, MD, MBBCh (*Presenter*) Nothing to Disclose

W1-CMS10S **RSNA Hands-On Lab: Contrast Reaction Management**

Emily Lowery, DO (*Presenter*) Nothing to Disclose

W1-CMS10T **RSNA Hands-On Lab: Contrast Reaction Management**

Rami El-Baba, DO (*Presenter*) Nothing to Disclose

W1-CMS10U **RSNA Hands-On Lab: Contrast Reaction Management**

William Chen, MD (*Presenter*) Nothing to Disclose

W1-CMS10V **RSNA Hands-On Lab: Contrast Reaction Management**

Ogechi Nwosu Hickman, MD (*Presenter*) Nothing to Disclose

W1-CMS10W **RSNA Hands-On Lab: Contrast Reaction Management**

Avin Khera, MD (*Presenter*) Nothing to Disclose

W1-CMS10X **RSNA Hands-On Lab: Contrast Reaction Management**

Sarah Nwia, MD (*Presenter*) Nothing to Disclose

W1-CMS10Y **RSNA Hands-On Lab: Contrast Reaction Management**

Usman Beg, DO (*Presenter*) Nothing to Disclose

W1-CMS10Z **RSNA Hands-On Lab: Contrast Reaction Management**

Nihal Thapa, MD (*Presenter*) Nothing to Disclose

W1-CMS10AA **RSNA Hands-On Lab: Contrast Reaction Management**

Alexandra L. Aronowitz, MD (*Presenter*) Nothing to Disclose

W1-CMS10AB **RSNA Hands-On Lab: Contrast Reaction Management**

Sheila Mullen, MD (*Presenter*) Nothing to Disclose

W1-CMS10AC **RSNA Hands-On Lab: Contrast Reaction Management**

Aman S. Buttar, MD (*Presenter*) Nothing to Disclose

W1-CMS10AD **RSNA Hands-On Lab: Contrast Reaction Management**

Jonathan Dzielski, DO (*Presenter*) Nothing to Disclose

W1-CMS10AE **RSNA Hands-On Lab: Contrast Reaction Management**

Rajangad Gurtatta (*Presenter*) Nothing to Disclose

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W1-CNR09

Body Ablaze: Inflammatory and Autoimmune Disorders of the Brain, Orbit, Neck, and Spine

Wednesday, Dec. 3 8:00AM - 9:00AM Room: S406B

Nancy Pham, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify and describe the key imaging findings of inflammatory and autoimmune disorders affecting the brain, orbit, neck, and spine, and differentiate these disorders from other conditions, such as tumors.

COURSE DESCRIPTION

This session is designed to enhance understanding of the key clinical and imaging findings of inflammatory and autoimmune disorders affecting critical areas of the body. By the end of the session, attendees will be able to apply this knowledge in their clinical practice.

Sub-Events

W1-CNR09B **Brain on Fire: Inflammatory and Autoimmune Disorders of the Brain**

Joshua P. Nickerson, MD (*Presenter*) Nothing to Disclose

W1-CNR09C **Burning Eyes: Inflammatory and Autoimmune Disorders of the Orbit**

Burce Ozgen Mocan, MD (*Presenter*) Nothing to Disclose

W1-CNR09D **Pain in the Neck: Inflammatory and Autoimmune Disorders of Neck**

Osamu Sakai, MD, PhD (*Presenter*) Other-DSMB; Akouos, inc.. Consultant; Boston Imaging Core Lab, LLC

W1-CNR09E **Spine Under Siege: The Spectrum of Inflammatory Spondyloarthropathies**

Nancy Pham, MD (*Presenter*) Nothing to Disclose

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W1-COB07

What Every Radiologist Should Know: Second and Third Trimester (Covers Beyond the Fetus)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E351

Paula J. Woodward, MD (*Moderator*) Other-Book royalties ; Elsevier

LEARNING OBJECTIVES

1) Recognize imaging features and confidently diagnose conditions that are life threatening to either the fetus (e.g., vasa previa) or the mother (e.g. placenta accreta spectrum). 2) Review the radiologic assessment of abdominal pain in the pregnant patient. 3) Critically evaluate ovarian masses to differentiate benign from malignant and learn how that effects pregnancy management.

COURSE DESCRIPTION

Imaging in pregnancy extends beyond just looking at the fetus. This review course is specifically designed to look beyond the fetus and address many conditions that face the radiologist when a pregnant woman presents with bleeding, pain, or an adnexal mass. It will include a multi-modality approach with ultrasound, CT and MRI, highlighting appropriate use of each modality. There will be an emphasis on the unique challenges of both diagnosis and management in pregnancy. Specific topics to be covered include vasa previa, the acute abdomen, diagnosis and management of malignancy, and placenta accreta spectrum; all don't miss diagnoses.

Sub-Events

W1-COB07B **Why it Matters!**

Paula J. Woodward, MD (*Presenter*) Other-Book royalties ; Elsevier

W1-COB07C **Non-Fetal Obstetrical Emergencies (Oligo, Open Cvx, Vasa Previa)**

Roya Sohaey, MD (*Presenter*) Nothing to Disclose

W1-COB07D **Pain: Second and Third Trimester (Appy, Ureteral Stones, Abruption)**

Anne M. Kennedy, MBBCh (*Presenter*) Other-Royalties ; Elsevier

W1-COB07E **Malignancy in Pregnancy**

Priyanka Jha, MBBS (*Presenter*) Nothing to Disclose

W1-COB07F **International Perspective on PASD**

Carlos Carnelli, MD (*Presenter*) Nothing to Disclose

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W1-CPH06

Imaging Biomarkers in Radiotherapy: A Pathway to Precision Medicine

Wednesday, Dec. 3 8:00AM - 9:00AM Room: S404

Anil Sethi, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Examine the utility and untapped potential of imaging biomarkers across MRI, PET, and CT in radiotherapy. 2) Discuss the role of AI and advanced radiotherapy platforms in enhancing treatment precision. 3) Understand the application of imaging biomarkers across different cancer disease sites. 4) Identify current barriers to clinical implementation and pathways for equitable adoption of biological or biomarker guided personalized radiotherapy.

COURSE DESCRIPTION

This session explores the evolving role of imaging biomarkers in radiotherapy, focusing on their capacity to improve target delineation, systemically predict and monitor treatment response, and inform personalized clinical decision making. Recent advances in MRI, PET, and CT/CBCT modalities, coupled with quantitative image analyses and AI-driven analytics, are transforming cancer care by enabling greater personalization. Current key trends include leveraging functional and multiparametric imaging to uncover underlying tumor biology beyond structural morphology. Radiotherapy is evolving with adaptive platforms that generate AI driven high quality longitudinal imaging data to enhance prediction accuracy. Furthermore, molecular imaging probes are emerging to target tumorspecific pathways related to radiotherapy. Through a series of expert-led talks, attendees will learn how innovations in personalized treatment strategies are translating into improved patient outcomes with reduced toxicities. This session will also address potential challenges such as lack of standardization, validation, and equitable access to cutting edge technologies while fostering discussions on inclusive solutions in clinical and research settings.

Sub-Events

W1-CPH06B **Technological Advances in Biomarker Guided Radiotherapy: Convergence of Imaging Biomarkers, Advanced Radiotherapy Platforms, and AI**

X. Sharon Qi, PhD (*Presenter*) Grant/Research Support; Varian Inc. . Grant/Research Support; Manteia Medical Technologies CO.. Other-Stipend; Deputy editor for Medical Physics Journal

W1-CPH06C **Clinical Evidence and Utilization of Imaging Biomarkers in Radiotherapy**

Dandan Zheng, PhD (*Presenter*) Stock/Shareholder; Eli Lilly

W1-CPH06D **Current Frontiers, Challenges, and Future Directions for Quantitative Imaging in Radiotherapy**

Issam El Naqa, PhD (*Presenter*) Owner; iRAI Technologies, LLC

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W1-CRT04

ASRT@RSNA: Breast Imaging: AI vs. CAD: What's the Big Deal?

Wednesday, Dec. 3 8:00AM - 9:00AM Room: N226

Melissa Culp, MEd (*Moderator*) Nothing to Disclose
Peter Rath (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Develop an understanding of the various artificial intelligence tools available in breast imaging and how they affect the patient, technologist, and radiologist. 2) Evaluate the differences between AI and traditional computer-aided detection tools. 3) Identify applications of AI that may be useful in attendees' practices.

COURSE DESCRIPTION

The speaker will discuss how artificial intelligence is being implemented within breast imaging, as well as other aspects of patient care in breast centers. We will demonstrate how artificial intelligence can co-exist with the radiologist to improve workflow and highlight the differences in AI compared to computer-aided detection. Additionally, we will discuss how AI can help radiologic technologists with workflow and quality measures.

Sub-Events

W1-CRT04C **Breast Imaging: AI vs. CAD - What's the Big Deal?**

Rita Gidwaney, MD (*Presenter*) Consultant; ICad, Inc.

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W1-DLL07

RSNA Deep Learning Lab: An Introduction to Multi-agent Artificial Intelligence Systems in Radiology (Advanced) (Registration Fee Required)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: RADIOLOGY LEARNING LAB

Pouria Rouzrokh, MD, MPH (*Moderator*) Consultant; PaxeraHealth

LEARNING OBJECTIVES

1) Define and describe the attributes of an artificial intelligence (AI) agent as well as a multi-agent system. 2) Explain the fundamental differences between assigning a task to a basic large language model (LLM), to a workflow of LLMs, to an agent, or to a multi-agent system; provide real-life examples and use cases of when each approach can help in day-to-day radiologist practice. 3)Learn the core principles and methods for using an agentic programming framework (Google Agent Development Kit) to design single and multi-agent systems in Python.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. Transform your understanding of artificial intelligence (AI) from simple chatbots to sophisticated problem-solving systems in this hands-on Deep Learning Lab designed specifically for radiologists. As AI rapidly evolves beyond basic language models, radiologists need to understand how to leverage advanced AI architectures—including single AI agents and multi-agent systems—to enhance diagnostic accuracy, streamline workflows, and ultimately, improve patient care. This workshop addresses the critical gap between knowing AI exists and actually implementing it effectively for real scenarios. Through a combination of interactive lectures and practical coding exercises, you'll discover when to use different AI approaches: from simple large language model (LLM) queries for quick information retrieval, to complex multi-agent systems for comprehensive case analysis and workflow optimization. This intensive session combines engaging lectures with hands-on programming using Google Colab and the Google Agent Development Kit (ADK), ensuring you leave with both theoretical knowledge and practical skills. You'll learn to distinguish between AI agents and traditional LLMs, understand the unique capabilities of multi-agent systems, and master the fundamentals of building these systems using Python. By the end of this workshop, you'll be able to design and implement AI agent solutions tailored to real radiology challenges—from automated report generation to complex diagnostic reasoning tasks. Basic familiarity with AI concepts and Python programming is recommended to maximize your learning experience. Join us to move beyond AI basics and become proficient in creating intelligent systems that truly enhance your radiological practice.

Sub-Events

W1-DLL07B **RSNA Deep Learning Lab: Multi-agent AI Frameworks**

M. Moein Shariatnia, MD (*Presenter*) Nothing to Disclose

W1-DLL07C **RSNA Deep Learning Lab: Multi-agent AI Frameworks**

Melina Hosseiny, MD (*Presenter*) Nothing to Disclose

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W1-RCP05

RSNA/ESR Symposium: Advances in Prostate Cancer Imaging and Therapy: Imaging in Prostate Cancer Diagnosis

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E352

Ivo Schoots, MD, PhD (*Moderator*) Nothing to Disclose
Katarzyna J. Macura, MD, PhD (*Moderator*) Grant/Research Support; Profound Medical Corp. Other-Patents; Siemens Healthineers. Other-Author - Royalties; Elsevier

LEARNING OBJECTIVES

1) Describe the PI-RADS system and how it improves cancer detection. 2) Understand the importance of appropriate staging for treatment management, emphasizing the consequences of under-and overstaging. 3) Review the impact of structured prostate MRI reporting on improved interdisciplinary communication and patient management.

COURSE DESCRIPTION

This session will address a standardized approach to prostate cancer detection on imaging and structured reporting, and will highlight the principles of cancer staging.

Sub-Events

W1-RCP05C PI-RADS v 2.1 and Beyond

Ivo Schoots, MD, PhD (*Presenter*) Nothing to Disclose

W1-RCP05D T-Staging: Perspectives on Diagnosis and Treatment Planning

Patrick Asbach, MD (*Presenter*) Grant/Research Support; Siemens Healthineers, Canon Medical Systems, Bayer AG, Bracco S.p.A., Guerbet SA, Visage Imaging. Consultant; Professional Association of the German Radiologist (BDR e. V.)

W1-RCP05E Standardized Reporting - Role in Patient Management

Katarzyna J. Macura, MD, PhD (*Presenter*) Grant/Research Support; Profound Medical Corp. Other-Patents; Siemens Healthineers. Other-Author - Royalties; Elsevier

W1-RCP05F Interactive Case-Vignettes

Katarzyna J. Macura, MD, PhD (*Presenter*) Grant/Research Support; Profound Medical Corp. Other-Patents; Siemens Healthineers. Other-Author - Royalties; Elsevier

W1-RCP05G Interactive Case-Vignettes

Ivo Schoots, MD, PhD (*Presenter*) Nothing to Disclose

W1-RCP05H Interactive Case-Vignettes

Patrick Asbach, MD (*Presenter*) Grant/Research Support; Siemens Healthineers, Canon Medical Systems, Bayer AG, Bracco S.p.A., Guerbet SA, Visage Imaging. Consultant; Professional Association of the German Radiologist (BDR e. V.)

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W1-RCP20

Recognizing and Remediating Bullying: A Leadership Imperative (Sponsored by the RSNA Professionalism Committee)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: N227B

Aine M. Kelly, MBBCh, FRCR (*Moderator*) Nothing to Disclose
Sarah D. Bixby, MD, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Illustrate manifestations of bullying in professional workplace settings compared to traditional schoolground settings. 2) Identify attributes of traditional workplace bullies, and attributes that may predispose others to become victims of workplace bullies. 3) Explore factors that enable bullying in the workplace. 4) Formulate leadership structures and strategies effective at addressing and eliminating bullying.

COURSE DESCRIPTION

This session will focus on manifestations of workplace bullying in the radiology workplace, aim to better understand factors that enable bullying, and identify the role of leadership in facilitating and remediating bullying.

Sub-Events

W1-RCP20C **Reforming Leadership to Eliminate Bullying**

Carolyn C. Meltzer, MD (*Presenter*) Nothing to Disclose

W1-RCP20D **Bullies, Targets, Bystanders, Allies and Whistleblowers**

Tara M. Catanzano, MD (*Presenter*) Nothing to Disclose

W1-RCP20E **Enablers of and Fallout from Bullying**

Ann K. Jay, MD (*Presenter*) Consultant; Airs Medical

W1-RCP20F **From the Schoolground to the Reading Room**

Brian D. Coley, MD (*Presenter*) Other-Board member; no financial compensation; Eyas Medical Imaging. Other Financial or Material Support; Elsevier

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W1-RCP22

RadioGraphics: Editor's Picks/Choice Over the Years

Wednesday, Dec. 3 8:00AM - 9:00AM Room: S401

Antonio Luna, MD, PhD (*Moderator*) Speaker's Bureau; GE. Other-Digital Oncology advisory board member;; Siemens Healthiners. Owner; Cells-IA. Other-Lecturer; Siemens Healthineers. Speaker's Bureau; United Imaging. Other-MEDICAL ADVISORY BOARD MEMBER ; Olea Medical. Other-Lecture fee; Bayer
Christine O. Menias, MD (*Moderator*) Nothing to Disclose
Mark M. Hammer, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify and comprehend the key characteristics of different disease entities discussed in top RadioGraphics papers from the past year. 2) Correlate anatomic, pathologic, and imaging findings for a variety of pathologic conditions relevant to clinical radiology practice. 3) Understand the clinical significance and management implications of diseases from select RadioGraphics papers from the past year.

COURSE DESCRIPTION

RadioGraphics: Editor’s Choice course will highlight 4 published papers from the last year, where authors will summarize key points from their manuscripts highlighting the significance of imaging findings, clinical significance and management implications to the wider radiology community.

Sub-Events

W1-RCP22D **Anatomic Basis of Rectal Cancer Staging: Clarifying Controversies and Misconceptions**

Harmeet Kaur, MD (*Presenter*) Speaker's Bureau; Medtronics

W1-RCP22E **Practical Approach to Orbital Lesions by Anatomic Compartments**

Guilherme Naves, MD (*Presenter*) Nothing to Disclose

W1-RCP22F **Hip Capsulolabral Complex: Anatomy, Disease, MRI Features, and Postoperative Appearance**

Dyan V. Flores, MD (*Presenter*) Nothing to Disclose

W1-RCP22G **Central Role of CT in Management of Pulmonary Fibrosis**

Kum Ju Chae, MD, PhD (*Presenter*) Nothing to Disclose

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W1-RCP24

QI Metrics: Must Have, Should Have, Could Have (Sponsored by the RSNA Quality Improvement Committee)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E353C

Jay K. Pahade, MD (*Moderator*) Consultant; GE healthcare. Consultant; Bioclinica. Consultant; Guerbet

LEARNING OBJECTIVES

1) Provide an overview on current state of quality metrics in radiology and potential future metrics.

COURSE DESCRIPTION

This course will provide an overview on use of quality metrics, what metrics are commonly used, and what metrics departments can think of using in the future.

Sub-Events

W1-RCP24B **How to Get Started with Metrics**

Nadja Kadom, MD (*Presenter*) Nothing to Disclose

W1-RCP24C **From Dashboard to Improvement**

Andrew Bowman, MD, PhD (*Presenter*) Consultant; Argon Medical Devices

W1-RCP24D **What Should we Measure? How Can QI Metrics Be Used Strategically?**

Jay K. Pahade, MD (*Presenter*) Consultant; GE healthcare. Consultant; Bioclinica. Consultant; Guerbet

W1-RCP24E **Which Metrics Most Effectively Drive Safety Culture?**

Bettina Siewert, MD (*Presenter*) Nothing to Disclose

W1-RCP24F **Future Metrics and Benchmarking**

Hanna M. Zafar, MD, MS (*Presenter*) Nothing to Disclose

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W3-CCH06

Diffuse Lung Diseases: Updates and Recent Advances

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E451A

Lea Azour, MD (*Moderator*) Speaker's Bureau; Siemens

LEARNING OBJECTIVES

1) Identify pathologies that may present as diffuse lung disease. 2) Share updates and recent advances in the diagnosis and management of diffuse lung disease including smoking, hypersensitivity, pneumoconiosis, and granulomatous lymphocytic-related diseases.

COURSE DESCRIPTION

Thoracic imaging experts will highlight updates in the imaging diagnosis and management of diffuse lung diseases. Each of four presenters will discuss smoking related lung diseases, hypersensitivity pneumonitis, GL-ILD, and pneumoconiosis.

Sub-Events

W3-CCH06B Smoking Related Lung Disease

Stephen Hobbs, MD (*Presenter*) Nothing to Disclose

W3-CCH06C Hypersensitivity Pneumonitis

Justus E. Roos, MD (*Presenter*) Nothing to Disclose

W3-CCH06D Granulomatous Lymphocytic Interstitial Lung Disease

Smita Patel, MBBS, FRCR (*Presenter*) Nothing to Disclose

W3-CCH06E Pneumoconiosis

Jonathan H. Chung, MD (*Presenter*) Consultant; Boehringer Ingelheim. Speaker's Bureau; Boehringer Ingelheim. Consultant; Daiichi Sankyo. Consultant; Riverain

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W3-CHN01

Post-Treatment Neuroimaging: A Primer to Changes in the Brain, Skull Base, Neck, and Spine (Joint Session with Neuroradiology)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: N227B

Aubrey McMillan, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize typical and atypical imaging features of post-treatment changes and related complications in the brain, spine, skull base, and neck. 2) Differentiate post-treatment changes from pathologic entities, including infection and disease recurrence.

COURSE DESCRIPTION

In this case-based combined Neuroradiology and Head and Neck session, attendees will be presented with an overview of post-treatment imaging findings in the brain, spine, skull base, and neck. Speakers will emphasize imaging pearls that distinguish postoperative, post-radiation, and post-treatment changes from pathology, including recurrent disease and infection. This session offers attendees the opportunity to refine their interpretation of complex neuroradiology and head and neck imaging studies by incorporating tips from world experts.

Sub-Events

W3-CHN01B **Brain Basics: Decoding the Post-Treatment Brain**

Nancy J. Fischbein, MD (*Presenter*) Nothing to Disclose

W3-CHN01C **Spine Guide: Making Sense of the Post-Treatment Spine**

Michael D. Malinzak, MD, PhD (*Presenter*) Nothing to Disclose

W3-CHN01D **Skull Base Primer: Mastering the Post-Treatment Skull Base**

Gillian M. Potter, MD, FRCR (*Presenter*) Nothing to Disclose

W3-CHN01E **Neck Roadmap: Navigating the Post-Treatment Neck**

Yun Jung Bae, MD, PhD (*Presenter*) Nothing to Disclose

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W3-CNMMI05

Novel Radiopharmaceuticals on the Horizon (Advanced)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: S405

Aileen O'Shea, MBBCh (*Moderator*) Other-Funding for conference attendance ; Novartis

LEARNING OBJECTIVES

1) Provide an introduction and overview to emerging radiotracers and theranostic agents. 2) Recognize the utility of PET imaging in the context of novel immunotherapeutic agents. 3) Understand the breadth of applications of fibroblast activated protein inhibitor (FAPI) PET imaging in oncology and the basic principles of interpretation.

COURSE DESCRIPTION

During these three lectures, experts in their field will provide an overview of novel radiotracers which will play important roles in the diagnosis and treatment of oncologic and inflammatory conditions. This session will highlight some radiotracers which are in early clinical trial phases and those which are poised for routine clinical practice, such as FAPI PET. The impact of these radiotracers in the context of novel immunotherapies will be discussed.

Sub-Events

W3-CNMMI05B FAPI PET Imaging

Shadi Abdar Esfahani, MD, MPH (*Presenter*) Grant/Research Support; SOFIE Biosciences . Consultant; Telix Pharmaceuticals. Grant/Research Support; Telix Pharmaceuticals. Grant/Research Support; Novartis Pharmaceuticals

W3-CNMMI05C Applications of Novel Radioisotopes in Radiopharmaceutical Therapies

Daniel L. Thorek, PhD (*Presenter*) Consultant; Curium

W3-CNMMI05D Emerging Radiotracers and Radiotheranostic Agents

Yingbing Wang, MD (*Presenter*) Nothing to Disclose

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W3-CNPM05

Choose Your Weapon: A Debate on the Merits of Generalist vs. Specialty Training in 2025

Wednesday, Dec. 3 9:30AM - 10:30AM Room: S402

Hanna M. Zafar, MD, MS (*Moderator*) Nothing to Disclose
Michael J. Hicks, MD (*Moderator*) Consultant; GE Healthcare

LEARNING OBJECTIVES

1) Compare and contrast the advantages and challenges of generalist and subspecialist focused training models for modern day academic and private practice radiology settings. 2) Evaluate workforce and healthcare system needs in relation to radiologist training paradigms, considering regional, institutional, and population-specific demands. 3) Identify key factors influencing recruitment and retention strategies for radiologists over the next decade, including the impact of training background on adaptability and marketability. 4) Assess the implications of training pathways on clinical coverage, quality of care, and professional development in radiology practices. 5) Apply insights from the debate to inform strategic decisions in residency program design, radiologist hiring, and departmental planning.

COURSE DESCRIPTION

In this session, participants will debate the merits of training graduating residents to be generalists versus sub-specialists in the context of modern population needs and market demands. Both pro-generalist and pro-subspecialist perspectives will be offered from the private practice and academic viewpoints. This session will be relevant to not only those involved in the training of future radiologists, but also anyone who will be involved in or impacted by recruitment in the next decade.

Sub-Events

W3-CNPM05C **Pro-Generalist, Private Practice Perspective**

Catherine J. Everett, MD, MBA (*Presenter*) Owner; Eidetico PLLC. Consultant; MSN. Employee; Radiology Partners

W3-CNPM05D **Pro-Specialist, Private Practice Perspective**

Susan B. Truman, MD (*Presenter*) Nothing to Disclose

W3-CNPM05E **Pro-Generalist, Academic Practice Perspective**

Laura L. Avery, MD (*Presenter*) Nothing to Disclose

W3-CNPM05F **Pro-Specialist, Academic Practice Perspective**

Sanjeev Bhalla, MD (*Presenter*) Nothing to Disclose

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W3-CPD06

Game, Set, Scan: Halftime Report on Imaging Sports Injuries

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E350

Ara Kassarjian, MD, FRCPC (*Moderator*) Other-Advisor; Siemens Healthineers. Other-Advisor; Gleamer
Eric L. Tung, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize common pediatric sports-related injuries of the shoulders, elbows, knees, and ankles. 2) Compare the mechanisms behind and imaging appearances of acute and overuse injuries in children. 3) Differentiate normal imaging findings from true pathology in the shoulders, elbows, knees, and ankles of children.

COURSE DESCRIPTION

Active children and adolescents are susceptible to unique acute and overuse injuries. Radiologists are challenged with identifying these injuries and distinguishing them from normal developmental findings. This session will review various sports-related injuries that can afflict pediatric athletes through four lectures on shoulder, elbow, knee, and ankle pathologies.

Sub-Events

W3-CPD06C **Pediatric Shoulder Injuries**

Randheer Shailam, MD (*Presenter*) Nothing to Disclose

W3-CPD06D **Elbow Injuries in the Young Throwing Athlete**

Nancy A. Chauvin, MD (*Presenter*) Nothing to Disclose

W3-CPD06E **Sports Injuries of the Pediatric Knee**

Delma Y. Jarrett, MD (*Presenter*) Nothing to Disclose

W3-CPD06F **Pediatric Ankle Injuries**

Arthur B. Meyers, MD (*Presenter*) Consultant; Pfizer . Other-Author/Editor ; Elsevier

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W3-CPH04

Quantitative CT and MRI

Wednesday, Dec. 3 9:30AM - 10:30AM Room: S404

Michael F. McNitt-Gray, PhD (*Moderator*) Grant/Research Support; Siemens Healthineers. Other-Travel expenses and stipend for speaking; Kyoto Kagaku, LLTravel C

LEARNING OBJECTIVES

1) Understand general statistical approaches in establishing repeatability, reproducibility, precision, variance, and confidence intervals for image-based measurements from quantitative imaging modalities. 2) Understand advances in CT technology and standardization efforts for quantitative imaging. 3) Understand the medical physics workflow for cross-platform harmonization in MRI techniques to enable quantitative use of PDFF and ADC in multi-site clinical trials.

COURSE DESCRIPTION

Novel clinical imaging technologies offer improved image quality, and more importantly, provide quantitative information via image-based measurements. There is a greater need for understanding the physics behind quantitative measurements and evaluating these imaging modalities in terms of study design, statistical methods and models for data analysis to ensure precise, repeatable, and reproducible quantitative measurements. Advanced multi-energy CT systems such as dual-energy CT and photon-counting CT routinely provide quantitative images such as virtual non-calcium or non-contrast image, and virtual monoenergetic image. Similarly, clinical MRI routinely provides parametric maps for proton density fat fraction (PDFF) and apparent diffusion coefficient (ADC). However, these images are still largely used qualitatively in part due to biases in acquisition techniques, lack of standardization, site preferences, and vendor implementations. It is imperative to standardize the imaging methodology to achieve cross-platform harmonization and to enable the routine use of quantitative information available from these advanced imaging systems. This educational course focusing on advances in quantitative CT and MRI, and statistical methods for quantitative imaging are valuable to medical physics and radiology practitioners for developing standardized imaging techniques and analytical approaches that are vital to multicenter clinical trials involving imaging biomarkers.

Sub-Events

W3-CPH04B Statistical Considerations for Quantitative Imaging and Data Analysis

Grace Hyun Kim, PhD, MS (*Presenter*) Consultant; Voiant. Consultant; Curocell. Grant/Research Support; Boehringer Ingelheim. Other-The IPF-PRO/ILD-PRO Registry is supported by Boehringer Ingelheim Pharmaceuticals, Inc. and run in collaboration with the Duke Clinical Research Institute (DCRI) and enrolling centers; Boehringer Ingelheim. Other-Writing assistance was provided by FleishmanHillard, London, UK, funded by Boehringer Ingelheim Pharmaceuticals, Inc. ; Boehringer Ingelheim

W3-CPH04C Advances in Quantitative CT: Technical Considerations for Improved Standardization

Kishore Rajendran, PhD (*Presenter*) Nothing to Disclose

W3-CPH04D Progress Toward Clinical Applications of Quantitative MRI

Michael Boss, PhD (*Presenter*) Employee; GlaxoSmithKline

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W3-CRO01

Thoracic Malignancies: Multidisciplinary Case-Based Review

Wednesday, Dec. 3 9:30AM - 10:30AM Room: S401

Percy Lee, MD (*Moderator*) Consultant; AstraZeneca. Consultant; Gententech. Consultant; Varian. Consultant; Johnson and Johnson. Consultant; Roche

LEARNING OBJECTIVES

1) Apply evidence-based multidisciplinary strategies to manage complex thoracic malignancies, including stage III NSCLC, thymic tumors, limited-stage SCLC, and oligometastatic lung cancer. 2) Interpret radiographic findings with clinical nuance to guide treatment sequencing and modality selection in thoracic oncology cases. 3) Discuss the role and optimal timing of radiation therapy through case-based examples across various thoracic malignancy scenarios. 4) Identify key factors influencing systemic therapy decisions, including patient characteristics, disease biology, and evolving clinical evidence. 5) Evaluate considerations for local therapy selection, distinguishing when surgery versus radiation is appropriate based on disease presentation and multidisciplinary input.

COURSE DESCRIPTION

This multidisciplinary session will provide a case-based review of complex thoracic malignancies, bringing together expert perspectives from radiation oncology, medical oncology, thoracic surgery, and diagnostic radiology. Through real-world clinical scenarios—including stage III non-small cell lung cancer, limited-stage small cell lung cancer, thymic tumors, and oligometastatic disease—faculty will demonstrate how evidence-based tumor board strategies can guide nuanced decision-making. Emphasis will be placed on radiographic interpretation as a foundation for determining treatment sequencing and selecting appropriate modalities. Participants will gain insights into the timing and application of radiation therapy, criteria for systemic therapy selection, and the factors that influence local therapy choices between surgery and radiation. This session is designed to enhance the practical application of multidisciplinary collaboration in thoracic oncology and improve patient-centered care.

Sub-Events

W3-CRO01B **Thoracic Malignancies: Multidisciplinary Case-based Review**

Michelle S. Ginsberg, MD (*Presenter*) Nothing to Disclose

W3-CRO01C **Thoracic Malignancies: Multidisciplinary Case-based Review**

Andreas Rimner, MD (*Presenter*) Grant/Research Support; AstraZeneca. Grant/Research Support; Merck. Grant/Research Support; Boehringer Ingelheim. Grant/Research Support; Pfizer. Grant/Research Support; Varian Medical Systems. Consultant; MoreHealth. Consultant; AstraZeneca. Consultant; Merck. Other-Speaker fee; Boehringer Ingelheim

W3-CRO01D **Thoracic Malignancies: Multidisciplinary Case-based Review**

David W. Johnstone, MD (*Presenter*) Nothing to Disclose

W3-CRO01E **Thoracic Malignancies: Multidisciplinary Case-based Review**

Rafael Santana-Davila, MD (*Presenter*) Consultant; Catalyst Pharmaceuticals. Consultant; Amgen. Consultant; Genentech. Consultant; Takeda

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W3-CRT05

ASRT@RSNA: Harnessing Generative AI in Medical Imaging: Insights and Critical Appraisal

Wednesday, Dec. 3 9:30AM - 10:30AM Room: N226

Melissa Culp, MEd (*Moderator*) Nothing to Disclose
Peter Rath (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Gain an overview of generative AI. 2) Understand the performance of ChatGPT on CAMRT-style entry-to-practice exam. 3) Learn a framework for critiquing AI-powered applications.

COURSE DESCRIPTION

The rapid evolution of generative artificial intelligence presents transformative opportunities in medical imaging but also necessitates a critical understanding of its capabilities and limitations. This session will provide a comprehensive overview of generative AI focusing on chat-based applications, such as ChatGPT, and their implications for medical imaging professionals. The course will begin by defining generative AI and its relevance to health care, outlining the mechanisms that enable these systems to generate human-like text and interact in real time. A recent study evaluating ChatGPT's performance on a Canadian Association of Medical Radiation Technologists-style entry-to-practice exam will be reviewed, highlighting its strengths, weaknesses and potential as a supplementary tool for education and training. To guide medical imaging professionals in navigating AI developments, a framework for critically appraising AI-powered applications will be presented. This framework will emphasize the roles of transparency, performance and clinical applicability. Special attention will be given to the integration of AI in medical imaging and its potential to enhance quality, workflow efficiency and patient outcomes. The session will conclude with takeaways for medical imaging professionals that will equip attendees with the knowledge and tools to engage with AI advancements responsibly and effectively within their practice. Attendees will leave with a balanced perspective on the promises and challenges of generative AI in medical imaging.

Sub-Events

W3-CRT05C **Harnessing Generative AI in Medical Imaging: Insights and Critical Appraisal**

Ryan Duggan (*Presenter*) Stock/Shareholder; Densitas Inc. Consultant; Densitas Inc

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W3-DLL08

RSNA Deep Learning Lab: Transforming Radiology with LLMs: Fine-Tuning and Explainable AI for Next-Gen Clinical Solutions (Advanced) (Registration Fee Required)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: RADIOLOGY LEARNING LAB

Paul H. Yi, MD (*Moderator*) Consultant; FHOrtho. Consultant; Bunkerhill Health. Stock/Shareholder; Bunkerhill Health. Consultant; Philips

LEARNING OBJECTIVES

1) Identify key limitations of general-domain foundation models in radiology applications and strategies for adaptation through fine-tuning and Retrieval-Augmented Generation (RAG). 2) Apply hands-on techniques for customizing LLMs for radiology-specific data and evaluate their outputs for clinical relevance and interpretability. 3) Hands-on experience understanding methods for explainability to support safe and effective use in radiology workflows.

COURSE DESCRIPTION

In Person Session Only. Tickets must be purchased in advance for this course. This course can be added through the registration portal or by stopping by the Registration Desk. Space is limited. Large language models (LLMs) are increasingly explored across applications in Radiology, including report writing, research, and clinical decision support. However, these models are trained on broad, general-domain data and often underperform with specialized medical/radiology domain-specific tasks. This hands-on lab will provide participants with practical experience adapting LLMs for radiology via fine-tuning techniques, improve accuracy via Retrieval-Augmented Generation (RAG), and methods for interpretability of model "thinking" with explainable AI. The session will include a 30-minute lecture and discussion on the foundational concepts and a 50-minute guided Python notebook, implementing the methods. By the end of the session, participants will be equipped to adapt general-purpose LLMs for domain-specific radiology use cases and assess for transparency in model outputs. Agenda: Lecture & Discussion (30 mins): Overview of LLMs in radiology, introduction to fine-tuning and Retrieval-Augmented Generation (RAG). Discussion of challenges and importance of explainability in clinical settings Hands-On Lab (50 mins): Guided Python exercises covering fine-tuning with radiology data, implementing Retrieval-Augmented Generation workflows, and explainability Wrap-Up and Q&A (10 mins): Summary of key takeaways and discussion of future directions.

Sub-Events

W3-DLL08B **RSNA Deep Learning Lab: Transforming Radiology with LLMs - Fine-Tuning and Explainable AI for Next-Gen Clinical Solutions**

Briana Malik, BS (*Presenter*) Nothing to Disclose

W3-DLL08C **RSNA Deep Learning Lab: Transforming Radiology with LLMs - Fine-Tuning and Explainable AI for Next-Gen Clinical Solutions**

Dharmam Savani, MS (*Presenter*) Nothing to Disclose

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W3-RCP06

RSNA/ESR Symposium: Advances in Prostate Cancer Imaging and Therapy: Prostate Cancer: Developments on Quality Control and Artificial Intelligence

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E352

Andrei S. Purysko, MD (*Moderator*) Consultant; Koelis. Grant/Research Support; Blue Earth Medical. Grant/Research Support; American College of Radiology. Grant/Research Support; Lantheus. Grant/Research Support; Siemens Healthineers
Patrick Asbach, MD (*Moderator*) Grant/Research Support; Siemens Healthineers, Canon Medical Systems, Bayer AG, Bracco S.p.A., Guerbet SA, Visage Imaging. Consultant; Professional Association of the German Radiologist (BDR e. V.)

LEARNING OBJECTIVES

1) Highlight critical insights and practical strategies from initiatives focused on enhancing the quality and diagnostic accuracy of prostate MRI. 2) Understand the concepts of QC in the prostate diagnostic pathway to identify areas requiring quality improvement. 3) Understand and reflect how AI can be integrated into the diagnostic workflow.

COURSE DESCRIPTION

This engaging lecture-based symposium, co-hosted by RSNA and ESR, will explore recent advancements in prostate cancer imaging and therapy with a focus on quality control and artificial intelligence (AI). Prostate MRI has become central to the diagnosis and management of prostate cancer, yet ensuring consistent quality across practices remains a key challenge. This session will highlight collaborative efforts to standardize and elevate prostate MRI performance, discuss the role of structured quality assurance programs, and examine the impact and readiness of AI tools in clinical workflows. Attendees will gain insights from international leaders on how to optimize prostate imaging quality and prepare for AI integration in everyday practice.

Sub-Events

W3-RCP06C Mastering Excellence - Elevating Prostate MRI Standards

Andrei S. Purysko, MD (*Presenter*) Consultant; Koelis. Grant/Research Support; Blue Earth Medical. Grant/Research Support; American College of Radiology. Grant/Research Support; Lantheus. Grant/Research Support; Siemens Healthineers

W3-RCP06D Quality Control and Artificial Intelligence

Tristan Barrett, MBBS, MD (*Presenter*) Nothing to Disclose

W3-RCP06E AI-driven Diagnostic Tools - A New Toy or the Next Level?

Patrick Asbach, MD (*Presenter*) Grant/Research Support; Siemens Healthineers, Canon Medical Systems, Bayer AG, Bracco S.p.A., Guerbet SA, Visage Imaging. Consultant; Professional Association of the German Radiologist (BDR e. V.)

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W3-RCP30

Preparing for Oral Boards: Strategies and Exemplar Case-Taking Skills (Sponsored by the RSNA Resident and Fellow Committee)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E353B

Brandon K.K. Fields, MD (*Moderator*) Consultant; Mendaera
Megan K. Mercer, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Didactic Overview: Presentation on the overall structure of the oral board exam and the primary evaluation criteria; practical tips and "pearls" for successful case-taking, including communication strategies, time management, and handling challenging scenarios will be reviewed. 2) Exemplar Case-Taking: Three attending-level panelists representing different institutions and specialties will be individually presented with different cases in a mock exam format. A moderator will act as the examiner to simulate the experience. Panelists will model effective case-taking approaches, highlighting techniques that trainees can emulate. Panelists will be given ~12 minutes per case.

COURSE DESCRIPTION

Trainees are in the midst of navigating a sea change in certification requirements with the reinstatement of oral board examinations. While the ABR will retain some aspects of the legacy oral board examinations, key differences—such as standardized evaluation criteria—present unique considerations. This session will provide attendees with actionable insights and real-world examples to solidify confidence and competence in preparing for the oral boards in a relatively stress-free environment.

Sub-Events

W3-RCP30C **GI Case**

Derek Sun, MD (*Presenter*) Nothing to Disclose

W3-RCP30D **Breast Case**

Christopher P. Ho, MD (*Presenter*) Consultant; Mammotome (Devicor Devices)

W3-RCP30E **GU Case**

Erin N. Gomez, MD (*Presenter*) Nothing to Disclose

W3-RCP30F **Examiner**

George S. Bisset III, MD (*Presenter*) Nothing to Disclose

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W3-RCP41

Douglas W. MacEwan Rising Star Track: Art for the Radiology Educator

Wednesday, Dec. 3 9:30AM - 10:30AM Room: S501

Monika Radike, MD, PhD (*Moderator*) Nothing to Disclose
Sherry S. Wang, MBBS, FRANZCR (*Moderator*) Consultant; Bracco. Other-Book Royalties; Elsevier

LEARNING OBJECTIVES

1) Understand the bridges between creativity, curiosity, and learning/innovation. 2) Understand how art can be used to help educate learners. 3) Explore how to use art as part of your toolkit as a radiologist.

COURSE DESCRIPTION

This didactic and interactive course delves into the utilization of art as a teaching and engagement tool for radiology educators. The course will explore various themes and ideas, with the primary objective of equipping educators with actionable skills for practical application in their daily work. 1) AI art (for the radiologist who cannot draw) 2) The Art of PowerPoint 3) Art, Wellness, and the Radiologist

Sub-Events

W3-RCP41C **AI Art (For the Radiologist Who Cannot Draw)**

Jonathan Revels, DO (*Presenter*) Nothing to Disclose

W3-RCP41D **The Art of PowerPoint**

Jennifer S. Weaver, MD (*Presenter*) Consultant; Forensics Radiology Group

W3-RCP41E **Art, Wellness, and the Radiologist**

Erin A. Cooke, MD (*Presenter*) Nothing to Disclose

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W4-CIN13

LLMs in Clinical Practice

Wednesday, Dec. 3 11:00AM - 12:00PM Room: E450B

Ayis T. Pyrros, MD (*Moderator*) Consultant; Inference Analytics. Consultant; Brainnet.ai. Consultant; HOPPR.ai

LEARNING OBJECTIVES

1) Describe the current and potential applications of large language models (LLMs) in radiology and broader clinical practice. 2) Evaluate practical strategies for safely deploying LLMs, including prompt engineering and workflow integration, in a clinical environment. 3) Identify key considerations and best practices for leveraging foundation models to improve efficiency, reporting accuracy, and clinical decision-making.

COURSE DESCRIPTION

The rapid advancement of large language models (LLMs) such as GPT-4 and other foundation models is reshaping the landscape of medical AI, offering new opportunities to streamline workflows and enhance patient care. This session will provide a practical, hands-on overview of LLM applications in radiology practice. Expert faculty will share real-world use cases for LLM-driven report drafting, prompt engineering, and safe model deployment. Attendees will gain actionable insights into integrating LLMs into their daily practice while understanding both the benefits and limitations of these transformative technologies. The session will equip learners to evaluate, implement, and optimize LLM-based tools in a safe and effective manner.

Sub-Events

W4-CIN13B **Does Foundation Model CXR Report Drafting Help Radiologists in Clinical Practice?**

Louis Blankemeier, PhD (*Presenter*) Employee; Cognita Imaging, Inc

W4-CIN13C **Show Me the Prompts! LLM Use Cases You Can Deploy in Your Practice Now**

Michael J. Choe, MD (*Presenter*) Speaker's Bureau; Mindray. Consultant; HOPPR

W4-CIN13D **Nuts and Bolts - How do I Run an LLM Safely Right Now?**

Ayis T. Pyrros, MD (*Presenter*) Consultant; Inference Analytics. Consultant; Brainnet.ai. Consultant; HOPPR.ai

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W4-CRT06

ASRT@RSNA: Multidisciplinary Osteoporosis Care and the Radiographer's Role in Fracture Liaison Services

Wednesday, Dec. 3 11:00AM - 12:00PM Room: N226

Melissa Culp, MEd (*Moderator*) Nothing to Disclose
Peter Rath (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define osteoporosis and explain the benefits of screening programs for early detection and fracture prevention. 2) Discuss the importance of a multidisciplinary approach in the management of osteoporosis and fracture prevention. 3) Describe the radiographer’s role in a fracture liaison service in the U.K.

COURSE DESCRIPTION

Osteoporosis and fragility fractures are preventable outcomes of aging that are, unfortunately, still underdiagnosed and undertreated. This session will provide an overview of the radiographer’s role in fracture prevention and osteoporosis management through multidisciplinary care and fracture liaison services. Attendees will learn about opportunities for osteoporosis screening within existing patient pathways and how to support patients. The speaker will also discuss the future of early osteoporosis diagnosis using new and innovative technologies.

Sub-Events

W4-CRT06C Multidisciplinary Osteoporosis Care and the Radiographer's Role in Fracture Liaison Services

Rosie James, BSc, MSc (*Presenter*) Nothing to Disclose

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W6-CBR15

Assignment of Risk Based on Traditional Models Versus Age-Based and AI for Breast Cancer Screening

Wednesday, Dec. 3 1:30PM - 2:30PM Room: S406A

Bonnie N. Joe, MD, PhD (*Moderator*) Other-Author royalties; UpToDate

Sub-Events

W6-CBR15B **Risk based Screening versus Routine Interval Screening based on Age**

Bonnie N. Joe, MD, PhD (*Presenter*) Other-Author royalties; UpToDate

W6-CBR15C **Intermediate Risk Group based Screening**

Lars J. Grimm, MD (*Presenter*) Consultant; Hologic. Consultant; Medscape Reference

W6-CBR15D **Image based Risk and AI**

Fredrik Strand, MD, PhD (*Presenter*) Consultant; Voio. Stock/Shareholder; ClearScan AI. Speaker's Bureau; Lunit

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W6-CCA06

Cardiac MRI in Systemic Diseases: How Your Diagnosis Guides Treatment

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E353C

Jadranka Stojanovska, MD, MS (*Moderator*) Nothing to Disclose
Luba Frank, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the role of cardiac MR in detecting and characterizing cardiac involvement in systemic diseases such as rheumatologic, oncologic, and infiltrative conditions. 2) Interpret key cardiac MR findings that impact clinical decision-making and guide individualized treatment approaches in patients with systemic disease. 3) Understand evidence-based imaging strategies to enhance multidisciplinary care and improve outcomes for patients with systemic diseases affecting the heart.

COURSE DESCRIPTION

Course Description Cardiac MRI in Systemic Diseases: How Your Diagnosis Guides Treatment This didactic lecture session will explore the pivotal role of cardiac MR in diagnosing and managing systemic diseases with cardiac involvement. As systemic conditions such as rheumatologic disorders, cancer therapies, and infiltrative diseases increasingly impact the heart, advanced imaging is essential for accurate diagnosis and personalized treatment planning. Expert faculty will illustrate how cardiac MRI findings directly inform clinical decisions and optimize patient outcomes. The session will include lectures and interactive discussions, informing participants with practical knowledge to confidently interpret cardiac MR in complex systemic disease scenarios. Format: Lecture and interactive discussion Expected Outcome: Participants will gain an understanding of the diagnostic and prognostic value of cardiac MR in systemic diseases, empowering them to apply imaging findings to guide treatment strategies and engage in interdisciplinary management.

Sub-Events

W6-CCA06C **Cardio-Rheumatology**

Luigi Natale, MD (*Presenter*) Nothing to Disclose

W6-CCA06D **Cardio-oncology**

Chad D. Strange, MD (*Presenter*) Nothing to Disclose

W6-CCA06E **Cardiac Sarcoid: Imaging to Guide Treatment**

Avanti Gulhane, MD (*Presenter*) Nothing to Disclose

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W6-CCH09

Multidisciplinary Approach to Diffuse Lung Diseases

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E451A

David A. Lynch, MBBCh (*Moderator*) Consultant; Calyx Inc. Consultant; Boehringer Inghelheim. Consultant; Daiichi Sankyo. Consultant; Astra Zeneca. Consultant; Merck

LEARNING OBJECTIVES

1) Understand how to interpret diffuse lung diseases images with inputs from various specialties. 2) Apply multidisciplinary principles for formulate strategies for diagnostic work-up and treatment of diffuse lung diseases.

COURSE DESCRIPTION

This course explores the complexities of diffuse lung diseases through a comprehensive, team-based lens using a case-based approach. Designed for radiologists of various levels of experience, it emphasizes collaborative diagnostic and therapeutic strategies often required for optimal patient care.

Sub-Events

W6-CCH09B Radiologist's Perspective

David A. Lynch, MBBCh (*Presenter*) Consultant; Calyx Inc. Consultant; Boehringer Inghelheim. Consultant; Daiichi Sankyo. Consultant; Astra Zeneca. Consultant; Merck

W6-CCH09C Pathologist's Perspective

Rosane D. Duarte Achcar, MD (*Presenter*) Nothing to Disclose

W6-CCH09D Pulmonologist's Perspective

Jeff Swigris, MD (*Presenter*) Consultant; Abbbie. Consultant; Puretech. Consultant; Tvardi. Stock/Shareholder; Tvardi. Consultant; Avalyn. Consultant; Astra Zeneca. Consultant; CSL Behring. Consultant; Boehringer Ingelheim. Consultant; BMS. Consultant; Gossamer. Consultant; GSK. Consultant; Pliant

W6-CCH09E Radiologist's Perspective

Tami J. Bang, MD (*Presenter*) Nothing to Disclose

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W6-CER11

Multi-Energy CT: Advanced Imaging Practices in Emergency Radiology

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E450A

Jeremy R. Wortman, MD, BA (*Moderator*) Consultant; United Imaging Intelligence
Krystal Archer-Arroyo, MD (*Moderator*) Consultant; Siemens Healthineers USA

LEARNING OBJECTIVES

1) Identify how multi-energy CT can improve accuracy in the acute care setting. 2) Explain common pitfalls in the use of multi-energy CT in emergency radiology. 3) Describe how multi-energy CT can be used for common incidental findings.

COURSE DESCRIPTION

This educational session will explore the uses of Multi-Energy CT (MECT) in Emergency Radiology, highlighting the impact of this technology on diagnostic accuracy and clinical decision-making in the acute care setting. Expert speakers will discuss the applications of MECT in the emergent setting, its value in characterizing acute bowel pathology, and its utility in identifying and interpreting incidental findings. Through case-based presentations and practical insights, attendees will gain a deeper understanding of how MECT can improve diagnostic confidence, workflows, and patient outcomes in Emergency Radiology.

Sub-Events

W6-CER11C MECT in the Emergent Setting

Nicolas Murray, MD, FRCPC (*Presenter*) Nothing to Disclose

W6-CER11D Spectral Imaging of Acute Bowel Pathology

Gopal V. Punjabi, MD (*Presenter*) Speaker's Bureau; Philips Medical

W6-CER11E Multi-Energy CT for Incidental Findings

Hei Shun Yu, MD (*Presenter*) Nothing to Disclose

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W6-CGI10

LIRADS (Advanced)

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E451B

Aya Kamaya, MD (*Moderator*) Other-Book royalties; Elsevier

LEARNING OBJECTIVES

1) Understand the LI-RADS US Surveillance algorithm for patients at-risk for HCC. 2) Be able to characterize focal liver lesions using LI-RADS for CT, MRI, and CEUS. 3) Learn how to characterize focal liver lesions after treatment.

COURSE DESCRIPTION

This course will provide a comprehensive overview of various aspects of imaging and management of patients with hepatocellular carcinoma (HCC) utilizing Liver Imaging and Reporting Data Systems (LI-RADS) including surveillance in at-risk patients, characterization of liver lesions with CT, MRI, and CEUS, and evaluation of liver lesions after treatment to assess for treatment response.

Sub-Events

W6-CGI10B Evidence Supporting Updates to CT and MR LIRADS

Victoria Chernyak, MD, MS (*Presenter*) Consultant; Bayer. Other-Member of the steering committee, paid lecturer; Medscape

W6-CGI10C HCC Surveillance with Ultrasound

James Seow, MBBS, FRANZCR (*Presenter*) Consultant; Bayer AG

W6-CGI10D CEUS LI-RADS

Yi Dong, MD, PhD (*Presenter*) Nothing to Disclose

W6-CGI10E LI-RADS Treatment Response

Richard Kinh Gian Do, MD, PhD (*Presenter*) Nothing to Disclose

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W6-CIN14

AI in Population Health (Advanced)

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E450B

Merel Huisman, MD, PhD (*Moderator*) Stock/Shareholder; xAID LLC. Speaker's Bureau; Canon. Speaker's Bureau; Abbvie. Speaker's Bureau; MedicalPhit consultancy

LEARNING OBJECTIVES

1) Distinguish between population health applications and hospital care applications of AI in clinical practice. 2) Evaluate the opportunities and pitfalls of (AI-based) prognostication. 3) Propose and appraise potential agentic workflows for personalized, patient-centric healthcare delivery.

COURSE DESCRIPTION

This advanced session is designed for participants with a solid understanding of current AI in clinical practice. Through didactic lectures and interactive discussions, participants will gain insights into the differences between population health applications and hospital care applications of AI. Attendees will understand the opportunities and pitfalls regarding AI-based prognostication with use-cases biologic aging CT biomarkers and breast cancer risk prediction. Potential future agentic workflows for personalized oncology care and shared decision making using AI will be explored as well.

Sub-Events

W6-CIN14B The AI Side Hustle: What Else your Mammogram is doing While Screening for Cancer

Laura Heacock, MD, MS (*Presenter*) Nothing to Disclose

W6-CIN14C Next-Generation Cancer Care: The Role of Healthcare Multi-Agents AI Orchestrators

Alberto Santamaria Pang, PhD (*Presenter*) Employee; Microsoft. Other-Adjunct Faculty at Biomedical Informatics and Data Science.; Johns Hopkins Medicine

W6-CIN14D Opportunistic CT for Phenotypic Biological Aging

Perry J. Pickhardt, MD (*Presenter*) Consultant; Bracco Diagnostics. Consultant; Nanox-X AI. Consultant; GE HealthCare. Stock/Shareholder; ColoWatch. Stock/Shareholder; Elucent. Stock/Shareholder; SHINE

W6-CIN14E From Images to Insights: Radiology's Role in Population Health Management

Nasir A. Siddiqui, MD (*Presenter*) Employee; Akumin

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W6-CMK15

MSK Sports Imaging: From Weekend Warrior to Professional Athlete

Wednesday, Dec. 3 1:30PM - 2:30PM Room: N228

Christopher F. Beaulieu, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Improve understanding of imaging protocols for sports injuries in various anatomic locations. 2) Learn to identify and classify imaging patterns in athletic injuries. 3) Appreciate common acute and chronic pathological conditions affecting both weekend warriors and professional athletes.

COURSE DESCRIPTION

This is a didactic lecture course covering a wide variety of sports-related injuries in both amateur and professional athletes. Attendees will learn tips for improving their imaging protocols and how to accurately diagnose acute and overuse musculoskeletal injuries.

Sub-Events

W6-CMK15B **The Spine in Sport: Protocols and Pathology**

Justin C. Lee, MBBS, FRCR (*Presenter*) Nothing to Disclose

W6-CMK15C **Pectoralis Injury: Imaging Tips and Tricks**

James M. Linklater, FRANZCR, BMedSc (*Presenter*) Nothing to Disclose

W6-CMK15D **The Athletic Groin: Advanced Imaging**

Adam C. Zoga, MD, MBA (*Presenter*) Nothing to Disclose

W6-CMK15E **Imaging the Achilles: Overuse and Acute Injuries**

Megan K. Mills, MD (*Presenter*) Nothing to Disclose

W6-CMK15F **Common Patterns of Ligamentous Injury Around the Ankle**

Eva Llopis, MD (*Presenter*) Nothing to Disclose

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W6-CMS03

Image Fusion Technologies and Clinical Utilities

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E353A

Nariman Nezami, MD (*Moderator*) Other-Advistory Borad; CAPS Medical. Owner; Nezami LLC. Owner; IRAD Graphics. Owner; Informed Medical Solutions. Consultant; Boston Scientific. Other-Safety Monitor; Microbot Medical. Consultant; Medtronic. Owner; NextSight Consulting. Grant/Research Support; Guerbet Medical

LEARNING OBJECTIVES

1) Understand the principles of image fusion and its role in multimodal imaging. 2) Explore clinical applications in oncology, neurology, musculoskeletal, and vascular imaging. 3) Learn about real-time image fusion for interventional procedures, including biopsies, tumor ablations, and vascular interventions. 4) Discuss the challenges, limitations, and future advancements in fusion imaging technology.

COURSE DESCRIPTION

This course provides a comprehensive overview of image fusion technologies and their applications in clinical practice. Participants will explore the principles of image registration, multimodality fusion (CT, MRI, PET, ultrasound), and real-time navigation systems. The curriculum covers technical aspects of fusion software, workflow integration, and quality assurance. Emphasis is placed on the clinical utility of image fusion in interventional radiology, oncology, surgery, and radiation therapy, with case-based examples illustrating enhanced procedural accuracy, safety, and outcomes.

Sub-Events

W6-CMS03B Image Fusion Needs in Dual Energy CT

Aaron D. Sodickson, MD, PhD (*Presenter*) Grant/Research Support; Siemens Healthineers. Other-Speaker honoraria; Siemens Healthineeers

W6-CMS03C Clinical Applications in Oncology

Clifford Shin, MD, PhD (*Presenter*) Nothing to Disclose

W6-CMS03D Clinical Applications in Neurology

Licia P. Luna, MD, PhD (*Presenter*) Nothing to Disclose

W6-CMS03E Real-time Image Fusion in Interventional Radiology

Keith M. Horton, MD (*Presenter*) Grant/Research Support; MediView

W6-CMS03F Advanced Technologies and Role of AI in Image Fusion

Charles Martin III, MD (*Presenter*) Consultant; Boston Scientific. Consultant; Terumo Medical. Consultant; MediView IR, Inc.. Consultant; Medtronic. Consultant; Cook Medical

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W6-CNPM12

Best Practices for Inclusive Pathways to Workforce Development (Sponsored by the RSNA Committee on Diversity, Equity, and Inclusion)

Wednesday, Dec. 3 1:30PM - 2:30PM Room: S402

Efren J. Flores, MD (*Moderator*) Nothing to Disclose
Judy Yee, MD (*Moderator*) Grant/Research Support; GE Healthcare

LEARNING OBJECTIVES

1) Provide strategies as to how early exposure to radiology can inspire interest in healthcare careers among high school students. 2) Examine the challenges faced by underserved students in higher education and how to promote academic success. 3) Demonstrate how research experiences in oncology can foster scientific curiosity and early career development in healthcare.

COURSE DESCRIPTION

This session explores innovative outreach and education initiatives to engage and empower students to explore careers in healthcare and in particular radiology. The session highlights the value of early exposure, mentorship, and inclusive programming in shaping the next generation of diverse healthcare and research professionals.

Sub-Events

W6-CNPM12C **RadExpo - Radiology is Fun!**

Olga Pasternak Wise, MD, MS (*Presenter*) Nothing to Disclose

W6-CNPM12D **Bringing Radiology to High School Students**

Judy Yee, MD (*Presenter*) Grant/Research Support; GE Healthcare

W6-CNPM12E **Seeds of Discovery: Cultivating Future Radiologists Through Research and Mentorship**

Anand K. Narayan, MD, PhD (*Presenter*) Nothing to Disclose

W6-CNPM12F **Strategies in Inclusion and Connection To Promote Belonging for Learners**

Matthew D. Bucknor, MD (*Presenter*) Nothing to Disclose

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W6-CNR07

Advanced Tools for Post-Operative Imaging of Brain Tumors

Wednesday, Dec. 3 1:30PM - 2:30PM Room: S406B

Nikdokht Farid, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the utility of RANO and BT-RADS in the evaluation of post-operative brain tumor imaging, particularly in communicating radiologic interpretation and recommendations to clinical colleagues. 2) Understand how cutting-edge perfusion techniques such as DSC perfusion-derived fractional tumor burden (FTB) and ASL perfusion can differentiate treatment change from recurrent tumor.

COURSE DESCRIPTION

In this Advanced Neuroradiology session, attendees will review the imaging approach to post-operative evaluation of brain tumors. In addition to learning about formal brain tumor assessment and reporting systems including RANO (Response Assessment in Neuro-Oncology) and BT-RADS (Brain Tumor Reporting and Data System), attendees will learn how to use cutting-edge perfusion techniques to differentiate treatment change from recurrent tumor. By the end of this session, participants will be better equipped to accurately interpret post-operative brain tumor imaging and to effectively communicate their interpretation and recommendations to our clinical colleagues.

Sub-Events

W6-CNR07B **Radiologist's Update on RANO/AI-RANO Criteria in Brain Tumor Assessment**

Javier Villanueva-Meyer, MD (*Presenter*) Grant/Research Support; GE HealthCare. Consultant; Alpheus Medical. Consultant; Servier. Speaker's Bureau; Telix Medical

W6-CNR07C **BT-RADS Demystified: A Radiologist's Guide to Brain Tumor Classification**

Ana Ramos, MD (*Presenter*) Nothing to Disclose

W6-CNR07D **Advances in DSC Perfusion: Quantifying Tumor Burden in Brain Tumor Surveillance**

Michael Iv, MD (*Presenter*) Consultant; Octave Bioscience Inc.. Consultant; Hanalytics Pte Ltd. Consultant; NordicImagingLab AS. Other-One time lecture; Imaging Biometrics. Consultant; Bayer CNS Advisory Group

W6-CNR07E **Advanced ASL Perfusion Imaging for Brain Tumor Monitoring**

Nikdokht Farid, MD (*Presenter*) Nothing to Disclose

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W6-CPD09

Fast, Smart, and Data-Driven: Charting the Future Landscape of Pediatric Radiology

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E350

Lane F. Donnelly, MD (*Moderator*) Nothing to Disclose
Marcelo S. Takahashi, MD, PhD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe data-driven strategies and key performance indicators to optimize operational efficiency and patient access in pediatric radiology. 2) Explain the fundamental applications of artificial intelligence (AI) in pediatric imaging, including its role in interpretation, reporting, and addressing unique pediatric challenges. 3) Identify and apply accelerated imaging protocols and other innovative techniques to reduce examination times and minimize the need for sedation and general anesthesia in pediatric patients.

COURSE DESCRIPTION

This educational session will review contemporary advancements in pediatric radiology focused on improving efficiency, diagnostic precision, and patient safety. The curriculum examines the use of departmental data and key performance metrics to inform operational strategies and enhance patient access. The session will cover the practical applications of artificial intelligence (AI) in pediatric imaging, including its role in interpretation and reporting, alongside the challenges specific to pediatric AI development. Further topics include the implementation of accelerated MRI protocols and a discussion of techniques designed to minimize the use of sedation and general anesthesia. The goal is to provide attendees with a clear understanding of these emerging strategies to support their integration into clinical practice.

Sub-Events

W6-CPD09C Data-Driven Strategies in Pediatric Radiology Administration

Sarah D. Bixby, MD, MBA (*Presenter*) Nothing to Disclose

W6-CPD09D Optimizing Fast Imaging (Accelerated Imaging Protocols)

Shreyas S. Vasanawala, MD, PhD (*Presenter*) Grant/Research Support; GE Healthcare. Stock/Shareholder; Inkspace Imaging. Stock/Shareholder; HeartVista. Grant/Research Support; Siemens Healthineers

W6-CPD09E Minimizing Sedation and General Anesthesia

Franz Wolfgang Hirsch, MD, PhD (*Presenter*) Nothing to Disclose

W6-CPD09F AI Strategies to Facilitate Imaging Interpretation and Reporting

Alex Towbin, MD (*Presenter*) Other-Travel to speak at user conference; Merative. Consultant; Applied Radiology. Other-Author roaylties; Elsevier. Grant/Research Support; Bayer

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W6-CRO06

Gastroesophageal Tumor Multidisciplinary Session

Wednesday, Dec. 3 1:30PM - 2:30PM Room: S401

Ann Raldow, MD, MPH (*Moderator*) Grant/Research Support; Viewray, Inc.. Grant/Research Support; BlueHalo

LEARNING OBJECTIVES

1) Interpret complex imaging findings relevant to gastroesophageal malignancies through expert-led review of radiologic studies. 2) Differentiate appropriate management strategies for localized versus advanced gastroesophageal cancers, integrating input from surgery, medical oncology, radiation oncology, and interventional endoscopy. 3) Assess criteria for resectability and operability, incorporating surgical and radiologic perspectives, including anatomical considerations, patient comorbidities, and tumor stage. 4) Formulate evidence-based treatment plans for gastroesophageal cancer patients, including sequencing of chemotherapy, chemoradiation, and surgery, with attention to current guideline recommendations and recent clinical trial data.

COURSE DESCRIPTION

Gastroesophageal cancers present unique diagnostic and therapeutic challenges that require a nuanced, multidisciplinary approach. This interactive case-based session brings together experts in radiology, surgery, medical oncology, radiation oncology, and interventional gastroenterology to review real-world cases and discuss optimal management strategies. Participants will gain insight into state-of-the-art imaging interpretation, staging criteria, treatment sequencing, and evolving roles for endoscopic and radiation-based therapies. Emphasis will be placed on integrating multiple perspectives to navigate complex decision-making and tailor individualized treatment plans. The format includes case presentations followed by multidisciplinary discussion, enabling learners to engage directly with faculty and peers in collaborative problem-solving. This session is ideal for clinicians seeking to strengthen their understanding of multidisciplinary cancer care and improve coordination across specialties. By the end of the session, learners will be better equipped to apply evidence-based, team-oriented strategies in the care of patients with gastroesophageal tumors.

Sub-Events

W6-CRO06B **Gastroesophageal Tumor Multidisciplinary Session**

Spencer C. Behr, MD (*Presenter*) Grant/Research Support; GE Healthcare. Consultant; GenVivo. Consultant; Novartis. Consultant; Riboscience

W6-CRO06C **Gastroesophageal Tumor Multidisciplinary Session**

Trudy Wu (*Presenter*) Nothing to Disclose

W6-CRO06D **Gastroesophageal Tumor Multidisciplinary Session**

Geoffrey Ku, MD (*Presenter*) Grant/Research Support; AstraZeneca. Consultant; BeOne. Grant/Research Support; Jazz. Consultant; Jazz. Consultant; Gilead. Grant/Research Support; Merck. Consultant; Merck. Grant/Research Support; Oncolys. Consultant; Oncolys. Grant/Research Support; Pieris. Consultant; Pieris. Consultant; AstraZeneca. Grant/Research Support; Triumvira. Grant/Research Support; Zymeworks. Consultant; Zymeworks. Other Financial or Material Support; Dava Oncology. Other Financial or Material Support; I-MAB. Grant/Research Support; BMS. Consultant; BMS. Grant/Research Support; CARsgen. Grant/Research Support; Daiichi Sankyo. Consultant; Daiichi Sankyo. Grant/Research Support; I-MAB. Consultant; I-MAB

W6-CRO06E **Gastroesophageal Tumor Multidisciplinary Session**

Ernest Chan, MD, MPH (*Presenter*) Nothing to Disclose

W6-CRO06F **Gastroesophageal Tumor Multidisciplinary Session**

Dennis Chen, MD (*Presenter*) Consultant; Cook Medical

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W6-CRT07

ASRT@RSNA: Aristotle Meets Kotter: The Role of Communication in Driving Successful Change Management in Healthcare

Wednesday, Dec. 3 1:30PM - 2:30PM Room: N226

Melissa Culp, MEd (*Moderator*) Nothing to Disclose
Peter Rath (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define the three types of rhetoric as a means of persuasion and how they affect changes in behavior. 2) Identify the basic framework of John Kotter's 8-Step Change Model and why linear communication delivery fails to change behavior. 3) Recognize and apply the basic concepts of rhetoric and communication science to accelerate the transformation to change champions. 4) Demonstrate an understanding of the connection between the art of persuasion, the science of communication, and successful change management efforts via a review of research and examples in health care change management.

COURSE DESCRIPTION

In 1995, John Kotter published what has since become the stalwart guide to successful change management. His 8-Step Change Model centers communication as a key component in driving successful change efforts. We know how important communication is to change management, yet poor communication is still the No. 1 reason change efforts fail. Communication to create changes in behavior is far more complex than simply delivering information. The speaker will discuss Aristotle's beliefs about this concept in the 4th-century B.C., and how John Kotter applied these communication principles in the modern era. Take a quick trip to ancient Greece to learn more about the three types of rhetoric, why we respond or don't respond to each type, and how to leverage this foundational aspect of communication science in change efforts.

Sub-Events

W6-CRT07C **Aristotle Meets Kotter: The Role of Communication in Driving Successful Change Management in Healthcare**

Stefanie Manack, MS, RT (*Presenter*) Nothing to Disclose

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W6-RCP07

RSNA/ESR Symposium: Advances in Prostate Cancer Imaging and Therapy: Monitoring Prostate Cancer

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E352

Fiona M. Fennessy, MBBCh, PhD (*Moderator*) Nothing to Disclose
Tristan Barrett, MBBS, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review MRI-guided approaches for triaging patients and selecting optimal biopsy strategies to enhance early prostate cancer detection. 2) Appreciate the clinical relevance of multiparametric MRI for treatment decision-making during active surveillance. 3) Highlight the importance of managing patient biochemical recurrence based on patient risk stratification and to understand when to use MR-based scoring systems and whole-body imaging for recurrence assessment.

Sub-Events

W6-RCP07C Hitting the Target - MRI-Guided Biopsy Strategies for Prostate Cancer Detection

Andrei S. Purysko, MD (*Presenter*) Consultant; Koelis. Grant/Research Support; Blue Earth Medical. Grant/Research Support; American College of Radiology. Grant/Research Support; Lantheus. Grant/Research Support; Siemens Healthineers

W6-RCP07D MRI in Active Surveillance

Tristan Barrett, MBBS, MD (*Presenter*) Nothing to Disclose

W6-RCP07E Prostate Cancer Recurrence Assessment

Fiona M. Fennessy, MBBCh, PhD (*Presenter*) Nothing to Disclose

W6-RCP07F Interactive Case-Vignettes

Andrei S. Purysko, MD (*Presenter*) Consultant; Koelis. Grant/Research Support; Blue Earth Medical. Grant/Research Support; American College of Radiology. Grant/Research Support; Lantheus. Grant/Research Support; Siemens Healthineers

W6-RCP07G Interactive Case-Vignettes

Tristan Barrett, MBBS, MD (*Presenter*) Nothing to Disclose

W6-RCP07H Interactive Case-Vignettes

Fiona M. Fennessy, MBBCh, PhD (*Presenter*) Nothing to Disclose

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W6-RCP44

Pearls and Pitfalls of Implementing Advanced Practice Providers (APPs) in Radiologist-Led Team

Wednesday, Dec. 3 1:30PM - 2:30PM Room: N227B

Brandon Smith (*Moderator*) Employee; GE Healthcare
Richard E. Heller III, MD, MBA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the clinical roles and responsibilities of Advanced Practice Providers (APPs) in both diagnostic and interventional radiology settings. 2) Describe the benefits and limitations of integrating APPs into radiology workflows, including their impact on efficiency, patient care, and physician workload. 3) Identify important billing and compliance issues regarding the use of APPs in radiology.

COURSE DESCRIPTION

This session, intended to help departments and practices considering introducing or refining the use of Advanced Practice Providers (APPs*), will explore the evolving role of APPs in radiology, highlighting both the advantages and challenges of their integration. Speakers will share insights into the clinical impact of APPs in diagnostic and interventional radiology, including workflow optimization, patient communication, and procedural assistance. The session will also address common pitfalls, such as scope-of-practice limitations, variability in training, and oversight concerns as well as include a discussion of billing and compliance issues. *such as nurse practitioner (NP), physician assistant (PA), radiologist assistant (RA), radiology practitioner assistant (RPA), or registered radiologist assistant (RRA)

Sub-Events

W6-RCP44C **Incorporating Radiologist Assistants into Clinical Practice**

Christopher M. Young, RRA, RT (*Presenter*) Nothing to Disclose

W6-RCP44D **Incorporating Radiologist Assistants into Clinical Practice**

Lauren M. Burke, MD (*Presenter*) Nothing to Disclose

W6-RCP44E **Incorporating Physician Assistants into Clinical Practice**

Courtney Watson (*Presenter*) Nothing to Disclose

W6-RCP44F **Incorporating Physician Assistants into Clinical Practice**

Sabala Mandava, MD (*Presenter*) Nothing to Disclose

W6-RCP44G **Incorporating Nurse Practitioners into Clinical Practice**

Jessica Wallace, RN (*Presenter*) Nothing to Disclose

W6-RCP44H **Incorporating Nurse Practitioners into Clinical Practice**

Aarti Luhar, MD (*Presenter*) Nothing to Disclose

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W7-CER12

Challenging Topics in Emergency Radiology

Wednesday, Dec. 3 3:00PM - 4:00PM Room: S401

Ellen X. Sun, MD (*Moderator*) Nothing to Disclose
Lawrence C. Chow, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the common surgeries in gender affirming care and potential associated complications. 2) Review common causes of ED presentation in cancer patients, associated imaging findings, and prognostic implications around emergently diagnosed malignancies. 3) Recognize the mechanisms of injury and imaging findings associated with intimate partner violence (IPV) and define the role of the radiologist in identifying victims of IPV.

COURSE DESCRIPTION

The lectures in this session focus on three potentially less familiar topics in emergency radiology which present unique and specific challenges for the emergency radiologist. Oncology related emergencies and complications of gender affirming surgery are being seen with greater frequency in the emergency department while intimate partner violence remains underdiagnosed. All require specific knowledge to avoid imaging related diagnostic errors and missed diagnoses. By the end of the session, attendees will have greater familiarity and awareness of these entities and be better equipped to recognize and identify their key imaging features.

Sub-Events

W7-CER12C **Transgender Imaging: Tips for the Emergency Radiologist**

Lawrence C. Chow, MD (*Presenter*) Nothing to Disclose

W7-CER12D **Intimate Partner Violence**

Ellen X. Sun, MD (*Presenter*) Nothing to Disclose

W7-CER12E **Oncologic Emergencies**

Meghan G. Lubner, MD (*Presenter*) Other-spouse, consultant; Elephas Bio

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W7-CHN06

Case-Based Review of Tricky Spaces of the Skull Base and Suprahyoid Neck

Wednesday, Dec. 3 3:00PM - 4:00PM Room: N227B

Sara B. Strauss, MD (*Moderator*) Nothing to Disclose

Sub-Events

W7-CHN06B **Central Skull Base and Petrous Apex**

Jan W. Casselman, MD, PhD (*Presenter*) Speaker's Bureau; Cefla S.A. - NewTom. Consultant; Cefla S.A. - NewTom. Consultant; GE Healthcare

W7-CHN06C **Posterior Skull Base and Foramen Magnum**

Divya Gunda, MD (*Presenter*) Nothing to Disclose

W7-CHN06D **Parapharyngeal Space**

Katherine L. Reinshagen, MD, FRCPC (*Presenter*) Nothing to Disclose

W7-CHN06E **Parotid and Masticator Spaces**

Gopi Nayak, MD (*Presenter*) Nothing to Disclose

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W7-CNMMI06

New Horizons for Pediatric Molecular Imaging and Theranostics

Wednesday, Dec. 3 3:00PM - 4:00PM Room: S405

Helen R. Nadel, MD, FRCPC (*Moderator*) Other-Image reviewer; ICON medical. Other-Image reviewer; Innervate Therapeutics. Other-Image reviewer; ITM

Sub-Events

W7-CNMMI06B Big Scanners for Little People

Barry L. Shulkin, MD, MBA (*Presenter*) Other-image reviewer; Innervate Radiopharmaceuticals

W7-CNMMI06C 3D CZT Imaging of Children

Zvi Bar-Sever, MD (*Presenter*) Consultant; Spectrum Dynamics Medical

W7-CNMMI06D A Primer of Pediatric Genitourinary Scintigraphy

Helen R. Nadel, MD, FRCPC (*Presenter*) Other-Image reviewer; ICON medical. Other-Image reviewer; Innervate Therapeutics. Other-Image reviewer; ITM

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W7-CNPM09

Nonphysician Providers (NPPs) in Radiology: Practical and Ethical Considerations for Improving Access and Maintaining Quality of Care (Sponsored by the RSNA Professionalism Committee)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: N228

Monica M. Sheth, MD (*Moderator*) Nothing to Disclose
R. Paul Guillerman, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Differentiate the types of radiology NPPs and discuss utilization trends of NPPs in clinical practice. 2) Understand how training programs, professional society guidelines, and governmental regulations affect the scope of NPP practice. 3) Expand access to care in local and global settings by judicious implementation of NPPs. 4) Address ethical and medicolegal considerations arising from independent practice of NPPs.

COURSE DESCRIPTION

The expanded use of nonphysician providers (NPPs) is touted to improve access to patient care in the setting of a limited radiologist workforce and the demands of ever-increasing volumes. However, adequate knowledge and skills are primary professional competencies that must be ensured for the ethical practice of medicine. The full impact of NPPs on radiology practice in terms of patient safety, practice revenue, cost of care, and trainee education remains unclear. Given the likelihood of a continued increase in the number of NPPs in clinical practice and expansion of their scope of practice to include not only performance but also interpretation of imaging studies, it is imperative that this be done with vigilant oversight to ensure preservation of standards of care. These issues will be addressed in a series of lectures from the perspective of both radiologists and NPPs in local and global settings.

Sub-Events

W7-CNPM09C **The Local and Global Impact of NPPs on Access to Care**

Katharine Halliday, MBChB, FRCR (*Presenter*) Nothing to Disclose

W7-CNPM09D **Current Trends in Radiologic NPP Practice and Economics**

Eric Christensen, PhD (*Presenter*) Nothing to Disclose

W7-CNPM09E **Rules and Regulations on Supervision and Scope of Practice**

David Hardwick, RRA, ARRT (*Presenter*) Nothing to Disclose

W7-CNPM09F **Ethical and Medicolegal Considerations**

Samantha P. Zuckerman, MD, MS (*Presenter*) Nothing to Disclose

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W7-COB03

Keep it Simple in the Adnexa: US and MRI

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E351

Elizabeth A. Sadowski, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn which imaging features are important in scoring lesions using the O-RADS US risk stratification system. 2) Learn which imaging features are important in scoring lesions using the O-RADS MRI risk stratification system. 3) Review cases to test your knowledge on using the O-RADS risk stratification system.

COURSE DESCRIPTION

This series of lectures will review the O-RADS US and MRI risk stratification system, with a focus on the imaging features used in adnexal lesion cancer risk assessment.

Sub-Events

W7-COB03B **Imaging Plays a Key Role in Triage**

Elizabeth A. Sadowski, MD (*Presenter*) Nothing to Disclose

W7-COB03C **US: The Basics of Benign and Malignant Lesions**

Catherine R. Phillips, MD (*Presenter*) Nothing to Disclose

W7-COB03D **MRI: The Basics of Benign and Malignant Lesions**

Krista E. Suarez-Weiss, MD (*Presenter*) Nothing to Disclose

W7-COB03E **Test Your Knowledge: Benign or Malignant? (Audience Response)**

Krupa K. Patel-Lippmann, MD (*Presenter*) Nothing to Disclose

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W7-CRT08

ASRT@RSNA: Managing Patient Anxiety in MRI: Achieving Near-Zero Refusals

Wednesday, Dec. 3 3:00PM - 4:00PM Room: N226

Melissa Culp, MEd (*Moderator*) Nothing to Disclose
Peter Rath (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify patient-management processes that lead to distress. 2) Implement improvements in managing anxious and claustrophobic patients in magnetic resonance examinations. 3) Select appropriate methods to reduce anxiety.

COURSE DESCRIPTION

Patient refusals and anxiety prior to and during magnetic resonance imaging examinations result in compromised health care and substantial cost to the imaging center. While claustrophobia is a real symptom, it frequently can be managed proactively by attending to a variety of simple factors. In more than 35 years of handling human subjects in research settings, the speakers have experienced a near-zero refusal rate, even though the examination times are often many times longer than typical clinical scans. The speakers will describe the factors in research settings that can be translated directly to imaging centers and that will lead to increased efficiency, income, improved diagnostics and improved patient satisfaction.

Sub-Events

W7-CRT08C **Managing Patient Anxiety in MRI: Achieving Near-Zero Refusals**

Mark S. Cohen, PhD (*Presenter*) Nothing to Disclose

W7-CRT08D **Managing Patient Anxiety in MRI: Achieving Near-Zero Refusals**

Jared Gilbert, MS (*Presenter*) Nothing to Disclose

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W7-CVA03

Vascular Imaging for the Next Decade: We're Not in Kansas Anymore (Advanced)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: S503

Bradley D. Allen, MD, MS (*Moderator*) Consultant; Circle Cardiovascular Imaging. Owner; Third Coast Dynamics. Speaker's Bureau; MRI Online. Grant/Research Support; Guerbet. Speaker's Bureau; Siemens. Stock/Shareholder; Third Coast Dynamics
Melany B. Atkins, MD (*Moderator*) Consultant; GE Heathcare. Speaker's Bureau; HeartFlow. Consultant; Arterys. Consultant; Bayer Healthcare CTEPH

LEARNING OBJECTIVES

1) Describe the principles, benefits, and limitations of next-generation imaging modalities such as Photon Counting CT and 4D Flow MRI, and assess their potential to transform vascular diagnostics and clinical decision-making over the next decade. 2) Gain practical knowledge on implementing advanced modalities like 4D Flow and utility in daily clinical workflows, including protocol selection, image interpretation, and integration into multidisciplinary care pathways. 3) Identify key AI applications in vascular imaging, critically assess their current capabilities, and apply AI tools to enhance diagnostic accuracy, streamline workflows, and support clinical decision making.

COURSE DESCRIPTION

This lecture series explores the future of vascular imaging with a focus on emerging technologies and clinical applications including photon counting CT and 4D Flow MRI, and practical strategies for using AI in vascular imaging. Attendees will gain insights to enhance diagnostic accuracy and integrate advanced imaging tools into routine clinical practice.

Sub-Events

W7-CVA03C **Non-Cardiac Vascular Applications of Photon Counting CT**

Anushri Parakh, MBBS, MD (*Presenter*) Nothing to Disclose

W7-CVA03D **4D Flow MRI: How I Do it in a Clinical Practice**

Bradley D. Allen, MD, MS (*Presenter*) Consultant; Circle Cardiovascular Imaging. Owner; Third Coast Dynamics. Speaker's Bureau; MRI Online. Grant/Research Support; Guerbet. Speaker's Bureau; Siemens. Stock/Shareholder; Third Coast Dynamics

W7-CVA03E **4D Flow for Clinical Problem Solving**

Thekla H. Oechtering, MD (*Presenter*) Nothing to Disclose

W7-CVA03F **How to Use AI for Clinical Vascular Imaging**

Martin J. Willemink, MD, PhD (*Presenter*) Nothing to Disclose

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W7-RCP08

RSNA/ESR Symposium: Advances in Prostate Cancer Imaging and Therapy: From Population to Precision Oncology in Prostate Cancer

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E352

Ivo Schoots, MD, PhD (*Moderator*) Nothing to Disclose
Katarzyna J. Macura, MD, PhD (*Moderator*) Grant/Research Support; Profound Medical Corp. Other-Patents; Siemens Healthineers. Other-Author - Royalties; Elsevier

LEARNING OBJECTIVES

1) Learn about European screening developments and to discuss the MRI challenges in prostate cancer screening programs. 2) Understand the role of novel imaging biomarkers in prostate cancer care. 3) Review novel image-guided treatment strategies for prostate cancer at any stage and discuss personalized care optimization from focal therapy to theranostics.

COURSE DESCRIPTION

This session will focus on prostate cancer screening programs and novel imaging biomarkers and image-guided treatment paradigms.

Sub-Events

W7-RCP08C **MR Imaging in Screening - Organized Testing in Europe**

Ivo Schoots, MD, PhD (*Presenter*) Nothing to Disclose

W7-RCP08D **Novel Multimodality Imaging Biomarkers**

Fiona M. Fennessy, MBBCh, PhD (*Presenter*) Nothing to Disclose

W7-RCP08E **Image-guided Therapies for Prostate Cancer**

Katarzyna J. Macura, MD, PhD (*Presenter*) Grant/Research Support; Profound Medical Corp. Other-Patents; Siemens Healthineers. Other-Author - Royalties; Elsevier

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W8-CBR11

Breast Imaging Interventions: Core Techniques and Best Practices

Wednesday, Dec. 3 4:30PM - 5:30PM Room: S406A

Cherie M. Kuzmiak, DO (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe and discuss the strengths and limitations of each image-guided breast procedure. 2) Identify challenges encountered during image-guided breast biopsy procedures and how to implement effective solutions to optimize sampling. 3) Describe and discuss ways to improve radiology-pathology concordance.

COURSE DESCRIPTION

Image-guided biopsies are crucial in diagnosing breast cancer and other breast/axillary lesions. These procedures, including pre-operative localization of non-palpable breast lesions, have become more accurate with advances in imaging technology, contributing significantly to improved outcomes for breast cancer patients. There are three main imaging modalities used for guidance: mammography/tomosynthesis, ultrasound and magnetic resonance imaging. Each technique has its specific indications, advantages, and limitations, and the choice of modality depends on the clinical context, lesion location, and patient factors. Understanding the strengths and limitations of each technique helps radiologists select the most appropriate method for each individual patient. This session will provide practical core techniques and best practices solutions to challenges that radiologists at all experience levels encounter with interventional breast procedures.

Sub-Events

W8-CBR11B **Mammography and DBT-guided**

Cherie M. Kuzmiak, DO (*Presenter*) Nothing to Disclose

W8-CBR11C **US-guided**

Gary J. Whitman, MD (*Presenter*) Consultant; Siemens. Other-Editor; UpToDate

W8-CBR11D **MRI-guided**

Lilian Wang, MD (*Presenter*) Nothing to Disclose

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W8-CCA07

Cardiac CT Updates 2025

Wednesday, Dec. 3 4:30PM - 5:30PM Room: E353C

Bradley D. Allen, MD, MS (*Moderator*) Consultant; Circle Cardiovascular Imaging. Owner; Third Coast Dynamics. Speaker's Bureau; MRI Online. Grant/Research Support; Guerbet. Speaker's Bureau; Siemens. Stock/Shareholder; Third Coast Dynamics
Brian B. Ghoshhajra, MD, MBA (*Moderator*) Grant/Research Support; Siemens. Consultant; Siemens. Consultant; Philips . Consultant; 3DR Laboratories

LEARNING OBJECTIVES

1) Understand the additive role of quantitative coronary plaque assessment for improved risk stratification and management decisions. 2) Describe how cardiac CT contributes to improved understanding and evaluation of heart disease in women. 3) Explain the role of cardiac CT in minimally invasive cardiac surgery planning.

COURSE DESCRIPTION

This session will provide updates on important, evolving topics within cardiac CT imaging including the role of quantitative coronary plaque assessment, evaluation of heart disease in women, and the role of cardiac CT in minimally invasive cardiac surgery planning.

Sub-Events

W8-CCA07C Cardiac CT in Minimally Invasive Cardiac Surgery Planning

Carole A. Ridge, FFR(RCSI) (*Presenter*) Nothing to Disclose

W8-CCA07D Quantitative Plaque Assessment: Beyond Stenosis to Improve Outcomes

Jonathon A. Leipsic, MD (*Presenter*) Consultant; Heartflow. Consultant; Circle CVI. Speaker's Bureau; GE Healthcare. Speaker's Bureau; Philips . Grant/Research Support; Edwards, Medtronic, Abbott, Boston Scientific, PI Cardia. Grant/Research Support; GE Healthcare. Consultant; Arineta

W8-CCA07E Ischemic Heart Disease in Women: Our Understanding in 2025

Michelle C. Williams, MBChB, PhD (*Presenter*) Consultant; Canon Medical Systems. Speaker's Bureau; Siemens Healthineers. Consultant; FEOPS. Speaker's Bureau; Novartis. Speaker's Bureau; GE Healthcare. Consultant; Novartis

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W8-CCH13

Lung Cancer Screening: Implementation and Advances

Wednesday, Dec. 3 4:30PM - 5:30PM Room: E451A

Palmi N. Shah, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Design and evaluate decentralized lung cancer screening programs. 2) Learn the common diagnostic and operational challenges in lung cancer screening. 3) Assess the utility and limitations of artificial intelligence applications in lung cancer screening. 4) Apply Lung-RADS guidelines with greater accuracy and confidence through case-based review.

COURSE DESCRIPTION

This advanced lecture session is designed for radiologists engaged in or preparing to lead lung cancer screening programs. With a focus on practical implementation, the course explores decentralized screening strategies, common diagnostic and operational challenges, and the transformative role of artificial intelligence in imaging workflows. A case-based review of Lung-RADS will enhance radiologists' diagnostic precision and standardization in nodule assessment. Attendees will gain actionable insights to optimize lung cancer screening processes, contribute to early detection, and improve patient outcomes in diverse clinical environments.

Sub-Events

W8-CCH13B Case-Based Review of Lung-RADS

Ashley E. Prosper, MD (*Presenter*) Consultant; MedQIA. Speaker's Bureau; Canon Medical. Grant/Research Support; Bristol Myers Squibb Foundation. Grant/Research Support; Siemens Medical Solutions. Consultant; Bayer

W8-CCH13C Applications of AI in Lung Cancer Screening

Marie-Pierre Revel (*Presenter*) Other-DICOM Viewer provided for free; MEVIS. Other-AI ALGORITHM FOR NODULE DETECTION PROVIDED FOR FREE; DEEPHEALTH. Other-AI ALGORITHM FOR CHEST X RAY READING PROVIDED FOR FREE; GLEAMER. Other-ASSISTANCE FOR RESEARCH; INCEPTO. Other-AI ALGORITHM FOR NODULE DETECTION PROVIDED FOR FREE; CORELINE. Other-LECTURE FEE; BRACCO

W8-CCH13D How to Build a Decentralized Lung Cancer Screening Program in the Community Setting

Terrance T. Healey, MD (*Presenter*) Nothing to Disclose

W8-CCH13E Beyond Traditional Criteria: Perspectives on Broadening Lung Cancer Screening

Palmi N. Shah, MD (*Presenter*) Nothing to Disclose

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W8-CER17

Challenging Cases in Emergency Radiology: Expert Panel Discussion

Wednesday, Dec. 3 4:30PM - 5:30PM Room: N228

Stefania Romano, MD (*Moderator*) Nothing to Disclose
Vincent M. Mellnick, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize challenging cases in emergency radiology. 2) Generate differential diagnoses when appropriate. 3) Utilize these skills to guide management.

COURSE DESCRIPTION

Experts in various organ systems of Emergency Radiology bring challenging cases to share with the audience and to elicit commentary provided from the panel of speakers.

Sub-Events

W8-CER17C **Thoracic Panelist**

Marc A. Camacho, MD, MS (*Presenter*) Nothing to Disclose

W8-CER17D **Abdominal Panelist**

Stefania Romano, MD (*Presenter*) Nothing to Disclose

W8-CER17E **Neuro Panelist**

Carlos H. Torres, MD, FRCPC (*Presenter*) Nothing to Disclose

W8-CER17F **MSK Panelist**

Nicholas M. Beckmann, MD (*Presenter*) Nothing to Disclose

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W8-CGI11

Case-Based: Gastrointestinal Missed Cases: Learn From Our (and Others) Mistakes

Wednesday, Dec. 3 4:30PM - 5:30PM Room: N226

Courtney C. Moreno, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn strategies to avoid pitfalls in imaging of the hepatobiliary system, bowel, pancreas, and abdominal vasculature. 2) Identify ways to expand your search pattern to avoid misses.

COURSE DESCRIPTION

Case-based review of missed and challenging cases including the hepatobiliary system, bowel, pancreas, and abdominal vasculature.

Sub-Events

W8-CGI11B Hepatobiliary

Jeong Hee Yoon, MD (*Presenter*) Speaker's Bureau; Bayer. Speaker's Bureau; GE Healthcare. Consultant; Bayer. Speaker's Bureau; Siemens Healthineers. Consultant; AIRS Medical

W8-CGI11C Bowel

Courtney C. Moreno, MD (*Presenter*) Nothing to Disclose

W8-CGI11D Pancreas

Frank H. Miller, MD (*Presenter*) Nothing to Disclose

W8-CGI11E Vascular

Antonio Luna, MD, PhD (*Presenter*) Speaker's Bureau; GE. Other-Digital Oncology advisory board member;; Siemens Healthiners. Owner; Cells-IA. Other-Lecturer; Siemens Healthineers. Speaker's Bureau; United Imaging. Other-MEDICAL ADVISORY BOARD MEMBER ; Olea Medical. Other-Lecture fee; Bayer

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W8-CGU07

What's Hot? PET and Theranostics for GU Radiologists

Wednesday, Dec. 3 4:30PM - 5:30PM Room: E353B

Eric M. Rohren, MD, PhD (*Moderator*) Nothing to Disclose
Tharakeswara K. Bathala, MD, MS (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the complimentary role of conventional GU imaging and molecular imaging in the management of prostate cancer. 2) Understand how the expanding field of theranostics creates opportunities in GU radiology.

COURSE DESCRIPTION

The combination of molecular imaging and therapy, termed Theranostics, is rapidly advancing in the area of prostate cancer. Alignment of these molecular techniques with other advanced imaging modalities (CT and MRI) is crucial to usher in the next phase of targeted therapy for GU malignancies. In this session, the state of imaging and therapy of prostate cancer will be discussed with illustrative case reviews.

Sub-Events

W8-CGU07C Advances and Emerging Techniques in the Imaging of Prostate Cancer

Baris Turkbey, MD (*Presenter*) Nothing to Disclose

W8-CGU07D Complementary use of Molecular Imaging to Optimize Conventional Imaging

Terence Z. Wong, MD, PhD (*Presenter*) Consultant; GE Health. Consultant; Progenics/Lantheus Pharmaceuticals. Consultant; Novartis Pharmaceuticals. Consultant; Telix Pharmaceuticals

W8-CGU07E Theranostics and What it Means for GU Radiologist

Devaki Shilpa S. Surasi, MD (*Presenter*) Grant/Research Support; Blue Earth Diagnostics. Grant/Research Support; Blue Earth Therapeutics. Consultant; Novartis. Consultant; Amgen

W8-CGU07F Case-based Review: Pearls and Pitfalls

Amy E. Eccles, MBBChir, FRCR (*Presenter*) Consultant; Novartis

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W8-CIN16

Collaborative AI Development: Multi-Stakeholder Perspectives

Wednesday, Dec. 3 4:30PM - 5:30PM Room: E450B

Walter F. Wiggins, MD, PhD (*Moderator*) Consultant; Qure.ai

LEARNING OBJECTIVES

1) Identify major healthcare AI coalitions and describe how they influence radiology practice, policy, and regulation. 2) Apply key concepts from post-deployment AI monitoring frameworks to assess the safety and effectiveness of deployed AI tools. 3) Evaluate vendor AI offerings using IHE integration profiles and published guidelines to inform purchasing and clinical implementation decisions.

COURSE DESCRIPTION

The successful deployment of radiology AI depends not only on technical accuracy, but also on strong coalitions, shared standards, and post-deployment governance. This didactic session brings together leading voices from across clinical, regulatory, technical, and vendor-facing perspectives to outline the evolving ecosystem of collaborative AI development. Learners will gain a practical understanding of major healthcare AI coalitions, key post-deployment monitoring frameworks, essential IHE profiles, and published guidelines that can guide safe, scalable, and clinically meaningful AI implementation. Attendees will leave with strategies to evaluate vendor readiness, influence enterprise decisions, and contribute to long-term quality assurance.

Sub-Events

W8-CIN16B Overview of Healthcare AI Coalitions - Who are They, What are They Doing, and Should you be Paying Attention?

Walter F. Wiggins, MD, PhD (*Presenter*) Consultant; Qure.ai

W8-CIN16C Published AI Guidelines for Health AI

Michail Klontzas, MD, PhD (*Presenter*) Nothing to Disclose

W8-CIN16D A Comprehensive Framework for Post-Deployment AI Monitoring

David B. Larson, MD, MBA (*Presenter*) Grant/Research Support; Gordon and Betty Moore Foundation. Grant/Research Support; Siemens Healthineers. Stock/Shareholder; Bunkerhill Health

W8-CIN16E Radiology AI IHE Profiles you Should Ask your Vendor to Use

Tessa S. Cook, MD, PhD (*Presenter*) Grant/Research Support; Independence Blue Cross. Other-Single honorarium for consulting about cardiac MRI software; relationship has ended, can't remember exactly when; Quattro Consulting. Grant/Research Support; ISMIE. Grant/Research Support; ACR. Consultant; Bayer. Consultant; Sectra

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W8-CIR09

Expert Approaches to the Management of Portal Hypertension

Wednesday, Dec. 3 4:30PM - 5:30PM Room: E353A

Jessica K. Stewart, MD (*Moderator*) Consultant; Terumo Interventional Systems. Grant/Research Support; Terumo Interventional Systems. Grant/Research Support; Varian . Consultant; Varian. Consultant; Cook Medical . Consultant; Crannmed. Consultant; ;Medtronic

Sub-Events

W8-CIR09B **TIPS Creation Techniques: ICE vs Conventional Methods**

James S. Ronald, MD,PhD (*Presenter*) Nothing to Disclose

W8-CIR09C **TIPS + Portal Vein Recanalization**

Bartley Thornburg, MD (*Presenter*) Nothing to Disclose

W8-CIR09D **Gastric Varices: BRTO v CARTO v PARTO vs ATO**

Wael E. Saad, MBBCh (*Presenter*) Consultant; Penumbra. Consultant; Gore & Associates

W8-CIR09E **Management of Nonocclusive and Occlusive PVT**

Vijay Ramalingam, MD (*Presenter*) Speaker's Bureau; Inari Medical. Consultant; Boston Scientific. Speaker's Bureau; Gore

W8-CIR09F **TIPS Diameter Reduction Techniques**

Timo A. Auer, MD (*Presenter*) Grant/Research Support; Bayee AG. Consultant; Boston Scientific. Other Financial or Material Support; Philips. Other Financial or Material Support; IGEA. Other Financial or Material Support; BD. Other Financial or Material Support; SIRTEX. Other Financial or Material Support; MERIT

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W8-CMK03

Tumour Imaging: The Fundamentals

Wednesday, Dec. 3 4:30PM - 5:30PM Room: E450A

Mark D. Murphey, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain the current utility of Bone and Soft Tissue RADS. 2) Identify the common pitfalls in adult musculoskeletal tumor imaging and how to manage cases with radiologic-pathologic discordance. 3) Identify the keys to diagnosis in pediatric musculoskeletal tumors and their patient management implications.

COURSE DESCRIPTION

This course will review the use of bone and soft tissue RADS in the categorization of musculoskeletal masses as to the risk of aggressiveness and potential diagnosis. The management of cases with radiologic pathologic discordance and common pitfalls in adult musculoskeletal tumor imaging is also discussed. Imaging assessment of pediatric musculoskeletal tumors and their implications on patient management are also reviewed.

Sub-Events

W8-CMK03B **Bone-RADS: Where are we now?**

Connie Y. Chang, MD (*Presenter*) Nothing to Disclose

W8-CMK03C **Managing Rad-Path Discordance: How I Do It**

Ronnie A. Sebro, MD, PhD (*Presenter*) Nothing to Disclose

W8-CMK03D **ST-RADS: Where are we now?**

Avneesh Chhabra, MD, MBA (*Presenter*) Consultant; ICON Medical, Treace Medical concepts, Inc.. Other-Book royalties; Jaypee, Wolters. Grant/Research Support; Qure-AI. Speaker's Bureau; Telemedicine clinics. Consultant; Boston scientific

W8-CMK03E **Pediatric MSK Tumors: Key Takeaways in Diagnosis and Management**

Sarah D. Bixby, MD, MBA (*Presenter*) Nothing to Disclose

W8-CMK03F **Adult MSK Tumors: Top Pitfalls to Avoid**

Mark D. Murphey, MD (*Presenter*) Nothing to Disclose

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W8-CNR11

What Am I SWI-ing?

Wednesday, Dec. 3 4:30PM - 5:30PM Room: S406B

Peter G. Kranz, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review patterns of common abnormalities seen on SWI imaging. 2) Discuss scenarios where SWI imaging may lead to important changes in clinical management. 3) Understand technical aspects of routine and advanced applications of SWI imaging.

COURSE DESCRIPTION

Susceptibility-weighed imaging has become a core sequence in many neuroimaging protocols. This session will review the techniques and clinical applications for SWI imaging, focusing on practical tips for mastering both common and uncommon abnormalities seen on SWI.

Sub-Events

W8-CNR11B **Pattern Based Approach to Cerebral Microbleeds**

Peter G. Kranz, MD (*Presenter*) Nothing to Disclose

W8-CNR11C **Update on Clinical Applications of SWI: What You Need to Know!**

Fabrice Bonneville, MD, PhD (*Presenter*) Nothing to Disclose

W8-CNR11D **A Deep Look at Superficial Siderosis**

Anoma Lalani Carlton Jones, MBBS, FRCR (*Presenter*) Nothing to Disclose

W8-CNR11E **Basic Techniques and Approach to SWI**

Salil Soman, MD, MS (*Presenter*) Consultant; Abbott poc. Consultant; roche. Consultant; acr. Consultant; Olea

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W8-CPH07

Clinical Implementation and Standardization of Ultra-High Field MRI for Neuro Applications: Physics, Protocols, Optimization, and Advanced Imaging

Wednesday, Dec. 3 4:30PM - 5:30PM Room: S404

Yuxiang Zhou, PHD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the fundamental physical principles behind ultra-high field MR imaging and explore unique ultra-high field techniques. 2) Identify strategies to develop, optimize, and standardize clinical imaging protocols for ultra-high field MRI. 3) Understand advanced imaging techniques, neuroimaging applications in clinical practice with 5T MRI. 4) Examine emerging neuroimaging applications of 7T MRI in clinical settings.

COURSE DESCRIPTION

This course will add value to medical physics and radiology by addressing the growing use of ultra-high field MRI in clinical practice. Ultra-high field MRI (5T and above) offers significant benefits, such as improved signal-to-noise ratio, higher spatial resolution, and better spectral resolution, which enhance the detection of small anatomical details and subtle pathologies, particularly in neurological diseases like multiple sclerosis, brain tumors, and neurodegenerative conditions. Despite its potential, consistent implementation of ultra-high field MRI remains challenging due to technical standardization issues. This tutorial (4 lectures) will cover the principles of ultra-high field MRI, the latest techniques, and strategies for optimizing clinical protocols to ensure high-quality imaging. It will also explore current and future applications of ultra-high field MRI for brain disease, providing a roadmap for successful implementation in clinical and research settings.

Sub-Events

W8-CPH07B Introduction and Physical Principles of 7T MR Imaging

Danny J. Wang, PhD (*Presenter*) Stock/Shareholder; Hura Imaging, INC

W8-CPH07C Develop, Optimize, and Standardize Clinical Imaging Protocols for 7T MRI

Yuxiang Zhou, PHD (*Presenter*) Nothing to Disclose

W8-CPH07D Neuroimaging Applications of 5T MRI in Clinical Practice

Bing Zhang, PhD (*Presenter*) Nothing to Disclose

W8-CPH07E Emerging Neuroimaging Applications of 7T MRI in Clinical Practice

Ichiro Ikuta, MD, MMedSc (*Presenter*) Nothing to Disclose

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W8-RCP09

New Horizons in Imaging in Arab Countries (Pan Arab Association of Radiological Societies Session)

Wednesday, Dec. 3 4:30PM - 5:30PM Room: E350

Lamia G. Jamjoom, MD (*Moderator*) Nothing to Disclose
Tarek A. El-Diasty, MD, FRCR (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the educational activities of the PAARS and cooperation/partnership with international radiological societies and organizations. 2) Identify the new dimensions in MSK imaging. 3) Learn how imaging can detect pancreatic intraepithelial neoplasia. 4) Understand the Egyptian experience in screening of lung cancer. 5) Get an in-depth view of MRI techniques for imaging pediatric brain tumors. 6) Acquire the essential interpretation skills for Cardiac MRI in assessment of cardiac amyloidosis.

COURSE DESCRIPTION

The course is aimed at participants from the middle east and North Africa to shed light on the radiology advances in a diversity of Arab countries. This course would provide the RSNA annual meeting attendees from these regions with an opportunity to network while in Chicago. It is organized as multimodality/multispecialty course discussing the most relevant imaging protocols used in the Arab region. The faculty consists of five known Arab experts who will ensure high-quality presentations that provide practical insights to improve image interpretation skills and diagnostic confidence of the participants.

Sub-Events

W8-RCP09C **Introduction to PAARS and its Activities**

Emad Shenouda Naguib, MD (*Presenter*) Nothing to Disclose

W8-RCP09D **Exploring New Dimensions in Musculoskeletal Imaging**

Tarek Hegazi, MD (*Presenter*) Nothing to Disclose

W8-RCP09E **Are PanIN Pancreatic Lesions Detectable with Imaging**

Lina Menassa-Moussa, MD (*Presenter*) Nothing to Disclose

W8-RCP09F **Lung Cancer Screening: Egyptian Experience**

Hisham W. Mikhael, MD, PhD (*Presenter*) Nothing to Disclose

W8-RCP09G **Basic and Advanced MRI Techniques for Imaging Pediatric Brain Tumors**

Tahani M. Ahmad, MD (*Presenter*) Nothing to Disclose

W8-RCP09H **How to Assess Cardiac Amyloidosis by Cardiac MRI**

Asma Zidi, MD (*Presenter*) Nothing to Disclose

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W8-RCP27

Bridging the Gap: New Opportunities to Connecting Radiology Reports to the Healthcare Enterprise (Sponsored by the RSNA Reporting Informatics Committee)

Wednesday, Dec. 3 4:30PM - 5:30PM Room: E451B

Krishna Juluru, MD (*Moderator*) Nothing to Disclose

Sub-Events

W8-RCP27B **Understanding the Role and Value of Common Data Elements for Radiology**

Namita S. Gandhi, MD, MSc (*Presenter*) Nothing to Disclose

W8-RCP27C **Bridging the EMR with Imaging Findings Using CDS Hooks**

Ali S. Tejani, MD (*Presenter*) Nothing to Disclose

W8-RCP27D **Leveraging National Registries for Device Monitoring**

Krishna Juluru, MD (*Presenter*) Nothing to Disclose

W8-RCP27E **Case Study: ACR Assess-AI**

Brian Bialecki (*Presenter*) Nothing to Disclose

W8-RCP27F **Getting the Message Across: Digital Tools that Enhance Communication with your Referring Physicians**

Kevin O'Donnell (*Presenter*) Employee; Canon Medical Research USA

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W8-RCP45

Synergy in Real World Practice: The Power of Collaboration between Radiologists and APPS

Wednesday, Dec. 3 4:30PM - 5:30PM Room: N227B

Gloria M. Salazar, MD (*Moderator*) Consultant; Medtronic;Boston Scientific ;TRisalus ;Optimed;Penumbra ;Cook. Speaker's Bureau; Medtronic;Boston Scientific;Cook;BD; Optimed;Penumbra
Leslie Partridge, RRA, MS (*Moderator*) Other-My husband is an employee.; FUJIFILM Heathcare Americas Corporation

LEARNING OBJECTIVES

1) Identify the varying role and functions of advanced practice providers (APPs) within a radiology department. 2) Discuss APP practice as it applies to patient care and interactions before, during, and after imaging procedures. 3) Examine collaborative processes between radiologists and APPs focusing on communication, workflow, benefits, and challenges. 4) Discuss how APPs and radiologists develop confidence and trust with each other in order to benefit daily workflows, establish productive work environments, and support patient access to imaging procedures.

COURSE DESCRIPTION

This course presents the advanced practice provider (APP) role in a radiology department and the interface with radiologists in providing patient care through a day in the life format. For this course APPs in radiology include nurse practitioners (NP), physician assistants (PA), radiologist assistants (RRA/RPA). APP faculty may present how they conduct an exam from pre-procedure preparation to delivering patient focused care through post-procedure responsibilities. They will discuss their tasks within the radiologist-led team and provide insight into the power of teamwork, benefits to a radiologist's workflow, establishing confidence and how they address challenges that arise. Faculty will include an NP, PA and RA allowing the audience to discover practice and collaboration variations among the different APP disciplines. Radiologist faculty will expand upon the utilization and impacts of APPs in their daily practice. How they work with and develop trust in their APPs will be examined. In addition, the presentation will include benefits, challenges and worth from a radiologist's perspective.

Sub-Events

W8-RCP45C **Synergy in Real World Practice: The Power of Collaboration between Radiologists and APPS**

Kevin W. Duncan, RRA, RDMS (*Presenter*) Nothing to Disclose

W8-RCP45D **Synergy in Real World Practice: The Power of Collaboration between Radiologists and APPS**

Lauren Wilkinson (*Presenter*) Nothing to Disclose

W8-RCP45E **Success! Launching an Outpatient Procedure Practice Area Using the Radiologist/APP Collaborative Model**

Judith Lotti (*Presenter*) Nothing to Disclose

W8-RCP45F **A Radiologist's Perspective: 25 Years Collaborating with Advanced Practice Providers**

Jennifer L. Kemp, MD (*Presenter*) Stock/Shareholder; Scanslated Inc

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M1-SSCA03

Science Session with Keynote: Cardiac Imaging (Clinical Trials)

Monday, Dec. 1 8:00AM - 9:00AM Room: S503

Suhny Abbara, MD (*Moderator*)
Michelle C. Williams, MBChB, PhD (*Moderator*)

Sub-Events

M1-SSCA03-2 SMOKERS SHOW DISTINCT CORONARY CTA PLAQUE FEATURES AND ELEVATED RISK: RESULTS FROM THE PROMISE TRIAL

Nora M. Kerkovits, MD (*Presenter*)
Isabel Luisa Langenbach, MD (*Abstract Co-Author*)
Thomas Mayrhofer (*Abstract Co-Author*)
Neha Pagidipati (*Abstract Co-Author*)
Julia Karady, MD (*Abstract Co-Author*)
Marton Kolossvary, MD, PhD (*Abstract Co-Author*)
Jan M. Brendel, MD (*Abstract Co-Author*)
Marcel C. Langenbach, MD (*Abstract Co-Author*)
Vinit Baliyan, MD,MBBS (*Abstract Co-Author*)
Maros Ferencik, MD (*Abstract Co-Author*)
Michael T. Lu, MD, MPH (*Abstract Co-Author*)
Pamela Douglas (*Abstract Co-Author*)
Borek Foldyna, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the association between smoking, CT-derived plaque characteristics, and adverse cardiovascular (CV) events.

METHODS AND MATERIALS

PROMISE participants with stable chest pain, suspected coronary artery disease (CAD) and analyzable CT data were included. Core lab plaque measures included coronary artery calcium (CAC), high-risk plaque features (HRP), obstructive disease, Leaman score, total (TPV), calcified (CPV), noncalcified (NCPV), and low-density plaque volume (LDPV). Associations between ever-smoking and plaque measures were assessed using multivariable logistic and linear regression models, adjusted for age, sex, body mass index, hypertension, dyslipidemia, and a family history of premature CAD. Multivariable Cox time-to-event models and causal mediation analysis assessed associations between ever-smoking and composite endpoints (all-cause death, myocardial infarction (MI), and unstable angina hospitalization; CV death and MI) over 36 months.

RESULTS

Among 4,402 participants (mean age 61 ± 8 years; 51.6% female), 2,252 (51.2%) were ever-smokers (788 [17.9%] current) with higher ASCVD risk scores (medians 13.9 vs. 7.9%, p<0.001) than never-smokers. Ever-smoking was independently associated with CAC>0 (aOR 1.86, 95% CI: 1.61-2.16), any plaque (aOR 1.74, 95% CI: 1.52-2.00), obstructive CAD (aOR 1.50, 95% CI: 1.25-1.79), HRP (aOR 1.60, 95% CI: 1.34-1.90), and Leaman score>5 (aOR 1.72, 95% CI: 1.51-1.97). It was also associated with higher TPV (ß=54.3 mm 3 , 95% CI: 39.8-68.7), CPV (ß=25.9 mm 3 , 95% CI: 19.2-32.6), NCPV (ß=28.3 mm 3 , 95% CI: 19.0-37.7), and LDPV (ß=1.48 mm 3 , 95% CI: 0.67-2.29). Ever-smoking predicted the incident composite endpoint (aHR 1.63, 95%CI: 1.12-2.39, p=0.011) and CV mortality and MI (aHR 2.41, 95% CI: 1.32-4.41, p=0.004), after adjustment for clinical risk factors and TPV. Three separate mediation analyses revealed that 17% of the effect of ever-smoking on adverse events was mediated by TPV (indirect effect OR 1.08, p<0.001), 15% by NCPV (indirect effect OR 1.07, p<0.001), and 8% by LDTPV (indirect effect OR 1.03, p=0.003). The corresponding direct effects for these analyses were OR 1.58, p=0.018; OR 1.62, p=0.013; and OR 1.66, p=0.009, respectively.

CONCLUSION

In stable chest pain patients, ever-smoking was independently linked to distinct coronary plaque phenotypes, such as HRP and high PV, and increased CV event risk. TPV partially mediates the effect of smoking on adverse events.

CLINICAL RELEVANCE/APPLICATION

CT-derived plaque characterization may aid risk stratification in individuals with a smoking history.

M1-SSCA03-3 ONE-YEAR FUNCTIONAL AND STRUCTURAL EFFECTS OF MAVACAMTEN IN OBSTRUCTIVE HYPERTROPHIC CARDIOMYOPATHY: A COMPREHENSIVE CMR STUDY

Kenan Kaya, MD (*Presenter*)
Roman J. Gertz, MD (*Abstract Co-Author*)
Jan Paul Janssen, MD (*Abstract Co-Author*)
Carsten H. Gietzen, MD (*Abstract Co-Author*)
David C. Maintz, MD (*Abstract Co-Author*)
Lenhard Pennig, MD (*Abstract Co-Author*)

PURPOSE

Mavacamten can improve clinical and functional outcomes in obstructive hypertrophic cardiomyopathy (oHCM). However, its long-term effects on myocardial function and structure remain unclear. This study aims to evaluate the one-year remodeling effects of mavacamten using comprehensive cardiovascular magnetic resonance (CMR).

METHODS AND MATERIALS

In this prospective single-center study, consecutive oHCM patients underwent 1.5T-CMR at first referral (baseline) and one-year later. After baseline, patients remained on negative inotropic therapy (control group) or were treated additionally with mavacamten according to patient`s discretion (mavacamten group). CMR assessment comprised volumetric, functional, and strain analysis of all chambers and left ventricular (LV) tissue characterization.

RESULTS

Twenty-two patients were enrolled, of whom 15 (68.2%) received mavacamten. Compared to controls, mavacamten treatment was associated with a significant reduction in left ventricular (LV) mass index (mean change from baseline: -26.5 g/m² [95% CI -37.6 to -12.6 g/m²]; p<0.001), maximal LV wall thickness (-4.5 mm [-3.2 to -5.7 mm]; p<0.001), right ventricular (RV) wall thickness (-0.9 mm [-0.3 to -1.4 mm]; p=0.017), and left atrial volume index (-16.1 mL/m² [-6.9 to -25.3 mL/m²]; p=0.005). LV ejection fraction (-11.4% [-5.3 to -17.4%]; p<0.001) and RV ejection fraction (-9.1% [-4.5 to -13.7%]; p=0.001) decreased, while LV global circumferential strain increased towards more positive values (+7.5% [+3.8 to +11.3%]; p<0.001), indicating attenuation of the hyperdynamic state. Although mavacamten had no significant effect on late gadolinium enhancement mass, native T1 (-30.4 ms [-21.7 to -39.1 ms]; p<0.001) and indexed extracellular volume (-4.0 mL/m² [-1.7 to -6.0]; p=0.004) showed a significant reduction.

CONCLUSION

One-year mavacamten therapy resulted in favourable remodeling with normalization of hyperdynamic state and regression of measures of interstitial fibrosis, all associated with worse outcome in oHCM.

CLINICAL RELEVANCE/APPLICATION

Mavacamten treatment led to a significant reduction in myocardial hypertrophy, the hallmark morphological feature of HCM, as evidenced by decreased LV mass, LV mass index, and maximal LV wall thickness. These findings support its potential as a new first-line therapy for patients.

M1-SSCA03-4 DISCRIMINATORY AND PROGNOSTIC VALUE OF MRI-DERIVED MYOCARDIAL WORK EFFICIENCY IN HEART FAILURE WITH PRESERVED EJECTION FRACTION: BEYOND GLOBAL LONGITUDINAL STRAIN

Leyi Zhu (*Presenter*)
Minjie Minjie, PhD (*Abstract Co-Author*)

PURPOSE

Left ventricular (LV) global longitudinal strain (GLS) is an established diagnostic and prognostic marker in heart failure with preserved ejection fraction (HFpEF); however, it is sensitive to LV afterload. Pressure-volume (PV) loop analysis accounts for LV loading conditions and may provide additional insights beyond GLS into myocardial energetics and work efficiency (WE). Compared with echocardiography, MRI-derived PV loop analysis offers superior geometric accuracy and direct volumetric measurements; nevertheless, evidence supporting its clinical value in HFpEF remains limited. The purpose of this study is to determine the discriminatory and prognostic value of myocardial WE derived from cardiac MRI in patients with HFpEF.

METHODS AND MATERIALS

This retrospective study included 158 participants, comprising 124 patients with HFpEF (age 53.8±13.7 years; 77% male) and 34 sex- and age-matched healthy controls (age 56.4±7.2 years; 65% male). LV GLS was measured using the feature-tracking technique. PV loop analysis was performed by integrating LV myocardial strain with brachial systolic and diastolic blood pressure data, and WE was subsequently calculated. The primary endpoint was a composite of all-cause death and HF hospitalization.

RESULTS

In all participants, WE showed moderate correlations with LVEF (r = 0.62; P < .001) and GLS (r = -0.58; P < .001). Participants were divided into three groups: healthy controls, HFpEF patients with GLS = median, and those with GLS > median. WE demonstrated a stepwise decline across these three groups (P for trend < .001; all Bonferroni-corrected P < .001), and this trend in WE remained significant after adjustment for GLS in the analysis of covariance (P for trend < .001). In multivariable logistic regression analysis, lower WE was significantly associated with higher odds of HFpEF (adjusted odds ratio per 1% decrease, 1.33 [95% CI: 1.03, 1.82; P = .044]), even after adjusting for GLS. During a median follow-up of 5.4 years, 49 patients with HFpEF reached the primary endpoint. Multivariable Cox regression analysis revealed that lower WE (<71.15%) was an independent predictor of the primary endpoint (adjusted hazard ratio, 1.92 [95% CI: 1.03, 3.57; P = .040]) even after adjustment for age, sex, late gadolinium enhancement, and extracellular volume fraction, whereas GLS was not.

CONCLUSION

WE derived from cardiac MRI provided independent discriminatory and prognostic value in patients with HFpEF, even after adjustment for GLS.

CLINICAL RELEVANCE/APPLICATION

MRI-derived myocardial WE is impaired in patients with HFpEF, and it may serve as a promising non-invasive marker for both diagnosis and risk stratification in this condition, providing a new dimension beyond GLS.

M1-SSCA03-6 Keynote Speaker: Perspectives of an Imager Running Clinical Trials

Harold I. Litt, MD, PhD (*Science Invited Presenter*)

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M1-SSGU03

Science Session with Keynote: Genitourinary Imaging (Advances in Imaging of Renal Masses)

Monday, Dec. 1 8:00AM - 9:00AM Room: E353B

Ivan Pedrosa, MD, PhD (*Moderator*)
Elizabeth A. Edney, MD (*Moderator*)

Sub-Events

M1-SSGU03-1 CT-BASED RADIOMICS DIFFERENTIATION OF HIGH GRADE FROM LOW GRADE CLEAR CELL RENAL CELL CARCINOMA: A META-ANALYSIS

Nima Broomand Lomer, MD (*Presenter*)
Sepideh Abdi, MD (*Abstract Co-Author*)
Drew A. Torigian, MD, MA (*Abstract Co-Author*)

PURPOSE

Low-grade clear cell renal cell carcinoma (ccRCC) (I + II), typically follows an indolent clinical course with a favorable long-term survival. In contrast, high-grade tumors (III + IV) are characterized by more aggressive behavior and a generally poor prognosis. This study aims to assess the diagnostic performance of CT-based radiomics models as a non-invasive approach for pre-operative differentiation of high-grade from low-grade ccRCC.

METHODS AND MATERIALS

This study was conducted in accordance with PRISMA guidelines. A comprehensive search was conducted across PubMed, Scopus, and Embase. Study quality was evaluated using the QUADAS-2 and METRICS tools. Pooled estimates of sensitivity, specificity, positive likelihood ratio (PLR), negative likelihood ratio (NLR), diagnostic odds ratio (DOR), and area under the curve (AUC) were calculated. Separate comparative analyses were performed based on tumor grading system, imaging phase, and model type. Subgroup analysis and sensitivity analysis were performed to identify potential sources of heterogeneity. Publication bias was assessed using Deek's funnel plot asymmetry test.

RESULTS

A total of 49 studies, including 11,125 patients and 11,922 lesions, were incorporated into this review. Methodological quality, as assessed by the METRICS tool, ranged from 40.7% to 88.0%, reflecting moderate to excellent quality, with a mean score of 62.4% and a median of 62.9%. Of these, 27 studies were eligible for meta-analysis. The pooled diagnostic performance of radiomics models yielded a sensitivity of 0.79, specificity of 0.85, PLR of 4.6, NLR of 0.30, DOR of 19.21, and an AUC of 0.88. Subgroup analysis revealed that studies using the WHO/ISUP tumor grading system achieved significantly higher sensitivity compared to those using the Fuhrman system (0.81 vs. 0.71, $p = 0.03$) and superior AUC (0.88 vs. 0.82, $p < 0.001$). Combined models showed similar performance to radiomics-only models (AUC: 0.87 vs. 0.85, $p = 0.1$). Among imaging phases, the nephrographic phase exhibited lower diagnostic performance (AUC: 0.67) compared to the corticomedullary phase (AUC: 0.82) and non-contrast images (AUC: 0.83). No significant publication bias was detected ($p = 0.73$).

CONCLUSION

CT-based radiomics models show potential as non-invasive methods for grading ccRCC and could serve as useful complements in clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

Accurate preoperative differentiation of high- vs low-grade ccRCC is essential for guiding treatment and improving outcomes. By reliably identifying aggressive tumors pre-operatively, radiomics can aid clinicians in selecting appropriate surgical strategies, optimizing patient counseling, and potentially reducing overtreatment in indolent cases.

M1-SSGU03-3 IMPROVING MRI CHARACTERISATION OF SMALL RENAL MASSES WITH THE CLEAR CELL LIKELIHOOD SCORE

Giorgio Brembilla, MD, PhD (*Presenter*)
Michele Cosenza (*Abstract Co-Author*)
Giulio Imperiale (*Abstract Co-Author*)
Salvatore Lavalle (*Abstract Co-Author*)
Alberto Briganti (*Abstract Co-Author*)
Francesco Montorsi (*Abstract Co-Author*)
Francesco A. De Cobelli, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of the Clear Cell Likelihood Score (ccLS) on radiologists' diagnostic performance in identifying clear cell and papillary renal cell carcinomas (RCC) on MRI.

METHODS AND MATERIALS

This retrospective study included consecutive patients who underwent MRI and percutaneous renal mass biopsy at our institution from 2013 to 2023. Five radiologists, none with subspecialty training in renal imaging, reviewed the MRI scans in two separate sessions: first through subjective assessment, and later after receiving dedicated training on the ccLS system. A four-week washout period separated the two sessions. Diagnostic accuracy and interreader agreement in detecting clear cell RCC (ccRCC) and papillary RCC (pRCC) were compared before and after the ccLS training. Histopathology served as the reference standard.

RESULTS

A total of 60 renal masses (median size: 21 mm, IQR 18-26) from 60 patients were evaluated, comprising 47% ccRCC, 25% pRCC, 18% oncocytomas, 7% chromophobe RCC, and 3% fat-poor angiomyolipomas. After training, all readers showed improved sensitivity and overall accuracy for diagnosing ccRCC, with changes ranging from +4% to +61% in sensitivity and +3% to +20% in accuracy. For pRCC, sensitivity and accuracy improved in all but one reader, with changes ranging from -12% to +31% and from 0% to +14%, respectively. Interreader agreement also improved, with Conger's kappa increasing from 0.29 to 0.59 for ccRCC and from 0.36 to 0.49 for pRCC.

CONCLUSION

The application of the ccLS algorithm improved both diagnostic accuracy and interobserver agreement in the MRI-based characterisation of ccRCC and pRCC.

CLINICAL RELEVANCE/APPLICATION

Incorporating ccLS criteria into routine clinical practice may improve both the diagnostic accuracy and reproducibility of MRI assessment of small renal masses.

M1-SSGU03-4 FULLY AUTOMATED CT-BASED BODY COMPOSITION ANALYSIS: A STRONG INDEPENDENT PREDICTOR OF SURVIVAL IN METASTATIC RENAL CELL CARCINOMA

Johannes Christian Harmes, MD (*Presenter*)
Mathias Holtkamp, MD (*Abstract Co-Author*)
Luca Salhofer, MD (*Abstract Co-Author*)
Rene Hosch, MSc, BSc (*Abstract Co-Author*)
Lea Schnitzler (*Abstract Co-Author*)
Christopher Darr (*Abstract Co-Author*)
Viktor Gruenwald (*Abstract Co-Author*)
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Sebastian Zensen, MD (*Abstract Co-Author*)
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Johannes Haubold, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to determine the independent prognostic value of fully automated CT-based body composition biomarkers in patients with metastatic renal cell carcinoma (mRCC).

METHODS AND MATERIALS

In this retrospective single-center study, 77 patients with mRCC (57 men, 20 women; mean age 60.4 ± 12.9 years) who underwent baseline contrast-enhanced abdominal CT before systemic therapy were included. Using a nnU-Net-based pipeline (BOA framework), two body composition biomarkers were automatically extracted: the Sarcopenia Index (SI; muscle-to-bone volume ratio) and the Myosteatotic Fat Index (MFI; intra-/intermuscular fat relative to total fat). Prognostic relevance for OS was assessed using univariable and multivariable Cox regression and Kaplan-Meier analysis. Clinical covariates included age, sex, leukocyte count, calcium, LDH, CRP, hemoglobin, platelet count, prior nephrectomy, and the number of metastatic sites. Laboratory variables were selected based on established prognostic models such as the IMDC score.

RESULTS

Forty deaths occurred during follow-up. In multivariable Cox regression, both SI (p=0.020) and MFI (p=0.001) were independently associated with OS. Kaplan-Meier analysis demonstrated significantly higher 5-year OS in patients with high SI and low MFI (67.9%) compared to those with low SI and high MFI (13.7%; log-rank p=0.027). Among the clinical parameters, leukocyte count (p = 0.009), prior nephrectomy (p = 0.033), and the presence of =2 metastatic sites (p = 0.038) were also independent predictors of overall survival.

CONCLUSION

CT-based body composition biomarkers derived from a fully automated deep learning framework are independent predictors of OS in metastatic RCC and enable robust patient stratification.

CLINICAL RELEVANCE/APPLICATION

The automated extraction of sarcopenia and myosteatosis parameters from routine CT scans enables individualized risk stratification in metastatic RCC without added workload or radiation exposure, supporting personalized therapeutic decision-making.

M1-SSGU03-6 TOWARD BIOPSY-FREE DIAGNOSIS: MULTIPARAMETRIC MRI RADIOMICS ACCURATELY CLASSIFIES RENAL NEOPLASMS

Ali Sheikhy, MD (*Presenter*)
Nathan S. Lay, PhD (*Abstract Co-Author*)
Negin Jarrah, MD (*Abstract Co-Author*)
Ashkan A. Malayeri, MD (*Abstract Co-Author*)

PURPOSE

Renal cell tumors constitute a complex spectrum of kidney neoplasms characterized by diverse genetic backgrounds, histopathological distinctions, and clinical implications. Notable subtypes include clear cell RCC (ccRCC), oncocytoma, chromophobe RCC, papillary RCC, angiomyolipoma, hereditary leiomyomatosis-RCC, and Birt-Hogg-Dubé-related hybrid tumors. Precise phenotypic delineation on MRI is pivotal for individualized therapy, yet most radiomic classifiers have focused on CT. We therefore evaluated a radiomics-based model to noninvasively distinguish these seven renal lesion subtypes on eight MRI sequences.

METHODS AND MATERIALS

With IRB approval, eight-sequence MRI (pre-, arterial-, nephrogenic-, delayed-phase T1; T2; low- and high-b DWI; ADC) from 880 surgically confirmed lesions was retrospectively collected. Seven post-doctoral fellows manually segmented each lesion, all masks were audited by an 11-year body radiologist. PyRadiomics extracted 1400 first-order, texture and filter-based features per ROI. Lesions were split lesion-wise into training (70 %), validation (15 %), and test (15 %) cohorts. An XGBoost classifier was tuned with successive-halving random search and 5-fold cross-validation to maximize balanced accuracy, then retrained on the combined training + validation data and evaluated on the locked test set. Gain importance and SHAP values quantified feature influence.

RESULTS

On the test cohort the model achieved 78 % overall accuracy, macro-averaged ROC-AUC 0.90, and balanced accuracy 0.74. F1-scores were 0.86 for ccRCC, 0.80 papillary, 0.67 hybrid, 0.40 HLRCC, 0.33 AML, 0.29 oncocytoma, and 0.25 chromophobe; ccRCC and papillary were correctly identified in 96 % and 74 % of cases, respectively. Exponential-filtered GLCM JointAverage from ADC, run-length non-uniformity from nephrogenic-phase T1, and the ADC 90th-percentile were the most influential discriminators, as confirmed by SHAP.

CONCLUSION

Our multiparametric-MRI radiomics model, powered by XGBoost, achieved 78 % accuracy (macro-AUC 0.90) in differentiating seven renal tumor subtypes, reliably classifying ccRCC and papillary RCC while offering useful discrimination for rarer lesions. Texture- and diffusion-based features were the key drivers, and SHAP analysis confirmed their biologic plausibility. This work highlights MRI radiomics as a promising, noninvasive tool for precision characterization of renal masses and paves the way for prospective, multi-center validation.

CLINICAL RELEVANCE/APPLICATION

A reliable MRI-based radiomics classifier can noninvasively distinguish benign from malignant renal tumor subtypes, informing personalized management and potentially reducing unnecessary biopsies or surgery.

M1-SSGU03-7 Keynote Speaker: Problem-Solving with CEUS in Renal Masses

Elizabeth A. Edney, MD (*Science Invited Presenter*)

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Nov. 30 – Dec. 4
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M1-SSNMMI02

Nuclear Medicine and Molecular Imaging (Novel Radiopharmaceuticals)

Monday, Dec. 1 8:00AM - 9:00AM Room: S501

Elizabeth H. Dibble, MD (*Moderator*)
Shadi Abdar Esfahani, MD, MPH (*Moderator*)

Sub-Events

M1-SSNMMI02-1 DIAGNOSTIC ACCURACY OF 68GA-PENTIXAFOR PET/CT, A NEW TEST FOR PRIMARY ALDOSTERONISM TARGETING THE CXCR4 RECEPTOR: A BIVARIATE DIAGNOSTIC META-ANALYSIS OF SENSITIVITY, SPECIFICITY, AND AUC

Victor Arthur Ohannesian (*Presenter*)
Karina De Lima Andrade (*Abstract Co-Author*)
Ricardo Suruagy-Motta (*Abstract Co-Author*)
Luiz Nascimento (*Abstract Co-Author*)
Bruno Ishizuka (*Abstract Co-Author*)
Mariana Lee Han (*Abstract Co-Author*)
Miguel J. Francisco Neto, MD, PhD (*Abstract Co-Author*)
Solange A. Nogueira, MD (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic performance of 68Ga-Pentixafor PET/CT, a CXCR4-targeted imaging tool, in identifying aldosterone-producing adenomas (APAs) in primary aldosteronism (PA). This study aimed to estimate pooled sensitivity, specificity, diagnostic odds ratio (DOR), and area under the curve (AUC). Given the technical challenges and limited availability of adrenal venous sampling (AVS), the goal was to determine whether PET/CT could serve as a non-invasive alternative for lesion lateralization and subtype classification in PA.

METHODS AND MATERIALS

A bivariate diagnostic meta-analysis was conducted per PRISMA-DTA and registered in PROSPERO. PubMed, Embase, Scopus, CENTRAL, and Web of Science were searched through January 2025. Studies included adults with confirmed PA who underwent 68Ga-Pentixafor PET/CT, using AVS, histology, or immunohistochemistry as reference. Sensitivity, specificity, DOR, and AUC were extracted. Methodological quality was assessed using QUADAS-2, and GRADE was used to rate evidence certainty. Reitsma's bivariate random-effects model (Stata 12.0) was used for analysis. Heterogeneity was tested by ?² and I²; publication bias by Deeks' funnel plot.

RESULTS

Eight studies with 564 patients were included, all from China. The median sample size was 58.5; mean age, 49 years. Bilateral adrenal masses were present in 103 cases. Median lesion size was 10 mm. Pooled sensitivity and specificity were 83% (95% CI: 75-89) and 94% (95% CI: 83-98), respectively. DOR was 27 (95% CI: 12-60), and AUC was 0.91 (95% CI: 0.88-0.93). Significant heterogeneity was found ($I^2 > 50\%$, $p < 0.001$). CXCR4 and CYP11B2 expression confirmed tracer uptake correlation. Inter-rater agreement was excellent (? = 0.93).

CONCLUSION

68Ga-Pentixafor PET/CT shows high accuracy in detecting APAs, with strong specificity (94%) and AUC (0.91). Despite heterogeneity and the geographic concentration of studies, findings support its use as a non-invasive alternative to AVS. The biological correlation with CXCR4 and CYP11B2 strengthens diagnostic confidence. Broader validation through multicenter studies with standardized imaging and histological confirmation is needed.

CLINICAL RELEVANCE/APPLICATION

68Ga-Pentixafor PET/CT is a fast, non-invasive method for PA lesion localization, especially when AVS is unavailable or contraindicated. Its high diagnostic accuracy supports surgical planning and patient stratification. Integration with biochemical and histological data may enhance diagnostic certainty and reduce reliance on invasive procedures, advancing personalized care in PA.

M1-SSNMMI02-4 A NOVEL IMAGING APPROACH IN PRIMARY HYPERPARATHYROIDISM: ^{68}GA-TRIVEHEXIN PET/CT

Dilara Denizmen Zorba, MD (*Presenter*)
Serkan Kuyumcu, MD (*Abstract Co-Author*)
Duygu Simsek, MD (*Abstract Co-Author*)
Emine Goknur Isik (*Abstract Co-Author*)
Arzu Poyanli, MD (*Abstract Co-Author*)
Ayse Kubat Uzum (*Abstract Co-Author*)
Fikret Buyukkaya (*Abstract Co-Author*)
Semen Onder, MD (*Abstract Co-Author*)
Nihat Aksakal (*Abstract Co-Author*)
Ahmet Yalin Iscan (*Abstract Co-Author*)
Zeynep Gozde Ozkan (*Abstract Co-Author*)
Yasemin Sanli, MD (*Abstract Co-Author*)

PURPOSE

Accurate preoperative localization of hyperfunctioning parathyroid tissue is essential for curative surgery in primary hyperparathyroidism (PHPT). 68 Ga-Trivehexin is a novel PET tracer targeting integrin aVß6, which has shown promising results in various malignancies. Its uptake in parathyroid adenomas has been incidentally observed. This study aimes to evaluate the diagnostic utility of 68 Ga-Trivehexin PET/CT (TRV-PET) in PHPT patients, in comparison with 99m Tc-MIBI SPECT/CT (MIBI).

METHODS AND MATERIALS

38 patients with biochemically confirmed PHPT (31 sporadic, 7 MEN-1) were included. All underwent serum calcium, phosphorus, and PTH assessment, along with cervical ultrasonography, MIBI, and TRV-PET. Additional imaging included 4D-CT (n=16) and 18 F-Choline PET/CT (n=8). Two nuclear medicine physicians independently evaluated imaging studies visually and semi-quantitatively. Final diagnoses were based on pathology, PTH wash-out (WO), or concordant imaging findings.

RESULTS

50 parathyroid lesions were evaluated. Of these, 18 were confirmed pathologically, 4 through WO, and others through correlated imaging findings. In 2 patients parathyroid lesion could not be localized by any imaging modality. In patient-based analysis TRV-PET detected lesions of 35/38 (92%) patients while MIBI was positive in 28/38 patients (74%) ($p<0.05$). In lesion-based analysis TRV-PET identified 49/50 lesions (98%), while MIBI only detected 29/50 lesions (58%) ($p<0.01$). TRV-PET showed clear uptake in 18 lesions with equivocal MIBI findings and revealed 2 lesions missed by both MIBI and 18 F-Choline PET/CT. Only one lesion identified by MIBI was negative on TRV-PET. TRV-PET successfully localized the residual lesions in all 7 patients with persistent disease after surgery.

CONCLUSION

TRV-PET offers high sensitivity for detecting hyperfunctioning parathyroid tissue and can potentially serve as an effective alternative when conventional imaging is inconclusive. Its diagnostic performance suggests clinical utility in both initial evaluation and patients with persistant hyperparathyrodism after surgery.

CLINICAL RELEVANCE/APPLICATION

68 Ga-Trivehexin PET/CT improves lesion detection in PHPT, particularly in familial cases, supporting its role in guiding effective surgical management.

M1-SSNMMI02-5 ADVANCING DETECTION: MOLECULAR PET IMAGING IN MRI-OCCULT SMALL FUNCTIONAL PITUITARY ADENOMAS

Yu Cai, MD, PhD (*Presenter*)
Manish Ora (*Abstract Co-Author*)
Neetu Soni, MD, FRCR (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic performance of positron emission tomography (PET) imaging using various tracers such as Fluorine-18 fluorodeoxyglucose (18F-FDG), Carbon-11 methionine (11C-MET), Fluorine-18 fluoroethyl-L-tyrosine (18F-FET), Gallium-68 DOTATATE (68Ga-DOTATATE), Gallium-68 Pentixafor, and Fluorine-18 fallypride (18F-fallypride) in localizing MRI-occult functional pituitary adenomas (PAs), and their impact on clinical management.

METHODS AND MATERIALS

A systematic literature review followed PRISMA guidelines, focusing on studies of patients with biochemically confirmed Cushing disease (CD), acromegaly, hyperprolactinemia and negative/equivocal conventional MRI. Data on PET-CT/MRI outcomes were analyzed.

RESULTS

Recent studies highlight the effectiveness of various PET radiotracers for detecting PAs, due to their high uptake in the pituitary gland and low background activity. These include tracers targeting glucose transport (18F-FDG); amino acid transport (11C-MET, 18F-FET); somatostatin receptor binding (68Ga-DOTATATE); CXCR4 (68Ga-pentixafor); Dopamine receptor binding (18F-fallypride). Tracers like 18F-FDG and 68Ga-DOTATATE exhibited variable physiologic pituitary uptake, reducing lesion conspicuity. 18F-FET PET/MRI localized tumors with 100% sensitivity and specificity, while 11C-MET PET/MRI achieved 89% sensitivity and specificity, based on intraoperative and histopathological confirmation. 68Ga-pentixafor PET/MRI showed higher sensitivity (92.7%) and diagnostic accuracy (88.6%) than contrast-enhanced MRI (78.0% and 77.3%). Combining both modalities improved sensitivity to 100% and accuracy to 95.5% ($P = .01$). SUVmax correlated positively with CXCR4 H-score ($R = 0.5$, $P < .001$) and ACTH levels.

CONCLUSION

Molecular PET improves detection and localization of small functional PAs, especially when conventional MRI is inconclusive. Various radiotracers offer high diagnostic accuracy and lesion conspicuity. Integrating PET into clinical workflows may enhance diagnostic confidence, guide surgical planning, and improve management of hormonally active, MRI-negative PAs.

CLINICAL RELEVANCE/APPLICATION

Molecular PET offers a valuable diagnostic tool for patients with small functional PAs when conventional MRI is inconclusive. By improving lesion detection and localization, particularly in hormonally active but MRI-negative cases, PET/MRI can enhance surgical planning, guide targeted therapy, and potentially improve patient outcomes.

M1-SSNMMI02-6 ACCURACY OF 99MTC-UBI(29-41) IN THE DETECTION OF MUSCULOSKELETAL AND IMPLANT-RELATED INFECTIONS: A SYSTEMATIC REVIEW AND DIAGNOSTIC META-ANALYSIS

Victor Arthur Ohannesian (*Presenter*)
Bruno Ishizuka (*Abstract Co-Author*)
Isabelle Menezes (*Abstract Co-Author*)
Luciano Falcao (*Abstract Co-Author*)
Luiz Nascimento (*Abstract Co-Author*)
Ricardo Suruagy-Motta (*Abstract Co-Author*)
Miriana E. Mariussi, MD (*Abstract Co-Author*)
Miguel J. Neto (*Abstract Co-Author*)
Akemi Osawa, MD (*Abstract Co-Author*)
Solange A. Nogueira, MD (*Abstract Co-Author*)

PURPOSE

Musculoskeletal and periprosthetic infections often resemble sterile inflammation, complicating diagnosis. The radiotracer 99mTc-UBI(29-41), an antimicrobial peptide with affinity for bacterial membranes, may differentiate active infection from non-infectious processes. This study systematically reviewed and meta-analyzed its diagnostic performance in such infections. We aimed to estimate pooled sensitivity, specificity, diagnostic odds ratio (DOR), likelihood ratios, and area under the ROC curve (AUC), assessing its validity compared to microbiological, clinical, and histopathological standards.

METHODS AND MATERIALS

A PRISMA-DTA-compliant review was registered on PROSPERO. PubMed, Embase, Scopus, Web of Science, and CENTRAL were searched (through Nov/2024). Included studies evaluated 99mTc-UBI(29-41) in musculoskeletal/periprosthetic infections with extractable sensitivity and specificity. QUADAS-2 assessed bias. Pooled estimates were calculated using a bivariate model (Reitsma) in Stata 14.2. Heterogeneity was assessed using t^2, I^2, and Q test. Deeks' test assessed publication bias.

RESULTS

Eleven studies (n = 704) were included. Pooled sensitivity was 96.5% (95% CI: 88.4-98.9%), specificity 88.9% (95% CI: 73.3-95.9%), and DOR 87.8 (95% CI: 26.0-295.9), with AUC of 0.946. Negative predictive value reached 95%. Specificity heterogeneity ($I^2 = 82.0\%$) was linked to protocol and reference standard variation. Deeks' test indicated publication bias ($p = 0.02$).

CONCLUSION

99mTc-UBI(29-41) demonstrates high accuracy in detecting bacterial infection in complex musculoskeletal contexts. Its bacterial selectivity offers diagnostic advantage over conventional tracers. Methodological heterogeneity and bias warrant further validation. The tracer is particularly useful when standard tests are inconclusive.

CLINICAL RELEVANCE/APPLICATION

This radiotracer supports non-invasive diagnosis of infection in orthopedic and implant-related cases. It enables early, targeted imaging and can inform clinical decisions, reduce unnecessary procedures, and optimize antibiotic use. Broader adoption requires standardization and cost-effectiveness studies.

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M1-SSPD02

Science Session with Keynote: Pediatric Imaging (Gastrointestinal and Genitourinary)

Monday, Dec. 1 8:00AM - 9:00AM Room: S502

Antonio S. Souza, MD (*Moderator*)
Raymond W. Sze, MD (*Moderator*)

Sub-Events

M1-SSPD02-1 Keynote Speaker: Imaging of Malrotation and Midgut Volvulus

Jeffrey Traubici, MD (*Science Invited Presenter*)

M1-SSPD02-3 NON-INVASIVE EVALUATION OF REMOTE ISCHEMIC CONDITIONING ON INTESTINAL PERFUSION IN MICE PUPS USING ULTRASOUND COLOR DOPPLER AND DYNAMIC TISSUE PERFUSION MEASUREMENT

Ricardo Faingold, MD (*Presenter*)
Stella Sabbatini (*Abstract Co-Author*)
Niloofar Ganji (*Abstract Co-Author*)
Agostino Pierro (*Abstract Co-Author*)

PURPOSE

Remote ischemic conditioning (RIC) has been shown to increase bowel perfusion in microvascular vessels in healthy mice using advanced imaging techniques such as two-photon electron microscopy. However, the effects of RIC on splanchnic vessels, particularly in neonatal mice, remain underexplored. Reproducible, non-invasive methods to evaluate these changes are needed to better understand the hemodynamic response to RIC. This study aimed to assess the effects of RIC on intestinal perfusion in 3 day-old mice pups using a non-invasive approach: ultrasound color Doppler combined with Dynamic Tissue Perfusion Measurement (pixel flux software). Previous studies demonstrated no change in SMA blood flow velocity. We hypothesized that RIC would increase perfusion in peripheral mesenteric and mural intestinal vessels, detectable by ultrasound.

METHODS AND MATERIALS

P3 mice pups, fasted for 6 hours, were scanned before and after RIC. Remote ischemic conditioning (RIC) is performed by applying a tourniquet to the hind limb of pups, consisting of four cycles of 5-minute ischemia followed by 5-minute reperfusion. The splanchnic perfusion was evaluated using ultrasound color Doppler (Vevo 3100 imaging system, Fujifilm VisualSonics transducer MX700, 29-71 MHz). Dynamic Tissue Perfusion Measurement (pixel flux software) was used to quantify Doppler color intensity in the peripheral mesenteric and mural intestinal vessels, focusing on the most peripheral vessels (1 mm closest to the abdominal wall). A paired t-test was performed to compare pre- and post-RIC perfusion changes.

RESULTS

Dynamic Tissue Perfusion Measurement revealed a significant increase in perfusion in the peripheral mesenteric and mural intestinal vessels post-RIC ($p = 0.009$).

CONCLUSION

Ultrasound color Doppler, combined with Dynamic Tissue Perfusion Measurement, is a feasible and non-invasive method to evaluate the effects of RIC on intestinal perfusion in P3 mice pups. This technique demonstrates that RIC significantly increases perfusion in peripheral mesenteric and mural intestinal vessels, providing new insights into the microvascular response to RIC in neonates.

CLINICAL RELEVANCE/APPLICATION

Remote ischemic conditioning (RIC) is emerging as a promising therapeutic strategy for pediatric vascular disorders affecting the bowel. Our findings demonstrate that Doppler ultrasound serves as a non-invasive and effective modality for assessing treatment.

M1-SSPD02-4 TWO-DIMENSIONAL ELASTOGRAPHY AND DISPERSION SLOPE FOR DETECTION OF ALLOGRAFT DAMAGE AFTER PEDIATRIC LIVER TRANSPLANTATION

Jeong Min Song, MD (*Presenter*)
Pyeong Hwa Kim (*Abstract Co-Author*)
Hee Mang Yoon, MD, PhD (*Abstract Co-Author*)
Ah Young Jung, MD (*Abstract Co-Author*)
Jin Seong Lee, MD (*Abstract Co-Author*)
Kyung Mo Kim (*Abstract Co-Author*)
Young Ah Cho, MD,PhD (*Abstract Co-Author*)

PURPOSE

This study evaluates the diagnostic efficacy of two-dimensional shear wave elastography (2D SWE) for detecting liver allograft damage in pediatric liver transplant (LT) recipients with left lobe or left lateral segment grafts, with comparison of the diagnostic accuracy of intercostal and subcostal approaches.

METHODS AND MATERIALS

We retrospectively analyzed LT recipients who received left lobe or left lateral segment as a graft during their childhood and who underwent paired 2D SWE and liver biopsy at a single institution between February 2020 and April 2024. Liver elasticity and dispersion slope were obtained via intercostal or subcostal approaches immediately prior to liver biopsy by one of two board-certified pediatric radiologists. Linear regression analysis assessed associations between elastographic parameters and histopathological findings, including METAVIR fibrosis grade and liver allograft fibrosis (LAF) score. Diagnostic performance was evaluated using receiver operating characteristic (ROC) curve analysis. Additionally, subgroup analysis was performed according to ultrasound approach.

RESULTS

A total of 108 patients (median age, 13.4 years; 47 males) were analyzed. Elasticity measured via the intercostal approach demonstrated significant association with both METAVIR fibrosis grade (coefficient, 1.65; p=0.001) and LAF score (coefficient, 0.51; p=0.02), whereas subcostal measurements showed no significant association with any pathologic parameters. Intercostal measurements showed excellent diagnostic performance in detecting severe fibrosis (F0-F2 vs. F3-F4: AUC 0.95; p<0.001) and moderate performance for earlier fibrosis stages (F0-F1 vs. F2-F4: AUC 0.70; p=0.005; F0 vs. F1-F4: AUC 0.70; p=0.003). Dispersion slope, regardless of approach, showed no significant association with any pathological parameter.

CONCLUSION

Liver elasticity measured using 2D SWE via the intercostal approach demonstrated diagnostic value in predicting graft fibrosis in pediatric LT recipients. Neither subcostal elasticity measurements nor dispersion slope values showed diagnostic utility.

CLINICAL RELEVANCE/APPLICATION

2D SWE via the intercostal approach provides a non-invasive, reliable method for early detection of graft fibrosis in pediatric LT recipients, potentially reducing the need for invasive biopsies and facilitating timely clinical intervention. Regarding scan approach, the intercostal approach should be prioritized over the subcostal approach whenever anatomically feasible.

M1-SSPD02-5 PEDIATRIC PANCREAS SEGMENTATION FROM MRI SCANS WITH DEEP LEARNING

Elif Keles, MD, PhD (*Presenter*)
Merve Yazol (*Abstract Co-Author*)
Gorkem Durak, MD (*Abstract Co-Author*)
Ziliang Hong (*Abstract Co-Author*)
Halil Ertugrul Aktas (*Abstract Co-Author*)
Zheyuan Zhang, PhD (*Abstract Co-Author*)
Linkai Peng, BEng (*Abstract Co-Author*)
Cemal Yazici (*Abstract Co-Author*)
Ulas Bagci, MSc, PhD (*Abstract Co-Author*)

PURPOSE

MRI is crucial for diagnosing pancreatitis in children, yet reliable MRI-based pediatric pancreas segmentation algorithms are lacking, impacting diagnostic accuracy and efficiency. While deep learning (DL) is promising, most studies focus on CT, which is less ideal for children. Our study aimed to validate PanSegNet, a DL algorithm for pediatric pancreas segmentation on MRI in children with acute pancreatitis (AP), chronic pancreatitis (CP), and healthy controls.

METHODS AND MATERIALS

In this IRB approved study. we retrospectively analyzed 84 T2-weighted abdominal MRI scans (1.5T/3T Siemens Aera/Verio) acquired between 2015 and 2024 from children aged 2-19 years. The dataset comprised 42 patients diagnosed with AP or CP based on clinical criteria and 42 healthy controls with hypoechoic liver lesions detected on ultrasonography. Manual pancreas segmentations were performed by a pediatric and a general radiologist, with final verification by a senior pediatric radiologist. PanSegNet segmentations were quantitatively evaluated using Dice Similarity Coefficient (DSC), 95th percentile Hausdorff Distance (HD95), and volumetric correlation with ground truth. Inter- and intra-observer agreement was assessed using Cohen’s kappa.

RESULTS

Pancreas MRI T2W scans were obtained from 42 children with AP/CP (mean age: 11.73 ± 3.9 years) and 42 healthy children (mean age: 11.19 ± 4.88 years).PanSegNet achieved DSC scores of 88% (controls), 81% (AP), and 80% (CP), with HD95 values of 3.98 mm (controls), 9.85 mm (AP), and 15.67 mm (CP). Inter-observer kappa was 0.86 (controls) and 0.82 (pancreatitis), and intra-observer agreement reached 0.88 and 0.81. Strong correlations were found between automated and manual volumes (R^2 = 0.85 controls, 0.77 diseased).

CONCLUSION

This is the first study to evaluate PanSegNet , a novel DL algorithm for pediatric pancreas segmentation from MRI. PanSegNet demonstrated robust, accurate performance across both healthy and diseased cohorts. Our software and source code are available at: https://github.com/NUBagciLab/PaNSegNet, annotated dataset can be accessed at https://osf.io/km6yz (PedPanSegData).

CLINICAL RELEVANCE/APPLICATION

PanSegNet was shown to effectively segment the pancreas in children's MRI scans with high accuracy. This open-source tool and its annotated dataset fill a significant gap and enhance clinical outcomes by improving diagnostic precision for pancreatic diseases in children. By providing our validated algorithm, user-friendly software, and well-curated pediatric MRI datasets, we aim to promote transparency and reproducibility and stimulate further advancements in pediatric pancreatic care.

M1-SSPD02-6 DEVELOPMENT OF A SIMPLIFIED PREDICTION MODEL FOR DIAGNOSING PROGRESSIVE CENTRAL PRECOCIOUS PUBERTY USING CLINICAL AND PELVIC ULTRASOUND PARAMETERS

Seungyeon Cha (*Presenter*)
Hyun Joo Shin, MD, PhD (*Abstract Co-Author*)
Hye Sun Lee (*Abstract Co-Author*)

PURPOSE

This study aimed to explore the predictive value of clinical and pelvic ultrasound parameters for diagnosing central precocious puberty (CPP) and to establish a clinically useful simplified prediction model to differentiate progressive CPP (P-CP) from nonprogressive precocious puberty (N-PP).

METHODS AND MATERIALS

Girls aged <9 years with secondary sexual development who underwent a gonadotropin-releasing hormone stimulation test and pelvic ultrasound between September 2020 and November 2023 were retrospectively included and divided into the P-CP and N-PP groups. Logistic regression analysis was used to determine the significant parameters and develop prediction models. The diagnostic performance of the models was compared using the area under the receiver operating characteristic curve (AUC) analysis and the Delong method. The continuous net reclassification improvement (cNRI) and absolute integrated discrimination improvement (IDI) were used to determine the additive effects of ultrasound parameters. A nomogram scoring system was constructed based on a simplified model to predict the probability of developing P-CP.

RESULTS

A total of 109 girls were included, with 64 (58.7%) in the P-CP group. Age, bone age, height, height minus midparental height, basal luteinizing hormone (LH), follicle-stimulating hormone, estradiol, insulin-like growth factor-I, Tanner stage, and cervical and fundus width were significant parameters for the diagnosis of P-CP. The models with ultrasound parameters yielded significantly higher cNRI and IDI values than the models without ultrasound parameters. The simplified model was composed of basal LH, estradiol, and fundus width that showed an AUC value of 0.93 (95% confidence interval: 0.88-0.98) with a cutoff value of 16.

CONCLUSION

In conclusion, adding pelvic ultrasound parameters to traditional clinical results has an additive effect on P-CP screening. A simplified predictive model is effective for CPP screening in real-world clinics. These findings highlight the potential of the prediction model to overcome the limitations of the classical diagnostic approach for CPP

in children.

CLINICAL RELEVANCE/APPLICATION

Our study demonstrated that adding pelvic US parameters to traditional clinical results has an additive effect on P-CP screening. A simplified predictive model comprised of basal LH, estradiol, and fundus width is effective for CPP screening in real-world clinics. These findings highlight the potential of the prediction model, including US parameters, to overcome the limitations of the classical diagnostic approach for CPP in children.

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M2-STCE1

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER THEATER 1

Sub-Events

M2-STCE1-1 ARTIFICIAL INTELLIGENCE IN ONCOLOGY: OPPORTUNISTIC SCREENING FOR INCIDENTAL PULMONARY EMBOLISM AND VERTEBRAL COMPRESSION FRACTURES ON ONCOLOGIC ASSESSMENT CT SCANS

Sarah Quenet, MEng (*Presenter*)
Angela Ayobi, MENG,MSc (*Abstract Co-Author*)
El Mehdi Mniai, MD (*Abstract Co-Author*)
Astrid Orfali Camez, MD (*Abstract Co-Author*)
Vladimir Laletin, MD, PhD (*Abstract Co-Author*)
Julie Kiewsky (*Abstract Co-Author*)
Tarek Assi (*Abstract Co-Author*)
Amir Zemmouri (*Abstract Co-Author*)
Lambros C. Tselikas, MD, PhD (*Abstract Co-Author*)
Baptiste Bonnet (*Abstract Co-Author*)
Nathalie B. Lassau, MD, PhD (*Abstract Co-Author*)
Corinne Balleyguier, MD, PhD (*Abstract Co-Author*)
Samy Ammari, MD, PhD (*Abstract Co-Author*)

PURPOSE

The goal of this study was to evaluate the performance and clinical impact of two AI-based tools for the opportunistic detection of incidental pulmonary embolism (iPE) and vertebral compression fractures (VCF) on routine CT scans in cancer patients, and to assess their potential to enhance early diagnosis and improve patient management.

METHODS AND MATERIALS

Two retrospective, consecutive analyses were conducted at Gustave Roussy Cancer Center (France) to evaluate CINA-iPE and CINA-VCF Quantix (Avicenna.AI, France), two FDA-cleared and CE-certified AI applications. CINA-iPE was assessed on a cohort of 3,047 oncology patients undergoing follow-up contrast-enhanced CT for iPE detection. Additionally, time from scan to iPE diagnosis was recorded. CINA-VCF was evaluated on a cohort of 1,501 stage IV cancer patients, with the algorithm identifying and quantifying VCFs based on vertebral height loss. AI results were compared to initial radiology reports, with discordant cases reviewed by a radiology resident and senior radiologist. Moreover, severe (grade 3) VCFs were independently reviewed by interventional radiologists to assess eligibility for cementoplasty.

RESULTS

For iPE detection, the AI system generated 104 alerts; 36 were confirmed, yielding a sensitivity of 97.3% and specificity of 97.7%. The majority of false positives were attributed to motion artifacts and lymph nodes. The average time from scan acquisition to diagnosis was 8.13 hours. Seven patients experienced delayed diagnosis, requiring emergency department readmission for treatment. For VCF detection, the AI identified 501 suspected cases, with 436 confirmed (PPV: 87%). Notably, 81% of these confirmed fractures had not been mentioned in the original radiology reports. Among the unreported cases, 10 were classified as severe (grade 3), of which 9 were deemed suitable for cementoplasty.

CONCLUSION

AI-based tools demonstrated high performance in the opportunistic detection of iPE and VCFs on routine CT scans, identifying clinically relevant findings often missed in standard radiological assessments. These tools demonstrate potential to support earlier and more effective interventions in oncology care.

CLINICAL RELEVANCE/APPLICATION

In oncology patients, where early intervention can alter outcomes, AI-driven tools for opportunistic screening may reduce diagnostic delays, streamline workflow, and guide timely therapeutic decision-making.

M2-STCE1-2 EFFECTIVE OPPORTUNISTIC DETECTION OF VISCERAL ARTERIAL ANEURYSMS USING NON-CONTRAST ABDOMINAL CT IMAGING

Yuan Gao, MSc, PhD (*Presenter*)
Yujian Hu (*Abstract Co-Author*)
Jianfeng Zhang (*Abstract Co-Author*)
Zirui Wang (*Abstract Co-Author*)
Yan-Jie Zhou (*Abstract Co-Author*)
Yilang Xiang (*Abstract Co-Author*)
Hongkun Zhang (*Abstract Co-Author*)
Minfeng Xu (*Abstract Co-Author*)

PURPOSE

We developed a model for the detection of visceral arterial aneurysms (VAAs) on non-contrast abdominal CT (NCT) images, which could potentially be used for opportunistic VAAs screening.

METHODS AND MATERIALS

We collected paired abdominal CTA and NCT images from 1388 patients along with their diagnostic reports. Preprocessing involved using a spine landmarks detection model to standardize the field of view (FOV) from T09 to L05 and resample to a uniform resolution. A robust image registration algorithm aligned the NCT images with the CTA images.Two experienced radiologists with over 10 years of experience manually annotated the vessels in the CTA images. Based on the diagnostic reports, they also annotated any aneurysms present in these vessels. To avoid ambiguous annotations, we utilized Curve Planar Reformation (CPR) to straighten small vessels.

Measurements were taken from the proximal to distal ends of the vessels on CPR images. If a segment showed a diameter increase of 1.5 times the baseline, it was labeled as an aneurysm. This process resulted in 791 positive cases (with aneurysms) and 597 negative cases. Each case's mask included 5 labels: aorta, celiac trunk (hepatic and splenic arteries), superior mesenteric artery, right renal artery, and left renal artery. Positive cases also included a sixth label for visceral arterial aneurysms.A multi-class segmentation model was trained to learn the CTA annotations on the registered NCT images. The model was trained on 1110 cases and evaluated on the remaining 278 cases. During evaluation, if the segmentation result did not include the aneurysm class mask, the case was classified as negative. If the aneurysm class mask was present, the average probability within each connected component was compared to a threshold. If at least one component's average probability exceeded the threshold, the case was classified as positive; otherwise, it was classified as negative.

RESULTS

At the patient level, the model achieved an AUC of 0.952 for the classification of VAA-positive versus VAA-negative cases. At the selected operating point, the sensitivity was 0.924, and the specificity was 0.911, with an average of 0.107 false positives per case. At the lesion level, the recall for VAAs was 0.869, and the precision was 0.845.

CONCLUSION

The proposed model effectively detects visceral arterial aneurysms on non-contrast abdominal CT images, achieving high sensitivity while maintaining a high specificity.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the feasibility of using non-contrast abdominal CT scans for opportunistic screening of visceral arterial aneurysms. This method could facilitate the early detection of VAAs, potentially reducing morbidity and mortality associated with these conditions.

M2-STCE1-3 AI-BASED QUANTIFICATION OF BREAST ARTERIAL CALCIFICATION ON MAMMOGRAPHY ADDS INCREMENTAL PROGNOSTIC VALUE TO PREVENT SCORES FOR CARDIOVASCULAR RISK STRATIFICATION

Theodorus Dapamede, MD, PhD (*Presenter*)
Aisha Urooj (*Abstract Co-Author*)
Vedant Joshi (*Abstract Co-Author*)
Gabrielle Gershon, BS (*Abstract Co-Author*)
Frank Li, PhD (*Abstract Co-Author*)
Seyed Mohammadreza Chavoshi, MD (*Abstract Co-Author*)
Beatrice Brown-Mulry (*Abstract Co-Author*)
Rohan Satya Isaac (*Abstract Co-Author*)
Aawez Mansuri, BS, MS (*Abstract Co-Author*)
Chad Robichaux (*Abstract Co-Author*)
Chadi Ayoub (*Abstract Co-Author*)
Reza Arsanjani, MD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)
Marly Van Assen, MSc, PhD (*Abstract Co-Author*)
William C. O'Neill, MD (*Abstract Co-Author*)
Imon Banerjee, PhD (*Abstract Co-Author*)
Hari Trivedi, MD (*Abstract Co-Author*)

PURPOSE

Cardiovascular disease (CVD) is the leading cause of death in women, who are often underdiagnosed and undertreated. Screening mammography offers an opportunity to identify asymptomatic women at high CVD risk via breast arterial calcification (BAC). Existing risk calculators may inadequately stratify diverse female populations. We aimed to determine if an automated AI algorithm quantifying BAC adds prognostic value for major adverse cardiovascular events (MACE) and mortality beyond the PREVENT score in a large, diverse, multi-institutional cohort.

METHODS AND MATERIALS

In this retrospective cohort study, we included 123,762 women who underwent screening mammography at two large healthcare systems (internal and external datasets). A hierarchical transformer-based neural network was used for automated semantic segmentation and quantification of BAC area (in mm^2). BAC burden was categorized as zero (0 mm^2), mild (>0-10 mm^2), moderate (>10-25 mm^2), or severe (>25 mm^2). The association between BAC severity and incident MACE was assessed using Kaplan-Meier analysis and Cox proportional hazards models, adjusted for the PREVENT 10-year risk score for total CVD.

RESULTS

Over a 7-year median follow-up, BAC was detected in 16.1% of women. Adding BAC to PREVENT scores improved MACE discrimination ($p<0.01$). Within PREVENT risk strata, Kaplan-Meier analysis showed moderate to severe BAC was associated with significantly lower MACE-free survival. After adjusting for PREVENT, compared to zero BAC, mild (internal HR: 1.32, 1.10-1.59; external HR: 1.28, 1.17-1.39), moderate (internal HR: 1.75, 1.23-2.50; external HR: 1.79, 1.55-2.06), and severe BAC (internal HR: 3.29, 2.15-5.05; external HR: 2.80, 2.36-3.32), were all prognostic for any MACE (all $p<0.005$).

CONCLUSION

Fully automated, AI-driven quantification of BAC is a robust, independent predictor of MACE and all-cause mortality. The incremental prognostic information it provides beyond the new PREVENT risk score demonstrates its distinct value in refining cardiovascular risk assessment in women.

CLINICAL RELEVANCE/APPLICATION

This AI-powered approach transforms a routine breast cancer screening into a dual-purpose, opportunistic test for cardiovascular health without requiring additional time, cost, or radiation exposure. By automatically identifying at-risk women who may be missed by standard risk calculators, this tool can trigger earlier preventive interventions, such as lipid-lowering therapies and cardiology referrals. Implementing this technology can help mitigate sex-based disparities in cardiovascular care and improve outcomes for women on a population scale.

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M2-STCE2

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER THEATER 2

Sub-Events

M2-STCE2-1 MATCHING CT IMAGE CHARACTERISTICS TO IMPROVE RADIOMIC REPRODUCIBILITY: A TRANSLATIONAL CALIBRATION PIPELINE USING 3D-PRINTED PHANTOMS

Alper M. Selver, PhD (*Presenter*)
Ismail Ozsoykal, BSC,MSc (*Abstract Co-Author*)
Aysegul YURT (*Abstract Co-Author*)
Ozgur I. Koska, PhD, MD (*Abstract Co-Author*)

PURPOSE

To enhance the clinical integration of radiomics by improving the reproducibility of CT-derived features through real-time correction of acquisition variability using a 3D-printed phantom-based calibration.

METHODS AND MATERIALS

Twenty cylindrical inserts (diameter and height: 4 cm) spanning -400 to +400 HU were scanned using a single CT (Philips Brilliance 64-slice) and imaging protocol (head/neck). Central ROIs (radius = 20 pixels) were taken from each. Mean and standard deviation values were used as reference points for intensity and noise calibration. Alongside these, ten 3D-printed texture phantoms (4 × 4 × 4 cm) with diverse texture patterns were included in each scan. Over six months, 24 acquisitions were performed to simulate scanner drift. A piecewise linear intensity stretching method was applied to match the mean of reference cylinders across scans, correcting for data drift. Standard deviation differences are used to determine level of noise removal or insertion. IBSI-compliant radiomic features were extracted from each texture before and after calibration. Feature variability was quantified using Normalized Standard Deviation (NSD), and image similarity is assesed by Structural Similarity Index Measure (SSIM) and Learned Perceptual Image Patch Similarity (LPIPS) across timepoints.

RESULTS

Prior to calibration, high variability was observed across repeated scans, particularly in frequency- and low-level texture features (e.g., DCT, GLCM). Following calibration, median NSD across all features and textures dropped from 0.28 to 0.09, representing more than 70% improvement in feature reproducibility. Moreover, without calibration, the observed SSIM and LPIPS were 0.87 and 0.17 in average, respectively, which is increased to 0.95 for SSIM, while LPIPS decreased to 0.11. These improvements show that the proposed calibration pipeline effectively minimizes inter-scan radiomics variability while preserving texture-specific signals.

CONCLUSION

This study introduces a practical, scanner-agnostic calibration framework using 3D-printed phantoms to align CT image characteristics across acquisitions. By significantly enhancing radiomic feature reproducibility, the method addresses a key barrier to clinical and regulatory adoption of quantitative imaging biomarkers.

CLINICAL RELEVANCE/APPLICATION

Radiomic features are increasingly used in AI models, prognostic algorithms, and clinical trials. Yet their clinical utility is undermined by poor reproducibility across scanners and timepoints. The proposed method is the first to combine a custom CT phantom with real-time data drift detection and mitigation algorithms, enabling scanner-specific, patient-centric calibration of CT images before quantitative analysis.

M2-STCE2-3 POPULATION-SCALE ARTIFICIAL INTELLIGENCE IN MAMMOGRAPHY SCREENING: POOLED ANALYSIS OF 652 000 EXAMINATIONS FROM THREE NATIONAL COHORTS

Romuald Ferre, MD (*Presenter*)
Cherie M. Kuzmiak, DO (*Abstract Co-Author*)

PURPOSE

The aim of this study was to determine, at program level, whether deployment of contemporary AI decision-support in organized breast-cancer screening increases screen-detected cancers without inflating false-positive callback (recall) rates.

METHODS AND MATERIALS

We extracted prospective numerator-denominator data from three large implementation studies that embedded AI into double-reading workflows: PRAIM 2025 (Germany; 12 centers; 461 818 examinations), MASAI 2023 (Sweden; cluster-randomized trial; 80 020 examinations) and ScreenTrustCAD 2023 (Sweden; paired-reader study; 111 162 examinations). For each cohort we calculated absolute differences between AI and control arms in recalls per 1 000 examinations and cancers detected per 1 000 examinations. Fixed- and random-effects meta-analyses were performed with inverse-variance weighting and Hartung-Knapp adjustment. Heterogeneity was summarized with the I^2 statistic. All source studies had ethics approval and complied with GDPR and the Declaration of Helsinki.

RESULTS

Across 652 000 screening examinations (356 316 with AI support and 295 785 controls), AI increased screen-detected cancers by 0.83 per 1 000 women (95 % CI 0.46 - 1.20) while reducing recalls by 0.54 per 1 000 (95 % CI -1.40 - 0.32). Heterogeneity was low for both outcomes (I^2 = 9 %). Individually, PRAIM and ScreenTrustCAD realized simultaneous gains—more cancers and fewer callbacks—whereas MASAI exchanged approximately one additional cancer for one additional callback, a difference that did not reach statistical significance.

CONCLUSION

In large, population-based screening programmes, modern AI support detects about one extra cancer per 1 000 women and, on average, does not increase—and may even reduce—false-positive callbacks.

CLINICAL RELEVANCE/APPLICATION

These findings suggest that health-systems can implement AI today to improve screening effectiveness while preserving, or modestly improving, patient safety and workflow efficiency.
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M3-SSCH03

Science Session with Keynote: Chest Imaging (Radiography)

Monday, Dec. 1 9:30AM - 10:30AM Room: S501

Amir Imanzadeh, MD (*Moderator*)
Furkan Ufuk, MD (*Moderator*)

Sub-Events

M3-SSCH03-1 MULTINATIONAL, REAL WORLD, CONSECUTIVE DATA, EXTERNAL VALIDATION OF CHEST RADIOGRAPH-BASED AI MODEL IN OPPORTUNISTIC SCREENING OF OSTEOPOROSIS AND OSTEOPENIA

Anushree M. Burade, MBBS (*Presenter*)
Monica O. Bernardo, MD (*Abstract Co-Author*)
Suman Singhal, MD (*Abstract Co-Author*)
Madhuri Barnwal (*Abstract Co-Author*)
Michael M. Maher, MD, FRCR (*Abstract Co-Author*)
Matthias F. Froelich, MD (*Abstract Co-Author*)
Parisa Kaviani, MD (*Abstract Co-Author*)
Aaminah Kobeisy, MBBS (*Abstract Co-Author*)
Emiliano Garza Frias, MD (*Abstract Co-Author*)
Harsh Mahajan, MD, MBBS (*Abstract Co-Author*)
Kabir Mahajan, MBA (*Abstract Co-Author*)
Alok Kumar Singh (*Abstract Co-Author*)
Antonio A. Moscatelli, MD (*Abstract Co-Author*)
Friedrich Pietsch (*Abstract Co-Author*)
Miso Jang (*Abstract Co-Author*)
Gaeun Lee (*Abstract Co-Author*)
Javier Contreras Yametti, MD (*Abstract Co-Author*)
Seyedehelaheh Hosseini, MD (*Abstract Co-Author*)
Shivangi Jha (*Abstract Co-Author*)
Lina Karout, MD (*Abstract Co-Author*)
Subba R. Digumarthy, MD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)

PURPOSE

To externally validate an AI tool for opportunistic osteopenia/osteoporosis detection on chest radiographs (CXR) with an international, multicenter real-world, consecutive data

METHODS AND MATERIALS

The ongoing study included consecutive, real-world, 1039 adult patients from US [685/1039 (65.9%)], India [251/1039 (24.1%)] and Brazil [103/1039 (9%)], who had both posterior-anterior CXRs and DEXA within 6 months. CXRs with any implanted devices, lines, tubes, prosthesis, moderate-severe scoliosis, or in anterior-posterior projection were excluded. The AI tool (Promedius.Inc) processed the de-identified CXRs to output probability scores for three classes of BMD: normal, osteopenia, osteoporosis. We recorded spinal T and Z scores from DEXA reports. Statistical analyses included ROC AUC, sensitivity, specificity, PPV, NPV and accuracy along with 95% confidence interval for differentiating the three BMD classes.

RESULTS

The mean age and SD for the cases was 65.5 ± 14.8 years (781 females, 258 males). For osteoporosis vs non-osteoporosis groups, the AI model had ROC AUC of 0.836 (95% CI: 0.799 - 0.873), sensitivity of 85.7% (95% CI: 79% - 92.4%), specificity of 68.8% (95% CI: 65.8% - 71.8%), PPV of 23.6% (95% CI: 19.3% - 27.8%), NPV of 97.7% (95% CI: 96.5% - 98.8%) and accuracy of 70.5% (95% CI: 67.7% - 73.3%). For osteopenia vs normal groups, the AI model had ROC AUC of 0.719 (95% CI: 0.681 - 0.758). There was no significant difference in the model performance across the three countries.

CONCLUSION

Our ongoing study supports the generalizability of CXR-based BMD prediction AI model across data from the three countries with high AUC and NPV. Given the global underutilization of dedicated osteoporosis screening with DEXA, such AI-based opportunistic screening using CXRs may help bridge the diagnostic gap.

CLINICAL RELEVANCE/APPLICATION

AI model can be used as an opportunistic screening tool for osteoporosis detection healthy population using CXRs.

M3-SSCH03-2 MULTICENTER VALIDATION OF AN AI SYSTEM FOR DETECTING AND LOCALIZING 13 CHEST X-RAY FINDINGS IN ADOLESCENTS AND ADULTS

Amit T. Kharat, PhD,DMRD (*Presenter*)
Akanksha Ojha (*Abstract Co-Author*)
Richa Pant (*Abstract Co-Author*)
Saumit Paul (*Abstract Co-Author*)
Aalhad Patwardhan (*Abstract Co-Author*)

PURPOSE

This study presents a comprehensive validation of CXR Detect v2.0 (DeepTek), an EU MDR-certified Class IIb CADe device, designed to detect and localize suspicious ROIs on chest radiographs. The device classifies each ROI into one of 13 clinically significant findings: Opacity, Tuberculosis, Pneumonia, Pulmonary Nodules, Atelectasis,

Fibrosis, Lung Mass, Cardiomegaly, Pleural Effusion, Pleural Thickening, Pneumothorax, Rib and Clavicular Fractures, and Hardware. The study assessed the standalone performance of the AI across diverse populations and imaging conditions in patients aged 12 years and above.

METHODS AND MATERIALS

A dataset of 2,100 chest X-rays was curated from multiple sources in the USA, India, and Europe. All scans were independently annotated by a panel of three radiologists (24, 10, and 4 years of experience), with final adjudication by a senior radiologist with 45 years of experience. The primary metrics used were sensitivity, specificity, and AUROC. Localization performance was measured using the weighted alternative free-response receiver operating characteristic (wAFROC) curve, with its area under the curve used as the figure of merit (FOM). Generalizability was tested by analyzing device performance across subgroups stratified by age, gender, radiographic view, site, and acquisition system manufacturer.

RESULTS

CXR Detect v2.0 demonstrated high diagnostic accuracy across all findings, with a sensitivity of 0.944 [95% CI: 0.934-0.952], specificity of 0.910 [0.901-0.919], and an AUROC of 0.951 [0.946-0.957]. The wAFROC-FOM was 0.908 [0.903-0.912], confirming strong localization performance. Subgroup analysis revealed robust performance across confounders: AUROC for males was 0.953 [0.946-0.960], and for females 0.949 [0.940-0.957]; age-based AUROCs ranged from 0.934 to 0.964, indicating reliable performance across adolescent to elderly cohorts. The performance remained high for radiographs acquired in different view positions and from different manufacturers of the acquisition system.

CONCLUSION

The validated AI solution shows excellent standalone performance in detecting and localizing 13 chest X-ray findings in individuals aged 12 years and older. Its high sensitivity, specificity, and generalizability across diverse demographics and imaging conditions underscore its potential to enhance radiographic screening and triage workflows, especially in resource-limited settings.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that CXR Detect v2.0 can be a reliable tool for automated detection of a broad spectrum of chest pathologies, supporting clinical decision-making and radiologist efficiency without requiring manual input.

M3-SSCH03-3 DYNAMIC CHEST RADIOGRAPHY IMPROVES DETECTION AND DIAGNOSTIC CONFIDENCE OF LUNG CANCER LESIONS COMPARED TO CONVENTIONAL RADIOGRAPHY

Koji Takumi, MD, PhD (*Presenter*)
Ryota Nakanosono, MD (*Abstract Co-Author*)
Hiroaki Nagano, MD, PhD (*Abstract Co-Author*)
Tsubasa Nakano (*Abstract Co-Author*)
Fumitaka Ejima (*Abstract Co-Author*)
Masanori Nakajo, MD (*Abstract Co-Author*)
Kiyohisa Kamimura, MD, PhD (*Abstract Co-Author*)
Takashi Yoshiura, MD, PhD (*Abstract Co-Author*)

PURPOSE

To investigate whether dynamic chest radiography (DCR) improves the diagnostic accuracy of conventional chest radiography (CCR) for detecting lung nodules.

METHODS AND MATERIALS

The study included 100 surgically treated lung cancer lesions. All patients underwent preoperative CCR, DCR, and CT examinations. DCR was obtained using a dynamic flat-panel detector imaging system, equipped with the X-ray moving image analysis workstation (KINOSIS, Konica Minolta, Inc., Tokyo, Japan). The diagnostic confidence for the lesions was evaluated by three chest radiologists on a 3-point scale (2: definite presence, 1: probable presence, 0: difficult to identify) for both CCR and DCR, with a score of 1 or higher defined as a detectable lesion. Artificial intelligence (AI)-based software (CXR-AID, Fujifilm, Tokyo, Japan) also evaluated lesions on conventional chest radiographs. The detectability of the lesions was compared between DCR and CCR as evaluated by radiologists and AI-based software.

RESULTS

The detectability of DCR based on radiologists' consensus (81.0% [81/100]) was significantly higher than that of CCR interpreted by radiologists (71.0% [71/100]; $p = 0.002$) and by AI-based software (64.0% [64/100]; $p < 0.001$). Among the 29 lesions that were difficult for radiologists to identify on CCR, 10 were successfully detected using DCR, all of which overlapped with normal anatomical structures on CCR. For almost all lesions (98.6%) that were initially diagnosed with a confidence level of 1 on CCR by radiologists, the confidence level improved on DCR.

CONCLUSION

DCR significantly improves the detectability and diagnostic confidence of lung cancer lesions compared to CCR, with or without AI-based software, particularly in cases complicated by anatomical overlap.

CLINICAL RELEVANCE/APPLICATION

DCR enhances the detectability and diagnostic confidence of lung cancer lesions, particularly in cases where CCR is limited by anatomical overlap, serving as a valuable complement to both conventional interpretation and AI-assisted analysis in clinical practice.

M3-SSCH03-4 QUANTITATIVE COMPARISON AND READER-BASED EVALUATION OF A VISION-LANGUAGE MODEL FOR CHEST RADIOGRAPH INTERPRETATION

Honggeun Cho, MD (*Presenter*)
Bumcheol Hwang (*Abstract Co-Author*)
Jonggwon Park, Phd (*Abstract Co-Author*)
Byungmu Yoon (*Abstract Co-Author*)
Kyoyun Choi, PhD (*Abstract Co-Author*)
Juyeon Yi, MD (*Abstract Co-Author*)
Joon Young Kim (*Abstract Co-Author*)
Hyun S. Choi, MD, PhD (*Abstract Co-Author*)
Jay Yoon (*Abstract Co-Author*)
Hyewon Kang (*Abstract Co-Author*)
Seongeun Lee (*Abstract Co-Author*)
Heeguen Kang (*Abstract Co-Author*)
Ro-Woon Lee, MD (*Abstract Co-Author*)
Kyuhong Lee, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the classification and segmentation capabilities of a vision-language model (VLM) for chest radiograph interpretation through a two-stage study: (1) quantitative comparison with a unimodal segmentation model (uSEG), and (2) reader-based evaluation of interpretability and perceived clinical utility.

METHODS AND MATERIALS

A newly developed VLM generates similarity maps between chest radiographs and textual descriptions. Thresholding the similarity maps allows the model to perform open-vocabulary segmentation. In contrast, the uSEG is a supervised segmentation model trained to detect five common thoracic abnormalities. Classification and segmentation performance of the VLM and uSEG were compared using a publicly available chest radiograph dataset annotated for findings including consolidation, pneumothorax, fibrosis, nodule/mass, and pleural effusion. Classification metrics included area under the receiver operating characteristic curve (AUROC), sensitivity, specificity, and accuracy, with AUROC comparisons performed using the DeLong test. Segmentation performance was assessed using Dice scores and compared using paired t-tests. For reader evaluation, 100 chest radiographs were retrospectively collected from a tertiary care hospital under IRB approval. Two general practitioners and two senior medical students independently evaluated the VLM's heatmaps, rating agreement with findings and perceived helpfulness for clinical or educational use on a 5-point Likert scale. Score distributions and acceptable response rates (scores =3) were analyzed.

RESULTS

The VLM demonstrated comparable classification performance to the uSEG across most findings (e.g., consolidation AUROC: 0.930 vs. 0.929; p = .83). For segmentation, the VLM achieved higher Dice scores for pleural effusion, comparable performance for fibrosis (p = .05), and modestly lower performance for other findings. In the reader evaluation, general practitioners demonstrated moderate agreement and helpfulness ratings, with acceptable rates of 94.0% and 81.0%, respectively, for GP1, and 79.0% and 67.0% for GP2. Medical students demonstrated higher acceptable rates for both agreement and helpfulness compared to general practitioners.

CONCLUSION

The VLM demonstrated performance comparable to a unimodal segmentation model while generating interpretable outputs without requiring manual annotation. Reader evaluations further supported its potential clinical and educational relevance.

CLINICAL RELEVANCE/APPLICATION

The VLM offers a scalable solution for chest radiograph interpretation by producing interpretable visual outputs. It may support clinical practice and education, pending prospective validation.

M3-SSCH03-6 DEEP LEARNING MODEL FOR CORONARY ARTERY CALCIUM DETECTION FROM DUAL-ENERGY CHEST X-RAYS: A SIMULATION STUDY

Adam S. Wang, PhD (*Presenter*)
Linxi Shi, PhD (*Abstract Co-Author*)
Akyl Swaby (*Abstract Co-Author*)
Kaitlin Hellier (*Abstract Co-Author*)
Praveen Gurunath Bharathi (*Abstract Co-Author*)
Dominik Fleischmann, MD (*Abstract Co-Author*)
Shiva Abbaszadeh (*Abstract Co-Author*)

PURPOSE

Coronary artery calcium (CAC) scoring is a key tool in cardiovascular risk stratification, traditionally performed using non-contrast cardiac CT. However, CT is expensive and unsuitable for large-scale screening. Dual-energy chest X-ray (DE-CXR) with material decomposition offers a potential low-cost alternative, but CAC detection is challenged by anatomical overlap with bony structures. This study aims to develop a deep learning model for detecting and segmenting CAC on DE-CXR projections and to identify the optimal projection angle for accurate CAC detection.

METHODS AND MATERIALS

We developed a CAC segmentation model based on DE-CXR bone images using the nn-Unet architecture. A training dataset was generated from two calcium scoring CT datasets of 159 and 391 patients by simulating DE-CXR projections with realistic x-ray physics. Ground truth calcium segmentations from CT were mapped onto the simulated projections. DE-CXR projections were synthesized and post processed by a high-pass filter across five views: AP, lateral, and three intermediate angles. For each view, we calculated the average overlap ratio between CAC and bony structures — hypothesizing the lower the overlap, the better the CAC visibility. We validated this theory by comparing model performance across views, using ~90% of the data for training and ~10% for testing.

RESULTS

Overlap analysis showed that CAC-bone overlap decreased progressively from AP to lateral views, suggesting better visibility in lateral projections. Model performance reflected this trend as well: in a test cohort of 44 patients (12 with CAC >300, 12 with 100-300, 10 with <50, 10 with score 0), lateral projections achieved 89% sensitivity and 100% specificity. The AP view, impacted by spine and sternum overlap, yielded only 53% sensitivity but still 100% specificity. Segmentation also improved when training subsets were stratified by CAC severity (>300), suggesting enhanced model generalization with higher calcium burden.

CONCLUSION

Our deep learning model aligns with theoretical predictions, demonstrating high accuracy in CAC detection from DE-CXR, particularly in lateral projections where bone overlap is minimized. These results support DE-CXR as a scalable, low-dose, and cost-effective alternative to CT for CAC screening, with important implications for population-level cardiovascular risk assessment.

CLINICAL RELEVANCE/APPLICATION

Our deep learning model can help detect Coronary Artery Calcium from dual-energy chest X-ray as an alternative to CT for Calcium Scoring.

M3-SSCH03-7 Keynote Speaker

Jin Mo Goo, MD, PhD (*Science Invited Presenter*)

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M3-SSGI04

Gastrointestinal Imaging (Pancreas - Cystic Lesions)

Monday, Dec. 1 9:30AM - 10:30AM Room: E350

Kumaresan Sandrasegaran, MD (*Moderator*)
Olga R. Brook, MD, MBA (*Moderator*)

Sub-Events

M3-SSGI04-1 USING LARGE LANGUAGE MODELS TO EXTRACT PANCREATIC CYST LESION FEATURES FROM RADIOLOGY REPORTS FOR AUTOMATED RISK STRATIFICATION

Chenchan Huang, MD (*Presenter*)
Ebrahim Rasromani (*Abstract Co-Author*)
Beisong Liu (*Abstract Co-Author*)
Yanqi Xu (*Abstract Co-Author*)
Garvit Luhadia (*Abstract Co-Author*)
Zehui Gu (*Abstract Co-Author*)
Wan Fung Chui, MD (*Abstract Co-Author*)
Felicia Pasadyn, MA, BA (*Abstract Co-Author*)
Yu Hung, MD (*Abstract Co-Author*)
Edwin Mathieu, MD (*Abstract Co-Author*)
Julie Y. An, MD (*Abstract Co-Author*)
Tamas Gonda (*Abstract Co-Author*)
Stella Kang, MD, MSc (*Abstract Co-Author*)
Yiqiu Shen, PhD, BSc (*Abstract Co-Author*)

PURPOSE

To develop large language models (LLMs) that automatically extract pancreatic cyst lesion (PCL) features from MRI/CT reports and assign risk categories based on clinical guidelines.

METHODS AND MATERIALS

We retrospectively identified a training dataset of 6000 MRI/CT radiology reports from 5134 patients (2005-2024) using a keyword search in our radiology database, the majority of which described a PCL. The training labels for all reports were generated by GPT-4o using chain-of-thought (CoT) prompting to extract key PCL features, including cyst presence, size, growth, wall thickening, mural nodules, pancreatic duct communication, duct dilation or stricture, duct caliber, differential diagnosis, cyst type (e.g., pseudocyst or serous cystadenoma), and presence of pancreatitis. Two open-source LLMs, LLAMA-3.1-8B-Instruct and DeepSeek-R1-8B, were fine-tuned using QLoRA on GPT-4o-generated CoT training data. Extracted features were mapped to cyst risk categories based on the 2017 ACR White Paper. For evaluation, we used a held-out test set of 285 reports, which were manually annotated by two trainees under the supervision of an abdominal radiologist with 9 years of experience. A separate radiologist assessment was performed on 100 PCL cases from the test set, independently reviewed by three radiologists. Feature extraction performance was measured using exact match accuracy, risk categorization with macro-averaged F1 score, and radiologist agreement using average Cohen's kappa across raters.

RESULTS

Fine-tuning with CoT supervision substantially improved PCL feature extraction accuracy for LLaMA (from 80% to 97%) and DeepSeek (from 79% to 98%), reaching performance comparable to GPT-4o with CoT (97%). For PCL risk categorization, fine-tuning also boosted F1 scores for LLaMA (from 79% to 95%) and DeepSeek (from 80% to 94%), though both remained below GPT-4o (97%). In the radiologist assessment study, GPT-4o with CoT achieved an average Cohen's kappa of 0.905 across raters, while fine-tuned DeepSeek with CoT achieved 0.898, indicating strong agreement with expert assessments.

CONCLUSION

LLMs can accurately extract PCL features and assign risk categories. While GPT-4o performed best, fine-tuned open-source models achieved comparable accuracy. Chain-of-thought enhances both performance and interpretability through explicit reasoning traces.

CLINICAL RELEVANCE/APPLICATION

LLMs can automate the labor-intensive and error-prone task of tracking high-risk PCLs with high accuracy, facilitating large-scale data curation crucial for advancing PCL research.

M3-SSGI04-2 IMAGING BIOMARKERS FOR PANCREATIC ADENOCARCINOMA RISK STRATIFICATION IN INCIDENTAL PANCREATIC CYSTS: A MULTI-HOSPITAL COHORT STUDY

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PURPOSE

Incidental pancreatic cysts, often premalignant intraductal papillary mucinous neoplasms (IPMNs), rarely progress to pancreatic ductal adenocarcinoma (PDAC). We aimed to identify imaging and patient risk factors for PDAC development in a large, longitudinal cohort to refine surveillance strategies.

METHODS AND MATERIALS

Our IRB approved retrospective study (2010-2024) included 112,361 patients with abdominal CT/MRI, identifying 3,604 incidental pancreatic cysts. Using ICD-9/10 codes, we performed a case-control analysis to compare patients who developed PDAC after > 1 year of follow-up imaging to unmatched cyst patients with >10 years of

follow-up who did not develop PDAC (1 case to 3 controls). Cases: 21 patients developing PDAC >1 year after cyst diagnosis. Controls: 67 patients with cysts and >10 years of surveillance without PDAC. Nine risk factors (patient demographics, cyst morphology) were analyzed via logistic regression. Imaging features (septations, cyst/maximal pancreatic duct [MPD] diameter) were extracted from radiology reports. Statistical analysis included odds ratios (ORs), two-sample t-tests, and 95% confidence intervals (CIs).

RESULTS

Cohort: 3.83% (138/3,604) of cyst patients developed PDAC; 15.2% (21/138) had delayed PDAC (>1 year post-cyst diagnosis). Key risk factors: Male sex (OR=3.36, CI=1.20-9.45). Cyst: Septations (OR=4.96, CI=1.33-18.45), larger cyst diameter (PDAC: 2.1 cm vs. controls: 1.1 cm; *p*=0.003), MPD dilation (PDAC: 23.8% vs. controls: 0%; *p*=3.9×10?5). Time to PDAC: Mean 6.24 years (SD=5.73).

CONCLUSION

Our study provides a detailed, longitudinal evaluation of PDAC development from incidentally identified IPMN in a multi-hospital system. While most patients in our study are diagnosed with PDAC at the same time as their cyst, our case cohort had a mean time to PDAC development from cyst diagnosis of 6.24 years. Improving non-invasive risk stratification methods can potentially reduce over 6 years of surveillance, cost, and patient burden.

CLINICAL RELEVANCE/APPLICATION

Long-term imaging surveillance (>5 years) may be warranted for cysts with specific risk factors, optimizing early PDAC detection while reducing unnecessary follow-up in low-risk patients. This evidence-based approach addresses the growing burden of incidental cyst management.

M3-SSGI04-3 IPMN MALIGNANCY RISK ASSESSMENT USING MRI UNDER FEDERATED LEARNING PARADIGM

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PURPOSE

To develop and validate a privacy-preserving federated learning (FL) framework for intraductal papillary mucinous neoplasm (IPMN) risk stratification using a multi-institutional MRI data, enabling collaborative model development without compromising patient data security or regulatory compliance.

METHODS AND MATERIALS

We utilized a comprehensive dataset of 652 T1-weighted (T1W) and 655 T2-weighted (T2W) MRI images with corresponding IPMN risk outcomes collected from seven international centers. IPMNs were categorized as: high-risk (high-grade dysplasia or in situ/invasive cancer, confirmed by EUS biopsy/surgery within 6 months of imaging), low-risk (low-grade dysplasia confirmed pathologically or no progression for =3 years), and no-risk (normal or non-IPMN lesions). After preprocessing with regions of interest, we implemented a 3D DenseNet-121 architecture for risk stratification. We developed and compared multiple learning approaches: traditional centralized learning (CL) versus privacy-preserving FL methods (FedAvg and FedProx) for binary classification of high-risk versus non-high-risk. Model performance was assessed and compared using accuracy (ACC) and area under the ROC curve (AUC) through four-fold cross-validation.

RESULTS

The FL approach achieved performance comparable to CL without sharing sensitive patient data across institutions. For T1W images, CL obtained a mean global AUC of 78.13% and an accuracy of 79.90%, while FedAvg and FedProx (μ=0.1) achieved mean global AUCs of 76.19% and 76.46%, with corresponding accuracies of 79.29% and 78.52%, respectively. On T2W images, the FL performed even more favorably: FedProx (μ=0.3) achieved a mean global AUC of 81.81% and accuracy of 79.27%, nearly matching the CL's AUC of 82.37% and accuracy of 78.23%.

CONCLUSION

FL enables effective IPMN risk stratification across multiple institutions while preserving patient privacy and addressing data scarcity challenges in pancreatic imaging. Our results demonstrate that privacy-preserving FL approaches can achieve performance similar to CL, offering a mature solution that maintains high diagnostic accuracy while protecting sensitive patient data.

CLINICAL RELEVANCE/APPLICATION

This study establishes a practical framework for collaborative multi-institutional IPMN risk assessment that maintains data privacy while leveraging diverse datasets to improve model robustness. Our publicly available dataset (the largest multi-center IPMN collection to date), along with open-source code and pre-trained models, provides radiologists with improved tools for identifying high-risk IPMNs requiring timely intervention while establishing a foundation for broader collaborative AI development in pancreatic imaging.

M3-SSGI04-4 AUTOMATED DIAGNOSIS OF PANCREATIC CYSTS ON MRI USING DEEP LEARNING-BASED SEGMENTATION AND INTENSITY THRESHOLDING

Hyena Park (*Presenter*)
Dong Wook Kim, MD, PhD (*Abstract Co-Author*)
June-Goo Lee, PhD (*Abstract Co-Author*)
Ji-Hoon Jung (*Abstract Co-Author*)
Jae Ho Byun, MD (*Abstract Co-Author*)

PURPOSE

To develop and validate an automated model for detecting and measuring pancreatic cysts on pancreatic MRI scans using deep learning-based multi-class segmentation and intensity-based thresholding.

METHODS AND MATERIALS

A total of 345 T2-weighted pancreatic MRI scans from patients with intraductal papillary mucinous neoplasms (IPMN) were used. A multi-class segmentation model (nnU-Net) classifying (1) pancreas parenchyma, (2) pancreatic duct, and (3) bile duct was trained using manually annotated segmentations as ground truth. For

pancreatic cyst extraction, bias field correction and intensity-based thresholding—derived from the mean intensity values of ductal structures—were applied within the pancreas parenchyma segmentation after excluding segmented pancreatic and bile ducts. Cyst sizes were determined through 3D connected component analysis and convex hull geometry. The largest cyst size was defined by selecting the longest axis length among multiple slices corresponding to each cyst. In a separate test cohort of 50 consecutive IPMN patients (25 under surveillance and 25 who underwent surgical resection), the agreement in identifying the largest cyst between automated and expert radiologist analyses was assessed. The largest cyst size and the number of cysts =10 mm obtained via automated analysis were compared with measurements by the radiologist.

RESULTS

Average Dice scores from 5-fold cross-validation were 0.899 ± 0.008 for pancreas parenchyma, 0.727 ± 0.036 for pancreatic duct, and 0.837 ± 0.019 for bile duct, indicating good to excellent segmentation performance. Agreement on the largest cyst between automated and radiologist analyses was observed in 94% (47/50) of cases. Automatically measured largest cyst sizes correlated strongly with radiologist measurements (29.9 ± 15.4 mm vs. 30.7 ± 16.3 mm; Pearson r = 0.949, p < 0.001). There was no statistically significant difference in the number of cysts =10 mm between automated and manual measurements (2.26 ± 1.93 vs. 2.16 ± 1.90; Wilcoxon signed-rank test, p = 0.404).

CONCLUSION

The deep learning- and intensity-based automated approach demonstrated high segmentation accuracy and reliable cyst measurement comparable to expert radiologists. This method provides robust and objective assessment of pancreatic cysts on MRI.

CLINICAL RELEVANCE/APPLICATION

This fully automated method enables standardized, objective, and scalable quantification of pancreatic cysts on routine MRI, aiding surveillance and reducing inter-reader variability in managing cystic pancreatic lesions such as IPMN.

M3-SSGI04-5 IMPROVING PREDICTIVE ACCURACY FOR SURGICAL INDICATION IN THE CURRENT MANAGEMENT GUIDELINES FOR INTRADUCTAL PAPILLARY MUCINOUS NEOPLASM OF THE PANCREAS VIA CUTOFF ADJUSTMENTS

Junghoan Park, MD (*Presenter*)
Jung Hoon Kim, MD (*Abstract Co-Author*)
Seok Jin Hong, MD (*Abstract Co-Author*)

PURPOSE

To evaluate how to improve predictive accuracy for surgical indication in the current international consensus guidelines for malignancy in pancreatic intraductal papillary mucinous neoplasm (IPMN) via cutoff adjustments of imaging criteria.

METHODS AND MATERIALS

We retrospectively analyzed patients who underwent surgical resection for pancreatic IPMN at a single center between January 2011 and March 2023. Two radiologists reviewed preoperative MRI according to the international consensus guidelines and reached a consensus. We calculated ORs for imaging and clinical features and determined the sensitivity and specificity of high-risk stigmata (HRS). ROC analyses for enhancing mural nodule (EMN) size and main pancreatic duct (MPD) diameter identified cutoffs achieving specificities of 85%, 90%, and 95%. Revised HRS criteria (HRS-85, HRS-90, and HRS-95) were established based on these cutoffs and compared with the original HRS. We also adopted a 6-point scale based on HRS and worrisome features (WFs) (0: no WF/HRS; 1: 1 WF; 2: 2 WFs; 3: 3 WFs; 4: = 4 WFs; 5: = 1 HRS) and compared its AUC between the original and revised HRS.

RESULTS

A total of 418 patients (mean age, 66.6 ± 8.2 years; 263 men) were included, with 173 (41.4%) having malignant IPMN. The original HRS had sensitivity, specificity, and PPV of 82.7%, 66.9%, and 63.8%, respectively. The ORs for each HRS feature ranged from 4.91 to 29.93. Obstructive jaundice (specificity, 98.8%) and positive cytology (99.6%) exhibited very high specificity, whereas EMN = 5 mm and MPD = 10 mm were less specific (80.4% each). Feature-level thresholds to achieve specificities of = 85%, 90%, and 95% were identified as 9.5 mm, 12 mm, and 17.5 mm for EMN size and 11.0 mm, 12.0 mm, and 13.5 mm for MPD diameter, respectively. When applying these thresholds to the revised HRS (HRS-85, 90, and 95), the resulting sensitivities and specificities were 74.6%/77.1%, 65.3%/82.9%, and 53.2%/90.6%, respectively. The 6-point scale AUC improved from 0.771 (original HRS) to 0.798, 0.802, and 0.812 for HRS-85, 90, and 95 (p = 0.015-0.028).

CONCLUSION

Given that the current HRS is used as an absolute surgical indication, its high false positive rate for malignancy remains a limitation. Adjusting the cutoffs for EMN size and MPD diameter improves specificity and the 6-point scale AUC, though at the expense of sensitivity. Therefore, cutoff values should be optimized according to the clinical context.

CLINICAL RELEVANCE/APPLICATION

Adjusting cutoff values for EMN size and MPD diameter improves specificity and AUC in predicting malignancy for pancreatic IPMN, potentially guiding more targeted surgical interventions. However, the associated reduction in sensitivity necessitates a balanced, individualized assessment in clinical practice.

M3-SSGI04-6 NATURAL HISTORY OF PANCREATIC CYSTS: SINGLE-CENTER EXPERIENCE OVER TWO DECADES

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Stella Kang, MD, MSc (*Abstract Co-Author*)
Ammar Javed, MD (*Abstract Co-Author*)
Vishnu Jayaprakash (*Abstract Co-Author*)
Greg Sacks (*Abstract Co-Author*)
Camila Hidalgo Salinas (*Abstract Co-Author*)
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Tamas Gonda (*Abstract Co-Author*)

PURPOSE

To characterize pancreatic cystic lesions (PCLs) based on MRI or CT reports and track their natural history.

METHODS AND MATERIALS

We retrospectively included individuals with abdominal radiology reports with PCL from 2000 to 2025 using a large language model (LLM) that we have previously validated to have 97% accuracy. For each patient's reports, we identified the dominant or most suspicious PCL and extracted key imaging features (e.g., size, wall thickening, mural nodule, duct caliber) per the ACR 2017 white paper. PCLs were categorized into 3 groups: low risk (LR), worrisome features (WF+), and high-risk stigmata (HRS+). Follow-up data were analyzed to assess A) Radiographic Progression (RP): =1 new WF or HRS on follow-up imaging reports; and B) Pathological progression: malignancy confirmed by biopsy or surgery (high-grade dysplasia [HGD] or pancreatic cancer). Exclusion criteria were (1) known pancreatic malignancy prior or within six months of baseline PCL identification, (2) any pancreatic surgery; (3) < 12 months surveillance. Follow-up continued until a pathological diagnosis or the last imaging study referencing the PCL.

RESULTS

Of 47,801 patients with reported PCLs, 6,078 patients (median age: 69.3, SD: 12.2; female: 3,797) met inclusion criteria. The median follow-up was 2.1 years. Among these, 1,531 patients had =5 years of imaging follow-up (median 4 CT/MRIs, range 2-44) and 157 patients had =10 years of imaging follow-up. At baseline, 89.9% cysts were classified as LR, 9.5% as WF+, and 0.06% as HRS+. For LR cysts, 13.5% (740/5,462) experienced RP, and 1.5% (82/5462) developed malignancy. For WF+ cysts, 22.5% (130/577) experienced RP, and 2.9% (17/577) developed malignancy. For HRS+ cysts, 33.3% (13/39) experienced RP, and 15.4% (6/39) developed malignancy. For those that experienced RP, 3.6% (32/883) developed malignancy, compared to 1.4% (73/5195) in the radiographically stable group. The median time from baseline imaging to RP was 72.6 months (SD 35.9); to HGD was 80.9 months (SD 46.1); and to cancer diagnosis was 22 months (SD 27.4). Out of 105 malignancy cases, 61% (64/105) were diagnosed by year 3, 82.9% (87/105) by year 5, and 98% (103/105) by year 10.

CONCLUSION

This work represents the largest AI-assisted evaluation of PCL progression to date. We found a higher proportion of baseline WF+/HRS+ cysts and those with radiographic progression during follow-up developed malignancy, with most malignancies detected within the first 5 years of the initial PCL description.

CLINICAL RELEVANCE/APPLICATION

This large AI-assisted study of PCL progression defines both radiographic and pathological progression rates, offering data-driven insights into the link between radiological patterns and malignancy.
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Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

M3-SSGI05

Gastrointestinal Imaging (Colorectal Cancer)

Monday, Dec. 1 9:30AM - 10:30AM Room: E451B

Kevin J. Chang, MD (*Moderator*)
Stephanie Nougaret, MD, PhD (*Moderator*)

Sub-Events

M3-SSGI05-2 DEEP LEARNING DECODES CT CLUES: PREDICTING POLE MUTATIONS IN MSS COLORECTAL CANCER FOR PRECISION IMMUNOTHERAPY

Zhen Guan (*Presenter*)
Ying-shi Sun, PhD (*Abstract Co-Author*)

PURPOSE

Immunotherapy has shown remarkable efficacy in POLE-mutated microsatellite-stable colorectal cancer (MSS/pMMR CRC), yet these mutations occur in only 2-4% of cases. We developed and validated a deep learning model using routine multi-phase CT scans to non-invasively identify POLE-mutated tumors, potentially enabling broader access to immunotherapy for eligible patients.

METHODS AND MATERIALS

This multicenter study included 119 histologically confirmed MSS/pMMR CRC patients (25 POLE-mutated, 94 wild-type) from January 2008 to June 2022. Patients were randomly divided into training (n=79) and testing (n=40) cohorts at a 2:1 ratio. A novel VGG-GRU hybrid network was developed to analyze manually segmented tumor and peritumoral adipose tissue across four CT phases (non-contrast, arterial, venous, and delayed). The model employed a unique slice-to-patient aggregation strategy, first predicting mutation probability for each CT slice before generating a final patient-level classification. Performance was rigorously evaluated using AUC, sensitivity, specificity, predictive values, decision curve analysis, and the Hosmer-Lemeshow test.

RESULTS

The model achieved exceptional discrimination with a patient-level AUC of 0.957 (95%CI: 0.914-1.000) in the testing cohort, improving to 0.969 in the combined model analysis. Key performance metrics included 90.6% specificity, 93.9% negative predictive value, and 85.7% positive predictive value. Decision curve analysis demonstrated strong clinical utility across all probability thresholds, while the Hosmer-Lemeshow test confirmed excellent model calibration. These results were consistent across different tumor stages and locations.

CONCLUSION

Our CT-based deep learning model accurately identifies POLE-mutated MSS CRC by capturing subtle imaging signatures in both tumor and peritumoral tissues. This approach represents a significant advancement in non-invasive biomarker discovery for precision immunotherapy selection.

CLINICAL RELEVANCE/APPLICATION

This AI model provides a practical, cost-effective solution for screening POLE mutations using existing CT protocols, addressing a critical gap in precision oncology. With its high negative predictive value (93.9%), the model could reduce unnecessary molecular testing costs, while its strong positive predictive value (85.7%) facilitates early identification of immunotherapy candidates. The immediate clinical applicability of this tool may significantly improve treatment selection and patient outcomes in MSS CRC, particularly for cases where molecular testing is unavailable or delayed.

M3-SSGI05-3 DETECTION OF COLORECTAL NEOPLASTIC LESIONSBYCOMBINEENERGY-SPECTRUM CTCOMPARATIVE ROUTINE CT COLONOGRAPHY:A PRELIMINARY STUDY

Yuna Li, BS (*Presenter*)
Shengyuan Lai, MMed,MMed (*Abstract Co-Author*)
Jiawen Luo (*Abstract Co-Author*)
Bin Mu (*Abstract Co-Author*)

PURPOSE

To compare the detection rate of colorectal tumor lesions using abdominal three-phase enhanced spectral CT without bowel preparation versus conventional three-phase enhanced CT colonography (CTC) with bowel preparation.

METHODS AND MATERIALS

A total of 200 patients with colorectal masses who underwent CT examinations were included in this retrospective study. Among them, 100 patients received spectral CT without bowel preparation, while the other 100 underwent conventional enhanced CTC with bowel preparation. All patients underwent colonoscopy within one week. Subjective image quality, rated using a 5-point scale, and objective image quality (including image noise, contrast-to-noise ratio, and signal-to-noise ratio) were compared between spectral CT and enhanced CTC. The diagnostic performance of spectral CT and enhanced CTC was evaluated and compared using pathological findings as the reference standard.

RESULTS

There were no statistically significant differences in age, height, and weight between patients undergoing spectral CT and conventional enhanced CTC (all $p>0.05$).The CT dose-index volumes, dose-length product, and effective dose in CTC colonography were significantly higher than those in spectral CT (CTC:89.58 ± 22.41, 1956.15 ± 586.28, 29.34 ± 8.79; spectral CT:78.27 ± 15.01, 1246.28 ± 144.53, 18.69 ± 2.17)(all $p<0.05$).The pathological results showed that among the patients who underwent CTC, there were 77 cases of adenocarcinoma and 23 cases of adenoma.In cases of Spectral CT, there were 81 cases of adenocarcinoma and 19 cases of adenoma. For diagnosing adenocarcinoma, CTC achieved 93.68% accuracy, 97.40% sensitivity, and 77.78% specificity. Spectral CT demonstrated 98.00% accuracy, 99.10% sensitivity, and 88.23% specificity. The difference between the spectral CT and enhanced CTC in the detection rate of adenocarcinoma and adenoma was statistically significant ($P<0.05$).

CONCLUSION

The spectral CT showed superior diagnostic performance in distinguishing between adenomas and adenocarcinomas compared to conventional enhanced CTC. Moreover, spectral CT requires lower radiation doses and eliminates the need for bowel preparation.

CLINICAL RELEVANCE/APPLICATION

The superior diagnostic performance of spectral CT in distinguishing between adenomas and adenocarcinomas, along with the advantages of lower radiation doses and absence of bowel preparation, make it a promising alternative to conventional enhanced CTC. Incorporating spectral CT into clinical practice may enhance the accuracy and efficiency of colorectal tumor detection, while also improving patient comfort and reducing radiation exposure.

M3-SSGI05-4 EVALUATING THE ADDED VALUE OF TOPOLOGICAL DATA ANALYSIS IN PREDICTING THE EFFICACY OF NEOADJUVANT THERAPY FOR LOCALLY ADVANCED RECTAL CANCER: A COMPARATIVE STUDY WITH RADIOMICS AND DEEP LEARNING APPROACHES

Kui Sun, MMedSc, PhD (*Presenter*)

PURPOSE

In clinical practice, approximately 15-25% of locally advanced rectal cancer (LARC) patients achieve pathological complete response (pCR), which is closely associated with favorable prognosis. However, noninvasive and accurate preoperative assessment methods remain a major clinical challenge. This study aims to integrate topological data analysis (TDA), radiomics, and deep learning (Dl) for predicting the response to neoadjuvant chemoradiotherapy (nCRT) and prognosis in LARC using baseline T2WI, and to further explore the incremental value provided by TDA.

METHODS AND MATERIALS

This multicenter retrospective study included 227 LARC patients from Center 1 as the development cohort and 72 and 55 patients from two separate centers as external validation cohorts 1 and 2, respectively. The bi-region, comprising the tumor and peritumoral lymph node volumes of interest (VOIs), was manually delineated by a highly experienced senior radiologist. Three analytical approaches were implemented, including radiomics, TDA and end-to-end analysis was performed by ResNet-50. The predictive performance was evaluated using the area under the receiver operating characteristic curves (AUROCs). Prognostic indices, including disease-free survival (DFS) and overall survival (OS), were assessed using Kaplan-Meier (KM) analysis, with the Log-Rank test used to compare KM curves.

RESULTS

In the single-model comparison, the AUROCs on the two external validation cohorts were as follows: for Rs-tumor (Rs_T), 0.740 and 0.716; for Rs-peritumoral lymph nodes (Rs_LN), 0.740 and 0.651; for Dl, 0.703 and 0.699; for TDA-tumor (TDA_T), 0.740 and 0.739; and for TDA-peritumoral lymph nodes (TDA_LN), 0.751 and 0.728. Upon integration of the bi-regional Rs and Dl models (Rs_DL), the AUROCs improved to 0.785 and 0.773. Further incorporation of the bi-regional TDA module (Rs_DL_TDA) led to a substantial enhancement in predictive performance, achieving AUROCs of 0.931 and 0.863, respectively. These findings underscore the additive predictive value of the TDA-based features. In terms of prognostic stratification, the Rs_DL_TDA model demonstrated significant capability in stratifying OS ($p < 0.05$) in both cohorts, and effectively distinguished DFS in external validation cohort 2 ($p = 0.0014$), albeit with marginal significance in cohort 1 ($p = 0.051$).

CONCLUSION

A predictive model based solely on baseline T2WI demonstrated effective assessment of nCRT response in LARC patients.

CLINICAL RELEVANCE/APPLICATION

This study presents a non-invasive model that accurately predicts nCRT response in LARC using baseline T2WI. The integration of TDA significantly enhances performance, offering valuable support for early treatment decision-making and personalized therapy.

M3-SSGI05-5 HOW BEST TO COMBINE DWI AND T2WI TO PREDICT PATHOLOGIC COMPLETE RESPONSE: A MULTI-CENTER STUDY ON INTERPRETING MRI FOLLOWING CHEMORADIOTHERAPY OF RECTAL CANCER

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Nieun Seo, MD, PhD (*Abstract Co-Author*)
Soon Nam Oh, MD, PhD (*Abstract Co-Author*)
Sung Kyoung Moon (*Abstract Co-Author*)
Chulmin Lee, MD (*Abstract Co-Author*)
Jong Keon Jang, MD (*Abstract Co-Author*)
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Seung Hyun Cho, MD, PhD (*Abstract Co-Author*)
Seong Ho Park, MD (*Abstract Co-Author*)
Joonseok Lim, MD (*Abstract Co-Author*)

PURPOSE

Consensus on how to integrate T2-weighted imaging (T2WI) and diffusion-weighted imaging (DWI) for predicting pathologic complete response (pCR) of rectal cancer on post-chemoradiotherapy (CRT) MRI remains lacking. This study aimed to explore practical strategies of integrating DWI on post-CRT MRI.

METHODS AND MATERIALS

This multicenter, retrospective study included patients from three different general hospitals who underwent CRT for rectal cancer bewteen 2017 and 2021. In addition to mrTRG, three criteria combining findings of DWI and T2WI were assessed: "AND" criterion (mrTRG 1-2 and absence of DWI restriction considered as CR), "OR" criterion (mrTRG 1-2 or absence of restriction considered as CR), and a modified MR tumor regression grade (modMR-TRG used in the previous literature). Crossed random effects model was used to pool sensitivity and specificity across five radiologists. F1 score and positive predictive value (PPV) were analyzed across varying pCR rates.

RESULTS

In 146 patients (median age [interquartile range], 63 [57-70] years; 87 men), the AND criterion yielded higher specificity (77.4% [63.3%-80.0%] vs. 75.3% [60.5%-79.0%], p=0.001) without significant difference in sensitivity (63.9% [42.8%-75.3%] vs. 67.5% [45.3%-76.0%], p=0.063) compared with mrTRG. The OR criterion yielded higher sensitivity (86.1% [65.3%-89.3%]; p<0.001) but lower specificity (49.5% [36.2%-62.6%]; p<0.001). The modMR-TRG demonstrated similar effects as OR criterion. Assuming 20% pCR rate, PPV and F1 score of the AND criterion (point estimate of 41.4% and 50.3%, respectively) were higher than those of the OR criterion (PPV, 29.9%; F1 score, 44.4%), although the difference diminished with increasing pCR rate.

CONCLUSION

The AND criterion—which utilizes DWI as a complementary tool to further exclude patients with residual tumors after an initial screening on T2W image—increases specificity without significantly compromising sensitivity compared to mrTRG.

CLINICAL RELEVANCE/APPLICATION

Given the currently attainable pCR rates below 30%, the AND criterion should be preferred over criteria giving greater significance to DWI. The OR or modMR-TRG criteria could be considered when higher pCR rates are anticipated such as with total neoadjuvant therapy, but this approach requires further validation.

M3-SSGI05-6 NODE-RADS OUTPERFORMS ESGAR CRITERIA IN RECTAL CANCER NODAL ASSESSMENT WITH NODE-BY-NODE HISTOPATHOLOGICAL VALIDATION

Qingyang Li, PhD (*Presenter*)
YUZHUO GUO (*Abstract Co-Author*)
Jiaqi Wu (*Abstract Co-Author*)
Ying-shi Sun, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the diagnostic performance of the Node Reporting and Data System 1.0 (Node-RADS) for assessing the nodal status in rectal cancer and compare it to the European Society of Gastrointestinal and Abdominal Radiology (ESGAR) criteria using a node-by-node matched postoperative pathologic result as the reference standard.

METHODS AND MATERIALS

Consecutive rectal cancer patients undergoing preoperative MRI followed by direct total mesorectal excision were prospectively enrolled at our institution between December 2021 and August 2023. Multiparametric MRI features of each lymph node which achieved a node-by-node matching between MRI and pathology were analyzed. According to the Node-RADS flowchart, the likelihood of metastases was assigned based on the assessment of the two levels of size and configuration, which together translated into the final Node-RADS score (Figs. 1 and 2). And the nodal status was also determined by the ESGAR criteria combined with short-axis diameter and morphological characteristics. The cutoff value of the Node-RADS score in diagnosing metastatic nodes was determined by the maximum Youden index method, and the diagnostic performance of Node-RADS and ESGAR criteria was evaluated by the areas under the receiver operating characteristic curve (AUCs) and compared by the DeLong method.

RESULTS

A total of 1,019 benign nodes and 283 metastatic nodes in 251 patients were finally included in this study. The optimal cutoff value of Node-RADS score was >2, i.e., a lymph node with a Node-RADS score of 1-2 was diagnosed as benign, whereas a Node-RADS score of 3-5 indicated metastases. Accordingly, the AUC, sensitivity, and specificity of Node-RADS in determining mesorectal nodal status were 0.83 (95% CI: 0.81, 0.85), 75%, and 91%, respectively, significantly outperforming the ESGAR criteria (AUC=0.70 [95% CI: 0.68, 0.73], P <.001) (Figs. 3 and 4).

CONCLUSION

With rigorous nodal-level pathology correlation, this study highlighted the better diagnostic performance of Node-RADS in determining the nodal status in rectal cancer compared to the currently most commonly used ESGAR criteria.

CLINICAL RELEVANCE/APPLICATION

Node-RADS offers a new solution to the long-bothering problem of unsatisfactory diagnostic performance of nodal status in rectal cancer.

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

M3-SSIN02

Imaging Informatics (Clinical Applications of Large Language Models in Radiology)

Monday, Dec. 1 9:30AM - 10:30AM Room: E450B

Axel Wismueller, MD, PhD (*Moderator*)
Ramkumar Rajabathar Babu Jai Shanker, MS (*Moderator*)

Sub-Events

M3-SSIN02-1 ENGINEERING PROMPTS, EXTRACTING DIAGNOSES: A MULTI-INSTITUTIONAL ASSESSMENT OF LLMS IN RADIOLOGY

Mana Moassefi, MD, MD (*Presenter*)
Sina Houshmand, MD (*Abstract Co-Author*)
Shahriar Faghani, MD (*Abstract Co-Author*)
Peter Chang, MD (*Abstract Co-Author*)
Shawn H. Sun, MD, MS (*Abstract Co-Author*)
Aakash Tripathi (*Abstract Co-Author*)
Bardia Khosravi, MD, MPH (*Abstract Co-Author*)
Ghulam Rasool, PhD (*Abstract Co-Author*)
Neil K. Bhatia, MD (*Abstract Co-Author*)
Les R. Folio, DO, MPH (*Abstract Co-Author*)
Katherine P. Andriole, PhD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)
Bradley J. Erickson, MD, PhD (*Abstract Co-Author*)

PURPOSE

The rapid evolution of large language models (LLMs) offers promising opportunities for radiology report annotation, particularly in identifying specific diagnostic findings. This study evaluates the effectiveness of a human-optimized prompt in extracting radiology diagnoses using LLMs across multiple healthcare institutions in the United States.

METHODS AND MATERIALS

To enable a robust, large-scale evaluation of LLMs for radiology diagnosis extraction, we manually annotated 3,000 radiology reports across six major U.S. institutions—500 reports per site—spanning five diagnostic categories with balanced representation (100 per category per site). Prior to multi-site deployment, prompt engineering was centrally conducted at Mayo Clinic through a systematic, three-stage refinement process using 30 separate example reports per category to iteratively optimize LLM performance. A standardized, open-source Python script incorporating the finalized prompt was then distributed to all participating institutions. This script enabled local execution of a common LLM, allowing for consistent analysis and comparison against site-specific reference annotations. Performance was evaluated using accuracy metrics, with results aggregated across institutions to assess generalizability and diagnostic consistency at scale.

RESULTS

The human-optimized prompt demonstrated high consistency across sites and pathologies. Preliminary analysis indicates significant agreement between the LLM's outputs and investigator-provided reference across 6 institutions. At one site, eight LLMs were systematically compared, with Llama 3.1 70b achieving the highest performance in accurately identifying the specified findings. Comparable performance with Llama 3.1 70b was observed at two additional centers, demonstrating the model's robust adaptability to variations in report structures and institutional practices.

CONCLUSION

Our findings highlight the promise of prompt-engineered LLMs as scalable tools for radiology diagnosis extraction across diverse healthcare institutions. By standardizing local deployment with minimal infrastructure needs, this approach demonstrates both feasibility and strong performance in multi-institutional settings. Future work will explore model robustness to diverse report structures and further refine prompts to improve generalizability.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates a practical, collaborative framework for deploying LLMs in real-world radiology settings. By using standardized prompts and local execution, institutions can leverage LLMs to rapidly annotate reports with minimal overhead—laying the groundwork for scalable AI integration in clinical workflows.

M3-SSIN02-3 ONE SLM IS ALL YOU NEED: ADAPTIVE, PRIVACY-PRESERVING SMALL LANGUAGE MODELS FOR MULTI-TASK CLINICAL ASSISTANCE

Guangyao Zheng (*Presenter*)
Peter Kamel, MD (*Abstract Co-Author*)
Michael A. Jacobs, PhD (*Abstract Co-Author*)
Vladimir Braverman, PhD (*Abstract Co-Author*)
Vishwa Parekh, PhD, MS (*Abstract Co-Author*)

PURPOSE

Recent research has shown that smaller, open-source, fine-tuned language models, known as Small Language Models (SLMs), can achieve performance comparable to or better than LLMs for clinical tasks. However, a major limitation of current SLMs is their training for a single task, which poses challenges for institutions with multiple clinical tasks needing numerous SLMs. We propose that training a single multi-task SLM capable of handling multiple clinical applications can maintain similar performance to closed-sourced LLMs. We use Low-Rank Adaptation (LoRA) to fine-tune an SLM on multiple clinical tasks. This allows hospitals to develop one customizable SLM to assist with various tasks.

METHODS AND MATERIALS

We evaluated the efficacy of a multi-task SLM across three different experiments: (1) medical report labeling, (2) DICOM metadata harmonization, and (3) impression generation from findings. For (1) and (3), we used the de-identified, public Chest X-Ray (CXR) data, which consisted of 3665 CXR reports labelled with thirteen diseases.

(2) was evaluated using a brain MRI dataset consisting of 1,395 DICOM metadata series descriptions. We trained the multi-task SLM by fine-tuning the 350 million parameters opt-350m using LoRA. An 80:20 train-test split is done. As a comparison, GPT-4o was tested without fine-tuning with Prompt Engineering. The evaluation metrics are F1 scores, overall accuracy, and the BLEU score.

RESULTS

For task (1), SLM achieved a class average F1-score of 0.894 compared to GPT-4o's 0.728. For task (2), SLM achieved an accuracy of 0.975 compared to GPT-4o's 0.878. For task (3), SLM achieved a BLEU score of 0.518 compared to GPT-4o's 0.098.

CONCLUSION

SLM with LoRA fine-tuning demonstrated excellent performance in adapting to multiple medical tasks compared to GPT-4o.

CLINICAL RELEVANCE/APPLICATION

Fine-tuned SLM enables on-site patient-private training and deployment and improves clinical decision support in institutions with limited computational resources. Additionally, fine-tuning multiple tasks together simplifies the usability and deployment of models.

M3-SSIN02-4 THE EXPERTISE PARADOX: WHO BENEFITS FROM LLM-ASSISTED BRAIN MRI DIFFERENTIAL DIAGNOSIS?

Bastien Le Guellec, MD (*Presenter*)
Severin Schramm (*Abstract Co-Author*)
Sebastian Ziegelmayer, MD (*Abstract Co-Author*)
Felix Busch, MD (*Abstract Co-Author*)
Karolin Paprottka (*Abstract Co-Author*)
Martin Renz, MD (*Abstract Co-Author*)
Jannis Bodden (*Abstract Co-Author*)
Marcus R. Makowski (*Abstract Co-Author*)
Jan S. Kirschke, MD (*Abstract Co-Author*)
Keno K. Bressem, MD (*Abstract Co-Author*)
Lisa C. Adams, MD, PhD (*Abstract Co-Author*)
Evamaria Riedel (*Abstract Co-Author*)
Dennis Hedderich, MD (*Abstract Co-Author*)
Benedikt Wiestler (*Abstract Co-Author*)
Su Hwan Kim, MD,MSc (*Abstract Co-Author*)

PURPOSE

Several studies demonstrated the potential of large language models (LLM) to perform radiological differential diagnosis based on textual image findings, but the relationship between reader expertise, LLM input quality, and resulting diagnostic benefit remains poorly understood. This study aimed to evaluate how different levels of radiological expertise influence the potential diagnostic benefit gained from LLM assistance in brain MRI differential diagnosis.

METHODS AND MATERIALS

Neuroradiologists (n = 4), radiology residents with an average neuroradiology experience of 1.5 years (n = 4), and two neurology and neurosurgery residents each (n = 4) were recruited. A dataset of complex brain MRI cases was curated from the local imaging database (n = 40). For each case, readers created a textual image descriptions for the main finding, and provided their top-3 differential diagnoses. Three state-of-the-art large language models (GPT-4.1, Gemini 2.5 Pro, DeepSeek-R1) were then prompted to generate the top-3 differential diagnosis, based on a clinical case description and imaging findings by readers. Top-3 diagnostic accuracy for 1) readers alone and 2) LLMs with reader input were determined for each reader subgroup, along with the accuracy gap between the two groups as a measure for potential benefit from LLM assistance. We used a population-averaged logistic regression (GEE) to evaluate its effect on top-3 accuracy per model.

RESULTS

LLM-generated differential diagnoses achieved the highest performance, when provided with image descriptions from neuroradiologists (top-3: 76.3-79.4%), followed by junior residents (top-3: 68.2-72.7%), and other clinicians (top-3: 60.0-65.4%). Logistic regression revealed a significant positive association between reader seniority and the odds of the correct diagnosis being included among the top-3 (Gemini 2.5 Pro: $p = 0.016$, GPT-4.1: $p < 0.001$, DeepSeek-R1: $p < 0.001$). Among neuroradiology and neurosurgery residents, LLM-augmented diagnosis substantially improved top-3 accuracy (e.g. +17.5% for Gemini). Radiology residents experienced only a modest gain (e.g. +6.3% for Gemini), while LLM augmentation reduced top-3 accuracy for neuroradiologists in all three models (e.g. -6.9% for Gemini).

CONCLUSION

With increasing level of reader experience, the diagnostic performance of LLMs based on textual descriptions of brain MRI findings improved, but the accuracy gain relative to reader assessments paradoxically diminished.

CLINICAL RELEVANCE/APPLICATION

These findings put into perspective the clinical relevance of widespread LLM performance metrics and underscore the necessity for evaluating these systems within authentic clinical workflows.

M3-SSIN02-6 OPTIMIZING CLINICAL DECISION-MAKING IN PANCREATIC CANCER: THE ROLE OF GPT-4O AND DEEPSEEK V3 LARGE LANGUAGE MODELS

Kartik Gupta, MD (*Presenter*)
Ankush Jajodia, MD, MBBS (*Abstract Co-Author*)
Mila Ferri Latinovich (*Abstract Co-Author*)
Michael N. Patlas, MD, FRCPC (*Abstract Co-Author*)
Khaled Y. Elbanna, FRCR (*Abstract Co-Author*)

PURPOSE

Multidisciplinary tumor boards (MTB) are considered the gold standard for decision-making, leveraging collective expertise to optimize patient outcomes. This study looks at how useful two well-known LLMs, GPT-4o and DeepSeek V3, are for creating treatment suggestions for pancreatic adenocarcinoma (PDAC).

METHODS AND MATERIALS

This retrospective study included 328 MTB events in 287 patients with PDAC discussed in MTB at a tertiary care center. The data included anonymous patient histories, imaging results, and suggestions from radiologists, and the latest NCCN PDAC guidelines were given to each LLM along with a standard request for a management plan and explanation. Actual MTB decisions established management plans based on ground truth. Model selection was guided by availability on Azure due to HIPAA/REB requirements and the LMarena leaderboard: open-source model DeepSeek V3 as well as the highest-performing closed-source, non-reasoning model available on Microsoft Azure, GPT-4o. Two abdominal radiologists, blinded to one another’s assessments, compared each model’s output with the MTB ground truth.

RESULTS

Overall Concordance DeepSeek V3 exhibited higher overall concordance with MTB recommendations compared to GPT-4o (98.5% vs. 91.2%; p=0.019). Specifically, GPT-4o failed to generate a recommendation in 12 cases (3.7%), whereas DeepSeek V3 successfully produced management plans for all 328 cases. Concordance by Clinical Decision Class DeepSeek V3 had perfect agreement (100%) in most clinical decision classes, such as borderline, metastatic, palliative, radiation, resectable/surgical, and systemic therapy categories. Its agreement was a bit lower in the unresectable/locally advanced category at 91.4%. In contrast, GPT-4o showed

variable concordance, ranging from 86.2% (unresectable/locally advanced) to 100% (palliative and radiation). Analysis of Discordant Cases GPT-4o exhibited a higher incidence of discordance, often recommending overly aggressive treatments despite clear evidence of metastatic or locally advanced disease (19 cases). On the other hand, DeepSeekV3's disagreements mostly came from mistakenly identifying metastatic disease due to small suspicious nodules (4 cases) and one case of incorrectly assessing vascular involvement.

CONCLUSION

Our study shows that LLMs, especially DeepSeek V3, are very helpful in making decisions about managing pancreatic adenocarcinoma.

CLINICAL RELEVANCE/APPLICATION

Using strong LLMs like DeepSeek V3 could greatly enhance how clinical work is done by offering precise initial management suggestions. These models serve as valuable adjuncts rather than replacements for expert judgment, ensuring streamlined decision-making while maintaining clinical oversight.

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M3-SSNR03

Neuroradiology (Spine)

Monday, Dec. 1 9:30AM - 10:30AM Room: S406B

Wende N. Gibbs, MD, MA (*Moderator*)
Timothy J. Amrhein, MD (*Moderator*)

Sub-Events

M3-SSNR03-1 DIAGNOSTIC CT-DERIVED DAMAGE FINITE ELEMENT MODELING FOR PREDICTION OF FRACTURE RISK IN METASTATIC VERTEBRAE

David B. Hackney, BA, MD (*Presenter*)
Zahra Soltani (*Abstract Co-Author*)
Nils Rehtanz (*Abstract Co-Author*)
Gnaneswar Chundi (*Abstract Co-Author*)
Raul A Radovitzky (*Abstract Co-Author*)
Ron N. Alkalay, PhD (*Abstract Co-Author*)

PURPOSE

To establish and validate an end-to-end, CT-based, damage-driven finite element (FE) pipeline that provides fully automated, patient-specific predictions of vertebral mechanical competence—encompassing stiffness, strength, and failure patterns—across osteolytic, osteosclerotic, and mixed metastatic lesions—with the goal of integrating fracture-risk assessment into clinical decision-making and personalized treatment planning in cancer patients with spinal metastases.

METHODS AND MATERIALS

Forty-four cadaveric vertebral bodies—comprising thirteen osteosclerotic, nine mixed, eleven osteolytic, and eleven with no observed lesions—were imaged on a clinical CT scanner at 0.3185 mm isotropic voxels. DICOM volumes were imported into 3D Slicer (v 5.9+) to segment. The binary segmentation of each vertebra was then exported as a surface and passed to Gmsh to produce watertight tetrahedral meshes, thereby yielding a homogenized finite-element (hFE) model of the enclosed vertebral volume. Bone heterogeneity is modeled by mapping CT-derived BV/TV to each element's Young's modulus via the power law. A continuum damage constitutive model— incorporating viscoelastic, viscoplastic components with a halfspacewise generalization of the Hill criterion—was implemented in the FE framework, SMIT (http://summit.mit.edu). Simulated monotonic compressive loading produced load-displacement curves, from which predicted stiffness (slope of 20-80% linear region) and strength (peak load) were extracted for each vertebra. The actual strength and stiffness were measured in vitro.

RESULTS

When calibrated individually, the damage-based hFE model achieved near-perfect prediction of both strength and stiffness ($R^2 = 0.99$, $p < 0.0001$ for each), with simulated load-displacement curves closely overlaying experimental data across all lesion types. The simulated FE results indicate that bone metastasis type affects bone damage evolution based on the distribution of abnormal bone. Damage propagated through the low-modulus regions of the vertebral bodies, the pattern of which depended on metastasis type.

CONCLUSION

The fully automated, CT-based damage FE pipeline demonstrated excellent accuracy in predicting vertebral stiffness and strength across metastatic vertebrae with each lesion type. The results highlight the critical influence of spatial heterogeneity on pathological fracture progression.

CLINICAL RELEVANCE/APPLICATION

By predicting "where and how" metastatic vertebrae will fail, this methodology enables us to quantify vertebral fracture risk in cancer patients, thereby informing personalized prophylactic strategies and optimizing treatment pathways.

M3-SSNR03-2 COMPLICATIONS OF SYNOVIAL CYST RUPTURE: AN INSTITUTIONAL EXPERIENCE

John J. McIntyre IV, MD (*Presenter*)
Burke Pekala (*Abstract Co-Author*)
Maisy Pekala (*Abstract Co-Author*)
Ryan J. Brandt, MD (*Abstract Co-Author*)

PURPOSE

This paper seeks to identify the complication rates of synovial cyst rupture in our cohort of 320 synovial cyst rupture procedures.

METHODS AND MATERIALS

After obtaining IRB approval, a retrospective review was performed at our institution on all patients who have received a synovial cyst rupture spanning an eight year period. All patients who received a CT-guided synovial cyst rupture via trans-facet or direct rupture were included in the study. All procedures were performed under CT guidance with moderate sedation after informed consent. Technical success rate and complications were recorded. Technical success was defined as contrast or air extravasation outside the cyst. The procedure notes were reviewed for immediate complications and follow up notes were reviewed for delayed complications.

RESULTS

In our cohort, 320 procedures were performed on 262 patients. Overall technical success rate was 84% and technical failure rate was 16%, which is similar to previous published results. Complications included six patients with postprocedure worsening pain, five patients with rupture into the subarachnoid space, two patients with subarachnoid hemorrhage, and one patient with subdural hemorrhage. No patients required hospital admission. Our study demonstrates an overall low complication rate, with subarachnoid and subdural hemorrhage occurring in <1% of procedures.

CONCLUSION

Synovial cyst rupture is an established technique for treatment of symptomatic cysts and provides a treatment alternative to surgical intervention. All the complications in our study were managed non-surgically, and none of the complications required admission to the hospital. Synovial cyst rupture is a safe procedure with a low risk of complications.

CLINICAL RELEVANCE/APPLICATION

Synovial cysts have been reported in up to 10% of patients presenting for imaging of low back pain. Treatment options for symptomatic synovial cysts include conservative treatment, percutaneous cyst rupture, and surgical intervention. Percutaneous cyst rupture can provide symptomatic relief in a majority of patients; however, the complications of the procedure have not been previously characterized.

M3-SSNR03-3 CEREBROSPINAL FLUID BETA TRACE PROTEIN LEVELS: COMPARING PATIENTS WITH SPINAL CSF LEAKS TO THOSE WITHOUT LEAKS AS A POTENTIAL BIOMARKER

Parnian Habibi, MD (*Presenter*)
Jared T. Verdoorn, MD (*Abstract Co-Author*)
John C. Benson, MD (*Abstract Co-Author*)
Ajay A. Madhavan, MD (*Abstract Co-Author*)
Loryn Hovelson, ARRT (*Abstract Co-Author*)
Lynsey Ploenzke, BS (*Abstract Co-Author*)
Ian T. Mark, MD (*Abstract Co-Author*)

PURPOSE

Spinal CSF leaks of all types, particularly CSF-Venous Fistula (CVF), are underdiagnosed. Conversely, unnecessary myelograms are performed on patients without spinal CSF leaks. This highlights the need for new biomarkers to better identify patients with spinal CSF leaks. Beta trace protein (BTP) is synthesized in the arachnoid and choroid plexus cells in the CNS and is the most abundant protein in the CSF produced by the CNS. The purpose of this study was to evaluate CSF BTP levels and compare them between patients with spinal CSF leaks and those without leaks.

METHODS AND MATERIALS

56 patients undergoing workup for SIH were prospectively enrolled and had CSF collected from the lumbar spine during a lateral decubitus myelogram (DSM or CTM). CSF samples were analyzed for BTP levels. Myelogram results were assessed by two neuroradiologists specializing in SIH to determine the presence of a spinal CSF leak. The CSF BTP levels were then compared between those two groups (leak vs no leak). Basic patient demographic information including age and sex was recorded.

RESULTS

Of the 56 patients undergoing lateral decubitus dynamic myelography, the mean age was 51.6 years (range 22-77) and 35 (62.5%) were female. 22 patients (39.3%) had a spinal CSF leak, with a mean CSF BTP level of 34.4 mg/L (SD 8.7). Of the 34 patients who did not have a spinal CSF leak, their CSF BTP levels were significantly lower (mean 16.8 mg/L; SD 5.2; $p < 0.001$). The mean difference between BTP levels in patients with a spinal CSF leak and patients without a CSF leak were statically significant -17.66 mg/L (SEM: 2.05; 95% CI -21.85 to -13.47; $p<0.0001$).

CONCLUSION

This study measured CSF BTP levels in patients with spinal CSF leaks and found significantly higher BTP levels compared to patients without spinal CSF leaks.

CLINICAL RELEVANCE/APPLICATION

This study helps to identify individuals with higher probability of CSF leak who may benefit from more invasive imaging modalities including DSM and CTM.

M3-SSNR03-4 AORTIC SURGERY-RELATED SPINAL CORD INFARCTION: IMAGING FEATURES COMPARED TO SPONTANEOUS CASES

Eiko Yamamori, MD (*Presenter*)
Hidenobu Takagi, MD, PhD (*Abstract Co-Author*)
Erina Kato (*Abstract Co-Author*)
Masayuki Otani (*Abstract Co-Author*)
Hideki Ota, PhD (*Abstract Co-Author*)
Yoshikatsu Saiki, MD, PhD (*Abstract Co-Author*)
Kei Takase, MD, PhD (*Abstract Co-Author*)

PURPOSE

Spinal cord infarction (SCI) is a serious complication of aortic surgery and its mechanism remains unclear, with prevention still challenging. MR imaging allows visualization of the distribution of SCI, and characterization of MR findings of surgery-related SCI would provide insights into the mechanism of SCI. The aim of this study was to compare MR findings between aortic surgery-related SCI and spontaneous SCI.

METHODS AND MATERIALS

In this single-center retrospective study, patients who underwent spine MRI for suspected SCI between 2006 and 2024 were included. Patients with unavailable or poor-quality MRI data, suspected SCI associated with other surgeries or procedures, a history of SCI, and an operation before the first MRI examination were excluded. In the cranio-caudal direction, lesion length and pattern (i.e. diffuse, focal, and multiple) were evaluated using sagittal T2-weighted images. In the axial direction, the presence of high-signal lesions in 11 areas was evaluated by two board-certified radiologists using axial T2-weighted images and final decisions were made by consensus. The axial distribution of SCI was categorized by vascular territory as whole, anterior spinal artery (ASA), watershed, and posterior spinal artery (PSA) in each vertebral level. Each MRI finding was compared between surgery-related and spontaneous SCI patients.

RESULTS

A total of 67 patients (mean age 65 ± 15 years; 56 [84%] male; 44 [65%] surgery-related SCI, including 31 aortic replacements and 13 endovascular repairs) were included. Patients with surgery-related SCI were older (68±11 vs. 58±18 years; $p = 0.02$), male dominant (41 [93%] vs. 15 [65%]; $p = 0.01$), and with higher prevalence of smoking history (23 [92%] vs. 3 [38%]; $p = 0.04$). There was no significant difference in lesion length (71 ± 66 vs. 77 ± 50 mm; $p = 0.706$) between groups. Surgery-related SCI was mainly found at the T2 or lower levels, while spontaneous SCI was found across various levels. Patients with surgery-related SCI showed less PSA territory lesions (50 [11%] vs. 38 [23%]; $p = 0.014$). The inter-observer agreement for presence of SCI on MR images was good (kappa = 0.74 [95% confidence interval, 0.72-0.76]).

CONCLUSION

Aortic surgery-related SCI more frequently showed multiple lesions but less often involved the cervical cord or PSA territories, compared to spontaneous SCI. These results may be compatible with underlying mechanisms of SCI related to aortic surgery, such as delayed infarction due to hemodynamic changes or embolic phenomena.

CLINICAL RELEVANCE/APPLICATION

These insights highlight imaging differences between surgery-related and spontaneous cases. These findings may inform surgical strategies for preventing SCI.

M3-SSNR03-5 MAXIMIZING THE CONSPICUITY OF CSF-VENOUS FISTULAS ON CT MYELOGRAPHY: ASSESSMENT OF CONTRAST DENSITY AND TIMING EFFECTS

Daphne Zhu
(*Presenter*)
Peter G. Kranz, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)
Soren Christensen (*Abstract Co-Author*)
Ajay A. Madhavan, MD (*Abstract Co-Author*)
Timothy J. Amrhein, MD (*Abstract Co-Author*)

PURPOSE

Advancements in CT myelography (CTM) have improved visualization of CSF-venous fistulas (CVFs), an increasingly recognized cause of spontaneous intracranial hypotension (SIH). However, the relative impact of the timing of image acquisition and the contrast density in the subarachnoid space remains unclear. This study compared the effects of both image timing and contrast density in the ipsilateral subarachnoid space on CVF conspicuity, using a validated instrument to stratify diagnostic confidence.

METHODS AND MATERIALS

A retrospective review of consecutive ICHD-3 confirmed SIH patients with CVFs was performed. Only fistulas classified as definite by the Duke CVF Confidence Score (DCCS) were included. All available CTMs covering each index fistula site were reviewed, excluding exams occurring after surgery or embolization for a definite CVF. We assigned a DCCS score to each acquisition and recorded contrast density in the subarachnoid space ipsilateral to the known CVF, time from contrast injection to image acquisition, patient positioning, scanner type, and respiratory phase. Logistic regression was used to assess associations with CVF conspicuity and evaluate contrast density performance via receiver operating characteristic (ROC) analysis.

RESULTS

144 patients (mean age 56.1 ± 11.1 years; 61% female) with 149 definite CVFs comprised the final cohort, from which 222 CTMs and 697 acquisitions were assessed. Univariate logistic regression demonstrated strong associations between both contrast density and time with CVF conspicuity ($p < .001$). In multivariate models adjusting for sex, scanner type, and patient positioning, contrast density (OR = 1.001 [95% CI: 1.001-1.002]; $p < .001$) and time (OR = 0.98 [95% CI: 0.97-0.99]; $p < .001$) remained significant. CVF-side-down positioning also improved conspicuity (OR = 3.42 [95% CI: 0.23, 5.16]; $p < .001$). Standardized models showed a 4.2-fold increase in conspicuity per SD increase in density (ß = 1.43; SE: 0.18) and a 29% decrease in conspicuity per SD increase in time (ß = -0.34; SE: 0.1). ROC analysis identified 836 HU as the optimal density threshold for definite CVF detection (12% false negative rate, 81% sensitivity, 80% specificity).

CONCLUSION

Both higher contrast density and shorter time to image acquisition were independently associated with enhanced CVF visualization. However, density showed a fourfold greater standardized effect than time, suggesting that myelogram technique should prioritize maximization of contrast density in cases of suspected CVFs.

CLINICAL RELEVANCE/APPLICATION

Positioning strategies that maximize local contrast density may improve CVF detection more effectively than timing adjustments alone.
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RSNA® 2025
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Abstract Archives of the RSNA, 2025

M3-SSNR04

Neuroradiology (Neoplasms: Diagnosis and Classification)

Monday, Dec. 1 9:30AM - 10:30AM Room: S401

Rashmi S. Thakkar, MD (*Moderator*)
Burak B. Ozkara, MD (*Moderator*)

Sub-Events

M3-SSNR04-1 CENTRAL NERVOUS SYSTEM LYMPHOMA PROGRESSION IN PRIMARY VITREORETINAL LYMPHOMA: A MULTICENTER REAL-WORLD STUDY WITH IMPLICATIONS FOR NEURO-ONCOLOGIC SURVEILLANCE

Zain Hussain, MD (*Presenter*)
Shabber Syed, MD (*Abstract Co-Author*)
Arif Musa, MD, MS (*Abstract Co-Author*)
Robert H. Bixler (*Abstract Co-Author*)

PURPOSE

To characterize the risk, timing, and clinical predictors of primary central nervous system lymphoma (PCNSL) progression in patients with Primary Vitreoretinal Lymphoma (PVRL), and to evaluate the implications for neuroimaging surveillance strategies and treatment escalation.

METHODS AND MATERIALS

This retrospective multicenter cohort study utilized the TriNetX research network to identify patients diagnosed with PVRL using a combination of ICD-10 codes representing diffuse large B-cell lymphoma of the head, neck, and retina (C83.39, C85.91, C85.11, C69.2). CNS involvement was defined as a subsequent diagnosis of primary central nervous system lymphoma (PCNSL, ICD-10: C83.390). Patients were stratified by presence of systemic treatment and prior misclassification as uveitis (H20), a common diagnostic confounder. Time-to-progression to CNS involvement, neuro-oncologic outcomes, and mortality were assessed using Kaplan-Meier analysis and Cox proportional hazards regression.

RESULTS

Among 101 patients with PVRL, 42 (41.6%) developed CNS involvement, all after the initial ocular diagnosis. Median time to PCNSL diagnosis was 857 days (IQR: 498-1213). CNS progression was strongly associated with increased mortality (HR 9.13, 95% CI 2.10-39.75, $p = 0.0032$). Patients initially misclassified as uveitis had a markedly elevated risk of CNS involvement (83.3% vs. 19.7%, $p < 0.0001$), underscoring the radiologic and clinical need for early brain imaging in ambiguous ocular presentations.

CONCLUSION

CNS progression in PVRL is common, severe, and often delayed, emphasizing the critical role of neuroimaging in early diagnosis and longitudinal surveillance. Radiologists and neuro-oncologists should maintain a high index of suspicion for occult CNS involvement in cases of atypical uveitis and PVRL, and consider early brain MRI even in the absence of neurologic symptoms.

CLINICAL RELEVANCE/APPLICATION

Early recognition of Primary Vitreoretinal Lymphoma (PVRL) is critical to prevent Primary Central Nervous System Lymphoma (PCNSL) progression, a complication associated with markedly increased mortality. This study highlights the need for high clinical and radiological suspicion in patients presenting with atypical uveitis, as misdiagnosis can significantly delay treatment. Findings emphasize the value of early neuroimaging in PVRL cases and the importance of multidisciplinary coordination between neuro-oncology, radiology, and ophthalmology. Enhanced surveillance strategies may improve outcomes by enabling timely intervention before CNS dissemination occurs.

M3-SSNR04-4 STAPLE-BASED SPATIAL AND GLOBAL RELIABILITY ANALYSIS OF MULTI-ANNOTATOR BRAIN METASTASIS SEGMENTATION DATA: BRATS-METS LIGHTHOUSE 2025 CHALLENGE

Monika Pytlarz, MSc (*Presenter*)
Fabian Umeh, BEng, MSc (*Abstract Co-Author*)
Nazanin Maleki, MD (*Abstract Co-Author*)
Raisa Amiruddin, MBBS (*Abstract Co-Author*)
Khaled Bousabarah, MSc (*Abstract Co-Author*)
Marina Ivory, MD, MSc (*Abstract Co-Author*)
Mohamed Ghonim, MD (*Abstract Co-Author*)
Mohanad Ghonim (*Abstract Co-Author*)
Albara Alotaibi (*Abstract Co-Author*)
Melisa Guelen (*Abstract Co-Author*)
Nathan Page (*Abstract Co-Author*)
Pascal Fehringer (*Abstract Co-Author*)
Sedra Abou Ali Mhana (*Abstract Co-Author*)
Bojan D. Petrovic, MD (*Abstract Co-Author*)
Fatima Memon, MD, MPH (*Abstract Co-Author*)
Basimah Albalooshy (*Abstract Co-Author*)
Elizabeth B. Schrickel, MD (*Abstract Co-Author*)
Justin Cramer, MD (*Abstract Co-Author*)
Michael C. Veronesi, MD, PhD (*Abstract Co-Author*)
Spyridon Bakas, PhD (*Abstract Co-Author*)
Mingde Lin, PhD (*Abstract Co-Author*)
Mariam S. Aboian, MD, PhD (*Abstract Co-Author*)

PURPOSE

Expert annotation of brain metastasis necrotic and enhancing tumor margins on MRI is essential for surgical planning, radiation targeting, treatment monitoring, and AI training. There is natural variability in image annotation among expert neuroradiologists, which results in generation of low-quality reference standard that affects translation of AI algorithms to the clinic. We propose a novel method STAPLE for generation of high-quality reference standard that approach the desired gold standard for image annotation. STAPLE is a consensus method that estimates annotator reliability and latent ground truth in a single pass; unlike Dice and other metrics, it does not require fixed references and multiple pairwise comparisons, thus providing a unified approach to label fusion.

METHODS AND MATERIALS

75 MRIs from BraTS-METS 2025 Lighthouse Challenge annotated 8 times by 3 rater-pairs (six board-certified neuroradiologists; 600 total segmentations: 300 manual, 300 AI-refined). Segmentation masks were fused by SimpleITK's STAPLE (200 iterations) to generate a voxel-wise consensus probability map (W). The ROI defined as the union of all rater masks yielded a binary label matrix D (voxels × 8). Within this ROI, per-session sensitivity (p) and specificity (q) were computed as the weighted overlap with W and with (1-W), respectively. Overall agreement was quantified by mean Dice similarity (vs. W > 0.5), Fleiss' ?, and Krippendorff's a; 95% CIs for Dice were estimated via 500-replicate percentile bootstrapping.

RESULTS

72 cases (576 annotations) analyzed after 3 mismatch exclusions probability maps were generated Intra-rater Dice was 0.82 ± 0.14 (sensitivity 0.78, specificity 0.75); inter-rater Dice was 0.79 ± 0.16 (sensitivity 0.73, specificity 0.85). Peak ? = 0.62; mean ? = 0.33 (inter) and 0.14 (intra). Mean Dice vs. STAPLE was 0.81 ± 0.15 (95% CI: 0.68-0.93); Fleiss' ? and Krippendorff's a were both 0.20. nnU-Net-assisted segmentations outperformed manual (+18% Dice, p<0.001) and paired consensus (+10%, p<0.01); paired consensus also exceeded manual (+6%, p<0.01).

CONCLUSION

Manual expert segmentation shows only fair inter- and intra-rater reliability (mean Dice ˜ 0.81; ? ˜ 0.20). STAPLE quantifies this uncertainty and generates probabilistic reference standards, informing annotation protocols, quality assurance, and AI models that account for variability; ultimately improving reliability and clinical applicability.

CLINICAL RELEVANCE/APPLICATION

This framework quantifies annotation variability and generates consensus maps that enhance quality assurance, reproducibility, and AI performance for more reliable clinical decision-making.

M3-SSNR04-5 MRI-DERIVED RADIOMICS AND DEEP LEARNING MODELS FOR PREDICTING EPIDERMAL GROWTH FACTOR RECEPTOR STATUS IN GLIOMA: A SYSTEMATIC REVIEW AND META-ANALYSIS OF DIAGNOSTIC TEST ACCURACY STUDIES

Nima Broomand Lomer, MD (*Presenter*)
Amir M. Ahmadzadeh, MD (*Abstract Co-Author*)
Mohammad A. Ashoobi, MD (*Abstract Co-Author*)
Rayehe Rahimi, MD (*Abstract Co-Author*)
Kambiz Nael, MD (*Abstract Co-Author*)

PURPOSE

Alterations in the epidermal growth factor receptor (EGFR) have been linked to prognosis in glioma patients, often contributing to increased tumor aggressiveness and resistance to chemo- and radiotherapy (1-3). This study systematically reviews the diagnostic performance of radiomics and deep learning (DL) models in predicting EGFR alterations.

METHODS AND MATERIALS

A thorough systematic search was performed across multiple databases, including PubMed, Scopus, Embase, and Web of Science. Study quality was evaluated using the METRICS tool. A bivariate meta-analytic model was applied to compute pooled estimates for sensitivity, specificity, positive and negative diagnostic likelihood ratios (DLR+ and DLR-), diagnostic odds ratio (DOR), and the area under the receiver operating characteristic curve (AUC). Subgroup analysis was conducted to investigate potential sources of heterogeneity. Outlier detection was carried out using bivariate boxplots and sensitivity analysis. The presence of potential publication bias was investigated using Deek's funnel plot asymmetry test.

RESULTS

A total of 12 studies were included in the systematic review, with six eligible for meta-analysis. All studies constructed radiomics models, and one also developed a DL model. Study quality according to the METRICS scale was mostly moderate (median: 56.5%), with individual study scores ranging from 38.7% to 83.9%. The pooled results of the radiomics meta-analysis were as follows: sensitivity: 0.74; specificity: 0.88; DLR+: 6.12; DLR-: 0.29; DOR: 21.07; and AUC: 0.87. A significantly higher pooled specificity was observed among studies conducted in Asia compared to those performed in North America Additionally, studies with smaller sample sizes demonstrated a significantly higher pooled sensitivity than those with larger cohorts. Sensitivity analyses did not identify any outliers, and no significant publication bias was detected.

CONCLUSION

Radiomics may have the potential to preoperatively predict EGFR status in glioma patients, improving prognostic assessments and treatment planning.

CLINICAL RELEVANCE/APPLICATION

According to the latest guideline of the World Health Organization for central nervous system tumors, EGFR alterations are among the key biomarkers in glioma, linked to poor prognosis and resistance to conventional therapies. Radiomics may be considered as a non-invasive approach to identify EGFR status, potentially improving prognostic evaluation and facilitating individualized treatment planning in glioma patients.

M3-SSNR04-6 UTILIZING MRI-BASED RADIOMIC FEATURES AND MACHINE LEARNING TO NON-INVASIVELY CHARACTERIZE THE HISTOPATHOLOGY OF ORBITAL LYMPHOMAS

Burak B. Ozkara, MD (*Presenter*)
Samir Dagher, MD (*Abstract Co-Author*)
Max Wintermark, MD (*Abstract Co-Author*)
James M. Debnam, MD (*Abstract Co-Author*)

PURPOSE

Orbital lymphomas (OLs) are rare tumors comprising 6-8% of orbital neoplasms, and their histopathologic characterization typically requires invasive biopsy or surgery. Extranodal marginal zone B-cell lymphoma of mucosa-associated lymphoid tissue (MALT-lymphoma) is the most common OL subtype and is associated with better prognosis. This study aimed to develop a radiomics-based machine learning model to non-invasively differentiate MALT-lymphomas from other OLs on preoperative contrast-enhanced MRI, an integral component of staging.

METHODS AND MATERIALS

All consecutive OL patients with diagnostic-quality, fat-saturated, contrast-enhanced T1-weighted MRI in our institutional PACS were included. Clinical data (age, gender, ethnicity, histologic subtype) were recorded. OLs were manually segmented using iTK-SNAP under the supervision of a board-certified neuroradiologist. Approximately 15,000 radiomic features were extracted with PyRadiomics. Feature selection was performed using the least absolute shrinkage and selection operator (LASSO). A

TabPFN model, based on a modified Prior-Data Fitted Network architecture, was developed and evaluated using 5-repeat 5-fold cross-validation. SHapley Additive exPlanations (SHAP) were used to assess feature contributions.

RESULTS

The cohort included 122 patients (65 men, 57 women; median age 63) imaged between March 2002 and February 2020. There were 47 biopsy-proven MALT-lymphomas and 75 non-MALT OLs (26 diffuse large B-cell, 12 follicular, 9 mantle cell, 9 T-cell, 17 other). Forty-five radiomic features were selected. Model performance was as follows: AUROC 0.772 (95% CI: 0.745-0.797), AUPRC 0.772 (95% CI: 0.742-0.797), accuracy 0.776 (95% CI: 0.753-0.799), precision 0.758 (95% CI: 0.720-0.796), recall 0.714 (95% CI: 0.671-0.752), F1-score 0.706 (95% CI: 0.678-0.736), MCC 0.555 (95% CI: 0.511-0.600), Brier score 0.198 (95% CI: 0.183-0.212).

CONCLUSION

Radiomics-based machine learning models show promise for distinguishing MALT-lymphomas from more aggressive OL subtypes. Once validated, such models could aid in the non-invasive characterization of OLs and potentially reduce the need for surgical biopsy.

CLINICAL RELEVANCE/APPLICATION

Non-invasively identifying MALT-lymphomas may help avoid biopsy in selected patients, accelerate diagnosis, inform prognosis, and guide treatment decisions, contributing to more personalized and less invasive care.
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Nov. 30 – Dec. 4
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M3-SSPH04

Physics (Phantoms and Virtual Trials)

Monday, Dec. 1 9:30AM - 10:30AM Room: S404

Zhihua Qi, PhD (*Moderator*)
Ehsan Abadi, PhD (*Moderator*)

Sub-Events

M3-SSPH04-1 PATIENT-DERIVED DIGITAL TWIN OF THE HUMAN BREAST: A MODEL FOR VIRTUAL CLINICAL TRIALS

Peymon Ghazi, PhD (*Presenter*)

PURPOSE

To create high-fidelity, patient-derived digital twin breast phantoms that reproduce micro-ductal anatomy at x-ray resolution, laying the groundwork for virtual clinical trials (VCTs) that can predict and compare the performance of emerging breast-imaging systems, optimize protocols, and de-risk first-in-human studies.

METHODS AND MATERIALS

Publicly available 3 T breast MRI datasets (0.6 × 0.6 × 1.0 mm) underwent expert-guided correction before being super-sampled to 0.1 × 0.1 × 0.11 mm. Skin, fascia, and adipose compartments were segmented; an L-system algorithm iteratively populated fibroglandular tissue with >106 ductal segments down to 5 μm. Each voxel was assigned mass density and elemental composition compatible with Monte-Carlo-based x-ray transport. A projection engine produced synthetic mammography, tomosynthesis, and breast-CT data, enabling side-by-side assessment of system resolution, dose, and spectral separation within a common digital-twin cohort.

RESULTS

The pipeline generated patient-specific twins that preserved realistic tissue interfaces, achieved <1 mm nipple-localization error, and supported 0.1-mm isotropic voxel rendering. Simulated acquisitions reproduced modulation-transfer-function roll-off and glandular-dose trends measured on physical systems, validating the twins for VCT use. Comparative simulations demonstrated modality-dependent detectability of 2-mm soft-tissue lesions at equalized dose, illustrating the framework's ability to benchmark new designs.

CONCLUSION

Patient-derived digital twins with micron-scale detail have been realized and cross-validated against established x-ray metrics, providing a robust platform for VCTs that accelerate technology evaluation, protocol optimization, and regulatory submission while minimizing patient risk.

CLINICAL RELEVANCE/APPLICATION

Digital-twin VCTs enable rapid, cost-effective assessment of novel breast-imaging modalities, facilitate head-to-head comparison under controlled conditions, and inform clinical-trial design—ultimately expediting the translation of safer, more sensitive x-ray-based breast-cancer screening and diagnostic technologies.

M3-SSPH04-2 PATIENT DATA-BASED VIRTUAL IMAGING TRIAL FOR HALLUCINATION QUANTIFICATION IN DEEP-LEARNING CT IMAGE RECONSTRUCTION

Zhongxing Zhou, PhD (*Presenter*)
Scott S. Hsieh, PhD (*Abstract Co-Author*)
Hao Gong, PHD (*Abstract Co-Author*)
Cynthia H. McCollough, PhD (*Abstract Co-Author*)
Lifeng Yu, PhD (*Abstract Co-Author*)

PURPOSE

Deep learning reconstruction and noise reduction (DLR) methods for low-dose CT show strong promise but can produce hallucinations—false structures resembling real anatomy. Quantifying hallucinations is critical but difficult due to the lack of ground truth. A patient-data-based virtual imaging trial (VIT) is an ideal paradigm to bridge this gap with the availability of reference images. This study aimed to develop a VIT-based method to quantitatively assess hallucinations produced by DLR methods in low-dose CT.

METHODS AND MATERIALS

Starting from patient projection data acquired at routine-dose CT exams, CT images at lower doses were generated by reconstructing simulated projection data after noise insertion. The degree of hallucination (DOH) at lower dose levels by DLR was quantified using the routine-dose images as reference. Specifically, we selected homogeneous regions of interest in patient images that are free of major anatomical structures and calculated a group of radiomics texture features that represent deviations from originally uniform regions. These features include Inverse Difference Moment and Long Run Emphasis, among others. Intraclass correlation coefficients (ICC) of those texture features were calculated between DLR denoised lower-dose images and the routine-dose images, with the DOH computed as (1 - ICC). This method was applied to two clinical cases, one from a chest CT for interstitial lung disease (ILD) and the other CT angiography (CTA) for Circle of Willis, to quantify the hallucination effect of two DLR methods (DLR1 and DLR2).

RESULTS

When the radiation dose was reduced from 100% to 8% in the chest exam, the DOH for DLR1 increased from 0.36 ± 0.08 to 0.59 ± 0.09, while for DLR2 it increased from 0.14 ± 0.07 to 0.54 ± 0.09. Similarly, in the CTA exam, reducing the dose from 100% to 25% resulted in a DOH increase for DLR1 from 0.19 ± 0.10 to 0.57 ± 0.16, and for DLR2 from 0.04 ± 0.03 to 0.15 ± 0.10. Although both methods showed more hallucinations at lower doses, DLR2 consistently exhibited lower absolute DOH values at each dose level, indicating better hallucination suppression.

CONCLUSION

Using a patient-data-based VIT method, we proposed a quantitative metric to assess the degree of hallucination. DLR methods vary in their degree of hallucination, and such metrics will help guide the design and selection of DLR methods with reduced hallucination at lower radiation doses.

CLINICAL RELEVANCE/APPLICATION

Our proposed method enables quantitative evaluation of hallucination effect for deep-learning reconstruction and noise reduction algorithms, ensuring safer deployment of those algorithms at reduced radiation dose in CT.

M3-SSPH04-3 VALIDATION OF A 3D-PRINTED ANTHROPOMORPHIC PEDIATRIC ABDOMEN-CT-PHANTOM: COMPARISON OF IMAGE QUALITY USING A NOVEL PHOTON-COUNTING CT

Thilo Schikorra (*Presenter*)
Matthias S. May, MD (*Abstract Co-Author*)
Thomas G. Flohr, PhD (*Abstract Co-Author*)
Thomas Allmendinger, PhD (*Abstract Co-Author*)
Ido Bitan, BSC (*Abstract Co-Author*)
Michael Uder, MD (*Abstract Co-Author*)
Markus Kopp (*Abstract Co-Author*)

PURPOSE

This study aims to validate the objective and subjective image quality between a patient CT scan and the subsequently 3D-printed, anatomically realistic CT-abdomen phantom on a novel photon-counting CT (PCCT).

METHODS AND MATERIALS

We developed and used a 3D-printed CT phantom based on the DICOM data obtained from a PCCT (NAEOTOM Alpha, Siemens Healthineers, Forchheim, Germany) scan of a 5-year-old boy (70 kV, 458 qRef mAs). We performed one scan on the phantom at 70 kV (461 qRef mAs) and one at 90 kV (148 qRef mAs), reconstructing the scans with three kernels (Br 40/44/60). The objective image quality was measured based on mean HU values and standard deviations of HU values as image noise in circular regions of interest in the liver, V. portae, abdominal aorta, abdominal fat, autochthonous dorsal muscles, spleen, pancreas, and rib bone. The non-normal distributed values were paired and compared with a non-parametric Wilcoxon equivalence test. The conspicuity as the subjective image quality of the kidneys, gallbladder, pancreas, liver-hyperenhancement, V. portae branches, V. splenica, bone cortex, and bone matrix structures was assessed subjectively (5-point Likert-scale) by three trained radiology experts. The ratings were compared between phantom and patient scans.

RESULTS

The CT values in the phantom without bone and fat were equivalent to those in the patient ($p<0.05$). However, fat demonstrated noticeable higher (-48.3 HU vs. -124.5 HU), and bone noticeable lower mean CT values (842.5 HU vs. 1059.5 HU) in the phantom. The image noise was also equivalent between patient and phantom ($p<0.05$). When scanned at 90 kV, the CT values of parenchymal organs increased contrary to observations in humans, while the high CT values of bone, V. portae, and aorta decreased, and the low CT values of fat increased as expected. The scan at 461 qRef mAs (Br40) showed the highest subjective comparability between patient and phantom scan with an overall median rating of 4 (vs. median 5 in the patient). The median rating is equal for the kidneys (5 vs. 5), liver-hyperenhancement (4 vs. 4), slightly lower medians in the conspicuity of the gallbladder, pancreas, V. portae, V. splenica (4 vs. 5), and significantly differing medians in the bone structures (3 vs. 5).

CONCLUSION

This study proves comparable image quality between the 3D-printed pediatric CT phantom and the patient scan at comparable dose parameters. This allows for realistic quantification of the dose-image-quality ratio. Especially for parenchymal organs, the phantom behaves similarly to human CT scans.

CLINICAL RELEVANCE/APPLICATION

In the future, radiation exposure in dose reduction studies can potentially be anticipated beforehand, which is especially relevant in the highly vulnerable pediatric collective.

M3-SSPH04-4 IODINEPRINT: PATIENT-SPECIFIC, IODINE-ENHANCED PHANTOMS FOR SPECTRAL CT IMAGING

Franz Englbrecht (*Presenter*)
Anatoliy Popov, MD (*Abstract Co-Author*)
Kai Mei, PhD (*Abstract Co-Author*)
Olivia Sandvold, BS (*Abstract Co-Author*)
Michael Geagan (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)

PURPOSE

Iodine-based (I) contrast agents enhance anatomical detail and improve diagnostic accuracy in CT imaging. With advancements in spectral CT, the ability to accurately quantify iodine has further elevated its role as a potential imaging biomarker. However, CT system design and validation still rely on simplistic, non-anthropomorphic phantoms, and there are currently no anatomically realistic, iodine-enhanced phantoms available. To address this gap, we expand upon our previously developed PixelPrint 3D-printing method by introducing a novel iodine-infused Polylactic Acid (PLA) filament (IodinePrint). This filament enables the fabrication of anatomically accurate phantoms with clinically relevant iodine enhancement.

METHODS AND MATERIALS

Iodine-rich compounds were embedded into PLA pellets using a dual-solvent technique—where a “bad” solvent preserve the polymer structure, and a “good” solvent facilitates iodine diffusion into the matrix. Following solvent evaporation, the modified pellets were extruded into a filament with a diameter of 1.75 mm. As an initial test, we printed four calibration cubes with varying infill ratios (ranging from 30% to 90%) and compared them to commercially available iodine inserts. A cylindrical calibration phantom was then fabricated using a dual-extruder 3D printer. It featured pie-slice segments with iodine concentrations ranging from 0.7 to 10.4 mg/mL by modifying the ratio of PLA infill to iodine filament infill. Based on this calibration, an anatomically accurate section of a contrast-enhanced pancreatic CT scan was printed to generate an anatomically accurate, iodine-enhanced phantom. All phantoms were scanned with a dual-layer spectral CT (Spectral CT 7500, Philips Healthcare) to evaluate Hounsfield units (HU) and iodine concentrations.

RESULTS

Spectral CT imaging demonstrated a similar spectral profile between the printed calibration cubes and commercial inserts, as well as a strong linear correlation between Hounsfield units and iodine concentration in the calibration phantom. The pancreatic phantom exhibited contrast levels within physiologically expected ranges and presented realistic textures and anatomical detail in conventional images and iodine maps.

CONCLUSION

IodinePrint demonstrates the feasibility of integrating iodine into PLA filament, enabling the fabrication of anatomically accurate, contrast-enhanced phantoms with consistent material properties and reproducible iodine distribution.

CLINICAL RELEVANCE/APPLICATION

These phantoms serve as a practical and clinically meaningful tool for evaluating key spectral CT performance metrics, including iodine quantification accuracy, contrast resolution, and the consistency of material decomposition algorithms.

M3-SSPH04-5 3D-PRINTED DEFORMABLE CHEST CT RESPIRATORY MOTION PHANTOM WITH MULTI-AXIS DEFORMATION MECHANISM

Jessica Im, BEng (*Presenter*)
Michael Geagan (*Abstract Co-Author*)
Kai Mei, PhD (*Abstract Co-Author*)
Boon-Keng K. Teo, PhD (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)

PURPOSE

Respiratory motion compensation technologies have been developed to mitigate motion artifacts in CT, but require evaluation with respiratory motion phantoms (RMPs) prior to clinical use. However, most existing RMPs are overly simplistic in structure and motion, with motion typically limited to the superior/inferior (SI) axis. In recent years, the development of nonlinear motion compensation technologies has necessitated more lifelike RMPs that better replicate clinical scenarios. This work describes the development of a deformable chest RMP that features realistic lung structures and a novel multi-axis deformation mechanism.

METHODS AND MATERIALS

A patient 4DCT was selected as a reference for phantom fabrication. Attenuation data within both lungs at end inhale were converted into 3D-printer instructions using PixelPrint software, which continuously varies the density of printed material to mimic patient attenuation profiles. The mediastinum was set to a uniform printed density of 50%. Using a flexible material, thermoplastic polyurethane (TPU), the deformable lung and mediastinum phantom was 3D-printed at 0.5x scale. The chest wall was then printed using a rigid material, polylactic acid (PLA), with a 15 mm coronal strip of TPU to allow for chest wall compression. To model multi-axis deformation, SI linear compression from the diaphragm was facilitated with a lead screw. Additionally, anterior/posterior (AP) compression was achieved with a lacing mechanism which encircled the chest wall. The phantom was scanned at different compression levels to match patient diaphragm and chest wall motion. Deformable image registration was then performed on both patient and phantom datasets to obtain deformation vectors and structural similarity index measures (SSIM).

RESULTS

The chest RMP exhibited realistic lung structures and motion profiles. The SSIM between phantom and patient lungs measured 0.95 and 0.96 at the 0% and 50% respiratory phases respectively, indicating high structural accuracy in both deformed and nondeformed states. Mean motion vector errors measured throughout the lungs between the 50% and 0% phases were -1.1 ± 1.9, -0.9 ± 1.5, and -1.3 ± 1.6 mm in the SI, AP, and right/left (RL) directions respectively.

CONCLUSION

The deformable chest RMP demonstrated realistic lung structures and produced multi-axis deformation patterns that closely matched patient 4DCT images. In future iterations, this 3D-printing process could be easily adapted to produce RMPs representing various clinical scenarios.

CLINICAL RELEVANCE/APPLICATION

Realistic RMPs will enable more clinically relevant assessment during development of motion compensation technologies compared to existing RMPs, facilitating more effective clinical translation.

M3-SSPH04-6 TASK-SPECIFIC EVALUATION OF PHOTON-COUNTING CT USING A 3D-PRINTED ANTHROPOMORPHIC LUNG PHANTOM WITH COPD PATHOLOGY

Fong Chi Ho, MS (*Presenter*)
Kai Mei, PhD (*Abstract Co-Author*)
Shobhit Sharma, PhD (*Abstract Co-Author*)
Zhou Yu, PhD (*Abstract Co-Author*)
Sandra S. Halliburton, PhD (*Abstract Co-Author*)
Steven Ross, PhD (*Abstract Co-Author*)
Leening P. Liu, PhD (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)
Ehsan Samei, PHD (*Abstract Co-Author*)
Ehsan Abadi, PhD (*Abstract Co-Author*)

PURPOSE

The absence of disease-specific anthropomorphic physical phantoms hinders efforts to evaluate emerging CT technologies in clinically relevant scenarios. We introduce a task-specific 3D-printed lung phantom based on extended cardiac-torso (XCAT) modeling, incorporating pathological features of chronic obstructive pulmonary disease (COPD), including thickened bronchial wall and mucus plugs. Using this novel phantom, this study compares the performance of Normal-Resolution (NR) and Super-High-Resolution (SHR) modes of a photon-counting CT (PCCT) prototype in quantifying airway-specific imaging biomarkers.

METHODS AND MATERIALS

A lung phantom was 3D printed with PixelPrint, a technique converting CT into voxel-based printer instructions by modeling density as a ratio of filament to voxel volume to generate sub-resolution partial volume effects to replicate realistic tissue densities and textures. The phantom was constructed based on anthropomorphic XCAT models derived from a clinical case with COPD pathologies. It included realistic and detailed pulmonary vessels, solid nodules, parenchyma, and airways with pathologically informed bronchitis wall thickening and mucus plugging. The phantom was scanned using a PCCT prototype (Canon) under NR and SHR (0.62 vs. 0.21 mm slice thickness) in multiple thoracic protocols, all reconstructed with an Adaptive Iterative Dose Reduction (AIDR) technique. Quantitative analysis included airway wall thickness, airway wall area percentage, mucus volume, lesion volume, spatial resolution, and global noise index (GNI). The percentage differences between NR and SHR measurements relative to the ground truth model were analyzed.

RESULTS

Compared to NR mode, SHR images, reconstructed with AIDR, showed reduced noise (28.8±4.2%), and improved accuracy in airway wall thickness (0.06±0.03mm), airway wall area percentage (11.40±5.38%), mucus volume (0.83±0.19 mm 3), and lesion volume (1.38±0.24 mm 3). SHR images suppressed noise and preserved anatomical details, notably in the smaller airway generations and mucus-plugged segments.

CONCLUSION

This study introduces the first XCAT-based anthropomorphic lung phantom specifically designed to model COPD, featuring controlled pathological characteristics for evaluating CT technologies. While PCCT offers superior resolution in its standard NR mode, SHR mode offers further advantage in quantifying clinically relevant biomarkers for pulmonary disease.

CLINICAL RELEVANCE/APPLICATION

Task-specific phantoms enable objective comparison of CT technologies for disease-specific imaging. SHR mode demonstrated a major advantage over NR mode in quantifying COPD biomarkers, emphasizing its clinical significance in thoracic imaging and management.

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M3-SSPH05

Physics (Spectral CT)

Monday, Dec. 1 9:30AM - 10:30AM Room: N227B

Peter B. Noel, PhD (*Moderator*)
Kishore Rajendran, PhD (*Moderator*)

Sub-Events

M3-SSPH05-1 SYNERGISTIC INTEGRATION OF AI MATERIAL DECOMPOSITION AND DENOISING IN LOW-ENERGY VIRTUAL MONOENERGETIC CTIMAGING FOR IMPROVED TISSUE CONTRAST AND DELINEATION

Kevin J. Treb, PhD (*Presenter*)
Hao Gong, PHD (*Abstract Co-Author*)
Ahmed O. El Sadaney, MBBCh (*Abstract Co-Author*)
Avinash Nehra, MD (*Abstract Co-Author*)
Joel G. Fletcher, MD (*Abstract Co-Author*)
Shuai Leng, PhD (*Abstract Co-Author*)

PURPOSE

To utilize two cascaded AI modules that capture complementary image features in spatial and energy domains for low-energy virtual monoenergetic imaging (VMI) with reduced noise and improved tissue delineation.

METHODS AND MATERIALS

Fourteen patients underwent contrast enhanced CT of the pelvis using a dual energy protocol on a commercial photon counting detector CT (NAEOTOM Alpha, Siemens). Images were reconstructed with a 180 mm field of view using a quantitative kernel (Qr60) with iterative reconstruction and a slice thickness of 0.6 mm. In one AI module, images were denoised using a modified version of an image-based convolutional neural network (CNN) denoiser (GARNET) trained on an independent subset of patient images using subtraction of adjacent image slices as estimates of patient-specific noise. In the other AI module, low and high energy images were fed into the previously developed AI generalizable algorithm for multi-energy CT (AGATE). AGATE uses a CNN trained on images of phantom material inserts to capture texture and material composition features in the energy domain. The network was modified to output 40 keV VMIs. Two cascaded frameworks were investigated by switching the order in which AGATE and GARNET were applied. Output images from the cascaded frameworks were reviewed by two radiologists and compared to commercial 40 keV VMIs reconstructed directly on the scanner and output images from each AI module individually.

RESULTS

Commercial 40 keV VMI showed noticeable artifacts and unnatural low frequency noise texture. AGATE (energy domain material quantification) images had more natural noise texture, substantially reduced artifacts, and improved tissue delineation, but marginally increased image noise (3.1%) compared to commercial VMI. Applying GARNET (spatial domain denoiser) directly to commercial VMI reduced noise by 7.5% but could not reduce artifacts or address the unnatural noise texture. With the cascaded frameworks, output images had improved tissue delineation and noise reductions of 51.6% (AGATE then GARNET) to 61.9% (GARNET then AGATE) compared to commercial VMI. Qualitative results were confirmed by the radiologist readers.

CONCLUSION

Two AI modules operating in complementary domains improved different aspects of image quality (noise, artifacts, contrast). Cascading the models synergistically improved their respective performance beyond that achieved by the individual models.

CLINICAL RELEVANCE/APPLICATION

Low-energy VMIs can greatly improve iodine contrast but can increase noise and artifacts. Cascading AI models can synergistically address these limitations and could enable routine use of low-energy VMIs to address a major limitation in CT, soft-tissue contrast, to open new opportunities for CT imaging.

M3-SSPH05-2 MEASUREMENT-BASED SPECTRAL DEEP SCATTER ESTIMATION FOR PHOTON-COUNTING CT

Lukas Hennemann, MSc (*Presenter*)
Julien Erath, MSc (*Abstract Co-Author*)
Andreas Heinkele, MSc (*Abstract Co-Author*)
Joscha Maier, PhD (*Abstract Co-Author*)
Eric Fournie (*Abstract Co-Author*)
Martin Petersilka, PhD (*Abstract Co-Author*)
Karl Stierstorfer, PhD (*Abstract Co-Author*)
Marc Kachelriess, PhD (*Abstract Co-Author*)

PURPOSE

To develop a Monte Carlo (MC)-free, scanner-specific deep scatter estimation (DSE) algorithm that may also utilize the energy threshold information of clinical photon-counting CT (PCCT).

METHODS AND MATERIALS

Many neural network-based scatter correction methods, such as the originally proposed DSE, rely on MC simulations that are unlikely to account for inaccuracies inherent to the scanner hardware. We propose a novel approach that avoids the need for scanner specific MC simulations. We introduce the measurement-based spectral deep scatter estimation (mbsDSE), a U-Net (that also utilizes spectral information from energy thresholds), to estimate scatter. Measuring scatter rather than simulating has the advantage that we capture the scanner's true scatter properties, including backscatter and other types, as well potential inaccuracies inherent to the scanner hardware. For training mbsDSE, we employed measured data from a NAEOTOM Alpha.Peak PCCT scanner. Single source scans with 140 kV, 400 mAs, 0.5 s scan time and two energy thresholds were performed using different phantoms in order to capture a large variety of scatter distributions. The scans were conducted with narrow (6×0.4 mm) and with full collimation (144×0.4 mm). The difference between the two scan configurations served as the scatter label. Our mbsDSE approach was tested on a circular scan of a semi-anthropomorphic thorax phantom using the same PCCT scanner. Image quality of mbsDSE was quantified and compared to the convolution

kernel-based scatter correction method according to the pep model of Ohnesorge et al. The ability to correct high frequency scatter artifacts such as those occurring with coarse anti-scatter grids (ASG) in the PCCT scanner, was also investigated.

RESULTS

With mbsDSE, the MAE can be reduced from 14.7 HU in the uncorrected case to 2.5 HU. In comparison, the pep model only achieves an MAE of 10.6 HU. Additionally, mbsDSE is capable of nearly eliminating high-frequency scatter artifacts, which cannot be addressed by conventional methods. It also delivers better results than the pep approach (MAE 17.9 HU) for spectral applications (50 keV VMI), with an MAE reduction from 24.7 HU to 7.2 HU.

CONCLUSION

By using measured data to train the DSE, the network is able to correct for scatter artifacts better than other existing methods. This also applies to spectral applications. This approach potentially enables the correction of artifacts that are difficult or nearly impossible to model accurately using MC simulations.

CLINICAL RELEVANCE/APPLICATION

Diagnostic image quality is significantly improved with mbsDSE, which makes use of the photon energy information and of measured scanner-specific imperfections that can cause artifacts not accounted for by conventional methods.

M3-SSPH05-3 ACCURACY OF VIRTUAL NON-CONTRAST IMAGING IN PHOTON-COUNTING DETECTOR CT: A COMPARATIVE EVALUATION WITH THIRD-GENERATION DUAL-SOURCE ENERGY-INTEGRATING DETECTOR CT

Kazuki Ishikawa (*Presenter*)
Keitaro Sofue, MD (*Abstract Co-Author*)
Tomoki Maebayashi (*Abstract Co-Author*)
Kiyosumi Kagawa (*Abstract Co-Author*)
Takashi Okunaga (*Abstract Co-Author*)
Noriyuki Negi, RT (*Abstract Co-Author*)
Akiko Kusaka, RT (*Abstract Co-Author*)
Kentaro Nishiuchi (*Abstract Co-Author*)
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Takamichi Murakami, MD, PhD (*Abstract Co-Author*)

PURPOSE

Virtual non-contrast (VNC) imaging in multi-energy CT has the potential to reduce radiation exposure and streamline workflow by replacing true non-contrast (TNC) imaging. Photon-counting detector CT (PCD-CT) may further enhance the clinical utility of VNC by enabling retrospective spectral analysis offering flexible protocol design. However, clinical implementation of VNC requires sufficient image accuracy, and thus validation of its performance is essential. This study aimed to compare the accuracy of VNC images generated from PCD-CT with energy-integrating detector CT (EID-CT).

METHODS AND MATERIALS

We retrospectively analyzed quadriphasic liver dynamic CT scans from 32 patients scanned with EID-CT (SOMATOM Force) and 31 with PCD-CT (NAEOTOM Alpha) using identical imaging protocol. Energy separation was assessed using the low-to-high attenuation ratio (L/H ratio), calculated from aortic CT values in low- and high-energy images during the arterial phase (AP). Accuracy of VNC was evaluated by comparing CT values of the liver, spleen, kidneys, and aorta on VNC images derived from AP, portal venous phase (PVP), and equilibrium phase (EP) with corresponding values on TNC images. Equivalence between VNC and TNC was assessed using the two one-sided test (TOST) with a predefined equivalence margin of ±10 Hounsfield Units (HU). For each patient, root mean square error (RMSE) was calculated for each phase based on organ-wise differences between VNC and TNC images and compared.

RESULTS

L/H ratio was higher in EID-CT (2.23 ± 0.06) than in PCD-CT (1.92 ± 0.06), indicating greater energy separation (Welch's t-test, $P < .001$). TOST showed statistical equivalence between VNC and TNC images for all phases and organs in the PCD-CT group ($P < .01$, except for the aorta in the AP ($P = .019$) and the kidneys in the EP ($P = .015$)). In the EID-CT group, statistical equivalence was observed across all phases and organs ($P < .01$), except for the aorta in the PVP ($P = .530$) and EP ($P = .928$). RMSE for EID-CT were 5.7 ± 2.0 HU (AP), 6.9 ± 2.0 HU (PVP), and 7.2 ± 2.2 HU (EP), and for PCD-CT were 6.3 ± 2.5 HU, 5.8 ± 2.1 HU, and 6.5 ± 2.0 HU, with Welch's t-test showing no significant difference in AP ($P = .272$) and EP ($P = .150$), but a significant difference in PVP ($P = .048$).

CONCLUSION

PCD-CT demonstrated superior VNC accuracy compared to EID-CT, achieving statistical equivalence with TNC images within a ±10 HU margin across all evaluated phases and organs, despite exhibiting smaller energy separation.

CLINICAL RELEVANCE/APPLICATION

PCD-CT achieved comparable or superior VNC accuracy compared with EID-CT. With its capability for flexible protocol design and retrospective analysis, PCD-CT has potential to expand the clinical utility of VNC imaging beyond those achievable with conventional EID-CT.

M3-SSPH05-4 NUMERICAL BIAS ESTIMATOR OF TWO BASIS MATERIAL DECOMPOSITION IN SPECTRAL CT

Olivia Sandvold, BS (*Presenter*)
Roland Proksa (*Abstract Co-Author*)
Amy Perkins (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)

PURPOSE

To enhance the clinical utility of spectral data, such as the use of iodine as a biomarker, it is essential to minimize bias in clinical imaging protocols. This study introduces a flexible statistical framework for quantifying bias in material decomposition basis domains derived in spectral CT.

METHODS AND MATERIALS

The central ray incident X-ray spectrum was modeled from a clinical-grade X-ray tube (Philips Healthcare) with a tube voltage of 120 kVp and a tube current of 50 mA. CZT photon-counting detector bins were derived using realistic responses for a 20 cm PMMA phantom with 10 mm of 2 mg/mL iodine to replicate a contrast-enhanced scan. A 20 keV electronic noise excluding threshold was set, and a second bin threshold was varied from 40-110 keV. We set a sufficiently high photon count and applied the Cramér-Rao lower bound (CRLB) to estimate the lowest achievable variance (s 2) in the iodine and PMMA domains. Then, 250 biased line projection values, ±6s around each expected path length, were generated to encompass >99.9% possible material path lengths. The expected detector data for each pair of biased projections (B 1 , B 2) was determined. Next, the likelihood of obtaining the pair of biased values was computed as the product of the probability of obtaining each individual, independent biased line integral value. A 2D map was generated by plotting the joint likelihood probabilities for each pair of biased line estimates. The x and y center of mass values of the joint likelihood map represented the expected biased B 1 iodine and B 2 PMMA measures. The material bias for each basis was computed as the difference between B 1 and B 2 values and respective expected B 1 and B 2 values.

RESULTS

Both CRLB and bias estimators had worse performance towards the extremes of the tested threshold levels. The iodine domain biases were at a minimum using a 101 keV bin threshold. In contrast, iodine CRLB noise was minimized at 66.9 keV. The estimated noise-induced bias per mg/mL using this threshold was 0.7 mm, implying an expected minimum of 0.7 mm error for every 1 mg/mL iodine. The minimum bias estimate error was 8.7x10 -3 mm per mg/mL.

CONCLUSION

This numerical bias estimator provides a statistical method for estimating spectral quantitative bias without the need for time-consuming simulations. Our results demonstrate that the optimal bin threshold determined by bias minimization differs from that derived through noise minimization, highlighting a key tradeoff in system design.

CLINICAL RELEVANCE/APPLICATION

In the context of clinical imaging, balancing quantitative accuracy and noise is essential. Our model addresses this challenge by offering a tool for researchers to optimize system parameters and design CT acquisition strategies that minimize bias—even in the presence of quantum noise.

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Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

M3-SSRO02

Radiation Oncology (CNS Oncology)

Monday, Dec. 1 9:30AM - 10:30AM Room: S503

Simon S. Lo, MBChB (*Moderator*)
Anca L. Grosu, MD (*Moderator*)

Sub-Events

M3-SSRO02-1 ONCOLOGICAL EFFICACY OF STEREOTACTIC RE-IRRADIATION IN RECURRENT GLIOBLASTOMA: RESULTS FROM THE PROSPECTIVE MULTICENTER GLIAA TRIAL (NCT01252459)

Anca L. Grosu, MD (*Presenter*)
Wolfgang Weber (*Abstract Co-Author*)
Erika Graf (*Abstract Co-Author*)
Michael Mix (*Abstract Co-Author*)
Rolf Wiehle (*Abstract Co-Author*)
Ursula Nestle, MD,PhD (*Abstract Co-Author*)
Tanja Schimek-Jasch, MD (*Abstract Co-Author*)
Maximilian Niyazi (*Abstract Co-Author*)
Claus Belka (*Abstract Co-Author*)
Frank Paulsen (*Abstract Co-Author*)
Franziska Eckert (*Abstract Co-Author*)
Michael Eble (*Abstract Co-Author*)
Liane Konig (*Abstract Co-Author*)
Frank Giordano (*Abstract Co-Author*)
Elena Sperk (*Abstract Co-Author*)
Felix Momm (*Abstract Co-Author*)
Irina Spehl (*Abstract Co-Author*)
Stephanie E. Combs, MD (*Abstract Co-Author*)
Denise Bernhardt (*Abstract Co-Author*)
Rita Engenhart-Cabillic, MD, PHD (*Abstract Co-Author*)
Markus Schymalla (*Abstract Co-Author*)
Martin Stuschke (*Abstract Co-Author*)
Christoph Pottgen (*Abstract Co-Author*)
Rainer Fietkau, MD (*Abstract Co-Author*)
Sabine Semrau, MD (*Abstract Co-Author*)
Thomas Brunner, PhD (*Abstract Co-Author*)
Stephan Nadji (*Abstract Co-Author*)
Beatrix Hueltenschmidt (*Abstract Co-Author*)
Guido Hildebrandt (*Abstract Co-Author*)
Bernd Krause (*Abstract Co-Author*)
Ilja Ciernik (*Abstract Co-Author*)
Brigitta Baumert (*Abstract Co-Author*)
Arnab Chakravarti (*Abstract Co-Author*)
Susan Short (*Abstract Co-Author*)
Carsten Nieder (*Abstract Co-Author*)
Juergen Beck (*Abstract Co-Author*)
Philipp Meyer (*Abstract Co-Author*)
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Ilinca Popp, MD (*Abstract Co-Author*)

PURPOSE

The GLIAA trial evaluated the efficacy and safety of re-irradiation in patients with recurrent glioblastoma (rGBM), using target volume delineation based on either O-(2-[18F]fluoroethyl)-L-tyrosine (FET)-PET or contrast-enhanced T1-weighted MRI (T1Gd-MRI).

METHODS AND MATERIALS

This prospective, multicenter, randomized trial included patients with in-field rGBM (lesion size 1-6 cm) visible on both FET-PET and T1Gd-MRI. Histological confirmation of glioblastoma was required either at initial diagnosis or at recurrence. All patients had received prior radiotherapy (59.4-60 Gy) at least 6 months before enrollment. Re-irradiation was delivered via high-precision stereotactic radiotherapy with a total dose of 39 Gy (3 Gy per fraction, 5 fractions/week). Tumor response was monitored with MRI, and suspected progression was verified via FET-PET or histology when feasible. The primary endpoint was progression-free survival (PFS); secondary endpoints included overall survival (OS), local control (LCS), recurrence patterns, and toxicity.

RESULTS

Between November 26, 2013, and September 2, 2021, 200 patients were randomized. Of these, 98 in the FET-PET arm and 97 in the T1Gd-MRI arm were treated per protocol. The cohort included first, second, and third recurrences; 54% of tumors were multifocal. Mean tumor volume was 10.9 ± 11.2 ml. Chemotherapy (allowed from April 2019) was administered to 41 patients. Median PFS was 4.2 months (95% CI: 3.8-5.3), median OS was 9.2 months (95% CI: 8.3-10.3), and median LCS was 6.5 months (95% CI: 6.1-7.1). The 12-month local control rate was 21%. Patients with tumors =3 cm showed significantly improved outcomes in PFS (HR = 0.64; p = 0.03), OS (HR = 0.50; p = 0.001), and LCS (HR = 0.48; p = 0.0006). Recurrence patterns included in-field (46.2%), out-of-field (29.9%), and marginal (17.9%) relapses. CTCAE grade 3-4 radiotherapy-related adverse events occurred in 11 patients within 90 days of treatment and in 10 patients thereafter. Radiation necrosis was observed in 23.6% of cases and was associated with a trend toward better prognosis (HR = 0.75; p = 0.12).

CONCLUSION

The GLIAA trial confirms that stereotactic re-irradiation with 39 Gy is a safe and feasible treatment for rGBM. It provides meaningful local tumor control with acceptable toxicity. Radiation necrosis may serve as a potential prognostic marker in this setting.

CLINICAL RELEVANCE/APPLICATION

FET-PET- and MRI-based re-irradiation achieves a 6-months locally controlled survival in rGBM and is a safe treatment option.

M3-SSRO02-2 GUARD: A GLIOMA UNIFIED AI-DRIVEN RADIOTHERAPY DECISION SYSTEM

Zihan Wang, MMEd, PhD (*Presenter*)
Yinyan Wang, MD (*Abstract Co-Author*)

PURPOSE

To develop and validate a machine learning system that non-invasively predicts radiotherapy sensitivity in low-grade glioma (LGG), enabling personalized treatment planning.

METHODS AND MATERIALS

Multi-sequence MRI data were collected from six centers at four time points: preoperative, postoperative, pre-radiotherapy(RT), and post-RT. Images were preprocessed using SimpleITK, and tumors were manually segmented in MRIcron. Radiomic features were extracted using PyRadiomics. Radiotherapy sensitivity was evaluated using RANO-LGG criteria. An XGBoost model integrating radiomic and clinical features was constructed, with SHAP analysis for interpretability. Imaging-genomic data from TCGA and CGGA were analyzed using GO and GSEA to explore underlying pathways. The prognostic value of the model was further assessed by Kaplan-Meier survival analysis.

RESULTS

This study reviewed 13,690 LGG patients who underwent craniotomy or stereotactic biopsy at the primary research center between 2008 and 2023. Of these, 963 patients who received postoperative radiotherapy and had complete imaging follow-up were selected, with 11,556 MRI scans collected to develop the GUARD model. Additionally, 1,764 MRI scans from 147 LGG patients across five independent clinical centers were used for external test. A prospective cohort of 328 patients with 3,936 MRI images served as the prospective test set. The GUARD model achieved prediction AUCs of 0.948, 0.911, 0.892, and 0.915 for the training, internal validation, external test, and prospective test sets, respectively. SHAP analysis identified residual tumor, age, and radiomic features such as T2W texture roughness and T1WC pixel intensity changes as key contributors. Radscore-based group analysis showed tumors in the low Radscore group (low RT sensitivity) were enriched in pathways like oxidative phosphorylation, fatty acid metabolism, hypoxia, and DNA damage repair, while those in the high Radscore group (high RT sensitivity) showed downregulation in these pathways. Patients in the high Radscore group also had significantly longer overall survival.

CONCLUSION

GUARD enables accurate preoperative prediction of radiotherapy sensitivity in LGG based on multicenter imaging and clinical data. With robust performance, interpretability, and generalizability, it offers a promising tool for personalized radiotherapy planning in clinical practice.

CLINICAL RELEVANCE/APPLICATION

Leveraging large-scale, multicenter imaging and clinical data, the GUARD model offers accurate, robust, and generalizable preoperative prediction of radiotherapy sensitivity in LGG. This tool holds potential to guide individualized radiotherapy strategies and improve clinical outcomes in glioma care.

M3-SSRO02-3 DEVICE-AWARE SYNTHETIC CT VIA MULTITASK LEARNING FOR IMPROVED MR-ONLY CNS RADIOTHERAPY PLANNING

Ho-Hsin Chang, BS (*Presenter*)
Rex Cardan, PHD (*Abstract Co-Author*)
Sandeep Bodduluri, MS, PhD (*Abstract Co-Author*)
Samantha Simiele (*Abstract Co-Author*)
Joseph Harms, PHD (*Abstract Co-Author*)
John B. Fiveash, MD (*Abstract Co-Author*)
Richard A. Popple, PhD (*Abstract Co-Author*)
Carlos E. Cardenas, PhD (*Abstract Co-Author*)

PURPOSE

Synthetic CT (sCT) predicts Hounsfield Unit information (HU) from MR images, eliminating the need for separate CT in radiotherapy (RT) planning. MR-only workflows reduce registration errors and streamline planning. However, immobilization devices used during CT-based simulation are not visible on MR, limiting the fidelity of MR-derived sCTs. In brain RT, differences in neck position between MR and CT further challenge accurate sCT generation. We developed a multi-task deep learning framework to generate sCTs and segment immobilization devices and organs-at-risk, enabling sCTs that better mimic CT setups for accurate planning.

METHODS AND MATERIALS

We developed a multi-task 3D U-Net framework based on nnU-Net and nnDoseNet, with adaptive training configured by dataset, task, and hardware. The multi-task architecture includes a shared encoder with task-specific decoders for simultaneous sCT prediction and ROI segmentation. MR images from the TCIA GLIS-RT dataset were rigidly registered and resampled to the corresponding CT grid. The paired MR-CT images were split into 164 training, 40 validation, and 25 test cases. Both models used identical hyperparameters (e.g., 200 epochs, batch size of 3 and patch size of [40, 160, 224]), differing only in decoder structure and loss function. The multi-task loss combined structural similarity index measure (SSIM) and mean-square error (MSE) for sCT regression and Dice loss for segmentation.

RESULTS

Among test cases, when compared to the ground truth CT scans, single-/multi-task sCT showed mean-absolute error (MAE) of 14.79/14.93 and SSIM of 0.97/0.97 overall; 20.5/19.74 MAE and 0.93/0.93 SSIM within ROIs; and 331.22/314.33 MAE and 0.56/0.55 SSIM for the skull (outside ROIs). Overall, the multi-task model performed slightly better across all regions.

CONCLUSION

We found ROIs segmentation supports sCT prediction. Improving skull prediction in sCT is essential for accurate patient-to-couch localization and dose calculation in MR-to-plan RT workflows.

CLINICAL RELEVANCE/APPLICATION

This work advances brain MR-only radiotherapy by improving synthetic CT generation and incorporating immobilization device segmentation, addressing MR/CT neck position mismatch to enable more accurate localization and dose calculation for clinical implementation.

M3-SSRO02-4 SAFETY OF CONCURRENT HER-2 ANTIBODY DRUG CONJUGATES WITH SINGLE ISOCENTER MULTI-FRACTION SRS FOR BRAIN METASTASES

Swati Baskiyar (*Presenter*)
Luke Moradi (*Abstract Co-Author*)
Richard A. Popple, PhD (*Abstract Co-Author*)

Christopher D. Willey, MD, PhD (*Abstract Co-Author*)
Drexell Boggs (*Abstract Co-Author*)
John B. Fiveash, MD (*Abstract Co-Author*)

PURPOSE

HER2-targeted therapies have improved outcomes in patients with breast cancer, including those with brain metastases. Antibody drug conjugates including trastuzumab emtansine (Kadcyla) and fam-trastuzumab deruxtecan (Enhertu) offer systemic disease control as well as some degree of intracranial activity. Prior studies have found mixed risk of toxicity and have not fully explored safety with fractionated SRS regimens (fSRS) for larger brain metastases. This study evaluates whether receipt of HER2-targeted mAb drug conjugate within one year of fSRS is associated with an increased incidence of Grade 3 or higher central nervous system (CNS) toxicity.

METHODS AND MATERIALS

We conducted a retrospective review of breast cancer patients treated with SRS for brain metastases from 2015 to 2022. The use of fSRS was up to the physician's discretion and was typically utilized when courses included tumors >2 cm in diameter or in eloquent locations. All tumors were treated with one prescription regardless of size to facilitate single isocenter treatment. The primary endpoint was to compare the incidence of Grade 3 or higher CNS toxicity from tumors treated with and without concurrent Her-2 targeted therapy. Concurrent was defined as HER-2 antibody drug conjugate within 12 months of SRS. Toxicity was assessed on a per-tumor basis using CTCAE v5.0 criteria. Freedom from toxicity was estimated using Kaplan-Meier analysis.

RESULTS

278 brain tumors treated with SRS from 50 patients with breast cancer were identified. There were 87 tumors from 25 patients that were HER-2 positive. HER-2 targeted therapy was delivered concurrently with 44 tumors. The median follow-up was 10 months. A total of six Grade 3+ toxicity events occurred, with only one event in the concurrent group. One-year freedom from toxicity was not significantly different between patients receiving HER2-targeted therapy and those who did not (100% vs. 96%, p = 0.746).

CONCLUSION

The concurrent use of Enhertu or Kadcyla with fSRS for brain metastases from HER2-positive breast cancer was not associated with an increased risk of high-grade CNS toxicity. These findings support the continued use of HER-2antibody drug conjugates without interruption during fSRS.

CLINICAL RELEVANCE/APPLICATION

The findings of this study demonstrate that Enhertu or Kadcyla can be safely administered alongside fSRS. This would allow for continuous patient treatment without compromising safety or treatment interruptions.

M3-SSRO02-5 QUANTIFYING THE BENEFIT OF PLANNING MRI OVER DIAGNOSTIC MRI IN SRS: A PAIRED ANALYSIS

Lakshmi Rekha Narra, MD (*Presenter*)
Taoran Cui, PHD (*Abstract Co-Author*)
Ritesh Kumar, MBBS,MD (*Abstract Co-Author*)
Zohaib Sherwani, MD (*Abstract Co-Author*)
Swati Mamidanna (*Abstract Co-Author*)
Chengzhu Zhang, PhD (*Abstract Co-Author*)
Mihir Patel, MD (*Abstract Co-Author*)
Imraan Jan (*Abstract Co-Author*)
Matthew P. Deek, MD (*Abstract Co-Author*)

PURPOSE

Stereotactic Radiosurgery (SRS) is a preferred modality to treat brain metastases due to its submillimeter accuracy in dose delivery. This precision requires dedicated planning MRI protocols with thin slices (1-1.5mm), independently acquired in all planes for optimal tumor volume delineation. While dedicated SRS planning MRI(s-MRI) offers higher spatial resolutions than standard diagnostic MRI (d-MRI), its clinical utility in terms of lesion detection and volumetric accuracy is not well quantified in real world cohorts. We aimed to evaluate the added value of dedicated SRS Planning MRI by comparing the number of detected lesions and lesion-level volumetric variability with standard d-MRI.

METHODS AND MATERIALS

Patients with Brain Metastases who underwent both d-MRI and s-MRI were retrospectively reviewed. Both d-MRI and s-MRI were acquired using the same contrast enhanced T1-weighted sequence, however with 5-6 mm and 1mm slice thicknesses, respectively. For each patient, metastases were independently identified and contoured on both MRIs. Difference in number of metastases detected was assessed using the Wilcoxon signed-rank test. Intact lesions visible only on d-MRI were contoured separately both on d-MRI and s- MRI, and volumetric data for each lesion is extracted from eclipse treatment planning system. For each lesion, both mean volume and volumetric difference from both MRI's were calculated. Bland-Altman Analysis was used to plot the volumetric variability.

RESULTS

Among twenty patients who underwent both d-MRI and s-MRI, the median age was 65 years (IQR, 61-72). Lung cancer was found to be the primary in (40%, n=8) followed by melanoma (25%, n=5). The median interval between the scans was 17 days (IQR, 13-23). Thin slice (~1mm) acquisitions were present in the diagnostic MRI protocol in 45% of patients (n=9). The difference in count and median number of brain metastases was 2 (IQR: 2-4) on d-MRI and 2 (IQR: 2-5) on s-MRI (p=0.058). Forty-seven intact brain metastases were contoured on both d-MRI and s-MRI. Bland-Altman analysis demonstrated a mean bias of -0.37cc (d-MRI - s-MRI) with 95% limits of agreement from -5.58 cc to 4.83 cc.

CONCLUSION

Lesion count was numerically higher on dedicated planning MRI (s-MRI) suggesting potential benefit in detecting more number of smaller metastatic lesions. Standard diagnostic MRI has shown to underestimate the target volume up to 0.37 cc. A larger sample size is needed to validate these findings. Future work will include larger sample size, assess tumor volume variability between stealth protocol and s-MRI, and evaluate the impact of image distortion on target delineation between 3T and 1.5T scanners.

CLINICAL RELEVANCE/APPLICATION

Stereotactic Radio Surgery

M3-SSRO02-6 HIPPOCAMPAL-AVOIDANCE WHOLE-BRAIN RADIOTHERAPY WITH DOSE ESCALATION ON METASTASES - RESULTS OF THE PROSPECTIVE MULTICENTRE RANDOMIZED HIPPORAD TRIAL

Anca L. Grosu, MD (*Presenter*)
Claudia Schmoor (*Abstract Co-Author*)
Erika Graf (*Abstract Co-Author*)
Lars Frings (*Abstract Co-Author*)
Thomas Rothe (*Abstract Co-Author*)
Sabine Schneider-Fuchs (*Abstract Co-Author*)
Oliver Oehlke (*Abstract Co-Author*)
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Raphael Bodensohn (*Abstract Co-Author*)
Frank Paulsen (*Abstract Co-Author*)
Victor Lewitzki (*Abstract Co-Author*)
Jurgen Dunst (*Abstract Co-Author*)
Emmanouil Fokas (*Abstract Co-Author*)
Sophie Wetzel (*Abstract Co-Author*)
Ilja Ciernik (*Abstract Co-Author*)
Christian Dietzel (*Abstract Co-Author*)
Marcel Ott (*Abstract Co-Author*)
Linda Agolli (*Abstract Co-Author*)
Carsten Nieder (*Abstract Co-Author*)
Karl Egger (*Abstract Co-Author*)
Juergen Beck (*Abstract Co-Author*)
Horst Urbach (*Abstract Co-Author*)
Claas Lahmann (*Abstract Co-Author*)
Ilinca Popp, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of hippocampal avoidance (HA) in the context of whole brain radiotherapy (WBRT) with a simultaneous integrated boost (SIB) on neurocognitive function and intracranial disease control in patients with multiple brain metastases.

METHODS AND MATERIALS

This double-blind, randomized, prospective multicenter study (DRKS00004598) included patients with 4-10 brain metastases (=5 mm), recruited from 13 institutions across Germany. Participants were randomized 1:1 to receive either WBRT with SIB and hippocampal avoidance (HA-WBRT+SIB; Arm A) or WBRT with SIB without hippocampal sparing (Arm B). The treatment regimen involved 30 Gy WBRT, supplemented by a SIB of 51 Gy to metastases and 42 Gy to brainstem lesions or resection cavities, delivered over 12 fractions (5x/week). The primary outcome was neurocognitive performance at 3 months post-treatment, assessed via the Verbal Learning and Memory Test (VLMT). Secondary endpoints included neurocognitive status at 9 and 18 months, emotional well-being (anxiety, depression), quality of life, and oncologic efficacy.

RESULTS

Out of 170 enrolled patients, 136 were randomized to Arm A (n=67) or Arm B (n=69). At 3 months, 38 patients in Arm A and 42 in Arm B met criteria for primary endpoint analysis. There was no significant difference in verbal learning performance between arms ($p = 0.83$). Both groups demonstrated a decline in VLMT scores at 3 months. At 9 months, cognitive function improved in both arms, with a favorable trend in Arm A. By 18 months, cognitive performance returned to baseline across both groups. HA-WBRT+SIB was associated with lower depression scores at 3 months ($p = 0.047$) and 18 months ($p = 0.048$). One-year distant brain progression rates were 22% in both arms, while local progression was 4% in Arm A vs. 12% in Arm B. Time to hippocampal recurrence did not differ significantly ($p = 0.98$). Neurological mortality at one year was lower in Arm A (4%) compared to Arm B (12%). Treatment-related serious adverse events were observed in 3% (Arm A) and 6% (Arm B).

CONCLUSION

In patients with multiple brain metastases, the integration of hippocampal avoidance into WBRT+SIB was safe and associated with reduced rates of depression and comparable neurocognitive recovery. Oncological outcomes remained robust, with lower local failure and neurological death rates observed in the HA group.

CLINICAL RELEVANCE/APPLICATION

These findings support the clinical feasibility and potential neuroprotective benefit of HA-WBRT+SIB for multiple brain metastases.
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M3-STCE1

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Monday, Dec. 1 10:00AM - 10:30AM Room: LEARNING CENTER THEATER 1

Sub-Events

M3-STCE1-1 "QUADRUPLE-LOW" CORONARY CT ANGIOGRAPHY WITH DEEP LEARNING IMAGE RECONSTRUCTION ALGORITHMFOR PATIENTS WITH HIGH BMI: IMAGE QUALITY AND DIAGNOSTIC PERFORMANCE ASSESSMENT

Ke Qi (*Presenter*)
Jie Liu (*Abstract Co-Author*)
Luotong Wang (*Abstract Co-Author*)

PURPOSE

This study aims to investigate the feasibility of the "quadruple-low" protocol, which involves reducing radiation dose, contrast media (CM) volume, injection rate, and CM concentration, in the context of CCTA utilizing DLIR algorithm to evaluate image quality and diagnostic performance of the degree of coronary artery stenosis in patients with a high BMI.

METHODS AND MATERIALS

This prospective study comprised 180 patients underwent CCTA with BMI = 26 kg/m². Patients were randomly allocated into three distinct groups: SDCT group utilized a tube voltage of 100 kVp with adaptive statistical iterative reconstruction (ASIR-V) and received a CM dosage of 245 mgI/kg (Iohexol, 350 mgI/mL) in 10s injection duration; Both the triple-LDCT group and the quadruple-LDCT group employed a tube voltage of 80 kVp with DLIR and received a CM dosage of 128 mgI/kg in 7s injection duration. The CM concentration was 350 mgI/mL(Iohexol) in the triple-LDCT group and was 320 mgI/mL (320 mgI/mL) in the quadruple -LDCT group. Image quality was graded based on the SNR, CNR, and on a Likert scale of 1-5. Furthermore, the diagnostic performance of the degree of coronary artery stenosis based on CCTA was evaluated using ICA as the reference standard including sensitivity, specificity, PPV, NPV, and diagnostic accuracy.

RESULTS

Compared with the SDCT group, the DLP was reduced by 32.5%, the CM volume was reduced by 41.5% , the CM flow rate was reduced by 14.5% and the CM concentration was reduced by 8.6% in the quadruple-LDCT group. The quadruple-LDCT achieved a significantly higher SNR, CNR, and subjective image quality (all $p<0.05$). The diagnostic performance of the triple-LDCT group was the highest. The DLP was reduced by 32.5%, the CM volume was reduced by 47.5% and the CM flow rate was reduced by 23.5% in the triple-LDCT group compared with the SDCT group. The triple-LDCT achieved a significantly higher SNR and CNR, while the subjective image quality and diagnostic performance were comparable between the triple-LDCT group and the SDCT group.

CONCLUSION

The 80 kVp CCTA with a 7s duration with iodine load of 128 mgI/kg assisted by DLIR could significantly reduce radiation exposure, CM volume, CM injection rate and CM concentration while improving image quality and diagnostic performance of coronary artery stenosis compared to the conventional 100 kVp protocol in overweight patients.

CLINICAL RELEVANCE/APPLICATION

Both the triple-LDCT and quadruple-LDCT groups, using 80 kVp, the deep learning iterative reconstruction algorithm, and optimized CM protocols, achieved higher image quality. These improvements were made without compromising diagnostic performance for detecting significant coronary artery stenosis, ensuring reliable results for high-BMI patients.

M3-STCE1-2 INDIRECT DEUTERIUM EXCHANGE IMAGING FOR NON-INVASIVE HIGH-RESOLUTION CSF PRODUCTION MAPPING

Arash Nazeri, MD (*Presenter*)
Debolina De (*Abstract Co-Author*)
Helia Hosseini, MD (*Abstract Co-Author*)
Nicholas Bateman (*Abstract Co-Author*)
Shelei Pan (*Abstract Co-Author*)
James D. Quirk, PhD (*Abstract Co-Author*)
Jennifer Strahle (*Abstract Co-Author*)

PURPOSE

Cerebrospinal fluid (CSF) is crucial for brain homeostasis and waste clearance; its disruption impairs brain fluid dynamics, contributing to neurological disease. Existing non-invasive CSF MRI methods often use indirect proxies, miss cumulative production, and have limited spatial resolution/signal-to-noise ratio. We used deuterium oxide (D 2 O) as an IV negative contrast agent and water analog, where 1H-MRI signal loss is proportional to its displacement of new CSF water.

METHODS AND MATERIALS

Twenty-four male Sprague Dawley rats (4-7 mo) were grouped: D 2 O (n=7); Acetazolamide (ACZ)/D 2 O (n=9); H2O controls (n=8). The ACZ/D 2 O group received IP ACZ (40mg/kg) pre-D 2 O infusion to suppress CSF production. Controls received an equivalent IV dose of H 2 O saline. High-resolution 3D balanced steady-state free precession (b-SSFP; 110 μm3 voxel size) was acquired on a 9.4T Bruker MRI before and after D 2 O infusion to detect deuterium-related CSF signal changes. Global % signal reduction from D 2 O displacement was computed from pre/post-infusion images in segmented CSF. Region-of-interest (ROI) analysis used a custom CSF atlas.

RESULTS

IV D 2 O induced marked signal attenuation within the CSF compared to control rats receiving H 2 O (first dose: 10.0% [SD: 2.3%] vs. 2.0% [SD: 3.1%], $p = 2.1 \times 10$-4; second dose: 6.3% [SD: 2.3%] vs. 0.7% [SD: 2.4%], $p = 5.2 \times 10$-4). Rats pretreated with ACZ demonstrated intermediate signal loss following D 2 O infusion (first dose: 5.6% [SD: 1.7%]; second dose: 3.6% [SD: 1.4%]), consistent with partial inhibition of CSF production. Follow-up ROI analysis across 13 ventricular and cisternal compartments revealed a similar pattern of group-wise signal attenuation, with the ACZ group exhibiting intermediate reductions between the D 2 O and H 2 O groups.

CONCLUSION

These findings establish deuterium displacement exchange imaging as a feasible high-resolution, non-invasive method for assessing CSF production and its pharmacological modulation. Future work will refine quantification and explore applications in various brain disorders.

CLINICAL RELEVANCE/APPLICATION

Future studies are needed to refine quantitative, dynamic CSF production mapping and apply this methodology to elucidate CSF production abnormalities underlying neurofluid disorders.

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Nov. 30 – Dec. 4
RSNA® 2025
Imaging the Individual

Abstract Archives of the RSNA, 2025

M3-STCE2

Science Session (Imaging-Guided Oncologic Therapies: From Histotripsy to Theranostics and Beyond)

Monday, Dec. 1 10:00AM - 10:40AM Room: LEARNING CENTER THEATER 2

Sub-Events

M3-STCE2-2 PHOTO-TRIGGERED ENGINEERED MICROBES FOR CT-GUIDED CANCER THERAPY

Chuyun Lou, PhD (*Presenter*)
Jianbo Gao, MD (*Abstract Co-Author*)

PURPOSE

Effective cancer treatment relies on the integration of precise imaging and targeted drug delivery. Computed tomography (CT) is widely used for cancer staging; however, adverse reactions to traditional contrast agents in some patients limit its application in personalized therapies. The emergence of Mo 1.33 C nanosheets, a two-dimensional material containing high atomic number molybdenum, offers new possibilities for CT imaging due to its excellent X-ray attenuation properties. In this study, we developed a photo-triggered engineered microbial system using tumor-targeting Escherichia coli to deliver Mo1.33C nanosheets to tumor sites, enabling precise CT-based localization. Additionally, Mo1.33C exhibits strong photothermal conversion capability under 808 nm NIR laser irradiation and can be loaded with the epigenetic drug 5-azacytidine (AZA), allowing image-guided photothermal-epigenetic immunotherapy. This multifunctional platform aims to advance image-guided precision cancer therapy.

METHODS AND MATERIALS

We compared Mo 1.33 C with iopromide at equal concentrations using GE Revolution CT to measure HU under identical keV settings. An engineered microbe (AM@Ec) was constructed using E. coli MG1655 to load Mo1.33C. In MFC tumor-bearing mice, PBS (control), Mo1.33C (M), or AZA-Mo1.33C@Ec (AM@Ec) was intravenously injected. CT scans were performed at 0, 2, 6, and 12 h post-injection using a small-animal CT system. Tumor ROI CT values were analyzed via PACS to assess in vivo imaging and accumulation.

RESULTS

Mo 1.33 C showed dose-dependent CT enhancement, with HU values linearly correlated with concentration. Below 5 mg/mL, Mo 1.33 C generated CT signals comparable to iopromide. In vivo, CT values at tumor sites increased from 48.65 ± 1.35 to 90.94 ± 4.30 HU in the M group and from 44.52 ± 0.83 to 265.31 ± 17.08 HU in the AM@Ec group at 12 h. This enhancement reflects E. coli -mediated targeting and accumulation. AM@Ec also enabled NIR-triggered epigenetic therapy, suppressing tumor growth and prolonging survival. H&E and blood analyses confirmed biosafety and biocompatibility.

CONCLUSION

AM@Ec enables tumor-targeted CT imaging and laser-triggered therapy with excellent biosafety, showing potential as a versatile contrast agent for real-time cancer monitoring.

CLINICAL RELEVANCE/APPLICATION

Compared to conventional CT agents, AM@Ec provides tumor-specific imaging with enhanced sensitivity and safe, multimodal functionality—supporting real-time, image-guided cancer therapy.

M3-STCE2-3 SPECTRAL CT-BASED NOMOGRAM FOR EVALUATION OF PD1PDL1INHIBITORS COMBINED WITH CHEMOTHERAPY RESPONSE IN GASTRIC CANCER

Songmei Fan, MD (*Presenter*)

PURPOSE

Objectives The value of spectral CT quantitative parameters in predicting the efficacy of PD-1/PDL1 inhibitor combined chemotherapy for gastric cancer was explored.

METHODS AND MATERIALS

From April 2022 to March 2025, a retrospective study enrolled 185 gastric adenocarcinoma patients who had undergone Spectral CT enhance scans prior to receiving PD-1/PDL-1 inhibitor combination therapy. According to IRECIST criteria, 73 patients (39%) were ultimately classified as the response group (CR and PR), while 112 patients (61%) were categorized as the non-response group (PD and SD).The data was divided into a primary set of 129 and a validation set of 56, maintaining a 7:3 random ratio.Measurements included iodine concentration (IC), normalized iodine concentration (nIC), CT40kev, CT70kev, CT100kev, CT140kev, spectral attenuation curve slope (?HU), and effective atomic number (Zeff) during non-contrast and venous phases (VP). Clinicopathologic characteristics were collected. Univariable and multivariable logistic regressions identi& 7;ed independent predictors of PD-1/PDL1 inhibitors combined with chemotherapy response. The model was visualized using nomograms, and its ef& 7;cacy was assessed via receiver operating characteristic (ROC) curves,Calibration curve, DCA curve.

RESULTS

R esults Multivariate logistic regression analysis identified tumor axial maximum thickness, ZeffAP, nICVP, and venous phase electron cloud density as independent predictors of response to PD-1/PDL1 inhibitor combination chemotherapy. The line plot incorporating all four independent predictors outperformed both spectral parameter models and clinical models. with the highest AUCs of auc 0.843 (95% CI: 0.773-0.912) for the primary set and 0.832 (95% CI: 0.711-0.950) for the validation set (DeLong test: all $p < 0.05$).The consistency between the response evaluation criteria in IRECISTand TRG was good, with a Kappa value of 0.628($p < 0.05$).The consistency between the response evaluation criteria in RECIST1.1and TRG was fair with a Kappa value of 0.469($p < 0.05$),It was visualized using Sangitutu.

CONCLUSION

The spectral CT and clinical models were useful in predicting Response of PD-1/PDL1 inhibitors to combined chemotherapy in gastric adenocarcinoma patients. Combining spectralCTimaging parameters and clinicopathologic characteristics in a nomogram improved predictive accuracy.

CLINICAL RELEVANCE/APPLICATION

This spectral CT-based nomogram is a non-invasive and easily obtainable tool for accurately predicting sdenocarcinoma of stomach response to PD-1/PDL1 inhibitors combined with chemotherapy , aiding clinicians in personalized treatment planning.

M3-STCE2-4 THE VALUE OF MULTI-PARAMETER EARLY PREDICTION OF LYMPH NODE METASTASIS AFTER NEOADJUVANT CHEMOTHERAPY IN GASTRIC CANCER BY NCT CT

Songmei Fan, MD (*Presenter*)

PURPOSE

To investigate the diagnostic value of energy spectrum CT multi-parameter in predicting lymph node metastasis (LNM) of gastric adenocarcinoma.

METHODS AND MATERIALS

This retrospective study retrospectively collected 107 patients with gastric adenocarcinoma undergoing concurrent surgery after neoadjuvant therapy from three medical centers. The patients were divided into a training set (n=74) and a validation set (n=33). Clinical, CT, and energy spectrum parameters were compared between the LNM(+) and LNM(-) groups. Parameters showing statistically significant differences were included in a multivariate logistic regression analysis to identify independent predictors. Clinical models, energy spectrum models, and a combined model (energy spectrum model + clinical model) using score fusion were established. The ROC curves were used to evaluate the predictive efficacy of each model for LNM in gastric adenocarcinoma, with AUC calculations and comparison of discrimination among models.

RESULTS

The training set comprised 36 cases with LNM(+) and 38 cases with LNM(-), while the validation set included 17 cases with LNM(+) and 16 cases with LNM(-). The AUC values for clinical model, energy spectrum model, and combined model in the training set were 0.82,0.89, and 0.94 respectively. In the validation set, these metrics stood at 0.87,0.81, and 0.93. Notably, the combined model demonstrated significantly better or marginally superior performance compared to single-model approaches in both training and validation datasets.

CONCLUSION

The energy spectrum model can effectively predict the lymph node metastasis after neoadjuvant chemotherapy for gastric cancer.

CLINICAL RELEVANCE/APPLICATION

Therefore, this study aims to analyze the application value of preoperative spectral CT quantitative parameters in predicting lymph node metastasis after neoadjuvant chemotherapy for gastric cancer, and provide noninvasive quantitative imaging basis for patient prognosis management.

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M5-STCE1

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Monday, Dec. 1 1:15PM - 1:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

M5-STCE1-1 SPECTRAL AI-BASED RECONSTRUCTION FOR CRANIAL SPECTRAL DETECTOR DUAL ENERGY CT IMPROVES IMAGE QUALITY BY ENABLING LOW KEV VIRTUAL MONOENERGETIC IMAGING FOR ROUTINE READING

Julia Maria Lueckel, MD (*Presenter*)
Lina Hieronymi (*Abstract Co-Author*)
Stephan Skornitzke (*Abstract Co-Author*)
Lukas Goertz (*Abstract Co-Author*)
David Zopfs, MD (*Abstract Co-Author*)
David C. Maintz, MD (*Abstract Co-Author*)
Nils Grosse Hokamp, MD, MBA (*Abstract Co-Author*)

PURPOSE

The advent of DECT has resulted in use of moderately low keV virtual monoenergetic imaging for routine reading of unenhanced cranial CT (e.g. 60/65 keV). These reconstructions demonstrated improved contrast without increasing noise or distortion of texture as compared to conventional iterative reconstructions. AI-based reconstruction has demonstrated its benefit in reconstruction of conventional images with similar advantages while spectral AI (SAI) -based reconstruction is unavailable to date. We evaluated a vendor provided late-prototype deep-learning based SAI reconstruction for conventional imaging and VMI.

METHODS AND MATERIALS

Retrospectively, 77 unenhanced cranial sdDECT exams were included in this IRB-approved study. HI-R (iDose, Philips), HI-65keV, SAI-R and SAI-VMI (40-200 keV) were reconstructed from the same data. Four regions-of-interest (ROIs) were placed in gray and white matter (GM and WM): thalamic/cortical frontoparietal and juxtacortical/internal capsule. Attenuation and standard deviation (SD) were averaged to calculate signal- and contrast-to-noise ratio (S-/CNR). SD was considered indicative of noise. Task-based image quality assessment included forced-choice ranking of GM-WM differentiation by two neuroradiologists. Statistics was carried out using ANOVA.

RESULTS

Attenuation in HI- and SAI-VMI was higher at 40-50 keV VMI as compared to HI- and SAI-R ($p=0.05$). Noise was lower for SAI reconstructions as compared to corresponding HI reconstructions in GM and WM (-R and -65keV: 3.58±0.48 vs. 5.10±0.69 and 4.03±0.52 vs. 4.46±0.64, $p=0.05$ respectively). Even SAI-50 keV yielded lower noise as compared to HI-R (4.43±0.66 vs. 5.10±0.69, $p=0.05$). This resulted in improvements of SNR for SAI reconstructions (e.g. WM for -R and -50keV: 8.37±1.21 vs. 5.91±0.87 and 7.06±0.95 vs. 5.94±0.96, $p=0.05$ respectively). CNR was superior in SAI-R compared to HI-R (1.80±0.34 vs. 1.27±0.26, $p=0.05$) and in SAI-VMI reconstructions (e.g. SAI-50 keV vs. HI-50 keV: 2.26±0.52 vs. 2.06± 0.48, $p=0.05$). Accordingly, readers rated assessment of GM-WM differentiation superior for SAI-R compared to HI-R and for SAI-VMI at 50 to 65 keV compared to HI-65 keV ($p=0.05$).

CONCLUSION

SAI reconstruction significantly reduces image noise in conventional imaging and VMI. Accordingly, SNR and CNR are superior in SAI compared to HI reconstructions for both, conventional imaging and VMI. These results are supported by significant increase in gray-white differentiation in qualitative reading in SAI reconstructions.

CLINICAL RELEVANCE/APPLICATION

By enhancing gray-white matter differentiation at reduced levels of image noise, SAI reconstructions allow for usage of lower keV virtual monoenergetic imaging in routine reading of unenhanced cranial sdDECT.

M5-STCE1-2 REAL-WORLD IMPLEMENTATION OF AI IN MRI: FIVE YEARS OF PRODUCTIVITY GAINS ACROSS A MULTISITE IMAGING NETWORK

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Carlos Capunay, MD (*Abstract Co-Author*)
Juan Cruz Gallo, MD, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the operational and clinical impact of integrating AI-based reconstruction into MRI scanners across five imaging centers, focusing on scan time reduction, patient throughput, and year-over-year growth trends.

METHODS AND MATERIALS

From 2021 to 2025, AI algorithms were implemented in five MRI scanners (1.5T and 3T) across five branches. Custom protocols were developed to reduce acquisition time and enhance image quality. Optimization of acquisition protocols with AI was primarily focused on musculoskeletal (knee, shoulder, ankle) and neurological (brain, spine) regions, as these represent the majority of clinical indications in our imaging workflow. Moreover, these anatomical areas demonstrated the highest impact in scan time reduction, given their relatively long acquisition durations and the importance of patient comfort and image quality in these studies. A moderate level of noise reduction was deliberately selected to enhance image quality. Using more aggressive noise suppression would have maintained quality similar to pre-AI protocols, but the moderate setting allowed for both reduced scan time and improved image clarity. Annual MRI volume was tracked per site, comparing pre- and post-AI implementation trends. Growth patterns and ramp-up speed were analyzed based on the time each site had used AI.

RESULTS

Quantitative comparisons between conventional and AI-accelerated sequences showed time reductions of: Knee: from 8:27 to 4:39 minutes (? 46.9%) Spine: from 9:37 to 5:38 minutes (? 42.6%) Shoulder: from 12:30 to 4:42 minutes (? 64.0%) Ankle: from 17:32 to 6:26 minutes (? 63.9%) Brain: from 10:31 to 8:05 minutes (? 21.9%) The mean scan time reduction across all regions was 47.9%, supporting improved scheduling capacity while maintaining image quality. Volume growth post-AI implementation was observed across all sites. Increment of volumes per year, Post vs Pre IA. Location Pilar: year 2022, 16%; 2023, 43%; 2024, 67%; 2025, 80%.

Location Cabildo: year 2022, 16%; 2023, 43%; 2024, 67%; 2025, 80%. Location San Isidro: year 2024, 46%; 2025, 55%. Location Vicente Lopez: year 2024, 52%; 2025, 75%. Location Urquiza: year 2025, 43%. Earlier adopters showed steady year-over-year growth, while newer implementations achieved rapid volume increases within months.

CONCLUSION

AI implementation in MRI scanners led to significant scan time reduction and sustained increases in patient throughput. The ramp-up pattern varied depending on time since AI deployment, suggesting that early adoption enables sustained operational gains over time.

CLINICAL RELEVANCE/APPLICATION

AI implementation in MRI scanners led to significant scan time reduction and sustained increases in patient throughput

M5-STCE1-3 ARTIFICIAL INTELLIGENCE AS A STRATEGIC ALTERNATIVE TO MRI SCANNER REPLACEMENT: FINANCIAL AND OPERATIONAL IMPACT IN AGING SYSTEMS

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Carlos Capunay, MD (*Abstract Co-Author*)
Juan Cruz Gallo, MD, MD (*Abstract Co-Author*)

PURPOSE

To compare the financial and operational outcomes of implementing artificial intelligence (AI) image reconstruction in MRI scanners over 10 years old versus replacing them with new equipment. This analysis focuses on capital efficiency, payback period, and return on investment (ROI).

METHODS AND MATERIALS

Three MRI scanners nearing the end of their expected 10-year lifespan were included. Two investment strategies were compared: AI Upgrade USD 150,000 per unit to install a deep-learning reconstruction algorithm. Scanner Replacement USD 800,000 per new 1.5T MRI scanner. All systems handled an average of 800 studies/month, with a reimbursement of USD 115 per study. AI implementation required temporary downtime of 1-2 weeks; full scanner replacement required 2-3 months of operational interruption. In replacement scenarios, potential upgrades to the RF shielding were also considered (USD 30,000-70,000).Operating costs (technologists, receptionists, physicians) and variables such as paper printing were modeled. Financial projections included three scenarios (optimistic, expected, pessimistic) over a 10-year horizon, using a 20.36% discount rate. Discount rate was determined using the CAPM model, considering a 5-year U.S. treasury rate (risk-free), S&P 500 average return (market), Argentina’s country risk premium (14.89%) at the moment of the analysis and unlevered beta for the healthcare sector from Damodaran.

RESULTS

The comparison of several metrics in expected scenarios between AI model and New scanner model demonstrate that: • Initial Investment, USD 150,000 vs USD 800,000 • Net Present value (NPV), USD 1,030,634 vs USD 325,579 • Internal rate of return (IRR), 120% vs 28% • Payback Period, 14 months vs 48 months • Downtime, 1-2 weeks vs 2-3 months • Infrastructure, no upgrades needed vs RF shielding (up to USD 70,000) • Monthly Exams (Yr 1 ? Yr 4), 2.880 ? 6.720 vs 2.880 ? 6.720 Across all scenarios, AI outperformed scanner replacement in terms of return and speed of capital recovery. The AI model maintained or improved imaging capacity and quality while avoiding costly infrastructure work and extended operational loss.

CONCLUSION

Upgrading older MRI scanners with AI reconstruction offers a high-yield, low-risk alternative to equipment replacement. This approach dramatically improves financial metrics (NPV, IRR, payback), minimizes downtime, and extends system longevity by another 10 years. AI-based upgrades represent a strategic and scalable solution for high-volume radiology centers aiming to optimize performance and delay capital reinvestment.

CLINICAL RELEVANCE/APPLICATION

AI-based upgrades represent a strategic and scalable solution for radiology centers aiming to optimize performance and delay capital reinvestment.

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M5-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Monday, Dec. 1 1:15PM - 1:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

M5-STCE2-1 NON-CONTRAST DIFFUSION TENSOR IMAGING FOR GLYMPHATIC ASSESSMENT IN ALZHEIMER'S DISEASE AND MILD COGNITIVE IMPAIRMENT

Omar Moustafa Fathy, MD, PhD (*Presenter*)
Odette Ganem (*Abstract Co-Author*)
Hana Farzaneh (*Abstract Co-Author*)
Bashar S. Kako, MD (*Abstract Co-Author*)
Jeremy N. Ford, MD,MBA (*Abstract Co-Author*)

PURPOSE

To test whether a non-contrast diffusion tensor imaging (DTI) metric of glymphatic function—the Along-the-Perivascular-Space (ALPS) index—differs across the cognitive spectrum (healthy controls [HC], mild cognitive impairment [MCI], Alzheimer's disease [AD]) and relates to clinical severity, plasma tau, amyloid burden, and perfusion measures.

METHODS AND MATERIALS

DTI data were obtained from 44 subjects classified into HC (n=15), MCI (n=19), and AD (n=10) groups. ALPS-index was calculated using DSI studio by taking the average of left and right hemisphere metrics after EDDY correction. Differences among groups were assessed using ANOVA with post hoc analysis. Spearman correlation analyses evaluated relationships between ALPS-indices and CDR scores, plasma and imaging biomarkers (pTau217, Centiloid values and regional standardized uptake value ratio (SUVR) for beta-amyloid), and arterial spin labeling (ASL) imaging measures (Whole brain CBF, Arterial transit time (ATT), and blood-brain barrier water exchange (k W).

RESULTS

The ALPS index declined stepwise across the diagnostic spectrum—highest in healthy controls, intermediate in MCI, and lowest in Alzheimer's disease—with an overall significant group effect ($p = 0.03$). After correction, HC > AD remained significant ($p = 0.02$), whereas MCI did not differ significantly from either group. The ALPS-index correlated negatively with clinical severity measures including CDR ($r = -0.363$, $p = 0.0154$) and CDR-SoB ($r = -0.418$, $p = 0.0066$), as well as with Plasma pTau217, ATT, k W /CBF ratio, Centiloid values, and regional SUVRs in the cingulate and parietal cortices. In contrast, positive associations were observed with Whole Brain CBF ($r = 0.383$, $p = 0.0103$). No significant correlations were found with Vascular Risk Factors ($r = -0.10$) or Whole Brain k W ($r = -0.16$).

CONCLUSION

These findings indicate a progressive reduction in the ALPS-index from healthy aging through MCI to AD, with the ALPS-index tracking clinical severity, tau pathology, amyloid burden, and perfusion. The lack of association with k W suggests that the ALPS-index and k W may probe different aspects of the glymphatic circuit—the former assessing perivenous efflux, and the latter estimating aquaporin-4-mediated influx and blood-brain barrier injury. Moreover, the absence of correlation between ALPS-index and vascular risk factors suggests possible specificity for AD. While these findings support DTI-ALPS as a potential contrast-free imaging biomarker for early detection and longitudinal monitoring of AD, further longitudinal studies are needed with expanded sample size.

CLINICAL RELEVANCE/APPLICATION

ALPS index from DTI could serve as a non-invasive biomarker for AD by probing glymphatic function.

M5-STCE2-2 DEEP LEARNING DENOISING ENABLES DIAGNOSTIC-QUALITY IMAGING FROM PEDIATRIC LOW-DOSE CT

Thomas C. Arnold, PhD (*Presenter*)
Zhihao Zhang (*Abstract Co-Author*)
Lei Xiang (*Abstract Co-Author*)
Qian Wang (*Abstract Co-Author*)
Guo Chen, MD (*Abstract Co-Author*)
Li Wei Hu, BEng (*Abstract Co-Author*)
He Xiaofang (*Abstract Co-Author*)
Yumin Zhong, MD, PhD (*Abstract Co-Author*)

PURPOSE

Pediatric low-dose CT is standard practice due to radiation sensitivity, but often results in noisy, low-quality images that may hinder diagnosis. We propose a deep learning-based denoising method to improve image quality and assess its clinical feasibility.

METHODS AND MATERIALS

We curated a large-scale low-dose CT dataset spanning multiple vendors, scanner models, and anatomical regions. A denoising model was trained using the Nonlinear Activation Free Network (NAFNet), known for strong performance in natural image restoration.To evaluate clinical feasibility, 39 pediatric patients under 5 years of age were prospectively enrolled. CT scans included coronary CT angiography (CCTA) and thin-slice lung CT (1.25 mm).Objective image quality was assessed using signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and noise power spectrum (NPS) to quantify frequency-domain noise and texture fidelity. Subjective evaluation was performed by two radiologists who independently rated noise, contrast, artifacts, sharpness, and diagnostic confidence on a 5-point Likert scale (1 = poor, 5 = excellent) in a randomized, blinded setting. To enhance sensitivity and mitigate ceiling effects, A/B testing was conducted with randomly ordered image pairs, with readers indicating preference.Statistical significance in Likert scores was evaluated using the Wilcoxon signed-rank test. A/B test results excluding ties were analyzed using a binomial test. Inter-reader agreement was assessed using Cohen's ?. Significance was defined as $p < 0.05$.

RESULTS

Denoising led to significant improvements in SNR and CNR across both sequences. For thin-slice lung series, SNR increased from 20.67 to 45.33 and CNR from 3.29 to 8.00. For CCTA series, SNR improved from 6.22 to 8.29 and CNR from 5.43 to 7.99. NPS analysis showed marked reduction of high-frequency noise while preserving low-frequency details.On the 5-point Likert scale, denoised images consistently exhibited lower subjective noise and better tissue-to-lesion contrast. Artifact presence showed no significant difference. In A/B testing, denoised images were favored, with at most two cases per dimension rated below raw data in CCTA or thin-slice lung series. Inter-reader agreement was excellent, with ? > 0.75 across all dimensions.

CONCLUSION

We evaluated a deep learning-based denoising model trained on a large-scale low-dose CT dataset for pediatric imaging. Objective and subjective assessments showed significant improvements in image quality and diagnostic confidence, supporting clinical applicability.

CLINICAL RELEVANCE/APPLICATION

The proposed method improves image quality and diagnostic confidence in pediatric low-dose CT, providing a safe, practical solution for routine use.

M5-STCE2-3 FEASIBILITY AND CLINICAL VALUE OF HALF-DOSE CONTRAST-ENHANCED MRI FOR PITUITARY AT 5.0 TESLA: A PRELIMINARY STUDY

Zhengmei Hao (*Presenter*)
Zhiwei Qin (*Abstract Co-Author*)
Shaofeng Duan (*Abstract Co-Author*)
Chunhong Hu, PhD (*Abstract Co-Author*)

PURPOSE

This study evaluated the feasibility of using half-dose gadolinium-based contrast agents for pituitary-enhanced MRI at 5.0T and compared with full-dose imaging to provide a basis for optimizing Gd agent dosage in clinical applications of ultra-high field MRI.

METHODS AND MATERIALS

Ten subjects (7 females, 3 males, ages ranging from 8 to 69 years; with 4 microadenomas, 2 Rathke's cysts, 1 pituitary tumor) underwent 5.0T magnetic resonance scans. After the injection of half-dose and full-dose contrast agents, a same high-resolution 3D T1-weighted modulated flip angle technique in refocused imaging with extended echo train (T1 Matrix3D) sequence was performed. The post-contrast images were compared through SNR, contrast-to-noise ratio (CNR) and subjective evaluation (artifact, homogeneity, edge sharpness, diagnostic efficacy) based on a 5-point Likert scale (1=poor; 5=excellent). The paired t-test was applied to assess the quantitative indices and the Wilcoxon signed-rank test was carried out to compare the qualitative scores. A p value less than 0.05 indicates a statistically significant difference.

RESULTS

For quantitative comparisons, no significant difference in pituitary SNR between half-dose and full-dose images (246.97±42.25 vs. 261.68±46.16, p=0.18), but the CNR between the pituitary gland and temporal lobe in the full dose was better than that in the half dose (122.76±32.98 vs. 95.27±27.28, p<0.05). For qualitative assessments, half-dose images achieved non-inferiority scores in terms of image homogeneity (half-dose 4.20±0.87 vs. full-dose 4.70±0.46, p=0.27), and were comparable to full-dose images in terms of artifacts (half-dose 4.50±0.67 vs. full-dose 4.40±0.66, p=0.73) and sharpness of the boundary between the pituitary gland and the cavernous sinus (half-dose 3.70±0.46 vs. full-dose 3.60±0.49, p=0.71). Ultimately, the two dose groups were consistent in terms of diagnostic performance (half-dose 4.90±0.30 vs. full-dose 4.90±0.30, p=1.00), meaning that half-dose images met clinical diagnostic requirements.

CONCLUSION

Quantitative and qualitative comparison results reveal that 5.0T MRI enables 50% Gd-based contrast agents reduction for pituitary imaging without compromising clinical diagnostic quality. This solution significantly decreases Gd exposure, aligning with goals of reducing environmental contamination and potential long-term tissue retention risks, while maintaining high diagnostic performance at ultra-high field strengths.

CLINICAL RELEVANCE/APPLICATION

This study provides the first and preliminary clinical evidence for pituitary-enhanced imaging using low-dose contrast agents at 5.0T MRI, advancing the development of strategies to minimize exogenous contrast agents in the next-generation imaging.

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M6-SSCA04

Cardiac Imaging (Imaging Innovations in Congenital Heart Disease)

Monday, Dec. 1 1:30PM - 2:30PM Room: E352

Prachi P. Agarwal, MD (*Moderator*)
Michael Markl, PhD (*Moderator*)

Sub-Events

M6-SSCA04-1 DUAL INVERSION RECOVERY TISSUE-SPECIFIC IMAGE CONTRAST OPTIMIZATION (DIRECTION)MRLYMPHANGIOGRAPHYIN FONTAN CIRCULATION

YAMADA HIROKI (*Presenter*)
Michinobu Nagao, MD, PhD (*Abstract Co-Author*)
Atsushi Yamamoto, MD, PhD (*Abstract Co-Author*)
Akihiro Inoue, MD (*Abstract Co-Author*)
Reiko Sakai (*Abstract Co-Author*)
Kei Inai (*Abstract Co-Author*)
Masami Yoneyama (*Abstract Co-Author*)
Shuji Sakai, MD, PhD (*Abstract Co-Author*)

PURPOSE

Fontan circulation often causes persistent lymphatic congestion, leading to seriouscomplications such as refractory ascites and protein-losing enteropathy. However,existing imaging techniques inadequately visualize lymphatic abnormalities. Wedeveloped a novel 3D turbo spin-echo (3D-TSE) MR lymphangiography with dualinversion recovery (DIRECTION) for safe, noncontrast, high-resolution lymphaticimaging.

METHODS AND MATERIALS

Twenty-five post-Fontan patients (mean age 25 years) underwent Gd-EOB-DTPA-enhanced MRI on a 3.0T scanner (Ingenia Elition X, Philips Healthcare). DIRECTION was performed pre-contrast, with conventional heavily T2-weighted imaging 10 min post-contrast. DIRECTION uses two sequential nonselective inversion pulses (TI1=1000 ms, TI2=250 ms) to exploit T1 differences, selectively suppressing fat, blood, and nerve signals while enhancing lymphatic fluid, and includes a broadband inversion pulse for robustness against B0/B1 inhomogeneities. Imaging parameters: FOV 380×380 mm^2, voxel size 1.3×1.6×2.0 mm^3, TR/TE 4000/324 ms, TSE factor 80, scan time 2 min 24 sec. Lymphatic vessel visualization was assessed in three anatomical regions (peri-lumbar vertebrae, peri-bile duct to peri-duodenum, thoracic ducts) on a 4-point scale (0: none, 1: poor, 2: good, 3: excellent).

RESULTS

DIRECTION provided significantly higher lymphatic visualization scores than heavily T2-weighted imaging in all three regions (Wilcoxon matched-pairs test, $p<0.0001$). DIRECTION vs heavily T2 •Peri-lumbar vertebrae: 2.64 vs, 0.92 •Peri-bile duct to peri-duodenum: 2.44 vs 0.76 •Thoracic ducts: 2.52 vs 0.60 Detection rates (visualization score =1) were: •Peri-lumbar vertebrae: 100% (25/25) vs 76% (19/25) •Peri-bile duct to peri-duodenum: 100% (25/25) vs 44% (11/25) •Thoracic ducts: 92% (23/25) vs 64% (16/25) DIRECTION images showed minimal background noise without window adjustment, allowing delineation of congested lymphatic pathways not visible on contrast-enhanced CT. Short scan time (<3 min) supports clinical feasibility. Figure 1 shows representative images.

CONCLUSION

DIRECTION MR lymphangiography significantly outperforms conventional heavily T2-weighted imaging in detecting and visualizing congested lymphatic vessels in Fontan circulation, offering a reliable, noninvasive, noncontrast technique.

CLINICAL RELEVANCE/APPLICATION

DIRECTION MR lymphangiography addresses a critical unmet clinical need by enabling safe, noncontrast, high-resolution visualization of lymphatic abnormalities in Fontan patients, improving diagnostic accuracy and facilitating interventional treatment planning.

M6-SSCA04-2 RIGHT VENTRICULAR REVERSE REMODELING AND PULMONARY ARTERY HEMODYNAMICS POST-TPVI: PREDICTIVE ROLE OF 4D FLOW-DERIVED REGURGITANT FRACTION AND WALL SHEAR STRESS

Hirozumi Mori, MD (*Presenter*)
Michinobu Nagao, MD, PhD (*Abstract Co-Author*)
Atsushi Yamamoto, MD, PhD (*Abstract Co-Author*)
Akihiro Inoue, MD (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

PURPOSE

Transcatheter pulmonary valve implantation (TPVI) is a treatment for worsening pulmonary regurgitation in patients with tetralogy of Fallot (TOF). This study evaluated the utility of 4D Flow MRI in assessing right ventriular remodeling and pulmonary artery hemodynamics before and after TPVI by Hamony TPV25, FDA-approved in 2021, including a comparison with conventional 2D phase contast.

METHODS AND MATERIALS

In this prospective, single-center study, 30 patients (45.1±14.8 years, 19 women) who underwent TPVI were assessed pre- and 3 months post-TPVI using cardiac MRI (CMR) including 4D flow. Of these, 15 patients underwent additional evaluation with CMR at 1 year.

RESULTS

1) Postoperative RVEDVi showed a favorable reduction at 3 months in the subgroup with preoperative RVEDVi =200 mL (from 150.6 ± 29.8ml to 98.9 ± 20.1ml). Among predictive factors, the preoperative regurgitant fraction (RF) calculated from 5 cross-sections using 4D flow (RF-4D; 41.5 ± 11.8%) demonstrated superior predictive accuracy compared to the RF obtained from a single 2D phase contrast MRI slice (RF-2D; 45.5 ± 9.9%) (AUC = 0.85 vs 0.72). At 1 year postoperatively, 13

out of 14 patients with a preoperative RVEDVi <200 mL achieved normalization (RVEDVi <108 mL). RF-4D continued to show a higher predictive value than RF-2D (AUC = 0.82 vs 0.73). 2) The pre-TPVI main pulmonary artery (MPA) cross-sectional area, as a morphological indicator of pulmonary artery dilation, correlated more strongly with the preoperative RF-4D (r = 0.514, p = 0.003) than with RF-2D (r = 0.329, p = 0.076). 3) Wall shear stress (WSS) pre-TPVI exhibited a biphasic pattern: it increased during early diastole due to pulmonary regurgitation and significantly decreased following TPVI. WSS is considered a key factor in the pathophysiological mechanism of pulmonary artery dilatation and is thought to contribute to a vicious cycle of further dilatation and regurgitation. WSS demonstrated a significant inverse correlation with MPA cross-sectional area, reflecting vascular reactivity to WSS.

CONCLUSION

The regurgitant fraction measured by 4D flow demonstrated a stronger correlation with both right ventricular remodeling improvement and the extent of pulmonary artery dilation compared to 2D phase contrast measurements, suggesting that 4D flow provides more reliable and valid assessments. Furthermore, 4D flow enables the evaluation of WSS, a key factor in vascular remodeling, and may serve as a potential predictor of long-term progression of pulmonary regurgitation.

CLINICAL RELEVANCE/APPLICATION

4D flow MRI provides clinically meaningful measurements of the regurgitant fraction and serves as an important marker of pathophysiology in adult patients following repair of Tetralogy of Fallot.

M6-SSCA04-3 RELATIONSHIP BETWEEN RIGHT VENTRICULAR OUTFLOW WAVEFORMS AND NEOPULMONARY STENOSIS SEVERITY: A MULTI-INSTITUTIONAL RETROSPECTIVE COHORT STUDY OF PATIENTS WITH TRANSPOSITION OF THE GREAT ARTERIES

Brendan Crabb, MD (*Presenter*)
Sophie Y. Wong, MD (*Abstract Co-Author*)
Parker Rushworth (*Abstract Co-Author*)
Shant T. Malkasian, MD,BS (*Abstract Co-Author*)
Roshun Sankaran, MD, MPH (*Abstract Co-Author*)
Nathan Young (*Abstract Co-Author*)
Sanjeet Hegde (*Abstract Co-Author*)
Laith Alshawabkeh, MD,MSc (*Abstract Co-Author*)
Daniela Valdez-Jasso (*Abstract Co-Author*)
Albert Hsiao, MD, PhD (*Abstract Co-Author*)

PURPOSE

Four-dimensional (4D) Flow has been increasingly adopted as an essential component of cardiac MRI, especially for congenital heart patients undergoing surveillance after surgical repair. We hypothesized that characteristics of the right ventricular (RV) outflow waveform might be useful as an alternative benchmark of downstream pulmonary vascular resistance. We observed that patients who undergo arterial switch repair for dextro-Transposition of the Great Arteries (d-TGA) often have varying degrees of neopulmonary stenosis, making this a potential population to study this relationship.

METHODS AND MATERIALS

This multi-institutional, retrospective cohort study included pediatric and adult patients with d-TGA and arterial switch repairs (n=44, mean age 19.9, range 6-34 years) and a reference population of patients with morphologically normal hearts (n=15, mean age 44.2, range 18-72 years) who had cardiac MRI including 4D Flow as part of clinical care between 2015 and 2024. Synchronous pulmonic and aortic blood flow waveforms from 4D Flow were collected and quantified using several metrics, including the right ventricular (RV) ejection time (RV-ET), RV time to peak flow (RV-TTP), and time to peak flow difference between the RV and left ventricle (RVLV-dTTP). Differences between d-TGA and controls were assessed using two-sample t-tests and Mann-Whitney U tests. Lastly, the relationship between each metric and the neopulmonary stenosis pressure gradient, which was estimated with the modified Bernoulli equation on 4D flow, was assessed using Spearman's rank correlation (r).

RESULTS

Patients with d-TGA showed significantly altered and delayed RV systolic waveforms compared to normal controls. RV systolic waveforms in d-TGA were prolonged (RV-ET 422 ± 45 vs. 385 ± 46 ms, p=0.011) and delayed (RV-TTP 209 ± 30 vs. 169 ± 29 ms, p<0.001; RVLV-dTTP 43 ± 33 vs. 17 ± 26 ms, p<0.01) relative to normal controls, despite having no significant difference in RV ejection fraction (56.4 ± 5.9 vs. 55.4 ± 6.0%, p=0.58). Patients with d-TGA had neopulmonary stenosis of varying severity, ranging from 3 to 45 mmHg, which correlated strongly with RVLV-dTTP (r=0.72, p<0.001).

CONCLUSION

Delayed time to peak (RVLV-dTTP) of the RV waveform correlates strongly with the severity of neopulmonary stenosis, which may be useful as an alternative marker of stenosis severity in patients in whom the pressure gradient cannot be directly measured.

CLINICAL RELEVANCE/APPLICATION

4D Flow waveforms may provide additional hemodynamic data to guide management of patients in whom downstream pulmonary vascular resistance cannot be measured non-invasively. Additional investigation of this metric in pulmonary hypertension and other diseases of the pulmonary vasculature may be warranted.

M6-SSCA04-4 COMPARATIVE EFFECTIVENESS OF GADOPICLENOL FOR CONGENITAL HEART MRA AND 4D FLOW

Roshun Sankaran, MD, MPH (*Presenter*)
Marlene Goetz (*Abstract Co-Author*)
Albert Hsiao, MD, PhD (*Abstract Co-Author*)

PURPOSE

Gadopiclenol is an FDA-approved, intravenous, extracellular macrocyclic gadolinium-based contrast agent. Its high T1 relaxivity may reduce total gadolinium administered, which is particularly desirable in patients with adult congenital heart disease (ACHD), who require routine, lifelong MRI surveillance. However, the performance of gadopiclenol for cardiovascular imaging, particularly for ACHD evaluation, is unknown. We therefore sought to assess noninferiority of gadopiclenol compared to gadobenate dimeglumine for image quality of MR angiography and 4D Flow in this patient population.

METHODS AND MATERIALS

We designed a prospective, single center, parallel group, double-blinded, randomized clinical trial (NCT 6517) in which adult patients undergoing routine cardiac MRI and chest MRA, including 4D Flow MRI, for monitoring of ACHD were eligible. Pregnant patients, lactating patients, and patients with renal insufficiency (eGFR < 60 mL/min/1.73m2) were excluded. Consecutive patients were prospectively enrolled and randomized to one of four study arms: 0.15 mmol/kg gadobenate dimeglumine (active control), 0.075 mmol/kg gadopiclenol, 0.10 mmol/kg gadopiclenol, 0.15 mmol/kg gadopiclenol. Signal to noise ratio (SNR) during first-pass contrast-enhanced MRA was assessed in the aorta (AO), main pulmonary artery (MPA), and ventricular septal myocardium (VSM). Flow measurement error on 4D Flow MRI was assessed in the AO and MPA. Kruskal-Wallis tests were used to compare median SNR and flow measurement error between study arms in a per-protocol analysis, with p-values adjusted for multiple comparisons.

RESULTS

Our study cohort included 40 patients (13 female, 32.5%) with a mean age of 40.28 years (range 21-75 years). Twelve received 0.15 mmol/kg gadobenate dimeglumine, 10 received 0.075 mmol/kg gadopiclenol, 11 received 0.10 mmol/kg gadopiclenol, and 7 received 0.15 mmol/kg gadopiclenol. Kruskal-Wallis tests revealed no significant differences between groups in median SNR in the AO (H = 4.61, p = 0.20), MPA (H = 2.43, p = 0.49), or VSM (H = 1.92, p = 0.59). Similarly, no significant differences between groups were found in 4D Flow measurement error in the AO (H = 2.78, p = 0.43) or MPA (H = 3.85, p = 0.28).

CONCLUSION

In this interim analysis of a randomized clinical trial comparing image quality of gadopiclenol with gadobenate dimeglumine in ACHD patients, we found no significant differences in SNR or flow measurement error between gadopiclenol at three different doses and gadobenate dimeglumine.

CLINICAL RELEVANCE/APPLICATION

Gadopiclenol can provide quantitatively noninferior images to gadobenate dimeglumine at a lower gadolinium dose among ACHD patients undergoing cardiac MRI/MRA, thereby minimizing overall gadolinium exposure.

M6-SSCA04-5 LEFT VENTRICULAR TORSION DERIVED FROM 3D ANALYSIS OF CARDIAC CINE MAGNETIC RESONANCE: INTERVENTRICULAR INTERACTION OF TRANSCATHETER PULMONARY VALVE IMPLANTATION FOR REPAIRED TETRALOGY OF FALLOT

Akihiro Inoue, MD (*Presenter*)
Michinobu Nagao, MD, PhD (*Abstract Co-Author*)
Atsushi Yamamoto, MD, PhD (*Abstract Co-Author*)
Kei Inai (*Abstract Co-Author*)
Masaki Watanabe, MD (*Abstract Co-Author*)
Seiko Shimizu (*Abstract Co-Author*)
Shuji Sakai, MD, PhD (*Abstract Co-Author*)

PURPOSE

In the long term after tetralogy of Fallot (TOF) repair, right ventricular (RV) volume expansion due to pulmonary regurgitation is common and right heart failure due to its worsening is prognostic. Recently, developed transcatheter pulmonary valve implantation (TPVI) is minimally invasive and requires only a short hospital stay. TPVI is effective for pulmonary regurgitation, resulting in a decrease in RV volume. However, the effect on the left ventricle (LV) is not clear, no good kinetic parameter has been found to identify LV function after TPVI. We hypothesized that the improvement in LV pump function underlies the relief of clinical symptoms after TPVI, and LV torsion could be used instead of LV ejection fraction (LVEF). In this study, LV torsion was calculated by 3-dimensional analysis of cardiac cine MRI, and was analyzed longitudinally before and after TPVI.

METHODS AND MATERIALS

We analyzed 30 patients with repaired TOF (mean age, 42.0 years)who underwent cardiac cine MRI with a 3-tesla scanner before TPVI, 3 months and 1 year after TPVI. We calculated the time-torsion curve all around in each segments using LV short-axis cine images of the basal to apex of the left ventricle and the motion tracking method. The LV torsion (degrees/cm) in each segment during ventricular contraction was extracted. The analysis was performed using the peak value of the global torsion. At the same time, both ventricular functions and pulmonary regurgitation fraction (PRF, %) were calculated. Serial measurements were compared by Wilcoxon matched-pairs signed rank test.

RESULTS

The torsion was significantly increased in the following order: before TPVI, 3 months, 1 year after TPVI (0.82±0.42 degree/cm vs 0.98±0.48 degree/cm vs 1.18±0.55 degree/cm ; pre vs 3 months, p=0.0098; pre vs. 12 months, p=0.0004; 3 months vs 12 months p=0.0026). On the other hand, there was no significant difference in LVEF between before TPVI and 3 months, 1 year after TPVI (52.1 ± 11.0% vs 53.7 ± 9.3% vs 55.3 ± 9.9%). And RVEDVI and PRF before TPVI were significantly decreased than those after one year (RVEDVI: 159.0 ± 31.5mL vs. 95.4 ± 17.2mL; PRF: 46.4 ± 10.4 % vs 3.3 ± 1.6%, p<0.0001).

CONCLUSION

Despite no change in LVEF before and after TPVI, LV torsion improved over the course of the first postoperative year. LV torsion is a LV pump function index that is independent of LVEF and reveals interventricular interactions with TPVI.

CLINICAL RELEVANCE/APPLICATION

The LV torsion is a new parameter that improves LV rotational mechanics and may be useful for predicting postoperative prognosis and determining additional treatment.

M6-SSCA04-6 AORTIC MORPHOLOGY IN BICUSPID VS TRICUSPID AORTIC VALVE PATIENTS: A MATCHED CT-BASED ANALYSIS BEYOND ASCENDING DIAMETER

Andre Lupp Mota, MD, PhD (*Presenter*)
Patricia Gonzalez Pagan (*Abstract Co-Author*)
Benjamin Bonner (*Abstract Co-Author*)
Sadia Sultana, MRCP,FRCR (*Abstract Co-Author*)
Borek Foldyna, MD (*Abstract Co-Author*)
Brian B. Ghoshhajra, MD, MBA (*Abstract Co-Author*)
Sandeep S. Hedgire, MD (*Abstract Co-Author*)

PURPOSE

Bicuspid aortic valve (BAV) is the most common congenital cardiac valvular defect and is associated with an increased risk of aortic dilatation and dissection. Current surgical thresholds rely primarily on the ascending aortic diameter, with a recommended cutoff of 55 mm. However, some studies have proposed lower thresholds and suggested that additional CT-based thoracic aortic parameters may better characterize BAV-associated aortopathy. This study aims to evaluate the differences in aortic morphometric measurements between BAV and tricuspid aortic valve (TAV) patients and assess their relationship with ascending aortic dilation.

METHODS AND MATERIALS

In this retrospective matched-pair study, 41 BAV patients were matched 1:1 to TAV controls by age, sex, and ascending aortic diameter using contrast-enhanced, ECG-gated chest CTs. The mean age was 49.1 ± 15.7 years, and 85% were male. Quantitative imaging parameters included root, ascending, and descending aortic diameters; aortic annulus and ascending aorta angles; and aortic and greater curvature lengths. The ratio of ascending to descending aortic diameters (A:D ratio) was also calculated. Ascending aortic dilation was defined as a diameter =4.0 cm. Wilcoxon signed-rank tests assessed differences between matched pairs. Pearson correlation coefficients were used to assess associations between ascending dilation and other morphologic features.

RESULTS

BAV patients (Table 1) had significantly greater aortic length (mean difference = +9.4 mm, $p < 0.001$), ascending aortic diameter (mean difference = +2.6 mm, $p = 0.003$), and A:D ratio (mean difference = +0.26, $p < 0.001$) compared to matched TAV controls. The aortic annulus angle was significantly smaller in BAV (mean difference = -6.0°, $p = 0.005$) (Figure 1). No significant differences were found in ascending aorta angle or root diameter. Among BAV patients, ascending aortic dilation showed strong positive correlations with ascending diameter (? = 0.80), greater curvature length (? = 0.64), and A:D ratio (? = 0.53) .

CONCLUSION

Despite matching for ascending aortic diameter, BAV patients demonstrated distinct aortic morphologies—including increased aortic length, A:D ratio, and decreased annulus angle—supporting the role of these additional morphometric measures in the assessment of BAV aortopathy.

CLINICAL RELEVANCE/APPLICATION

Reliance solely on ascending aortic diameter may underestimate disease severity in BAV patients. Incorporating CT-based morphometric parameters into routine evaluation may improve risk stratification and guide more personalized surgical decision-making.

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Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

M6-SSIR01

Science Session with Keynote: Interventional Radiology (Innovations in Lung Ablation and Thoracic Interventions)

Monday, Dec. 1 1:30PM - 2:30PM Room: E351

Robert A. Morgan, MBChB, FRCR (*Moderator*)
David C. Madoff, MD (*Moderator*)

Sub-Events

M6-SSIR01-1 EFFECT OF PERCUTANEOUS CELIAC PLEXUS NEUROLYSIS ON GLUCOSE CONTROL IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

Tushar Garg, MD (*Presenter*)
Kausthubh Hegde, MBBS (*Abstract Co-Author*)
Apurva Shrigiriwar (*Abstract Co-Author*)
Eric Wehrenberg-Klee, MD (*Abstract Co-Author*)
Ronald S. Arellano, MD (*Abstract Co-Author*)
Ashraf Thabet, MD (*Abstract Co-Author*)
Raul N. Uppot, MD (*Abstract Co-Author*)
Thomas J. An, MD (*Abstract Co-Author*)
Shams I. Iqbal, MD (*Abstract Co-Author*)

PURPOSE

In patients with type 2 diabetes mellitus (T2DM), the chronic elevation in the activity of the sympathetic system has been identified as an important factor contributing to the lack of glycemic control. Preclinical studies have shown that the removal of celiac ganglion, which contains sympathetic nerves that supply the liver and pancreas, can lead to improvement in glucose tolerance/control. The purpose of this study was to retrospectively review glucose control in patients with T2DM who underwent CT-guided celiac plexus neurolysis.

METHODS AND MATERIALS

In patients with type 2 diabetes mellitus (T2DM), the chronic elevation in the activity of the sympathetic system has been identified as an important factor contributing to the lack of glycemic control. Preclinical studies have shown that the removal of celiac ganglion, which contains sympathetic nerves that supply the liver and pancreas, can lead to improvement in glucose tolerance/control. The purpose of this study was to retrospectively review glucose control in patients with T2DM who underwent CT-guided celiac plexus neurolysis.

RESULTS

A total of 17 patients were included in the study (Age 62 ± 14.3 years; 29.4% Female) with mean BMI of 23.5 ± 5. 88.2% (15/17) had active cancer history with the most common being pancreatic cancer in 70.6% (12/17) patients. 47.1% (8/17) patients had metastasis at the time of procedure. The average duration of T2DM in these patients was 3.3 ± 2.7 years with mean HbA1c of 7.2 ± 1.8 and random blood sugar of 162.4 ± 73.5 mg/dL. 58.8% (10/17) patients were on insulin for T2DM management. All of the neurolysis procedures were performed with ethanol injection. All procedures were technically successful without any adverse events during the procedure or post-procedurally. Average HbA1c levels (6.9 ± 2.1, p=0.06) and random blood sugar (123.6 ± 27.6 mg/dL; p=0.03) were lower compared to the baseline at 3 months post-procedurally.

CONCLUSION

CT-guided celiac plexus neurolysis is a technically feasible and safe procedure which may be useful in patients with T2DM for providing glucose control.

CLINICAL RELEVANCE/APPLICATION

The management of T2DM currently mainly consists of hypoglycemic drugs and insulin; however, even in patients who are compliant with these medications, glycemic control can be inadequate. This study demonstrates that adjunctive use of celiac plexus neurolysis may be useful in these patients by improving glucose control.

M6-SSIR01-2 NON-INVASIVE, REAL-TIME TEMPERATURE MONITORING OF THERMAL ABLATION WITH SPECTRAL CT THERMOMETRY: IN VIVO EVALUATION

Leening P. Liu, PhD (*Presenter*)
Amy Perkins (*Abstract Co-Author*)
Thomas Schaer (*Abstract Co-Author*)
Ali H. Dhanaliwala, MD, PhD (*Abstract Co-Author*)
Daniel Depietro, MD (*Abstract Co-Author*)
Michael C. Soulen, MD (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)

PURPOSE

Non-invasive, real-time temperature monitoring for thermal ablation provides intraprocedural feedback on the treated ablation zone to ensure complete ablation of both the tumor and ablative margin critical to reducing local tumor recurrences. Spectral CT thermometry enables visualization of temperature distributions during ablation by relating physical density to temperature and has demonstrated potential in previous phantom studies. Thus, we assessed the feasibility of spectral CT thermometry for intra-ablation temperature monitoring in vivo .

METHODS AND MATERIALS

To establish the feasibility of spectral CT thermometry in vivo , microwave ablation was performed on the liver of a Yorkshire pig at 65 W for 5 minutes. During the ablation, ground truth temperatures adjacent to the ablation probe (PR15, Neuwave Medical) were measured with three optical fiber thermometers (Fiber Optic Thermometer, Omega Engineering). Additionally, scans were performed with a dual-layer spectral CT (Spectral CT 7500, Philips Healthcare) every 30 seconds at a tube voltage of 120 kVp. Spectral results at each time point were utilized to calculate physical density maps with a previously developed spectral physical density

quantification model. Physical density was measured at each thermometer, avoiding metal artifacts and gas formation. A linear regression was then applied to the ratio of the initial physical density to the measured physical density and ground truth temperature to determine the feasibility of spectral CT thermometry in vivo .

RESULTS

Intra-ablation temperatures reached a maximum of 81.3, 45.4, and 40.1 °C for the three thermometers. For the thermometer farthest from the ablation probe tip, the 3.2 °C increase in temperature resulted in a minimal change in the physical density ratio from 0.999 to 0.997. With a larger rise in temperature of 44.8 °C from the closest thermometer, the physical density ratio increased from 1.008 to 1.025, which matched values observed in previous phantom studies. The physical density ratio and temperature demonstrated a strong linear relationship with a correlation coefficient of 0.88, illustrating the feasibility of spectral CT thermometry.

CONCLUSION

In vivo ablation of a porcine liver demonstrated the feasibility of spectral CT thermometry for non-invasive, real-time temperature monitoring of thermal ablations. Validation of spectral CT thermometry encourages its clinical translation, where it may facilitate a reduction in local tumor recurrence rates.

CLINICAL RELEVANCE/APPLICATION

Intraprocedural surveillance of temperature changes during ablation enables more precise and careful treatment of liver tumors to prevent thermal injury to adjacent structures and reduce local recurrence rates.

M6-SSIR01-3 A SYSTEMATIC REVIEW AND META-ANALYSIS ON PULMONARY FUNCTION PARAMETERS AFTER THERMAL ABLATION VS STEREOTACTIC BODY RADIATION THERAPY OF LUNG TUMORS

Andreas K. Papadopoulos, MD, MSc (*Presenter*)

PURPOSE

Literature suggests that stereotactic body radiation therapy (SBRT) has a greater impact on pulmonary function when compared to percutaneous thermal ablation (TA), among patients treated for lung tumors. We sought to systematically review and quantify through a meta-analysis changes in pulmonary function tests following either TA or SBRT in patients treated for primary lung cancer or oligo-metastatic lung disease.

METHODS AND MATERIALS

Following the PRISMA guidelines, PubMed, Embase, and the Cochrane Library were systematically searched for records examining pulmonary function before and after either TA or SBRT. Eligible were considered reports quantifying changes in FVC, FEV 1 , or DLCO. Pooled incidence ratios were computed using a random-effects meta-analysis model, utilizing the DerSimonian and Laird variance estimator.

RESULTS

Our search yielded 2,729 records, of which 12 studies published between 2008 and 2022 were ultimately included, comprising a total of 759 patients (TA, 179; SBRT, 580). SBRT was associated with an estimated mean FVC reduction of 4.0% (95% CI, -0.6 to 8.6, p=0.16) compared to 0.1% (95% CI, -2.3 to 2.2, p=0.74) for TA; however, no statistically significant difference between the two techniques was found (p=0.12). SBRT was further associated with an estimated mean FEV 1 decrease of 9.0% (95% CI, 5.8 to 12.1, p<0.001) compared to only 0.3% (95% CI, -2.5 to 3.2, p=0.80) for TA. Similarly, SBRT was associated with an estimated mean DLCO decrease of 16.9% (95% CI, 12.5 to 21.3, p<0.01) compared to 1.3% (95% CI, -9.9 to 12.5, p=0.99) for TA. When compared to TA, the decrease of FEV 1 and DLCO was statistically significantly greater after SBRT (p<0.001 and p=0.01, respectively).

CONCLUSION

Our results indicate that SBRT may lead to a significantly greater reduction of both FEV 1 and DLCO compared the effect of TA, which was found to be minimal.

CLINICAL RELEVANCE/APPLICATION

When both TA and SBRT are valid treatment options, the use of TA is linked to better preservation of post-treatment lung function.

M6-SSIR01-4 THERMAL ABLATION OF LUNG TUMORS IN PATIENTS WITH PULMONARY HYPERTENSION: SAFETY ANALYSIS ACROSS TWO INSTITUTIONS

Julian Westphal (*Presenter*)
Alexander Alessi, MD (*Abstract Co-Author*)
Behrooz Masuodi, MD (*Abstract Co-Author*)
Alexander Graur (*Abstract Co-Author*)
David Moscho (*Abstract Co-Author*)
Paul B. Shyn, MD (*Abstract Co-Author*)
Stuart G. Silverman, MD (*Abstract Co-Author*)
Josanna Rodriguez-Lopez, MD (*Abstract Co-Author*)
Michael Lanuti, MD, BEng (*Abstract Co-Author*)
Florian J. Fintelmann, MD (*Abstract Co-Author*)

PURPOSE

Pulmonary hypertension (PH) has been listed as a minor criterion for surgical ineligibility by the American College of Surgeons Oncology Group in the treatment of primary lung cancer and lung metastases. Hence, local therapy options in this setting focus on image-guided thermal ablation (IGTA) and radiation therapy. However, outcomes following IGTA in patients with PH have not been previously reported. This study aims to compare the safety profile of IGTA of lung tumors in patients with and without PH.

METHODS AND MATERIALS

This retrospective bi-institutional cohort study included consecutive adults who underwent microwave or cryoablation of lung tumors from 2/2015 to 10/2024. Patients were classified as having PH based on the best available evidence. PH status was determined using a tiered approach: right heart catheterization as gold standard (mean pulmonary arterial pressure =20 mmHg), followed by echocardiography (peak tricuspid regurgitant jet velocity >2.8 m/s), and then CT-based metrics (pulmonary artery to aortic diameter ratio >1.1, >1.0, or >0.9 in populations with low, intermediate, and high risk of PH, respectively; or, in cases of aortic dilation [>40 mm], pulmonary artery diameter >34 mm, >32 mm, or >30 mm). Major adverse events (AE) within 30 days (defined as CTCAE grade 3 or higher), hospital length of stay =2 days (HLOS), hemorrhagic events within 30 days (defined as hemoptysis, bronchopulmonary hemorrhage, or hemothorax), 90-day mortality, and overall survival (OS) were compared between groups.

RESULTS

Overall, 310 patients (58% females; median age 65 years) underwent 512 ablation sessions to treat 741 lung tumors (83% metastases), including 50 patients with PH and 260 patients without. Patients with PH had higher Eastern Cooperative Oncology Group and Charlson Comorbidity scores (medians: 1 vs. 0, and 9 vs. 8; both p=.003). No patient had more than one major AE per session, and 44 major AEs occurred across 512 sessions (9%), including 11 hemorrhagic events (2%). Median HLOS was 1 day. After adjusting for applicator number, ablation modality, and tumor location by zone, there was no significant difference between patients with and without PH regarding major AE rate (14% vs. 8%, p=.07), HLOS (p=.72), hemorrhagic events (p =.10), 90-day mortality (p=.08). OS was also not significantly different (p=.70).

CONCLUSION

There was no significant difference in terms of major AEs, hemorrhagic events, HLOS, 90-day mortality, and OS following IGTA between patients with and without PH. IGTA of lung tumors is a safe option in patients with PH.

CLINICAL RELEVANCE/APPLICATION

Although PH is a relative contraindication to lung tumor resection due to increased risk of morbidity and mortality, it had no significant effect on the safety of IGTA of lung tumors.

M6-SSIR01-5 COMMON CULPRIT OF IATROGENIC CHYLOTHORAX- THE SUBCARINAL TRANSVERSE THORACIC DUCT COLLATERAL

Hsien-Tzu Liu, MD (*Presenter*)

PURPOSE

This study describes an anatomical variation of the thoracic duct-the subcarinal transverse collateral. Injury to this collateral branch during mediastinal lymph node dissection is a predominant cause of iatrogenic chylothorax.

METHODS AND MATERIALS

A total of 21 patients with lymphatic leakage who underwent lymphangiography with thoracic duct catheterization were included. The thoracic duct was catheterized and the anatomical variation of the thoracic duct, its collaterals, and the exact point of contrast extravasation were evaluated.

RESULTS

The patterns of thoracic duct were identified: a single duct, transverse collaterals crossing the mediastinum at the subcarinal level, transverse collaterals at the thymic level, and plexiform appearance. Further analysis of 11 patients with iatrogenic chylothorax based on the types of surgery they underwent, revealed that 8 (72.7%) had a subcarinal transverse collateral duct. All of them underwent mediastinal lymph node dissection and the subcarinal transverse collateral lymph duct were culprits of chylothorax.

CONCLUSION

This study on patients with various types of lymphatic leakages revealed that the common cause of iatrogenic chylothorax was injury to a subcarinal transverse collateral branch, rather than injury to the thoracic duct itself. Surgeons are generally more aware of the anatomical location of the thoracic duct, while the subcarinal transverse collateral branch is often overlooked. While the prevalence of this variant collateral in the general population is unknown, injury to it during mediastinal lymph node dissection without proper management of the cut end is a common cause of post-operative chylothorax.

CLINICAL RELEVANCE/APPLICATION

The subcarinal transverse collateral of the thoracic duct is crucial in clinical practice because it lies near the subcarinal and hilar lymph nodes, which are often dissected during surgical resection for lung cancer. Because this collateral duct is located away from the known anatomical location of the thoracic duct, and is often imperceptible during surgery, it can sometimes be transected unintentionally, resulting in iatrogenic chylothorax. This study alerts surgeons to the presence of this transverse collateral lymph duct and that its prevalence might be more common than traditionally perceived. Also, identifying this subcarinal transverse collateral as a common culprit of iatrogenic chylothorax gives cause for choosing minimally invasive embolization for treatment over surgical ligation. Because superselective embolization of only this collateral lymph duct helps preserve the patency of the thoracic duct. Thus, reducing potential long term obstructive complications related to blockage of the central lymphatic channel.

M6-SSIR01-6 Keynote Speaker

Robert A. Morgan, MBChB, FRCR (*Science Invited Presenter*)

Nov. 30 – Dec. 4
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M6-SSMK03

Musculoskeletal Imaging (Clinical Applied, Artificial Intelligence)

Monday, Dec. 1 1:30PM - 2:30PM Room: E450A

Jonathan A. Flug, MD, MBA (*Moderator*)
Usa Cain, MD (*Moderator*)

Sub-Events

M6-SSMK03-1 AI-AUGMENTED MSK ULTRASOUND REPORTING: STREAMLINING CLINICAL WORKFLOW AND RESIDENT TRAINING IN A HIGH-VOLUME TERTIARY CARE GOVERNMENT HOSPITAL"

Daksh D. Mehta, MD, MBBS (*Presenter*)
Mahak K. Balani, MD (*Abstract Co-Author*)
Ashwini Sankhe, MD (*Abstract Co-Author*)
Anagha R. Joshi, MD, MBBS (*Abstract Co-Author*)

PURPOSE

Musculoskeletal (MSK) ultrasound is a dynamic, operator-dependent imaging modality with a steep learning curve, especially in high-volume tertiary care government hospitals. Challenges such as variability in reporting, time pressure, and resident fatigue affect consistency and training. This study evaluated the role of artificial intelligence (AI) in improving efficiency, completeness, and standardization of MSK ultrasound reporting using AI-assisted draft generation and real-time guidance.

METHODS AND MATERIALS

A multiphase study was conducted at a high-volume tertiary care government hospital. In Phase 1, baseline challenges in MSK ultrasound reporting and training were documented through observation and feedback. In Phase 2, an open AI-assisted draft report generator was developed, using joint-specific structured templates and anatomical checklists for common MSK pathologies. Phase 3 involved a 3-month pilot study with 12 radiology residents alternating between conventional and AI-assisted reporting weeks. Outcomes included report completeness (scored by blinded radiologists), reporting time, and subjective cognitive load (NASA Task Load Index).

RESULTS

AI-assisted reporting reduced reporting time by 31% ($p < 0.01$) and improved report completeness from a mean of 6.8 to 9.3. NASA-TLX scores showed a 23% reduction in cognitive workload. The system prompted scanning of often-missed structures and enhanced diagnostic quality. Residents reported high usability and supported further integration across subspecialties.

CONCLUSION

AI-assisted draft reporting and checklist guidance improve efficiency, standardization, and education in MSK ultrasound. Structured templates reduce variability, ease cognitive load, and improve report quality. Beyond routine draft reporting, large language models supported voice-guided scanning assistance, clinician-specific report refinement, differential generation, resident skill tracking, research dataset creation and automated error detection—extending their impact across clinical, educational, and research domains.

CLINICAL RELEVANCE/APPLICATION

Integrating AI and language models into MSK ultrasound workflows can streamline reporting, support personalized communication, enhance resident training, and build structured datasets for research and future AI tools—addressing key gaps in consistency, speed, and quality.

M6-SSMK03-2 REDUCING UNREPORTED VERTEBRAL COMPRESSION FRACTURES: PERFORMANCE OF AN AI-BASED SCREENING TOOL ON OPPORTUNISTIC CT IMAGING

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PURPOSE

Osteoporosis-related vertebral compression fractures (VCF) are fragility fractures, often progressing silently and remaining undetected. Their severity is typically classified using Genant’s semiquantitative method based on the vertebral height loss (VHL). As VCFs are frequently asymptomatic, opportunistic identification on CT scans acquired for unrelated clinical reasons offers a solution for early diagnosis without additional radiation exposure or imaging costs. This study aims to evaluate an AI-based system designed to automatically label vertebrae, quantify VHL, calculate mean Hounsfield Units (mean HU) of vertebral bone attenuation at L1-L4 and detect unsuspected VCF cases (VHL=25%) on real-world CT.

METHODS AND MATERIALS

We retrospectively and consecutively analyzed chest and abdominal CT scans acquired for any clinical indication other than VCF at two major teleradiology networks in the US and France. Both contrast-enhanced and non-contrast-enhanced CT acquired on 37 different scanner models from 5 manufacturers were included. Patients under 50 years old and scans with slice thickness >3mm were excluded. Reference Standard (RS) was established by consensus of three senior musculoskeletal radiologists who measured and labelled vertebrae following Genant’s method. All cases were analyzed by the AI tool CINA-VCF Quantix v1.0 (Avicenna.AI, France) and its diagnostic performance was evaluated against the RS and the original radiology report.

RESULTS

Of the 319 initially screened patients, 271 (mean age 72.4±10.4[SD] years old; 47.6% male, 23.3% VCF prevalence) met inclusion criteria, spanning 3,141 vertebrae (6.9% with VHL=25%). The AI achieved a vertebral labelling accuracy of 95.3% (95%CI: 94.6%-96.0%). Agreement with the RS for VHL and mean HU quantification yielded 95% limits of agreement of [-9.2%, 8.6%], and [-20.7, 16.7] HU, respectively. Sensitivity and specificity for detecting VCF cases were 83.6% (95%CI: 75.8%-89.7%) and 95.3% (95%CI: 90.5%-98.1%), respectively. Figure 1 shows an example of a positive case. Main causes of disagreements were Schmorl's nodes and osteophytes. Notably, 63.5% (40/63) of VCF cases confirmed by the RS were not reported in the radiology report; the AI tool successfully detected 75% (30/40) of these unreported cases, suggesting the potential to reduce the missed rate from 55% to 15.9% (10/63).

CONCLUSION

The AI tool shows strong performance in opportunistic VCF assessment. The integration into clinical workflow may enhance early recognition of osteoporotic VCF.

CLINICAL RELEVANCE/APPLICATION

Automated opportunistic detection of VCF on routine CT may enable earlier treatment of osteoporosis and reduce fracture-related morbidity without the need for additional imaging or radiation.

M6-SSMK03-3 AUTOMATION BIAS REDUCES RADIOLOGIST ACCURACY IN AI-ASSISTED SCAPHOID FRACTURE DETECTION ON WRIST RADIOGRAPHS

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PURPOSE

Automation bias, the tendency of clinicians to over-rely on automated decision support, is a potential threat to diagnostic accuracy. We evaluated how disclosure of AI-generated fracture overlays and confidence affects radiologists' scaphoid fracture detection, and whether reader experience or case order modulates this effect.

METHODS AND MATERIALS

Twenty-four radiologists (12 residents, 12 attendings) participated in a prospective, two-read study of 213 wrist radiographs obtained between 2019 and 2024 that prompted confirmatory CT (mean patient age 44 ± 15 years; 56% male; 81% CT-proven fractures). In Read 1, each reader reviewed 48 unique cases without AI assistance; after a 6-week washout period, they reviewed the identical images again in Read 2, this time overlaid with AI-generated bounding boxes at suspected fracture sites and a three-level confidence indicator (high/medium/low). To assess any "warm-up" effect of early correct or incorrect AI predictions, cases were presented in false-first, random, or true-first order. A mixed effects regression model with random intercepts for each reader quantified the effects of AI disclosure, reader expertise, and presentation order. On the same images, the AI's stand-alone performance achieved 71% sensitivity, 100% specificity, 100% PPV, and 65% NPV.

RESULTS

Without AI, radiologist accuracy averaged 69.1 ± 3.1%. Displaying AI overlays in Read 2 reduced accuracy by 8.7 percentage points (ß = -0.087 ± 0.039; P = .026), demonstrating a significant negative automation bias. Reader experience did not attenuate this effect (interaction P = .64), nor did case order (all P > .30). Reader-AI agreement increased from 76% in Read 1 to 83% in Read 2 (P = .025), confirming the increased reliance on algorithmic suggestions. Interreader variance was negligible after accounting for fixed effects (s^2 ˜0.001).

CONCLUSION

Disclosure of AI-generated fracture flags and confidence levels paradoxically decreased radiologist performance in scaphoid fracture detection by encouraging uncritical adoption of algorithmic output. This decline reflects an automation bias, not a deficiency in the AI itself. Neither greater experience nor strategic case ordering prevented this bias. To safely integrate AI into clinical workflows, measures such as mandatory critical review prompts, confidence thresholds, or selective gating of AI output are essential to preserve independent diagnostic judgment.

CLINICAL RELEVANCE/APPLICATION

Automation bias is a significant, under-appreciated risk in AI-assisted diagnostic imaging; even powerful algorithms can reduce overall accuracy if their suggestions are adopted uncritically. Targeted safeguards are therefore critical to preserve the independent judgment of clinicians.

M6-SSMK03-4 IMPACT OF AI ASSISTANCE ON KNEE MRI READING TIME: A REAL-WORLD MULTICENTER STUDY

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Sergey Morozov, PhD, MPH (*Abstract Co-Author*)
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Philippine Cordelle (*Abstract Co-Author*)
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PURPOSE

To evaluate the impact of seamless AI integration on knee MRI reporting time in a prospective multicentric setting by comparing 3 reporting workflows: standard reporting without AI, reporting with AI-generated results available but not integrated and fully AI-assisted structured reporting with integrated AI outputs.

METHODS AND MATERIALS

A prospective multicenter study was conducted across 10 private radiology centers in Switzerland (September 2023-October 2024). 8 radiologists (4 musculoskeletal [MSK] subspecialists; 4 generalists [GEN]) participated. 1,285 knee MRI exams were consecutively allocated across 3 phases: (1) baseline standard reporting without AI, (2) partial AI integration of KEROS (Incepto), a CE-marked Class IIa knee-MRI multifaceted AI tool intended to assist radiologists with automatic assessment of cartilage/menisci/ligaments, with AI findings available in DICOM Secondary Capture format, and (3) full AI integration with AI-generated findings autopopulating structured report templates. Reporting time, measured automatically via Radiology Information System (RIS, EDL), was the primary outcome. Statistical analysis included Kruskal-Wallis test and inverse-variance weighted means to compare reporting times across phases and radiologist subgroups. A post-study questionnaire assessed user satisfaction and perceived workflow impact.

RESULTS

Fully integrated AI-assisted reporting reduced overall knee MRI reporting time by 13.4% compared to standard reporting ($p < 0.01$). The largest reduction was observed among general radiologists (17.5%, $p < 0.01$), while MSK specialists also benefited, albeit to a smaller extent due to already optimized workflows. Partial AI integration did not yield time savings and, in some cases, slightly increased reporting time, likely due to workflow modifications. Qualitative feedback revealed that 75% of radiologists felt AI facilitated their work, and 62.5% found structured report integration beneficial, particularly for straightforward cases. Suggestions for further optimization included extending the scope of lesion characterization.

CONCLUSION

Direct integration of AI-generated findings into structured knee MRI reports significantly reduces reporting time, especially for general radiologists. Partial AI integration without workflow embedding does not confer similar efficiency gains.

CLINICAL RELEVANCE/APPLICATION

AI-assisted structured reporting for knee MRI can meaningfully enhance radiology workflow efficiency, particularly for non-specialist readers, by reducing reporting time and cognitive workload. Effective integration into existing reporting systems is crucial to realizing these benefits in routine clinical practice.

M6-SSMK03-5 EARLY NONINVASIVE PREDICTION OF INSULIN RESISTANCE THROUGH MUSCLE ULTRASOUND RADIOMICS

Sameed Khan (*Presenter*)
Chad L. Klochko, MD (*Abstract Co-Author*)
Steven B. Soliman, DO (*Abstract Co-Author*)

PURPOSE

Current methods for detecting insulin resistance (IR) and type 2 diabetes (T2D) are often invasive and costly. Previous work has shown retrospective success of machine learning models using muscle radiomics. This study aimed to prospectively evaluate the performance of a gradient-boosted decision tree model trained on retrospective deltoid muscle ultrasound radiomics to identify individuals with IR despite normal glycemic markers.

METHODS AND MATERIALS

A model was initially trained on 1191 retrospective patients using deltoid muscle radiomics to predict prediabetes/diabetes risk status (diagnosis in EHR). For prospective validation, 17 subjects (age 18-40) were recruited: 8 with obesity (BMI 34.3 +/- 2.7 kg/m 2 , 87.5% male, mean age 37) and 9 healthy lean controls (BMI 22.5 +/- 1.4 kg/m 2 , 28.6% male, mean age 25). All 17 subjects had normal HbA1c (<5.7%). Standardized ultrasound (12-MHz linear transducer) of the dominant deltoid muscle was performed by an experienced radiologist. Subjects then underwent a 2-hour 75g oral glucose tolerance test with insulin levels to calculate the Matsuda Index. All subjects with obesity were confirmed to have IR (Matsuda Index <4), while all lean controls had normal insulin sensitivity (Matsuda Index mean 12). Radiomics features were extracted from the deltoid ultrasound images, and the pre-trained model was applied.

RESULTS

On the prospective cohort of 17 subjects, all with normal HbA1c, the model trained on retrospective data demonstrated an Area Under the Receiver Operating Characteristic curve (AUROC) of 0.78 in distinguishing individuals with IR (n=8) from those without (n=9). At an optimal threshold determined by Youden's J-index (0.43), the model achieved a sensitivity of 0.88 and a specificity of 0.56. The model showed an internal validation AUROC of 0.79 +/- 0.036 over 10-fold cross-validation on the larger retrospective training set.

CONCLUSION

This pilot study demonstrates promising potential for ultrasound muscle radiomics to prospectively identify individuals with underlying insulin resistance despite normal HbA1c levels. These initial findings suggest muscle imaging may detect early metabolic dysfunction related to impaired glycogen synthesis. Patient follow-up is ongoing, and future directions include integrating multimodal data and higher-powered but lower-interpretability predictive methods, such as deep learning.

CLINICAL RELEVANCE/APPLICATION

With millions unaware of their prediabetes or T2D, a non-invasive ultrasound approach could offer accessible screening for insulin resistance. A positive finding on ultrasound screen could prompt further testing, enabling timely, targeted interventions, particularly in underserved communities.

M6-SSMK03-6 TASK-AGNOSTIC DXA FEATURES: A DEEP LEARNING FOUNDATION FOR DIVERSE RADIOLOGICAL TASKS

Yannik Glaser, PhD (*Presenter*)
Thomas K. Wolfgruber, PhD (*Abstract Co-Author*)
Arianna Bunnell (*Abstract Co-Author*)
Peter Sadowski, PhD (*Abstract Co-Author*)
John A. Shepherd, PhD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a deep learning model that extracts clinically meaningful imaging features directly from hip, spine, and whole-body DXA scans for opportunistic risk prediction, such as 10-year mortality and hip fracture. The model is designed using self-supervised deep learning (SSL) to be robust across anatomical sites and scan protocols, enabling broad applicability in diverse clinical settings.

METHODS AND MATERIALS

A total of 85,461 DXA scans were used to train the model, sourced from NIH-supported studies (MrOS, HANDLS, HealthABC, and Shape Up!). The scans included 33,360 whole-body, 28,928 hip, and 23,173 spine images. Using a SSL approach, a vision transformer model was trained to learn shared imaging patterns across scans without requiring labels. The resulting image-based features ("embeddings") were then evaluated on two clinical prediction tasks. For 10-year all-cause mortality prediction, 17,218 whole-body scans were used, including 6,911 participant deaths. For 10-year hip fracture prediction, 4,199 hip scans were used, including 258 fractures. Each task used logistic regression models trained solely on the extracted imaging features, without access to demographics, bone mineral density, or laboratory values.

RESULTS

The model achieved an area under the receiver operating characteristic curve (AUROC) of 0.70 for 10-year mortality prediction. For hip fracture prediction, the AUROC was 0.74. These results are comparable to prior task-specific models developed using the HealthABC cohort, which achieved AUROCs of 0.71 and 0.75, respectively, but required multiple clinical variables including bone mineral density, biomarkers, and fitness measures.

CONCLUSION

This study demonstrates that DXA images alone, when processed with advanced deep learning, can reveal imaging features predictive of long-term clinical outcomes. The model is trained on multiple anatomical regions (hip, spine, and whole body), making it inherently agnostic to scan site and capable of generalizing across imaging protocols. Unlike traditional end-to-end models trained for specific tasks, these general-purpose features can be reused across new prediction problems, supporting a modular and scalable approach to DXA-based risk assessment.

CLINICAL RELEVANCE/APPLICATION

This model can enable automated, opportunistic screening for fracture risk or mortality directly from DXA scans. It requires no additional imaging, clinical data, or patient burden, thereby potentially enhancing the value of routine DXA exams in everyday practice.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

M6-SSMS01

Science Session with Keynote: Multisystem (Tumor Prognostication and Risk Stratification)

Monday, Dec. 1 1:30PM - 2:30PM Room: S405

Chloe M. Chhor, MD (*Moderator*)
Jose P. Martinez Barbero, MD, PhD (*Moderator*)

Sub-Events

M6-SSMS01-1 PROGNOSTIC FACTORS FOR METASTATIC PATIENTS: NUMERIC TUMOR FRACTION IN LIQUID BIOPSY, TUMOR VOLUME AND ANTHROPOMETRY IN CT SCANS

Aurelie Choucair, MD (*Presenter*)
Jules Dupont (*Abstract Co-Author*)
Ghina Jardali, MD (*Abstract Co-Author*)
Lama DAWI, MD (*Abstract Co-Author*)
Littisha Lawrance (*Abstract Co-Author*)
Vincent GOLDSCHMIDT (*Abstract Co-Author*)
Samy Ammari, MD, PhD (*Abstract Co-Author*)
Christophe Massard (*Abstract Co-Author*)
Antoine Italiano (*Abstract Co-Author*)
Nathalie B. Lassau, MD, PhD (*Abstract Co-Author*)

PURPOSE

Total tumor volume on CT scan and circulating tumor DNA from liquid biopsy, known as tumor fraction (TF), are parameters to predict metastatic patients' overall survival (OS). While TF was previously binary (below or above 10%), numerical values are now available. The goal is to predict OS correlating numeric TF, Total Tumor Volume (TTV) and 3D anthropometry.

METHODS AND MATERIALS

This is a retrospective study including metastatic patients between January 2021 and December 2023 who had a baseline CT scan and liquid biopsy (STING study, NCT04932525, Gustave Roussy). The collected data include age, sex, cancer type, treatment line, and date of death. Thoraco-abdomino-pelvic CT scans were anonymized and manually annotated in 2D on the slice with the largest diameter by senior radiologists on the SPYD platform. A 3D estimate was made (Tumor volume = 2/3 x Mesh surface area x Minor axis). The numerical values of the TF were reported as a percentage. The Anthropometer3DNet software was used to obtain 3D measurements, allowing the calculation of muscle, superficial and deep fat masses. TTV and anthropometric measurements were combined using coefficients of a cox model, resulting in a CT scan risk score. Patients were first divided into two groups based on their TF: equal to or superior to 0%. They were further divided into two subgroups based on the CT scan risk score: below or above its median. The primary endpoint was OS. Analyses were performed using Kaplan-Meier estimators and log-rank statistics.

RESULTS

Among 720 patients with a liquid biopsy and baseline CT scan, 38,283 metastases were outlined. The median OS of patients was 13.11 months (95% CI: 11.50-15.11). The median TF was 3.30% (IQR 20%) and the median TTV was 91.61 cm^3 (IQR 213.68 cm^3). A TF of 0% was found in 213 patients (29.58%), despite having tumor burden on the CT scan, with a median of 35.34 cm^3 (IQR 84.00 cm^3). The OS median of patients with TF=0% was 10.15 months (95% CI: 8.71-11.60), compared to 25.46 months (95% CI: 21.26-30.09) for those with a TF above 0%. In the TF=0% group, patients with a low CT-scan risk score had a median OS of 35.35 months (95% CI: 27.10- superior to 44 months), compared to 19.35 months (95% CI: 13.37-25.36) for those with a high CT-scan risk score. In the group with TF > 0%, patients with a low CT-scan risk score had a median OS of 13.24 months (95% CI: 6.54-13.24) compared to 7.46 months (95% CI: 6.54-13.24) for those with a TTV above the median. Survival curves were significantly different, with $p=0.003$ and $p<0.001$, respectively.

CONCLUSION

TTV and anthropometry, in conjunction with TF, provide a more accurate prediction of OS compared to TF alone.

CLINICAL RELEVANCE/APPLICATION

The assessment of tumor burden and 3D anthropometry are a promising prognostic tool in the management of metastatic patients.

M6-SSMS01-2 ADDITIONAL PROGNOSTIC VALUE OF TUMOR BURDEN IN STAGE I/II COMPARED TO STAGE III/IV LYMPHOMA PATIENTS UNDERGOING CAR T-CELL THERAPY

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Rudolf A. Werner (*Abstract Co-Author*)
Michael von Bergwelt-Baildon (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
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Michael Winkelmann, MD (*Abstract Co-Author*)

PURPOSE

Chimeric Antigen Receptor (CAR) T-cell therapy has revolutionized the treatment landscape for relapsed or refractory B-cell lymphomas. While disease stage remains a cornerstone of risk stratification, emerging evidence suggests that tumor burden (TB) quantified through imaging may provide additional prognostic insights. The differential impact of TB in early-stage (I/II) versus advanced-stage (III/IV) lymphoma remains underexplored. In stage I/II patients, tumor burden may serve as an enhanced risk stratifier due to lower baseline disease heterogeneity. We evaluated the additional prognostic value of the Lugano-based sum of product diameters (SPD) for stage I/II patients compared to stage III/IV patients in terms of progression-free survival (PFS) and overall survival (OS).

METHODS AND MATERIALS

This retrospective analysis was conducted on a cohort of 103 patients treated with CAR T-cell therapy. Tumor burden at baseline was quantified using SPD according tu Lugano Criteria. Patients were stratified by Ann Arbor stage and SPD levels. PFS and OS were analyzed using Kaplan-Meier curves and log-rank tests.

RESULTS

Median age was 67 years; 38% patients were female. Patients with Stage III/IV disease had significantly higher baseline SPD compared to Stage I/II (median SPD: 6,088 mm^2 vs. 1,504 mm^2; $p<0.001$). Survival analysis demonstrated significantly inferior PFS ($p<0.001$) and OS ($p=0.018$) in patients with advanced disease (III/IV). The additional subdivision of the early stage patients according to their median SPD of 1,504 mm2 resulted in a significant separation of the two groups. The early stage patients with a low SPD showed a significantly longer OS and a slightly longer PFS than those with a high SPD. Interestingly, stage I/II patients with higher tumor burden showed a similar overall survival curve as the advanced stage patients.

CONCLUSION

Baseline tumor burden, as measured by SPD, had a significant prognostic value in early-stage (Ann Arbor Stage I/II) lymphoma patients undergoing CAR T-cell therapy. In this subgroup, higher SPD was associated with markedly inferior OS and slightly inferior PFS. In contrast, SPD did not show a clear prognostic impact among patients with advanced-stage (Stage III/IV) disease.

CLINICAL RELEVANCE/APPLICATION

These findings suggest that tumor burden may be particularly useful for risk stratification in early-stage lymphoma and should be considered when evaluating candidates for CAR T-cell therapy in this population. Understanding the prognostic implications of tumor burden can guide clinical decision-making and therapeutic strategies.

M6-SSMS01-3 MULTI-CENTER RADIOMICS-DEEP LEARNING FUSION MODEL FOR STRATIFYING IPMN MALIGNANCY RISK ON MRI

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PURPOSE

Current guidelines for intraductal papillary mucinous neoplasm (IPMN) risk stratification lack specificity, leading to unnecessary surgeries and costs. We developed a radiomics-deep learning fusion algorithm to improve malignancy risk prediction using cyst segmentation on T2W-MRI.

METHODS AND MATERIALS

This IRB approved multicenter retrospective study included 746 T2W MRI scans from seven institutions. Inclusion criteria: IPMNs with confirmed dysplasia grade determined by EUS-FNA or surgical histopathology. Lesions were categorized as Low Risk (low-grade dysplasia) or High Risk (high-grade dysplasia or invasive carcinoma). Excluded: inadequate imaging quality or incomplete follow-up. IPMNs were manually segmented by an interdisciplinary team using ITK-SNAP. We developed and compared three algorithms:Radiomics: Features were extracted, selected, and used to train a random forest model with both 2D and 3D analyses.DL: six convolutional neural networks (CNNs) were developed and evaluated.Radiomics-DL Fusion: The best-performing CNN (DenseNet121) was integrated with radiomic features.Additionally, images were scored by three expert radiologists using T1W and T2W images. Performance was evaluated with AUC, accuracy (Acc), sensitivity, and specificity.

RESULTS

359 cases met the inclusion criteria; 217 were Low Risk (38.5% MD-IPMN) and 142 were High Risk (27.7% BD-IPMN). Expert radiologist scorers achieved a mean Acc of 66.9% on cases with majority agreement (n=349). Similar performance was seen when using 2D and 3D features across all three algorithms. The mean AUC was 66.4% and 66.5%, and the Acc was 65.9% and 66.1% on testing for the radiomics-only analysis using 2D and 3D features, respectively. On DL-only analysis, DenseNet121 demonstrated the highest AUC of 73.3% and Acc of 68.0% among the six evaluated CNNs on cross-validation. The fusion algorithm demonstrated weighted average AUC of 74.3% and 73.4%, and Acc of 71.0% and 98.4% on cross-validation using 2D and 3D features. On testing, the fusion algorithm achieved 69.2% and 68.3% AUC, and 61.6% and 62.7% Acc on testing with 2D and 3D features.

CONCLUSION

Our fusion algorithm achieves comparable accuracy or even better to expert radiologists in IPMN risk stratification using T2W MRI alone, despite lacking clinical data or T1W sequences.

CLINICAL RELEVANCE/APPLICATION

Advanced image analysis methods like our fusion algorithm can enhance IPMN malignancy risk assessment, potentially reducing invasive interventions, minimizing patient harm, and lowering healthcare expenditures. This approach demonstrates the value of combining complementary quantitative imaging techniques in pancreatic lesion characterization.

M6-SSMS01-4 MAXIMUM LYMPHOMA SPREAD (DMAX) AS A PROGNOSTIC IMAGING BIOMARKER IN LYMPHOMA PATIENTS UNDERGOING CD19 CAR T-CELL THERAPY

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PURPOSE

CD19-directed chimeric antigen receptor (CAR) T-cell therapy using autologous T cells has become a promising treatment option for patients with relapsed or refractory (r/r) lymphoma. As imaging biomarkers gain relevance in risk stratification, the maximum distance (Dmax) between lymphoma lesions—a surrogate of disease dissemination—has emerged as a potential prognostic factor in patients receiving conventional therapy. However, its role in the context of CAR T-cell therapy remains unexplored. This study aimed to evaluate baseline Dmax as a predictive biomarker for metabolic and overall response, progression-free survival (PFS), and overall survival (OS) in r/r lymphoma patients treated with CD19-specific CAR T cells.

METHODS AND MATERIALS

We retrospectively analyzed consecutive r/r lymphoma patients with available baseline PET/CT or CT imaging and 3-month follow-up (FU) PET/CT after CAR T-cell infusion. Baseline Dmax was calculated in centimeters and patients were stratified into tertiles: low, intermediate, and high-risk groups. Ann Arbor staging was used for comparative purposes. Tumor burden (TB) was quantified as the sum of product diameters (SPD) in mm^2 of up to six target lesions. Treatment response was assessed using the Lugano criteria and Deauville score on FU PET/CT scans.

RESULTS

Among 103 patients with measurable Dmax at baseline, 63 had available FU PET/CT scans. The median baseline Dmax was 40.0 cm (IQR: 16.4-70.3 cm). Median TB decreased from 4,095 mm^2 at baseline to 770 mm^2 at FU. The intermediate- and high-risk Dmax groups had significantly higher baseline TB compared to the low-risk group ($p = 0.005$), with medians of 7,222 mm^2, 4,649 mm^2, and 1,739 mm^2, respectively. Higher Dmax was also associated with more advanced Ann Arbor stages ($p < 0.001$). PFS was significantly shorter in the high-risk Dmax group (median: 91 vs. 364 days, $p = 0.030$), while OS did not differ significantly ($p = 0.151$), mirroring findings based on Ann Arbor staging. No significant differences were observed in Deauville scores or overall response rates (ORR) across groups.

CONCLUSION

Patients with high baseline Dmax experienced significantly shorter PFS, though OS and treatment response rates were unaffected. While Dmax did not outperform Ann Arbor staging in risk stratification, its continuous nature offers a nuanced and scalable alternative for prognostic evaluation.

CLINICAL RELEVANCE/APPLICATION

Dmax represents a simple, quantifiable imaging biomarker that could enhance multiparametric risk models and aid in optimizing individualized treatment strategies in CAR T-cell therapy.

M6-SSMS01-6 ARTIFICIAL INTELLIGENCE PIPELINE FOR DETECTION, SEGMENTATION AND CLASSIFICATION OF METASTATIC LYMPH NODES OF TUMOR ACROSS WHOLE BODY

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PURPOSE

To develop and deploy a robust multi-modality artificial intelligence (AI) pipeline for the automated detection, segmentation, and classification of lymph nodes in whole-body imaging datasets, further improve the evaluation and management of metastatic tumors.

METHODS AND MATERIALS

A total of 801 cases involving breast, liver, rectal, and other tumor types were collected from The Cancer Imaging Archive and multiple international institutions to train (n=534) and validate (n=267) an AI pipeline for lymph node detection and segmentation. All cases underwent either CT or MRI imaging. Lymph node segmentations were performed by two experienced radiologists, with a third radiologist reviewing all cases and revising the segmentations as necessary. A subset of 53 cases of malignant lymph nodes, pathologically confirmed with biopsy or surgery, was used specifically to train (n=35) and validate (n=18) the classification task. The AI pipeline, designed for both CT and MRI modalities, comprised three stages: (1) lymph node localization using Retina-UNet-3D with additional false positive reduction networks, (2) segmentation using UNet-3D, and (3) malignancy classification using EfficientNetV2S. Performance evaluation was based on the following metrics: (1) sensitivity and false positives per true positive (FPs/TP); (2) Dice similarity coefficient; and (3) accuracy and area under the receiver operating characteristic curve (AUC).

RESULTS

The pipeline demonstrated robust performance across imaging modalities and anatomical regions. For lymph node detection, it achieved an average sensitivity of 77.39% with 1.69 false positives per true positive (FPs/TP) for CT, and 65.8% with 1.65 FPs/TP for MRI. Segmentation performance yielded a mean Dice similarity coefficient of 0.638±0.091 for CT and 0.639 ± 0.177 for MRI. For malignancy classification, the model achieved an accuracy of 0.633 and an AUC of 0.659 in distinguishing benign from malignant lymph nodes.

CONCLUSION

This AI-based pipeline provides a comprehensive tool for automated lymph node analysis in different tumor types across the whole body, with the potential to facilitate rapid and accurate staging of metastatic tumors.

CLINICAL RELEVANCE/APPLICATION

Assessment of lymph nodes is essential for tumor staging, treatment planning, and prognosis. Detecting abnormal lymph nodes remains a challenge for radiologists, particularly in clinical settings with diverse tumor types and imaging modalities. The proposed AI pipeline offers an automated tool for lymph node detection, segmentation, and classification across CT and MRI, potentially assisting radiologists in large-scale lymph node evaluations, reducing their workload, and streamlining workflows in oncological imaging practices.

M6-SSMS01-7 Keynote Speaker

Seyedmehdi Payabvash, MD (*Science Invited Presenter*)

Nov. 30 – Dec. 4
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M6-SSNPM01

Science Session with Keynote: Noninterpretive Skills (Beyond Imaging) (Sustainability)

Monday, Dec. 1 1:30PM - 2:30PM Room: S402

Kate Hanneman, MD, MPH (*Moderator*)
Florence X. Doo, MD, MA (*Moderator*)

Sub-Events

M6-SSNPM01-1 Keynote Speaker

Geraldine B. McGinty, MD, MBA (*Science Invited Presenter*)

M6-SSNPM01-4 PROJECTIONS OF FUTURE HEAT-RELATED EMERGENCY MEDICAL IMAGING UNDER CLIMATE CHANGE SCENARIOS

Eray Yilmaz, BSc (*Presenter*)
Chloe DesRoche, MD,MSc (*Abstract Co-Author*)
Pierre Masselot (*Abstract Co-Author*)
Kate Hanneman, MD, MPH (*Abstract Co-Author*)

PURPOSE

Short-term exposures to ambient heat is associated with higher demand for health care services including medical imaging. However, empirical evidence is lacking regarding future projections of heat-related medical imaging utilization. The purpose of this study was to estimate projections of excess medical imaging associated with ambient heat exposures under future climate change scenarios.

METHODS AND MATERIALS

In the baseline period (2013-2023), short-term associations of ambient heat exposure with emergency department medical imaging utilization over a lag of 0-5 days were determined based on data from four local emergency departments in Toronto, Canada, using conditional Poisson regression models. Baseline data was then applied to statistically downscaled climate projections through the year 2100. Future temperature projections were based on an ensemble mean of 35 global climate models (GCMs) from the Government of Canda. Heat-related excess medical imaging utilization was projected under future climate change scenarios based on Shared Socioeconomic Pathways (SSPs) overall and stratified by imaging modality.

RESULTS

Based on baseline data between 2013-2023, including a total of 1,946,465 emergency department medical imaging studies (mean 485±61/day) and mean daily temperature of 13.7 °C, short-term exposure to ambient heat was associated with overall imaging utilization increases of 3.3% (incidence rate ratio [IRR], 1.033; 95% CI: 1.028, 1.037, P <0.001) for a 10°C rise in the 5-day moving average of mean daily temperature. In 2083-2093, heat-related excess medical imaging utilization is projected to increase by 0.55% (95% CI: 0.48, 0.63) under the SSP1-2.6 low-emissions scenario and by 1.43% (95% CI: 1.24, 1.63) under the SSP3-7.0 high-emissions scenario compared to the baseline period. These projections correspond to an excess absolute increase of 9871 (95% CI: 7150, 12,744) and 25,908 (95% CI: 18,757, 33,460) local imaging studies per decade, respectively. Projected absolute increases in local imaging utilization under the SSP2-4.5 medium-emissions scenario are 1441 radiographs (95% CI: 1017, 1891), 373 CTs (95% CI: 172, 614), and 119 ultrasounds per year (95% CI 28, 245).

CONCLUSION

Future heat-related impacts on medical imaging utilization are expected to increase toward the end of this century across all future emission scenarios.

CLINICAL RELEVANCE/APPLICATION

Climate change adversely impacts human health and increases demand for health care. The projections in this study can be used to develop resilient radiology organizations and health systems by informing adaptation strategies to prepare for the impacts of climate change.

M6-SSNPM01-5 QUANTIFYING THE ENVIRONMENTAL IMPACT OF LOW-VALUE L-SPINE MRIS IN A SAFETY-NET HEALTHCARE SYSTEM

Isa Abdul Cader, MD (*Presenter*)
Anton A. Mlikotic, MD (*Abstract Co-Author*)
Andrew M. Hernandez, PhD (*Abstract Co-Author*)

PURPOSE

Early MRI of the lumbar spine (L-spine) for low back pain rarely improves outcomes. Unnecessary L-spine MRIs waste resources, cost the US healthcare sector $300 million annually, and confer an additional, underappreciated impact: planetary harm. The US healthcare sector generates roughly 8.5% of all nationwide greenhouse gas emissions. Medical imaging accounts for up to 1% of global greenhouse gas emissions, and MRI is the most energy-intensive modality. The purpose of this study was to quantify low-value L-spine MRIs and their environmental impact in a large, safety-net academic healthcare system.

METHODS AND MATERIALS

We conducted a multicenter retrospective chart review quantifying low-value L-spine MRIs ordered outside American College of Radiology (ACR) Appropriateness Criteria for Low Back Pain. The study period was 6 weeks in 2023: the first weeks of January - March and July - September. We measured energy consumption on a 3T and 1.5T MRI scanner. Energy data was synchronized with scanner logs to determine scan time and quantify energy consumption for L-spine protocols at the exam-level after adjusting for scan time differences. We approximated transportation emissions using zip codes and assuming transport via gas-powered vehicles.

RESULTS

During the study period, 534 L-spine MRIs were conducted in 4 centers. Of these, 92 (19%) were deemed low-value. Most low-value MRIs (97%) were conducted on 3T or 1.5T MRI scanners. We found that an L-spine MRI with and without contrast on a 3T scanner consumed the most energy at 12.1 kilowatt-hours (kWh)/scan, while an L-spine MRI without contrast on a 1.5T scanner used the least at 10.0 kWh/scan. The low-value L-spine MRIs (N=89) on 3T/1.5T scanners consumed 650.7 kWh of

energy, equivalent to 360 kg CO2 equivalents (CO2e). Patient travel generated 1119 kg CO2e. During the study period, low-value L-spine MRIs generated 1479 kg CO2e. Projecting our findings across 1 year, inappropriate L-spine MRIs generated 12,818 kg CO2e.

CONCLUSION

We found that ordering L-spine MRIs within ACR criteria in our system would have averted emissions equal to driving >32,500 miles in a gas vehicle in 1 year. Our method ignores energy consumption of MRI system modes without active patient scanning - suggesting that our findings likely underestimate total environmental impact. Our findings suggest that a collaborative approach involving frontline providers is crucial to decreasing emissions. Implementing this approach at scale could reduce the negative environmental impact associated with low-value MRIs.

CLINICAL RELEVANCE/APPLICATION

Reducing low-value L-spine MRIs can substantially mitigate the environmental impact of medical imaging.

M6-SSNPM01-6 ENERGY-SAVING EFFICIENCY OF A NOVEL SILICON CARBIDE MRI GRADIENT POWER AMPLIFIER

Liu Bi (*Presenter*)
Hui Huang (*Abstract Co-Author*)
Jianguo Xiao (*Abstract Co-Author*)
Ning Yang, MD (*Abstract Co-Author*)
Zhe Zhang (*Abstract Co-Author*)
Bin Liu (*Abstract Co-Author*)
Bin Cao (*Abstract Co-Author*)
Xu Chu (*Abstract Co-Author*)
Xiaopeng Song (*Abstract Co-Author*)
Danjiang Yuan (*Abstract Co-Author*)

PURPOSE

Magnetic Resonance Imaging (MRI) systems contribute substantially to healthcare energy costs and environmental impact, driven largely by inefficient gradient power amplifiers (GPAs). This study evaluates the energy efficiency of a novel Silicon Carbide (SiC)-based GPA compared to conventional silicon (Si) GPAs in 1.5T MRI systems, aiming to quantify potential energy savings and support sustainable medical imaging practices.

METHODS AND MATERIALS

A comparative analysis was conducted using two 1.5T MRI scanners (uMR 600 with SiC GPA and uMR 580 with Si GPA, United Imaging Healthcare) at Jingzhou Central Hospital. Identical imaging protocols (T1w/T2w SE, STIR, DWI-EPI) were applied to image the head, spine, knee, and pelvis of healthy subjects (four on SiC GPA, three on Si GPA). A power meter isolated to each GPA recorded energy consumption at 1 Hz. System logs synchronized energy data with scanning activities to calculate mean power per scan. Paired t-tests compared total power consumption, while subgroup analyses assessed sequence-specific differences. Additionally, clinical operational usage data were collected over five weeks (SiC GPA) and two weeks (Si GPA), analyzed via mixed-effects models to account for clinical variability.

RESULTS

In controlled experiments, the SiC GPA system consumed 109.34 kWh/person versus 237.13 kWh/person for the Si GPA system, demonstrating 53.89% reductions ($p<0.001$). Sequence-specific savings ranged from 47.75% (STIR) to 58.86% (PDw-SE). Clinically, the SiC GPA operated at 2.91±1.12 kW versus 8.40±2.86 kW for the Si GPA. Clinical operational data confirmed consistent energy reductions across diverse clinical workloads ($p<0.001$). Image quality (resolution, contrast, artifacts) was equivalent between systems (radiologist ratings, $p>0.05$). For a hospital performing 5,000 annual patient scans matching the protocols used in controlled experiments, adopting the SiC GPA could yield energy savings totaling 638,940 kWh—comparable to the annual electricity consumption of 123 households (each requiring 5,200 kWh/year).

CONCLUSION

The SiC GPA significantly reduces MRI energy consumption by over 50% without compromising image quality, validating its potential to enhance sustainability in medical imaging.

CLINICAL RELEVANCE/APPLICATION

Replacing conventional GPAs with SiC technology could substantially lower healthcare costs and carbon footprints. For a mid-sized hospital, annual savings exceeding 600,000 kWh would translate to reduced operational expenses and align with global green healthcare initiatives. This innovation supports broader adoption of energy-efficient technologies across medical imaging infrastructure, addressing both economic and environmental challenges in healthcare.

M6-SSNPM01-7 SEX-SPECIFIC ASSOCIATIONS OF SHORT-TERM ENVIRONMENTAL EXPOSURES WITH UTILIZATION OF MEDICAL IMAGING IN THE EMERGENCY DEPARTMENT

Kate Hanneman, MD, MPH (*Presenter*)
Shane O'Driscoll, MBBCh, FFR(RCSI) (*Abstract Co-Author*)
Scott Delaney (*Abstract Co-Author*)
Rachel Nethery (*Abstract Co-Author*)
Chloe DesRoche, MD,MSc (*Abstract Co-Author*)
Julien Aguet, MD (*Abstract Co-Author*)
Birgit B. Ertl-Wagner, MD, PhD (*Abstract Co-Author*)
Anish Kirpalani, MD, FRCPC (*Abstract Co-Author*)
Heidi C. Schmidt, MD (*Abstract Co-Author*)
Hayley Panet (*Abstract Co-Author*)
Ania Z. Kielar, MD, FRCPC (*Abstract Co-Author*)
Michael N. Patlas, MD, FRCPC (*Abstract Co-Author*)
Joseph Choi (*Abstract Co-Author*)
Felipe Castillo Aravena, MD (*Abstract Co-Author*)

PURPOSE

To determine short-term associations of climate-related environmental exposures with utilization of emergency department medical imaging by patient sex.

METHODS AND MATERIALS

In this retrospective, time-stratified, case-crossover study, daily imaging utilization counts from four local emergency departments were linked to local daily environmental data over a 11-year period (2013-2023). Moving daily averages of each environmental exposure were calculated to account for lagged exposure effects. Conditional Poisson regression models were used to evaluate short-term associations of daily variations in environmental exposures with daily utilization of medical imaging stratified by patient sex, controlling for day-of-week, month, and year.

RESULTS

A total of 1,946,465 emergency department medical imaging studies were included. Short-term exposures to higher fine particulate matter ($PM_{2.5}$) air pollution (incidence rate ratio [IRR] 1.039; 95%CI 1.033, 1.046, $p<0.001$ for a 10 μg/m 3 rise in the 6-day moving average), gaseous nitrogen dioxide (NO_2) air pollution (IRR 1.034; 95%CI 1.028, 1.040, $p<0.001$ for a 10 ppb rise in the 5-day moving average), and outdoor temperature (IRR 1.033; 95%CI 1.028, 1.038, $p<0.001$ for a 10°C rise in the 5-day moving average) were associated with higher utilization. Short-term exposure to higher wind speeds (IRR 0.810; 95%CI 0.775, 0.846, $p<0.001$ for a

100 km/h rise in the 4-day moving average), rain (IRR 0.913; 95%CI 0.876, 0.951, p<0.001 for a 10 cm rise in the 2-day moving average), and snow (IRR 0.942; 95%CI 0.929, 0.956, p<0.001 for a 10 cm rise in the 2-day moving average) were associated with lower utilization. Associations remained significant when stratified by patient sex, with larger effect sizes in men compared to women for all exposures. When stratified by imaging modality, associations were significant between all environmental exposures and both CT and radiography utilization; whereas associations with ultrasound utilization were only significant for exposures to PM 2.5 , temperature, and snow.

CONCLUSION

Short-term environmental exposures are associated with daily utilization of emergency department medical imaging with larger effect sizes in men compared to women. Short-term exposures to particulate and gaseous air pollution and higher outdoor temperatures are associated with higher short-term imaging utilization, while short-term exposures to higher wind speeds, rain, and snow are associated with lower short-term imaging utilization.

CLINICAL RELEVANCE/APPLICATION

These results advance our understanding of the impact of climate related environmental exposures on medical imaging and can be used to inform preparations in radiology departments to build resilience

M6-SSNPM01-8 AWARENESS DRIVES ACTION: CARBON FOOTPRINT MEASUREMENT OF A RADIOLOGY DEPARTMENT IN A HIGH-COMPLEXITY HOSPITAL

Catalina Ramirez, MD (*Presenter*)

PURPOSE

To describe the carbon footprint and define the contribution of its components in the Radiology Department of a high-complexity hospital from January to December 2024.

METHODS AND MATERIALS

Retrospective descriptive study based on data collected between January and December 2024 in the Radiology Department of a high-complexity hospital. Carbon footprint measurement focused on indirect emissions, following international standards developed by the International Organization for Standardization (ISO), and included Scope 2 and 3 variables such as electricity consumption, medical supplies (including contrast agents), staff commuting, and special waste generation. Data obtained from the local database and hospital information system were tabulated and analyzed using descriptive statistics. Emissions were quantified in metric tons of CO2 equivalent (tons CO2eq). Additionally, results were compared with existing data on the carbon footprint, electricity consumption, and associated costs of the hospital.

RESULTS

Total emissions from the Radiology Department between January and December 2024 were 1,404.6 tons CO2eq. The main contributor was special waste (717.7 tons CO2eq, 51%), followed by medical supplies (431.5 tons CO2eq, 31%), electricity consumption (214.7 tons CO2eq, 15%), and staff commuting (40.7 tons CO2eq, 3%). Electricity use accounted for 37.3% of the hospital's total and cost USD 931,321.5 annually. The radiology department's carbon footprint represented 25% of the total footprint of the hospital.

CONCLUSION

A limitation of this study was the inability to quantify household-type waste, as such waste is collected at the hospital-wide level rather than by individual department. Consequently, the carbon footprint attributable to waste—and specifically to the Radiology Department—is likely underestimated. Proper segregation of waste, reducing single-use plastics, selecting recyclable or biodegradable supplies, minimizing standby mode in high-energy equipment such as CT and MRI, and promoting low-emission transport and carpooling are impactful measures to reduce emissions.

CLINICAL RELEVANCE/APPLICATION

Identifying the key contributors to the department's carbon footprint enables the implementation of targeted strategies and efficient resource allocation.

Nov. 30 – Dec. 4
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M6-SSVA02

Vascular Imaging (Artificial Intelligence and Quantitative Imaging for Prognosis and Disease Monitoring in Vascular Disease)

Monday, Dec. 1 1:30PM - 2:30PM Room: S503

Jeremy D. Collins, MD (*Moderator*)
Thekla H. Oechtering, MD (*Moderator*)

Sub-Events

M6-SSVA02-2 AN EXPLAINABLE MACHINE LEARNING MODEL FOR PREDICTING 4-YEAR RISK OF CORONARY PLAQUE PROGRESSION IN EARLY-STAGE ATHEROSCLEROSIS: INSIGHTS FROM A COMMUNITY-BASED SERIAL CT STUDY

Yanping Su (*Presenter*)
Chenying Lu (*Abstract Co-Author*)
Jiansong Ji, MD (*Abstract Co-Author*)

PURPOSE

Coronary atherosclerosis (CAS) treatment decisions are critical for optimal patient outcomes. This study develops a clinically interpretable machine learning model for early-stage CAS by integrating traditional cardiovascular risk factors and quantitative coronary computed tomography angiography (CCTA)-derived plaque features to predict short-term plaque progression in asymptomatic populations.

METHODS AND MATERIALS

This retrospective cohort study analyzed serial CCTA data from 329 adults with early-stage CAS (median follow-up: 56 months). Feature selection combined Spearman correlation and minimal-redundancy-maximal relevance (mRMR). Eight machine learning algorithms were tested, with Random Forest selected for SHapley Additive exPlanation (SHAP) analysis.

RESULTS

The cohort (mean age 62.51±6.51 years, 57% male) demonstrated distinct plaque progression patterns in early-stage disease. Among the eight ML algorithms, Random Forest performed best (training AUC=0.94; testing AUC=0.84), outperforming traditional methods (DeLong test $p<0.05$). SHAP analysis identified key progression drivers: fibrofatty plaque volume, plaque composition heterogeneity, and monocyte count.

CONCLUSION

The ML-SHAP framework provides quantifiable insights into early-stage CAS, enabling personalized risk stratification before disease onset. The model outperforms conventional approaches in capturing complex biomarker interactions while ensuring clinical interpretability.

CLINICAL RELEVANCE/APPLICATION

This model facilitates proactive management strategies for early-stage CAS by integrating plaque characteristics and systemic inflammation markers, potentially delaying atherosclerotic progression in community-based populations.

M6-SSVA02-4 LATENT GROWTH OF THE DESCENDING THORACIC AORTA IS A MARKER OF GENETIC AORTOPATHY

Carlos Alberto Campello Jorge, MD (*Presenter*)
Prabhvir S. Marway, BA, MBBChir (*Abstract Co-Author*)
Gregory Spahlinger (*Abstract Co-Author*)
Nic Tjahjadi (*Abstract Co-Author*)
Nicholas S. Burris, MD (*Abstract Co-Author*)

PURPOSE

Accurate determination of disease etiology in ascending thoracic aortic aneurysm (aTAA) is crucial for best management. Specifically, identifying patients with heritable thoracic aortic diseases (HTAD) caused by genetic mutations (e.g., Marfan syndrome) is critical as the risk of aortic complications in this population is 250 times higher than the general population. Diffuse aortic involvement in HTAD is commonly observed, however, the importance of growth in non-dilated descending aortic segments, termed latent aortic growth (LAG), remains unclear. Vascular deformation mapping (VDM), an image analysis technique, accurately quantifies 3D aortic growth from CT angiography (CTA). We aimed to determine the association between LAG and HTAD diagnosis in a population of aTAA patients.

METHODS AND MATERIALS

This single-center retrospective cohort study (2004-2024) included adult patients (=18 years) with aTAA, non-dilated descending aortas (<30mm), and =2 gated thoracic CTAs over =2 years. Exclusions included poor imaging, aortitis, or prior descending aortic intervention. Patients were grouped based on genetic testing: 1) Tested/HTAD - pathogenic variant; 2) Tested/VUS - variant of uncertain significance; 3) Tested/Negative - negative or likely benign variant; 4) Untested/Community - aTAA patients without genetic testing or strong HTAD suspicion. Descending thoracic aortic growth rate was quantified by VDM, with LAG defined as >0.3 mm/year (90th percentile).

RESULTS

Of 717 patients (Tested/HTAD n=112; Tested/VUS n=35; Tested/Negative n=101; Untested/Community n=471), LAG was present in 32%, 23%, 9%, and 18% of these groups, respectively. Presence of LAG was associated with greater odds of HTAD diagnosis versus a Negative result (OR = 4.8 [95% CI: 2.2 - 10.7], $p < 0.01$). Multivariable analysis confirmed LAG as an independent predictor of HTAD diagnosis (OR = 4.69 [95% CI: 1.63 - 13.53], $p < 0.01$), while older age (OR = 0.93, $p < 0.01$) and bicuspid aortic valve (OR = 0.31, $p = 0.02$) were associated with decreased odds.Patients with LAG in the Untested/Community group had higher rates of tobacco use (63% vs. 39%, $p = 0.02$), family history of aTAA (42 vs. 29%, $p = 0.03$), and met AHA guidelines for genetic testing more frequently (72% vs. 56%, $p = 0.01$), but had lower rates of hyperlipidemia (50% vs. 64%, $p = 0.01$). LAG prevalence in this group was higher than in Tested/Negative group (18% vs. 9%; $p = 0.04$).

CONCLUSION

In patients with aTAA, the presence of growth in a non-dilated descending aorta (LAG) indicates a more diffuse disease phenotype, and one that is significantly associated with genetic aortopathy.

CLINICAL RELEVANCE/APPLICATION

Three-dimensional growth phenotyping by VDM may be helpful in defining disease etiology and severity in patients with aTAA.

M6-SSVA02-5 QUANTIFYING VARIABILITY OF ASCENDING AORTIC GROWTH MEASUREMENTS BETWEEN MANUAL, AI-BASED, AND THREE-DIMENSIONAL METHODS

Prabhvir S. Marway, BA, MBBChir (*Presenter*)
Carlos Alberto Campello Jorge, MD (*Abstract Co-Author*)
Timothy Baker, PhD (*Abstract Co-Author*)
Gregory Spahlinger (*Abstract Co-Author*)
Nicholas S. Burris, MD (*Abstract Co-Author*)

PURPOSE

Imaging surveillance to track growth of ascending thoracic aortic aneurysm (aTAA) is central to management. Increased growth rates (>3-5 mm/year) are a criterion for prophylactic repair and confer a 2-3-fold risk of aortic dissection. However, the large degree of measurement variability (±2-5 mm) seen with manual diameter measurements significantly hinders reliable tracking of aortic growth. To address this challenge, emerging image analysis methods have emerged that employ either an AI-based approach (multi-task U-net for aortic diameter measurement) or a registration-based technique that yields a 3D aortic growth map (vascular deformation mapping, VDM). The purpose of this study was to compare the consistency of ascending aortic (AsAo) growth trajectories between manual, AI and VDM based methods.

METHODS AND MATERIALS

Manual AsAo diameters were collected retrospectively from all available clinical CTA reports (Jan 2000 - Dec 2023), performed by 3D technicians using standardized protocols. U-Net and VDM pipelines were applied to CTAs from 4664 patients from an institutional cardiovascular research database, matching outputs to respective manual diameters where available. VDM was used for 3D growth analysis at each CTA surveillance interval, with the 90th percentile radial growth value (in mm) at each interval added to the baseline diameter to yield a trajectory. Patients with ascending aortic repair or < 2 available CTAs were excluded. Growth trajectories were classified as "inconsistent" if the diameter decreased by >1 mm over any interval. Among subjects with =3 intervals, growth variability was further quantified using isotonic regression by analyzing residuals from the fitted monotonic function.

RESULTS

11,867 Manual diameters (8,504 intervals) were collected from 3,363 patients. 2,456 paired U-Net diameters (1,611 intervals) were collected from 731 patients, alongside 712 paired VDM intervals in 406 patients. Inconsistent intervals were present in 29.4% of Manual trajectories, 21.1% for U-Net trajectories ($p<0.001$) and 1.4% for VDM-derived trajectories ($p<0.001$). After fitting isotonic regressions, residuals were much more widely distributed for Manual diameters (95% CI: -1.233, 1.220 mm, 9,133 measures), compared to U-Net (95% CI: -0.670, 0.706 mm, 1,426 measures) and VDM (95% CI: -0.327, 0.325 mm, 589 measures) (Figure 1).

CONCLUSION

Automated AI and image registration-based approaches for tracking AsAo growth demonstrate less variability compared to manual measurements.

CLINICAL RELEVANCE/APPLICATION

Reduced variability in aortic growth measurements from automated approaches improve distinction between stable and progressive disease.

M6-SSVA02-6 HIPATH: A MULTIMODAL DEEP LEARNING TOOL FOR VESSEL SEGMENTATION AND PRECISION DIAGNOSIS OF PAD

Eniko Pomozi, MD (*Presenter*)

PURPOSE

Peripheral Artery Disease (PAD) is a major global health issue, resulting in lower limb amputations. Comprehensive disease understanding of its pathophysiology remains limited. Conventional imaging often fails to delineate soft tissue and plaque components, limiting clinical decision-making. To address this gap, we established our unique Biorepository, comprising 109 cadaveric legs from patients with chronic limb-threatening ischemia. From this collection, selected specimens undergo multimodal imaging and histologic analysis. We have already shown strong correlations between UTE MRI imaging and vascular lesion characteristics, although precise integration of these modalities remains challenging. For the solution, we introduce HiPath, a deep-learning model for enhanced tissue characterization.

METHODS AND MATERIALS

We analyzed 15 vessel samples from 15 amputated legs, each scanned using ultra-short echo time (UTE) 9.4T MRI and processed with H&E and Movat histology staining, yielding 114 cross-sections. Our workflow includes: training HiPath to generate virtual histology from real histology slices, aligning virtual histology to high-resolution MRI images, performing transcriptomics sequencing for further integration and ultimately building an automated pipeline for MRI-only-based virtual histology generation.

RESULTS

9.4T ex vivo ultra-high resolution UTE MRI images were successfully co-registered with histologic sections. HiPath outperformed already existing PLIP and CONCH models in tissue segmentation and classification. Natural language annotations were used to enhance MRI interpretation via NLP-based model training. Transcriptomic sequencing was performed to integrate gene expression data for molecular-level tissue characterization.

CONCLUSION

Our novel biorepository and MRA imaging platform represent a significant step forward in AI-driven PAD diagnostics. By integrating deep learning and multimodal imaging, HiPath enables high-precision segmentation, automated tissue characterization, and improved diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

Our workflow enables non-invasive, biopsy-free tissue characterization using UTE MRI, supports precision diagnostics and individual care in vascular medicine, establishes a standardized, scalable framework for AI model training and validation in PAD research, as well as provides critical insights into plaque characteristics and vessel remodeling processes.

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M6-STCE1

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Monday, Dec. 1 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

M6-STCE1-1 ASSESSING THE EFFECTIVENESS OF MICROVASCULAR FLOW IMAGING FOR ULTRASOUND-BASED DIAGNOSING FOCAL NODULAR HYPERPLASIA

Pal Novak Kaposi, MD, PhD (*Presenter*)
Aladar D. Ronaszeki, MD (*Abstract Co-Author*)
Robert Stollmayer (*Abstract Co-Author*)
Viktor Berczi, MD, PhD (*Abstract Co-Author*)
Pal Maurovich-Horvat, PhD (*Abstract Co-Author*)
Gabriella Gyoriga (*Abstract Co-Author*)

PURPOSE

To identify the characteristic vascular features of focal nodular hyperplasia (FNH) using microvascular flow imaging (MVI) and evaluate the effectiveness of MVI in diagnosing FNH.

METHODS AND MATERIALS

This retrospective study involved the use of B-mode ultrasound (US) and MVI scans of 41 FNHs, 21 hepatocellular carcinomas (HCCs), 20 metastases (METs), 10 hepatocellular adenomas (HCAs), and 8 hemangiomas (HEMs) from a total of 80 patients. Diagnoses were confirmed through contrast-enhanced imaging or histological analysis. Two independent observers assessed the vascular patterns on MVI. We calculated interobserver agreement and developed logistic regression models based on either B-mode or MVI features to differentiate FNH from other focal liver lesions (FLLs).

RESULTS

Interobserver agreement for MVI patterns showed substantial consistency, with a ? value of 0.641 ($p < 0.001$). The spoke-wheel pattern had a strong association with FNH, indicated by odds ratios (OR) of 51.53 and 35.28, while the central artery displayed ORs of 4.96 and 1.95. However, the spoke-wheel pattern was also observed by the two observers in subsets of HCAs (20-30%), HCCs (14-19%), and METs (5-15%). Rim vascularity was frequently seen but lacked specificity. The model based on MVI features showed significantly better performance in distinguishing FNHs, achieving an area under the curve (AUC) of 0.891 ($p < 0.001$). In comparison, the B-mode model had an AUC of 0.814. For lesions measuring 3 cm or larger, the accuracy of the MVI model was even higher, with an AUC of 0.944 ($p < 0.001$).

CONCLUSION

MVI enhances diagnostic confidence for FNH, particularly in asymptomatic patients with low malignancy risk. However, due to overlapping features with a subset of malignant FLLs, MVI must be interpreted with caution.

CLINICAL RELEVANCE/APPLICATION

MVI can be applied to all incidentally detected FLLs and in cases with equivocal imaging or clinical findings to narrow down or confirm the differential diagnosis.

M6-STCE1-3 CYCLEGAN BASED HYBRID MULTIDIMENSIONAL MRI SYNTHESIS FOR RAPID NONINVASIVE CHARACTERIZATION OF PROSTATE CANCER MICROARCHITECTURE

Aritrick Chatterjee, PhD (*Presenter*)
Dianning He (*Abstract Co-Author*)
Guantian Huang (*Abstract Co-Author*)
Abel Lorente Campos, PhD (*Abstract Co-Author*)
Aytekin Oto, MD (*Abstract Co-Author*)
Gregory S. Karczmar, PhD (*Abstract Co-Author*)

PURPOSE

Hybrid multidimensional MRI (HM-MRI) offers a novel avenue for in-vivo characterization of prostate cancer (PCa) microstructure by probing the interaction between diffusion and relaxation parameters using two dimensional sampling. However, the need to acquire multiple combinations of diffusion weightings (b values) and echo times (TEs) in conventional HM-MRI leads to prolonged scans, which limits clinical application. To overcome this barrier, we propose a deep learning based HM-MRI synthesis framework that dramatically shortens scan time without compromising tissue composition mapping accuracy.

METHODS AND MATERIALS

18 patients with biopsy-proven PCa underwent HM-MRI on a 3T MRI. The HM-MRI protocol comprised b values (0, 150 and 1000 s/mm²) and TEs (57, 70 and 150 ms), requiring 9-12 minutes of acquisition. Histopathology provided ground truth of epithelium, stroma, and lumen. We trained CycleGAN based model to infer HM-MRI from a reduced acquisition subset. Key methodological innovations included: (1) ROI guided generator training restricted to prostate gland; (2) three channels prediction of microstructure fractions with sum-to-one softmax; and (3) evaluation of all b value/TE pairings, identifying the combination of b = 0, 150 and 1000 s/mm² with TE = 150, 70 and 57 ms as the best optimal. Performance was quantified by peak signal to noise ratio (PSNR) and structural similarity index measure (SSIM).

RESULTS

Our framework reduced the acquisition time by 65%. Averaged across the five patients test set, epithelium yielded PSNR = 16.38 ± 1.04 dB and SSIM = 0.83 ± 0.05; stroma yielded PSNR = 12.62 ± 1.22 dB and SSIM = 0.83 ± 0.06; lumen yielded PSNR = 16.61 ± 1.48 dB and SSIM = 0.86 ± 0.05. In normal regions, predicted epithelium was 24.86 ± 6.46% (vs. 24.28 ± 7.23%), stroma 54.11 ± 7.41% (vs. 54.78 ± 10.06%), and lumen 21.03 ± 8.13% (vs. 21.27 ± 10.87%). Within PCa zones, epithelium was 39.01 ± 6.53% (vs. 42.20 ± 1.32%), stroma 44.08 ± 4.86% (vs. 43.27 ± 10.25%), and lumen 16.91 ± 4.76% (vs. 14.53 ± 10.68%).

CONCLUSION

The proposed CycleGAN based HM-MRI synthesis framework achieves a drastic reduction in scan time while delivering accurate maps showing volume fractions of three tissues. By optimizing b value/TE selection and incorporating anatomical constraints, it enables rapid, noninvasive delineation of PCa microstructure, with potential to improve lesion grading and guide precision therapy.

CLINICAL RELEVANCE/APPLICATION

This deep learning-accelerated HM-MRI framework effectively reduces the time to acquire patient images. Quantitative epithelium, stroma, and lumen fractions derived from this approach hold promise as biomarkers for distinguishing clinically significant PCa, optimizing targeted biopsy, and monitoring therapeutic response.

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Nov. 30 – Dec. 4
RSNA® 2025
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M6-STCE2

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Monday, Dec. 1 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

M6-STCE2-1 A MULTI-HOSPITAL STUDY OF AUTOMATED OPPORTUNISTIC SCREENING FOR HEPATIC STEATOSIS

Garv Mehdiratta (*Presenter*)
Jeffrey Duda (*Abstract Co-Author*)
Ameena Elahi, MS, ARRT (*Abstract Co-Author*)
Arijitt Borthakur, PhD, MBA (*Abstract Co-Author*)
Neil R. Chatterjee, MD, PhD (*Abstract Co-Author*)
James C. Gee, PhD (*Abstract Co-Author*)
Daniel Rader (*Abstract Co-Author*)
Matthew T. MacLean, MD (*Abstract Co-Author*)
Marina Serper (*Abstract Co-Author*)
David Zhang (*Abstract Co-Author*)
Hersh Sagreiya, MD (*Abstract Co-Author*)
Charles E. Kahn JR, MD, MS (*Abstract Co-Author*)
Walter R. Witschey, PhD (*Abstract Co-Author*)

PURPOSE

Hepatic steatosis is common but often underreported in abdominal imaging, despite its diagnostic significance and screening potential. Automated AI systems with orchestrated liver segmentation offer scalable steatosis detection. This study examined how such an AI orchestrator impacted radiologist reporting and concordance with quantitative findings on routine unenhanced abdominal computed tomography (CT) scans.

METHODS AND MATERIALS

We deployed an orchestrated AI liver segmentation model in a multihospital network consisting of a tertiary care center and community hospitals. We describe the performance characteristics of the AI orchestrator among eligible abdominal imaging studies. We analyzed 12,086 abdominal CT studies from February 2024 to March 2025, integrating natural language processing (NLP) to identify documentation of hepatic steatosis and comparing to AI-derived attenuation measurements. Readers were stratified into groups based on AI utilization: Group 1A (used AI), Group 1B (past AI users not using AI for these reports), and Group 2 (never used AI). Positivity rates and AI-enhanced detection rates (AEDR) were compared among these readers. AEDR was defined as AI-positive cases not documented in the radiology report divided by AI-positive cases that were documented.

RESULTS

NLP identified steatosis in 12.2% of reports overall. The AEDR for Groups 1A (n = 248 cases), 1B (n = 3,408), and 2 (n = 8,587) was 0.318, 4.500, and 3.359, respectively. Quantitative thresholds captured numerous cases not documented by radiologists, suggesting underreporting. Liver attenuation was higher in females (mean = 53.15 HU, 95% CI: 52.86-53.44) than males (50.89 HU, 95% CI: 50.59-51.19), while spleen-hepatic attenuation difference (SHAD) was more negative in females (-11.78 HU, 95% CI: -12.05 to -11.52) than males (-10.42 HU, 95% CI: -10.69 to -10.15). SHAD demonstrated a small but statistically significant decline with age (slope = -0.099 HU/year, $p < 0.0001$), while liver attenuation did not ($p = 0.545$).

CONCLUSION

Quantitative imaging traits identify many potential cases of hepatic steatosis not documented in clinical reports. Usage of attenuation and liver volume metrics in reporting is associated with higher concordance between quantitative findings and NLP-detected steatosis. These findings support the potential utility of automated tools to surface underreported imaging biomarkers and standardize detection across practice settings.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the potential of AI-derived quantitative metrics to enhance opportunistic screening for hepatic steatosis. This enables earlier detection of hepatic steatosis through analysis of routine patient scans, adding clinical value at no additional cost.

M6-STCE2-2 MULTI-ORGAN MACHINE LEARNING ANALYSIS OF COMPUTED TOMOGRAPHY BODY COMPOSITION AND MYOCARDIAL INFARCTION AND MORTALITY IN THE SCOT-HEART TRIAL

Michelle C. Williams, MBChB, PhD (*Presenter*)
Alan Ranieri Medeiros Guimaraes (*Abstract Co-Author*)
Steven Williams (*Abstract Co-Author*)
Mark T. Macmillan, BMedSc,MBChB (*Abstract Co-Author*)
Kayleigh Wood, MBChB, FRCR (*Abstract Co-Author*)
Chaoyang Wang, MBChB (*Abstract Co-Author*)
Jonathan Weir-McCall, FRCR (*Abstract Co-Author*)
Philip Adamson (*Abstract Co-Author*)
Giles Roditi, FRCR (*Abstract Co-Author*)
Nicholas Mills, MD (*Abstract Co-Author*)
Marc R. Dweck, BSC, MBChB (*Abstract Co-Author*)
Marc Dewey, MD (*Abstract Co-Author*)
Jakob Wasserthal (*Abstract Co-Author*)
Piotr J. Slomka, PhD (*Abstract Co-Author*)
Damini Dey, PhD (*Abstract Co-Author*)
David E. Newby, PHD, MRCP (*Abstract Co-Author*)

PURPOSE

Coronary computed tomography angiography (CCTA) contains valuable prognostic information beyond coronary findings. We assessed 10-year prognostic implications of machine learning-based multi-organ body composition assessment in the Scottish COmputed Tomography of the HEART (SCOT-HEART) trial.

METHODS AND MATERIALS

Wide field-of-view images were processed using the TotalSegmentator model. Volume and mean attenuation were calculated for organ segmentations. Multivariable models were constructed for all-cause mortality and myocardial infarction (MI), adjusted for age, sex, and scan length, with odds ratio (aOR) or hazard ratio (aHR) and 95% confidence interval (CI) calculated per 10-unit increment.

RESULTS

In 1722 patients (age 57.5±9.5 years, 55.7% male) mortality occurred in 133 (7.7%) and MI in 106 (6.2%). Coronary artery disease was associated with lower lung (aOR 1.04, 95% CI 1.03, 1.06, p<0.001) and liver (aOR 0.87, 95% CI 0.8, 0.95, p=0.034) attenuation and higher torso fat volume (aOR 1.01, 95% CI 1.01, 1.02, p<0.001). Mortality was associated with volume of skeletal muscle, costal cartilage, vertebrae, torso fat, aorta, left ventricle, right ventricle and oesophagus, and with attenuation of ribs, vertebrae and skeletal muscle. Lower skeletal muscle attenuation was an independent predictor of all-cause mortality (aHR 0.61, 95% CI 0.47, 0.79, p<0.001). MI was associated with myocardial volume (aHR 1.09, 95% CI 1.01, 1.16, p=0.018) and attenuation of ribs (aHR 0.98, 95% CI 0.96, 1.0, p=0.043) and skeletal muscle (aHR 0.96, 95% CI 0.89, 1.02, p=0.002). However, when additionally adjusted for coronary calcium, only skeletal muscle attenuation was associated with MI (aHR 0.72, 95% CI 0.57, 0.91, p=0.007). Patients with skeletal muscle attenuation below the median were more likely to die (HR 1.85, 95% CI 1.30, 2.64, p<0.001) or suffer MI (HR 1.58, 95% CI 1.07, 2.33, p=0.022).

CONCLUSION

Multi-organ body composition analysis from CCTA provides additional prognostic information, and skeletal muscle attenuation is particularly important.

CLINICAL RELEVANCE/APPLICATION

Machine learning-based body composition analysis from CCTA provides prognostic information beyond the assessment of the coronary arteries, identifying both myocardial infarction and all cause mortality. Skeletal muscle in particular provided important prognostic information. This information could be used to identify high risk groups who could benefit from additional treatment.

M6-STCE2-3 PREVALENCE AND CLINICAL SIGNIFICANCE OF WHOLE-BODY MAGNETIC RESONANCE IMAGING (MRI) FINDINGS IN A LARGE COHORT

Sean D. Raj, MD, MBA (*Presenter*)
Xiaowei Hong (*Abstract Co-Author*)
Erik Sober (*Abstract Co-Author*)
Barry J. Sadegi, MD (*Abstract Co-Author*)
John Simon, MD (*Abstract Co-Author*)

PURPOSE

Determine prevalence, anatomical distribution, and clinical significance of abnormalities detected using standardized whole-body MRI (WB-MRI).

METHODS AND MATERIALS

Radiology reports from WB-MRI examinations performed from July 2024 to Jun 2025 at SimonMed Imaging centers were retrospectively analyzed. The imaging protocol included brain imaging (axial T2 FLAIR, 3-D T1, axial DWI), neck imaging (axial T2), non-contrast 3D time-of-flight MRA of the circle of Willis and carotid arteries (stenosis quantified per NASCET criteria), lumbar spine imaging (sagittal T2), and multiplanar multisequence imaging of the chest, abdomen, and pelvis. Partial or full protocols applied per clinical need. clinical need. A large language model and keyword search were used to extract information from radiology reports. All reported abnormalities were categorized by anatomical region and follow-up recommendations were classified as: no follow-up needed, additional imaging required, biopsy, recall, or others.

RESULTS

The study included radiology reports from 2773 unique patients underwent WB-MRI examination from 59 imaging center locations. WB-MRI detected abnormalities in 2,576 of 2,773 patients (92.9%), totaling 13,971 distinct findings. Anatomical distribution analysis revealed abdominal abnormalities as most frequent (5089 findings, 36.4%), followed by osseous structures (2773, 19.6%), head (2,245, 16.1%), pelvis (2046, 14.6%), neck (976, 7.0%), chest (648, 4.6%), and limbs (234, 1.7%). Follow-up recommendations were made for 2,559 findings (18.3%): imaging surveillance or further imaging for more definite diagnosis was suggested for 1997 findings (14.3%) most commonly for thyroid, hepatic and hepatic lesions, biopsy for 67 (0.5%) primarily for prostate lesions and thyroid lesions. Overall, 48.6% (1,252/2,773) of patients were recommended with imaging follow-up. There is a positive correlation between patient age and the average number of findings per patient.

CONCLUSION

WB-MRI offers a comprehensive, single-session evaluation of asymptomatic adults, commonly identifying abnormalities (predominantly abdominal and osseous). WB-MRI demonstrates high diagnostic yield and effectively differentiates findings requiring intervention from benign variants.

CLINICAL RELEVANCE/APPLICATION

This study provides valuable data on the prevalence and significance of WB-MRI findings in asymptomatic adults. These results support the development of evidence-based follow-up strategies, which can help optimize resource utilization by potentially reducing unnecessary downstream imaging while maintaining diagnostic accuracy for clinically significant lesions.

Nov. 30 – Dec. 4
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M7-SSBR03

Breast Imaging (Breast Density and Breast Cancer Risk)

Monday, Dec. 1 3:00PM - 4:00PM Room: S406A

Nisha Sharma, MBChB, FRCR (*Moderator*)
Vilert A. Loving, MD, MMM (*Moderator*)

Sub-Events

M7-SSBR03-1 DO DEEP LEARNING BREAST CANCER RISK SCORES CHANGE MEANINGFULLY OVER TIME? A LONGITUDINAL ANALYSIS

Constance D. Lehman, MD, PhD (*Presenter*)
Sarah Mercaldo, PhD (*Abstract Co-Author*)
Shadi Azam (*Abstract Co-Author*)
Andrew R. Carney, MS (*Abstract Co-Author*)
Leslie Lamb, MD, MSc (*Abstract Co-Author*)

PURPOSE

Prior studies show that AI-based breast cancer detection scores may rise years before diagnosis, but these reflect models trained to identify visible abnormalities. We evaluated whether image-only deep learning (DL) risk scores—generated by a model trained to predict 5-year future breast cancer risk—change meaningfully over time and whether trajectories differ between women who develop breast cancer and those who remain cancer-free.

METHODS AND MATERIALS

We applied a validated image-only DL model, trained to estimate 5-year future breast cancer risk from four-view digital screening mammograms, to exams from 54,361 women (2009-2024). The model uses no clinical or demographic data. We analyzed 159,556 consecutive screening digital mammograms from women who either remained cancer-free or were diagnosed with breast cancer within 1 year of their final ("index") exam. All exams within 6 years prior to the index exam were included. Women were categorized into "future cancer" (n=817) and "cancer-free" (n=53,544) groups. We summarized DL risk scores at each time point using medians and interquartile ranges (IQR), and we used Wilcoxon rank-sum tests to compare groups. Linear mixed-effects models estimated longitudinal slopes, with and without adjustment for age.

RESULTS

Median patient age was 61 years (IQR: 52-70); the median number of mammograms per woman was 3 (IQR: 2-4). Risk scores increased over time in the future cancer group (slope = 1.13/year; 95% CI: 1.08-1.18; $p < .001$) and remained flat in the cancer-free group (slope = 0.09/year; 95% CI: 0.08-0.10; $p < .001$); the between-group slope difference was 1.04 ($p < .001$). At each annual interval, DL risk scores were significantly higher in the future cancer group than in the cancer-free group: at 5-6 years (median 2.1 [IQR: 1.5-2.8] vs 1.8 [1.4-2.4]; $p = .003$), 4-5 years (2.3 [1.8-3.1] vs 2.0 [1.5-2.7]; $p < .001$), 3-4 years (2.8 [2.0-5.0] vs 2.1 [1.5-3.0]; $p < .001$), 2-3 years (2.7 [2.0-5.6] vs 2.1 [1.5-3.1]; $p < .001$), 1-2 years (3.2 [2.1-7.1] vs 2.1 [1.5-3.1]; $p < .001$), and at the index exam (6.6 [2.7-12.5] vs 2.2 [1.6-3.1]; $p < .001$). Adjustment for age yielded similar slope estimates.

CONCLUSION

Image-only DL risk scores demonstrate dynamic changes over time, rising as early as 6 years before breast cancer diagnosis. This suggests value in monitoring longitudinal risk patterns.

CLINICAL RELEVANCE/APPLICATION

These findings position DL risk scores as dynamic biomarkers. Monitoring changes over time may enhance personalized screening strategies and support more effective risk-reduction interventions.

M7-SSBR03-2 IMPACT OF BREAST DENSITY CHANGE OVER TIME ON RISK MODEL CALIBRATION AND PREDICTION ACCURACY

Stamatia V. Destounis, MD (*Presenter*)
Melissa L. Hill, PhD (*Abstract Co-Author*)
Jessica Salamone, MS (*Abstract Co-Author*)
Andrea L. Arieno, BS (*Abstract Co-Author*)
Brian Drohan, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate how changes in breast density over time affect the calibration and predictive performance of breast cancer risk models in a screening population, using both volumetric and BI-RADS-equivalent density measures.

METHODS AND MATERIALS

This retrospective study analyzed breast cancer risk assessments in a screening mammography cohort from 12/1/2016 to 4/3/2024. Included were women aged 40-79 with =5 years of screening and no prior cancer history. Volumetric breast density (VBD) was measured via Volpara software, and BI-RADS-like categories were derived. Risk scores were calculated using the Tyrer-Cuzick v8 model, which adjusts for density through a density residual (DR) based on age and BMI. DR values were analyzed over time to assess their variance and associated relative risk (RR). Calibration was evaluated by comparing observed vs. expected cancer incidence using four inputs: no density, initial VBD, initial BI-RADS-equivalent density, and 5-year average VBD. Discrimination was measured using the area under the curve (AUC). Risk results presented are TC 5-year risk.

RESULTS

The dataset included 335,328 images from 15,105 patients (median follow-up 5.3 years); 420 developed breast cancer. AUC values were similar across models, with average VBD performing best (AUC = 0.647) and no density the lowest (AUC = 0.632). Calibration improved with VBD input. Expected cancers were underestimated without density (370.8; $p<0.05$) and with BI-RADS (348.4; $p<0.001$) but closely matched observed with VBD (433.8) and average VBD (424.4). E/O ratios were 0.88, 0.83, 1.03, and 1.01, respectively. The median maximum RR shift per patient was greater using VBD vs. BI-RADS (0.281 vs. 0.220).

CONCLUSION

Breast density changes over time meaningfully impact risk prediction. Although AUC differences were minimal, longitudinal VBD improves calibration and may enhance the reliability of model-based screening decisions. These findings align with emerging evidence that incorporating density change over time enhances predictive accuracy and model reliability.

CLINICAL RELEVANCE/APPLICATION

Tracking VBD over time provides more accurate breast cancer risk estimates than static or categorical density measures, supporting its use in longitudinal screening and high-risk patient management.

M7-SSBR03-3 MAMMOGRAPHY AI RISK SCORE PERFORMANCE STRATIFIED ACROSS BI-RADS BREAST DENSITY AMONG A COHORT OF 183,441 WOMEN WITH A NEGATIVE SCREENING MAMMOGRAM OVER 15 YEARS

Tejomay Gadgil (*Presenter*)
Stacey Alexeeff (*Abstract Co-Author*)
Ninah Achacoso (*Abstract Co-Author*)
Laura J. Esserman, MD (*Abstract Co-Author*)
Lawrence Gerstley (*Abstract Co-Author*)
Nola M. Hylton, PhD (*Abstract Co-Author*)
Lawrence Kushi (*Abstract Co-Author*)
Catherine Lee (*Abstract Co-Author*)
Amethyst Leimpeter (*Abstract Co-Author*)
Donald Lewis, MS (*Abstract Co-Author*)
Vincent Liu (*Abstract Co-Author*)
Laurie R. Margolies, MD (*Abstract Co-Author*)
Albert Pu (*Abstract Co-Author*)
Joe Rothstein (*Abstract Co-Author*)
Jun Shan, PhD (*Abstract Co-Author*)
Yiwey Shieh (*Abstract Co-Author*)
Jeffery Tice (*Abstract Co-Author*)
Laura v. Veer, PhD (*Abstract Co-Author*)
Marvella Villasenor (*Abstract Co-Author*)
Mark Westley (*Abstract Co-Author*)
Li Shen, PhD (*Abstract Co-Author*)
Dorota J. Wisner, MD, PhD (*Abstract Co-Author*)
Jason Cord, MD (*Abstract Co-Author*)
Weiva Sieh, MD,PhD (*Abstract Co-Author*)
Laurel Habel (*Abstract Co-Author*)
Vignesh A. Arasu, MD, PhD (*Abstract Co-Author*)

PURPOSE

Compare performance of BI-RADS breast density and Mirai, a mammography AI risk model, in predicting breast cancer occurrence after a negative screening mammogram in a large and diverse cohort.

METHODS AND MATERIALS

Negative screening full-field digital mammograms and BI-RADS assessments from 183,441 women with no observable breast cancer history or high-penetrant gene mutation were drawn from a large medical system from 2003-2022. 5-year Mirai risk scores were generated from 4 standard mammographic views. Ability to predict invasive or DCIS breast cancer for three models (BI-RADS, Mirai, and BI-RADS + Mirai) was estimated using a 1000 bootstrap, 5-fold cross-validated Cox proportional-hazards model at various time thresholds using Harrell's c-index and restricted cubic splines in the combined model. Mirai performance alone was further stratified by BI-RADS density. Cancer yield of Extremely Dense BI-RADS breasts and Mirai were compared at the threshold corresponding to the population percentage of women classified with Extremely Dense breasts.

RESULTS

Of the 183,441 women in the cohort, 6,998 women developed breast cancer within 15 years. AUCs for BI-RADS, Mirai, and the combined models were 0.60 (0.58-0.61), 0.70 (0.69-0.72), 0.71 (0.70-0.73) at 2 years, and 0.55 (0.55-0.56), 0.67 (0.66-0.67), 0.67 (0.66-0.68) at 10 years. AUCs for Mirai stratified by breast density were 0.76 (0.68-0.82) for Density A, 0.70 (0.67-0.73) for Density B, 0.69 (0.67-0.71) for Density C, 0.65 (0.60-0.69) for Density D at 2 years, and 0.67 (0.64-0.70) for Density A, 0.66 (0.65-0.67) for Density B, 0.66 (0.65-0.67) for Density C, 0.65 (0.62-0.67) for Density D at 10 years. Extremely dense women (~7% of population) only had mild increased risk for cancers (detecting 9% of all cancers, relative risk of 1.3). Mirai detected approximately double the cancers at the same proportion of density D women, with low overlap between the two measures (see accompanying figure).

CONCLUSION

Mirai had higher discrimination than BI-RADS breast density for short and long time horizons, with no improvement in the combined model. Mirai performed similarly when stratified by breast density and time horizons, except in density A women at 2 years, likely due to Mirai's diagnostic ability to detect cancers missed at screening.

CLINICAL RELEVANCE/APPLICATION

AI substantially improves risk stratification beyond breast density. Decisions for supplemental imaging and screening frequency should not rely on density alone in the age of AI risk models.

M7-SSBR03-4 IMAGE-ONLY DEEP LEARNING RISK MODEL VS BREAST DENSITY TO PREDICT FALSE NEGATIVE EXAMINATIONS

Leslie Lamb, MD, MSc (*Presenter*)
Sarah Mercaldo, PhD (*Abstract Co-Author*)
Andrew R. Carney, MS (*Abstract Co-Author*)
Constance D. Lehman, MD, PhD (*Abstract Co-Author*)

PURPOSE

As of September 2024, the US FDA mandated that women be informed of their breast density, both as a biomarker of future cancer risk and as a cancer masking factor. Image-only deep learning (DL) mammography-based risk models have demonstrated superior performance in predicting future cancer compared to breast density, but less is known of the potential role of DL models to predict risk of false negative (FN) examinations. The purpose of this study was to compare the performance of a DL risk model versus breast density in predicting FN screening examinations.

METHODS AND MATERIALS

This retrospective, multisite study included consecutive patients aged 30 years or older undergoing routine bilateral screening mammography from 2009-2018 across five facilities at a large academic medical center. A DL 5-year risk model (Mirai) was used to assess breast cancer risk. Based on National Comprehensive Cancer Network (NCCN) guidelines, patients were classified as low risk if their DL score was <1.7%, intermediate if > 1.7% and <3.0% and high risk if > 3.0%. Patient demographics and radiologist-assigned BI-RADS breast density were obtained from electronic medical records. Cancer outcomes were obtained through linkage to state

and regional cancer registries. FN rates (FNR) were calculated per 1000 screening mammograms and compared across risk and density groups using the Pearson chi-squared test.

RESULTS

123,091 bilateral screening mammograms in 67,019 patients met inclusion criteria. Median age was 58.0 years (IQR: 50.0-67.0). 82.1% (101,016/123,091) of exams were in White/non-Hispanic patients, 17.9% (22,075/123,091) in races other than White/non-Hispanic, and 1.6% (1996/123,091) in Hispanic. 9.0% (11,023/123,091) had fatty breasts, 49.6% (61,094/123,091) scattered fibroglandular, 37.2% (45,771/123,091) heterogeneously dense, and 4.2% (5203/123,091) extremely dense. FNRs in examinations classified as high, intermediate, and low risk by Mirai were 2.1 (59/27,906), 1.0 (50/50,683), and 0.6 (26/44,502); FNRs in dense and non-dense exams were 1.7 (89/50,974) and 0.6 (46/72,117).

CONCLUSION

A DL breast cancer risk model applied at screening mammography not only predicts future cancer but also identifies patients more likely to experience FN mammograms, providing added clinical value beyond breast density alone.

CLINICAL RELEVANCE/APPLICATION

Breast density notifications are now federally mandated. A DL risk model derived automatically at screening mammography offers a more individualized and potentially superior approach to identify patients at risk for both future cancers and missed diagnoses.

M7-SSBR03-5 IMPACT OF MAMMOGRAPHIC POSITIONING AND BREAST DENSITY ON AI-BASED SHORT-TERM BREAST CANCER RISK PREDICTION: PRELIMINARY RESULTS

Georgia G. Spear, MD (*Presenter*)
Mohamed Abdolell, MSc, BSc (*Abstract Co-Author*)
Laurie R. Margolies, MD (*Abstract Co-Author*)
Katharine Yao, MD (*Abstract Co-Author*)

PURPOSE

Artificial intelligence (AI) models offer the potential for scalable, image-based breast cancer risk stratification; however, the acquisition factors that may influence their accuracy require further understanding. This study quantifies the impact of mammographic positioning quality and the Breast Imaging Reporting and Data System (BI-RADS) breast density category on the discriminatory performance of a short-term AI risk model, with the objective of assessing calibration and performance in clinical deployment. This investigation examines the influence of mammographic positioning quality and breast density on the predictive accuracy of AI-based short-term breast cancer risk models.

METHODS AND MATERIALS

A retrospective cohort analysis included 11,136 screening mammograms (1,562 breast cancer cases, 9,574 controls) acquired between May 2017 and April 2023 from an urban healthcare network. Eligible mammograms had standard four-view sets without implants. Controls required negative follow-up mammograms =1 year post-screening. AI algorithms categorized mammographic positioning quality (Perfect, Good, Moderate, Inadequate) and breast density (BI-RADS 5th ed., categories A-D). Short-term risk predictions from the Mirai image-based model were evaluated using area under receiver operating characteristic curves (AUC) at 1-4-year intervals. Stratified analyses assessed the influences of positioning quality and breast density on prediction accuracy. Preliminary results were considered statistically significant at $p < 0.10$.

RESULTS

Performance of the Mirai risk model varied with mammographic positioning; mammograms rated Perfect had higher AUCs compared to Inadequate (2-year AUC, p=0.076). Breast density similarly impacted performance, with BI-RADS category A consistently demonstrating superior accuracy relative to the more dense categories (B,C,D; 2-year AUC, p=0.11). Both breast density and positioning quality independently affected AI model accuracy with less dense and higher quality positioning yielding higher AUCs.

CONCLUSION

Preliminary results show that inadequate mammographic positioning quality and higher breast density reduce the predictive accuracy of AI-based short-term breast cancer risk models. Ensuring optimal image quality is critical for reliable AI-driven risk assessment.

CLINICAL RELEVANCE/APPLICATION

Maintaining high-quality mammography and accurately assessing breast density are essential for effectively integrating AI-driven personalized breast cancer screening, particularly in patients with dense breast tissue or compromised image quality.

M7-SSBR03-6 INCREASING CANCER DETECTION IN DENSE BREASTS: A REAL-WORLD DEPLOYMENT OF A MULTISTAGE AI-DRIVEN WORKFLOW IN BREAST SCREENING WITH STRATIFIED ANALYSES ON OVER 570,000 CASES

Annie Ng, PhD (*Presenter*)
Leeann Louis, BS, PhD (*Abstract Co-Author*)
Edgar Wakelin (*Abstract Co-Author*)
Matthew McCabe, PhD (*Abstract Co-Author*)
Jiye G. Kim, PhD (*Abstract Co-Author*)
Christoph I. Lee, MD,MS (*Abstract Co-Author*)
Diana S. Buist, PhD,MPH (*Abstract Co-Author*)
Bryan Haslam, PhD (*Abstract Co-Author*)

PURPOSE

Women with dense breasts have a higher risk of developing breast cancer and a higher risk of cancer going undetected given cancer is more challenging to detect in dense breast tissue. AI has been shown to support increased cancer detection in breast screening, however, large-scale stratified analyses by breast density are required to assess the clinical impact across these relevant subgroups. This study assesses the clinical outcomes of a large-scale deployment of a multistage AI-driven workflow, including stratified analyses by breast density.

METHODS AND MATERIALS

A multistage AI-driven workflow was deployed across 109 sites and four states in the United States and involved concurrent reading with a CADe/x device, followed by an AI-facilitated safeguard review routing potentially missed findings to breast imaging experts. The standard of care (SOC) cohort included screens between Sept 2021 to May 2022. The AI-driven workflow cohort included screens between Aug 2022 and Dec 2022. Cancer detection outcomes including cancer detection rate (CDR), positive predictive value (PPV1), and cancer subtype proportions (grade, invasivity, and hormone receptor status (ER, PR, HER2)) were stratified for women with dense and non-dense breasts, defined as BIRADS categories C or D and A or B, respectively. Results for women with dense and non-dense breasts were compared using an unadjusted chi-square test.

RESULTS

The deployment of the multistage AI-driven workflow (N = 208 891) resulted in significantly increased CDR (6.18 vs 5.04, p<0.001) and PPV1 (4.25 vs 3.68, p=0.008) for women with dense breast as well as non-dense (CDR: 5.10 vs 4.21, p<0.001; PPV1: 6.09 vs 5.35, p=0.014) compared to SOC (N = 307 692). The majority of cancers detected by the AI-driven workflow were intermediate or high grade (80.6%) and invasive (67.5%). No differences were found in the distribution of cancer grade, invasiveness, and hormonal receptor status (p>0.05) for women with dense versus non-dense breasts.

CONCLUSION

The deployment of a multistage AI-driven workflow significantly improved clinical outcomes (CDR and PPV1) for women with dense and non-dense breasts, with the majority of cancers detected being clinically relevant.

CLINICAL RELEVANCE/APPLICATION

Detecting more clinically relevant cancers in women across all breast densities demonstrates the effectiveness and generalisability of an AI-driven workflow to support equitable clinical outcomes in screening mammography.

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Nov. 30 – Dec. 4
RSNA® 2025
Imaging the Individual

Abstract Archives of the RSNA, 2025

M7-SSBR04

Breast Imaging (Screening Mammography)

Monday, Dec. 1 3:00PM - 4:00PM Room: E451A

Jean M. Seely, MD, FRCPC (*Moderator*)
Thomas H. Helbich, MD, MBA (*Moderator*)

Sub-Events

M7-SSBR04-1 EVOLUTION OF BREAST CANCER SCREENING: FROM HUMAN-ONLY DOUBLE READING VIA AI-INTEGRATED DOUBLE READING TO AI-INTEGRATED SINGLE READING

Karin Dembrower, MD, PhD (*Presenter*)
Frida Pilblad (*Abstract Co-Author*)
Fredrik Strand, MD, PhD (*Abstract Co-Author*)

PURPOSE

At Capio S:t Göran hospital the interventional trial ScreenTrustCAD (NCT04778670) demonstrated that AI could safely replace one of two human radiologists in breast cancer screening. After the study, AI-integrated single-reading was implemented. Here, we compare screening metrics before and with AI.

METHODS AND MATERIALS

We analyzed three time periods with different reader settings. AI made blinded standalone binary flagging decisions similar to the radiologists. Any flagged exam was referred to a consensus discussion where at least two breast radiologist decided to recall or not. - PERIOD 1: Two radiologists without AI (Sep 2020- Mar 2021) - PERIOD 2: Two radiologists with AI (Apr 2021-Jun 2023) - PERIOD 3: One radiologist with AI (Jun 2023-Jun 2024). Women reporting symptoms, prior breast cancer or in a high-risk surveillance program were excluded. The AI system Lunit Insight MMG was used for all full-field mammograms from Philips equipment. For each time period, we determined the Recall Rate (RR), Cancer Detection Rate (CDR), Positive Predictive Value (PPV). Statistical estimations and tests were performed on Stata software.

RESULTS

During PERIOD 1, there were 24,770 screening examinations with a RR of 2.62% (649/24,770), CDR of 0.44% (108/24,770), PPV of 16.6%, CDR of invasive cancers 0.29% (71/24770). Below, percentages of positive or negative change represent comparison with period 1 (double-reading without AI).During PERIOD 2, there were 110,591 screening examinations with a RR of 2.96% (2,603/110,591) (+13.1%), CDR of 0.53% (+20.5%), PPV of 22.6% (+36.1%), CDR of invasive cancers 0.37% (410/110,591) (+28.9%)During PERIOD 3, there were 58,462 screening examinations with a RR of 2.54% (2,603/58,462) (-3.1%), CDR of 0.51% (+16.1%), PPV of 25.6% (+54.2%), CDR of invasive cancers 0.39% (+34,5%)Statistical significance was shown for the differences between: Lower RR for period 2 vs. period 1 (p=0.013), period 3 vs. period 1 (p<0.001); Lower PPV for period 2 vs. period 1 (p=0.001) and period 2 vs. period 3 (p=0.036); Higher invasive CDR for period 3 vs. period 1 (p=0.022). All other apparent differences were not significant.

CONCLUSION

When using the AI system Insight MMG as a standalone reader of screening mammograms paired with one radiologist, there were more invasive cancers detected and fewer healthy women recalled compared to double-reading radiologists. Compared to pairing AI with one radiologist, adding a second radiologist, the only difference was recalling more healthy women.

CLINICAL RELEVANCE/APPLICATION

The real-world results, comparing periods before and after AI implementation, reinforce the findings from the previous ScreenTrustCAD trial that AI may be favorably used as one reader of screening mammograms.

M7-SSBR04-3 COMPARISON OF BREAST DENSITY AND AJCC BREAST CANCER PATHOLOGICAL PROGNOSTIC STAGE IN SCREEN DETECTED AND INTERVAL CANCERS IN A UK PROGRAMME

Fleur Kilburn-Toppin, MBBChir, MA (*Presenter*)
Joshua Rothwell (*Abstract Co-Author*)
Nicholas R. Payne, PhD, MSc (*Abstract Co-Author*)
Sarah Hickman, MBBS (*Abstract Co-Author*)
Fiona J. Gilbert, MBChB, FRCR (*Abstract Co-Author*)

PURPOSE

To compare the relationship of breast density and tumour subtype using newer American Joint Committee on Cancer (AJCC) breast cancer staging 8 th edition pathological prognostic staging. Incorporated biomarkers have been shown to improve mortality prediction compared to anatomic TNM staging.

METHODS AND MATERIALS

All women screened in a three-year cohort (2017-2020) from a single site were included. Screen detected cancers (SDC) and interval cancer (IC) tumour characteristics were compared and related to breast density, AJCC prognostic staging and, for ICs, retrospective radiological classification ('normal/benign mammographic features' vs 'seen on retrospective review'). Tumour subtypes (tumour size, grade, lymph node status, ER/PR/HER2 status) were obtained from histological databases. BI-RADS breast density was estimated using Volpara and two deep learning algorithms and classified as non-dense (a+b) and dense (c+d).

RESULTS

55,010 women were screened and 723 cancers were diagnosed (463 SDCs; 260 ICs). 38% SDCs and 69% ICs were in dense breasts. Time to IC diagnosis was longer in dense breasts vs non-dense breasts (median: 636 days vs 759 days). 49% of all ICs were detected in the third year, irrespective of density. 19.2% of SDCs were stage 2A and above, compared to 45% for ICs. No significant difference was seen comparing SDC and IC tumour subtypes grouped by density but women with dense breasts were more likely to require neo-adjuvant chemotherapy (NAC) than those with non-dense breasts for both SDCs (12% vs 7.5%) and ICs; (21% vs 14%). Compared to other years, ICs diagnosed in the first year had the worst prognostic AJCC staging (64.7% year 1 vs 37.7.% year 2 vs 42.9% year 3 stage 2A and above). ICs classified

'as seen on retrospective review' were more likely to be stage 2A and above compared to radiological classification 'normal/benign mammographic features' (60.9% vs 43.1%).

CONCLUSION

ICs demonstrate worse prognostic staging than SDCs and are more likely to occur in dense breasts. ICs demonstrate a longer time from screen to diagnosis in dense breasts, but there is no prognostic difference for ICs based on breast density. Women with dense breasts are however more likely to undergo NAC. Prognostically worse ICs are more likely to occur in the first year and demonstrate retrospective radiological signs on mammography.

CLINICAL RELEVANCE/APPLICATION

Detection of biologically important cancers is crucial in reducing mortality with screening. Prognostically worse ICs are more likely in the first year and if radiological signs are present, highlighting an important opportunity for AI tools to support screening programs and improve breast cancer mortality.

M7-SSBR04-4 ASSOCIATION BETWEEN FALSE POSITIVE MAMMOGRAMS AND RETURN TO SCREENING IN A RACIALLY DIVERSE COHORT

Medha Gupta, BS (*Presenter*)
Janice M. Newsome, MD (*Abstract Co-Author*)
Hari Trivedi, MD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)
Rohan Satya Isaac (*Abstract Co-Author*)

PURPOSE

False positive (FP) results from mammography screening can cause financial and emotional burdens, increased healthcare costs, missed work, and patient anxiety. FP rates can reach 10- 12% among women aged 40-49. Prior studies have evaluated whether women with FP results return to screening, but certain findings report higher return rates compared to those with true negative results while others report lower rates. We evaluated the association between FP mammography and the likelihood of returning to screening within overall and stratified by race and age.

METHODS AND MATERIALS

We analyzed data from the Emory Breast Imaging Dataset (EMBED), from which we analyzed screening mammograms between January 1, 2013 and January 1, 2018. 75,429 patients with a BI-RADS 0 result ("needs additional imaging") were followed through their diagnostic pathway. Of these patients, 22,587 (29.9%) underwent diagnostic mammography, ultimately resulting in 19,741 patients with no suspicious findings (FP- imaging only) and 684 who required further biopsy which resulted in benign findings (FP- biopsy). FPs were classified based on the diagnostic outcome: either imaging showed no suspicious findings, or biopsy confirmed benign pathology. The measured outcomes were whether a patient returned to screening within 9-36 months and median time to return. Kaplan-Meier curves and log-rank tests were used to assess time to return and differences by race, age, and FP type.

RESULTS

Over the five-year period, the overall FP rate was 13.77% per screening exam. The highest FP rates were in Black patients (43.3%) and in age groups 40-49 (32.0%). Among patients who returned to screening, 52.3% were Asian, 57.4% Black and 65.1% White. The rate of return among patients with a true negative (TN) return (90.1%) was significantly greater than that of patients with any false positive result (58.0%) ($p<0.001$). Median time to return was significantly shorter among TN patients (388 days) and FP patients (423 days)($p<0.001$). Between FP types, there was no significant difference in rates of return between imaging only (61.3%) and biopsy (57.9%) groups ($p<0.05$). The median time to return was longer in the imaging only group (483 days) than the biopsy group (420 days) ($p>0.001$).

CONCLUSION

We found a higher FP than reported in previous studies, with Black patients and young patients experiencing a higher proportion of FPs compared to other race and age groups.

CLINICAL RELEVANCE/APPLICATION

Since FPs result from BI-RADS 0 findings, interventions are needed to reduce uncertainty and decrease recall rates. These interventions include AI-assisted interpretation and workflow changes to accommodate same-day diagnostic imaging, reducing time and opportunity cost associated with false positives.

M7-SSBR04-5 AUTOMATIC QUANTIFICATION OF BREAST ARTERIAL CALCIFICATION (BAC) ON SCREENING MAMMOGRAPHY IS AN INDEPENDENT PREDICTOR OF PERIPHERAL ARTERIAL DISEASE (PAD) IN WOMEN

Theodorus Dapamede, MD, PhD (*Presenter*)
Vedant Joshi (*Abstract Co-Author*)
Aisha Urooj (*Abstract Co-Author*)
Chad Robichaux (*Abstract Co-Author*)
Frank Li, PhD (*Abstract Co-Author*)
Seyed Mohammadreza Chavoshi, MD (*Abstract Co-Author*)
Bardia Khosravi, MD, MPH (*Abstract Co-Author*)
Aawez Mansuri, BS, MS (*Abstract Co-Author*)
Rohan Satya Isaac (*Abstract Co-Author*)
Beatrice Brown-Mulry (*Abstract Co-Author*)
Janice M. Newsome, MD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)
William C. O'Neill, MD (*Abstract Co-Author*)
Imon Banerjee, PhD (*Abstract Co-Author*)
Hari Trivedi, MD (*Abstract Co-Author*)

PURPOSE

Studies have shown that automatic quantification of BAC on routine screening mammography can opportunistically screen women at increased risk of major adverse cardiac events (MACE). We evaluated if BAC can also independently predict future diagnosis of peripheral artery disease (PAD) and vascular intervention.

METHODS AND MATERIALS

This retrospective cohort study included 59,854 women undergoing screening mammography at our institution between 2012-2020. An in-house AI model quantified BAC area (mm2) into Zero (0 mm2), Mild (>0-5 mm2), Moderate (>5-25 mm2) and Severe (>25mm2). Incident PAD diagnoses (ICD codes) and vascular interventions (CPT codes) were identified over a median of 8 years follow-up. We used Cox proportional hazard models to calculate adjusted Hazard Ratios (aHRs) for BAC categories (vs. Zero) in predicting time-to-PAD events, adjusting for age, DM, HTN, HLD, CKD, and smoking status.

RESULTS

Increasing BAC severity showed significant, graded associations with higher risk for both incident PAD diagnosis and intervention. Compared to Zero BAC, Moderate BAC (aHR 1.49, 95%CI: 1.24-1.78) and Severe BAC (aHR 2.59, 2.03-3.30) significantly predicted PAD diagnosis . For PAD intervention, Moderate (aHR 2.43, 1.50-3.94) and Severe BAC (aHR 3.62, 1.93-6.82) also showed significantly elevated risk ($p<0.001$). BAC remained a significant independent predictor for PAD diagnosis within all analyzed subgroups (age <50, DM, HTN, HLD, CKD, smoking history) after adjustment. Significant associations for Severe BAC and vascular intervention were seen in most subgroups.

CONCLUSION

AI-quantified BAC on screening mammograms independently predicts long-term risk of both PAD diagnosis and vascular intervention, with a significant graded effect. Its predictive value in younger women (<50) suggests utility for identifying premature risk. Furthermore, BAC significantly refines risk stratification within diverse high-risk subgroups (DM, HTN, HLD, CKD, smoking history), highlighting the value of opportunistic cardiovascular risk assessment derived from routine breast imaging.

CLINICAL RELEVANCE/APPLICATION

Mammogram BAC opportunistically identifies women at increased PAD risk, including younger individuals (<50) and those within major risk groups (DM, HTN, etc.), guiding targeted prevention.

M7-SSBR04-6 TRENDS IN BREAST CANCER INCIDENCE IN YOUNG WOMEN: EXPERIENCE AT AN OUTPATIENT COMMUNITY BREAST FACILITY

Stamatia V. Destounis, MD (*Presenter*)
Andrea L. Arieno, BS (*Abstract Co-Author*)

PURPOSE

To assess longitudinal trends in breast cancer incidence, method of detection, and tumor characteristics among women aged 18-49 over an 11-year period at an outpatient breast imaging practice.

METHODS AND MATERIALS

A retrospective review was conducted of breast cancer cases diagnosed in women aged 18-49 between 2014 and 2024 at a community outpatient breast imaging facility. This age group comprised 21-25% of the annual patient volume during the study period. Clinical and imaging data were reviewed, including detection modality, tumor grade, receptor status, size, and stage at presentation. Non-breast malignancies and cases lacking follow-up were excluded.

RESULTS

A total of 1,799 breast cancers were diagnosed in 1,290 women aged 18-49. Annual diagnoses in this group ranged from 145 to 196, with a mean age of 42.6 years (range 23-49). Of these, 731 (41%) were detected on screening and 1,068 (59%) on diagnostic evaluation. Invasive cancers comprised 1,451 cases (80.7%), while 347 (19.3%) were non-invasive. Twenty-three patients (1.8%) presented with metastatic disease. The average tumor size was 27 mm for DCIS and 22 mm for invasive cancers. A family history of breast cancer was documented in 381 cases (21%). Tumor grade distribution included 347 (19.3%) low-grade, 790 (43.9%) intermediate-grade, and 593 (33.0%) high-grade tumors; 154 (8.6%) were triple-negative. Age-stratified analysis showed that 423 cancers (24%) occurred in women under 40, and 1,376 (76%) in women aged 40-49. Annual cancer diagnoses in women under 40 ranged from 17 to 56, peaking in 2019, while cancers in women aged 40-49 consistently exceeded 98 per year. Total patients under 50 declined slightly from 24% in 2014 to 21% in 2024, but the absolute number of breast cancers in this cohort remained stable, representing approximately 20-24% of total breast cancer volume each year.

CONCLUSION

Women under 50 consistently represent a substantial portion of the breast cancer burden at our center. A significant percentage of these tumors are invasive, high-grade and triple negative, particularly among those under 40. These findings support the need for ongoing vigilance in imaging protocols and consideration of earlier or more intensive screening for higher-risk younger populations.

CLINICAL RELEVANCE/APPLICATION

Emerging national trends highlight a rising incidence of breast cancer in younger women, prompting re-evaluation of age-based screening thresholds and risk stratification strategies. Understanding age-specific tumor behavior and detection patterns can inform optimized imaging guidelines and early intervention approaches.

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Abstract Archives of the RSNA, 2025

M7-SSCH04

Chest Imaging (Vascular)

Monday, Dec. 1 3:00PM - 4:00PM Room: S403A

Patricia J. Mergo, MD (*Moderator*)
Stuart L. Cohen, MD (*Moderator*)

Sub-Events

M7-SSCH04-1 AGE-RELATED CHANGES IN LUNG PERFUSION USING PHOTON-COUNTING CT: EXPLORING A POTENTIAL IMAGING BIOMARKER FOR PULMONARY HYPERTENSION

Bjarne Kerber, MD (*Presenter*)
Jasmin Maria-Theresia Happe (*Abstract Co-Author*)
Thomas Frauenfelder, MD (*Abstract Co-Author*)
Sabine Franckenberg, MD (*Abstract Co-Author*)

PURPOSE

To assess age-related changes in lung perfusion using photon-counting CT (PCD-CT) and evaluate its potential as a diagnostic marker for chronic thromboembolic pulmonary hypertension (CTEPH) and pulmonary arterial hypertension (PAH).

METHODS AND MATERIALS

In this retrospective study, 50 patients aged 20 to 80 years (20 male, 30 female; mean age: males 57.2 ± 14.0 years, females 49.9 ± 19.7 years) underwent clinically indicated PCD-CT scans using a standardized CTEPH protocol. Scans were considered unremarkable based on initial radiology reports and secondary review, and patients with any pulmonary or vascular pathology were excluded to form a "healthy" reference cohort. Iodine maps were generated from spectral data and analyzed using a research version of a commercially available quantitative imaging platform. For each pulmonary lobe, mean enhancement, perfusion index (mean enhancement normalized to pulmonary trunc enhancement), and segmented lung volume were computed. Linear regression analysis was performed to evaluate associations with age and to derive age-adjusted reference values. A second cohort comprising 28 patients with confirmed pulmonary hypertension (PAH, CTEPH, lung disease, or multiple etiologies) was analyzed for comparison, using independent t-tests against healthy controls to assess perfusion deficits.

RESULTS

In healthy individuals, mean enhancement significantly declined with age across all lobes (e.g., LLL: r=-0.51, p<0.001; RLL: r=-0.52, p<0.001). Perfusion index similarly declined (e.g., RLL: r=-0.67, p<0.001). Lung volume showed a moderate positive correlation with age, especially in the upper lobes (RUL: r=0.48, p<0.001; LUL: r=0.38, p=0.007). Compared to controls, patients with PAH and CTEPH had significantly lower mean enhancement, especially in CTEPH (e.g., RLL: p=0.001; LLL: p=0.016). PAH patients especially with higher disease severity showed lower mean enhancement diffusely in all lobes (e.g., RUL: p=0.023), while CTEPH exhibited regional reduction consistent with vascular obstruction.

CONCLUSION

PCD-CT perfusion parameters correlate with age and are significantly reduced in pulmonary artery hypertension and CTEPH-affected lobes. These findings suggest potential for PCD-CT perfusion metrics as non-invasive imaging biomarkers for pulmonary hypertension (PH).

CLINICAL RELEVANCE/APPLICATION

Pulmonary hypertension, especially CTEPH, carries high morbidity and mortality but is treatable if detected early. Spectral CT allows quantitative lung perfusion imaging, revealing both age-related decline and disease-specific patterns, enabling potential early identification and severity estimation of PH using routine imaging protocols.

M7-SSCH04-2 A PREDICTION MODEL FOR PULMONARY EMBOLISM FROM CLINICAL AND CHEST X-RAY DATA

Nicoletta Raciti, MD (*Presenter*)
Caterina B. Monti, MD, PhD (*Abstract Co-Author*)
Francesco Rizzetto, MD (*Abstract Co-Author*)
Davide Capra, MD (*Abstract Co-Author*)
Moreno Zanardo, PhD (*Abstract Co-Author*)
Francesco Sardanelli, MD (*Abstract Co-Author*)
Francesco Secchi, MD, PhD (*Abstract Co-Author*)

PURPOSE

Pulmonary embolism (PE) is a common cause for emergency imaging referrals. The main imaging studies that patients with suspected PE usually undergo are represented by chest X-ray (CXR) and computed tomography (CT). The aim of our study was to build a machine learning model to identify patients with PE from CXR.

METHODS AND MATERIALS

We retrospectively included all adult patients who had undergone CXR and CT within one day of each other at our institution. For each patient we recorded age and sex, clinical variables such as D-dimer, a personal history of cancer, deep vein thrombosis, tachycardia and presence of dyspnea or cough, and imaging variables, namely Westermark sign, Fleischner sign, Hampton hump, and presence of pleural effusion. We subsequently divided our population with an 85:15 split into training and testing datasets and trained a classificator (XGBoost) with 5-fold cross-validation on our training dataset to predict the presence of PE.

RESULTS

Our study population counted 255 patients, 150 (59%) of whom males, with a median age of 75 years (interquartile range, IQR, 61-83 years). Overall, 80 (31%) patients had PE. Median D-dimer was 3.19 (IQR 1.54-8.08), 52 (20%) patients had a history of cancer, 16 (6%) presented with deep vein thrombosis, 42 (16%) with tachycardia, 150 (59%) with dyspnea and 48 (19%) with cough. Westermark sign was positive in 2 (1%) patients, Fleischer sign in 25 (10%) patients, 4 (2%) presented with Hampton hump and 95 (37%) with pleural effusion. The accuracy for our classificator on the testing set was 85%, with 67% sensitivity and 93% specificity and an area under the curve of 0.92.

CONCLUSION

A model using clinical data and information from CXR predicts the presence of pulmonary embolism with substantial accuracy.

CLINICAL RELEVANCE/APPLICATION

Normal 0 false false false EN-US X-NONE AR-SA /* Style Definitions */ table.MsoNormalTable {mso-style-name:"Table Normal"; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-priority:99; mso-style-parent:""; mso-padding-alt:0cm 5.4pt 0cm 5.4pt; mso-para-margin-top:0cm; mso-para-margin-right:0cm; mso-para-margin-bottom:8.0pt; mso-para-margin-left:0cm; line-height:107%; mso-pagination:widow-orphan; font-size:11.0pt; font-family:"Aptos",sans-serif; mso-ascii-font-family:Aptos; mso-ascii-theme-font:minor-latin; mso-hansi-font-family:Aptos; mso-hansi-theme-font:minor-latin; mso-ligatures:standardcontextual; mso-fareast-language:EN-US;} CXR images and clinical data from patients referred to imaging departments for suspicion of acute PE could be used for risk stratification and a better management of further referral for computed tomography.

M7-SSCH04-3 UNEXPECTED EARLY PULMONARY THROMBI IN WAR INJURED PATIENTS

Itai Sasson (*Presenter*)
Vera Sorin, MD (*Abstract Co-Author*)
Tomer Ziv-Baran, PhD (*Abstract Co-Author*)
Edith M. Marom, MD (*Abstract Co-Author*)
Sharon Z. Adam, MD (*Abstract Co-Author*)
Galit Aviram, MD (*Abstract Co-Author*)

PURPOSE

Pulmonary embolism (PE) is commonly associated with deep vein thrombosis and the components of Virchow`s triad: hypercoagulability, stasis, and endothelial injury. High-risk patients are traditionally considered those with prolonged immobility and hypercoagulable conditions. Recent findings of pulmonary thrombosis (PT) in young, healthy combat soldiers, found on CT performed for initial trauma assessment, challenge this assumption. Our objectives were to investigate the prevalence and characteristics of incidental PT detected in relation with acute traumatic war injuries, and to evaluate the effectiveness of an artificial intelligence (AI) algorithm in these settings.

METHODS AND MATERIALS

This retrospective study analyzed immediate post-trauma CT scans of war-injured patients aged 18-45, from two tertiary hospitals between October 7, 2023, and January 7, 2024. Thrombi were retrospectively detected using an AI algorithm and confirmed by 2 senior radiologists. Findings were compared to the original CT reports. Clinical and injury-related data were recorded.

RESULTS

Of 190 patients (age 25.91±6.05, 183 males), the AI identified 10 confirmed patients with PT (5.6%). Of them, six (60%) were not originally diagnosed. The only difference between patients with PT to patients without PT was an increase in complexity and severity of the injuries in cases with PT (higher Injury Severity Score, 22.83±5.67 versus 13.05±10.60 respectively, p - =-0.01). Notably, despite the presence of thrombi, significant right ventricular dilatation was absent in all patients

CONCLUSION

To our knowledge, this is the first report of early PT in war injured patients, providing a unique opportunity to characterize these findings. PT occur more frequently than anticipated, without clinical suspicion, highlighting the need for improved radiologists' awareness and the crucial role of AI systems.

CLINICAL RELEVANCE/APPLICATION

Pulmonary Thrombosis is a distinct clinical entity separate from traditional venous thromboembolism, which raises the need for further investigation of the appropriate treatment paradigm.

M7-SSCH04-4 DEEP LEARNING RECONSTRUCTION COMBINED WITH CONTRAST-ENHANCEMENT BOOST IN DUAL-LOW DOSE CT PULMONARY ANGIOGRAPHY: TWO-CENTER PROSPECTIVE TRIAL

Leilei Shen, MD (*Presenter*)
Jinjuan Lu (*Abstract Co-Author*)
Zhenghong Bi (*Abstract Co-Author*)
Zicheng Zhao (*Abstract Co-Author*)
Mengsu Zeng, PhD (*Abstract Co-Author*)
Mingliang Wang, MD (*Abstract Co-Author*)

PURPOSE

To investigate whether the deep learning reconstruction (DLR) combined with contrast-enhancement-boost (CE-boost) technique can improve the diagnostic quality of CT pulmonary angiography (CTPA) at low radiation and contrast doses, compared with routine CTPA using hybrid iterative reconstruction (HIR).

METHODS AND MATERIALS

This prospective two-center study included 130 patients who underwent CTPA for suspected pulmonary embolism. Patients were randomly divided into two groups: the routine CTPA group reconstructed using HIR; the dual-low dose CTPA group reconstructed using HIR and DLR, following the CE-boost was additionally performed to generate HIR-boost and DLR-boost images. Signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) of pulmonary arteries were quantitatively assessed. Two experienced radiologists independently ordered CT images (5, best; 1, worst) based on overall image noise and vascular contrast. Diagnostic performance for PE detection was calculated for each dataset.

RESULTS

Patient demographics were similar between groups. Compared to HIR images of the routine group, DLR-boost images of the dual-low dose group were significantly better at qualitative scores ($p < 0.001$). The CT values of pulmonary arteries between the DLR-boost and the HIR images were comparable ($p > 0.05$), whereas the SNRs and CNRs of pulmonary arteries in the DLR-boost images were the highest among all five datasets ($p < 0.001$). The AUCs of DLR, HIR-boost, and DLR-boost were 0.933, 0.924, and 0.986, respectively (all $p > 0.05$).

CONCLUSION

DLR combined with CE-boost technique can significantly improve the image quality of CTPA with reduced radiation and contrast doses, facilitating a more accurate diagnosis of pulmonary embolism.

CLINICAL RELEVANCE/APPLICATION

DLR-boost based low-radiation and low-contrast-dose CTPA protocol offers a novel strategy to further enhance the image quality and diagnosis accuracy for pulmonary embolism patients.

M7-SSCH04-5 EXTERNAL VALIDATION AND COMPARISON OF TWO AI MODELS FOR PE TRIAGE ON PCD-CTPA AND EID-CTPA EXAMINATIONS

Javier Contreras Yametti, MD (*Presenter*)
Anushree M. Burade, MBBS (*Abstract Co-Author*)
Seyedehelaheh Hosseini, MD (*Abstract Co-Author*)
Parisa Kaviani, MD (*Abstract Co-Author*)
Chelsea Dunning, PhD (*Abstract Co-Author*)
Saikiran Rapaka, PhD (*Abstract Co-Author*)
Julian Anhaus (*Abstract Co-Author*)
Andrei Chekkoury (*Abstract Co-Author*)
Lina Karout, MD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)
Florin Condrea (*Abstract Co-Author*)

PURPOSE

Comparing the performance of two CT pulmonary angiogram (CTPA)-based AI models for triaging patients for pulmonary emboli (PE) on photon-counting detector CT (PCD-CT) and energy-integrating detector (EID-CT) scanners.

METHODS AND MATERIALS

Our consecutive patients, IRB-approved, cross-sectional study included 745 CTPA examinations performed on either PCD-CT (Siemens NAEOTOM Alpha) (n= 345 patients; =18 years; mean age 60 years, female: male 179:166) or multivendor EID-CT scanners (GE/Philips/Siemens) (n= 400 patients; =18 years; mean age 61 years, female: male 242:158). Thin-section (1-1.25mm) were exported at 50 keV for PCD-CT, conventional images for EID-CT then all CT DICOM image datasets were processed separately with a prototype (Siemens Healthineers) and commercial (Avicenna.ai) CTPA-AI model (Blinded as A1 and A2) to obtain information on the presence and location of PE. Neither model was trained using data from the external validation site. A thoracic radiologist conducted the failure analysis to evaluate potential causes for false-positive and false-negative AI outputs. Data were tabulated in EXCEL and analyzed with SPSS (Statistical Package for the Social Sciences) to estimate the ROC area under the curve (AUC). We performed the DeLong test to assess differences in AI tool performance between PCD-CT and EID-CT.

RESULTS

PE were present in 51/345 PCD-CTPA (15%: central PE 11/51, peripheral PE 40/51) and 21/400 EID-CTPA (5%: central PE 17/51, peripheral PE 4/51). The respective NPV, PPV, AUC (95% CI), sensitivity, and specificity for detecting PE in PCD-CT were AI-1 model: 0.9, 0.84, 0.9, 0.83, 0.98; AI-2 model: 0.94, 0.89, 0.83,0.68, 0.99. The respective statistics for triaging PE on EID-CT were AI-1: 0.99, 0.32, 0.9, 0.9, 0.99; and AI-2: 0.98, 0.6, 0.82, 0.66, 0.99. Although there was a significant difference in the two vendors' AUCs ($p<0.01$), there was no AUC difference between PCD-CT and EID-CT ($p>0.1$). Despite a 51% lower dose with PCD-CT (median CTDIvol 6 mGy) versus EID-CT (CTDIvol 11 mGy), both models had higher specificity (rule out PE) on PCD-CT than EID-CT but similar AUCs ($p>0.1$)

CONCLUSION

Despite half-radiation doses with PCD-CT compared to EID-CT, both PE detection AI models performed at a similar or higher level on PCD-CT than on EID-CT exams.

CLINICAL RELEVANCE/APPLICATION

Higher image quality at lower radiation doses associated with PCD-CT scanners likely contributed to similar/improved diagnostic performance of the two assessed AI models on PCD-CT data without any prior PCD-CT-based training.

M7-SSCH04-6 ASSESSMENT OF DIFFERENCES IN RIGHT VENTRICULAR REMODELING IN ACUTE AND CHRONIC PULMONARY EMBOLISM ON NON-ECG GATED CHEST COMPUTED TOMOGRAPHY

Neel Vora, MBBS (*Presenter*)
Jennifer Bullen, MSc (*Abstract Co-Author*)
Michael A. Bolen, MD (*Abstract Co-Author*)
Rahul D. Renapurkar, MD (*Abstract Co-Author*)

PURPOSE

Right ventricular (RV) dilation is a nonspecific finding that can be seen in patients with both acute and chronic pulmonary embolism (PE). The aim of the study was to evaluate if there is a simplified approach to understand differences in RV remodeling in patients with acute versus chronic PE on non-ECG gated chest computed tomography (CT).

METHODS AND MATERIALS

This is a retrospective analysis of RV parameters among patients with acute PE, chronic PE, and normal controls. 216 patients were included; 89 patients without PE, 66 with chronic PE, and 61 with acute PE. We measured RV basal (RVBD), mid (RVMD), and apical (RVAD) diameter including the RVBD/RVAD ratio of the patients on an approximate four chamber axial view on non-ECG gated chest CT. The Kruskal-Wallis rank sum test was used to assess differences in the RV parameters among the three cohorts and if statistically significant, follow-up Wilcoxon rank sum tests were used. For RV parameters with a statistically significant association with diagnosis, an empirical receiver operating characteristic (ROC) curve and its area (AUC) was also estimated.

RESULTS

RVBD, RVMD, and RVAD were higher and statistically significant among patients with chronic PE (median: 44, 38, and 21, respectively) and acute PE (median: 48, 43, and 21, respectively) compared to patients without PE (median: 40, 33, and 20, respectively), except for the difference in RVAD between patients with acute PE and those with no PE ($p = 0.19$). The RVBD/RVAD ratio was higher among patients with acute PE compared to patients without PE and chronic PE ($p < 0.001$). This ratio was not statistically significant between patients with chronic PE and normal controls. RVBD and RVMD tended to be better than RVAD at distinguishing the PE diagnoses. RVBD and RVMD had the highest accuracies when distinguishing patients with acute PE versus patients without PE (AUC: 0.80 and 0.83) and the lowest accuracies when distinguishing patients with acute versus chronic PE (AUC: 0.60 and 0.63). RVBD/RVAD ratio had the highest accuracy when distinguishing patients with acute PE versus patients without PE (AUC: 0.75) and when distinguishing patients with acute versus chronic (AUC: 0.75); the ratio performed poorly when distinguishing patients with chronic PE and those without PE (AUC: 0.54).

CONCLUSION

This study shows the potential of using simple RV measurements in differentiating RV remodeling in patients with acute versus chronic PE. RVBD/RVAD ratio can be used as an effective marker in distinguishing the different cohorts.

CLINICAL RELEVANCE/APPLICATION

A simplified assessment of RV remodeling on routine non-ECG gated chest CT, using RV diameters and the RVBD/RVAD ratio, offers a practical and accessible tool to aid in differentiating acute PE, chronic PE, and normal cases.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

M7-SSNMMI03

Nuclear Medicine and Molecular Imaging (Prostate Cancer)

Monday, Dec. 1 3:00PM - 4:00PM Room: S501

Hossein Jadvar, MD, PhD (*Moderator*)
Aileen O'Shea, MBBCh (*Moderator*)

Sub-Events

M7-SSNMMI03-1 SPECT TO PET IMAGE TRANSLATION WITH A CONDITIONAL GENERATIVE ADVERSARIAL NETWORK (GAN) IMPROVES ASSESSMENT OF 177LU-PSMA POST THERAPY SCANS

Tomoaki Otani, PhD (*Presenter*)
Farshad Moradi, MD (*Abstract Co-Author*)
Hong Song, MD, PhD (*Abstract Co-Author*)
Guido A. Davidzon, MD (*Abstract Co-Author*)
Kip E. Guja, MD, PhD (*Abstract Co-Author*)
Andrei Iagaru, MD (*Abstract Co-Author*)

PURPOSE

Direct comparison between SPECT/CT after 177Lu-PSMA treatment and PSMA PET could be challenging due to differences in image quality and visual appearance. We used a conditional GAN (Pix2Pix) to transformed SPECT into PET-quality images (synthetic PET).

METHODS AND MATERIALS

97 prostate cancer patients treated with ¹77Lu-PSMA therapy were divided into training sets (n = 72) and test sets (n = 25). For model training, the input data consisted of SPECT images acquired at the time of the first 177Lu-PSMA treatment cycle, and the ground truth data comprised PSMA PET/CT images obtained prior to the first treatment. In the test set, SPECT/CT images acquired after the first and last cycles of Lu-PSMA therapy were converted into synthetic PET images by the trained model. Therapeutic response to ¹77Lu-PSMA therapy was assessed using the Response Evaluation Criteria in PSMA Imaging (RECIP), based on synthetic PET images versus the original SPECT images. The results derived from the two imaging modalities were then compared. The treatment response assessment based on post-therapy PSMA PET/CT was used as the gold standard. The ¹77Lu-PSMA-617-positive total tumor volume (Lu-TTV) and lesion count for each modality were quantified using the Segment Lesion workflow (MIM Software Inc., Cleveland, OH).

RESULTS

Treatment response assessment was concordant between SPECT and synthetic PET in 22 of 25 cases, with discrepancies observed in the remaining three. In all three discordant cases, the response classification based on synthetic PET was consistent with that derived from PSMA PET/CT. Specifically, two of the discordant cases were classified as complete response (CR) on SPECT but as partial response (PR) on synthetic PET. In the third case, the response was assessed as stable disease (SD) on SPECT and as PR on synthetic PET. The total tumor volume (Lu-TTV) derived from SPECT was significantly higher than that from synthetic PET in both the first and last treatment cycles (paired t-test, $p = 0.033$ and $p = 0.136$, respectively). Furthermore, the number of lesions detected on SPECT was significantly lower than that detected on synthetic PET for both the first and last cycles ($p = 0.014$ and $p = 0.015$, respectively).

CONCLUSION

This study demonstrates that synthetic PET from post-therapy SPECT using the pix2pix model added value for the assessment of treatment response following 177Lu-PSMA therapy.

CLINICAL RELEVANCE/APPLICATION

Synthetic PET images generated from post-therapy SPECT using a conditional GAN improve the accuracy of treatment response assessment in ¹77Lu-PSMA therapy. This approach may enhance clinical decision-making by offering PET-like image quality even in post-therapy settings where only SPECT is available.

M7-SSNMMI03-3 AUTOMATED RECIP SCORING VIA DEEP LEARNING PREDICTS SURVIVAL IN PROSTATE CANCER PSMA PET/CT

Sizhuo Meng, BSc, MSc (*Presenter*)
Ruohua Chen (*Abstract Co-Author*)
Wenchi Hsu, MD (*Abstract Co-Author*)
Linmei Zhao, MD, PhD (*Abstract Co-Author*)
Yitao Mao (*Abstract Co-Author*)
Andrei Gafita, MD (*Abstract Co-Author*)
Jeffrey P. Leal, BA (*Abstract Co-Author*)
Junyu Chen (*Abstract Co-Author*)
Fabio Raman, MD, PhD (*Abstract Co-Author*)
Yong Du, PhD (*Abstract Co-Author*)
Bennett B. Chin, MD (*Abstract Co-Author*)
Zhicheng Jiao, PhD, BS (*Abstract Co-Author*)
Lilja B. Solnes, MD, MBA (*Abstract Co-Author*)
Harrison X. Bai, MD (*Abstract Co-Author*)

PURPOSE

Accurate prognostication based on PSMA PET/CT remains clinically challenging. This study aimed to evaluate the feasibility of using a deep learning-based automatic segmentation pipeline to derive RECIP scores for predicting overall survival (OS) in prostate cancer patients, and to compare its performance against manual and empirical RECIP scoring.

METHODS AND MATERIALS

PSMA PET/CT scans from 172 patients were retrospectively analyzed. Of these, 170 had analyzable paired scans before and after treatment, with a median interval of 206 days (range: 1-2366; mean: 517). Automatic segmentation of PSMA-avid lesions was performed using a nnUNetv2 3D full-resolution model trained on manually annotated data. For each patient, three RECIP scores were generated: (1) Auto RECIP (based on ?TTV from automatic segmentation), (2) Manual RECIP (based on ?TTV from expert delineation), and (3) Empirical RECIP (based on physician judgment). RECIP progression was defined as =20% increase in total tumor volume (TTV).

RESULTS

The model successfully extracted TTV values for all analyzable patients and achieved a mean Dice coefficient of 0.738. Manual RECIP categorization: 36.6% PD, 14.5% SD, 18.6% PR, 30.3% CR; Auto RECIP: 29.0% PD, 11.7% SD, 20.0% PR, 39.3% CR. Inter-rater agreement for empirical scoring was high (Cohen's Kappa = 0.897; accuracy = 92.4%; PD agreement = 95.9%). Agreement between Auto/Manual RECIP and physicians was moderate (Kappa = 0.467-0.536; PD accuracy = 73-77%), and Auto vs. Manual was also moderate (Kappa = 0.541; accuracy = 66.2%; PD agreement = 73.8%). Kaplan-Meier analysis showed significant OS stratification using Auto and Manual RECIP ($p = 0.001$ and 0.043, respectively). Cox regression confirmed Auto RECIP PD status as an independent predictor of OS (HR = 2.33; 95% CI: 1.15-4.72; $p = 0.02$), along with post-PSMA PSA (HR = 1.04; 95% CI: 1.02-1.06; $p < 0.005$). Manual RECIP yielded comparable results (PD HR = 2.23; PSA HR = 1.05; both $p = 0.02$). Age was not significant ($p > 0.05$). Concordance indices were 0.72 (Auto) and 0.71 (Manual).

CONCLUSION

Automatic RECIP scoring using deep learning-derived lesion segmentation offers prognostic performance comparable to expert manual assessment. By capturing treatment-related tumor burden changes objectively and consistently, it serves as a viable surrogate marker for OS risk stratification.

CLINICAL RELEVANCE/APPLICATION

This work demonstrates a scalable, fully automated pipeline—from lesion segmentation to RECIP scoring—that enables rapid, reproducible, and clinically actionable prognostic assessment. The workflow can be integrated into PSMA PET/CT interpretation to support real-time decision-making.

M7-SSNMMI03-4 PSMA PET-DERIVED BONE TUMOR VOLUME AS A FACTOR ASSOCIATED WITH HEMATOLOGIC ADVERSE EVENTS IN ^{177}LU-PSMA-617 THERAPY FOR METASTATIC CASTRATION-RESISTANT PROSTATE CANCER (MCRPC)

Alireza Ghodsi, MD (*Presenter*)
Lukas Owens (*Abstract Co-Author*)
Ridvan A. Demirci, MD (*Abstract Co-Author*)
Heather Cheng (*Abstract Co-Author*)
Jessica Hawley (*Abstract Co-Author*)
Ruben Raychaudhuri (*Abstract Co-Author*)
Andrew Hsieh (*Abstract Co-Author*)
Petros Grivas (*Abstract Co-Author*)
Bruce Montgomery (*Abstract Co-Author*)
Todd Yezefski (*Abstract Co-Author*)
Evan Yu (*Abstract Co-Author*)
Michael Schweizer (*Abstract Co-Author*)
Delphine L. Chen, MD (*Abstract Co-Author*)
Roman Gulati (*Abstract Co-Author*)
Amir Iravani, MD (*Abstract Co-Author*)

PURPOSE

Lutetium-177 prostate-specific membrane antigen (Lu-PSMA) is a life prolonging treatment in mCRPC and is used in later lines, when patients often have bone involvement and limited marrow reserve. Hematologic adverse events (AEs) are common, and can lead to treatment delay or interruption. We developed a multivariate regression model to study the association between PSMA PET-derived bone tumor volume and hematologic AEs.

METHODS AND MATERIALS

This retrospective cohort study included patients with mCRPC who received =1 cycle of Lu-PSMA treatment between June 2022 and January 2025. Hematological parameters were recorded at baseline and every three weeks during treatment. AE severity was assessed using the CTCAE V5. Baseline PSMA PET/CT scans were quantitatively analyzed with a semi-automated whole-body tumor segmentation workflow to extract bone volume. Time to AE was defined as the number of cycles from first cycle of Lu-PSMA to the first grade =3 AE. Kaplan-Meier estimation compared grade =3 AEs based on PSMA PET bone volume above or below the median. Multivariate Cox regression assessed the relationship between PSMA PET bone volume and grade =3 AE adjusting for other baseline characteristics, including baseline hematological parameters, patient age, prior radiation, radium-223, and lines of chemotherapy.

RESULTS

A total of 237 patients (median age: 73 years; IQR: 68, 79) received a median of 3 cycles (IQR: 2, 5) of Lu-PSMA. Prior chemotherapy was administered in 91% (59% with one line, 32% with =2 lines); 64% had prior radiation, and 13% received Radium-223; 37 patients (16%) experienced grade =3 anemia, 12 (5%) grade =3 leukopenia, and 16 (7%) grade =3 thrombocytopenia. Univariate Kaplan-Meier analysis showed a significantly shorter time to develop grade =3 AEs in patients with higher PSMA PET bone volume for anemia ($p<0.001$) and thrombocytopenia ($p<0.001$). Multivariable Cox regression showed PSMA PET bone volume was significantly associated with the occurrence of grade =3 anemia (HR=1.47, 95% CI 1.04-2.1, $p=0.031$), grade =3 thrombocytopenia (HR=2.74, 95% CI 1.75-4.31, $p<0.001$) when adjusting for other baseline characteristics. Additionally, baseline hematologic parameter levels were significantly associated with grade = 3 AEs during treatment.

CONCLUSION

Higher PSMA PET bone tumor volume was significantly associated with a higher risk of grade =3 anemia and thrombocytopenia, in patients with mCRPC treated with Lu-PSMA when adjusted for other risk factors.

CLINICAL RELEVANCE/APPLICATION

PSMA PET bone tumor volume can help identify patients with mCRPC at higher risk for severe hematologic AEs during Lu-PSMA therapy, informing attempts for early recognition and best supportive care during treatment to improve outcomes.

M7-SSNMMI03-5 IMAGING RESPONSE ASSESSMENT USING QUANTITATIVE POST-THERAPY ^{177}LU-PSMA SPECT/CT IN MCRPC PATIENTS

Yalda Nikanpour, MD (*Presenter*)
Daniel Childs (*Abstract Co-Author*)
Gokce Belge Bilgin, MD (*Abstract Co-Author*)
Carrie B. Hruska, PhD (*Abstract Co-Author*)
Miguel Muniz (*Abstract Co-Author*)
Jun Zhang, PhD (*Abstract Co-Author*)
Jolanta M. Durski, MD (*Abstract Co-Author*)
Ayse T. Karagulle Kendi, MD, MD (*Abstract Co-Author*)
Geoffrey Johnson, MD, PhD (*Abstract Co-Author*)
Eugene D. Kwon, MD (*Abstract Co-Author*)
Oliver Sartor (*Abstract Co-Author*)
Matthew P. Thorpe, MD, PhD (*Abstract Co-Author*)

PURPOSE

177 Lu-PSMA therapy benefits patients with metastatic castration-resistant prostate cancer (mCRPC), but individual outcomes vary, and reliable survival predictors are lacking. This study evaluated early post-therapy SPECT/CT imaging 24 hours post-infusion to assess changes in quantitative parameters across cycles for predicting overall survival (OS)

METHODS AND MATERIALS

This was a single-center, retrospective study of patients with mCRPC treated with at least three cycles of 177 Lu-PSMA -617 between May 2022 and November 2023. Post-therapy whole-body SPECT/CT imaging was performed 24hr after each infusion, using a vertex-to-thighs acquisition protocol. Images were quantified using MIM software; 177 Lu-PSMA-positive lesions were segmented semi-automatically based on absolute thresholds reviewed and edited by radiology research assistants to reject false positive lesions; known lesions with uptake below threshold SUV < 3 were ignored. Total Lesion volume (TLV), maximum lesion standardized uptake value (SUV), mean lesion SUV, and lesion uptake volume product (UVP= mean * volume) were extracted for each timepoint. Baseline imaging from cycle 1 was compared with subsequent cycles (2 through 6), and changes in these quantitative metrics were correlated with OS using Conditional Change Cox Regression to evaluate the prognostic value of early SPECT/CT, testing the hypotheses that tumor uptake and burden conceptualized as total lesion mean SUV, max SUV, avid volume and UVP predict hazard ratio at a = 0.05

RESULTS

A total of 50 patients were included in the analysis; 5 received four cycles, 12 received five cycles, and 33 completed six cycles of 177 Lu-PSMA therapy. Mean OS for the cohort was 24.7 months, interquartile range (IQR) 12 months. Quantitative changes in tumor burden were associated with OS, particularly at cycles 4 and 5. The strongest association was observed at cycle 4, where change in lesion UVP from baseline was linked to predicted survival (HR 3.1, p = 0.0009). TLV changes from baseline to cycles 4 and 5 also reached significance (HR 2.0, 2.0, p = 0.009, 0.011). Lesion SUV Max was predictive only at cycle 5 (HR 1.7, p = 0.019), but predicted uptake independently of tumor volume at this cycle.

CONCLUSION

Change in tumor burden quantified on post-therapy SPECT/CT during 177 Lu-PSMA treatment predicted OS in patients with mCRPC. The strongest associations were observed at cycles 4 and 5, particularly for UVP and TLV. These findings highlight the potential prognostic value of timepoint-specific post-therapy SPECT/CT metrics during treatment.

CLINICAL RELEVANCE/APPLICATION

Quantitative post-therapy SPECT/CT during 177 Lu-PSMA treatment may help identify patients at higher risk of poor outcomes and support early response evaluation in mCRPC.

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Nov. 30 – Dec. 4
RSNA® 2025
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M7-SSNR05

Neuroradiology (Neoplasms: Post-Treatment Evaluation)

Monday, Dec. 1 3:00PM - 4:00PM Room: S405

Rajan Jain, MD (*Moderator*)

Sub-Events

M7-SSNR05-1 COMPARATIVE EVALUATION OF MANUAL AND VOLUMETRIC PROGRESSION ASSESSMENT IN GLIOBLASTOMA USING RANO 2.0 CRITERIA

John Kim, BA (*Presenter*)
Thomas Nelson (*Abstract Co-Author*)
Zhou Lan (*Abstract Co-Author*)
Gilbert Youssef (*Abstract Co-Author*)
Patrick Y. Wen, MD (*Abstract Co-Author*)
Raymond Y. Huang, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate concordance between manual 2D measurements and automated volumetric segmentation for determining progression-free survival (PFS) in glioblastoma using the updated Response Assessment in Neuro-Oncology (RANO) 2.0 criteria.

METHODS AND MATERIALS

We retrospectively analyzed brain MRIs from 394 patients with newly diagnosed (nGBM) and/or recurrent glioblastoma (rGBM) treated between 2014-2020, comprising 614 treatment segments. Segments were defined as treatment intervals ending in progression, death, or loss to follow-up. Manual 2D progression was determined by expert readers using bidimensional area products per RANO 2.0. Volumetric segmentations were generated using a commercial tool, and an in-house algorithm applied RANO 2.0 criteria to automatically track lesions and assess response. Progression of disease (PD) was defined as a new measurable contrast-enhancing lesion (=1.0 × 1.0 cm in 2D or =1000 mm^3 in 3D) or increase (=25% in 2D, =40% in 3D) in the sum of target lesions. Spearman correlation between PFS and overall survival (OS) was computed with left-censoring handled using iterative multiple imputation described previously by Schemper et al. (2013).

RESULTS

Overall discordance between manual 2D and automated volumetric assessments was observed in 338/614 (55.0%) treatment segments. In discordant cases, volumetric criteria identified progression earlier than manual reads in 234 cases (69%), while manual reads were earlier in 104 cases (31%). Discordance rates were similar between nGBM (58.2%) and rGBM (52.9%) cohorts. Volumetric criteria tended to call PD earlier in both nGBM (74%) and rGBM (66%) cases. The median time difference in progression among discordant cases was 56 days earlier by volumetric criteria (IQR: 158 days), with a range of -634 to 1078 days. Automated volumetric criteria for both nGBM (0.40) and rGBM (0.32) resulted in weaker survival rank correlation between PFS and OS compared to manual criteria (nGBM = 0.58, rGBM = 0.48).

CONCLUSION

Automated volumetric criteria identified progression earlier than manual reads in most discordant cases, but this earlier detection was associated with weaker correlation to OS. These findings suggest that the volumetric approach may determine progression prematurely, warranting further refinement and validation before clinical adoption.

CLINICAL RELEVANCE/APPLICATION

RANO 2.0 introduced the option of using volumetric tumor measurements for response assessment, which, when paired with automated segmentation, offers a promising framework for standardized and scalable response evaluation. Further refinement of automatic volumetric methods may be needed to optimize their utility in determining treatment response.

M7-SSNR05-2 DIAGNOSTIC PERFORMANCE OF GA-68 DOTATATE PET/MRI IN THE EVALUATION OF PATIENTS WITH MENINGIOMA IN THE EARLY POSTOPERATIVE PERIOD

Hannah Otis, BA (*Presenter*)
Kellen Vu, BS (*Abstract Co-Author*)
Marcus Konner, MS,DO (*Abstract Co-Author*)
Heejong Kim (*Abstract Co-Author*)
Nicolas A. Karakatsanis, PhD (*Abstract Co-Author*)
Mert R. Sabuncu, PhD (*Abstract Co-Author*)
Joseph R. Osborne, MD, PhD (*Abstract Co-Author*)
Philip Stieg (*Abstract Co-Author*)
RAJIV MAGGE (*Abstract Co-Author*)
Rohan Ramakrishna (*Abstract Co-Author*)
Jana Ivanidze, MD, PhD (*Abstract Co-Author*)

PURPOSE

DOTATATE PET is a powerful adjunct to MRI in the post-surgical management of meningioma. However, due to the potential risk of false positive findings from mild SSTR2 expression in inflammatory cells, DOTATATE PET is often delayed until 3 months post-resection. Given the importance of timely adjuvant radiotherapy (RT) planning, particularly in patients with intermediate and high risk meningiomas, our purpose was to retrospectively evaluate the diagnostic performance of DOTATATE PET in the first 3 months post-resection.

METHODS AND MATERIALS

This study is based on our prospectively enrolled cohort of patients with Brain DOTATATE PET/MRI. All patients consecutively enrolled in our registry from 2018 - October 2024 were assessed for inclusion. Inclusion criteria were 1) Brain DOTATATE PET and MRI within 13 weeks post-resection of pathology-proven meningioma and 2) follow-up MRI within 1.5 years after resection (reference standard). One patient was excluded due to severe MRI motion degradation. Lesions were classified as Treatment-Related Change (TRC), Probable TRC, Indeterminate, Probable Meningioma, or Meningioma based on the interpretation in the clinical PET/MRI and MRI reports. For the reference standard, indeterminate lesions and lesions not assessable by report were adjudicated by a neuroradiologist. Probable TRC was reclassified as TRC while Indeterminate and Probable Meningioma were reclassified as Meningioma, consistent with clinical treatment practices. Sensitivity and specificity were determined for the overall period (weeks 1-13), the early period (weeks 2-7), and the late period (weeks 8-13). Diagnostic performance of PET/MRI in the early and late periods was compared using Fisher's Exact Test.

RESULTS

24 patients with 94 lesions (71/23 TRC/Meningioma) were analyzed (11 women; 1/19/4 with WHO grade 1/2/3). Sensitivity of DOTATATE PET/MRI over the first three months post-resection was 95.7% (95% CI 79.0% - 99.2%) and specificity was 94.4% (95% CI 86.4% - 97.8%). During the early period, sensitivity was 100% (95% CI 70.1% - 100%) and specificity was 82.4% (95% CI 59.0% - 93.8%). During the late period, sensitivity was 92.9% (95% CI 68.5% - 98.7%) and specificity was 98.1% (95% CI 90.2% - 99.7%). The specificity of DOTATATE PET/MRI differed between the early and late periods ($p = 0.04$), while the sensitivity did not ($p = 1.0$).

CONCLUSION

Early postoperative DOTATATE PET/MRI demonstrated excellent diagnostic performance, with increased specificity in weeks 9-13.

CLINICAL RELEVANCE/APPLICATION

Postoperative DOTATATE PET/MRI demonstrates excellent diagnostic performance for the detection of residual meningioma as early as 9 weeks after surgery, without concern for reduced specificity, allowing timely adjuvant RT planning.

M7-SSNR05-3 IS CONTRAST NECESSARY FOR POSTOPERATIVE FOLLOW-UP PITUITARY MRI? A RETROSPECTIVE MULTI-READER COMPARISON OF UNENHANCED AND CONTRAST-ENHANCED SEQUENCES

Eliana Sacher (*Presenter*)
Sukhmanjit Singh Ghumman, MD,MSc (*Abstract Co-Author*)
Eshetu Atenafu (*Abstract Co-Author*)
Pejman Jabehdar Maralani, MD, FRCPC (*Abstract Co-Author*)

PURPOSE

Transsphenoidal surgery is the most common procedure for resection or debulking of pituitary macroadenomas. Patients often undergo multiple surveillance MRIs, raising concerns about gadolinium use, cost, and scan time. This study evaluates whether gadolinium-based contrast adds diagnostic value over unenhanced MRI post-surgery.

METHODS AND MATERIALS

A retrospective single-center cohort study included adults (=18 years old) who underwent transsphenoidal surgery for pituitary macroadenoma between January 2008 and January 2023. Inclusion required at least two post-surgical MRIs (postoperative baseline and most recent or last before reintervention), each with and without contrast. Three readers (neuroradiologists/ fellows), blinded to clinical data, independently scored each exam on: Residual tumor volume (on T1/T2 pre-gadolinium and T1 post-gadolinium images). Mass effect on the optic pathway (3-point scale: no contact, contact without displacement, displacement). Cavernous sinus invasion (Knosp grade 0-4). Paired t-tests were performed for volume comparison; weighted kappa for agreement between pre-contrast and post-contrast MRI for categorical data (optic pathway and Knosp grading). Inter-reader reliability was assessed with intra-class correlation coefficients (ICC) for volume and overall kappa between readers for categorical scores. Significance was defined as $p < 0.05$.

RESULTS

91 cases met inclusion criteria. Across all three readers: ICC for volume across readers was excellent (>0.75; ICC range 0.89-0.96). Optic pathway agreement was moderate to substantial (kappa 0.53-0.77); Knosp grading was fair (kappa 0.33-0.38). No significant difference between unenhanced and contrast-enhanced volumes for most readers ($p = 0.10$-0.63), except one ($p = 0.047$). Optic pathway agreement between pre- and post-contrast was substantial to almost perfect (kappa 0.67-0.95). Knosp agreement ranged from fair to substantial (kappa 0.39-0.85). In the subgroup requiring re-intervention due to tumor growth (N=42), most readers found no significant difference in tumor volumes between pre- and post-contrast MRI, except one ($p=0.047$ at baseline and $p=0.014$ at most recent). Agreement for optic pathway involvement was substantial to almost perfect (kappa 0.63-1.00), and for Knosp grading, fair to almost perfect (kappa 0.37-0.86).

CONCLUSION

Postoperative unenhanced MRI offers comparable information to contrast-enhanced MRI for assessing residual volume, Knosp grade, and optic pathway involvement in pituitary macroadenomas.

CLINICAL RELEVANCE/APPLICATION

Routine follow-up using non-contrast MRI may streamline protocols, reduce contrast use, and still detect clinically significant growth.

M7-SSNR05-4 BRAIN FES PET STANDARDIZED UPTAKE VALUE ASSOCIATION WITH ESR1 AND PIK3CA MUTATIONS

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Letizia Pontolillo (*Abstract Co-Author*)
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Sadek Nehmeh (*Abstract Co-Author*)
Andrew Brandmaier, MD, PhD (*Abstract Co-Author*)
RAJIV MAGGE (*Abstract Co-Author*)
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Kathryn F. Beal, MD (*Abstract Co-Author*)
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Massimo Cristofanilli, MD (*Abstract Co-Author*)
Jana Ivanidze, MD, PhD (*Abstract Co-Author*)

PURPOSE

Breast cancer (BC) is the second most common cancer linked to brain metastases (BM), with 70% of patients having estrogen receptor positive (ER+) disease. [F18]Fluoroestradiol (FES) is a PET radiotracer that targets ER, and brain FES PET has shown promise as an adjunct diagnostic tool in BC BM. Liquid biopsies including circulating tumor DNA (ctDNA), circulating tumor cells (CTCs) and exosomes are emerging non-invasive diagnostic and monitoring tools. Our purpose was to combine FES PET with liquid biopsy in a pilot cohort to assess the potential of this multi-modal biomarker in evaluating response to endocrine and radiotherapy in patients with ER+ BC BM.

METHODS AND MATERIALS

Following informed consent, patients with ER+ BC and known or suspected BM who underwent dedicated brain FES PET/CT and blood ctDNA analysis were included in this IRB-approved prospective study. Demographic and clinical data were collected. Dedicated brain PET/CT dynamic acquisition was performed. FES PET was co-registered to post-gadolinium contrast 3D T1 MRI. All patients also underwent Two 10-mL blood samples were collected and analyzed using the Guardant360 next-generation sequencing platform to detect genetic alterations. Codon variants of ESR1 and PIK3CA mutations were analyzed, and mutant allele frequency was assessed for personalized treatment. The average of maximum standardized uptake values (SUV) in ESR1 and PIK3CA-positive and ESR1 and PIK3CA-negative groups was compared separately. Mann-Whitney and Spearman correlation tests were performed.

RESULTS

7 patients with FES-positive lesions were stratified by PIK3CA and ESR1 mutations. 5/7 (71%) were PIK3CA-positive, and 4/6 (67%) were ESR1-positive. The mean FES PET SUV was 5.26 in the PIK3CA-positive and 1.3 in the PIK3CA-negative subgroup ($p = 0.095$). The mean FES PET SUV was 3.8 in the ESR1-positive and 1.8 in the ESR1-negative subgroup ($p = 0.533$). Strong correlation found between FES PET SUV and mutation count approaching statistical significance ($r=0.94$, $p=0.06$).

CONCLUSION

We observed a trend for higher FES PET SUV in patients with PIK3CA and ESR1 mutations, as well as a trend for greater SUV in patients with greater number of mutations, noting limitations of small sample size.

CLINICAL RELEVANCE/APPLICATION

Integrating brain FES PET with liquid biopsy has the potential to optimize treatment response in patients with ER-positive BC BM. This multi-modal approach has the potential to enhance our understanding of therapy resistance mechanisms by integrating biologically targeted PET with molecular profiling to guide treatment decisions in patients with ER+ BCBM.

M7-SSNR05-5 THE 3D NNU-NET CONVOLUTIONAL NEURAL NETWORKS FOR DETECTION AND QUANTITATIVE ASSESSMENT OF VESTIBULAR SCHWANNOMA

Uyen Nguyen, BS (*Presenter*)
Maria Correia de Verdier, MD, PhD (*Abstract Co-Author*)
Rachit Saluja, MS,BEng (*Abstract Co-Author*)
Krish Suresh (*Abstract Co-Author*)
Michael Brandel (*Abstract Co-Author*)
Jessica Schulte (*Abstract Co-Author*)
Nikdokht Farid, MD (*Abstract Co-Author*)
Jeffrey Rudie, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop and validate an automated image-processing 3D convolutional neural network (CNN) for detection and quantitative assessment of pre- and post-treatment vestibular schwannoma (VS).

METHODS AND MATERIALS

A retrospective study of 571 MRIs from 191 sporadic VS patients (mean age of 60 +/- 16[SD], 98 male, 93 female) from 12/2015 to 5/2024. Of these patients, 35% underwent surgery, 18% underwent radiation, and 47% did not receive treatment. Preliminary segmentations were generated by an nnU-Net CNN trained on T1-weighted post-contrast images from 242 patients from the TCIA Vestibular-Schwannoma-SEG dataset. These were then revised and approved by a neuroradiologist to create reference standard segmentations. The sample was randomly split into 153 training patients (452 MRIs) and 38 testing patients (119 MRIs). The nnU-Net CNN with a batch size of 4 and a patch size of 80x160x160 was used for model training.

RESULTS

Median Dice score was 0.90 (IQR 0.71-0.95) for all segmentation and varied by tumor size: 0.63 (IQR 0.00-0.84), 0.92 (IQR 0.84-0.95), and 0.95 (IQR 0.94-0.96) for small (V=100mm3), medium (100mm = V < 1000mm3), and large (V > 1000mm3) respectively. Median volume similarity was 95% (IQR 80%-98%) for all segmentation and was 73% (IQR 0%-90%), 96% (IQR 91%-98%), and 98% (IQR 97%-99%) for small, medium, and large size respectively. For pre-treatment group, the median Dice score was 0.93 (IQR 0.82-0.95) and volume similarity was 97% (IQR 85%-99%), which were better compared to 0.81 (IQR 0.00-0.91) and 88% (IQR 0%-96%) for the post-treatment group. Within the post-treatment group, average Dice score was significantly lower for post-surgery (0.36 +/- 0.41[SD]) compared to post-radiation (0.90 +/- 0.08[SD]) group (p-value <0.01). The model had 100% sensitivity for VS detection, but 41% of cases had false positive (FP) predictions with more FP in the small group (66%) compared to medium (27%) and large (31%) group.

CONCLUSION

3D nnU-Net CNN was able to segment VS at various volume sizes (optimal for medium size and exceptional for large size VS) with perfect sensitivity for VS detection. It performed well in the pre-treatment group and for patients who had undergone radiation. However, performance was affected by FP predictions and was suboptimal in patients with small VS and those who had undergone surgery.

CLINICAL RELEVANCE/APPLICATION

VS is a common tumor that can lead to hearing loss and hydrocephalus. Regardless of treatment approach, nearly all patients undergo multiple MRIs to determine growth behavior. Current longitudinal surveillance relies on manual measurements, which are time-consuming and error-prone. Thus, an automated model for detection and quantitative assessment of VS may improve clinical management of these patients.

M7-SSNR05-6 [^{68}GA]-DOTATATE PET SUV REDUCTION AFTER BEVACIZUMAB IN HIGH-GRADE MENINGIOMA: A POTENTIAL TREATMENT RESPONSE BIOMARKER

Kellen Vu, BS (*Presenter*)
Hannah Otis, BA (*Abstract Co-Author*)
Andrew Brandmaier, MD, PhD (*Abstract Co-Author*)
Joseph R. Osborne, MD, PhD (*Abstract Co-Author*)
Philip Stieg (*Abstract Co-Author*)
Rohan Ramakrishna (*Abstract Co-Author*)
Kathryn F. Beal, MD (*Abstract Co-Author*)
Susan C. Pannullo, MD (*Abstract Co-Author*)
Jonathan P. Knisely, MD (*Abstract Co-Author*)
RAJIV MAGGE (*Abstract Co-Author*)
Mary Welch (*Abstract Co-Author*)
Jana Ivanidze, MD, PhD (*Abstract Co-Author*)
Peter Pan (*Abstract Co-Author*)
Fabio Iwamoto (*Abstract Co-Author*)

PURPOSE

Meningiomas are the most common primary intracranial neoplasms, but treatment options are limited for high-grade cases that progress despite surgery and radiotherapy. Bevacizumab, an anti-angiogenic agent, has been reported to improve progression-free survival and reduce tumor growth in this setting; however, most

radiographic assessments have relied on MRI-based criteria that may underestimate biologic effects. [68 Ga]-DOTATATE PET/MRI, which targets somatostatin receptor 2 (SSTR2), offers enhanced sensitivity and specificity over MRI alone in meningioma detection, with emerging evidence linking SSTR2 expression to vascularity, but changes in [68 Ga]-DOTATATE avidity following bevacizumab are not well studied. We present a case series of patients with high-grade meningioma who underwent [68 Ga]-DOTATATE PET/MRI before and after bevacizumab, to further characterize its therapeutic effects.

METHODS AND MATERIALS

We selected patients from our prospective registry of meningioma and other SSTR2-positive brain tumors who met the following criteria: (1) WHO grade 3 meningioma; (2) [68 Ga]-DOTATATE PET/MRI before or within 60 days of starting bevacizumab; and (3) [68 Ga]-DOTATATE PET/MRI after completing bevacizumab. We performed lesion-by-lesion analysis to track SUV max changes between pre- and post-treatment scans. A linear mixed effects model was used to assess bevacizumab's effect on [68 Ga]-DOTATATE uptake, accounting for within-patient clustering and lesion-level variability.

RESULTS

3 male patients (ages 55, 57, and 81) met the inclusion criteria, contributing 18 evaluable lesions. Following bevacizumab therapy, SUV max decreased in 15 out of 18 lesions (83%). Mixed effects modeling confirmed a mean decrease of 5.13 SUV units post-treatment ($p = 0.002$), with random effects accounting for patient- and lesion-level heterogeneity.

CONCLUSION

We observed significant decreases in [68 Ga]-DOTATATE PET SUV max following bevacizumab therapy in patients with recurrent high-grade meningioma, reinforcing its potential utility as a treatment option. These findings support further clinical evaluation of bevacizumab and suggest a future role for [68 Ga]-DOTATATE PET in guiding management in this setting.

CLINICAL RELEVANCE/APPLICATION

By demonstrating consistent [68 Ga]-DOTATATE SUV reductions following bevacizumab in high-grade meningioma, this case series supports further investigation of bevacizumab as a treatment option and reinforces the role of [68 Ga]-DOTATATE PET in assessing response.
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M7-SSNR06

Neuroradiology (Stroke: Risk Factors and Prevention)

Monday, Dec. 1 3:00PM - 4:00PM Room: S406B

Hediyeh Baradaran, MD, MS (*Moderator*)
Dhairya Lakhani, MD (*Moderator*)

Sub-Events

M7-SSNR06-1 QUANTITATIVE ANALYSIS OF MULTIMODAL MRI MARKERS AND CLINICAL RISK FACTORS FOR CEREBRAL SMALL VESSEL DISEASE BASED ON DEEP LEARNING

Zhiliang Zhang (*Presenter*)
Caiyun Mou (*Abstract Co-Author*)
Jianjun Zhang (*Abstract Co-Author*)
Qing Chen (*Abstract Co-Author*)
Jianhua Mao (*Abstract Co-Author*)

PURPOSE

Cerebral small vessel disease lacks specific clinical manifestations, and extraction of valuable features from multimodal images is expected to improve its diagnostic accuracy. In this study, we used deep learning techniques to segment cerebral small vessel disease imaging markers in multimodal magnetic resonance images and analyze them with clinical risk factors

METHODS AND MATERIALS

We recruited 211 lacunar stroke patients and 83 control patients. The patients' cerebral small vessel disease markers were automatically segmented using a V-shaped bottleneck network, and the number and volume were calculated after manual correction.

RESULTS

The segmentation results of the V-shaped bottleneck network for white matter hyperintensity and recent small subcortical infarction were in high agreement with the ground truth (DSC>0.90). In small lesion segmentation, cerebral microbleed (average recall=0.778; average precision=0.758) and perivascular spaces (average recall=0.953; average precision=0.923) were superior to lacunar infarct (average recall=0.339; average precision=0.432) in recall and precision. Binary logistic regression analysis showed that age, systolic blood pressure, and total cerebral small vessel disease load score were independent risk factors for lacunar stroke ($P<0.05$). Ordered logistic regression analysis showed age was positively correlated with cerebral small vessel disease load score and total cholesterol was negatively correlated with cerebral small vessel disease score ($P<0.05$).

CONCLUSION

Lacunar stroke patients exhibited higher cerebral small vessel disease imaging markers, and age, systolic blood pressure, and total cerebral small vessel disease score were independent risk factors for lacunar stroke patients. V-shaped bottleneck network segmentation network based on multimodal deep learning can segment and quantify various cerebral small vessel disease lesions to some extent.

CLINICAL RELEVANCE/APPLICATION

This study offers a new perspective and tool for the diagnosis and risk assessment of cerebral small vessel disease (CSVD). Using a V-shaped bottleneck network, a deep learning technique, we can automatically segment and quantify CSVD markers in multimodal MR images.

M7-SSNR06-2 COMPARISON OF DANTE BLOOD SUPPRESSED AND CONVENTIONAL T1-WEIGHTED POST-CONTRAST SPACE INTRACRANIAL VESSEL WALL MRI IN MOYAMOYAVASCULOPATHY PATIENTS

Dan Cheng, MD (*Presenter*)
Mona Kharaji, MD (*Abstract Co-Author*)
Beibei Sun (*Abstract Co-Author*)
Cristina Sanchez-Vizcaino (*Abstract Co-Author*)
Javid Azadbakht, MD (*Abstract Co-Author*)
Yin Guo, PhD (*Abstract Co-Author*)
Chun Yuan, PhD (*Abstract Co-Author*)
Mahmud Mossa-Basha, MD (*Abstract Co-Author*)

PURPOSE

To compare the wall enhancement characteristics between delay alternating with nutation for tailored excitation (DANTE) blood suppressed and conventional sampling perfection with application optimized contrasts (SPACE) postcontrast 3D T1 weighted imaging (T1WI) intracranial vessel wall MRI (IVW) in Moyamoya vasculopathy patients.

METHODS AND MATERIALS

A total of 29 Moyamoya vasculopathy subjects who underwent both Dante and SPACE postcontrast 3D T1WI during the same IVW scanning session were included. 43 affected internal carotid artery and middle cerebral artery segments were analyzed. Two neuroradiologists blinded to clinical data qualitatively evaluated imaging features including overall image quality, signal-to-noise (SNR), severity of artifacts, arterial and venous suppression, and lesion assessment by using 4-point or 5-point Likert scales on DANTE and SPACE images independently and blinded to the acquisition, in a random order. Quantitative wall SNR and contrast-to-noise ratio (CNR) were determined for affected segments on both sequences. MRI findings including collateral extent, presence, pattern and intensity of post-contrast enhancement were also assessed. Interrater agreement was assessed using the intraclass correlation coefficient (ICC). Group comparisons were performed using bootstrapping, the Wilcoxon signed-rank test, or the chi-square test.

RESULTS

Inter-rater reliability coefficients ranged from 0.53 (concentric/eccentric morphology in SPACE sequences) to 0.97 (overall image quality in SPACE sequences). DANTE showed significantly reduced arterial (1 [1, 1] versus 2 [1, 2], P < .001) and venous flow artifacts (1 [1, 1] versus 2 [2, 3], P < .001) compared with SPACE. Quantitative wall SNR and CNR for the lesions did not differ between DANTE and SPACE sequences (wall SNR: 31.28 [22, 49] versus 38.03 [25.79, 52.86], P = 0.126; CNR: 16.56 [10.74, 29.64] versus 20.94 [12.59, 30.11], P = 0.124). DANTE demonstrated significantly lower distal enhancement compared with SPACE (16.7% versus 56.0%), P < .001). No significant differences were observed in stenosis/occlusion classification, concentric/eccentric morphology, proximal enhancement, or pattern enhancement between the two sequences.

CONCLUSION

DANTE blood suppression on T1-SPACE post-contrast IVW can significantly improve arterial and venous blood flow artifacts and reduce the intensity of wall enhancement without an impact on image quality, relative to conventional SPACE.

CLINICAL RELEVANCE/APPLICATION

Improved artifact suppression and consistent image quality are crucial for precise assessment of vessel wall pathology, aiding in the diagnosis, monitoring, and treatment planning for patients with Moyamoya vasculopathy.

M7-SSNR06-3 CHARACTERIZING ATHEROSCLEROTIC INTRAPLAQUE HEMORRHAGE WITH COMPUTED TOMOGRAPHY ANGIOGRAPHY AND A TRAINED RADIOMICS MODEL: A HISTOPATHOLOGICAL CORRELATION STUDY

Martin Cabarique, MD (*Presenter*)
Carlos Dier, MD (*Abstract Co-Author*)
Navami Shenoy (*Abstract Co-Author*)
Andres Gudino (*Abstract Co-Author*)
Sebastian Sanchez (*Abstract Co-Author*)
Elena Sagues (*Abstract Co-Author*)
Domenica Cifuentes (*Abstract Co-Author*)
Ruben Calle (*Abstract Co-Author*)
Pablo S. Martinez (*Abstract Co-Author*)
Bruno A. Policeni, MD, MBA (*Abstract Co-Author*)
Minako Hayakawa, MD (*Abstract Co-Author*)
Edgar Samaniego (*Abstract Co-Author*)

PURPOSE

Characterizing carotid plaque composition with CTA can help identify vulnerable plaques. A radiomics-based algorithm, derived from imaging-histology matching, may assist in detecting intraplaque hemorrhage (IPH).

METHODS AND MATERIALS

Patients with severe carotid stenosis who underwent CTA prior to carotid endarterectomy (CEA) were included, and their samples were histologically analyzed. Regions of IPH, lipid-rich necrotic core (LRNC), and calcification were identified through imaging-histology matching. Radiomic features (RFs) were extracted from these regions using 3D Slicer. RFs with the highest area under the curve (AUC) for each component were selected, and cutoff values were determined using receiver operating characteristic analysis, with optimal thresholds identified through Youden's index. The DeLong test was applied to compare AUCs, and the RFs with the best diagnostic performance were used to build a classification model. Whole plaque segmentations were also performed on CTA using 3D Slicer. Voxel-wise plaque composition estimation from the entire plaque segmentations were generated with an in-house Python algorithm, based on the previously identified thresholds. The components percentages from the algorithm were validated by comparison with those obtained from histological analysis. A registry of patients who underwent CTA neck as part of the stroke protocol was then analyzed. Multivariate analysis was performed to assess the association between plaque morphology and the presence of IPH.

RESULTS

Six patients (mean age: 73.7 ± 8.16 years; 3 men) with severe carotid stenosis (>70%) underwent CEA. Histological analysis showed median percentages of 1.49 ± 0.86% for IPH, 25.75 ± 8.59% for LRNC, and 19.22 ± 22.57% for calcification. The voxel-wise radiomics model yielded median values of 1.28 ± 2.77% for IPH, 28.52 ± 59.91% for LRNC, and 69.57 ± 63.03% for calcification. No significant differences were observed between the two methods for IPH and LRNC percentages ($p > 0.05$). The inter-method agreement for detecting IPH was 83%. A retrospective analysis of 173 plaques identified 50 (29%) with IPH. In patients with cryptogenic stroke, 25% (7/28) had plaques with IPH on the ipsilateral side of the stroke territory. Multivariable analysis indicated that ulcerated plaques were more likely to present IPH (OR: 4.81, 95% CI: 2.24-10.8, $p < 0.001$).

CONCLUSION

A radiomics-based model, developed through imaging-histology correlation, can identify voxel-level differences in plaque composition on CTA.

CLINICAL RELEVANCE/APPLICATION

Voxel-based radiomics analysis can help identify vulnerable plaques with IPH

M7-SSNR06-6 QUANTITATIVE ASSESSMENT OF CAROTID PERIVASULAR ADIPOSE TISSUE ON CAROTID CTA: CORRELATION WITH HIGH-INTENSITY PLAQUES AND HISTOLOGICALLY CONFIRMED INTRAPLAQUE HEMORRHAGE

Shun Okuyama, RT (*Presenter*)
Hiroki Nakajima, RT (*Abstract Co-Author*)
Rin Shimada (*Abstract Co-Author*)
Masaki Sakurai (*Abstract Co-Author*)
Tatsuya Nishii, MD, PhD (*Abstract Co-Author*)
Keizo Murakawa (*Abstract Co-Author*)
Tetsuya Fukuda, MD, PhD (*Abstract Co-Author*)

PURPOSE

High-Intensity Plaques (HIPs) on MPRAGE have been associated with changes in carotid perivascular adipose tissue (PVAT).In previous methods requires the manual placement of small regions of interest (ROIs) with an area of 2.5 mm^2 near the carotid wall, which may limit reproducibility. Therefore, we hypothesized that a more reproducible assessment of PVAT could be achieved by adopting the approach used in coronary CTA.

METHODS AND MATERIALS

We retrospectively analyzed 125 patients who underwent carotid CTA using a 320-detector row CT scanner at 100 kV from January 2022 to December 2023. Patients with significant carotid stenosis, stents, or PVAT volumes less than 0.1 cm^3 were excluded. PVAT was measured by two radiological technologist over axial segments of 4 cm and 8 cm centered on the carotid bifurcation. Interobserver agreement was evaluated using intraclass correlation coefficients (ICCs), and measurement differences were compared using Bland-Altman analysis. PVAT values were compared between MPRAGE HIPs-positive and HIPs-negative groups. Additionally, comparisons were made between HIPs-positive patients with pathological IPH (intraplaque hemorrhage) and HIPs-negative patients. Statistical analyses were performed using the Wilcoxon rank-sum test.

RESULTS

We analyzed 125 patients (median age 77, IQR 70-81; 82% male) with 233 carotid arteries (121 right, 112 left). Of these, 111/233 were MPRAGE HIP-negative and 122/233 were HIP-positive, including 16 with pathologically confirmed IPH. Interobserver agreement for PVAT was high, with ICCs of 0.97 (95% CI 0.96-0.98) for 4 cm and 0.98 (95% CI 0.97-0.98) for 8 cm measurements. Intraobserver correlation between 4 cm and 8 cm segments was R = 0.80 (95% CI 0.75-0.84, P < 0.001), with 8 cm measurements being slightly lower by -1.1 HU (95% CI -0.41 to -1.7). PVAT at 4 cm did not differ significantly between MPRAGE HIP-positive (-60.6 [IQR, -66.8 to -53.7] HU) and HIP-negative (-61.8 [IQR, -66.5 to -55.1] HU) groups (P = .68). Pathologically confirmed IPH cases also showed a trend toward lower PVAT (-58.6 [IQR, -64.4 to -53.4] HU) compared to HIP-negative cases, but this was not significant (P = .34).

CONCLUSION

The PVAT measurements obtained using this method demonstrated high reproducibility and objectivity. When the measurement range was doubled, PVAT values decreased slightly. There was no significant difference in PVAT between the MPRAGE HIP-positive and HIP-negative groups, nor between the MPRAGE HIP-negative group and the pathologically confirmed IPH group.

CLINICAL RELEVANCE/APPLICATION

This method provides high reproducibility and objectivity, but it did not replicate the diagnostic accuracy reported by other methods in detecting associations with HIPs

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M7-STCE1

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Monday, Dec. 1 3:15PM - 3:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

M7-STCE1-1 AI ENHANCED SILICOSIS SCREENING FROM CHEST RADIOGRAPHS: AN OPPORTUNISTIC APPROACH FOR OCCUPATIONAL LUNG DISEASE

Sivasailam Kalyan (*Presenter*)
Vasantha Kumar Venugopal, MD (*Abstract Co-Author*)
Bargava Subramanian (*Abstract Co-Author*)
Anandakumar D (*Abstract Co-Author*)
Charulatha K (*Abstract Co-Author*)
Elakkiya R (*Abstract Co-Author*)
Karthika M (*Abstract Co-Author*)
Saianiruth M (*Abstract Co-Author*)
Revathi Ezhumalai (*Abstract Co-Author*)

PURPOSE

To develop and validate a deep learning model capable of detecting radiographic patterns of silicosis on chest X-rays with high diagnostic accuracy. The model is designed for deployment in opportunistic screening workflows targeting high-risk occupational groups such as miners, construction workers, and sandblasters, particularly in resource-limited settings.

METHODS AND MATERIALS

A retrospective dataset of 75,000 posteroanterior and anteroposterior chest radiographs was assembled from occupational health archives. Each image was annotated by expert readers according to International Labour Organization (ILO) classification standards. A ResNet-50 convolutional neural network was trained using stratified sampling to ensure representative coverage of all ILO profusion categories. Data augmentation techniques were used to simulate acquisition variability and strengthen generalizability. External validation was performed on a separate dataset of 2,500 chest radiographs from a silicosis surveillance program. Grad-CAM-based heatmaps were generated for visual localization to support clinical explainability. Model performance was compared to expert consensus using sensitivity, specificity, AUC, and Cohen's kappa.

RESULTS

The model achieved an area under the ROC curve (AUC) of 0.921, with a sensitivity of 88.4% and specificity of 91.2% for silicosis detection. Agreement with expert consensus yielded a Cohen's kappa of 0.772, indicating substantial inter-rater reliability. For early-stage silicosis (ILO 1/0 category), the model maintained a sensitivity of 83.1%, suggesting strong utility in identifying subclinical disease. False positives in healthy controls were limited to 4.3%. The heatmap visualization module demonstrated high overlap with expert-annotated nodular regions, enhancing model transparency for clinical users.

CONCLUSION

The deep learning model exhibits high diagnostic accuracy and robustness for detecting silicosis on chest radiographs. Its performance across early and late disease stages, combined with visual explainability and external validation, supports its potential integration into screening workflows.Limitations: Model performance may vary across chest X-ray machines with non-standard settings. Lack of clinical correlation limits staging accuracy. Prospective field validation is pending.

CLINICAL RELEVANCE/APPLICATION

This AI tool offers a practical and scalable approach for opportunistic silicosis screening in occupational health settings. By leveraging existing chest radiograph infrastructure, it can help bridge diagnostic gaps in high-risk populations, enabling early detection and timely intervention for pneumoconiosis.

M7-STCE1-3 A PIPELINE FOR EXTRACTION OF NOVEL FLAIR BIOMARKERS FOR DIAGNOSIS OF ALZHEIMER'S DISEASE AND VASCULAR DEMENTIA

Matthew So, MD (*Presenter*)
April Khademi, BEng (*Abstract Co-Author*)

PURPOSE

Alzheimer's disease (AD) is a neurodegenerative clinical syndrome primarily characterized by impairments in memory. While AD is a clinical diagnosis, neuroimaging is used to rule out reversible causes of dementia. This represents an ideal role for deriving opportunistic biomarkers, as FLAIR sequences are routinely acquired. While volumetric biomarkers have been previously described, new research suggests the utility of whole-brain FLAIR texture biomarkers in AD diagnosis including macrostructural damage (MAD) and microstructural integrity (MII). The objective of this study was to validate an end-to-end FLAIR biomarker extraction method for neurodegenerative conditions including Alzheimer's disease (AD) and mixed vascular dementia and AD (vAD), including texture, volume, and summary statistical biomarkers.

METHODS AND MATERIALS

Data was obtained from the COMPASS-ND trial, a large Canadian multicenter prospective cohort study of dementia and aging. Patient diagnoses included: cognitively unimpaired (CU), mild cognitive impairment (MCI), AD, vascular MCI (vMCI), and vAD. A convolutional neural network was used to segment anatomical regions from FLAIR images. Texture, statistical, and volumetric biomarkers were computed. Binary classification using random forests with 5-fold cross-validation were used for the following tasks: CU compared to MCI, AD, vMCI, vAD, AD+MCI, vAD+vMCI, all respectively; MCI vs vMCI, MCI vs AD, vMCI vs vAD, AD vs vAD, vAD+vMCI vs AD+MCI.

RESULTS

582 patients were analyzed. A classifier using texture, volume, and summary statistics showed stronger performance (Area under the curve (AUC)=0.86 for tasks involving CU and AUC=0.8 for tasks without) compared to texture (AUC=0.84, 0.75), volume (AUC=0.84, 0.67), and summary statistics (AUC=0.83, 0.79) alone.

Notable tasks include CU vs vAD and CU vs AD (AUC=0.95, AUC=0.92) respectively, and MCI vs AD (AUC=0.80). Post-hoc analyses showed important univariate predictors across multiple tasks included whole-brain volume, MAD, MII, and volume of the hippocampus, and MII of the white matter.

CONCLUSION

A machine learning-based classifier using a combination of FLAIR biomarkers showed strong classification performance on neurodegenerative tasks along the AD spectrum. The strongest predictors included both new and novel biomarkers including texture biomarkers of the white matter and hippocampus.

CLINICAL RELEVANCE/APPLICATION

A fast, highly interpretable neurodegenerative biomarker extraction pipeline is described using routinely acquired FLAIR sequences. This may be used to improve diagnosis in unclear clinical cases (such as differentiation from pseudodementia), to quantify and track the degree of parenchymal degeneration, and to prognosticate the course of disease.

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M7-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Monday, Dec. 1 3:15PM - 3:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

M7-STCE2-1 CLINICAL VALUE OF ARTIFICIAL INTELLIGENCE ITERATIVE RECONSTRUCTION IN ULTRA-LOW-DOSE UPPER EXTREMITY CTA FOR ASSESSING ARTERIOVENOUS FISTULAS/GRAFTS AMONG HEMODIALYSIS PATIENTS

Beili Shou (*Presenter*)
Jing Li (*Abstract Co-Author*)
Wenming Zhang (*Abstract Co-Author*)
Xi Hu (*Abstract Co-Author*)
Yangheng Zhou (*Abstract Co-Author*)
Hongjie Hu, MD (*Abstract Co-Author*)

PURPOSE

To investigate the clinical value of artificial intelligence iterative reconstruction (AIIR) in ultra-low-dose upper extremity CT angiography for arteriovenous fistula or graft (AVF/G) assessment in hemodialysis patients.

METHODS AND MATERIALS

Ninety patients with suspected or known AVF/G dysfunction among hemodialysis patients were prospectively enrolled and randomized into three groups: routine-dose group (RD, n=30; 100 kVp; 1.0 ml/kg contrast; hybrid iterative reconstruction), low-dose group (LD, n=30; 80 kVp; 0.6 ml/kg contrast; AIIR) and ultra- low-dose group (ULD, n=30; 60 kVp; 0.5 ml/kg contrast; AIIR). Two radiologists independently scored the overall image quality using a 4-point scale (1=poor; 4=excellent). Diagnostic performance (area under the curve, accuracy, sensitivity, specificity) for detecting significant (>50%) stenosis was evaluated on a per-segment basis, using digital subtraction angiography as the reference standard. Signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) in anastomotic stoma were also analyzed.

RESULTS

No significant differences in demographic characteristics were observed among the three groups (all p >0.05). Compared to the RD and LD, the ULD (77.09 mGyxcm, 28 mL contrast) demonstrated 83.91% and 65.67% reductions in radiation dose and 55.56% and 22.22% decreases in contrast dosage, respectively. Subjective image quality scores showed no intergroup differences (RD: 3.86±0.36 vs. LD: 3.68±0.48 vs. ULD: 3.64±0.38, p >0.05). In the per-segment analysis, diagnostic performance metrics (AUC/accuracy/sensitivity/specificity) remained comparable among three groups, with RD at (0.91, 90%, 92%, 90%), LD at (0.94, 90%, 100%, 87%), and ULD at (0.93, 88%, 100%, 86%). Notably, the ULD exhibited significantly higher SNR (39.71 vs. 23.18, p <0.001) and CNR (43.91 vs. 22.13, p <0.001) compared with RD, though lower than LD (SNR: 61.03; CNR: 57.24, both p <0.05) in anastomotic stoma.

CONCLUSION

Ultra-low-dose CTA with AIIR significantly reduces radiation and contrast doses while providing superior image quality and maintaining high diagnostic accuracy for AVF/G stenosis, offering a viable alternative to routine-dose CTA.

CLINICAL RELEVANCE/APPLICATION

The AIIR algorithm could be a promising reconstruction technique to improve image quality and maintain diagnostic performance of stenosis detection in upper extremity CTA for hemodialysis arteriovenous fistula/graft.

M7-STCE2-3 BOOSTING VASCULAR CONTRAST: ENERGY-AWARE DIFFUSION MODEL TO SALVAGE SUBOPTIMAL CT PULMONARY ANGIOGRAMS

Chang Yong Choi, MS (*Presenter*)
Seongyong Pak (*Abstract Co-Author*)
Hyunki Lee (*Abstract Co-Author*)
Joon Park, MD (*Abstract Co-Author*)
Yoojin Nam, MD (*Abstract Co-Author*)
Seungjoo Park (*Abstract Co-Author*)
Gil-Sun Hong, MD, PhD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

To salvage suboptimal enhanced CT pulmonary angiograms (CTPA) by generating contrast-boosted images using an energy-aware diffusion model (EADM), thus avoiding additional contrast media or repeat CT scans.

METHODS AND MATERIALS

A total of 212 contrast-enhanced dual-energy CTPA studies were used for model training, and evaluation was conducted on a temporally separated test set of 95 cases collected from a tertiary hospital. For each case, suboptimal enhanced CTPA (SE-CTPA) images were simulated at 80, 84, 90, 100, 110, and 125 keV using dual-energy simulation software (syngo.via, Siemens Healthineers) and paired with the corresponding optimally enhanced CTPA (OE-CTPA) images at 70 keV to serve as reference targets. EADM was designed to translate SE-CTPA into OE-CTPA by embedding energy-specific features extracted from the input images via an energy-aware encoder, aiming to restore optimal vascular contrast in SE-CTPA. EADM were compared to Image-to-Image Schrödinger Bridge (I²SB) and Pix2PixHD. The contrast boosting ratio percentage (CBR%) was calculated as the percentage of progress toward the target pulmonary artery attenuation of 400 HU. For quantitative metrics, root-mean-square error (RMSE), peak signal-to-noise ratio (PSNR), and structural-similarity index (SSIM) were calculated. Two expert radiologists performed a visual quality assessment of synthesized OE-CTPAs from 80, 100, and 125 keV SE-CTPA inputs in 16 PE-positive cases. This evaluation focused on pulmonary embolism (PE) conspicuity and was performed using a five-point Likert scale.

RESULTS

EADM achieved a mean CBR% of 74.59% ± 26.7% across the test set, indicating substantial progress toward the target pulmonary artery enhancement of 400 HU. For quantitative evaluation, EADM outperformed I²SB and Pix2PixHD in image similarity metrics, achieving the lowest RMSE (11.63 ± 7.27), highest PSNR (50.26 ± 3.76 dB), and highest SSIM (0.992 ± 0.007), all with statistically significant differences ($p < 0.001$). In the visual assessment of 16 PE-positive cases, synthesized OE-CTPAs generated by EADM demonstrated significantly improved conspicuity of pulmonary embolism, achieving a mean Likert score of 4.18 ± 1.13, compared with 3.33 ± 1.07 for I²SB and 3.53 ± 0.52 for Pix2PixHD ($p < 0.01$).

CONCLUSION

EADM effectively restores vascular contrast in SE-CTPA by generating diagnostically reliable synthetic images with improved visual quality compared to existing baseline models and achieved contrast enhancement.

CLINICAL RELEVANCE/APPLICATION

This technique can enhance pulmonary embolism detection, potentially reducing the need for repeat scans or additional contrast administration in clinical settings.

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R1-SSBR10

Breast Imaging (Digital Breast Tomosynthesis)

Thursday, Dec. 4 8:00AM - 9:00AM Room: S406A

Hiroyuki Abe, MD, PhD (*Moderator*)
Laurie R. Margolies, MD (*Moderator*)

Sub-Events

R1-SSBR10-1 DOES SLAB RECONSTRUCTION TECHNOLOGY IMPACT SCREENING MAMMOGRAPHY PERFORMANCE? A COMPARATIVE ANALYSIS OF SCREENING DBT PERFORMANCE METRICS BEFORE AND AFTER IMPLEMENTATION

Manisha Bahl, MD, MPH (*Presenter*)
Sarah Mercaldo, PhD (*Abstract Co-Author*)
Leslie Lamb, MD, MSc (*Abstract Co-Author*)

PURPOSE

Standard digital breast tomosynthesis (DBT) uses 1 mm slices, resulting in large image volumes and longer interpretation times. Slab reconstruction technologies address this challenge by generating thicker slices, thus reducing image count, improving efficiency, and lowering storage needs. However, their impact on screening performance remains unknown. The purpose of this study was to compare screening DBT performance metrics before and after implementation of a slab reconstruction technology.

METHODS AND MATERIALS

Performance metrics from consecutive screening DBT exams acquired before and after implementation of 3DQuorum ® Imaging (Hologic, Inc.; Marlborough, MA) at an academic medical center were retrospectively reviewed. 3DQuorum is a slab reconstruction technology that generates 6-mm synthetic slices with 3-mm overlap. The pre-implementation period was January 2018-December 2019 and post-implementation period was October 2021-December 2022. Exams were categorized as true-positive, false-positive, true-negative, or false-negative based on one-year follow-up data. Multivariable logistic regression was used to compare screening performance metrics in the pre- and post-implementation periods, after adjusting for age, race, breast density, presence of a prior screening mammogram, and reader.

RESULTS

A total of 157,532 screening DBT exams in 81,416 women were included: 89,218 exams (60,692 women, mean age 60, SD 11) in the pre-implementation period and 68,314 exams (60,338 women, mean age 61, SD 12) in the post-implementation period. In the pre- and post-implementation periods, cancer detection rates (CDRs) were 6.0 per 1000 exams (537/89,218) and 6.6 per 1000 exams (454/68,314), respectively. Multivariable analysis showed no significant differences in CDRs in the pre- and post-implementation periods (adjusted odds ratio [aOR] 1.05, p =0.54), nor in sensitivity (82.0% vs 87.0%, aOR 1.53, p =0.06) or false-negative rates (1.3 per 1000 vs 1.0 per 1000, aOR 0.72, p =0.10). The abnormal interpretation rate (AIR) was lower (6.6% vs 5.9%, aOR 0.85, p <0.001) and specificity higher (94.0% vs 94.7%, aOR 1.2, p <0.001) in the post-implementation period. Positive predictive value (PPV) 1 was also higher in the post-implementation period (9.1% vs 11.2%, p =0.01).

CONCLUSION

Implementation of a slab reconstruction technology maintained comparable CDRs and sensitivity while significantly improving specificity and reducing AIRs.

CLINICAL RELEVANCE/APPLICATION

Slab reconstruction technologies may optimize screening DBT workflows by reducing image volume and interpretation time without compromising - and potentially improving - diagnostic performance. These findings support their broader integration into clinical practice.

R1-SSBR10-2 REASSESSING RADIAL SCARS ON DBT: LOW MALIGNANCY UPGRADE RATES SUPPORT CONSERVATIVE MANAGEMENT

Romuald Ferre, MD (*Presenter*)
Cherie M. Kuzmiak, DO (*Abstract Co-Author*)

PURPOSE

Digital breast tomosynthesis (DBT) has enhanced the detection of radial scars (RS), often identified as incidental findings. Although RS are generally benign, concerns regarding associated malignancy often lead to surgical excision. However, limited data exist on the malignancy risk of RS detected exclusively by DBT. This meta-analysis aimed to estimate the pooled malignancy rate of DBT-detected RS and evaluate potential publication bias.

METHODS AND MATERIALS

A systematic meta-analysis was conducted across nine studies. Data on malignancy events and total cases were extracted from each study. Event rates and their variances were calculated. A random-effects model (DerSimonian and Laird method) was employed to estimate the pooled malignancy rate. Heterogeneity was assessed visually with a funnel plot and quantitatively via Egger’s regression test.

RESULTS

A total of 593 cases were included. The pooled malignancy event rate was 3.8% (95% CI: 2.5-5.9%), reflecting a low incidence across studies. Visual inspection of the funnel plot revealed no significant asymmetry, and Egger’s test yielded an intercept of -4.44 (p = 0.071), indicating no significant evidence of publication bias. Overall, findings were consistent and robust across the included studies.

CONCLUSION

RS detected on DBT demonstrate a low malignancy upgrade rate, which would support conservative management instead of surgical excision.

CLINICAL RELEVANCE/APPLICATION

This meta-analysis supports a conservative approach to managing RS identified exclusively on DBT, potentially reducing unnecessary surgeries and minimizing patient morbidity. Further prospective studies are needed to refine and validate these management strategies.

R1-SSBR10-4 AI PRE-READING OF DIGITAL BREAST TOMOSYNTHESIS: A MULTI-SITE VALIDATION OF A NOVEL IMAGING BIOMARKER FOR CONFIDENT IDENTIFICATION OF NORMAL DBT EXAMINATIONS

Joep Stevens (*Presenter*)
Santiago Pires (*Abstract Co-Author*)
Alejandro Rodriguez-Ruiz (*Abstract Co-Author*)
Andreas Lauritzen, PhD (*Abstract Co-Author*)
Nico Karssemeijer, PhD (*Abstract Co-Author*)
Christoph I. Lee, MD,MS (*Abstract Co-Author*)
Roger S. Yang, MD (*Abstract Co-Author*)
Ioannis Sechopoulos, PhD (*Abstract Co-Author*)
Hannah Milch, MD (*Abstract Co-Author*)
Marina Alvarez Benito, MD,PhD (*Abstract Co-Author*)
Katja Pinker-Domenig, MD, PhD (*Abstract Co-Author*)
Ritse M. Mann, MD, PhD (*Abstract Co-Author*)

PURPOSE

To validate the accuracy of a novel AI-driven imaging biomarker specifically engineered to identify normal breast tomosynthesis (DBT) examinations in breast cancer screening.

METHODS AND MATERIALS

The effect of AI pre-reading using the novel imaging biomarker was retrospectively evaluated in an independent multi-site dataset of 4-view DBT exams gathered across 15 institutions in the US (53%) and Europe (47%). In total, 6,344 DBT exams were included in this study, of which 614 led to diagnosis of biopsy proven screen-detected cancers (SDC), 159 were non-cancer recall cases and 5,571 were normal. DBT exams were acquired with Hologic (30%), Siemens (15%), GE (27%) and Fujifilm (28%) systems.The imaging biomarker was engineered to identify normal DBT exams using an AI ensemble including a multi-modal foundation model to distinguish normal from malignant and abnormal exams. The imaging biomarker was pre-calibrated to identify one-third (1/3) of the normal screening exams. Percentage of total normal examinations, negative predictive value (simulating a screening cancer incidence of 5.8/1000) and sensitivity for excluding SDC, and their corresponding 95% confidence intervals (CI) were computed. Sub-analyses were done per DBT acquisition vendor to test robustness of the imaging biomarker.

RESULTS

Pre-reading with the imaging biomarker correctly identified 35% (1951/5571, 95% CI: 34-36%) of the normal DBT exams, while achieving a sensitivity of 99.67% (612/614, 95% CI: 98.83-99.96%) to exclude SDC (2/614 missed). 16/159 (10%, 95% CI:6%-16%) of non-cancer recall cases were identified as normal. Assuming a SDC incidence of 5.8/1,000 exams, applying the pre-reading biomarker to a cohort of 54,000 women would misclassify only one DBT exam that contains a SDC for every 18,000 exams it labels as normal. This corresponds to an NPV of 99.995 % (95 % CI: 99.98-100%).The imaging biomarker performance was not significantly influenced by the DBT acquisition system, achieving NPV values of 99.982% (95% CI: 99.94-100%), 100% (95% CI: 99.87-100%), 100% (95% CI: 99.97-100%) and 100% (95% CI: 99.97-100%) while identifying 31% (504/1650), 30% (253/837), 37% (553/1507) and 41% (641/1577) of normal exams for Hologic, Siemens, GE and Fujifilm respectively.

CONCLUSION

A novel AI-driven imaging biomarker for pre-reading of DBT can confidently identify approximately one-third of normal DBT examinations in breast cancer screening with a negative predictive value nearing 100%.

CLINICAL RELEVANCE/APPLICATION

This AI-driven imaging biomarker can enable pre-reading in breast cancer screening, potentially allowing radiologists to skip or significantly accelerate the reading of this group of DBT exams, safely improving radiologist efficiency and reducing workload.

R1-SSBR10-5 CAN NEW CONCEPT SYNTHESIZED MAMMOGRAMS (SM) REPLACE DIGITAL BREAST TOMOSYNTHESIS (DBT) WITH DIGITAL MAMMOGRAPHY (DM)? : SM ALONE READING VERSUS DM WITH OR WITHOUT DBT READING

Takayoshi Uematsu, MD, PhD (*Presenter*)

PURPOSE

To evaluate the efficacy of new standalone synthesized mammograms (SM) in maintaining or improving diagnostic accuracy while reducing reading time compared to digital breast tomosynthesis (DBT) combined with digital mammography (DM), or DM alone.

METHODS AND MATERIALS

The SM were generated as a kind of artificial intelligence (AI)-supported DBT reading method. AI recognized characteristic breast objects in DBT images and generated them into the SM without marks or outlines, allowing readers to avoid scrolling through DBT images and to perform natural image reading without distractions. A study involving 12 readers assessed the performance of SM alone across 200 examinations (including 50 cancer cases) and compared it to DM with or without DBT. Key metrics—area under the receiver operating characteristic curve (AUC), sensitivity, specificity, and reading time—were analyzed using statistical methods designed for multireader, multicase studies. Power and sample size calculations for the endpoints were conducted according to parameter estimates from our prior reader study. This study has received funding from FUJIFILM (Tokyo, Japan) .

RESULTS

The AUC improved from 0.906 (DBT with DM) to 0.912 (SM alone), indicating noninferiority for SM alone reading (95% CI: -0.013 to 0.026; $p = 0.538$). Similarly, SM showed noninferiority when compared to DM, with an AUC increase from 0.897 to 0.912 (95% CI: -0.005 to 0.037; $p = 0.13$). Sensitivity improved from 88.1% (DBT with DM) to 90.9% (SM alone) (95% CI: -0.0015 to 0.0072; $p = 0.152$) and significantly improved from 86.6% (DM) to 90.9% (SM) (95% CI: 0.0001 to 0.089; $p = 0.042$). Specificity values for SM alone, DBT with DM, and DM alone were 84.5%, 85.9%, and 86.5%, respectively, with no significant reduction observed. Importantly, mean reading time decreased by 53.2% (95% CI: 58.1%, 49.0%; $p < 0.001$), from 122.6 seconds (DBT with DM) to 57.5 seconds (SM alone).

CONCLUSION

New concept standalone SM reading was shown to maintain the diagnostic performance of DBT combined with DM, significantly reducing reading time. Additionally, the SM demonstrated statistically higher sensitivity compared to DM without significant reduction in specificity.

CLINICAL RELEVANCE/APPLICATION

This innovative SM has enough potential to replace DBT with DM reading for breast cancer screening with magnificent work efficiency decreasing radiologists' workload.

R1-SSBR10-6 FEASIBILITY OF REDUCING COMPRESSION FORCE IN DIGITAL BREAST TOMOSYNTHESIS: A MULTIVENDOR PHANTOM STUDY WITH MULTIREADER ASSESSMENT

Hee Jeong Kim, MD, PhD (*Presenter*)
Hak Hee Kim, MD, PhD (*Abstract Co-Author*)
Hye Joung Eom (*Abstract Co-Author*)
Woo Jung Choi, MD (*Abstract Co-Author*)
Eun Young Chae, MD, PhD (*Abstract Co-Author*)
Hee Jung Shin, MD, PhD (*Abstract Co-Author*)
Joo Hee Cha, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility of reducing compression force during digital breast tomosynthesis (DBT) acquisition by comparing image quality and radiation dose across varying compression levels using a compressible breast phantom and multiple DBT systems.

METHODS AND MATERIALS

A compressible mammography phantom embedded with simulated lesions and parenchymal structures was imaged using four different DBT systems under four compression forces (20, 15, 10, and 5 daN) and two angulated positions (0° and 45°), using automatic exposure control. Each acquisition was repeated three times, generating 96 image sets. Slice, slab, and synthetic 2D images were independently assessed by seven dedicated breast radiologists, scoring lesion visibility, margin sharpness, and overall image quality. System-recorded average glandular dose (AGD) and compression thickness were also collected. Statistical comparisons were performed using linear mixed models.

RESULTS

Slice images maintained consistent visibility, sharpness, and overall quality scores across all compression levels, with no significant degradation observed down to 5 daN in all readers ($P = 0.181$). In slab images, visibility and overall quality at 5 daN were comparable to those at 20 daN in 57% (4/7) and 86% (6/7) of readers, respectively ($P = 0.077$), and were even rated higher than 20 daN by 43% (3/7) and 14% (1/7) of readers, respectively ($P = 0.004$-0.043). Sharpness scores in slab images remained unchanged in all readers ($P = 0.101$). For synthetic 2D images, image quality at 10 and 15 daN remained comparable to 20 daN in all readers for all metrics ($P = 0.096$), while at 5 daN, visibility, sharpness, and overall quality were significantly reduced in 86% (6/7), 57% (4/7), and 57% (4/7) of readers, respectively ($P = 0.035$). AGD values were 1.4, 1.5, 1.6, and 1.9 mGy at 20, 15, 10, and 5 daN, respectively, with no significant increase observed down to 10 daN ($P = 0.179$).

CONCLUSION

Reducing compression force to 10 daN did not compromise diagnostic image quality or increase AGD, supporting the feasibility of lower compression protocols in DBT. These findings suggest that moderate reductions in compression could enhance patient comfort without sacrificing diagnostic performance or safety. Further clinical validation in diverse patient populations is warranted.

CLINICAL RELEVANCE/APPLICATION

This phantom study demonstrates that reducing compression force to 10 daN during DBT acquisition maintains diagnostic image quality and does not significantly increase radiation dose. These findings support the clinical feasibility of implementing lower compression protocols, which may improve patient comfort and enhance participation in breast cancer screening programs.

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

R1-SSCA09

Science Session with Keynote: Cardiac Imaging (Systemic Effects of Cardiac Diseases)

Thursday, Dec. 4 8:00AM - 9:00AM Room: E353C

Jonathan Revels, DO (*Moderator*)
Matthew T. Stib, MD (*Moderator*)

Sub-Events

R1-SSCA09-3 SEX-SPECIFIC ASSOCIATIONS OF LONG-TERM AIR POLLUTION EXPOSURE WITH CORONARY ARTERY STENOSIS ON CARDIAC CT

Felipe Castillo Aravena, MD (*Presenter*)
Chloe DesRoche, MD,MSc (*Abstract Co-Author*)
Scott Delaney (*Abstract Co-Author*)
Rachel Nethery (*Abstract Co-Author*)
Paaladinesh Thavendiranathan, MD (*Abstract Co-Author*)
Heather Ross (*Abstract Co-Author*)
Kate Hanneman, MD, MPH (*Abstract Co-Author*)

PURPOSE

Exposure to air pollution is associated with cardiovascular mortality. However, evidence on the relationship between air pollution and obstructive coronary artery disease (CAD) is lacking. The purpose of this study was to evaluate the association of long-term air pollution exposure with coronary artery stenosis on cardiac CT.

METHODS AND MATERIALS

Adult patients who had undergone coronary CT angiography at one of three hospitals between 2015-2023 were retrospectively evaluated. Luminal stenosis was categorized using CAD-RADS 2.0 stenosis categories and obstructive CAD was defined as >50% diameter stenosis. Mean daily fine particulate matter (PM2.5) and gaseous nitrogen dioxide (NO2) air pollution concentrations in the 10-year period prior to cardiac CT were assessed based on direct measurements from the nearest monitoring station to each patient's home. Ordinal logistic (CAD-RADS categories) and logistic (obstructive CAD) regression models were adjusted for sex, distance to monitoring station, rural residence, CT unit, and socioeconomic status.

RESULTS

2172 patients were included (51.5% male, mean age 58.2±12.3 years). Median 10-year exposure to PM2.5 was 7.5 (range 4.6-9.3) μg/m3 and NO2 was 12.2 (range 2.0-20.2) parts per billion (ppb). A 1 μg/m3 increase in ten-year PM2.5 exposure was associated with 1.24 times greater odds of moving to a higher CAD-RADS stenosis category (OR 1.24; 95% CI: 1.04, 1.48, P=0.02) and 1.33 times greater odds of obstructive CAD (OR 1.33; 95% CI: 1.01, 1.75, P=0.04). A 1 ppb increase in ten-year NO2 exposure was associated with 1.04 times greater odds of obstructive CAD (OR 1.04; 95% CI: 1.01, 1.09, P=0.03), although the association with CAD-RADS stenosis category was not significant (OR 1.02; 95% CI: 0.99, 1.05, P=0.09). When stratified by sex, a 1 μg/m3 increase in ten-year PM2.5 exposure was associated with 1.47 times greater odds of moving to a higher CAD-RADS stenosis category in men (OR 1.47; 95% CI: 1.16, 1.87, P=0.002); however, the association was not significant in women (OR 1.03; 95% CI: 0.79, 1.35, P=0.81, interaction term P=0.03). A 1 ppb increase in ten-year NO2 exposure was associated with 1.04 greater odds of moving to a higher CAD-RADS stenosis category in men (OR 1.04; 95% CI: 1.00, 1.07, P=0.02); however, the association was not significant in women (OR 1.01; 95% CI: 0.98, 1.05, P=0.51, interaction term P=0.28).

CONCLUSION

Higher long-term exposure to air pollution, particularly PM2.5, is independently associated with coronary artery stenosis and obstructive CAD in men but not women.

CLINICAL RELEVANCE/APPLICATION

Atherosclerosis may be one of the underlying pathophysiological mechanisms by which air pollution leads to adverse cardiovascular outcomes in men.

R1-SSCA09-4 MITRAL ANNULAR DISJUNCTION IN MARFAN SYNDROME ASSESSED USING CARDIOVASCULAR MAGNETIC RESONANCE

Lenhard Pennig, MD (*Presenter*)
Jonathan M. Kottlors, MD (*Abstract Co-Author*)
Carsten H. Gietzen, MD (*Abstract Co-Author*)
Leon Bischoff, MD (*Abstract Co-Author*)
Moritz Halfmann, MD (*Abstract Co-Author*)
Jan Paul Janssen, MD (*Abstract Co-Author*)
Roman J. Gertz, MD (*Abstract Co-Author*)
Tilman S. Emrich, MD (*Abstract Co-Author*)
Patrick Krumm, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)
Kenan Kaya, MD (*Abstract Co-Author*)

PURPOSE

To assess prevalence, extent, and distribution of mitral annular disjunction (MAD) in Marfan syndrome (MFS) using cardiovascular magnetic resonance (CMR) and to examine its association with left heart parameters, aortic dimensions, and cardiovascular events.

METHODS AND MATERIALS

This retrospective multicenter study included CMR studies of patients treated for MFS at four tertiary care medical centers with a (likely) pathogenic fibrillin-1 gene variant. Two radiologists (five and eight years of experience in CMR) evaluated CMR for MAD (at four points around the annulus, including measurement of extent) and mitral valve prolapse (MVP). Furthermore, left ventricular (LV) function and volumes, left atrial size, and aortic root diameters were analyzed. Cardiovascular events included aortic (aortic surgery or aortic dissection), arrhythmic (sustained ventricular tachycardia or sudden cardiac death), and mitral events (mitral valve surgery, MVS).

RESULTS

Among 91 patients (28.9±14.0 years, 47.3% female), 81.3% had MAD (extent: 6.1±2.6 mm). MAD was mostly found at the inferior insertion (72.5% of patients) and generally affected all sites (39.6% of patients). Left heart parameters and aortic dimensions did not differ between MAD and no MAD groups (p>0.05). MAD extent and localizations showed significant correlations with LV dilatation (e.g., inferior MAD: r=0.62 for end-diastolic volume index), decreased LV ejection fraction (e.g., anterolateral MAD: r=-0.46), and MVP (e.g., MAD distance: r=0.83), which was found in 44.6% of patients with MAD while only affecting 11.8% of patients without MAD (p=0.017). After a mean follow-up of 4.0±3.0 years, cardiovascular events (aortic: 14.3%, both arrhythmic and mitral: 2.2% of patients) did not differ significantly (all p>0.05) between groups albeit MVS being exclusively performed in MAD.

CONCLUSION

MAD is highly prevalent in MFS, mostly affects the inferior site, and usually involves all sites. Left heart parameters, aortic dimensions, and cardiovascular events did not differ between patients with and without MAD. However, localization and extent of MAD yielded distinct correlations with LV dilatation and dysfunction as well as the presence of MVP, which almost exclusively occurred in MAD.

CLINICAL RELEVANCE/APPLICATION

MAD´s high prevalence, large extent, and pan-annular distribution suggest a systemic annular pathology in MFS. While overall presence of MAD was not associated with changes to left heart parameters including aortic dimensions and the occurrence of cardiovascular events, MAD might serve as a potential marker of disease progression given its correlation of localization and distance with LV dysfunction and dilatation as well as the formation of MVP.

R1-SSCA09-5 OPPORTUNISTIC SCREENING FOR ADVERSE CARDIOVASCULAR EVENTS USING ROUTINE CLINICAL CHEST COMPUTED TOMOGRAPHY - A STUDY ON PERFORMANCE AND GENERALIZATION

Amara Tariq, PhD, MS (*Presenter*)
Theodorus Dapamede, MD, PhD (*Abstract Co-Author*)
Hari Trivedi, MD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)
Matthew T. Stib, MD (*Abstract Co-Author*)
Imon Banerjee, PhD (*Abstract Co-Author*)

PURPOSE

Traditional methods for major adverse cardiovascular events (MACE) risk estimation, e.g., pooled cohort equation, do not incorporate radiology imaging directly, rely on known clinical and demographic risk factors and achieve suboptimal performance when applied to external institutions with clinical and demographic distributions shift. We developed a 3D CNN model to estimate MACE risk from chest computed tomography (CT) with causal intervention to enhance model's generalizability to 'shifted' external cohorts.

METHODS AND MATERIALS

Causal intervention was introduced into 3D CNN by a learnable codebook that simulated distribution of 'unknown' confounding variable (P(U)). The underlying assumption is that the learned relationship between input (chest CT) and output (MACE risk) is affected by an unobserved variable (U) like complex socioeconomic factors that limits model's generalization capabilities. P(U) was partially estimated using auxiliary tasks of concepts (hypertension, diabetes, chronic kidney disease) and proxy (demographics) prediction in addition to MACE prediction. Baseline performance was estimated by a machine learning model using demographic and body composition statistics (visceral and subcutaneous fat and muscle) computed from CT. Composite MACE labels (myocardial infarction, cardioembolic stroke, acute heart failure, all cause mortality) with 5 years followup were curated using structured diagnosis codes (ICD10).

RESULTS

4431 CTs (4231 patients) from multi-site healthcare institute X formed the internal cohort (MACE: 47%, Age: 62+/-18 years; 10% African American); 20% data held out for testing. Random set of 201 CT (191 patients) without history of MACE (MACE: 50%, Age: 62+/-15 years; 29% African American patients) was used for external validation from geographically distant healthcare institute Y. 3D CNN with and without causal intervention achieved comparable performance (0.73 AUROC) on the internal test set but outperformed the baseline (0.67 AUROC, +0.06). In external validation, CNN3D with causal intervention (0.69 AUROC) outperformed CNN3D without causal intervention (0.65 AUROC, +0.04) proving the benefits of causal intervention for model generalization.

CONCLUSION

We developed a 3D CNN model to estimate MACE risk from chest CT and incorporated causal intervention to improve model generalization. Our model outperformed comparative models and generalized well to external data with significant shift in patient populations.

CLINICAL RELEVANCE/APPLICATION

Leveraging AI to analyze rich, underutilized data within routinely performed chest CTs holds significant promise for enhancing early MACE risk estimation across diverse patient populations beyond the capabilities of current clinical tools.

R1-SSCA09-6 Keynote Speaker

Jonathan Revels, DO (*Science Invited Presenter*)

Nov. 30 – Dec. 4
RSNA® 2025
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R1-SSGU06

Genitourinary Imaging (Innovations and Emerging Applications in Genitourinary Imaging)

Thursday, Dec. 4 8:00AM - 9:00AM Room: E353B

Rebecca Rakow-Penner, MD, PhD (*Moderator*)
Alexandra Ljimani, MD (*Moderator*)

Sub-Events

R1-SSGU06-1 TIME-DEPENDENT DIFFUSION MRI HELPS PREDICT HISTOLOGIC FINGDINGS AND TREATMENT RESPONSE TO NEOADJUVANT TREATMENT IN BLADDER CANCER

Lingmin Kong, MD (*Presenter*)
Qian Cai (*Abstract Co-Author*)
Yan Guo (*Abstract Co-Author*)
Huanjun Wang (*Abstract Co-Author*)

PURPOSE

To investigate the capability of time dependent diffusion MRI (td-dMRI) based microstructural parameters in the characterization and differential diagnosis of bladder cancer (BCa).

METHODS AND MATERIALS

From August 2023 to April 2025, BCa participants who underwent MRI examination, including oscillating and pulsed gradient encoded sequences, were prospectively enrolled. The td-dMRI data were fitted with a two-compartment model to estimate cell diameter (d), cellularity, intracellular volume fraction (f in) and extracellular diffusivities (D ex). The correlation between the td-dMRI-based microstructural parameters and histopathology as well as patients' response to the neoadjuvant treatment (NAT) was investigated. A P value < 0.05 was considered significant.

RESULTS

A total of 150 participants (mean age, 65.53 years ± 11.50 [SD]; 131 men) was included in this prospective study. More aggressive tumors (high grade, muscle invasive and tumor with the presence of VH) tend to have higher f in and cellularity as well as lower D ex and ADC 0,17 and 33HZ values (all P < 0.05). For patients who achieved pathological complete response after NAT, lower d and ADC 0,17 and 33HZ values were observed (all P < 0.05).

CONCLUSION

The td-dMRI could noninvasively depict tumor pathologic findings and may be useful for predicting the prognosis of BCa patients.

CLINICAL RELEVANCE/APPLICATION

Noninvasively characterizing the pathologic properties of bladder cancer (BCa) plays a crucial role in modern risk stratification in the management of BCa. The newly development of time-dependent diffusion MRI (td-d MRI) has further enhanced the capacity to probe tissue microstructure. In this study, we found that the td-dMRI-based microstructural parameters not only were correlated with the aggressiveness of bladder tumor but also shed lights on helping to predict pCR to neoadjuvant treatment in participants with BCa. The present study demonstrated time-dependent diffusion MRI had promising application in BCa.

R1-SSGU06-2 IMAGING OF THE RENAL ALLOGRAFT VASCULATURE WITHOUT GADOLINIUM CONTRAST: INTRAINDIVIDUAL COMPARISON BETWEEN RELAXATION-ENHANCED ANGIOGRAPHY WITHOUT CONTRAST AND TRIGGERING (REACT) AND 4D CONTRAST-ENHANCED MR-ANGIOGRAPHY

Carsten H. Gietzen, MD (*Presenter*)
Jan Paul Janssen, MD (*Abstract Co-Author*)
Kenan Kaya, MD (*Abstract Co-Author*)
Roman J. Gertz, MD (*Abstract Co-Author*)
Thorsten Persigehl, MD (*Abstract Co-Author*)
Kilian Weiss, PhD (*Abstract Co-Author*)
Lenhard Pennig, MD (*Abstract Co-Author*)

PURPOSE

To evaluate Relaxation-Enhanced Angiography without Contrast and Triggering (REACT), a novel 3D isotropic flow-independent non-CE-MRA sequence, for imaging of the renal allograft vasculature by performing an intraindividual comparison to 4D CE-MRA at 3Tesla.

METHODS AND MATERIALS

Forty studies of 39 patients were included in this retrospective, single-centre study. Two board-certified radiologists independently evaluated MRA datasets for TRAS and rated their diagnostic confidence and the image quality of pelvic vessels using 5-point Likert scales (5=excellent). Apparent signal- and contrast-to-noise ratios (aSNR/aCNR) were measured for arterial and venous graft vessels.

RESULTS

REACT (median acquisition time 04:33 min [IQR 3:58-5:20 min]) showed 90.0% sensitivity and 100.0% specificity for TRAS in almost perfect agreement (r=0.97) with 4D CE-MRA (03:41 min [3:38-4:46 min], p=0.001) and similar diagnostic confidence (REACT: 4.0 [4.0-4.0] vs. 4D CE-MRA: 4.0 [3.0-4.0], p=0.54). Arterial image quality was comparable (4.0 [3.7-4.4] vs. 4.0 [4.0-4.4], p=0.49) whereas veins yielded higher scores in REACT (3.2 [3.0-3.5] vs. 2.4 [2.0-3.0], p<0.001). Transplant renal artery (mean±SD; 44.5±18.2 vs. 45.9±21.0, p=0.71; 36.3±15.0 vs. 41.0±20.0, p=0.16) and vein (37.1±19.8 vs. 30.3±15.2, p=0.06; 29.4±17.1 vs. 25.0±14.7, p=0.17) showed no difference in aSNR and aCNR.

CONCLUSION

Contrast-enhanced MRA (CE-MRA) has limitations, including potential allergic reactions, limited use in kidney failure, and uncertain long-term effects of gadolinium retention. REACT provides accurate detection of TRAS with image quality comparable to 4D CE-MRA, offering a risk-free alternative for imaging after renal transplantation.

CLINICAL RELEVANCE/APPLICATION

In a short scan time of less than five minutes, REACT provides high diagnostic performance for identifying TRAS and other vascular findings. These findings highlight the potential of REACT for imaging of the renal allograft vasculature without the use of gadolinium contrast in patients after renal transplantation to identify complications after kidney transplantation.

R1-SSGU06-3 PHOTON-COUNTING CT TO CHARACTERIZE INDETERMINATE RENAL LESIONS - A TWO-CENTER STUDY

Olga Sliwicka, MD, PhD (*Presenter*)
Khanin Khanungwanitkul, MD (*Abstract Co-Author*)
Fides Schwartz, MD (*Abstract Co-Author*)
Aaron D. Sodickson, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the role of Photon-Counting Computed Tomography (PCCT) to definitively characterize incidental indeterminate renal lesions identified during routine abdominal imaging, aiming to reduce follow-up examinations.

METHODS AND MATERIALS

Retrospective analysis was performed on 2733 consecutive portal-venous phase PCCT scans obtained between July 2023 and October 2024 from three scanners (NAEOTOM Alpha) at two institutions. Renal lesions with indeterminate attenuation >20 HU (or heterogeneous lesions with components > 20 HU) were included. Reference standard criteria used to define lesions as benign or non-benign were: Benign: 1) No growth over two years OR 2) No enhancement on MRI, renal protocol CT or non-contrast CT within two years, (if 1-3 thin enhancing septations were present, lesions were considered non-enhancing). Non-benign: 1) Contrast enhancement on MRI or renal protocol CT; 2) rapid growth in patients with a known malignancy; 3) FDG-avidity on PET/CT; 4) lesion biopsy. PCCT iodine measurements were made on dual-energy iodine-overlay maps using an ROI covering two-thirds of homogeneous lesions to prevent volume averaging, on 0.4 mm (n=130), 1.0 mm (n=36) and 1.5 mm (n=49) slice thickness (depending on scanner protocol). The cut-off (mg/mL) in iodine concentration for benign lesions was calculated from ROC analysis to maintain 100% sensitivity in order to avoid mischaracterizing enhancing lesions as benign.

RESULTS

Of 2733 scans performed on the three PCCT scanners, 169 contained 216 indeterminate lesions with reference standard imaging, of which 190 (87%) were benign, and 26 (13%) were non-benign. Median iodine concentration [25-75% IQR] was 0.4 [0.1 - 0.7] mg/mL for benign lesions, and 2.0 [1.4 - 2.8] mg/mL for non-benign lesions (Wilcoxon $p<0.005$). At the ROC operating point that maintains 100% sensitivity for non-benign lesion detection, specificity was 88%. This was accomplished at an iodine concentration cut-off value of 1.0 mg/mL.

CONCLUSION

PCCT can accurately characterize up to 88% of indeterminate renal lesions as benign non-enhancing complex cysts, at an iodine threshold that avoids incorrectly characterizing any truly enhancing lesions as benign.

CLINICAL RELEVANCE/APPLICATION

Using spectral information from PCCT to characterize indeterminate renal lesions has the potential to substantially reduce the need for downstream imaging workup.

R1-SSGU06-5 PELVIC CALCIUM MEASURED BY NON-CONTRAST ABDOMINOPELVIC RADIOTHERAPY PLANNING CT CORRELATES WITH CORONARY ATHEROSCLEROTIC BURDEN AND PREDICTS NEAR-TERM CORONARY ARTERY PLAQUE PROGRESSION IN PROSTATE CANCER MEN UNDERGOING ANDROGEN DEPRIVATION THERAPY

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Adithya Yadalam (*Abstract Co-Author*)
Marly Van Assen (*Abstract Co-Author*)
Carlo N. De Cecco, MD, PhD (*Abstract Co-Author*)
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Bruce Hershatter, MD (*Abstract Co-Author*)
Ashesh B. Jani, MD, MS (*Abstract Co-Author*)
Stephanie Cantu (*Abstract Co-Author*)
Anant Mandawat (*Abstract Co-Author*)
Sagar A. Patel, MD (*Abstract Co-Author*)

PURPOSE

Prostate cancer (PCa) men, especially those receiving androgen deprivation therapy (ADT), are at increased risk of cardiovascular (CV) morbidity. This analysis aims to identify an imaging biomarker to predict CV risk from PCa treatment.

METHODS AND MATERIALS

Men with localized PCa pursuing definitive radiotherapy (RT) alone or RT + 6 months ADT were enrolled on a prospective trial (NCT05320406). All patients underwent pre-treatment and 12-month post-treatment coronary CT angiography (CCTA) to measure change in coronary artery total plaque volume (TPV), non-calcified plaque volume (NCPV), calcified plaque volume (CPV), and calcium score (CACS). Non-contrast abdominopelvic CT for RT treatment planning was used to quantify lower aortic and iliac artery calcium volume (i.e. pelvic artery calcium, PAC (mm^3)) prior to treatment, using commercially available software. The Spearman test was used to assess correlation between PAC and baseline coronary plaque features. PAC associations with 12-month CCTA were assessed via ANCOVA adjusted for baseline respective plaque volume/CACS, age, and statin use.

RESULTS

The study included 47 PCa men (N=13 RT alone; N=34 RT +ADT). There were no significant demographic differences between treatment groups. Median PAC was 500 mm^3. PAC volume correlated with baseline coronary TPV (rho 0.332, p=0.02), NCPV (rho 0.333, p=0.02), CPV (rho 0.326, p=0.03), and CACS (rho 0.298, p=0.04). Median (IQR) 12-month change in TPV was +13.00 mm^3 (-3.00-49.50) versus +25.50 mm^3 (-7.50-62.00) in men with less than versus greater than median total PAC, respectively. Among the entire cohort, patients with elevated baseline PAC volume = 500.0 mm^3 had greater post-treatment CPV change compared to those below this threshold (estimated difference +15.6 mm^3, 95% CI: -0.7 to 32.0, p=0.06). This change was driven by post-treatment CPV increase in men receiving ADT, which exhibited an increase in mean-adjusted CPV of 20.9 mm^3 (95% CI: -1.1 to 42.9, p=0.06), compared to no change in the RT alone cohort (2.9 mm^3, 95% CI: -7.0 to 12.9, p=0.52).

CONCLUSION

In men with localized prostate cancer, pelvic artery calcium burden, measured on non-contrast CT scans used for RT treatment planning, correlated with baseline coronary atherosclerosis, including specific CCTA imaging features that are validated predictors of adverse CV events. Further, elevated baseline PAC >500 mm^3 is associated with increases in coronary CPV after treatment, specifically in patients receiving ADT.

CLINICAL RELEVANCE/APPLICATION

Non-contrast abdominopelvic CT scans used for RT treatment planning may offer a cost-effective, accessible biomarker to identify men at elevated CV risk from ADT

R1-SSGU06-6 CLINICALLY SIGNIFICANT PROSTATE CANCER CHARACTERIZATION USING RAPID B1-INSENSITIVE MR FINGERPRINTING

Dheeman Futela, MBBS (*Presenter*)
Zhiqing Yin (*Abstract Co-Author*)
Sohrab Afshari Mirak, MD (*Abstract Co-Author*)
Nikhil H. Ramaiya, MD (*Abstract Co-Author*)
Chris A. Flask, PhD (*Abstract Co-Author*)
Leonardo K. Bittencourt, MD, PhD (*Abstract Co-Author*)
Mark A. Griswold, PhD (*Abstract Co-Author*)
Yong Chen (*Abstract Co-Author*)
Sreeharsha Tirumani, MD (*Abstract Co-Author*)

PURPOSE

MR fingerprinting (MRF) has shown utility in characterization of focal prostate lesions, especially when combined with apparent diffusion coefficient (ADC). However, prior studies were retrospective and employed an MRF acquisition with long scan times and prone to B1 field inhomogeneities. In addition, inconsistent sampling techniques were applied for histopathologic correlation. This study aimed to determine the utility of MRF, combined with ADC and clinical parameters, in prostate lesion characterization by adopting a rapid, B1-insensitive MRF technique.

METHODS AND MATERIALS

Between 2020 and 2024, consecutive biopsy-naïve adult men with clinical suspicion of prostate cancer were prospectively enrolled and bi- or multi-parametric MRI was performed. Axial T1 and T2 maps were acquired using a rapid MRF technique (15 sec/slice) with low flip angles (5°-12°), which is relatively insensitive to B1 inhomogeneities. Lesions with PI-RADS 3-5 were selected and quantitative tissue properties (T1, T2, and ADC) were extracted from region of interests. The target region was sampled using MR-transrectal ultrasound fusion biopsy. ROC analysis was performed to differentiate focal lesions with clinically significant prostate cancer (Gleason 3+4 or above, csPCa) from clinically insignificant lesions (Gleason 3+3 or benign).

RESULTS

51 peripheral zone lesions from 40 patients (age 65 ± 12) were included. csPCa had lower mean T2 (56 ± 12 ms) and ADC (668 ± 111 x 10-6 mm2/s) compared to clinically insignificant lesions (80 ± 20 ms and 876 ± 181 x 10-6 mm2/s respectively, P<.001). To separate csPCa (n=22) from insignificant lesions (n=29), T2 was the strongest univariate predictor (AUC T2 = 0.87 [95% CI: 0.76-0.97], AUC ADC = 0.83 [0.71-0.95], and AUC T1 = 0.63 [0.48-0.79]). Combined MRF and ADC yielded excellent differentiation (AUC ADC+T2 = 0.90, AUC ADC+T1+T2 = 0.91), significantly outperforming univariate models (P<0.05). Among clinical parameters, adding PSA density further improved the AUC to 0.94 (P=0.01). Using thresholds of ADC 650 x 10-6 mm2/s and T2 63 ms, 20/29 (68%) of unnecessary biopsies could have been avoided, at the expense of missing only 1/22 (4%) of csPCa.

CONCLUSION

csPCa have significantly lower ADC and MRF-T2 values compared to insignificant lesions. Combination of ADC and MRF relaxometry provides excellent differentiation of csPCa from insignificant lesions. In addition, inclusion of PSA density has incremental value when combined with ADC and MRF.

CLINICAL RELEVANCE/APPLICATION

Quantitative MRI using ADC and rapid B 1 -insensitive MRF provides objective non-invasive assessment of focal prostate lesions with excellent differentiation of csPCa from insignificant lesions, with the potential to eliminate unnecessary biopsies.

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

R1-SSNMMI07

Nuclear Medicine and Molecular Imaging (Cardiac)

Thursday, Dec. 4 8:00AM - 9:00AM Room: S405

Joanna R. Fair, MD, PhD (*Moderator*)
Paulo Henrique Rosado de Castro, MD, PhD (*Moderator*)

Sub-Events

R1-SSNMMI07-1 FRACTAL ANALYSIS OF FDG UPTAKE FOR DIFFERENTIATING PHYSIOLOGICAL MYOCARDIAL UPTAKE FROM ACTIVE CARDIAC SARCOIDOSIS

Ryuji Sakai, RT (*Presenter*)
Emi Tateishi (*Abstract Co-Author*)
Takuji Nanno (*Abstract Co-Author*)
Yoshifumi Nouno (*Abstract Co-Author*)
Akihide Shimizu (*Abstract Co-Author*)
Midori Fukuyama, MD (*Abstract Co-Author*)
Masateru Kawakubo, PhD (*Abstract Co-Author*)
Keizo Murakawa (*Abstract Co-Author*)
Tetsuya Fukuda, MD, PhD (*Abstract Co-Author*)

PURPOSE

18 F-fluorodeoxyglucose (FDG) PET is used to assess disease activity in cardiac sarcoidosis (CS); however, distinguishing active inflammatory lesions from physiological myocardial uptake remains challenging when relying solely on FDG uptake. Recently, heterogeneity of FDG uptake has been shown to help differentiate malignant from benign tumors in oncologic imaging. We applied fractal analysis to myocardial FDG uptake to quantify spatial complexity and heterogeneity, and evaluated their ability to differentiate pathological uptake from physiological uptake.

METHODS AND MATERIALS

We retrospectively analyzed 51 patients who underwent FDG PET/CT for evaluation of disease activity or clinical diagnosis of CS. Based on visual interpretation by two experts, patients were classified into a physiological group (n = 21, with physiological myocardial FDG uptake) and a pathological group (n = 30, with FDG uptake suggesting active inflammatory lesions). Short-axis images of the left ventricle were reconstructed to generate polar maps. Fractal analysis of FDG uptake was performed on these maps using a custom MATLAB script to calculate the fractal dimension (FD). Spatial complexity was quantified as the peak ratio of FD (PR-FD), defined as max / mean FD. Heterogeneity was assessed as the coefficient of variation of FD (CV-FD), defined as SD / mean FD. FD, PR-FD, and CV-FD were compared between two groups. Reproducibility of FD calculation was assessed by two radiological technologists.

RESULTS

FD values significantly differed between the physiological and pathological groups (1.37 vs. 1.16, $p < 0.001$). PR-FD and CV-FD were significantly elevated in the pathological group compared to the physiological group (PR-FD: 1.20 vs. 1.07, $p < 0.001$; CV-FD: 0.13 vs. 0.06, $p < 0.001$). Based on ROC analysis, the optimal cutoff values for differentiating pathological uptake from physiological uptake were 1.115 for PR-FD and 0.093 for CV-FD, demonstrating excellent discrimination. Reproducibility of FD calculation was excellent, with an intra-observer ICC of 0.981 and an inter-observer ICC of 0.961.

CONCLUSION

Fractal analysis of FDG PET images can quantify the spatial complexity and heterogeneity of myocardial FDG uptake in patients with CS. PR-FD and CV-FD demonstrated high accuracy in differentiating pathological uptake from physiological myocardial uptake, suggesting their potential as objective imaging biomarkers for assessing disease activity in CS.

CLINICAL RELEVANCE/APPLICATION

Fractal analysis of myocardial FDG uptake can evaluate spatial complexity and heterogeneity in cardiac sarcoidosis (CS). Fractal dimension-based indices may serve as novel imaging biomarkers for assessing disease activity in CS.

R1-SSNMMI07-2 AI-BASED DENOISING TO FULLY EXPLOIT PATHOPHYSIOLOGICAL MEANING AND CLINICAL IMPACT OF EARLY PERFUSION AMYLOID PET IMAGING

Maarten Larmuseau, DPhil (*Presenter*)
Alessandro Coccarelli (*Abstract Co-Author*)
Michela Zotta (*Abstract Co-Author*)
Simon Dekeyser (*Abstract Co-Author*)
Vic De Ridder (*Abstract Co-Author*)
Tomas Brants (*Abstract Co-Author*)
Guido Rovera (*Abstract Co-Author*)
Silvia Daniela Morbelli (*Abstract Co-Author*)

PURPOSE

Early-perfusion-amyloid PET is considered able to capture neurodegeneration. However, scanner occupancy during early-image acquisition is an unresolved issue. Moreover, while the first 3-minutes post-injection better represents cerebral blood-flow, such a short acquisition-time may result in noisy images, making pattern identification challenging. We investigated the feasibility of AI-based denoising of 3-minute early-phase-amyloid-PET and simulated its clinical use using visual and voxel-based approaches.

METHODS AND MATERIALS

Because 10-minute scans underrepresent hypoperfusion, we used a model trained on low-dose datasets that preserve signal, and compared it to one using 10-minute scans as ground truth. Expert and non-expert readers evaluated 92 original and enhanced scans from 23 patients, assessing AD pattern detection (positive/negative) in 3-, 5-, and 10-minute frames versus enhanced 3-minute images. Diagnostic confidence was rated on a 5-point scale. Single-subject SPM12 analyses evaluated voxel-level sensitivity using a normative early-phase amyloid PET dataset.

RESULTS

The model trained on low-dose datasets preserved true signals in 3-minute scans, unlike the 10-minute-trained model. Enhanced 3-minute images improved diagnostic confidence (75% vs. 55% score 5), interobserver agreement (?=0.88 vs. 0.75), and voxel-based sensitivity (807±233 vs. 210±160 voxels) compared to longer acquisitions. In one case, hypoperfusion was detected only in the enhanced 3-minute scan.

CONCLUSION

The investigation into early-phase 3-minute scans highlighted the limitations of traditional supervised learning approaches, as the high-count data (10-minute scans) lack some clinically relevant perfusion signals. The method based on low-dose-enhancement seems promising as it was able to enhance images without suppressing the hypoperfusion pattern and allowed to increase readers' agreement, diagnostic confidence and voxel-based sensitivity.

CLINICAL RELEVANCE/APPLICATION

AI-based denoising restores diagnostic quality in noisy 3-minute early-phase amyloid PET scans, enabling reliable same-tracer assessment of both perfusion and amyloidosis within routine workflows.

R1-SSNMMI07-3 SPLENIC SWITCH-OFF ON MYOCARDIAL PET IN HEMODIALYSIS AND RENAL TRANSPLANTATION DEFINES THE PROGNOSIS

Atsushi Yamamoto, MD, PhD (*Presenter*)
Michinobu Nagao, MD, PhD (*Abstract Co-Author*)
Masaki Watanabe, MD (*Abstract Co-Author*)
Ryotaro Ando (*Abstract Co-Author*)
Hiroki Yamada, MD (*Abstract Co-Author*)
Akihiro Inoue, MD (*Abstract Co-Author*)
Risako Nakao, MD (*Abstract Co-Author*)
Reiko Sakai (*Abstract Co-Author*)
YUI MAEKAWA (*Abstract Co-Author*)
Yuka Matsuo, MD (*Abstract Co-Author*)
Akiko Sakai, MD,PhD (*Abstract Co-Author*)
Koichiro Kaneko, MD (*Abstract Co-Author*)
Mitsuru Momose, MD,PhD (*Abstract Co-Author*)
Shuji Sakai, MD, PhD (*Abstract Co-Author*)

PURPOSE

Hemodialysis is a cause of arteriosclerosis, resulted in major adverse cardiac events (MACEs). Approximately half of the deaths are due to cardiovascular disease. Myocardial flow reserve (MFR) obtained from 13 N-ammonia positron emission tomography (NH 3 -PET) is a prognostic factor for patients with ischemic heart disease (IHD). In NH 3 -PET imaging, the splenic switch-off (SSO) sign, which visually assesses the decrease in splenic 13 N-ammonia uptake during adenosine stress, is a hemodynamic indicator of a favorable response to adenosine. This phenomenon is assumed to be due to the fact that adenosine receptor stimulation produces coronary artery dilation while producing vasoconstriction in the splenic circulation. Previous study indicated SSO was a predictor of coronary artery event after heart transplantation. We hypothesized patients with hemodialysis had arteriosclerosis of the systemic blood vessels, and splenic reactivity to adenosine was reduced.We aimed to compare the splenic blood flow evaluated using NH 3 -PET among patients with hemodialysis, non-hemodialysis and renal transplantation, and examine its prognostic value for MACE.

METHODS AND MATERIALS

100 patients (hemodialysis:40, non-hemodialysis:50, renal transplantation:10) who underwent NH 3 -PET were enrolled. Using NH 3 -PET projection images, we placed an ROI on the spleen and measured the mean standardized uptake value (SUV). The spleen ratio (SR) was defined as the mean SUV of the spleen at stress divided by that at rest, and compared among the three groups. The endpoint was the occurrence of MACEs comprising acute coronary syndrome, heart failure hospitalization, and all-cause mortality. SSO was determined by a cutoff obtained using receiver operating characteristic (ROC) analysis for the SR. The patients were divided into two groups according to the presence or absence of SSO, and the frequency of MACE was compared by Kaplan-Meier and log-rank test.

RESULTS

The hemodialysis group had reduced MFR. The SR was significantly higher in patients with hemodialysis than without hemodialysis (0.92±0.16 vs. 0.78±0.21, p=0.014). The ROC curve analysis of the SR for MACE showed a cutoff value of 0.96 (sensitivity, specificity, and AUC of 55%, 72%, and 0.67). Patients without SSO had higher rate of MACE than with SSO (p=0.0074).

CONCLUSION

Splenic reactivity to adenosine in patients with hemodialysis was reduced compared to those with non-hemodialysis. SSO might be associated with the endothelial function of systemic blood vessels and was a prognostic factor for MACE.

CLINICAL RELEVANCE/APPLICATION

SSO is a quantitative index which reflects the severity of arteriosclerosis and provides additional predictive ability for MACE non-invasively without additional exposure or imaging.

R1-SSNMMI07-5 ASSOCIATION BETWEEN NON-ALCOHOLICFATTY LIVER DISEASE AND MYOCARDIAL INFARCT SIZE IN PATIENTS WITH ST ELEVATION MYOCARDIAL INFARCTION:A CROSS-SECTIONAL STUDY AND BIOINFORMATICS ANALYSIS BASED ON THE GEO DATABASE

Weiwei Cui (*Presenter*)
Ningjun Li (*Abstract Co-Author*)
Xiao Gao (*Abstract Co-Author*)
Xiaohan Zheng (*Abstract Co-Author*)
Jun Liu, PhD (*Abstract Co-Author*)

PURPOSE

We aim to explore the association between nonalcoholic fatty liver disease (NAFLD), intrathoracic fat (IF), pericardial fat (PF) and myocardial infarct size (MIS) in patients with ST-elevation myocardial infarction (STEMI).

METHODS AND MATERIALS

SPECT-MPI was used to detect MIS, while CT scans were used to measure IF, PF, and NAFLD in patients with STEMI. Firstly, we categorised the patients into two groups (those with measurable and nonmeasurable MIS). The difference in fat between the two groups was compared using a two-sample t-test to determine which type of fat might be correlated with MIS. Secondly, the association between the related fats obtained in the aforementioned steps and MIS was evaluated using linear regression

analysis. Third, to further verify this association at the molecular level, we explored the potential shared genes associated with related fat obtained in the above steps and acute myocardial infarction via bioinformatics analysis using the Gene Expression Omnibus (GEO) database. Finally, the association between the expression of shared genes in the serum of patients with STEMI and related fat was confirmed using Pearson's correlation analysis.

RESULTS

The volume and fat attenuation index of IF and PF showed no difference between patients with MIS and those without. However, the L/S of NAFLD on CT reduced significantly in patients with MIS (P =0.001). The L/S of NAFLD on CT was an independent predictor of MIS on SPECT-MPI in patients with STEMI (P =0.042). We identified ST2, THBD, LEPR, and CEBP-a in NAFLD and acute myocardial infarction cases from the GEO database (P <0.05). Compared to patients with STEMI without NAFLD, those with NAFLD exhibited a reduction in sST2 levels (P =0.042); however, no differences were observed in THBD, LEPR, and CEBP-a levels. Correlation analysis showed a positive correlation between L/S and sST2 levels (r=0.459, P =0.032).

CONCLUSION

Among patients with STEMI, the L/S of NAFLD, but not IF or PF, was associated with MIS on SPECT-MPI. Additionally, the L/S of NAFLD on CT emerged as an independent predictor of MIS.

CLINICAL RELEVANCE/APPLICATION

Our findings demonstrate among patients with STEMI, the presence of NAFLD identified through CT imaging, but not IF or PF, was associated with MIS on SPECT-MPI, highlighting the importance of considering hepatic fat accumulation in cardiovascular risk assessment. Notably, we observed that the liver-to-spleen (L/S) ratio of NAFLD on CT imaging independently predicted MIS, providing a novel diagnostic tool for risk stratification in patients with STEMI. Furthermore, our study revealed a correlation between sST2 levels and NAFLD, shedding light on the molecular mechanisms underlying this association and further verifying the association between NAFLD and MIS.

R1-SSNMMI07-6 PIB PET/CT FOR DETECTION AND SUBTYPE DIFFERENTIATION OF CARDIAC AMYLOIDOSIS

Takashi Norikane, MD, PhD (*Presenter*)
Yuka Yamamoto, PhD (*Abstract Co-Author*)
Yasukage Takami (*Abstract Co-Author*)
Takahisa Noma (*Abstract Co-Author*)
Yoshihiro Nishiyama, MD (*Abstract Co-Author*)

PURPOSE

Various imaging modalities, including echocardiography, CMRI, and PYP scintigraphy, are widely utilized and valuable for diagnosing cardiac amyloidosis (CA). However, identifying disease subtypes remains challenging with echocardiography and CMRI, and PYP scintigraphy has limited sensitivity for detecting the AL type. Recently, amyloid PET/CT using C-11 Pittsburgh compound B (PiB) has gained recognition for its potential to detect all amyloid types. This study aimed to evaluate the utility of PiB PET/CT for detecting CA and differentiating its subtypes.

METHODS AND MATERIALS

A total of 81 patients underwent PiB PET/CT imaging. Of these, 60 were diagnosed with CA (8 AL-type and 52 ATTR-type). Dynamic PET emission scanning was performed over 30 minutes, starting with an intravenous bolus injection of PiB. Retention index (RI) images and SUV images were reconstructed from the dynamic data. The RI was calculated as the mean myocardial radioactivity concentration from 15-25 minutes divided by the integral of the arterial time-activity curve from 0-20 minutes. SUV images were reconstructed by summing data from 0-10 min (SUV010), 10-20 min (SUV1020), and 20-30 min (SUV2030). Quantitative evaluation used the myocardial-to-blood pool ratio (MBR), defined as the maximum myocardial uptake normalized to blood pool activity.

RESULTS

MBR-RI showed moderate correlation with MBR-SUV010 (? = 0.438, p = 0.002) and strong correlations with MBR-SUV1020 (? = 0.688, p < 0.001) and MBR-SUV2030 (? = 0.589, p < 0.001). A very strong correlation was found between MBR-SUV1020 and MBR-SUV2030 (? = 0.904, p < 0.001). Across all images , AL-CA cases exhibited significantly higher MBR values compared with both ATTR-CA and non-CA cases. ATTR-CA cases also demonstrated significantly higher myocardial uptake than non-CA cases on RI, SUV010, and SUV1020 images. ROC analysis showed that SUV2030 images yielded the highest diagnostic accuracy for differentiating cardiac amyloidosis from non-amyloidosis (AUC = 0.960, cutoff 0.985; sensitivity, 93.3%; specificity, 95.2%). For distinguishing AL-CA from ATTR-CA, SUV010 images provided the best performance (AUC = 0.851, cutoff 1.605; sensitivity, 87.5%; specificity, 73.5%).

CONCLUSION

PiB PET/CT demonstrated robust capability for detecting cardiac amyloidosis and accurately differentiating AL-CA from ATTR-CA. SUV2030 images optimized amyloidosis detection, while SUV010 images maximized subtype discrimination. PiB PET/CT shows strong promise as a next-generation diagnostic tool for cardiac amyloidosis.

CLINICAL RELEVANCE/APPLICATION

PiB PET/CT enables accurate detection and subtype differentiation of cardiac amyloidosis, offering a potential adjunct to current diagnostic strategies.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

R1-SSRO04

Radiation Oncology (Genitourinary/GYN)

Thursday, Dec. 4 8:00AM - 9:00AM Room: S401

Brittany Simone, DO (*Moderator*)
Tyler Seibert, MD, PhD (*Moderator*)

Sub-Events

R1-SSRO04-2 METAL ARTIFACT REDUCTION IN SPECTRAL COMPUTED TOMOGRAPHY FOR INTRACAVITY BRACHYTHERAPY IN CERVICAL CANCER PATIENTS:A PROSPECTIVE STUDY

Yining Chen (*Presenter*)
Zheng Zeng (*Abstract Co-Author*)
Junfang Yan (*Abstract Co-Author*)
Fuquan Zhang (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the effectiveness of combining virtual monochromatic images (VMI) with metal artifact reduction (MAR) algorithms in reducing metal artifacts in cervical cancer patients treated with intracavitary brachytherapy.

METHODS AND MATERIALS

A total of 50 cervical cancer patients underwent intracavitary brachytherapy were included in the study, and their spectral computed tomography (CT) images were acquired. VMI±MAR were reconstructed at energy levels ranging from 40 to 140 keV. CT attenuation and image noise were measured to calculate the signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR) for the most prominent artifacts, and the artifact index (AI) for the cervix, bladder, and rectum. These objective metrics were compared between the VMI+MAR and VMI+no-MAR groups. Subjective image quality was evaluated using a relative visual grading analysis on a 5-point Likert scale, focusing on artifact reduction, soft tissue contrast, and contouring preference for clinical use.

RESULTS

Quantitative analysis demonstrated that VMI+MAR significantly reduced the AI for both the cervix (by 34.74% to 88.51%) and rectum (by 11.31% to 81.35%) compared to VMI+no MAR across all energy levels (all $p < 0.05$). Image quality evaluation revealed that both the SNR and CNR were consistently higher in MAR-corrected images. Specifically, SNR improved significantly at all energy levels, increasing from 0.70-1.00 to 1.75-1.97 (an increase of 95.00%-152.11%, all $p < 0.001$), while CNR showed significant enhancement from 90 keV onwards ($p < 0.05$). Among all energy levels, VMI with MAR at 140 keV achieved the greatest artifact reduction, evidenced by the highest SNR and CNR and the lowest AI. Subjective assessment further confirmed that 140 keV+MAR offered the best balance between artifact suppression and soft tissue contrast, receiving significantly higher scores for artifact reduction and contouring preference than other energy levels ($p < 0.001$).

CONCLUSION

High-energy VMI combined with MAR, especially at 140 keV, provides effective artifact suppression while maintaining clinical utility in brachytherapy.

CLINICAL RELEVANCE/APPLICATION

The metal reduction efficacy of VMI+MAR have potential for improvement of delineation of metal-affected structures in CT-based brachytherapy, enhancing treatment accuracy.

R1-SSRO04-3 INTEGRATING CT BASED RADIOMICS, CLINICAL AND GENOMIC FEATURES TO PREDICT PSMA AVIDITY IN OLIGOMETASTATIC CASTRATE SENSITIVE PROSTATE CANCER (OMCSPC): UPDATED LESION LEVEL ANALYSIS

Lakshmi Rekha Narra, MD (*Presenter*)
Ritesh Kumar, MBBS,MD (*Abstract Co-Author*)
Chengzhu Zhang, PhD (*Abstract Co-Author*)
Ke Nie, PhD (*Abstract Co-Author*)
Matthew P. Deek, MD (*Abstract Co-Author*)

PURPOSE

To determine whether radiomic features extracted from Computed-Tomography (CT) visible lesions, combined with clinical and High-risk genomic variables, can predict PSMA-PET avidity in patients with oligometastatic castrate sensitive prostate cancer (omCSPC)

METHODS AND MATERIALS

In this lesion level analysis, 84 patients with (omCSPC) who underwent PSMA PET imaging and had clinical and high-risk genomic mutation data were included. Lesions visible on CT Component of PSMA PET are manually contoured using velocity AI software to generate 3D-Volume of Interest (VOI). CT-based radiomic features were extracted using PyRadiomics Total of 107 features were extracted for each lesion which include shaped based metrics (Volume, surface area, sphericity), first-order features include distribution of voxel intensities represented by histogram & second order features include textural analysis which assess intralesional heterogeneity by capturing spatial relationships between neighboring voxels. These are derived from gray-level co-occurrence matrix (GLCM), gray-level run-length matrix (GLRLM), gray-level size zone matrix (GLSZM), and neighborhood gray-level difference matrix (NGLDM). Clinical Variables include lesion site, number of lesions, and premetastatic PSA and Genomic data on high-risk mutations (TP53, BRCA1/2, ATM, RB1, PTEN, CHEK2, ATRX) are included in the analysis.Machine learning models: ensemble RU boosted trees are used to test and validate the model on training data in 5 distinct sets and the overall model performance was assessed using receiver operating characteristic curve

RESULTS

A total of 1,492 metastatic lesions were included in the analysis, of which 234 (15.7%) were PSMA-avid and 1,258 (84.3%) were non-avid. Among 1,016 lymph node lesions, 164 (16.1% were PSMA-avid). Of 332 bone lesions, 47 (14.2% : PSMA-Avid). Of 144 other lesions, 23 (16%: PSMA Avid) In the validation set, the ensemble RUS Boosted tree model achieved the highest AUC using all features, including radiomics, clinical and genomic data - (AUC = 0.93, Sensitivity 84.4%, Specificity 87.4%)

followed by Clinical variables with specified lesion location (AUC = 0.85, Sensitivity 88.9%), Clinical variables without specified lesion location (AUC = 0.75), Radiomic features alone (AUC = 0.70) and High-risk gene mutations alone (AUC = 0.50)

CONCLUSION

Lesionlevel PSMA Avidity was best predicted using a combined model incorporating all radiomic, clinical and genomic features. Lesion Location with clinical features has shown high sensitivity, whereas radiomics, clinical or genomic data alone has limited predictive value. Studies in larger independent cohorts are required to validate these findings.

CLINICAL RELEVANCE/APPLICATION

Radiogenomics

R1-SSRO04-4 DOES SPACEOAR GEL MORPHOLOGY CHANGE DURING THE COURSE OF RADIATION? : AN ANALYSIS OF OVER 1000 TREATMENT SCANS

Sravya Koduri, MD (*Presenter*)
David Barbee, PHD (*Abstract Co-Author*)
Tal Sherman (*Abstract Co-Author*)
Michael J. Zelefsky, MD (*Abstract Co-Author*)

PURPOSE

The purpose of this study is to explore whether spaceOAR gel morphology changes during the course of SBRT radiation to the prostate.

METHODS AND MATERIALS

180 patients with 1080 MRI scans (1 simulation, 5 on-treatment) received a SpaceOAR gel prior to MR-Linac based SBRT between October 2023 and March 2025. A U-Net deep learning model was implemented using nnUNetv2 (Isensee 2021). This model was iteratively trained using inference images from 50 training sets, resulting in a Dice Similarity Coefficient (DSC)>0.96, and then applied to all patient images. Geometric/spatial comparison metrics include: volume, sphericity, compactness, flatness, elongation, eccentricity, surface area, and surface/volume ratio. Test contours were compared to reference contours using DSC, Jaccard, Hausdorff, and average surface distance.

RESULTS

Average time between spaceOAR placement and MR simulation and between simulation and first treatment was 7.1 days and 20.3 days respectively, with 2-3 day intervals between treatments. Across all scans, mean spaceOAR volume was 12.5 (std dev. 3.0) cc, with mean dimensions of 42.1 (8.9), 23.6 (7.4), and 48.0 (9.7) mm in the left-right, anterior-posterior, and superior-inferior orientations, respectively. Shape descriptors revealed a mean sphericity of 0.39 (0.13), compactness of 0.74 (0.16), flatness of 0.72 (0.16), and elongation of 0.45 (0.12). Average eccentricity was 0.95 (0.03), indicating highly elongated shapes, and mean surface-to-volume ratio was 0.61 (0.23), consistent with irregular, enclosed geometries. Compared to reference scans, on-treatment scans showed a mean volume difference of +1.36 (1.57) cc over time with increases in sphericity +0.01, compactness by +0.02, and elongation by +0.006, while flatness decreased by -0.02. Eccentricity remained stable (+0.003), and surface-to-volume ratio decreased by -0.12, reflecting smoother but more voluminous segmentations. Median percent changes across A-P dimension from simulation to last scan and first to last scan were both 0%. Mean volume change from first to last scan was 4.1%.

CONCLUSION

Although a mild increase in volume was noted, the results demonstrated no clinically significant changes in the spaceOAR gel morphology changes following simulation and during the course of treatment.

CLINICAL RELEVANCE/APPLICATION

The use of a spaceOAR gel to limit high-dose exposure to the rectum is a staple of stereotactic body radiation therapy (SBRT) for prostate cancer. However, the question arises of whether there may be inter- and intra-fractional change in the morphology of the spaceOAR gel between simulation and 5 fractions of SBRT. Such change would impact the accuracy of dosimetric calculations of rectal exposure in standard CT-based treatment paradigms.

R1-SSRO04-5 5-YEAR OUTCOMES OF A PHASE II INTERVENTIONAL CLINICAL TRIAL OF PROSTATE BED STEREOTACTIC BODY RADIATION THERAPY FOR PROSTATE CANCER WITH HIGH-RISK FEATURES FOLLOWING RADICAL PROSTATECTOMY

Alan Zhu, BS (*Presenter*)
Carlos Vargas (*Abstract Co-Author*)
Molly Voss (*Abstract Co-Author*)
Thomas B. Daniels, MD (*Abstract Co-Author*)
William W. Wong, MD (*Abstract Co-Author*)
Sameer R. Keole, MD (*Abstract Co-Author*)
Jean-Claude M. Rwigema, MD (*Abstract Co-Author*)
Brian J. Davis, MD, PhD (*Abstract Co-Author*)
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Brady Laughlin (*Abstract Co-Author*)
Joshua R. Niska, MD (*Abstract Co-Author*)

PURPOSE

This study reports the 5-year safety and efficacy outcomes of stereotactic body radiation therapy (SBRT) to the prostate bed in patients with high-risk features following radical prostatectomy.

METHODS AND MATERIALS

Between May 2018 and May 2020, 49 patients were prospectively treated post-prostatectomy and stratified into three groups: Group I received adjuvant SBRT (PSA <0.2 ng/mL with adverse features including positive margins, seminal vesicle invasion, or extraprostatic extension); Group II received salvage SBRT (PSA =0.2 and <2.0 ng/mL); and Group III included patients with oligometastatic disease (=5 sites). All patients underwent staging with choline C11 PET, and those with biochemical failure (PSA >0.2 ng/mL) were restaged with PSMA PET. SBRT using photons or protons was delivered to the prostate bed at a total dose of 30-32 Gy in five fractions, administered every other day. Salvage patients received 6 months of androgen deprivation therapy (ADT), and oligometastatic patients received 18 months of ADT. The primary endpoint was freedom from failure, defined as PSA <0.5 ng/mL without clinical progression or re-initiation of ADT. Secondary endpoints included freedom from failure with a PSA <0.2 ng/mL post-treatment, toxicity rates graded by CTCAE v5.0, clinical failure, and patterns of first recurrence.

RESULTS

The median follow-up was 60 months. Baseline characteristics included a pre-radiotherapy T stage of T2-T3b (47% T3a-b), a median pre-radiotherapy PSA of 0.4 ng/mL (range <0.1-1.9), a median Gleason score of 8 (range 6-9), and positive surgical margins in 48.8% of patients. Sites of oligometastatic disease included lymph nodes and bone. Treatment was well tolerated overall, with grade 2 or higher toxicities limited to one case of hematuria (Group I) and one case of rectal bleeding (Group II); no significant adverse events were observed in Group III. Clinical failures occurred in one patient in Group I, eight patients in Group II, and none in Group III. Five-year freedom from failure rates, as defined by the primary endpoint or using a PSA threshold of >0.2 ng/mL, were 50% for Group I, 62.5% for Group II, and 80% for Group III.

CONCLUSION

Prostate bed SBRT demonstrated excellent long-term safety with low rates of grade 2 or higher treatment-related adverse events. The observed low rates of clinical failure support the efficacy of this treatment approach in the postoperative setting. Freedom from failure improving from Group I to Group III is consistent with the known association of longer ADT durations.

CLINICAL RELEVANCE/APPLICATION

These findings support the use of prostate bed SBRT as a safe and effective strategy in selected high-risk post-prostatectomy patients.

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Nov. 30 – Dec. 4
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R1-SSVA04

Vascular Imaging (Ultrasound and CT In Endovascular Therapy and Other Vascular Pathologies)

Thursday, Dec. 4 8:00AM - 9:00AM Room: S503

Ayaz Aghayev, MD (*Moderator*)
Katherine A. Cheng, MD (*Moderator*)

Sub-Events

R1-SSVA04-1 DIAGNOSTIC PERFORMANCE OF MICROVASCULAR ULTRASOUND IN DETECTION OF ENDOLEAKS AFTER EVAR: COMPARISON WITH CEUS AND CTA

Marcin Czeczelewski, MD, MBA (*Presenter*)
Maryla Kuczynska (*Abstract Co-Author*)
Eryk Mikos (*Abstract Co-Author*)
Anna Drelich-Zbroja (*Abstract Co-Author*)

PURPOSE

Patients after endovascular aneurysm repair (EVAR) require long-term surveillance to detect late complications. Computed tomography angiography (CTA) is the gold standard for follow-up imaging but involves exposure to high dose ionizing radiation and iodinated contrast agents. Doppler ultrasound is a safe, accessible, and cost-effective alternative, but its sensitivity and specificity are lower than CTA according to current literature. Contrast-enhanced ultrasound (CEUS) offers improved accuracy, while microvascular ultrasound (MVUS) is a novel, contrast-free technique. The aim of this study was to compare the diagnostic accuracy of MVUS with CEUS and CTA in detecting endoleaks in patients after EVAR.

METHODS AND MATERIALS

A prospective cross-sectional study was conducted involving consecutive patients after EVAR. All participants underwent ultrasound within one week of the procedure, including both MVUS and CEUS techniques. CEUS involved intravenous administration of 1.6 mL of SonoVue (Bracco, Italy). Triple-phase CTA was performed within one month postoperatively and served as the reference standard. Endoleaks were classified according to the Mayo Clinic classification.

RESULTS

Between July 2024 and the time of analysis, 52 patients (42 males, 10 females) who underwent EVAR were enrolled. Graft types included Zenith Flex (26.9%), Zenith t-Branch (38.5%), Gore Excluder (23.1%), and Medtronic Endurant II (11.5%). Ultrasound prior to discharge revealed 28 endoleaks detectable by both MVUS and CEUS, with an additional 8 endoleaks seen only on MVUS. One month later, CTA confirmed 22 of the 28 endoleaks initially detected in CEUS and MVUS, 2 had resolved, and 4 patients were lost to follow-up. Of the 8 endoleaks detected only by MVUS, one was confirmed by CTA. These MVUS-only endoleaks were characterized by fine, linear flow patterns perpendicular to the transducer. Endoleak types identified on ultrasound were: type Ia - 1 (3%), type Ib - 4 (11%), type II (lumbar) - 12 (33%), type II (IMA) - 5 (14%), type IIIa - 2 (6%), and type IIIc - 12 (33%).

CONCLUSION

MVUS demonstrates high sensitivity in detecting endoleaks after EVAR and may identify subtle, linear flow patterns.

CLINICAL RELEVANCE/APPLICATION

Microvascular ultrasound (MVUS) offers a non-invasive, contrast-free method for detecting endoleaks after EVAR with high sensitivity, including subtle leaks. Its routine use could reduce reliance on ionizing radiation and iodinated contrast agents in long-term follow-up protocols.

R1-SSVA04-2 THE MINIMUM PRE-EMPTIVE EMBOLIZATION OF AORTIC SIDE BRANCHES FOR PREVENTION OF TYPE II ENDOLEAK AFTER EVAR

Akihiro Murata (*Presenter*)
Hiroki Horinouchi (*Abstract Co-Author*)
Akiyuki Kotoku, MD, PhD (*Abstract Co-Author*)
Tetsuya Fukuda, MD, PhD (*Abstract Co-Author*)
Teruhito Hayashi (*Abstract Co-Author*)
Kazuki Hara, RT (*Abstract Co-Author*)

PURPOSE

Type II endoleak (T2EL) is the most common complication following endovascular abdominal aortic repair (EVAR) for abdominal aortic aneurysm (AAA). The efficacy of pre-emptive aortic side branch embolization for prevention of T2EL has been reported, however, no reasonable endpoint of embolization has been established. We hypothesized that minimal embolization would be sufficient to prevent T2EL after EVAR. The purpose of this study was to investigate the predictors of T2EL and to define the minimal endpoints of pre-emptive embolization.

METHODS AND MATERIALS

We retrospectively reviewed our institutional data to identify patients who underwent pre-emptive side branch embolization before EVAR from 2020 to 2025. Patients with insufficient data, dissecting or inflammatory AAA were excluded. Aortic side branches and endoleaks were assessed on contrast-enhanced CT images before and after EVAR. Volume embolization ratio (VER) was calculated as the percentage of coil volume relative to embolized vessel volume. Patient characteristics and anatomical factors were evaluated for association with T2EL after EVAR.

RESULTS

We identified 96 patients (median age 81 years, 75 men) who underwent EVAR with pre-emptive embolization. Among patent 469 aortic side branches (321 lumbar arteries, 79 inferior mesenteric arteries, 69 median sacral arteries) associated with AAA, 211 (45.0%) branches were embolized with coils. The median VER of embolized branches was 13.2% (IQR: 10.0-16.2%). T2EL and type I endoleak were identified in 22 (22.9%) and 7 (7.3%) patients, respectively. There were no T2EL from embolized branches. In contrast, 51 (19.8%) non-embolized branches were associated with T2EL. In multivariate analysis, number of non-embolized branches (OR =

2.85, 95% CI: 1.55-6.12, p < 0.05), concomitant internal iliac embolization, female, and Excluder device were independent predictors of T2EL after EVAR with pre-emptive embolization. The ROC analysis revealed that the optimal cutoff values of the number of non-embolized branches was three.

CONCLUSION

Independent of VER, T2EL from embolized branches was sufficiently preventable. It was suggested that the minimal endpoint of pre-emptive embolization should be to reduce the number of patent aortic side branches to two or fewer. Furthermore, patients with risk factors for T2EL require more aggressive embolization.

CLINICAL RELEVANCE/APPLICATION

Defining the minimal endpoint of pre-emptive aortic side branch embolization for prevention of T2EL can optimize coil use and reduce contrast and radiation doses. To achieve clinically sufficient prevention of T2EL, it is essential to reduce the number of patent aortic side branches to two or fewer, regardless of VER.

R1-SSVA04-3 DOPPLER ULTRASOUND FINDINGS IN FILLER-RELATED VASCULAR COMPLICATIONS: A MULTICENTRIC STUDY

Rosa Maria Silveira Sigrist, MD (*Presenter*)
Claudia Gonzalez (*Abstract Co-Author*)
Leonie Schelke (*Abstract Co-Author*)
Ximena L. Wortsman, MD (*Abstract Co-Author*)
Stella Desyatnikova, MD (*Abstract Co-Author*)
Fernanda A. Cavallieri, MD (*Abstract Co-Author*)
Maria Cristina Chammas, MD, PhD (*Abstract Co-Author*)

PURPOSE

The global surge in the use of cosmetic fillers—particularly hyaluronic acid (HA)—has led to a significant rise in vascular adverse events (VAEs) in the face, including necrosis, blindness, and stroke. The facial vasculature is uniquely complex and extensively anastomosed, differing from territories such as the carotids or extremities, where Doppler criteria are well established. No such reference standards exist for the face. This study aimed to identify the most frequent Doppler ultrasound findings in filler-induced VAEs to support diagnosis and management as well as to evaluate their association with prior use of hyaluronidase, the enzyme commonly used for treatment.

METHODS AND MATERIALS

A retrospective, international, multicenter, cross-sectional study was conducted across four radiology, one dermatology, and one plastic surgery centers between May 2022 and April 2025. Patients presenting with clinical signs of facial VAEs following filler injections were evaluated using high-frequency color or power Doppler ultrasound and in some cases microvascularity software (echoangio). Data regarding Doppler findings, clinical signs, arterial involvement, and prior hyaluronidase use were extracted from records. Statistical analysis was performed using R software, with Fisher's exact test applied to assess associations ($a<0.05$).

RESULTS

Among 100 patients, 93% were female, 98% had received HA fillers and 79% received hyaluronidase prior to Doppler evaluation. The most common color Doppler findings were absent flow in perforator vessels (42%), absent flow in major vessels (35%), compensatory flow (26%), string sign (18%), and increased peak systolic velocity (16%). No significant association was found between hyaluronidase use and specific Doppler findings ($p>0.05$). A moderate correlation was observed between absent flow in perforators and compensatory flow ($F = 0.37$, $p = 0.0004$). Lateral nasal artery involvement was significantly associated with absent major vessel flow ($p = 0.0004$).

CONCLUSION

The most frequent color Doppler ultrasound findings in filler-related VAEs were absent flow in perforator and major vessels. Although no association was found between hyaluronidase use and Doppler patterns, significant correlations emerged between specific findings and arterial territories, suggesting that color Doppler ultrasound can provide relevant hemodynamic information to support diagnosis.

CLINICAL RELEVANCE/APPLICATION

Recognizing Doppler ultrasound patterns may help radiologists more precisely identify cosmetic filler-induced VAEs and support timely clinical decision-making.

R1-SSVA04-4 ANEURYSM ECHO - THE ROLE OF ULTRASONOGRAPHY IN THE DIAGNOSIS OF VISCERAL ARTERY ANEURYSMS

Monika Zbroja-Putowska (*Presenter*)
Katarzyna Drelich (*Abstract Co-Author*)
Eryk Mikos (*Abstract Co-Author*)
Maryla Kuczynska (*Abstract Co-Author*)
Krzysztof Pyra (*Abstract Co-Author*)

PURPOSE

This study aims to highlight the role of ultrasonography in the diagnosis of visceral artery aneurysms (VAAs).

METHODS AND MATERIALS

During 11 years ultrasound evaluation of visceral vessels was performed in a group of 12540 patients (6850 men and 5690 women), aged 16-85. All patients underwent fasting examination. For each case, a morphological assessment in the B-mode presentation with an additional hemodynamic evaluation with color and spectral Doppler was made. Power Doppler and B-Flow were used in specific cases. 3D reconstructions were not used routinely.

RESULTS

Of the 12540 patients examined, aneurysms were diagnosed in 94 (51 men and 43 women). No case of multiple aneurysms has been detected. None of the 94 subjects presented characteristic symptoms, while 36 of them reported non-specific abdominal pain. There were 52 cases of splenic, 16 hepatic, 14 celiac trunk, 4 gastro-duodenal, 6 superior mesenteric and 2 inferior mesenteric artery aneurysms. In 62 cases (66%) the diameter of the aneurysm exceeded >2 cm. Each of the 36 symptomatic patients who presented as emergency admission underwent a CT scan. All of the ultrasound examinations performed afterwards turned out to be non-diagnostic. Diagnoses of >2 cm aneurysms were verified by CT examination. 36 of these aneurysms were successfully embolized. Patients with <2 cm aneurysms were referred for a follow-up Doppler ultrasound at 6 months.

CONCLUSION

Ultrasound examination demonstrates diagnostic effectiveness comparable to CT in detecting non-ruptured visceral artery aneurysms larger than 2 cm in diameter. Appropriate imaging techniques such as B-Flow and Doppler modalities (color, pulsed, and power Doppler) enable precise evaluation of vessel morphology and hemodynamic blood flow parameters. However, sonographic methods are less effective in cases of vessel wall rupture, where free intraperitoneal blood obscures vascular morphology, and the patient's critical condition limits effective cooperation during the examination.

CLINICAL RELEVANCE/APPLICATION

Ultrasound offers a valuable, non-invasive, and widely accessible alternative to CT in the diagnosis of non-ruptured visceral artery aneurysms (VAAs) larger than 2 cm. Its ability to accurately assess vessel structure and hemodynamics supports its use in routine screening and follow-up.

R1-SSVA04-5 PREVALENCE OF VASCULAR COMPRESSION SYNDROMES IN PATIENTS WITH POSTURAL ORTHOSTATIC TACHYCARDIA SYNDROME AND POSTURAL SYMPTOMS WITHOUT TACHYCARDIA

(*Presenter*)
Jawad Shahid (*Abstract Co-Author*)
Amna Butt (*Abstract Co-Author*)
Kazma Kulsoom (*Abstract Co-Author*)
Nidhi Shah (*Abstract Co-Author*)
Amer Suleman, MD (*Abstract Co-Author*)

PURPOSE

Postural Orthostatic Tachycardia Syndrome (POTS) is an autonomic nervous system dysfunction characterized by an incremental heart rate increase of =30 bpm within 10 minutes of standing. Postural Symptoms Without Tachycardia (PSWT) is a related autonomic dysfunction that presents similarly to POTS but with a heart rate increase of <30 bpm. Vascular compression syndromes result from the compression of blood vessels by surrounding anatomical structures, leading to symptoms of pain, blood pooling, discoloration, etc., that may worsen POTS or PSWT conditions. The objective of this study is to determine the prevalence of vascular compression syndromes, including Median Arcuate Ligament Syndrome (MALS), May-Thurner Syndrome, Nutcracker Syndrome, and Thoracic Outlet Syndrome (TOS) in patients diagnosed with Postural Orthostatic Tachycardia Syndrome (POTS) and Postural Symptoms Without Tachycardia (PSWT).

METHODS AND MATERIALS

A retrospective analysis was conducted using a random sample of 392 patients diagnosed with POTS or PSWT via tilt table testing. The study population included 30 males (7.7%) and 362 females (92.3%), with 311 (79.3%) diagnosed with POTS and 81 (20.7%) with PSWT. CT angiogram results of the abdomen and pelvis were reviewed to diagnose cases of MALS, Nutcracker Syndrome, and May-Thurner Syndrome, whereas Thoracic Doppler studies were used to diagnose TOS. Out of 392 patients, 367 patients (93.6%) had CT scans, and 310 patients (79.1%) had Thoracic Doppler studies. Frequency analysis was performed using SPSS 29.0.

RESULTS

May-Thurner syndrome was the most common compression syndrome, affecting 138 POTS patients (44.4%) and 33 PSWT patients (40.7%). Nutcracker syndrome was identified in 117 POTS patients (37.6%) and 24 PSWT patients (29.6%). MALS affected 107 POTS patients (34.4%) and 32 PSWT patients (39.5%). TOS was present in 61 POTS patients (19.6%) and 10 PSWT patients (12.3%). Eight patients (2.0%) were diagnosed with all four compression syndromes.

CONCLUSION

There is a high prevalence of vascular compression syndromes in patients with POTS and PSWT. May-Thurner Syndrome is the most commonly identified, followed by Nutcracker Syndrome, MALS, and then TOS. These findings highlight vascular compression as a potential contributing factor in autonomic dysfunction and support its consideration in diagnostic and treatment strategies.

CLINICAL RELEVANCE/APPLICATION

Early detection of vascular compression syndromes in patients with POTS and PSWT may help guide treatment and improve symptoms such as blood pooling, heaviness in the extremities, abdominal pain, nausea, dizziness, lightheadedness, etc., by addressing the potential underlying vascular etiology.

R1-SSVA04-6 EFFECTIVENESS OF DOPPLER ULTRASOUND IN THE EVALUATION OF VENOUS THORACIC OUTLET SYNDROME: A BIVARIATE DIAGNOSTIC META-ANALYSIS

Bruno Ishizuka (*Presenter*)
Luiz Nascimento (*Abstract Co-Author*)
Victor Arthur Ohannesian (*Abstract Co-Author*)
Isabelle Menezes (*Abstract Co-Author*)
Luciano Falcao (*Abstract Co-Author*)
Luiza G. Schmitt, MD (*Abstract Co-Author*)
Miriana E. Mariussi, MD (*Abstract Co-Author*)
Matheus Cabral (*Abstract Co-Author*)
Henrique Vaqueiro (*Abstract Co-Author*)
Victor A. Jabour, MD (*Abstract Co-Author*)
Guilherme C. del Guerra, MD (*Abstract Co-Author*)
Miguel J. Francisco Neto, MD, PhD (*Abstract Co-Author*)
Marcelo R. Silva, MD (*Abstract Co-Author*)
Marcos R. Queiroz, MD, MBA (*Abstract Co-Author*)
Carlos Augusto V. Pinto, MD (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic accuracy of Doppler ultrasound in detecting venous thoracic outlet syndrome (vTOS), characterized by subclavian vein compression. The objective was to estimate sensitivity, specificity, diagnostic odds ratio (DOR), and overall diagnostic performance. Study heterogeneity and the influence of different reference standards (venography, CT, clinical criteria) were also analyzed.

METHODS AND MATERIALS

Following PRISMA-DTA guidelines and PROSPERO registration (CRD42024621782), a comprehensive search was conducted in PubMed, Embase, Scopus, and Web of Science through November 2024. Eligible studies included adult patients undergoing Doppler ultrasound for vTOS diagnosis, with available sensitivity and specificity data. Extracted variables included TP, FP, FN, TN, AUC, and DOR. Study quality was assessed using QUADAS-2. A bivariate random-effects model was applied using R software (v4.4.2). Analyses included SROC curves, heterogeneity testing (I^2, t^2), and publication bias assessment (Deeks' funnel plot).

RESULTS

Five studies with 293 patients were included. Pooled sensitivity was 91.4% (95% CI: 83.5-95.7%) and specificity was 91.1% (95% CI: 63.8-98.3%). AUC was 0.919, indicating excellent diagnostic performance. Pooled DOR was 54.1 (95% CI: 13.59-215.49). Sensitivity heterogeneity was moderate (I^2 = 25.4%) and specificity heterogeneity was high (I^2 = 82.0%). Excluding one study reduced sensitivity heterogeneity to I^2 = 0% (adjusted sensitivity: 88.6%). No significant publication bias was identified (p = 0.3819). Heterogeneity was mainly due to differences in reference standards.

CONCLUSION

Doppler ultrasound with sensitivity >90% and AUC of 0.919 is an effective tool for vTOS screening. While it shows excellent sensitivity, specificity varies due to methodological heterogeneity. Diagnostic performance was influenced by the type of reference standard used. Doppler should be adopted as a first-line assessment in clinically suspected cases, though additional imaging is advised in anatomically complex or preoperative scenarios.

CLINICAL RELEVANCE/APPLICATION

Doppler ultrasound is a non-invasive, rapid, and widely available tool suitable for initial vTOS screening, especially in resource-limited settings. Its high sensitivity supports early detection and reduces diagnostic delay. However, in cases of asymptomatic compression or challenging anatomy, sole reliance on Doppler may lead to false positives. Combining Doppler findings with venous CT and clinical data enhances diagnostic accuracy and risk stratification.

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R2-STCE1

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER THEATER 1

Sub-Events

R2-STCE1-2 BREAST ARTERIAL CALCIFICATION ON MAMMOGRAMS: NATURAL HISTORY ANALYSIS USING ARTIFICIAL INTELLIGENCE IN OVER 10,000 WOMEN

Alyssa T. Watanabe, MD (*Presenter*)
Richard Mantey (*Abstract Co-Author*)
Junhao Wang (*Abstract Co-Author*)
Nitesh Nerlekar (*Abstract Co-Author*)

PURPOSE

Presence and extent of breast arterial calcifications (BAC) correlates with cardiovascular disease risk. The rate of BAC progression may also be tied to increased risk. BAC progression rate was evaluated in a large screening cohort using an artificial intelligence model.

METHODS AND MATERIALS

In this retrospective study, 27,780 full-field digital mammograms from 10,348 women (age 26-94 years, mean 56) performed 2006-2016 at a single Southwestern U.S. academic center were analyzed. Using an artificial intelligence model (AI) , BAC scores (0-100) for each exam were obtained. BAC-positive scores were age-adjusted to derive percentiles, then binned by quartile (Q): 1st-25th (Q1, n=529), 26-50th (Q2, n=566), 51-75th (Q3, n=469), and 76-100th (Q4, n=461) percentiles. The majority of women (n=8,323) were classified as BAC-negative. Kaplan Meier and Aalen-Johansen multi-state models were used to estimate probabilities of transitioning to higher quartiles between 1 to 5 years.

RESULTS

Using Aalen-Johansen estimation, the one-year cumulative probability of progression to a higher BAC quartile was 2% among BAC-negative women, 7% among those in the Q1, 5% in Q2, and 6% in Q3. By five years, these cumulative transition probabilities increased to 10%, 39%, 29%, and 23%, in the same categories.

CONCLUSION

BAC progression on sequential mammograms was seen in as little as 1 year. Women with mild baseline BAC (defined as BAC score in the 1st quartile at index) exhibited the greatest likelihood of progression over time. AI scoring of BAC progression may be used to identify subgroups of women who may be at higher cardiovascular risk.

CLINICAL RELEVANCE/APPLICATION

Breast arterial calcification on mammography is a known cardiovascular marker in women. Opportunistic BAC reporting on mammograms is recommended and may aid in improving cardiovascular outcomes and mortality in women. Using artificial intelligence scoring, temporal BAC progression rates can be obtained, which may be useful for further research in risk stratification.

R2-STCE1-3 AI-DRIVEN OPPORTUNISTIC LIVER-BASED ASSESSMENT OF METABOLIC HEALTH ON CORONARY ARTERY CALCIUM CT IS ASSOCIATED WITH CARDIOVASCULAR RISK

GOURAV MODANWAL (*Presenter*)
Rohan Dhamdhere (*Abstract Co-Author*)
Mendel Lebowitz (*Abstract Co-Author*)
Amritpal Singh (*Abstract Co-Author*)
Santosh Kumar Sirasapalli (*Abstract Co-Author*)
Sanjay Rajagopalan (*Abstract Co-Author*)
Sadeer Al-Kindi (*Abstract Co-Author*)
Anant Madabhushi, PhD (*Abstract Co-Author*)

PURPOSE

Hepatic steatosis, a manifestation of metabolic dysfunction, is increasingly associated with cardiovascular disease (CVD). Coronary artery calcium CT (CAC-CT), routinely performed for coronary artery disease risk assessment, presents an underused opportunity for opportunistic assessment of metabolic dysfunction. In this large cohort study, we evaluated whether AI-derived liver CT attenuation—measured opportunistically from CAC-CT as a non-invasive surrogate of steatosis—is associated with major adverse cardiovascular events (MACE).

METHODS AND MATERIALS

DeHFT, a validated deep learning model for automated liver attenuation estimation from CAC-CT, was applied to 43,518 participants in the CLARIFY Registry (NCT04075162). Participants were stratified into risk groups based on liver attenuation tertiles (T1-T3) and were followed for MACE (myocardial infarction, stroke, revascularization, heart failure, and all-cause mortality). MACE-free survival was assessed using Kaplan-Meier analysis, and hazard ratios (HRs) were estimated via Cox proportional hazards model.

RESULTS

Over a median follow-up of ~ 3.75 years, 3868 had MACE. Compared to individuals in the highest attenuation group (T3, > 57.08 HU), those in the lowest (T1, < 50.41 HU) and intermediate (T2, 50.41-57.08 HU) groups exhibited significantly elevated risk, with HR of 1.63 [95% CI: 1.51-1.77] and 1.36 [95% CI: 1.25-1.47], respectively ($p<0.001$ for all comparisons). These associations remained robust even after adjusting for age, sex, smoking, BMI, diabetes, hypertension, and CAC score with HR of 1.19 [95% CI: 1.08-1.30, $p < 0.001$] for T1 and 1.16 [95% CI: 1.06-1.27, $p < 0.01$] for T2 versus T3.

CONCLUSION

AI-derived liver attenuation, previously validated as a surrogate for hepatic steatosis, was opportunistically extracted from routine CAC-CT to assess metabolic health. In this study, lower liver attenuation—indicative of greater hepatic fat—was associated with higher MACE risk. These findings highlight the prognostic value of liver routinely captured on CAC-CT and support the integration of AI analysis into clinical workflows.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that AI-derived liver attenuation can be repurposed from routine CAC-CT to stratify cardiometabolic risk without the need for additional imaging. By enabling non-invasive, scalable identification of at-risk individuals during standard care, this approach supports earlier intervention and extends the preventive value of existing cardiovascular imaging workflows.

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R2-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER THEATER 2

Sub-Events

R2-STCE2-1 MULTI-FREQUENCY MR ELASTOGRAPHY FOR CERVICAL BIOMECHANICAL PROPERTY ASSESSMENT: A PRELIMINARY STUDY

Jing Lu (*Presenter*)
Yi Fu, PhD,MD (*Abstract Co-Author*)
Yajia Gu (*Abstract Co-Author*)

PURPOSE

Cervical cancer (CC) is the leading cause of cancer-related death among women worldwide. While MRI assesses morphology, MR elastography (MRE) quantifies biomechanical properties, potentially offering novel biomarkers. This prospective study investigated cervical stiffness (c) and viscosity (f) in healthy women and CC patients, correlating them with menopaus and clinicopathological features.

METHODS AND MATERIALS

This study included 65 CC patients and 34 healthy participants (HHs) who underwent 3.0T multifrequency MRE (40-70 Hz) between April and July 2025 at a single center. HHs were stratified by reproductive status. MRE quantitative parameters (c , f) were compared among groups and correlated with tumor size, growth pattern, histology (squamous cell carcinoma [SCC] vs. non-SCC), lymphovascular space invasion, stromal invasion, lymph node metastasis, parametrial invasion and patient-derived organoids (PDO)-derived stiffness in a subset (n = 9). Univariate statistical analyses were performed.

RESULTS

Premenopausal HHs had higher mean c value (1.16 m/sec ± 0.21 vs. 0.95 m/sec ± 0.18, P = 0.004) and f value (0.67 radians ± 0.11 vs. 0.56 radians ± 0.15, P = 0.028) than postmenopausal HHs. CC tissues showed elevated mean c value (median, 1.81 m/sec [IQR, 1.01, 1.61 m/sec] vs. 1.04 m/sec [IQR, 0.90, 1.27 m/sec], P = 0.002) and f value (0.86 radians ± 0.19 vs. 0.63 radians ± 0.14, P < 0.001) versus HHs. Premenopausal CCs showed significantly higher values in mean c (median, 1.38 m/sec [IQR, 1.09, 1.89 m/sec] vs 1.07 m/sec [IQR, 0.98, 1.37 m/sec], P = 0.008), and minimum f (0.41 radians ± 0.13 vs 0.32 radians ± 0.11, P = 0.002) compared to postmenopausal cases. SCCs had significantly greater mean c value (median, 1.21 m/sec [IQR, 1.03, 1.62 m/sec] vs 1.00 m/sec [IQR, 0.95, 1.21 m/sec], P = 0.033), and mean f value (0.88 radians ± 0.19 vs 0.72 radians ± 0.14, P = 0.038) than non-SCCs. Maximum tumor diameter correlated with maximum c value (r s = 0.590, P < 0.001). MRE c value moderately correlated with PDO stiffness (r s = 0.700, P = 0.036).

CONCLUSION

Cervical biomechanics vary significantly across reproductive phases. MRE quantifies distinct biomechanical properties in CCs, correlating with histology and tumor size. It may enhance CC characterization, offering potential prognostic biomarkers. The PDO-MRE correlation underscores MRE's translational relevance.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that MRE-based assessment of cervical biomechanical properties can help differentiate malignant from healthy tissue and may serve as a biomarker for tumor characterization. The findings suggest potential clinical utility in improving diagnosis, risk stratification while offering a non-invasive alternative for tracking disease progression.

R2-STCE2-2 FERROQUANT: A STEP TOWARD CLINICALLY RELEVANT IRON TYPING USING T1 MRI IN SUBDURAL HEMATOMAS

Ogechukwu Pamela Ngwu-Hyacinth, MSc, MBBS (*Presenter*)

PURPOSE

Blood breakdown products (BBPs) evolve in predictable patterns after cerebral hemorrhage and are key imaging biomarkers for injury progression and lesion age. Radiologists currently rely on subjective interpretation of T1 and T2 signal changes to infer these stages. However, no quantitative method exists for iron mapping in different BBPs. Quantifying iron in a hematoma is necessary to correlate signal changes to biological or pathological processes, including inflammation, white matter injury and toxicity; monitor progression/resolution over time and inform clinical decisions. We propose FerroQuant, a multimodal MRI technique integrating Quantitative Susceptibility Mapping (QSM), T2, T2*, and T1 to characterize iron in ferritin phantoms and in ex vivo human subdural hematomas, complementing the traditional T2 and Susceptibility Weighted MRI.

METHODS AND MATERIALS

Ferritin phantoms (0.0195-5.0 mg/mL) were scanned at 3T using inversion recovery spin-echo (T1), T2, and QSM MRI. T1 mapping and relaxivity were estimated using a reproducible MATLAB technique. Similarly, human subdural hematoma samples (obtained from craniotomy) were scanned to capture temporal evolution of BBPs.

RESULTS

T1 decreased with rising ferritin concentration, consistent with its paramagnetic nature. The T1 results were consistent and reproducible across the ferritin phantoms and clot samples.

CONCLUSION

We present the first step toward iron quantification in intracranial hemorrhage. In clot samples, spatial T1 contrast reflected BBP evolution in ways complementary (not redundant) to T2 and QSM. T1 is sensitive to tissue composition, directly reflecting the effects of iron. T2 is sensitive to edema or tissue microenvironment, important in hemorrhage staging. Our approach expands conventional T2 and susceptibility-based paradigms by incorporating quantitative T1 relaxometry. To the best of our knowledge, this is the first study to quantify iron in surgically removed human (subdural) hematomas, with translational potential for image-guided prognosis in stroke, trauma and cerebrovascular malformations.

CLINICAL RELEVANCE/APPLICATION

Radiologic interpretation of hemorrhagic lesions is often qualitative and dependent on reader experience. No single MRI modality can effectively distinguish all forms of iron due to overlapping effects on MRI signals and the complex magnetic interactions within brain tissue. To address these limitations, FerroQuant introduces a multiparametric approach for iron quantification; it focuses on leveraging endogenous contrast from iron in BBPs, the hallmark of non-contrast imaging innovation. FerroQuant has the potential to enhance diagnostic accuracy, monitoring, and clinical decisions in the management of intracranial hemorrhage.

R2-STCE2-3 SIMULTANEOUS REAL-TIME IMAGING OF NEUROFLUID AND NEUROVASCULAR DYNAMICS USING ULTRAFAST FLOW-WEIGHTED ECHO-PLANAR IMAGING

Amir Shaker, BSc (*Presenter*)
Helia Hosseini, MD (*Abstract Co-Author*)
Cihat Eldeniz, PhD (*Abstract Co-Author*)
Bryn A. Martin, PhD (*Abstract Co-Author*)
Aristeidis Sotiras, PhD (*Abstract Co-Author*)
Jennifer Strahle (*Abstract Co-Author*)
Arash Nazeri, MD (*Abstract Co-Author*)

PURPOSE

Understanding connection between cerebrospinal fluid (CSF) and blood flow is crucial for brain pressure regulation, waste clearance, and homeostasis. Phase-contrast (PC) MRI measures CSF flow but requires gating and velocity encoding, limiting temporal resolution and simultaneous vascular-CSF capture.

METHODS AND MATERIALS

We present self-gated ultrafast echo planar imaging method enabling bi-directional inflow-weighted imaging with 47 ms temporal and 1.3 mm² spatial resolution capturing both neurovascular and CSF flow. This approach was done alongside PC MRI at C2-C3 in 21 participants on 3T Siemens Prisma scanner. Frequency-domain and event-related analyses assessed vascular-CSF coupling and reconstructed CSF waveforms across cardiac cycle.

RESULTS

Spectral analysis of CSF signals showed clear respiratory and cardiac peaks, with higher-order harmonics. Coherence analysis revealed stronger CSF-neurovascular coupling at cardiac frequencies, peaking at third harmonic, indicating arterial and venous pulsations drive spinal CSF flow. Systolic peaks from vertebral artery waveforms enabled event-related CSF cycle reconstruction without external gating. Time segments around these events were averaged to generate voxel-wise CSF waveforms. We compared cardiac cycle lengths from SURF-EPI with physiological logs ($n = 15$; 14 ICC > 0.60; error < 47 ms in 14). In addition, waveform comparisons with PC MRI showed strong/very strong correlation ($r > 0.60$) in 75% of participants, and moderate correlation ($r = 0.49$-0.58) in the rest. We compared ventral and dorsal CSF columns using (i) systole/diastole ratio, defined as peak systolic signal intensity divided by mean diastolic signal intensity, and (ii) variability metrics, quantified as coefficients of variation over cardiac cycles for (a) peak systolic signal, (b) late diastolic signal, and (c) systole/diastole ratio. (iii) systolic and diastolic outlier proportions, defined separately as fraction of cardiac cycles in which peak systolic or late diastolic signal intensity exceeded twice the corresponding peak systolic or late diastolic signal intensity of ROI's average waveform. These findings suggest increased beat-to-beat variability and more complex flow dynamics in ventral CSF.

CONCLUSION

SURF-EPI enables rapid (>20 Hz), simultaneous CSF and neurovascular imaging, capturing cardiac-driven flow without external gating. By avoiding velocity encoding, it overcomes dynamic range and phase noise limitations of real-time PC MRI, offering a robust, efficient alternative.

CLINICAL RELEVANCE/APPLICATION

SURF-EPI quantified ventral CSF flow variability in 14 subjects with Chiari I malformation and matched controls, showing trend of greater diastolic variability in Chiari ($p = 0.08$).

Nov. 30 – Dec. 4
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R3-SSCA10

Cardiac Imaging (Advanced CMR)

Thursday, Dec. 4 9:30AM - 10:30AM Room: E353C

Jeremy D. Collins, MD (*Moderator*)
Michael F. Morris, MD (*Moderator*)

Sub-Events

R3-SSCA10-1 FULL FREE-BREATHING CARDIAC MAGNETIC RESONANCE IMAGING: CLINICAL FEASIBILITY, EFFICIENCY, AND DIAGNOSTIC CONCORDANCE

Wenli Zhou (*Presenter*)
Kai Yang (*Abstract Co-Author*)
Jing An (*Abstract Co-Author*)
Gang Yin SR, BS (*Abstract Co-Author*)
Xinling Yang (*Abstract Co-Author*)
Minjie Minjie, PhD (*Abstract Co-Author*)

PURPOSE

To validate a comprehensive full free-breathing CMR protocol integrating motion correction and compressed sensing for clinical feasibility, efficiency, and diagnostic accuracy.

METHODS AND MATERIALS

In a prospective study, 605 patients underwent paired free-breathing and breath-holding CMR (3.0 scanner) across four cohorts. Primary evaluations included cine, T1 mapping, and late gadolinium enhancement (LGE) sequences, assessing scan time, image quality, cardiac function and tissue characterization.

RESULTS

The full free-breathing CMR protocol significantly reduced scan time by 39% (20.9 ± 3.1 vs. 34.4 ± 7.5 minutes, $P < 0.001$), with cine, T1 mapping, and LGE shortened by 54%, 28%, and 33%, respectively. A 10-minute focused protocol (cine+ +LGE) retained diagnostic fidelity. Free-breathing LGE demonstrated superior image quality versus breath-holding (median score 5 vs. 4, $P < 0.001$), particularly in arrhythmia/heart failure patients, while T1 mapping maintained equivalent quality (median 5 vs. 5, $P = 0.77$). Free-breathing cine showed minor but clinical acceptable quality reduction (median 4 vs. 5, $P < 0.001$). Quantitative analysis revealed marginally higher LV volumes (?EDV +5.01 mL, ?ESV +5.71 mL, $P < 0.001$) and lower LVEF (-1.67%, $P < 0.001$) with free-breathing, yet maintained excellent agreement (ICC 0.98-0.99). Native T1 and LGE mass were slightly elevated in free-breathing ($P = 0.001$) but obtained excellent consistency.

CONCLUSION

Full free-breathing CMR with MOCO and CS significantly reduces scan duration while maintaining diagnostic accuracy and strong concordance with breath-holding techniques.

CLINICAL RELEVANCE/APPLICATION

Full free-breathing CMR significantly shortens scan time while preserving diagnostic accuracy, enhancing accessibility in resource-limited settings.

R3-SSCA10-2 COMPARING THE PROGNOSTIC SIGNIFICANCE OF DUAL BOLUS AND DUAL SEQUENCE QUANTITATIVE STRESS PERFUSION CARDIAC MAGNETIC RESONANCE

Ming-Yen Ng, BMBS, FRCR (*Presenter*)
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Haonan Wang (*Abstract Co-Author*)
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Wan Wai Vivian Tse (*Abstract Co-Author*)
Cheuk Nam Felix Kwan (*Abstract Co-Author*)
Chi Ting Kwan (*Abstract Co-Author*)
Romelie Tuplano (*Abstract Co-Author*)
Jason Sin (*Abstract Co-Author*)
Chor Cheung Frankie Tam (*Abstract Co-Author*)
Chun Yu Leung, MBChB,MRCP (*Abstract Co-Author*)
Victor Goh (*Abstract Co-Author*)
Konrad Werys (*Abstract Co-Author*)
Randall Stafford (*Abstract Co-Author*)

PURPOSE

Quantitative stress perfusion (QP-stress) cardiac magnetic resonance (CMR) has the ability to diagnose and assess coronary artery disease and predict major adverse cardiovascular events (MACEs). Two techniques for QP-stress are Dual Bolus (DB) and Dual Sequence (DS). Our aim was to compare the prognostic significance of DB and DS.

METHODS AND MATERIALS

Both DB and DS were simultaneously performed on the same patient. Patients were excluded due to QP-stress protocol error, inadequate stress response, ECG pulse gating error, suboptimal images, primary congenital coronary abnormality and implanted cardiac device. Myocardial blood flow (MBF) was quantified for both stress and rest sequence to estimate myocardial perfusion reserve (MPR). Composite MACE comprised of acute coronary syndrome, stroke, heart failure (HF) hospitalisation, late (>90days) revascularisation and all-cause death was regarded as the primary study endpoint. Cox proportional hazard models and Kaplan-Meier survival estimate curves with log-rank tests were performed to determine the prognostic significance of DB and DS stress MBF and MPR.

RESULTS

577 patients (mean age 63.1±12.3 years and 61.8% male) were eligible for final analysis. Median follow-up was 737 days (interquartile range, 408-1142 days). 54 events were documented. All QP-stress CMR variables demonstrated significance in univariate Cox proportional hazard models [DB stress MBF (p=0.008), DB MPR (p=0.020), DS stress MBF (p<0.001) and DS MPR (p<0.001)]. After adjustment for age, left ventricular ejection fraction, left ventricular mass index and the presence of late gadolinium enhancement, only DS quantifications remained significant for MACE [DS stress MBF (95% CI, hazard ratio: 0.23-0.53, p<0.001), DS MPR (95% CI, hazard ratio: 0.15-0.36, p<0.001)]. Sub-analyses with Kaplan-Meier survival estimate curves were performed on HF hospitalisation (16 cases) [DS stress MBF (p<0.001), DS MPR (p=0.017), DB stress MBF (p=0.17), DB MPR (p=0.20)] and on all-cause death (15 cases) [DS stress MBF (p=0.01), DS MPR (p<0.001), DB stress MBF (p=0.17), DB MPR (p=0.046)].

CONCLUSION

DS stress MBF and MPR demonstrated a better prognostic ability than DB stress MBF and MPR. This provides an additional reason to use DS QP-stress instead of DB QP-stress as the standardised technique for QP-stress CMR examinations, on top of its easier workflow.

CLINICAL RELEVANCE/APPLICATION

To the best of our knowledge, there is no study directly comparing the prognostic significance of DB and DS QP-stress on MACE. This study provides key insights into MACE predictability by DB and DS QP-stress and shows DS out-performing DB, providing an additional reason to use the DS technique which is already a much easier technique to utilise and less time-consuming.

R3-SSCA10-3 FEASIBILITY OF FREE-RUNNING 3D CARDIAC CINE IMAGING ON A 0.6T MRI

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Tzu Cheng Chao (*Abstract Co-Author*)
Alessio Perazzolo, MD (*Abstract Co-Author*)
Camilla Vittoria Vita, MD (*Abstract Co-Author*)
Jerome Yerly, PhD (*Abstract Co-Author*)
Christopher Roy (*Abstract Co-Author*)
Matthias Stuber, PhD (*Abstract Co-Author*)
Spencer Waddle (*Abstract Co-Author*)
Jacinta Browne, PhD (*Abstract Co-Author*)
Ece Ercan (*Abstract Co-Author*)
Michal Povazan (*Abstract Co-Author*)
Omer Demirel (*Abstract Co-Author*)
Tim Leiner, MD, PhD (*Abstract Co-Author*)

PURPOSE

Free-running (FR) whole-heart 5D cardiovascular magnetic resonance (FR-5DCMR) continuously collects data without the need for breath-holding and cardiac gating. Cardiac and respiratory motion resolved images are reconstructed by compressed sensing reconstruction. 3D cine images can be obtained using a balanced steady-state free precession (bSSFP) sequence with the FR-5DCMR, and most studies have been performed at 1.5T and 3.0T field strengths. Compared to higher field strengths, a low field scanner has beneficial features for bSSFP FR-5DCMR, such as more uniform static magnetic field and lower specific absorption rate. However, low field CMR also presents the major challenge of the significantly decreased signal-to-noise ratio. The purpose of this work is to study the feasibility of FR 3D cine CMR on a 0.6T MRI system.

METHODS AND MATERIALS

The 3D radial phyllotaxis bSSFP FR-5DCMR sequence was implemented on a 0.6 T scanner (Philips Healthcare, Best, The Netherlands). FR-5DCMR data of six volunteers were acquired using field of view of 220 mm 3 , voxel size of 1.38 mm 3 , TE/TR of 2.85/5.7 ms and flip angle of 90 o with a scan time of 9 min. Readout length was 2.76 ms, resulting in 48% of the scan time for data acquisition. Data were reconstructed to four respiratory and 14-18 cardiac phases with a 50 ms temporal resolution. The 3D cine images of one respiratory phase were reformatted to short-axis (SA), two-chamber (2ch) and four-chamber (4ch) views and compared to cine images acquired by conventional 2D breath-holding cardiac gated acquisitions. End-diastolic volume (EDV), end-systolic volume (ESV) and ejection fraction (EF) were assessed for both left (LV) and right ventricles (RV) by two radiologists using CVI42 (Circle, Calgary, Canada). Paired student t-test and Bland-Altman plots were used to compare quantitative measurements.

RESULTS

The reformatted 3D SA, 2ch and 4ch views are compared to conventional 2D cine in fig.1(a). Despite the visually lower image quality in terms of contrast and sharpness, contouring was successfully performed on all volunteer data. LVEDV was 142±25 ml /130±23 ml (p = 0.11), LVESV was 56±12ml /54±12 ml (p = 0.24), and LVEF was 58.2±4.5% /61.6±2.5% (p = 0.08) for 3D and 2D respectively. RVEDV was 145±28 ml /141±30ml (p = 0.48), RVESV was 78±10ml /77±12 ml (p = 0.65), the RFEV was 55.50±4.7% /55.2±4.4% (p = 0.53) for 3D and 2D respectively. Bland-Altman plots of LVEF and RVEF are shown in fig.1 (b).

CONCLUSION

This study demonstrates the feasibility of FR 3D cine CMR at 0.6 T with acceptable image quality and quantitative LV and RV parameters.

CLINICAL RELEVANCE/APPLICATION

FR-5DCMR has the potential to significantly simplify the workflow of CMR. The results could have profound impacts on improvement on efficiency and accessibility of CMR.

R3-SSCA10-4 QUANTITATIVE MYOCARDIAL PERFUSION USING IN-LINE CARDIAC MRI: FEASIBILITY AND CLINICAL INSIGHTS

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Ahmed S. Negm, MD (*Abstract Co-Author*)
Phillip M. Young, MD (*Abstract Co-Author*)
Christopher J. Francois, MD (*Abstract Co-Author*)
Tim Leiner, MD, PhD (*Abstract Co-Author*)
Thomas A. Foley, MD (*Abstract Co-Author*)
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Jeremy D. Collins, MD (*Abstract Co-Author*)

PURPOSE

Cardiac MR myocardial quantitative perfusion (MQP) measures myocardial blood flow (MBF) in ml/min/g. Quantitative methods are more sensitive than semiquantitative ones for detecting ischemia and predicting cardiac events. We investigated single bolus MQP in consecutive patients (pts) referred for stress perfusion imaging and assessed rest only perfusion in pts receiving contrast for non stress imaging on a 1.5T vendor platform

METHODS AND MATERIALS

We included pts referred for contrast-enhanced stress or non-stress cardiac perfusion MRI. Imaging was performed at 1.5T on a single scanner with a dedicated cardiac coil (Optima 450W, GE Healthcare, WI) using a developmental MQP pulse sequence. Stress perfusion was performed with regadenoson (0.4 mg over 10 sec). Rest imaging followed stress imaging after a 10-min washout. Gadobutrol (0.05 mmol/kg) was given at 2 cc/sec for both phases. Aminophylline (100 mg IV) was given post-

stress at the radiologist's discretion. An additional 0.10 mmol/kg Gadobutrol was given post-rest (total 0.2 mmol/kg). Stress and rest imaging included three short-axis slices (base, mid, apex). MQP analysis used investigational software (QP, CVi42 v5.17, Circle, Canada). Cine and conventional myocardial delayed enhancement (MDE) imaging were obtained. LVEF and MDE were extracted from clinical reports. Pts were grouped by LVEF (=50% vs. <50%) and by presence/absence of scar on MDE. Resting MBF was compared between those who received vasodilator vs rest-only imaging, and global values were analyzed using a two-tailed Student's t test.

RESULTS

94 pts (50 female; 19-84 yrs) underwent MQP imaging with off-line resting MBF analysis. Automated MQP contours required correction in 10 pts. Pts were grouped by LVEF and scar. Mean ± SD are reported. Pts with preserved LVEF and no scar had higher global resting MBF than those with preserved LVEF and scar ($p < 0.001$). Resting MBF differed between those with and without aminophylline reversal ($p < 0.05$). Resting MBF was similar between pts with preserved LVEF and no scar and those undergoing stress imaging with reversal

CONCLUSION

Single bolus off line MBF quantification is feasible in a heterogeneous clinical population using an investigational 1.5T sequence. Residual regadenoson effects beyond 10 minutes elevated resting MBF unless reversed with aminophylline, potentially lowering perfusion reserve when rest follows stress without reversal. Resting MBF was higher in pts with LVEF >50% without scar vs. those with scar, with consistent absolute differences

CLINICAL RELEVANCE/APPLICATION

Single bolus off line MBF quantification is feasible and may help identify discrepancies in myocardial perfusion reserve, especially in patients with residual vasodilatory effects or myocardial scarring.

R3-SSCA10-5 ULTRAFAST DEEP LEARNING-BASED SINGLE-BEAT CARDIOVASCULAR MAGNETIC RESONANCE IN PATIENTS WITH SUSPECTED MYOCARDIAL DISEASE

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Christoph Katemann (*Abstract Co-Author*)
Dmitrij Kravchenko, MD (*Abstract Co-Author*)
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Oliver M. Weber (*Abstract Co-Author*)
Claus C. Pieper, MD (*Abstract Co-Author*)
Daniel Kuetting, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)
Alexander Isaak, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic interchangeability of a novel deep-learning (DL) enhanced single-beat cardiovascular magnetic resonance (CMR) protocol compared to standard CMR protocol in patients with suspected myocardial disease.

METHODS AND MATERIALS

In this prospective study, participants with suspected myocardial disease consecutively underwent both standard and DL single-beat CMR protocol including cine, T2-STIR, and late gadolinium enhancement (LGE) sequences at 1.5T. Single-beat images were reconstructed using a DL super-resolution algorithm provided by Philips Healthcare that combines and integrates compressed sensing with two convolutional neural networks: Adaptive-CS-Net and Precise-Image-Net. Three readers assessed wall motion abnormalities, edema, LGE, and CMR diagnosis. Interchangeability was evaluated using individual equivalence indices (IEIs, margin ±5%). Interreader agreement was analyzed using Fleiss ?. Total scan time (including acquisition and breath-hold time) was compared using Student's t'test. Diagnostic certainty was evaluated using a 5-point Likert scale. For total examination time comparison, examinations were retrospectively identified which used either a DL single-beat or standard CMR protocol only (each n=10).

RESULTS

In total, 107 participants were included (mean age 56±21 years, 61% male). Total scan time of the short-axis DL single-beat sequences was reduced by 66% in cine (92±7 vs. 274±8 sec; p<.0001), 73% in LGE (77±4 vs. 286±4 sec; p<.0001), and 86% in T2-STIR (35±4 vs. 244±18 sec; p<.0001) compared to standard CMR. Total examination time for the full CMR protocol using the DL single-beat approach was reduced by 54% (24.2±8.2 vs. 52.3±1.7 min; p<.0001). Interreader agreement was comparable between DL single-beat and standard CMR, e.g. CMR diagnosis (0.88 vs. 0.89). Interchangeability analysis confirmed no clinically significant differences, with IEIs within the predefined equivalence margin (e.g. CMR diagnosis: 0.01 [CI: -0.02, 0.05]). Diagnostic certainty was rated significantly higher for DL single-beat CMR protocol (5 [IQR: 4.7-5] vs. 4.7 [IQR: 4.3-5]; p<.0001).

CONCLUSION

DL-based single-beat CMR enables an ultrafast, clinically equivalent cardiomyopathy protocol (approximately 24 min) without compromising diagnostic accuracy. This approach can enhance workflow efficiency and serve as a robust alternative for comprehensive CMR evaluations in myocardial disease.

CLINICAL RELEVANCE/APPLICATION

DL-based single-beat CMR offers a time-efficient and robust diagnostic alternative to standard CMR. Faster imaging techniques using DL may improve patient comfort and compliance and could be a possible concept for overcoming increasing CMR investigations in the future.

R3-SSCA10-6 PROGNOSTIC VALUE OF CMR CINE-BASED HEMODYNAMIC FORCES ANALYSIS IN ACUTE PERICARDITIS

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Thomas M. Vollbrecht, MD (*Abstract Co-Author*)
Taraneh Aziz-Safaie, MD (*Abstract Co-Author*)
Leon Bischoff, MD (*Abstract Co-Author*)
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Daniel Kuetting, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)
Alexander Isaak, MD (*Abstract Co-Author*)

PURPOSE

Cardiac magnetic resonance (CMR) enables advanced functional evaluation including strain imaging and quantification of hemodynamic forces (HDF). HDF represents the intraventricular forces exchanged between the myocardium and blood, offering a non-invasive assessment of pressure gradients. This study aimed to investigate the prognostic value of HDF in patients with acute pericarditis.

METHODS AND MATERIALS

I n this retrospective single-center study, patients with CMR-confirmed acute pericarditis (08/2008- 12/2024) were analyzed. In addition to standard left ventricular (LV) functional metrics (e.g., ejection fraction), strain parameters (endocardial global longitudinal strain [GLS] and circumferential strain [GCS]) and HDF parameters (e.g., HDF strength root mean square in apex-base and lateral-septal direction, HDF average angle, hemodynamic work), were assessed using standard cine imaging (Medis

Suite QStrain). Major adverse cardiac events (MACE) were defined as constrictive pericarditis, tamponade, recurrence of pericarditis, or cardiac decompensation. Follow-up was available up to 5 years. Statistical tests included Mann-Whitney U and Kaplan-Meier analysis.

RESULTS

Among 150 patients (mean age 56 ± 17 years; 39% female), 17 (11.3%) experienced MACE. MACE included constrictive pericarditis (n=4, 23.5%), recurrence (n=7, 41.2%), tamponade (n=1, 5.9%), and cardiac decompensation (n=5, 29.4%). Patients with MACE had significantly lower apex-base HDF values at baseline compared to those without MACE (17.0 ± 7.6% vs. 21.9 ± 9.0%, p=0.032); other parameters (LVEF, GLS, GCS, lateral-septal HDF, angle, work) showed no significant differences (p>0.05 for each parameter). On Kaplan-Meier analysis an apex-base HDF threshold of <19.6% was associated with MACE (log-rank p=0.002).

CONCLUSION

Reduced apex-base HDF at initial diagnosis is independently associated with increased risk of long-term cardiac complications in patients with acute pericarditis.

CLINICAL RELEVANCE/APPLICATION

CMR-derived HDF may serve as a non-invasive marker for prognostic risk stratification in pericarditis.

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Nov. 30 – Dec. 4
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R3-SSCH09

Science Session with Keynote: Chest Imaging (Techniques)

Thursday, Dec. 4 9:30AM - 10:30AM Room: E451A

Jane P. Ko, MD (*Moderator*)
Masahiro Yanagawa, MD, PhD (*Moderator*)

Sub-Events

R3-SSCH09-1 THYMIC HEALTH CONSEQUENCES IN ADULTS

Simon Bernatz, MD (*Presenter*)
Vasco Prudente (*Abstract Co-Author*)
Suraj Pai, BEng (*Abstract Co-Author*)
Asbjorn Kjer (*Abstract Co-Author*)
Yumeng Cao (*Abstract Co-Author*)
Jiachen Chen (*Abstract Co-Author*)
Borek Foldyna, MD (*Abstract Co-Author*)
Leonard Nuernberg, MSc, BSc (*Abstract Co-Author*)
MARIAM JAMAL-HANJANI (*Abstract Co-Author*)
Michael T. Lu, MD, MPH (*Abstract Co-Author*)
Joanne Murabito (*Abstract Co-Author*)
Kathryn Lunetta (*Abstract Co-Author*)
Nicolai Birkbak (*Abstract Co-Author*)
Hugo Aerts, PhD (*Abstract Co-Author*)

PURPOSE

While the thymus is critical for T cell maturation in childhood, its later role in adult health is uncertain. We hypothesized that thymic functionality remains essential across the lifespan and evaluated its relevance to mortality and disease risk.

METHODS AND MATERIALS

We developed a deep learning system to quantify preserved thymic tissue on computed tomography as a proxy for its functionality, referred to as thymic health. This fully automatic system was applied to two large prospective cohorts of asymptomatic adults: the Framingham Heart Study (FHS) and the National Lung Screening Trial (NLST). Participants were categorized as low, average, or high thymic health based on percentiles. We assessed associations of thymic health with all-cause mortality, cancer, and cardiovascular disease. In a subset, we also evaluated plasma protein levels and lifestyle factors.

RESULTS

We included 27,612 individuals (2,581 FHS and 25,031 NLST) with a 12-year follow-up. In FHS, participants with high thymic health had a lower mortality risk than those with low thymic health (hazard ratio [HR], 0.24; 95% confidence interval [CI], 0.16-0.38); similar results were observed in NLST (HR, 0.49; 95% CI, 0.45-0.53). These associations remained significant independent of age, sex, and smoking (FHS, P=0.012; NLST, Type III P<0.001). High thymic health was also associated with reduced risk of lung cancer (HR, 0.64; 95% CI, 0.53-0.76) and cardiovascular disease (HR, 0.26; 95% CI, 0.16-0.40), as well as lower disease-specific mortality from lung cancer (HR, 0.52; 95% CI, 0.44-0.63) and cardiovascular causes (HR, 0.08; 95% CI, 0.02-0.34). Again, these associations remained significant independent of sex, age, and smoking (P < 0.02). Inflammatory protein levels and markers of chronic inflammation, including Interleukin-6 and C-reactive protein, were negatively associated with thymic health. Thymic health was further negatively associated with metabolic dysregulation and unhealthy lifestyle factors such as smoking and physical inactivity.

CONCLUSION

Our findings challenge long-standing assumptions about thymic redundancy in adulthood and open new avenues for targeted preventive and regenerative strategies.

CLINICAL RELEVANCE/APPLICATION

CT-based quantification of thymic health enables non-invasive, automated assessment of immune competence, offering a scalable biomarker for stratifying risk in asymptomatic populations. This approach may enhance early and opportunistic identification of individuals at elevated risk for death, cancer, and cardiovascular disease, informing personalized prevention and the potential for future regenerative approaches.

R3-SSCH09-2 AI-DRIVEN DETECTION OF THORACIC MEDICAL DEVICES IN PEDIATRIC CHEST RADIOGRAPHS: ENHANCING SAFETY AND EFFICIENCY IN IMAGING INTERPRETATION

Amit T. Kharat, PhD,DMRD (*Presenter*)
Siddhant Pardeshi (*Abstract Co-Author*)
Richa Pant (*Abstract Co-Author*)

PURPOSE

Accurate identification of medical devices in pediatric chest radiographs (CXRs) is essential for timely clinical decision-making. In fast-paced clinical settings, especially in pediatric care, subtle hardware can be overlooked that may lead to diagnostic errors or delayed interventions. While existing AI models have shown promise in adult populations, pediatric radiology remains underserved due to anatomical variation and limited datasets. To address this gap, we validated a deep learning model to automatically detect and localize thoracic medical devices: invasive, non-invasive, and postsurgical materials in pediatric CXRs. The goal was to support radiologists in interpreting images more efficiently and reliably, thereby improving the overall quality and safety of care.

METHODS AND MATERIALS

The study included 9,719 pediatric patients under the age of 18 who underwent chest radiography. The dataset was collected from 353 institutions and spanned over 20 different DX and CR acquisition system manufacturers. Of the total cohort, 5,690 were male and 4,006 were female, with an average age of 7.1 years (0-11 years). A convolutional neural network was trained to detect the following devices and postsurgical material: sternal sutures, central venous lines, endotracheal tubes, and chest

leads. Radiologists' reports served as the reference standard. Model performance was evaluated using sensitivity, specificity, and AUROC. Metrics were calculated at a decision threshold of 0.5. Bootstrapping was used to calculate confidence intervals.

RESULTS

The model achieved an overall sensitivity of 0.92 [0.85 - 0.98], specificity of 0.81 [0.80 to 0.82], and an AUROC of 0.86 [0.84 - 0.89] across all medical device types. Performance was strong across individual device categories: sternal sutures (AUROC 0.99, sensitivity 0.82, specificity 1.00), central venous lines (AUROC 0.98, sensitivity 0.88, specificity 0.96), endotracheal tubes (AUROC 0.98, sensitivity 0.96, specificity 0.92), and chest leads (AUROC 0.95, sensitivity 0.85, specificity 0.93).

CONCLUSION

The AI model demonstrated high sensitivity and specificity in detecting most hardware in pediatric chest radiographs, including sternal sutures, central venous lines, endotracheal tubes, and chest leads. With AUROCs exceeding 0.95 for all, the tool shows strong potential as a reliable assistant in pediatric imaging workflows.

CLINICAL RELEVANCE/APPLICATION

AI offers a scalable and sustainable approach to enhancing the accuracy, efficiency, and safety of pediatric chest imaging, with potential to significantly support radiologists and improve patient outcomes in clinical practice.

R3-SSCH09-3 DEVELOPMENT AND IMPLEMENTATION OF A GENERATIVE CHEST XR MACHINE LEARNING MODEL AT A LARGE-SCALE RADIOLOGY PRACTICE

Robert J. Harris, PhD (*Presenter*)
Shwan Kim, MD (*Abstract Co-Author*)
Michael Rethy, MD (*Abstract Co-Author*)
Michael J. Cooney, MD (*Abstract Co-Author*)
Kenneth H. Segel, MD (*Abstract Co-Author*)
Brian Baker (*Abstract Co-Author*)

PURPOSE

Our radiology practice interprets over 1 million Chest XR studies per year but like many practices experiences radiologist capacity limitations resulting from the national radiologist shortage. We hypothesized that a generative model could be trained that inputs a Chest XR study and outputs a clinical report with accuracy comparable to a radiologist. We further hypothesized that single-pathology outputs from this model could be used for worklist prioritization and quality assurance of prospective data.

METHODS AND MATERIALS

All available Chest XR studies and their corresponding reports were extracted from our database, yielding 1,604,083 studies. The model utilized a Swin encoder and BERT decoder. Pneumothorax sensitivity was used during the validation step to determine the best epoch to save. Following training the model was deployed in a large-scale radiology system to analyze all prospective Chest XR data for a 2-week period. An NLP model with 155 outputs representing 155 findings on Chest XR was run on the generated text report and the ground truth radiologist report for all studies. Studies for which the model-generated and radiologist reports were discrepant for pneumothorax were sent to secondary review. Studies for which the generated report was positive for pneumothorax were prioritized in the reading queue. A report comparison tool was developed that displays study images, the corresponding radiologist report, and the model-generated report to blinded annotating radiologists; these radiologists classified 300 studies using this tool, selecting which report they thought was more accurate.

RESULTS

The optimal training epoch was epoch 64 with a validation pneumothorax sensitivity of 58.7% and specificity of 100.0%. The model ran on 34,680 studies over the 2-week prospective period. During this time, sensitivity and specificity for pneumothorax were 62.4% and 99.3%, respectively. There were 36 studies flagged for secondary review; 25.0% were positive for missed pneumothorax. Radiologists using the report comparison tool selected the model-generated report 22% of the time and the radiologist report 34% of the time, with the remaining 44% rated as equivalent in quality.

CONCLUSION

A generative Chest XR model was trained and implemented to generate text reports in a large-scale production workflow. This model shows utility for worklist prioritization and QA, producing reports of equivalent or better quality than a radiologist for a majority of cases.

CLINICAL RELEVANCE/APPLICATION

Chest XR studies have a degree of interpretation error related to inherent modality and visualization limitations. A generative model that interprets Chest XR imaging could mitigate radiologist workload and help alleviate the national radiologist shortage.

R3-SSCH09-6 DIAGNOSTIC PERFORMANCE OF A LARGE LANGUAGE MODEL IN MULTIMODAL RETRIEVAL-AUGMENTED RADIOLOGY REPORT GENERATION: A COMPARATIVE STUDY WITH AN EXPERIENCED HUMAN READER

Yeon Joo Jeong, MD, PhD (*Presenter*)
Jong Eun Lee, MD, PhD (*Abstract Co-Author*)
Kyubin Kim, MD (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the diagnostic performance of a large language model (LLM) in multimodal retrieval-augmented radiology report generation for chest radiographs, comparing its performance with that of an experienced human reader.

METHODS AND MATERIALS

This retrospective study included 1260 anonymized chest radiographs obtained from five clinical settings: screening, outpatient non-respiratory clinics, outpatient respiratory clinics, inpatient wards, and emergency departments. The evaluation focused on posteroanterior and anteroposterior radiographs, with chest computed tomography (CT) performed on the same day or within one week serving as the standard reference. Diagnostic accuracy and report quality (assessed using a 5-point Likert scale) were compared between LLM-generated reports and those from an experienced human reader, using the McNemar test for diagnostic accuracy and the Wilcoxon Signed-Rank test for report quality. Efficiency was assessed by measuring the time required for LLM interpretation, and hallucinations in the generated reports were analyzed to evaluate the reliability of LLM interpretations.

RESULTS

The human reader achieved an overall diagnostic accuracy of 90.3% (1138/1260), significantly higher than the LLM's accuracy of 62.1% (783/1260) ($P < 0.001$). The average Likert score for report quality was 4.51 for the human reader and 3.34 for the LLM ($P < 0.001$). The LLM demonstrated a hallucination rate of 6.1% (77/1260). The mean reporting time for the LLM was 3.4 seconds (SD 0.9), ranging from 2.0 to 9.6 seconds. Across all clinical settings, the human reader consistently achieved higher diagnostic accuracy than the LLM (all $P < 0.001$). The highest accuracy for both was observed in the screening setting (96.4% [241/250] vs. 79.2% [198/250]), while the largest performance gap occurred in outpatient respiratory clinics (87.3% [227/260] vs. 45% [117/260]). In inpatient wards and emergency departments, the human reader maintained accuracies above 89%, significantly outperforming the LLM (60.8% [152/250] and 62.4% [156/250, respectively).

CONCLUSION

These findings underscore the superior diagnostic accuracy and report quality of the human reader across all clinical settings. However, the LLM demonstrated acceptable diagnostic accuracy in screening examinations, highlighting its potential utility in specific scenarios where efficiency and scalability are prioritized.

CLINICAL RELEVANCE/APPLICATION

This study highlights the potential of large language models as efficient support tools in screening chest radiographs, while emphasizing the essential role of human expertise for accurate interpretation in diverse clinical settings.

R3-SSCH09-7 Keynote Speaker: Computer-Aided Diagnosis and Artificial Intelligence: Current Status and Future Direction for Chest Radiology

Yoshiharu Ohno, MD, PhD (*Science Invited Presenter*)

Printed on: 02/18/26

Nov. 30 – Dec. 4
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R3-SSGI15

Gastrointestinal Imaging (Gastric Cancer)

Thursday, Dec. 4 9:30AM - 10:30AM Room: E451B

Matthew A. Morgan, MD (*Moderator*)
Eun Sun Lee, MD, PhD (*Moderator*)

Sub-Events

R3-SSGI15-1 BIOLOGY-GUIDED MULTIMODAL DEEP LEARNING RADIOMICS FOR PREDICTION OF IMMUNOTHERAPY RESPONSE IN GASTRIC CANCER: A MULTICENTER STUDY

Qingyu Yuan (*Presenter*)

PURPOSE

Immunotherapy is a standard treatment for many tumor types. However, clinical benefit is limited to a minority of patients and reliable predictive biomarkers of immunotherapy response are lacking. Deep learning has advanced cancer detection and diagnosis but has had limited success in predicting immunotherapy response. A significant hurdle for clinical translation of current data-driven AI models is lack of interpretability, often due to a disconnect from the underlying pathobiology. Here, we aim to predict immunotherapy response of gastric cancer patients by developing biology-guided multimodal deep learning radiomics model.

METHODS AND MATERIALS

We present a biology-guided multi-modal deep learning radiomics approach to predict immunotherapy response using both clinical data and computed tomography (CT) images. We present a biology-guided deep learning radiomics approach that enables simultaneous prediction of the tumor immune and stromal microenvironment status as well as immunotherapy response from clinical data and CT images.Besides deep learning features, 584 quantitative features were extracted from intratumoral and peritumoral regions on contrast-enhanced CT scans. We validate the model for predicting immunotherapy response and progression-free survival in the multicenter study. To overcome limitations of small training data, we leverage an additional dataset of 2,200 patients who did not receive immunotherapy in a pretrained framework using self-supervised learning to learn intrinsic imaging phenotypes of the disease. We trained and validated the model in three independent cohorts of 260 patients treated with immunotherapy. We compared the proposed biology-guided multi-modal model with the traditional deep learning and radiomics approaches.

RESULTS

The AI model achieved area under receiver operating characteristics curve (AUC) of 0.80 to 0.83 for predicting immunotherapy response in the internal and external validation cohorts. The proposed biology-guided multi-modal model significantly improved the performance of immunotherapy response prediction with AUCs 0.80-0.83 vs. 0.69-0.76 compared with the traditional deep learning and radiomics approaches. The model was significantly associated with progression-free survival ($p<0.001$).

CONCLUSION

The deep learning model achieved promising performance in predicting immunotherapy response from routine clinical and image data. The proposed biology-guided multi-modal deep learning radiomics approach is general and can improve prediction of immunotherapy response.

CLINICAL RELEVANCE/APPLICATION

This model noninvasively and accurately predicts immunotherapy response in gastric cancer, enabling personalized treatment and better clinical outcomes.

R3-SSGI15-3 DUAL-LAYER SPECTRAL DETECTOR CT-BASED SCORING SYSTEM FOR NONINVASIVE TP53 EXPRESSION ASSESSMENT AND ADJUVANT CHEMOTHERAPY RESPONSE PREDICTION IN GASTRIC CANCER: A MULTICENTER STUDY

Yinchen Wu (*Presenter*)
Dairong Cao, MD (*Abstract Co-Author*)
Dejun She (*Abstract Co-Author*)

PURPOSE

Noninvasive early prediction of TP53 is a key strategy for improving the prognosis of gastric cancer (GC) patients. To establish a novel, noninvasive and simple scoring system using dual-layer spectral detector CT (DLCT) for preoperative prediction of TP53 expression, prognosis and response to adjuvant chemotherapy (ACT) with retrospective and prospective validation.

METHODS AND MATERIALS

Between April 2021 and March 2025, 568 GC patients were retrospectively and prospectively recruited from two hospitals into a training cohort (TC), a validation cohort (VC), an internal test cohort (ITC), and an external test cohort (ETC). A nomogram prediction model was constructed based on clinical characteristics and DLCT quantitative parameters, which was further simplified to a scoring system. The performance of the system was assessed by discrimination, calibration and clinical applicability. The patients' recurrence-free survival (RFS) and benefit of ACT were evaluated by survival analysis.

RESULTS

The nomogram outperformed clinical, conventional CT and DLCT models for TP53 prediction. The scoring system exhibited comparable predictive efficacy to the nomogram. The areas under the curve (AUCs) of the scoring system were 0.864 (0.815-0.914) for TC, 0.887 (0.802-0.972) for VC, 0.893 (0.844-0.942) for ITC, and 0.912 (0.838-0.985) for ETC, respectively. There were differences in RFS between patients with different TP53 types predicted by the scoring system (P =0.006, 0.018, 0.015), in consistent with the results from truth labels. RFS differed between the patients who received the system-recommended ACT regimen and those who did not (P =0.006, 0.027, 0.032). Furthermore, the scoring system was superior to other currently used testing techniques by using cost-effectiveness analysis (incremental cost-effectiveness ratio and incremental cost-utility ratio were 0).

CONCLUSION

The simple DLCT-based scoring system enables noninvasively, cost-effectively and rapidly predict TP53 expression, prognosis, and benefit from ACT in GC patient, which is expected to guide individualized treatment.

CLINICAL RELEVANCE/APPLICATION

1. To the best of our knowledge, this is the first simple scoring system based on DLCT for predicting TP53 expression. It allowed direct estimation of TP53 mutation probability by rapid and simple measurement of the scanning images without additional complex processing. 2. Physicians should focus on patients with scores greater than 21.5, recommend them for ACT, and concentrate on following up this group of patients to make timely adjustments to their treatment regimens.
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Nov. 30 – Dec. 4
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R3-SSGI16

Gastrointestinal Imaging (Pancreas - Adenocarcinoma)

Thursday, Dec. 4 9:30AM - 10:30AM Room: E350

Paul Nikolaidis, MD (*Moderator*)
Dow-Mu Koh, FRCR (*Moderator*)

Sub-Events

R3-SSGI16-1 EARLY PANCREATIC CANCER DETECTION VIA PREDIAGNOSTIC CT AND ARTIFICIAL INTELLIGENCE

Zongwei Zhou, PhD (*Presenter*)
Wenxuan Li, BS (*Abstract Co-Author*)
Pedro Ricardo Ariel Salvador Bassi (*Abstract Co-Author*)
Xinze Zhou (*Abstract Co-Author*)
Qi Chen (*Abstract Co-Author*)
Tianyu Lin (*Abstract Co-Author*)
Xiaoxi Chen, MD (*Abstract Co-Author*)
Shanshan Jiang, MD, PhD (*Abstract Co-Author*)
Chandana G. Lall, MD (*Abstract Co-Author*)
Zheren Zhu, MSc (*Abstract Co-Author*)
Yang Yang, PhD (*Abstract Co-Author*)
Kai Ding, PHD (*Abstract Co-Author*)
Heng Li (*Abstract Co-Author*)
Kang Wang, MD,PhD (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate AI in detecting early-stage pancreatic ductal adenocarcinoma (PDAC) and compare the performance with board-certified radiologists.

METHODS AND MATERIALS

We develop an automated system, ePAI (early Pancreatic cancer detection with Artificial Intelligence), that can detect early-stage PDAC in contrast-enhanced CT scans. ePAI consists of three stages. Stage 1: An nnU-Net model was trained for anatomical segmentation of the pancreas (head, body, tail), surrounding vessels (arteries and veins), and visible dilated ducts. Stage 2: The same nnU-Net model was fine-tuned to detect pancreatic lesions. It was trained on both real and synthetic lesions (improved sensitivity) and on a large cohort of normal scans to reduce false positives (improved specificity). Stage 3: Detected lesions were classified into three categories—PDAC, non-PDAC, and Normal—using an auxiliary transformer-based module considering image features such as lesion texture, location, and pancreas morphology. ePAI was trained on data from 1,598 patients (each has both portal venous and arterial phase CT scans) at a single center. ePAI is interpretable, as it can directly output segmentation masks of the detected PDAC, pancreas, and other anatomical structures. Our study first evaluated ePAI internally on 1,012 patients and then validated ePAI on a large external multicenter test cohort (n = 140 centers) involving 43,038 patients. Moreover, we compared ePAI's performance in detecting early-stage PDAC to that of 40 radiologists using the same CT scans, including scans with small PDAC (<2 cm) and prediagnostic scans in which radiologists had previously overlooked the PDAC.

RESULTS

ePAI achieved an area under the receiver operating characteristic curve (AUC) of 0.975 (95% CI: 0.941 - 1.000; n =345) for detecting early-stage PDAC (<2 cm) in the internal validation, detected PDAC as small as 2 mm, and 0.941 (95% CI: 0.922 - 0.958; n = 3,421) in the external validation, detected PDAC as small as 5 mm, and outperformed 40 radiologists by ### (P = ###) in sensitivity and ### (P = ###) in specificity. Importantly, ePAI successfully detected early-stage PDAC in 7 of 19 patients that had been overlooked by radiologists, with a median lead time of 244 days before clinical diagnosis.

CONCLUSION

AI can accurately detect small PDAC (<2 cm) at a substantial lead time before clinical diagnosis (prediagnostic), suggesting its potential as an assistive tool for radiologists to improve early detection of pancreatic cancer.

CLINICAL RELEVANCE/APPLICATION

The development of ePAI will result in safe and effective detection of early-stage cancer missed by standard of care diagnostic techniques, and in some cases, will enable timely treatment with intent to cure.

R3-SSGI16-3 AN AI MODEL REDUCES THE CT RETROSPECTIVE MISS RATE IN PANCREATIC DUCTAL ADENOCARCINOMA

Andres Kohan, MD, MMedSc (*Presenter*)
Robert C. Grant, MD,MA (*Abstract Co-Author*)
David Henault (*Abstract Co-Author*)
Steven Gallinger (*Abstract Co-Author*)
Ana Dodd (*Abstract Co-Author*)
Julie Wilson (*Abstract Co-Author*)
Masoom A. Haider, MD (*Abstract Co-Author*)

PURPOSE

Pancreatic ductal adenocarcinoma (PDAC) has a 5-year survival rate of <10%, which is dramatically improved when detected in early stages. However, early detection remains a challenge due to the subtle changes in CT associated to it than can be easily missed. AI models might be a reporting adjunct for radiologists by highlighting potential cancer regions during routine portal phase CT that might otherwise be missed

METHODS AND MATERIALS

A nnU-Net v2 based AI model was trained on a labelled dataset of 683 patients (501PANORMA open source, 182 internal) with PDAC. The trained model was tested in a retrospective cohort of patients with pathology proven PDAC that had had a contrast enhanced CT scan of the abdomen for any indication prior to the index CT at our institution. Prior imaging of this cohort was reviewed to determine whether the PDAC was already present prior to diagnosis. Performance of the trained model, clinical characteristics of the patients, size of the lesion at diagnosis and delay in diagnosis if a lesion was missed were tabulated for analysis. Radiologist, AI and combined retrospective miss rates (RMR) were calculated. For false positive rate 488 normal control cases from the KiTS23 open-source data set for small renal masses were used.

RESULTS

A retrospective cohort of 141 patients with prior imaging before PDAC diagnosis was identified. At the time of final diagnosis, 60% (85/141) had a lesion >=2cm. An average delay of 512 days to diagnosis was observed in patients that had a retrospective lesion on prior imaging. Radiologist, AI and joint RMR was 40% (57/141), 32% (45/141) and 25% (35/141) for the overall cohort respectively (p=0.04); 36% (20/56), 46% (26/56) and 30% (17/56) for lesions <=2cm respectively (p=0.1); and 44% (37/85), 22% (19/85) and 21% (18/85) for lesions >2cm respectively (p<0.001). Of the latter group (lesions >2cm), 27 (32%) where missed when <=2cm with 12/27 (44%) that would have been spotted by the AI model. The false positive rate on normal controls was manageable at 8% (38/488).

CONCLUSION

A nnU-NET trained AI model can significantly reduce the retrospective miss rate of radiologists on single phase contrast enhanced CT in the context of PDAC with a joint approach (AI+radiologist) being the most beneficial. The largest impact was observed in lesions >2cm at diagnosis where almost half of the radiologist misses that progressed in stage could have been detected early had our AI model been used at the moment of prior imaging.

CLINICAL RELEVANCE/APPLICATION

AI assisted radiology reporting shows promise in reducing the number of missed PDAC on routine imaging when used as a radiologist aid with a manageable false positive rate. Issues of effect on interpretation bias and tolerance to false positives still need to be assessed.

R3-SSGI16-4 DEEP LEARNING DETECTION OF MULTIPLE IMAGING FEATURES ASSOCIATED WITH PANCREATIC CANCER ON NON-CONTRAST AND CONTRAST-ENHANCED CT SCANS

Takeru Yamaguchi, MD, PhD (*Presenter*)
Keitaro Sofue, MD (*Abstract Co-Author*)
Atsuhiro Masuda (*Abstract Co-Author*)
Nobuyuki Hirahara (*Abstract Co-Author*)
Aya Ogasawara (*Abstract Co-Author*)
Eisuke Ueshima (*Abstract Co-Author*)
Akihiro Umeno (*Abstract Co-Author*)
Naoya Ebisu (*Abstract Co-Author*)
Mizuki Takei (*Abstract Co-Author*)
Yuzo Kodama (*Abstract Co-Author*)
Takamichi Murakami, MD, PhD (*Abstract Co-Author*)

PURPOSE

Previous studies have reported that indirect imaging features, such as main pancreatic duct (MPD) abnormalities and parenchymal atrophy, can assist in the detection of pancreatic cancer (PC). This study aimed to develop deep learning (DL) models capable of identifying these PC-associated features on both non-contrast CT (NCCT) and contrast-enhanced CT (CECT) scans, and to compare their diagnostic performance with that of physicians.

METHODS AND MATERIALS

Two DL models were trained to recognize four PC-associated imaging features (mass, parenchymal atrophy, MPD dilatation, and MPD stenosis) on NCCT and CECT, and to diagnose PC based on these features. A dataset of 3,916 abdominal CT scans collected from multiple institutions was manually labeled and annotated for training and validation. Model performance was assessed using two external datasets: a CECT dataset (90 PCs and 100 controls) and an NCCT dataset (87 PCs and 100 controls). The diagnostic performance of the DL models in identifying PC-associated imaging features and diagnosing PC was compared to that of six physicians.

RESULTS

The DL models achieved area under the receiver operating characteristic curves (AUROC) values of 0.938, 0.901, 0.937, and 0.943 on CECT, and 0.877, 0.883, 0.954, and 0.926 on NCCT for mass, parenchymal atrophy, MPD dilatation, and MPD stenosis, respectively. For PC diagnosis, the models' AUROCs were comparable to and significantly higher than the physicians' mean (0.987 vs. 0.987, p=0.84 on CECT; 0.933 vs. 0.913, p=0.026 on NCCT). The DL models also demonstrated significantly higher sensitivity for the detection of small PCs (= 20mm) on CECT (97.7% vs. 82.6%; p<0.001) and NCCT (86.0% vs. 41.1%; p<0.001).

CONCLUSION

The proposed DL models could identify PC-related imaging features and diagnose PC more accurately than physicians on NCCT and CECT scans.

CLINICAL RELEVANCE/APPLICATION

The proposed DL models could alert readers to subtle lesions and imaging features associated with PC and help detect PC on NCCT and CECT scans. In particular, they may aid in identifying small and early-stage PCs, which are more amenable to curative surgical resection and could ultimately lead to improved patient outcomes.

R3-SSGI16-5 DEVELOPMENT OF A MULTIMODAL DATA-BASED MODEL FOR PRECISE PROGNOSTIC STRATIFICATION IN RESECTED PANCREATIC CANCER

Wei Liu, MD (*Presenter*)
Zheng-rong Zhou (*Abstract Co-Author*)
Yi Chen, BMedSc, MMedSc (*Abstract Co-Author*)

PURPOSE

Accurate prognosis in pancreatic cancer (PC) is crucial for treatment decisions. This study developed a deep learning model integrating clinical, radiological, and pathological data to improve risk stratification for resected PC patients.

METHODS AND MATERIALS

Retrospectively enrolled PC patients who underwent radical surgery with histopathological confirmation at our institution between February 1, 2012, and December 30, 2020, were divided into training and internal validation cohorts. An external validation cohort was derived from a public database. Patients were stratified by 3-year overall survival (OS). A radiomics model was built from preoperative CT tumor features, while a Swin-Trans model captured spatial tumor features; these were combined into a hybrid DRadiomics model. Pathomic features from H&E-stained WSIs formed a pathomics model, and clinical variables were used for a clinical model. Multimodal and multiomics models integrated clinical, radiological, and pathological data. Prognostic scores were generated for internal and external validation cohorts. Model performance was compared using receiver operating characteristic (ROC) curves with area under the curve (AUC). The predictive efficacy was evaluated by time-dependent ROC analysis. Patients were stratified into high/low-risk groups by optimal cutoff value, with survival analyzed via Kaplan-Meier/log-rank tests. Immunohistochemical (IHC) markers were compared between risk groups in the internal validation cohort. $p < 0.05$ was considered significant.

RESULTS

n this study, 202 patients from our institute (140 training, 62 internal validation) and 48 from a public database (external validation) were analyzed. The multimodal (AUC: 0.95 training, 0.85 internal validation) and multiomics models (AUC: 0.94 training, 0.85 internal validation) outperformed others, with the multiomics model leading in external validation (AUC=0.76 vs. 0.56-0.69 for other models). Patients were stratified into low- and high-risk groups by the multimodal model's cutoff value. The OS and disease-free survival (DFS) were significantly differentiated between the low and high risk groups ($p < 0.05$). High-risk patients exhibited elevated Ki-67 expression ($p < 0.05$).

CONCLUSION

The model integrating clinical, radiological, and pathological data achieves a superior prognostic prediction performance in resected PC compared to AJCC staging. The multiomics model retains robust predictive capability even with missing clinical variables, offering a potential tool for prognostic stratification of resected PC.

CLINICAL RELEVANCE/APPLICATION

The framework can provide more precise and individualized prognostic assessments for patients who have undergone surgical resection.

R3-SSGI16-6 THE IMPACT OF RADIOLOGIST EXPERIENCE ON PANCREATIC CANCER DETECTION IN ROUTINE CONTRAST-ENHANCED CT

Tijmen De Haas, MSc (*Presenter*)
Megan Schuurmans (*Abstract Co-Author*)
Natalia Alves, MSc (*Abstract Co-Author*)
Henkjan Huisman, PhD (*Abstract Co-Author*)
John J. Hermans, MD, PhD (*Abstract Co-Author*)

PURPOSE

Pancreatic ductal adenocarcinoma (PDAC) is highly lethal and early and accurate detection via CT imaging is crucial but challenging. Radiologist performance in detecting pancreatic cancer is believed to rely on clinical experience, though current literature provides only limited evidence. This study aimed to quantify the relationship between various experience metrics and detection performance in PDAC on routine contrast-enhanced CT (CECT). We hypothesized that greater experience would be associated with improved detection performance.

METHODS AND MATERIALS

The PANORAMA study is the largest multi-institutional reader study on PDAC detection using routine CECT. It included 391 cases (144 PDAC, 247 controls) and 68 radiologists from 12 countries and 40 institutions. PDAC cases were histologically confirmed, and negative cases were confirmed by =3 years of clinical follow-up or histopathology. Each reader interpreted ~97 cases using a 0-100 likelihood scale. Detection performance of readers was assessed using the area under the receiver operating curve (AUC). Experience was assessed using six self-reported metrics: (1) years of reading abdominal CTs, (2) total of abdominal CTs read, (3) abdominal CTs read per year, (4) total of pancreatic CTs read, (5) pancreatic CTs read per year, and (6) residency status (n=11). For each variable, a split was made to create a low and a high experience group. The five continuous variables were split at the median; residency was already binary. Performance differences between the groups were tested using Mann-Whitney U tests with Holm-Bonferroni correction.

RESULTS

Radiologists reported 1-30 years of abdominal CT reading experience (median 9) and 0-1800 pancreatic CTs read per year (median 100). AUCs ranged from 0.75 to 0.96 (median 0.89). Higher detection performance was observed for readers with more total abdominal CTs read (?AUC=0.020, p=0.002), abdominal CTs read per year (?AUC=0.026, p<0.001), total pancreatic CTs read (?AUC=0.020, p=0.002), and pancreatic CTs read per year (?AUC=0.015, p=0.009). No significant differences were found for years of experience (p=0.12) or residency (p=0.48).

CONCLUSION

Reading volume of abdominal and pancreatic CTs was associated with improved PDAC detection, while years of experience and residency status were not.

CLINICAL RELEVANCE/APPLICATION

AI tools could help radiologists in low-volume centers improve PDAC detection.

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R3-SSIN07

Science Session with Keynote: Imaging Informatics (Next-Gen Imaging: Foundation Models and Beyond)

Thursday, Dec. 4 9:30AM - 10:30AM Room: E450B

Martha G. Menchaca, MD, PhD (*Moderator*)
Okan Ince, MD (*Moderator*)

Sub-Events

R3-SSIN07-1 GENERATIVE AI FOR LONGITUDINAL LINES AND TUBES CHEST X-RAY REPORTING

Panagiotis Korfiatis, PhD (*Presenter*)
Harshita Sharma (*Abstract Co-Author*)
Maximilian Ilse (*Abstract Co-Author*)
Anne-Marie G. Sykes, MD (*Abstract Co-Author*)
Kelly K. Horst, MD (*Abstract Co-Author*)
Anton Schwaighofer (*Abstract Co-Author*)
Sam Bond-Taylor (*Abstract Co-Author*)
Fernando Perez-Garcia (*Abstract Co-Author*)
Olesya Melnichenko (*Abstract Co-Author*)
Shaury Srivastav (*Abstract Co-Author*)
Maxwell Reynolds (*Abstract Co-Author*)
Kenza Bouzid, MEng, MSc (*Abstract Co-Author*)
Ashish R. Khandelwal, MD (*Abstract Co-Author*)
Maria T. Wetscherek, MD (*Abstract Co-Author*)
Javier Alvarez-Valle, MSc (*Abstract Co-Author*)
Valentina Salvatelli (*Abstract Co-Author*)

PURPOSE

To develop MAIRA-X, a multimodal AI model for chest X-ray (CXR) report generation focused on lines and tubes (L&T) reporting to enhance critical patient management, and to conduct the first large-scale L&T-specific quantitative evaluation of AI-generated reports.

METHODS AND MATERIALS

This retrospective study utilized a large-scale, multi-center, longitudinal dataset of 3.1 million CXR studies from a prominent medical institution (23% with L&T; 49% F / 51% M; mean age 62±16 years; 73% with priors). MAIRA-X, built on the MAIRA-2 multimodal large-language model (MLLM) architecture, was trained, validated, and tested on an 80/10/10 split. MAIRA-X incorporates current frontal and lateral CXR images, prior frontal CXR images, prior report, current indication and comparison, to generate current findings. It was tuned for L&T-specific elements, including image encoder fine-tuning, LLM selection, hyperparameter optimization, and prompt modifications. L&T-specific generation performance was assessed using a novel GPT-based structured report metric suite on L&T type (PICC, Chest tube, ETT, NGT, CVC, IABP, Swan-Ganz, Mediastinal Drain, or Tracheostomy), count (0, 1, 2, 3 or more), longitudinal change (new, moved, removed, unchanged, or unclear), and placement (correct, incorrect, unclear, or NA). Clinical quality was measured with RadFact, a published LLM-based metric for comparing text reports. The L&T GPT structuring prompt was evaluated on 115 manually labeled reports. Three radiologists performed a qualitative analysis of 100 AI-generated reports.

RESULTS

MAIRA-X demonstrated significant improvements over MAIRA-2, with L&T F 1 -scores [95% CIs] increasing from 62.6% [61.6, 63.5] to 83.6% [82.9, 84.3] for type, 73.4% [72.3, 74.6] to 83.6% [82.7, 84.7] for longitudinal change, and 54.4% [53.1, 55.5] to 72.8% [71.7, 74.0] for placement. RadFact F 1 -score rose from 48.5% [48.2, 48.7] to 63.3% [63.1, 63.6]. Evaluation of L&T GPT structuring prompt achieved F 1 -scores as 94% for L&T type and 91% for tip locations. In qualitative analysis, AI-generated reports were found congruent with radiologists' written reports.

CONCLUSION

Training MAIRA-X models on large-scale longitudinal datasets has significantly improved AI generated reports over MAIRA-2, enhancing L&T and clinical reporting quality. Future work includes retrospective user evaluation of MAIRA-X, and deployment in a clinical setting for prospective evaluation.

CLINICAL RELEVANCE/APPLICATION

Frequent and accurate L&T reporting is crucial for critical patient management. MAIRA-X can improve longitudinal CXR report generation, serving as a radiologist's AI assistant to enhance clinical efficiency, decision-making, and patient outcomes, specifically in high-volume settings.

R3-SSIN07-2 EFFICIENCY IMPACTS OF GENERATIVE AI-ASSISTED COMPUTED TOMOGRAPHY REPORTING

Jonathan Huang, PhD (*Presenter*)
Matthew Wittbrodt (*Abstract Co-Author*)
Caitlin Teague (*Abstract Co-Author*)
Eric Karl (*Abstract Co-Author*)
Galal Galal (*Abstract Co-Author*)
Konrad Rauscher (*Abstract Co-Author*)
Andrii Sadovyi (*Abstract Co-Author*)
Samir Abboud, MD (*Abstract Co-Author*)
Mozziyar Etemadi, MD,PhD (*Abstract Co-Author*)

PURPOSE

Use of generative artificial intelligence (AI) to assist documentation of computed tomography (CT) reports has the potential to provide more timely results to patients while reducing provider workload and burnout. However, application in live clinical settings is to date unstudied. This study evaluated the impact on reporting time of a

generative model capable of providing draft radiological reports for CT studies that was integrated into the radiologist clinical workflow across a tertiary care health system.

METHODS AND MATERIALS

Model-generated reports were automatically populated within reporting software (PowerScribe, Nuance Communications) as a selectable template; thus, radiologists could elect to document by verifying and editing these model-generated reports within their normal workflow. Model-assisted CT reads of all anatomy were identified from January 5, 2025 through April 15, 2025. Reads without model assistance, matched by radiologist, were randomly sampled from January 3, 2024 through January 4, 2025. Reads with trainee involvement were excluded. Reporting time, defined as time from study opening to report signing, was determined using the PowerScribe database and compared for studies read with and without the model using a linear mixed-effects model with fixed effects of model usage and procedure type (brain, chest, abdomen/pelvis, and other) and random effect of radiologist. Data are presented as estimated marginal means with standard errors. The a level was set to P = 0.05 for significance.

RESULTS

In total, 52,230 CT studies were included, comprising 21,591 (41.3%) brain, 18,521 (35.5%) abdomen/pelvis, 11,208 (21.5%) chest, and 910 (1.7%) other studies. There was a significant association of model assistance with decreased reporting time (F = 7.4; P = 0.01). Interpretations with model assistance (17.9 ± 2.1 minutes; n = 9,074) were faster than a baseline set of those without (23.6 ± 2.3 minutes; n = 43,156; P = 0.007), representing a 24.2% reporting efficiency increase with a per-report time savings of 5.7 minutes. The procedure type by model assistance interaction was not significant (F = 0.7; P = 0.55), indicating that no evidence was found for a modifying effect by procedure type on model impact. There was no difference in addendum rate for studies read with (114, 1.3%) and without (571, 1.3%) model assistance (? 2 = 0.26; P = 0.61).

CONCLUSION

Use of the model was associated with improved reporting efficiency with no change in addendum rate. This study demonstrates potential for improved care delivery with radiologist-generative AI collaboration in CT reporting.

CLINICAL RELEVANCE/APPLICATION

Improved CT reporting efficiency via adoption of generative AI may streamline clinical care, benefiting patients and clinicians.

R3-SSIN07-3 EXTERNAL VALIDATION OF A CT ABDOMEN-PELVIS FOUNDATION MODEL FOR DETECTION OF 348 FINDINGS

Pranav Rajpurkar, PhD (*Presenter*)
Deepanshu Jindal (*Abstract Co-Author*)
Julian Acosta (*Abstract Co-Author*)
Michael Moritz (*Abstract Co-Author*)
Sraavya Sambara (*Abstract Co-Author*)
Siddhant Dogra, MD (*Abstract Co-Author*)
Jenanan Vairavamurthy (*Abstract Co-Author*)
Samir Rajpurkar (*Abstract Co-Author*)

PURPOSE

CT abdomen-pelvis (CTAP) scan interpretation is complex due to anatomic and pathologic diversity, often resulting in diagnostic variability and errors. Recent advancements in CTAP foundation models have shown promise but typically focus on relatively few findings, limiting their clinical applicability. We developed and validated a comprehensive CTAP radiology foundation model (a2z-3) capable of automated detection across 348 clinically significant findings.

METHODS AND MATERIALS

348 target pathologies spanning 36 CTAP anatomic groups were identified by an abdominal fellowship-trained radiologist. Over 280,000 paired CTAP exams and radiology reports from 2 distinct health systems were used for model training. Pathology labels from each report were extracted using a validated large language model based annotation pipeline. These labels served as reference standards to train a transformer-based deep learning model to recognize each pathology on paired CT images. An internal validation set (6,116 paired CTAP exams and reports) from the same data source as the training set was used to select the best-performing model. No data overlapped between training and internal validation. External validation assessed generalizability using 19,263 paired CTAPs and radiology reports from 2 geographically distinct health systems not involved in training or internal validation. Performance was quantified using receiver operating characteristic (ROC) curves and area under the curve (AUC) calculated individually per pathology.

RESULTS

Across 348 pathologies, mean AUC was 0.9097 (standard deviation 0.06) on external validation. Notably, 100 findings (28.7%) demonstrated excellent discrimination (AUC >0.95), while 221 findings (63.5%) exceeded AUC of 0.90. Highest individual performance was observed for splenic injury (AUC 0.9995); the lowest were benign bone lesions, sacroiliac degenerative changes, and bone islands (AUC range 0.6346-0.6830). Anatomic group analysis demonstrated strongest collective performance for ureteral findings (mean AUC 0.9685), whereas stomach findings exhibited the weakest performance (mean AUC 0.8439).

CONCLUSION

The a2z-3 CTAP foundation model demonstrated strong diagnostic performance across 348 findings, with 63.5% of findings having AUC over 0.90 and 28.7% of findings having AUC over 0.95. Its capability to accurately detect a wide range of critical and incidental findings supports potential integration into clinical practice.

CLINICAL RELEVANCE/APPLICATION

The a2z-3 CT foundation model provides comprehensive automated detection across diverse abdominal-pelvic pathologies, significantly reducing potential for diagnostic variability, perceptual errors, and overlooked incidental findings.

R3-SSIN07-4 PROMPT-BASED FEW-SHOT IN-CONTEXT LEARNING FOR RADIOLOGY REPORT GENERATION: ENHANCING REPORT GENERATION WITHOUT FINE-TUNING

Krishna Nand Keshava Murthy, PhD, MSc (*Presenter*)
Chirag Mahajan (*Abstract Co-Author*)
Nathaniel Swinburne, MD (*Abstract Co-Author*)
Sarah Eskreis-Winkler, MD, PhD (*Abstract Co-Author*)
Joseph N. Stember, MD, PhD (*Abstract Co-Author*)
Etay Ziv, MD,PhD (*Abstract Co-Author*)
Chinmay Hegde (*Abstract Co-Author*)

PURPOSE

To demonstrate that few-shot in-context learning (ICL), without any model fine-tuning can unlock significant gains in generating the reports, rivaling what is typically achieved only through dedicated domain adaptation.

METHODS AND MATERIALS

The IU-X-Ray dataset contains 7,470 chest X-ray image-report pairs; studies with empty FINDINGS were dropped and remaining data was stratified 60/40 by pathology into training and test sets. For each k ? {0, 2, 4, 6, 8}, k-shot examples were sampled and prepended to prompts for four models - GPT-4.1, Gemini 2.5 Flash, Claude 3.7 Sonnet, and a medical model - Med Flamingo. Outputs were evaluated against reference FINDINGS using BLEU-4, METEOR, ROUGE-L, BERTScore and RaTEScore.

RESULTS

As k increased from 0 to 6, both BLEU-4 and ROUGE-L scores approximately doubled, before plateauing or even dipping slightly at k = 8. Meanwhile, METEOR and BERTScore climbed steadily through k = 8, reflecting progressively richer semantic and contextual alignment. The RaTEScore reached its peak between k = 6 and k = 8, underscoring substantial gains in clinical-domain accuracy achieved solely via prompting. Notably, by k = 6, Gemini 2.5 Flash (0.6309) and GPT-4.1 (0.6275) attained RaTEScores equivalent to those of Med Flamingo's domain-tuned performance, demonstrating that simple few-shot in-context learning with general-purpose models can match specialized accuracy without any fine-tuning.

CONCLUSION

Few-shot ICL alone yields substantial gains across lexical, semantic and clinically focused metrics, matching or exceeding performance typically reserved for fine-tuned systems. Prompt-engineering, therefore, is a first-class adaptation strategy for deploying LLMs on specialized medical reporting tasks without additional training.

CLINICAL RELEVANCE/APPLICATION

Few-shot prompting with a handful of examples yields significant gains in report accuracy and coherence, enabling rapid, low-cost LLM integration into radiology workflows without custom retraining.

R3-SSIN07-5 EXPLORING VISION-LANGUAGE AI-ASSISTED DOUBLE READING FOR ERROR DETECTION IN CHEST RADIOGRAPH REPORTS USING SYNTHETIC ERRORS

Honggeun Cho, MD (*Presenter*)
Jonggwon Park, Phd (*Abstract Co-Author*)
Kyoyun Choi, PhD (*Abstract Co-Author*)
Bumcheol Hwang (*Abstract Co-Author*)
Byungmu Yoon (*Abstract Co-Author*)
Eui Jin Hwang, MD, PhD (*Abstract Co-Author*)
Jiyoung Song, MD (*Abstract Co-Author*)

PURPOSE

To explore the feasibility of using a vision-language model (VLM) as an AI-assisted double reading system to detect discrepancies between chest radiographs and corresponding radiology reports.

METHODS AND MATERIALS

We developed an AI system utilizing a VLM that computes the similarity between chest radiographs and radiology report sentences. The system analyzes input chest X-rays and associated reports through three methods: (1) identifying semantically inconsistent sentences using image-text similarity scoring; (2) flagging false-positive (FP) findings when the image is classified as normal but the report mentions abnormality; and (3) identifying false-negative (FN) cases where findings detected by the model are not described in the report. To assess performance, we conducted experiments on 500 randomly selected cases from the publicly available MIMIC-CXR test split. Synthetic errors were introduced in three ways: (a) reversing horizontal directional terms in reports by swapping "left" and "right" (side-swap); (b) injecting two randomly selected abnormal findings into normal reports (FP-injection); and (c) randomly removing one or two sentences describing abnormal findings from reports containing at least one abnormality (FN-injection).

RESULTS

The AI system detected discrepancies in 52.0% of original reports, where side-swap increased the error detection rate to 65.0%. For FP-injection and FN-injection, the error detection rate increased from 49.1% to 89.1% and from 52.4% to 74.8%, respectively. For FP-injection, the inconsistency detection and FP-detection rates increased from 16.4% to 80.0% and from 7.3% to 49.1%, respectively. For FN-injection, FN-detection increased from 33.0% to 63.6%. An aggregate analysis of 10 targeted abnormalities showed that the system identified 69.1% of the inserted FPs and detected 28.5% of the removed FNs.

CONCLUSION

The vision-language model-based system showed potential as an AI-assisted double reading tool by identifying report-image discrepancies introduced through synthetic errors, particularly false-positive and directional changes. Detection of omitted findings was moderate, indicating areas for improvement. Further development and validation on real-world errors are needed to support safe and effective integration of AI into radiology double reading workflows.

CLINICAL RELEVANCE/APPLICATION

AI-assisted double reading with VLMs may enhance report accuracy and safety while offering scalable support for radiologists in routine chest imaging workflows.

R3-SSIN07-6 Keynote Speaker

Vineeth Gangaram, MD (*Science Invited Presenter*)

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

R3-SSMK11

Musculoskeletal Imaging (Spine)

Thursday, Dec. 4 9:30AM - 10:30AM Room: E450A

Rosemary J. Klecker, MD (*Moderator*)
Miriam Frenken (*Moderator*)

Sub-Events

R3-SSMK11-1 OPPORTUNISTIC BODY COMPOSITION ASSESSMENT: CORRELATION BETWEEN VOLUMETRIC AND L3-BASED CT MEASUREMENTS

Jennifer Gotta, MD (*Presenter*)
Vitali Koch, MD (*Abstract Co-Author*)
Scherwin Mahmoudi, MD (*Abstract Co-Author*)
Christian Booz, MD (*Abstract Co-Author*)
Simon S. Martin, MD (*Abstract Co-Author*)
Jan-Erik Scholtz, MD (*Abstract Co-Author*)
Ibrahim Yel, MD (*Abstract Co-Author*)
Thomas J. Vogl, MD, PhD (*Abstract Co-Author*)
Leon D. Gruenewald, MD (*Abstract Co-Author*)

PURPOSE

Standardized single-slice measurements at the third lumbar vertebra (L3) are widely accepted for body composition assessment. However, comprehensive volumetric analyses may better capture the distribution and quality of muscle and adipose tissues. This study evaluates the correlation between volumetric body composition measurements and traditional L3-based metrics across multiple tissue compartments.

METHODS AND MATERIALS

In this retrospective cohort study, 25,251 patients were included, among them 9,005 females (35.7%) and 16,246 males (64.3%). For each subject, volumetric measurements of skeletal muscle, myosteatosis, visceral adipose tissue (VAT), subcutaneous adipose tissue (SAT), and intramuscular fat were extracted. Standard single-slice measurements at L3, including skeletal muscle area (SMA_L3), muscle radiodensity (SMRA_L3), VAT and SAT areas, and VAT/SAT ratios, were also collected. Pearson correlation coefficients (r) were calculated to determine the association between volumetric and L3-based measures. Subgroup analyses by sex were performed. Statistical significance was set at $p < 0.05$.

RESULTS

Volumetric and L3-based measurements demonstrated strong positive correlations across all assessed compartments. Skeletal muscle volume showed a high correlation with skeletal muscle area at L3 (SMA_L3; $r = 0.87$, $p < 0.001$). Similarly, volumetric myosteatosis measurements correlated strongly with muscle radiodensity at L3 (SMRA_L3; $r = 0.84$, $p < 0.001$). Visceral fat volume exhibited a robust correlation with visceral adipose tissue area at L3 (VAT_L3; $r = 0.89$, $p < 0.001$), while subcutaneous fat volume correlated very strongly with subcutaneous adipose tissue area at L3 (SAT_L3; $r = 0.91$, $p < 0.001$). The strength of these correlations remained consistent across male and female patients.

CONCLUSION

Volumetric body composition analysis is strongly correlated with traditional L3 single-slice measurements and may serve as a comprehensive and reliable alternative for assessing muscle mass, muscle quality, and adipose tissue distribution.

CLINICAL RELEVANCE/APPLICATION

Volumetric body composition analysis from routine CT scans provides a comprehensive and reliable alternative to traditional single-slice L3 measurements, enabling opportunistic assessment of muscle mass, muscle quality, and adipose tissue distribution without additional imaging or radiation exposure.

R3-SSMK11-2 HYBRID [18F]FDG PET/MRI FOR IDENTIFICATION OF PAIN GENERATORS IN DIAGNOSTICALLY CHALLENGING CHRONIC MUSCULOSKELETAL PAIN

Edwin H. Oei, MD, PhD (*Presenter*)
Jacob Mostert (*Abstract Co-Author*)
Rianne A. Van der Heijden, MD, PhD (*Abstract Co-Author*)

PURPOSE

Chronic musculoskeletal pain is a common health problem with large impact on patients' quality of life. The majority of patients with chronic pain do not receive proper treatment and hence do not achieve adequate pain relief, partly due to our inability to accurately identify pain generators with conventional anatomical imaging. Hybrid imaging with [18F]FDG PET/MRI can visualize both structural and metabolic abnormalities, and could therefore potentially be more accurate in identifying musculoskeletal pain generators. This study aims to evaluate the value of [18F]FDG PET/MRI in two patient groups often presenting with musculoskeletal pain of unknown origin: chronic low back pain (LBP) or persistent pain after total hip replacement (THR).

METHODS AND MATERIALS

Patients (18-75 years) with chronic LBP or hip pain after THR of unknown origin according to a pain specialist or orthopedic surgeon were recruited. Participants were randomized to either the control arm comprising of standard clinical care or the intervention arm consisting of [18F]FDG PET/MRI. Potential pain generators were identified by increased FDG uptake on PET and/or structural abnormalities on MRI. Findings were discussed with the referring physicians and treatment outcomes were recorded.

RESULTS

75 patients were included, 57 with LBP and 18 with hip pain after THR. After randomization 33 patients successfully underwent PET/MRI. PET/MRI identified potential pain generators in 27 patients (82%) which were treated in 23 patients. Low Back Pain: 14 patients in the PET/MRI group underwent PET/MRI guided treatment (targeted injection or surgery), with positive outcome in 10 (success rate 71%). In the control group, 13 patients underwent treatment based on clinical symptoms or other imaging, with positive outcome in 6 (success rate 46%). The number of patients that reported pain relief was similar in both groups (50% vs 52%), but 45% of control group participants had increased their pain medication or used transcutaneous electrical nerve stimulation, compared to 33% in the PET/MRI group. Pain after Total Hip Replacement: PET/MRI guided treatment in 9 patients was successful with pain relief in 6 (67%). In the control group, 5 participants underwent targeted treatment and 2 patients reported pain relief (40%).

CONCLUSION

[18F]FDG PET/MRI can reveal previously unidentified pain generators in patients with chronic LBP or persistent pain after THR. PET/MRI guided targeted treatment is more successful than treatment based on other imaging modalities or clinical symptoms only.

CLINICAL RELEVANCE/APPLICATION

Our results indicate that [18F]FDG PET/MRI could be useful for detecting pain generators in patients with chronic musculoskeletal pain, but evaluation of patient outcomes is still needed.

R3-SSMK11-3 QUANTITATIVE MRI ASSESSMENT OF SKELETAL MUSCLE CHANGES AFTER TIME-RESTRICTED EATING AND SUPERVISED EXERCISE IN ADULTS WITH OBESITY: PRELIMINARY RESULTS FROM THE TEMPUS RANDOMIZED CONTROLLED TRIAL

Rocio Martin Marquez, MD (*Presenter*)
Alba Camacho-Cardenosa (*Abstract Co-Author*)
Antonio Clavero-Jimeno (*Abstract Co-Author*)
Juan Jose Martin Olmedo (*Abstract Co-Author*)
Balma Boira Nacher (*Abstract Co-Author*)
Adrian Cortes-Martin (*Abstract Co-Author*)
Marcos Molina-Fernandez (*Abstract Co-Author*)
Rafael Cabeza Laguna (*Abstract Co-Author*)
Mara De La Caridad Concepcion Alvarez (*Abstract Co-Author*)
JOSE LUIS MARTIN RODRIGUEZ (*Abstract Co-Author*)
Jonatan Ruiz (*Abstract Co-Author*)

PURPOSE

Magnetic Resonance Imaging (MRI) offers unparalleled precision in evaluating skeletal muscle tissue (SMT) changes, a critical aspect of obesity management strategies. Nutritional weight loss interventions, such us Time-restricted eating (TRE) may lead to reductions in SMT, while combining supervised exercise, particularly resistance training, could counteract this effect. However, MRI-based evaluations in this context remain limited. This study aimed to investigate the effects of a 12-week intervention combining TRE and supervised exercise on changes in mid-thigh SMT area (assessed using 3T MRI) compared to TRE or supervised exercise alone, and a usual care (UC) group in men and women with obesity, and to highlight the clinical utility of MRI in monitoring body composition changes.

METHODS AND MATERIALS

187 adults with obesity (50% women; age: 48.4±8.9 years; BMI: 34.8±3.7 kg/m²) were randomized into four groups: UC (n=48), TRE (n=46), Exercise (n=47), and TRE+Exercise (n=46). All participants received a Mediterranean diet-based education program. TRE and TRE+Exercise groups self-selected an 8-hour eating window, maintained throughout the intervention. Exercise and TRE+Exercise groups completed 24 supervised sessions combining resistance and high-intensity interval aerobic training, plus a weekly walking program. Mid-thigh SMT area was quantified at baseline and after the 12-week intervention using a 3T MRI scanner (Siemens 3T Magnetom Vida).

RESULTS

MRI revealed significant increases in mid-thigh SMT area in the Exercise group (mean difference [MD]: 6 cm²; 95% confidence interval [CI]: 3-9; P <0.001) and the TRE+Exercise group (MD: 3 cm²; 95% CI: 0-6; P =0.04) compared with the UC group. Similarly, Exercise (MD: 8 cm²; 95% CI: 5-11; P <0.001) and TRE+Exercise (MD: 5 cm²; 95% CI: 2-8; P <0.001) groups showed greater SMT increases compared to the TRE-only group. No statistically significant differences were observed between the Exercise and TRE+Exercise groups (P =0.12).

CONCLUSION

Combined TRE and supervised exercise intervention improved mid-thigh SMT area in adults with obesity. These findings suggest that incorporating supervised exercise into TRE protocols can mitigate potential adverse effects on SMT, supporting this combined approach as a effective strategy for obesity management.

CLINICAL RELEVANCE/APPLICATION

MRI serves as a powerful tool to accurately monitor skeletal muscle adaptations during lifestyle interventions for obesity. Its application enables clinicians to personalize treatment strategies and track therapeutic outcomes more precisely, reinforcing the role of imaging not only in diagnostics but also in optimizing patient management.

R3-SSMK11-4 HIGH DIAGNOSTIC ACCURACY OF CONTRAST-ENHANCED FIVE-PHASE ABDOMINAL CT FOR OPPORTUNISTIC BONE MINERAL DENSITY ASSESSMENT USING UNENHANCED CT AS REFERENCE STANDARD

Mengqiang Xiao, MMEd (*Presenter*)
Rulin Xu (*Abstract Co-Author*)
Jun Chen (*Abstract Co-Author*)

PURPOSE

To evaluate whether volumetric bone mineral density (vBMD) measurements obtained during contrast-enhanced CT phases yield diagnostic accuracy for osteoporosis comparable to unenhanced CT, using unenhanced vBMD as the reference standard.

METHODS AND MATERIALS

In this IRB-approved, retrospective study, we screened 479 consecutive patients who underwent five-phase abdominal CT (unenhanced; arterial, 30 ± 2 s; portal venous, 63 ± 2 s; late venous, 4 min; excretory, 30 min) from February 2022 to August 2024. After excluding cases with hip fractures, adjacent implants or pathology (n = 38), metastatic or hematologic bone disease (n = 12), 429 patients (227 women; 202 men; mean age 60.5 ± 12.3 years) remained. Volumetric BMD and T-values for the femoral head, neck, and proximal shaft (1 cm below trochanters) were measured twice on each phase by an AI-based QCT workstation (iCare QCT), with the mean values used for analysis. Osteoporosis was defined as T = -2.5 on unenhanced CT. Statistical analyses included ANOVA (LSD or Dunnett's T3 post-hoc) for inter-phase comparisons, subgroup analyses by age, sex, malignancy history, and ROC curve analysis for each phase.

RESULTS

Based on unenhanced CT, 378 patients had osteoporosis and 51 were non-osteoporotic (2 normal, 49 osteopenia). Diagnostic accuracy for osteoporosis detection was 98.14% in both the arterial and portal venous phases (misclassifications: arterial, 5 non-osteoporotic as osteoporotic; 3 osteoporotic as osteopenic; portal venous, 3 and 5 respectively), 99.30% in the late venous phase (2/51 non-osteoporotic; 1/378 osteoporotic misclassified), and 99.53% in the excretory phase (2/51 non-osteoporotic misclassified; no osteoporosis misclassification). Mean vBMD and T-values did not differ significantly across phases (vBMD: 231.5-235.9 mg/cm³, P = 0.49; T-values:

-3.54 to -3.65, P = 0.68). Subgroup analyses confirmed stable vBMD and T-values across all clinical strata (P = 0.45-0.95). ROC AUCs were 0.999 (95% CI, 0.991-1.000) for the overall cohort and 0.999 (95% CI, 0.982-1.000) across subgroups for every phase.

CONCLUSION

Contrast-enhanced phases of five-phase abdominal CT demonstrate near-perfect agreement with unenhanced CT for opportunistic femoral bone density assessment. Any post-contrast phase can reliably opportunistically screen for osteoporosis without compromising diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

Contrast-enhanced CT phases from routine abdominal scans can be reliably used for opportunistic osteoporosis screening, enabling bone mineral density assessment without the need for additional unenhanced imaging or radiation exposure.

R3-SSMK11-5 DIAGNOSTIC ACCURACY OF PHOTON-COUNTING CT VIRTUAL NON-CALCIUM IMAGING IN OSTEOPOROSIS: A HEAD-TO-HEAD COMPARISON WITH QUANTITATIVE CT

Yaojun Jiang (*Presenter*)
Yan Wu, MD,PhD (*Abstract Co-Author*)
Jianbo Gao, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate the diagnostic accuracy of photon-counting CT (PCCT) virtual non-calcium (VNCa) technology for osteoporosis using quantitative CT (QCT) as the reference standard.

METHODS AND MATERIALS

In this cross-sectional study, 445 patients undergoing L1-L3 lumbar PCCT scans were retrospectively enrolled. Among them, 30 cases served as an internal test set to establish a decalcification density ratio calibration model, and 415 independent cases were included in an external validation set to assess the correlation between decalcification density and BMD. All participants underwent concurrent PCCT quantitative parameter acquisition and QCT BMD measurement (QCT Pro software; Mindways, USA). By inversely reconfiguring dual-energy analysis software parameters, the VNCa output variable was remapped from iodine value to calcium density for decalcification measurement. Pearson correlation and multivariate linear regression were employed to analyze the association between decalcification density and BMD. The diagnostic threshold of decalcification density was determined by ROC curve analysis based on QCT criteria (BMD <80 mg/cm³).

RESULTS

The calibration model identified a calcium ratio of 1.57. Multivariate regression revealed a significant equation (F=749.2, p<0.0001): BMD=24.68×decalcification density -0.4297×age -0.4139×sex -0.4354×BMI +6.556. Decalcification density (ß=24.68, p<0.0001), age (ß=-0.4297, p<0.0001), and BMI (ß=-0.4354, p=0.0341) were independent predictors of BMD, while sex showed no significant effect (p=0.792). The AUC of decalcification density for osteoporosis diagnosis was 0.9917 (95% CI: 0.9856-0.9997, p<0.0001), with an optimal threshold of 4.685 mg/cm³ (sensitivity 97.61%, specificity 96.3%).

CONCLUSION

Dual-energy CT VNCa technology demonstrates high concordance with QCT in quantifying bone mineral content, suggesting its potential as a non-invasive screening tool for osteoporosis.

CLINICAL RELEVANCE/APPLICATION

Photon-counting CT (PCCT) with virtual non-calcium (VNCa) technology provides a rapid, non-invasive alternative to quantitative CT (QCT) for osteoporosis screening, eliminating the need for additional calibration phantoms or specialized software.

R3-SSMK11-6 FEASIBILITY OF USING TWELFTH THORACIC VERTEBRA (T12)-BASED COMPUTED TOMOGRAPHY (CT) PARAMETERS AS SURROGATES FOR THIRD LUMBAR VERTEBRA (L3) IN BODY COMPOSITION ASSESSMENT

Vitali Koch, MD (*Presenter*)
Jennifer Gotta, MD (*Abstract Co-Author*)
Scherwin Mahmoudi, MD (*Abstract Co-Author*)
Christian Booz, MD (*Abstract Co-Author*)
Jan-Erik Scholtz, MD (*Abstract Co-Author*)
Simon S. Martin, MD (*Abstract Co-Author*)
Ibrahim Yel, MD (*Abstract Co-Author*)
Philipp Reschke, MD (*Abstract Co-Author*)
Elena Hohne, MD (*Abstract Co-Author*)
Thomas J. Vogl, MD, PhD (*Abstract Co-Author*)
Leon D. Gruenewald, MD (*Abstract Co-Author*)

PURPOSE

Computed tomography (CT)-based body composition analysis is conventionally performed at the level of the third lumbar vertebra (L3), due to its strong correlation with whole-body muscle and fat distribution. However, thoracic CTs, which include the twelfth thoracic vertebra (T12) but not L3, are more commonly available in routine clinical care. This study aims to evaluate whether T12-based measurements can reliably approximate L3-derived parameters.

METHODS AND MATERIALS

A retrospective cohort (n = 9.915, median age 62 years) was analyzed, in which skeletal muscle area (SMA), visceral adipose tissue (VAT), subcutaneous adipose tissue (SAT), muscle radiodensity (SMRA), and intramuscular fat were extracted at both T12 and L3 levels from CT images. Pearson correlation coefficients (r) and linear regression models were calculated to quantify the association between T12 and L3 parameters. Coefficient of determination (R^2), intercepts, and slopes were used to assess model fit and predictive validity.

RESULTS

Strong correlations were observed between L3 and T12 measurements, particularly for SMA (r > 0.85), VAT (r > 0.80), and SAT (r > 0.75), with corresponding linear models yielding R^2 values above 0.70 in all valid cases. Regression slopes approached unity, and intercepts remained close to zero, suggesting a consistent and predictable linear relationship. The quality of T12-derived estimations varied across different tissue compartments, with muscle parameters outperforming fat-related indices.

CONCLUSION

T12-based body composition parameters demonstrate strong statistical agreement with L3 values and may serve as reliable surrogates when L3-level imaging is unavailable. This finding could broaden the applicability of body composition analysis in thoracic CT datasets, enabling wider clinical and prognostic use.

CLINICAL RELEVANCE/APPLICATION

These results support the clinical utility of T12 as a practical and reliable surrogate for opportunistic body composition analysis in patients undergoing thoracic imaging, including those with cancer, chronic illness, or during acute hospital admissions. By enabling muscle and fat quantification without additional scanning, T12-level assessment facilitates broader integration of nutritional and prognostic markers into routine care.

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R3-SSNR13

Neuroradiology (Artificial Intelligence: Image Interpretation)

Thursday, Dec. 4 9:30AM - 10:30AM Room: N228

Mariam S. Aboian, MD, PhD (*Moderator*)
Ichiro Ikuta, MD, MMedSc (*Moderator*)

Sub-Events

R3-SSNR13-1 PREDICTING MULTIPLE SCLEROSIS WITH A MULTIMODAL DEEP LEARNING MODEL INTEGRATING BRAIN STRUCTURAL AND DIFFUSION MRI (Kuo York Chynn Neuroradiology Research Award)

Jiajian Ma, MD (*Presenter*)
Valentin N. Stepanov, MD (*Abstract Co-Author*)
Wushuang Rui (*Abstract Co-Author*)
Hsuan-Chih Chen (*Abstract Co-Author*)
Jenny Chen (*Abstract Co-Author*)
Michael Lan (*Abstract Co-Author*)
Dmitry S. Novikov, PhD (*Abstract Co-Author*)
Kimberly O'Neill (*Abstract Co-Author*)
Els Fieremans, PhD (*Abstract Co-Author*)
Yiqiu Shen, PhD, BSc (*Abstract Co-Author*)

PURPOSE

To develop a deep learning (DL) model for predicting multiple sclerosis (MS) using brain structural MRI (sMRI) and diffusion MRI (dMRI).

METHODS AND MATERIALS

We collected an internal dataset consisting of 7,651 brain MRI studies from 6,564 patients scanned between 2014 and 2020 at a multicenter health system in New York. The dataset includes 7,472 T1-weighted (3,117 3D; 4,355 2D), 2,769 contrast-enhanced T1-weighted (2,025 3D; 744 2D), 7,998 FLAIR (2,604 3D; 5,394 2D), and 4,466 multi-shell diffusion MRI scans with derived quantitative maps including diffusion tensor imaging (DTI), diffusion kurtosis imaging (DKI), and standard model imaging (SMI). The cohort comprised 1,333 MS cases (per 2010/2017 McDonald criteria) and 2,484 non-MS cases with white matter lesions associated with migraine (n=1,332), cerebrovascular disease (n=1,143), non-MS demyelinating disorders (n=83), and other conditions. Data were split at the patient level into training (n=6,432), validation (n=331), and test (n=888; 467 with both 3D FLAIR and dMRI). An external test set of 490 patients (70 MS, 420 non-MS with white matter lesions) from four public datasets was used for validation. A deep learning model was developed to extract visual features from multimodal MRI scans, produce modality-specific saliency maps that predict MS at the voxel level, and fuse them into a single subject-level MS probability. Model performance was evaluated using ROC-AUC and partial AUC (pAUC) with a maximum false positive rate of 5%.

RESULTS

On the internal test set (n=467, 95 MS patients), DL model using 3D FLAIR alone achieved an ROC-AUC of 0.957 (95% CI: 0.936-0.976). Adding T1-weighted and contrast-enhanced T1-weighted images improved ROC-AUC to 0.970 (95% CI: 0.950-0.986, p=0.0342). Further incorporation of dMRI raised the ROC-AUC to 0.975 (95% CI: 0.956-0.990). Clinically relevant pAUC (FPR <5%) was improved from 0.875 to 0.905. On the external validation set (n=490), performance with FLAIR alone remained robust (ROC-AUC 0.891, 95% CI: 0.845-0.933) and improved with adding T1-weighted sequences (ROC-AUC 0.918, 95% CI: 0.876-0.955, p=0.0013).

CONCLUSION

Deep learning models can accurately differentiate MS from other white matter lesions using structural MRI, with strong generalization to external datasets. Incorporating diffusion MRI further improves prediction performance, especially at clinically relevant specificity levels (false-positive rate <5%).

CLINICAL RELEVANCE/APPLICATION

Deep learning models show strong potential to support MS diagnoses and reduce diagnostic uncertainty. Our findings provide preliminary evidence for incorporating diffusion MRI into routine MS imaging protocols.

R3-SSNR13-2 PERFORMANCE COMPARISON OF TWO AI-BASED ICH DETECTION TOOLS ON HEAD CT IN A REAL-WORLD CLINICAL SETTING

Mark Marino, BS (*Presenter*)
Connor Parrish (*Abstract Co-Author*)
Thomas Renfrew (*Abstract Co-Author*)
Kavya Sudanagunta, MD (*Abstract Co-Author*)

PURPOSE

To perform a comparative evaluation of the diagnostic sensitivity of two FDA-cleared artificial intelligence (AI) algorithms—Vendor A (Aidoc, Tel Aviv, Israel) and Vendor B (Viz.ai, San Francisco, USA)—for the detection of intracranial hemorrhage (ICH) on non-contrast head CT in a real-world, single-institution clinical setting.

METHODS AND MATERIALS

A retrospective analysis was conducted over a six-week period (June 7 - July 16, 2023) at a single academic medical center. Consecutive non-contrast head CT cases were collected during this interval, and results from both Vendor A and Vendor B were obtained for comparison. To enforce a one-to-one correspondence between patients and scans, follow-up examinations were excluded. For cases in which only one algorithm identified the presence of ICH, independent adjudication by board-certified radiologists was conducted to establish reference ground truth.

RESULTS

The study cohort included 1,192 individual CT scans of which 147 scans had confirmed ICH, establishing a cohort prevalence of 12.3%. A total of 87 discordant cases were identified between Vendor A and Vendor B. Of these, 43 were confirmed as true positives following radiologist review and analysis. Vendor A was unable to process

10 cases that were successfully analyzed by Vendor B. Vendor A demonstrated a sensitivity of 99.2%, specificity of 96.8%, Positive Predictive Value (PPV) of 79.6%, and Negative Predictive Value (NPV) of 99.9%. Vendor B demonstrated a sensitivity of 68.7%, specificity of 99.6%, PPV of 95.7%, and NPV 96.2%.

CONCLUSION

In a real-world clinical setting, Vendor A demonstrated superior diagnostic sensitivity for detecting intracranial hemorrhage on non-contrast head CT compared to Vendor B, while maintaining high specificity. These findings highlight meaningful differences in the diagnostic performance of FDA-cleared AI algorithms.

CLINICAL RELEVANCE/APPLICATION

As AI tools are increasingly integrated into radiology practice, understanding real-world diagnostic performance is essential for safe and effective implementation. This study provides comparative evidence on two commercial AI solutions for ICH detection, offering data to optimize patient triage and enabling appropriate clinical management.

R3-SSNR13-3 AI-ASSISTED CEREBRAL ANEURYSM DETECTION ENHANCES DIAGNOSTIC PERFORMANCE ON HEAD CT ANGIOGRAPHY: A MULTICENTER RETROSPECTIVE, PIVOTAL, RANDOMIZED READER TESTS

Inpyeong Hwang, MD (*Presenter*)
Tae Jin Yun, MD (*Abstract Co-Author*)
Jin Wook Choi, MD, PhD (*Abstract Co-Author*)
Hoon Na (*Abstract Co-Author*)
Miran Han, MD (*Abstract Co-Author*)
Woo Sang Jung (*Abstract Co-Author*)
Roh-Eul Yoo, MD, PhD (*Abstract Co-Author*)
Ji Ye Lee, MD, PhD (*Abstract Co-Author*)
Sun Won Park, MD, PhD (*Abstract Co-Author*)

PURPOSE

To validate the diagnostic performance of head CT angiography (CTA) interpretation assisted by an AI-based automatic aneurysm detection algorithm for identifying cerebral aneurysms.

METHODS AND MATERIALS

We conducted a multi-center, pivotal, randomized clinical trial for a reader test of an AI-based aneurysm detection algorithm on head CTA source images. The algorithm was trained on 2,094 patients from two institutions and provided aneurysm localization on CTA source images. The external test dataset for the reader test was retrospectively collected from three academic institutions and comprised 872 patients (392 patients with 532 aneurysms, and 480 patients without aneurysm), confirmed by MRA or DSA. The patients were randomly split into two equal sized groups (A and B). Nine reviewers (3 non-radiologist physicians, 3 board-certified radiologists, 3 neuroradiologists) interpreted head CTA for aneurysm presence and location first without AI (group A) and with AI (group B), then crossed over after a four-week washout. Reviewers assessed CTA source images and thick-slab MIP images in three orthogonal planes. Patient-wise sensitivity, specificity and accuracy with/without AI assistance were calculated and compared with generalized estimating equation. Statistical significance was defined as a P-value < 0.05.

RESULTS

Across all readers, the AI-assisted reading demonstrated higher sensitivity than the unassisted reading (75.74% vs. 65.08%, respectively; $P < 0.001$) and slightly higher specificity (94.70% vs. 93.80%; $P = 0.50$). Overall accuracy was greater with AI assistance (86.17% vs. 80.89%; $P < 0.001$). By reader subgroup, sensitivity improved significantly with AI assistance in neuroradiologists (88.01% vs. 84.95%, $P = 0.03$), board-certified radiologists (73.38% vs. 66.75%; $P < 0.001$), and non-radiology physicians (65.82% vs. 43.54% $P < 0.001$). Specificity increased significantly only for non-radiology physicians (90.69% vs. 87.01%; $P = 0.002$). Accuracy gains were significant for board-certified radiologists (86.66% vs. 83.94%; $P = 0.006$) and non-radiology physicians (79.51% vs. 67.47%; $P < 0.001$), but not for neuroradiologists (92.35% vs. 91.25%; $P = 0.14$).

CONCLUSION

AI-assisted head CTA interpretation for cerebral aneurysm detection demonstrated superior diagnostic performance compared to unassisted reading. The greatest improvement in detection accuracy with AI assistance was observed in the non-radiologist physician subgroup.

CLINICAL RELEVANCE/APPLICATION

Implementation of AI-based aneurysm detection on head CTA can meaningfully enhance diagnostic accuracy—especially for less experienced readers—thereby supporting earlier and more reliable identification of cerebral aneurysms in clinical practice.

R3-SSNR13-4 THE IMPACT OF ARTIFICIAL INTELLIGENCE ON LONGITUDINAL ASSESSMENT OF MULTIPLE SCLEROSIS: A COMPARISON OF RADIOLOGIST REPORTS AND EFFECT ON BLINDED RETROSPECTIVE INTERPRETATION

Matheus Luis Silva (*Presenter*)
Mariana Cerdeira Machado, MD (*Abstract Co-Author*)
Khatya Gonzales de Holanda, BMedSc (*Abstract Co-Author*)
Patricia Oliveira-Szejnfeld, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of artificial intelligence (AI) tools in measuring brain volume and lesion count in serial brain MRIs of patients with multiple sclerosis (MS), comparing their results with radiologist assessments. A secondary objective was determining whether radiologists would modify their interpretations of a blinded retrospective review when presented with AI-derived results.

METHODS AND MATERIALS

We initially selected 53 patients from our institutional database with confirmed MS. We excluded those unsuited for analysis. Then, we performed a retrospective analysis of at least two serial brain MRIs (within 6 to 24 month apart), including 3D-FLAIR and 3D-T1 sequences. Finally, we processed the images utilizing a previously validated AI tool (volBrain). We conducted the study in 3 phases: Initial Assessment : 3 experienced blinded neuroradiologists independently reviewed all MRI series, estimating brain atrophy throughout subjective and corpus callosum index analysis as much as the number and location of new and persistent white matter lesions. The AI tool extracted brain volume and lesion metrics. Performance Comparison : Statistical comparisons between AI and radiologist data for categorical lesion and/or encephalic atrophy progression classification. Blinded Reassessment : After a 12-week washout interval, radiologists re-evaluated a random subset of cases with access to prior AI results without knowledge of having reviewed the case before. Changes in diagnostic interpretation, reading time, and diagnostic confidence were recorded.

RESULTS

Our preliminary results showed that the AI tools used presented an inferior capacity for detecting MS lesions, especially subcortical, infratentorial, and cavitated lesions. However, it showed usefulness in demonstrating comparative volume loss in sequential exams, even in short intervals, when our subjective evaluation might not be sensitive enough to access. The most significant changes were observed when assessing parenchymal atrophy, since most radiologists altered their initial interpretation of encephalic volume loss at some point after reviewing AI-derived outputs.

CONCLUSION

In a preliminary analysis, AI-based tools have demonstrated potential auxiliary influence on radiologists' retrospective interpretations when incorporated into the workflow. These results might support the improvement of the wide usage of AI as a decision-support tool in serial imaging of MS patients.

CLINICAL RELEVANCE/APPLICATION

Incorporating AI into evaluating longitudinal brain MRI studies in MS may improve diagnostic sensitivity, reduce interobserver variability, and enhance clinical efficiency, offering a pathway toward more personalized disease monitoring.

R3-SSNR13-5 FALSE POSITIVE AI DETECTION OF INTRACRANIAL HEMORRHAGE ON EMERGENCY DEPARTMENT HEAD CT: INCIDENCE AND IMAGING PATTERNS

Emily Mungovan, BA (*Presenter*)
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Owen Donnelly, RT (*Abstract Co-Author*)
Debra Desmarais, MBA (*Abstract Co-Author*)
Daniel Sacchetti (*Abstract Co-Author*)
John A. Mungovan, MD (*Abstract Co-Author*)

PURPOSE

This study aims to characterize the incidence and common causes of false positive intracranial hemorrhage (ICH) identified by artificial intelligence (AI) on noncontrast computed tomography (CT) scans in the emergency department (ED). It was hypothesized that AI generates a significant number of false positive notifications by misclassifying hyperdense structures on CT as hemorrhage.

METHODS AND MATERIALS

All noncontrast head CT scans with positive AI notifications for ICH across a multi-institutional hospital network over a 12- month period were reviewed. A single commercially available AI platform was used at all sites. Each CT examination was classified as either a true positive or false positive, with documentation of the structure flagged by AI in false positives. Studies performed between 10 PM and 7:30 AM were excluded, as overnight radiologists did not have access to AI.

RESULTS

Out of 14,707 total ED CT scans in 2024, 632 were flagged as positive for ICH by AI. There were 243 false positives (38%), corresponding to a positive predictive value of 72.2%. An AI widget and CT heat maps were used to identify the flagged regions; these showed that unusual hyperdense areas could trigger a positive notification. False positives flagged by AI included normal anatomic structures that often calcify with age, including the choroid plexus, falx cerebri, and tentorium cerebelli. Additional common causes included postoperative and post-ischemic findings such as dural thickening and cortical or dural calcifications. Non-hemorrhagic intracranial neoplasms (e.g., meningiomas), motion artifacts, beam-hardening artifacts, and calcifications in the dentate nuclei and basal ganglia were also frequent contributors.

CONCLUSION

While AI has been shown to aid in detecting ICH on noncontrast head CT, high false positive rates may distract from or delay identification of true positive ICH. At this institution, radiologists can review AI notifications and flagged imaging via a desktop widget without opening the full study. Familiarity with common false positive sources and efficient use of this tool may enable radiologists to triage cases more effectively and expedite true positive reporting.

CLINICAL RELEVANCE/APPLICATION

High rates of AI false positive notifications can distract from or delay reporting of new ICH in the ED. Awareness of common false positive sources can assist radiologists in accurately and promptly reporting new ICH in the ED.

R3-SSNR13-6 GLIO-LLAMA-VISION: A ROBUST VISION-LANGUAGE MODEL FOR MOLECULAR STATUS PREDICTION AND RADIOLOGY REPORT GENERATION IN ADULT-TYPE DIFFUSE GLIOMAS

Yaewon Park, MD, PhD (*Presenter*)
Sung Soo Ahn, MD (*Abstract Co-Author*)
Kyunghwa Han, PhD (*Abstract Co-Author*)
Seung-Koo Lee, PhD (*Abstract Co-Author*)

PURPOSE

To establish a robust vision-language model ("Glio-LLaMA-Vision") for molecular status prediction and radiology report generation (RRG) in adult-type diffuse gliomas.

METHODS AND MATERIALS

Multiparametric MRI data (T1, T2, FLAIR, and postcontrast T1-weighted images) and paired radiology reports (in English) from 1,001 patients with adult-type diffuse gliomas (144 oligodendrogliomas, 157 IDH-mutant astrocytomas, and 700 IDH-wildtype glioblastomas) diagnosed according to the 2021 WHO classification were included as the institutional training set. A vision-language model, Glio-LLaMA-Vision, was developed based on LLaMA 3.1, pre-trained on 2.79 million biomedical image-text pairs from PubMed Central, and further optimized through fine-tuning using the institutional training set. Performance was validated in 100 patients from an institutional validation set, patients from another tertiary institution, and in 170 and 477 patients with MRI from TCGA and UCSF, respectively. The performance for IDH mutation status prediction was evaluated, and the performance for RRG was assessed both quantitatively and qualitatively, with comparison to original reports in terms of "correctness," "readability," and "preference."

RESULTS

For IDH mutation status prediction, Glio-LLaMA-Vision achieved areas under the curve ranging from 0.89 to 0.95 in internal and external validation sets. For RRG, the BLEU-1, ROUGE-L, and METEOR scores were 0.49, 0.42, and 0.24, respectively. Compared with the original reports, the "correctness" was significantly lower in the generated reports (3.32 vs. 3.95, $P < 0.001$), while the "readability" was significantly higher (4.60 vs. 4.34, $P < 0.001$). In terms of "preference," the majority (91.3%) of generated reports were considered clinically acceptable.

CONCLUSION

Glio-LLaMA-Vision demonstrated promising performance in molecular status prediction and RRG for adult-type diffuse gliomas, showing potential for clinical application.

CLINICAL RELEVANCE/APPLICATION

Glio-LLaMA-Vision enables accurate prediction of molecular status and generates clinically acceptable radiology reports for adult-type diffuse gliomas. This model may assist radiologists by improving diagnostic efficiency and supporting clinical decision-making. Its promising performance suggests potential integration into clinical workflows for glioma management.

Nov. 30 – Dec. 4
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R3-SSNR14

Neuroradiology (Techniques and Methods: Perfusion, Diffusion and Other Techniques)

Thursday, Dec. 4 9:30AM - 10:30AM Room: N227B

Salil Soman, MD, MS (*Moderator*)
Alexander M. Khalaf, MD (*Moderator*)

Sub-Events

R3-SSNR14-1 A LOW-DOSE TWO-VOLUME CT PERFUSION TECHNIQUE FOR ABSOLUTE CEREBRAL BLOOD FLOW MEASUREMENT

Alireza Shojazadeh, MD (*Presenter*)
Qiyu Zhang (*Abstract Co-Author*)
Caedin Miller (*Abstract Co-Author*)
Ciprian N. Ionita, PhD (*Abstract Co-Author*)
Sabee Y. Molloi, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate a patient-specific post-trigger delay (PTD) protocol for a prospective low-dose CT brain perfusion technique based on only two volume scans.

METHODS AND MATERIALS

A total of 45 patients (41-87 years old) suspected of cerebral ischemia who underwent standard dynamic cerebral CT perfusion (320 slices, slice thickness of 0.5 mm) were used. For each patient, 19 scans were acquired within 49.3 s (50 mL of Omnipaque-350, rate of 5 mL/s), reconstructed, and registered to simulate all arterial input function curves at the level of the Internal Carotid Artery. Using only two systematically selected volume scans, one at the base (simulating bolus tracking) and one at the peak of the time attenuation curve, brain blood flow (mL/min/g) was quantified with first-pass analysis technique. In the retrospective method, the peak scan was selected by reviewing the full contrast enhancement curve, while the prospective method estimated the peak timing using a previously developed patient-specific PTD method (half the injection duration + 2.5 seconds). Perfusion values derived from the prospective two-volume approach were compared to those from the retrospective method using the Wilcoxon signed-rank test, linear regression, and Bland-Altman analysis.

RESULTS

Mean retrospective and prospective cerebral blood flow (CBF) were 0.240 ± 0.127 mL/min/g and 0.239 ± 0.125 mL/min/g, respectively. Shapiro-Wilk tests confirmed non-normal distribution in both datasets ($p < 0.001$). No significant difference was observed between methods (Wilcoxon $p = 0.23$). Linear regression showed strong agreement between retrospective and prospective estimates (slope = 0.97, $p < 0.001$, $R^2 = 0.98$), with a minimal bias of 0.0008 mL/min/g on Bland-Altman analysis (limits of agreement: -0.035 to 0.036 mL/min/g).

CONCLUSION

An optimal two-volume scan acquisition at the base and peak of the aortic enhancement was retrospectively validated. This technique has the potential for clinical implementation of an accurate brain perfusion technique, streamlining perfusion imaging and reducing radiation exposure.

CLINICAL RELEVANCE/APPLICATION

Conventional CT perfusion techniques are limited by variability in blood flow measurements across postprocessing algorithms and high radiation doses (66-452 mGy) from repeated scans. The proposed two-volume approach offers a simplified, low-dose alternative that supports the feasibility of prospective protocols while maintaining measurement reliability.

R3-SSNR14-2 ASSOCIATION OF CORTICAL IRON LEVELS WITH IN-VIVO MAGNETIC SUSCEPTIBILITY IN COMMUNITY-BASED OLDER ADULTS

Rasheed Abid, BSc (*Presenter*)
Md Tahmid Yasar, PhD (*Abstract Co-Author*)
Abdur Raquib Ridwan, PhD (*Abstract Co-Author*)
Mohammad Rakeen Niaz (*Abstract Co-Author*)
Arnold M. Evia JR, PhD (*Abstract Co-Author*)
Shengwei Zhang, PhD (*Abstract Co-Author*)
Yingjuan Wu, MS,BEng (*Abstract Co-Author*)
David A. Bennett, MD (*Abstract Co-Author*)
Julie A. Schneider, MD (*Abstract Co-Author*)
Konstantinos Arfanakis, PhD (*Abstract Co-Author*)

PURPOSE

Quantitative Susceptibility Mapping (QSM) offers a non-invasive technique to evaluate brain iron content, a biomarker implicated in aging and neurodegeneration. While previous research has focused on subcortical regions, this study investigates the relationship between in-vivo cortical magnetic susceptibility and post-mortem iron concentrations in older adults.

METHODS AND MATERIALS

This study included 20 well-characterized community-based older adults (ages 71-101; 16 females) who underwent 3D multi-echo GRE MRI before death. QSM was reconstructed using the Morphology Enabled Dipole Inversion (MEDI) algorithm. T1-weighted images were segmented and registered to native space using ANTs. Following death, cortical tissue samples were obtained from one hemisphere (14 left, 6 right), and the contralateral side was preserved. Tissue was harvested from the anterior cingulate cortex (ACC), middle frontal cortex (MFC), and inferior temporal cortex (ITC). Iron concentrations were quantified via inductively coupled plasma mass spectrometry (ICP-MS) and log-transformed to reduce skewness. Median susceptibility values were extracted for each region. Pairwise correlations were computed among iron levels, susceptibility, age, and antemortem interval. Multiple linear regression was performed to assess the adjusted relationship between susceptibility and iron concentrations.

RESULTS

A strong positive correlation was observed between post-mortem iron concentration and in-vivo magnetic susceptibility across all three cortical regions. Multiple linear regression analysis—controlling for age, sex, and antemortem interval—revealed a significant association ($R^2 = 0.85$, $p < 0.005$). Pairwise analyses further confirmed consistent relationships among the studied variables.

CONCLUSION

Our findings demonstrate that in-vivo cortical magnetic susceptibility significantly reflects post-mortem iron concentrations in older adults, even after adjusting for age, sex, and antemortem interval. These results support the potential of QSM as a non-invasive proxy for cortical iron content, with implications for aging and neurodegenerative disease research.

CLINICAL RELEVANCE/APPLICATION

In-vivo QSM may serve as a valuable imaging biomarker for estimating cortical iron deposition and understanding iron dysregulation in the aging brain.

R3-SSNR14-4 WHITE MATTER MICROSTRUCTURE AND COGNITIVE DECLINE IN SUBACUTE ISCHEMIC STROKE: INSIGHTS FROM FREE WATER IMAGING AND GLYMPHATIC DYSFUNCTION

Xin Li (*Presenter*)
Yue Qin (*Abstract Co-Author*)
Lei Wang, MD, PhD (*Abstract Co-Author*)
Yanqiang Qiao (*Abstract Co-Author*)
Juan Tian (*Abstract Co-Author*)
Yifan Qian (*Abstract Co-Author*)

PURPOSE

To investigate white matter microstructural changes and their relationship with cognitive function in subacute ischemic stroke (IS) using free water diffusion tensor imaging (FW-DTI) and tract-based spatial statistics (TBSS).

METHODS AND MATERIALS

Thirty-nine subacute IS patients (31 males, 59.21±11.24 years) and 39 well-matched healthy controls (HC, 30 males, 58.54±7.69 years) underwent diffusion spectrum imaging. FW, fractional anisotropy (FA), mean diffusivity (MD), and FW-corrected DTI metrics (FA T and MD T) were analyzed using TBSS. Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA). Group differences and correlations with imaging metrics, cognitive performance, and clinical variables were examined.

RESULTS

Compared with the HCs, IS patients showed significantly higher FW in both the whole-brain ($t = -3.03$, $p = 0.0034$) and white matter skeleton ($t = -3.20$, $p = 0.0022$), and reduced skeleton FA ($t = 3.81$, $p = 0.0003$) and FA T ($t = 3.60$, $p = 0.0059$). In the IS group, MoCA scores were negatively correlated with whole-brain FW ($r=-0.44$, $p=0.0069$) and skeleton MD ($r=-0.33$, $p=0.047$), and positively correlated with skeleton FA ($r=0.34$, $p=0.044$) and FAT ($r=0.35$, $p=0.035$). Skeleton FW was positively associated with time since stroke onset (? = 0.48, $p = 0.0391$). Age was negatively correlated with skeleton FA ($r = -0.35$, $p = 0.0295$) and FA T ($r = -0.38$, $p = 0.0183$), but positively with whole-brain FW ($r = 0.59$, $p = 7.57\times10?5$) and skeleton MD ($r = 0.38$, $p = 0.0179$).

CONCLUSION

Free water imaging offers valuable insights into white matter microstructure alterations and cognitive impairment following subacute IS. In this study of patients within one month post-stroke, we observed elevated whole-brain FW, indicative of vasogenic edema, neuroinflammation, and glymphatic system dysfunction. FW provides a novel metric for assessing white matter damage in the subacute phase and may serve as a potential imaging biomarker of poststroke cognitive health. Future large-scale, longitudinal studies are needed to investigate how FW-corrected DTI metrics evolve over time and relate to long-term cognitive outcomes.

CLINICAL RELEVANCE/APPLICATION

These findings suggested that subacute IS may lead to the disruption of white matter integrity, dysfunction of the glymphatic system, and subsequent white matter-related cognitive impairment. The results provide a theoretical foundation for the development of therapeutic strategies targeting white matter injury and glymphatic dysfunction during the subacute phase of stroke.

R3-SSNR14-5 CLINICAL VALIDATION OF A NOVEL ARTIFICIAL INTELLIGENCE METAL ARTIFACT CORRECTION ALGORITHM IN CT PERFUSION FOR POSTPROCEDURAL EVALUATION OF INTRACRANIAL ANEURYSM CLIPPING AND COILING

Jianjun Shen, PhD (*Presenter*)
Haonan Zhao (*Abstract Co-Author*)
Manman Zhu (*Abstract Co-Author*)
Yixuan Zou, MS (*Abstract Co-Author*)
Jingfeng Huang (*Abstract Co-Author*)
Pan Yuning, MD (*Abstract Co-Author*)

PURPOSE

To explore the clinical value of a novel artificial intelligence metal artifact correction (AI-MAC) algorithm in CT perfusion (CTP) imaging for postprocedural evaluation of intracranial aneurysm clipping and coiling.

METHODS AND MATERIALS

This retrospective study included 24 patients (8 males; 60.5±11.2 years; 23±2.5 kg/m 2) with unilateral intracranial clips or coils, who underwent CT perfusion for postprocedural evaluation, and 5 of the patients had the digital subtraction angiography (DSA) results ipsilateral to clips and coils. CT data were reconstructed using three methods: hybrid iterative reconstruction (HIR) algorithm (uncorrected group), HIR with conventional metal artifact correction algorithm (MAC group), HIR with AIMAC algorithm (AI-MAC group). For three groups, the artifact area ratio caused by clips or coils was assessed using a 5-point Likert scale (1: <10%; 2: 10-30%; 3: 30-50%; 4: 50-70%; 5: >70%), and the maximum diameter of stripe artifacts was also measured. For the five patients with DSA reference, cerebral blood flow (CBF), cerebral blood volume (CBV), mean transit time (MTT), time to peak (TTP) and time-to-maximum (Tmax) were measured to identify the ischemia in frontal lobe, temporal lobe, parietal lobe, occipital lobe and basal ganglia regions ipsilateral to clips and coils.

RESULTS

Compared to the uncorrected group, the AI-MAC group demonstrated a 31.3% significant reduction in the metal artifact area, whereas the MAC group had a 34.4% significant increase. The maximum artifact diameter of the AI-MAC group (13.8±13.4 mm) was significantly lower than that of the MAC group (66.1±21.3 mm) and the uncorrected group (34.9±24.9 mm), with 79.1% and 60.5% reduction (both $p <0.001$), respectively. For the ischemia diagnosis across all measured brain regions, the AI-MAC group achieved higher specificity (95.5%), higher positive predictive value (PPV; 66.7%), and higher accuracy (95.8%), compared to the uncorrected group (specificity: 77.3%; PPV: 28.6%; accuracy: 79.2%) and the MAC group (specificity: 72.7%; PPV: 25.0%; accuracy: 75.0%).

CONCLUSION

The AI-MAC algorithm significantly improves the correction of metal artifacts in postprocedural CTP of intracranial aneurysm patients compared to the conventional MAC. It reduces secondary artifacts and increases the stability of CTP parameters.

CLINICAL RELEVANCE/APPLICATION

The AI-MAC algorithm effectively reduces metal artifacts in postprocedural CTP for intracranial aneurysm patients, thereby improving diagnostic accuracy and providing more reliable perfusion parameters for clinical decision-making.

R3-SSNR14-6 DIFFUSION TENSOR IMAGING IN TRIGEMINAL NEURALGIA: QUANTITATIVE EVALUATION OF THE ROOT ENTRY ZONE

Amitnandan D. Dwivedi, MBBS, MD (*Presenter*)
Mohammad Aamir, MBBS (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic role of Diffusion Tensor Imaging (DTI) in patients with Trigeminal Neuralgia (TN) by evaluating fractional anisotropy (FA) and apparent diffusion coefficient (ADC) values at the root entry zone (REZ) of the trigeminal nerve, and to compare these metrics with the contralateral unaffected side

METHODS AND MATERIALS

In this prospective observational study, 29 patients clinically diagnosed with unilateral TN underwent 3T MRI with DTI sequences. FA and ADC values were measured at the affected and contralateral REZ of the trigeminal nerve. The data were statistically analyzed to evaluate the significance of DTI metrics in identifying microstructural alterations in TN. Presence of neurovascular compression (NVC) was noted, though not all patients exhibited it

RESULTS

Mean FA values at the affected REZ were significantly reduced compared to the contralateral side (0.27 ± 0.05 vs. 0.36 ± 0.04; $P < 0.001$). Similarly, ADC values were significantly elevated on the affected side ($1.31 \pm 0.19 \times 10?^{3}$ mm²/s vs. $1.01 \pm 0.13 \times 10?^{3}$ mm²/s; $P < 0.001$). Among 29 patients, 17 showed vascular loop compression. DTI changes were consistently observed irrespective of NVC, indicating DTI's capability to detect neural microstructural damage beyond compressive etiology

CONCLUSION

DTI offers a valuable non-invasive imaging biomarker for assessing trigeminal nerve microstructural integrity in TN. Reduced FA and elevated ADC at the REZ serve as objective indicators for early diagnosis, even in the absence of demonstrable neurovascular compression on conventional MRI

CLINICAL RELEVANCE/APPLICATION

Incorporating DTI into standard MRI protocols may enhance the diagnostic accuracy for TN and guide tailored therapeutic strategies, especially in ambiguous or early-stage cases

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R3-SSPH13

Physics (Novel Imaging Systems)

Thursday, Dec. 4 9:30AM - 10:30AM Room: S404

Patrick J. La Riviere, PhD (*Moderator*)
Scott S. Hsieh, PhD (*Moderator*)

Sub-Events

R3-SSPH13-1 DEVELOPING A NOVEL X-RAY SOURCE AND A 6TH GENERATION ULTRA-FAST AND GENERAL-PURPOSE CT

Hui Hu, PhD (*Presenter*)
Vitaliy Ziskin, PhD (*Abstract Co-Author*)
Andrew Cross (*Abstract Co-Author*)
Hong Chen (*Abstract Co-Author*)
Botao Zhao (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a novel X-Ray source technology, referred to as the Magnetically-Scanning Stationary (MSS) X-Ray source, and a CT platform, referred to as the 6th generation (6th-gen) CT, that combines the MSS X-Ray source and a rotating detector array. A 6th-gen CT avoids the need to rotate heavy X-Ray source(s) and high-voltage power supply, thus promising a much faster rotation speed.

METHODS AND MATERIALS

Several iterations of the MSS X-Ray source and the 6th-gen CT prototype have been developed. The X-Ray focal spot movement is synchronized with the detector rotation using encoder-based scan trigger electronics. The performance of the MSS X-Ray source and the 6th-gen CT were evaluated using hardware prototypes.

RESULTS

The MSS X-Ray source has achieved: 1) Ultra-fast scan down to 30 ms of image temporal resolution, far exceeding the 125-250 ms range achieved by today's high-end CT; 2) sufficient X-Ray flux (up to over 1000 mA) that is required for general-purpose diagnostic CT; 3) An X-Ray focal spot size down to 1x0.6 mm. Currently, the 6th-gen CT prototype has achieved 260 RPM rotation speed measured by a home-position trigger, and the X-Ray focal spot motion is synchronized with the detector rotation as evident by the sinogram data collected.

CONCLUSION

The MSS X-Ray source has demonstrated the capability to match the X-Ray power performance of leading CTs on the market. The focal spot size of 1 mm has been demonstrated, with a sub-millimeter focal spot is being developed in the next prototype. The current 6th-gen CT prototype has demonstrated a rotational speed of 260 RPM, which is slightly faster than that of the leading CTs. A 480 RPM rotation speed is being developed in the next prototype. A ~960 RPM (i.e., an image temporal resolution of 30-40 ms range) is potentially achievable, which constitutes ~4x the speed of today's CT, a speed that can be achieved because the current physical constraint of mechanical rotation of the CT tube has been eliminated in the 6th-gen CT

CLINICAL RELEVANCE/APPLICATION

The MSS X-Ray source and the 6th-gen CT will transform the entire field of CT. It is a flexible system that is compatible with all other state-of-the-art technology innovations, such as photon-counting detectors, Spectral CT, dose-reduction techniques, more detector rows, AI, as well as software-based technologies. The 6th-gen CT will transform many CT applications, from general-purpose CT to cardiac CT. Since the 6th-gen CT will be lighter and more compact than conventional CT, it will also open up special applications such as emergency room (ER) / operating room (OR) CT, mobile CT, and miniaturized vehicle-based CT. Due to its stationary source design, it is expected to be more economical compared with high-end CT systems, such as dual-source/dual-detector CT.

R3-SSPH13-2 ULTRA-LOW DOSE, HIGH-RESOLUTION SPECTRAL CT IMAGING ENABLED IN HYBRID RAPID-KVP SWITCHING AND PHOTON-COUNTING DETECTOR SYSTEM

Olivia Sandvold, BS (*Presenter*)
Roland Proksa (*Abstract Co-Author*)
Amy Perkins (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)

PURPOSE

While spectral CT has improved adult diagnostic imaging, it remains primarily optimized for larger body sizes, neglecting key pediatric imaging challenges, namely, small anatomical detail, low intrinsic contrast, and high radiation sensitivity. Ultra-low dose protocols in pediatrics limit photon fluence, confounding the generation of high-resolution, quantitative spectral images even using state-of-the-art photon-counting technology. This work proposes a novel sparse spectral imaging paradigm tailored to pediatric needs, enabling low-dose, ultra-high resolution spectral CT through a hybrid CT technology combination.

METHODS AND MATERIALS

The proposed method acquires most of the scan using a low tube voltage, with a photon-counting detector operating in a high-resolution mode that sums photon counts across energy bins, effectively functioning in a non-spectral mode, excluding electronic noise. During designated sparse intervals, the system transitions into a rapid kilovolt-peak mode to activate spectral imaging in conjunction with the detector's energy-discriminating functionality. A Monte Carlo simulation demonstrated this pediatric imaging protocol, using a tube voltage of 70 kVp with intermittent 110 kVp pulses for spectral data. The detector pixel size was set to 0.5x0.5 mm^2 and 1x1 mm^2. Dose was changed through varying the high kVp pulse duration from 25-125 μs. A 150 mm pediatric phantom was simulated. Spectral signal-to-noise ratio (SNR) in virtual monoenergetic images was estimated using the Cramér-Rao Lower Bound, and the area under the monoenergetic curve (AUMC) was calculated by integrating spectral SNR over 35-120 keV. Bias was estimated in the photoelectric and Compton scatter domains.

RESULTS

The sparse spectral protocol obtained AUMC 124% relative to a constant 100 kVp photon-counting scan using the same dose level and pixel size. Binning pixels to 1x1 mm 2 , the sparse spectral performance was over 267% of the 100 kVp reference scan AUMC. Bias in the photoelectric domain decreased using the sparse spectral protocol compared to the reference system bias by 89% for 0.5x0.5 mm 2 pixel sizes and over 97% in resolution binned mode.

CONCLUSION

This work demonstrates a novel sparse spectral CT acquisition strategy optimized for pediatric imaging, successfully balancing ultra-high spatial resolution, spectral quantification, and ultra-low radiation dose.

CLINICAL RELEVANCE/APPLICATION

The hybrid CT combination of kVp-switching and photon-counting detectors may reduce quantitative noise and bias in pediatric imaging while maintaining ultra-low radiation doses necessary to facilitate adaptation of spectral CT for pediatric populations.

R3-SSPH13-3 ANALYSIS OF CT DOSE REDUCTION AND RECONSTRUCTION ACCURACY USING AN ADJUSTABLE SEMI-RADIOLUCENT COLLIMATOR

Stephanie Leon, PhD (*Presenter*)
Timothy Olson (*Abstract Co-Author*)
Philip A. Templeton, MD (*Abstract Co-Author*)

PURPOSE

Standard CT reconstruction algorithms require relatively uniform detector dose. However, the clinical focus is often on a smaller anatomic region of interest (ROI), resulting in tissue dose without diagnostic utility. An experimental technology uses a novel reconstruction with a moving semi-radiolucent collimator that adjusts position in real-time during tube rotation, transmitting the full dose within an ROI but blocking dose outside the ROI. This work assesses the reconstruction fidelity and measures the dose reduction as a function of ROI diameter and position.

METHODS AND MATERIALS

An initial trial simulated the collimator by scanning a cadaver on a clinical CT scanner at 17 mGy and 1.7 mGy. The images were digitally combined into a single image representing a typical dose in the ROI with a 90% reduction off-ROI. The combined image was processed and compared with the 17 mGy image for HU accuracy. A difference image assessed the preservation of detail. Then, images of a water phantom were acquired using a research scanner with the experimental collimator installed, using all available kVs and a scanner-reported CTDI of 20 mGy. Scans were performed with the collimator producing a 10-cm diameter ROI, as well as with the collimator blades fully retracted. The algorithm was applied to the ROI images. HU values within the ROI were compared to those from the uncollimated scan. To assess dose, scans of the 32-cm CTDI phantom were performed with centered ROIs of 0 cm (collimator fully closed), 5 cm, 10 cm, 20 cm, and fully open. ROIs were also moved to offsets from phantom center of 5 cm and 10 cm. CTDI was calculated for each scenario using standard methodology.

RESULTS

The difference image from the cadaver test showed no discernable structures within the ROI, indicating no loss of detail. The majority of CT number errors were from 2-4 HU, with no errors greater than 20 HU. The experimental water phantom reconstructions showed errors averaging -0.1 HU, with all values within 20 HU, regardless of kV. Dose reduction depended strongly on ROI size and location, but not kV. A reduction of 90% was seen with the collimator fully closed, dropping to a low of 16% for a centrally-located 20-cm ROI. For a reasonably-sized 10 cm ROI, CTDI reduction was 44% when centrally-located and 60% when offset.

CONCLUSION

The experimental collimator accurately preserves HU values and image detail within the ROI. The magnitude of dose reduction depends strongly on ROI size and location; for a typical application with a medium-sized ROI located off-center within the patient, CTDI reductions of 40-60% are reasonable.

CLINICAL RELEVANCE/APPLICATION

Dose to tissues not of clinical interest can be reduced dramatically using the experimental collimator, without loss of image detail and accuracy.

R3-SSPH13-4 MULTI-SOURCE STATIC CT: SCATTER CORRECTION AND NOISE ANALYSIS

Andreas Heinkele, MSc (*Presenter*)
Lukas Hennemann, MSc (*Abstract Co-Author*)
Julien Erath (*Abstract Co-Author*)
Marc Kachelriess, PhD (*Abstract Co-Author*)
Karl Stierstorfer, PhD (*Abstract Co-Author*)
Joscha Maier, PhD (*Abstract Co-Author*)
Eric Fournie (*Abstract Co-Author*)
Johan Sunnegaardh (*Abstract Co-Author*)
Martin Petersilka, PhD (*Abstract Co-Author*)
Christian Hofmann (*Abstract Co-Author*)

PURPOSE

To provide a scatter correction for static CT of 4th generation geometry.

METHODS AND MATERIALS

In recent years, static CT scanners gained attention in CT research as they may offer some advantages compared to today’s clinical CT systems. Our static CT is composed of a detector ring and a source ring array. This expands the acquisition possibilities from sequential and spiral trajectories to arbitrary patterns. Moreover, the static nature of the scanner inherently avoids ring artifacts. Operation with more than one x-ray source operating simultaneously is possible to enhance temporal resolution, e.g. for cardiac CT. One major drawback is that the deployment of anti-scatter grids (ASGs) is not feasible due to the 4 th generation geometry. This increases the risk of artifacts and eventually leads to increased image noise when using scatter correction algorithms, especially in the case of multiple sources. Deep learning-based methods offer an approach to tackle scatter artifacts: Deep scatter estimation (DSE) is based on a U-net architecture, and we trained it to predict Monte Carlo (MC) scatter estimates in projection domain. Scatter correction can then be done by subtraction of the DSE estimate from the total signal in intensity domain. For operation with 2 and 3 sources, the sources are fired in an angular distance of 120 degree to prevent primary beams from overlapping. As an entire 360° detector ring is available in static CT, this allows the measurement of cross-scatter as additional information that DSE can use for more accurate scatter estimation. DSE was trained on circular and elliptic water phantoms as well as semi-anthropomorphic thorax phantoms. Noise is added to the reconstructions with a Poisson-noise generator in projection domain. The noise level was matched to resemble a realistic scan.

RESULTS

In our test scenario, scatter can be well corrected even for operation with three sources. However, DSE cannot avoid increased image noise after applying scatter correction. With scatter correction, the noise level for a 32 cm water phantom with 3-source operation and same dose increases by 63.5% compared to a scan with a single source. This means that the 2.7-fold dose would be necessary to achieve the same noise level as with single-source operation.

CONCLUSION

Scatter correction with DSE shows promising results. However, it still results in a strong increase in noise, especially for operation with 2 and 3 sources. Hence, this operation might only be reasonable when combined with physical scatter rejection like some sort of ASG.

CLINICAL RELEVANCE/APPLICATION

In the future, static CT might serve as a complementary CT system to clinical scanners today. Its advantages might make it a preferable option for cardiac CT or interventional applications.

R3-SSPH13-5 IMPROVED SPECTRAL QUANTIFICATION WITH K-EDGE FILTRATION: AN EXPERIMENTAL STUDY IN PEDIATRIC CT

Yinglin Ge, MS (*Presenter*)
Olivia Sandvold, BS (*Abstract Co-Author*)
Amy Perkins (*Abstract Co-Author*)
Roland Proksa (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)

PURPOSE

Accurate quantitative imaging at low radiation doses is essential for diagnostic pediatric spectral CT. In this experimental study, we demonstrate that integrating a K-edge filter with a dual-layer spectral CT system enhances quantitative performance without increasing radiation exposure.

METHODS AND MATERIALS

To optimize the setup for follow-up experiments, we simulated a dual-layer spectral CT system with fan beam geometry. A reference pediatric dose was generated using a 100 kVp tube voltage and a 70 mA tube current. A holmium (Ho) filter was simulated at varying thicknesses while the tube current was increased and optimized to obtain an equivalent dose to the reference configuration. Optimal spectral performance with the highest overall signal-to-noise ratio (SNR) was identified at a Ho thickness of 0.3 mm and an adjusted tube current of 438 mA. To validate the simulation results, an experimental spectral CT bench system equipped with a clinical-grade x-ray tube and a dual-layer detector (Philips Healthcare) was operated with the optimized current for the 0.3 mm thick Ho filter attached to the collimation box and the reference parameters without a filter for comparison. For both configurations, a 100 mm diameter phantom containing four tissue-mimicking inserts (iodine 1, 2, 5 mg/mL, and solid water; Sun Nuclear) was scanned. A 2D projection-based material decomposition was performed. Iodine and water basis images were created using a 150 mm field of view. No denoising or scatter correction was applied. To estimate spectral sensitivity with and without Ho filtration, noise was measured in each insert, and bias was calculated by comparing the iodine density measurement to the value measured with a clinical dual-layer CT scanner (Spectral CT 7500, Philips Healthcare).

RESULTS

Using the Ho filter, noise was reduced by over 20% on average across all inserts compared to the reference scan for iodine/water images. Noise reduction was greater in the water inserts than in the iodine inserts. Compared to non-filtered acquisitions, bias analysis of filtered images showed 19-61% reduction across all inserts, and all biases were less than 0.21 mg/mL. Water density measurements remained accurate within a 2% error margin in both filtered and non-filtered cases.

CONCLUSION

The combination of Ho K-edge filtration and dual-layer spectral CT significantly enhances quantitative imaging at low pediatric dose levels. This improvement in iodine accuracy may reduce reliance on extra non-contrast scans, streamlining workflow and minimizing radiation exposure in pediatric care.

CLINICAL RELEVANCE/APPLICATION

Given the increase in CT imaging and the associated safety concerns for pediatric patients, it is crucial to provide high-quality, low-dose spectral CT imaging.

R3-SSPH13-6 REVISITING FILL FACTOR LIMITATIONS OF HIGH-RESOLUTION, ENERGY-INTEGRATING DETECTOR CT WITH A FALSE FOCAL SPOT

Scott S. Hsieh, PhD (*Presenter*)

PURPOSE

The most important clinical draw for photon counting detector (PCD) CT today is its excellent spatial resolution. It is often stated that energy integrating detectors cannot match this resolution without suffering from poor fill factor, because more dead space would be occupied by reflective septa placed between scintillator pixels. We propose a different system geometry that accommodates reflective septa without suffering from poor fill factor.

METHODS AND MATERIALS

We propose that the detector be pointed towards a “false focal spot,” 4 cm from the true focal spot in both x- and z- directions. The reflective septa are no longer parallel to X-rays originating from the true focal spot, such that X-rays incident on reflective septa can penetrate the septa and deposit energy in scintillator buried underneath. To characterize this system, we calculated the modulation transfer function (MTF) and zero-frequency detective quantum efficiency (DQE(0)) for (1) a conventional detector with 0.1 mm wide septa, (2) a false focal spot detector with 0.1 mm wide septa, and (3) an idealized detector without septa. We assumed monochromatic radiation at 80 keV, that detectors were 3 mm thick with attenuation of 34 cm -1 (gadolinium oxysulfide), that reflective septa had attenuation of 0.3 cm -1 (PMMA-equivalent with 0.25 g/cc TiO 2), that the source was a point, that the anti-scatter grid was absent, and that photons deposited their whole energy at first scattering. Resolution measurements are reported at the detector, before de-magnification or reconstruction. While scatter was not modeled, any grid that is used must be pointed towards the true (not false) focal spot.

RESULTS

With a 0.5 mm pixel pitch, the DQE(0) of conventional, false focal spot, and ideal detectors were 64%, 92%, and 100%, respectively. This corresponds to recovering 77% of the lost fill factor using the false focal spot. The MTFs at 10% for conventional, proposed, and ideal detector were 22.9, 19.2, and 18.2 lp/cm, respectively. The MTF of the conventional detector outperforms the ideal detector because of the increased aperture area. The aperture of false focal spot is intermediate and slightly asymmetric. The DQE(0) of false focal spot had minor spatial variation across the fan beam, decreasing by 1% at the periphery.

CONCLUSION

Most of the fill factor penalty of high resolution energy integrating detectors is recovered with a false focal spot geometry.

CLINICAL RELEVANCE/APPLICATION

Dose efficient, high resolution CT could be achieved with energy integrating (not just photon counting) detectors if a false focal spot geometry is used. This could improve clinical access to high resolution CT.

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R3-STCE1

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Thursday, Dec. 4 10:00AM - 10:30AM Room: LEARNING CENTER THEATER 1

Sub-Events

R3-STCE1-2 LARGE-SCALE AI IMPLEMENTATION IN RADIOLOGY: TECHNICAL, OPERATIONAL, AND BEHAVIORAL ADOPTION PATTERNS ACROSS A 20-CENTER SWISS NETWORK

Sergey Morozov, PhD, MPH (*Presenter*)
Benoit Rizk, MD (*Abstract Co-Author*)
Cyril Thouly (*Abstract Co-Author*)
Benoit Dufour (*Abstract Co-Author*)
Natalie Heracleous, PhD (*Abstract Co-Author*)
Octave Novarina (*Abstract Co-Author*)
Simon Pericou (*Abstract Co-Author*)

PURPOSE

To assess efficiency gains and radiologist adoption of AI tools in musculoskeletal, chest, breast, and neurologic imaging across Switzerland’s largest radiology network, establishing benchmarks for AI processing times, turnaround time improvement, and user acceptance.

METHODS AND MATERIALS

Retrospective analysis of 397,694 AI-processed studies from 20 Swiss centers (Jan 2022-Jun 2025) was combined with a radiologist survey (91.4% response, 53/58) and report turnaround analysis. Evaluated AI included musculoskeletal tools (bone age, trauma/orthopedic radiography, knee/spine MRI), mammography, chest CT and radiography, and brain MRI for MS and volumetry. Metrics: AI processing latency, report turnaround with/without AI, usage frequency, trust, and Net Promoter Scores (NPS).

RESULTS

Musculoskeletal AI made up 67.8% of utilization (trauma radiography 37%). Breast, chest, and brain applications had 76% specialty adoption. 66.1% of radiologists were frequent AI users, most engaged mid-career. AI was valued for protection against errors (71.7%) and time saving (56.6%). Requests included faster AI (48%) and automated report integration (34%). NPS ranged from bone age (+86.7) and orthopedic XR (+65.2) to spine MRI (-55.3). Chest CT scored highest NPS among non-musculoskeletal AI (+38.5, 73.6% use). Innovation indices ranged 43.0-74.0. Broader AI use found among musculoskeletal/general radiologists; median productivity sentiment was 2/5. Bottlenecks were data transfer for radiography/mammography (2.1-3.5min) and AI computation for brain/spine MRI (8.2min). Only 21.6% of AI results were ready pre-report and 5% missing at validation. In subgroup analysis, AI reduced report times: knee MRI 16?14min (12%), trauma radiography 7?3min (57%), bone age 3.5?1.6min (55%).

CONCLUSION

Large-scale AI yielded 12-57% turnaround reductions and 90%+ adoption, with persistent speed and integration challenges. Future priorities include technical improvements, feedback mechanisms, and site-specific initiatives. User demand for increased AI interoperability and seamless EHR/report integration was a common theme, highlighting the need for optimized workflows and continuous AI performance evaluation requiring collaborative multidisciplinary efforts.

CLINICAL RELEVANCE/APPLICATION

This multi-year study presents benchmarks for AI adoption across specialties, supporting it as a strategy to meet imaging demand, improve quality, and enhance radiologist confidence. Notably, AI tools demonstrated variable clinical impact across modalities, emphasizing the importance of tailored solution selection according to specialty-specific needs and diagnostic workflows.

R3-STCE1-3 DEEP LEARNING-ENHANCED PHOTON-COUNTING CT FOR CARDIAC DELAYED IODINE IMAGING: A STEP FORWARD IN MYOCARDIAL TISSUE CHARACTERIZATION

Jose Osoria-Velasquez, MD (*Presenter*)
James Griggers (*Abstract Co-Author*)
Milan Vecsey-Nagy, MD, PhD (*Abstract Co-Author*)
Tilman S. Emrich, MD (*Abstract Co-Author*)
Akos Varga-Szemes, MD, PhD (*Abstract Co-Author*)
Muhammad Taha Hagar, MD (*Abstract Co-Author*)

PURPOSE

Spectral photon-counting detector CT (PCD-CT) enables high-resolution myocardial imaging but is limited by elevated noise, particularly in low-keV reconstructions required for late iodine enhancement (LIE). To address this, we incorporated a convolutional neural network-based denoising model derived from U-Net into the reconstruction pipeline. This study evaluates its impact on image quality and diagnostic performance in cardiac LIE imaging.

METHODS AND MATERIALS

In this IRB-approved retrospective study, 27 patients underwent cardiac LIE imaging with PCD-CT and same-day cardiac MRI with late gadolinium enhancement (LGE) as reference. CT images were reconstructed with and without a U-Net-based AI post-processing module applied after quantum iterative reconstruction (QIR3). The network was trained to suppress stochastic noise while preserving anatomical structures using synthetically degraded input. Attenuation, image noise, signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) were measured on iodine maps and 40-keV virtual monoenergetic images (VMI). Two blinded cardiovascular radiologists evaluated enhancement patterns, with diagnostic accuracy compared to LGE-MRI. Inter-reader agreement was measured using Cohen’s ?.

RESULTS

AI denoising reduced noise (iodine: 39%; VMI: 32%) and significantly improved SNR and CNR ($p < 0.001$). Sensitivity and NPV reached 100% on iodine maps, with diagnostic accuracy rising from 85.2% to 88.9%. Similar improvements were observed for VMI. Inter-reader agreement increased (?: iodine 0.70-0.77; VMI 0.63-0.70).

CONCLUSION

Integrating U-Net-based deep learning denoising into the PCD-CT workflow improves objective image quality and interpretability in myocardial LIE imaging. This AI-driven approach reduces quantum noise while preserving diagnostic fidelity, advancing the clinical viability of low-keV spectral imaging.

CLINICAL RELEVANCE/APPLICATION

By enhancing image quality and diagnostic performance without altering acquisition protocols or increasing radiation dose, U-Net-based AI denoising in photon-counting CT improves the reliability of myocardial scar detection in late iodine enhancement imaging. This supports the clinical utility of CT-based late enhancement as a viable, rapid, and accessible alternative to cardiac MRI for myocardial viability assessment, especially in patients with implanted devices, arrhythmias, or MRI contraindications.
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Nov. 30 – Dec. 4
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R3-STCE2

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Thursday, Dec. 4 10:00AM - 10:30AM Room: LEARNING CENTER THEATER 2

Sub-Events

R3-STCE2-1 COMBINING CT-BASED HEPATIC STEATOSIS ASSESSMENT AND CORONARY ARTERY CALCIUM SCORE FOR IMPROVED CARDIOVASCULAR RISK STRATIFICATION IN ASYMPTOMATIC ADULTS

KANG HEE CHO (*Presenter*)
Ijin Joo, MD, PhD (*Abstract Co-Author*)
Bo Yun Hur (*Abstract Co-Author*)
Yoonseong Lee, MD (*Abstract Co-Author*)

PURPOSE

To assess the value of combining CT-based hepatic steatosis evaluation and coronary artery calcium (CAC) score for cardiovascular risk stratification in asymptomatic adults, and to determine whether CT provides comparable added value to conventional noninvasive steatosis markers such as ultrasound and fatty liver index (FLI).

METHODS AND MATERIALS

This single-center retrospective study included 2,701 asymptomatic adults who underwent health screening with low-dose chest CT, abdominal ultrasound, and coronary calcium scoring CT (January 2023-June 2024). CT images were analyzed using 3D organ segmentation to measure mean CT attenuation values of the liver and spleen. Hepatic steatosis was evaluated via: (1) CT-based parameters (liver Hounsfield units [HU] and liver-spleen HU difference), (2) ultrasound grading, and (3) fatty liver index (FLI), a non-invasive score based on clinical and laboratory data to classify liver fat content. CAC scores were divided into five categories by Agatston score. Cardiovascular disease (CVD) risk groups were determined using Atherosclerotic Cardiovascular Disease (ASCVD) 10-year risk thresholds (>5%, >7.5%, >20%). Logistic regression identified predictors for CVD risk classification, and receiver operating characteristic (ROC) curve analysis compared CAC score alone versus models with hepatic steatosis markers.

RESULTS

CAC grade alone showed good performance across ASCVD risk thresholds, with AUROCs of 0.710-0.720. Adding CT-based hepatic steatosis parameters to CAC significantly improved AUROCs at all thresholds (P<0.001). Specifically, adding liver HU increased AUROCs from 0.712 (95% CI: 0.694-0.729) to 0.752 (0.735-0.768) for ASCVD >5%, from 0.710 (0.693-0.727) to 0.735 (0.718-0.751) for >7.5%, and from 0.720 (0.703-0.737) to 0.736 (0.719-0.753) for >20%. Similarly, the liver-spleen HU difference combined with CAC yielded AUROCs of 0.736 (0.719-0.753), 0.725 (0.708-0.742), and 0.730 (0.713-0.747) at the same thresholds. Ultrasound and FLI also improved performance when added to CAC, with no significant differences among markers (all P>0.05).

CONCLUSION

Combining CAC grade with CT-based hepatic steatosis parameters significantly improves the identification of CVD high-risk status.

CLINICAL RELEVANCE/APPLICATION

Integrated CT-based imaging biomarkers for coronary artery calcium and hepatic steatosis enable enhanced cardiovascular disease screening and risk stratification in asymptomatic adults.

R3-STCE2-2 PANCREATIC FIBRO-INFLAMMATION DETECTED VIA STANDARDISED T1 MAPPING IS CAUSALLY LINKED TO PANCREATIC CANCER: A UK BIOBANK STUDY

Michele Pansini, MD (*Presenter*)
Edward Jackson (*Abstract Co-Author*)
Alessandro Fichera (*Abstract Co-Author*)
Yameng Deng (*Abstract Co-Author*)
George Ralli, DPhil (*Abstract Co-Author*)
Alexandre Triay Bagur, MSc (*Abstract Co-Author*)
Giovanni Morana, MD (*Abstract Co-Author*)
Filippo del Grande, MD (*Abstract Co-Author*)
Andrea Dennis (*Abstract Co-Author*)
Mustafa F. Akisik, MD (*Abstract Co-Author*)
Philip Awadalla (*Abstract Co-Author*)

PURPOSE

To determine whether pancreatic fibroinflammation measured from a population-based abdominal MRI protocol using standardised T1 mapping (srT1) is associated with future pancreatic cancer development and to assess its genetic architecture and causal relevance via Mendelian randomisation.

METHODS AND MATERIALS

In 54,227 UK Biobank participants undergoing a standardised, non-contrast abdominal MRI protocol, we extracted pancreatic srT1 and pancreatic fat content using an automated, scanner-independent pipeline. Incident pancreatic cancer was identified via linked healthcare records. Cox models assessed associations between srT1/PDFF and cancer risk. GWAS and two-sample Mendelian randomisation were conducted to explore genetic determinants and causal inference.

RESULTS

Among participants, 41 developed new-onset pancreatic cancer. Elevated srT1 was significantly associated with cancer risk (adjusted HR per SD = 1.5, 95% CI: 1.1-2.0, p<0.05), independent of confounders and genetic risk. PDFF was not associated with cancer. In MR analyses, srT1 showed a significant causal effect on pancreatic cancer after correcting for pleiotropy (p<0.05), while PDFF did not. GWAS identified 20 loci associated with srT1, including SLC39A8, ABO, and BANK1, genes implicated in inflammation and immune function. Radiological review revealed elevated srT1 in parenchyma and tumours up to two years before diagnosis.

CONCLUSION

Pancreatic fibro-inflammation, quantified via standardised T1 mapping, is causally associated with future pancreatic cancer development. This biomarker captures early parenchymal changes linked to fibroinflammatory processes, suggesting a potential role in cancer risk stratification, especially in non-hereditary populations.

CLINICAL RELEVANCE/APPLICATION

Where implemented, srT1 mapping provides non-invasive, biologically sensitive assessment of pancreatic tissue characteristics, supporting its potential inclusion in future abdominal MRI protocols for early cancer risk stratification.

R3-STCE2-3 ACCURATE LEFT VENTRICULAR EJECTION FRACTION PREDICTION FROM UNGATED CHEST CT BY AI: A MULTI-CENTER STUDY

Jianhang Zhou, MSc (*Presenter*)
Jacek Kwiecinski (*Abstract Co-Author*)
Waseem Hijazi (*Abstract Co-Author*)
Aakash Dhananjay Shanbhag, MSc (*Abstract Co-Author*)
Giselle Ramirez (*Abstract Co-Author*)
Mark Lemley (*Abstract Co-Author*)
Robert Miller (*Abstract Co-Author*)
Paul Kavanagh, MSc (*Abstract Co-Author*)
Joanna Liang (*Abstract Co-Author*)
Leandro Slipczuk, MD,PhD (*Abstract Co-Author*)
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Marcelo F. Di Carli, MD (*Abstract Co-Author*)
Damini Dey, PhD (*Abstract Co-Author*)
Piotr J. Slomka, PhD (*Abstract Co-Author*)

PURPOSE

CT is the most widely used cross-sectional imaging modality in clinical practice worldwide. Left ventricular ejection fraction (LVEF) remains a cornerstone dynamic metric for diagnosing heart failure, stratifying risk, and guiding guideline-directed medical and device therapies. LVEF assessment is not currently possible from non-contrast, ungated CT scans. We aimed to develop an artificial intelligence model to predict LVEF from such scans.

METHODS AND MATERIALS

We considered patients from 9 different clinical sites within the large multi-site registry REFINE PET, which includes gated PET and low-dose, non-contrast CT attenuation correction scans (N = 19,542). LVEF was determined from the gated rest PET scans using standard clinical software. Deep learning models employing ungated CT were applied to quantify cardiac chamber volumes (left and right ventricles, left and right atria), aortic and pulmonary artery volumes, coronary artery calcium score and volume, and epicardial fat volume density. Clinical variables, including age, sex, heart rate, and systolic/diastolic blood pressure, were also incorporated. Subsequently, a boosting regressor was trained to predict the actual LVEF value from ungated CT scans and clinical variables using a leave-one-site-out (LOSO) strategy: 9-fold training on 8 sites and external validation in the 9 th site. External validation results were then concatenated.

RESULTS

The CT-predicted LVEF correlated with the gated PET LVEF (intraclass correlation coefficient = 0.80), with a mean absolute error of 5.7%. Out of 19,542 patients, 18,218 (93%) were correctly classified as LVEF < 40%. The positive predictive value was 80% and the negative predictive value was 96%. The area under the operating-characteristic curve for predicting PET LVEF < 40% was 0.95 [0.94 - 0.95].

CONCLUSION

LVEF can be predicted from non-contrast, ungated, low-dose chest CT, demonstrating strong correlation and high classification accuracy for a clinically relevant threshold in external validation.

CLINICAL RELEVANCE/APPLICATION

We show in rigorous external validation that LVEF can be accurately predicted from low-dose ungated chest CT. This novel approach enables opportunistic, non-invasive, and cost-effective identification of patients with reduced cardiac function.

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R4-SSHN03

Science Session with Keynote: Head and Neck Imaging (Imaging Advances in Head and Neck Cancer Characterization)

Thursday, Dec. 4 11:00AM - 12:00PM Room: E352

Jacqueline Junn, MD (*Moderator*)
Noriyuki Fujima, MD, PhD (*Moderator*)

Sub-Events

R4-SSHN03-2 INTEGRATED DEEP LEARNING-RADIOMICS PROGNOSTIC MODEL AND HBV-DRIVEN T-CELL EXHAUSTION SYNERGISTICALLY REVEAL EBV-MEDIATED RISK IN NASOPHARYNGEAL CARCINOMA

Song Xinyang, MS (*Presenter*)

PURPOSE

We aimed to develop an integrated prognostic model combining deep learning (DL) features, handcrafted radiomics, and clinical variables to predict progression, metastasis, relapse, and survival in Nasopharyngeal carcinoma. Additionally, we explored whether HBV coinfection amplifies EBV-driven risk through immune exhaustion.

METHODS AND MATERIALS

Retrospectively analyzed 1,308 NPC patients. Pretreatment imaging yielded deep learning features via an EfficientNet-B0 network and handcrafted radiomic features selected by LASSO cross-validation. Clinical predictors and, pretreatment plasma EBV DNA load (dichotomized at an optimal threshold), HBV infection status , and an EBV×HBV interaction term. XGBoost models were trained for binary classification of progression, metastasis,dead, and relapse, while a custom XGBoost-Cox model predicted overall survival. Performance was assessed by area under the ROC curve (AUC) and Harrell's C-index using cross-validation. 16 patients , single-cell RNA sequencing of tumor-infiltrating immune cells profiled CD8+ T-cell exhaustion markers. Interaction and mediation analyses evaluated the combined effect of EBV and HBV and the role of liver injury (AST/ALT) as a mediator.

RESULTS

The integrated model achieved AUCs of 0.84-0.92 and C-indices of 0.82-0.90 across endpoints, outperforming single-modality models. Deep learning imaging features alone yielded highest single-modality AUCs (up to 0.91), compared to radiomics (0.59-0.65) and clinical variables (0.51-0.67). EBV×HBV interaction significantly amplified risk: for distant metastasis, interaction OR=5.09 ($p<0.01$) and HR=1.87 ($p<0.01$); for progression, OR=2.60 ($p=0.02$), HR=1.45 ($p=0.06$). HBV status alone had little effect in EBV-negative cases. In HBV?/EBV-high tumors, single-cell data showed CD8? T cells with high PD-1 and CTLA-4 expression, indicating pronounced immune exhaustion, with not mediation by liver injury($P>0.05$).

CONCLUSION

1.A multimodal XGBoost model that integrates deep learning-derived imaging features, radiomics, and clinical variables enables accurate prognostic prediction and risk stratification in nasopharyngeal carcinoma.2.In patients with high EBV viral load, HBV positivity identifies a high-risk subgroup characterized by immune exhaustion.

CLINICAL RELEVANCE/APPLICATION

Our integrated prognostic model combined with radiomics and deep learning, precisely identifies NPC patients at high risk of poor outcomes, especially highlighting that EBV stratification significantly guides prognosis in HBV-positive patients. Recognizing HBV-driven immune exhaustion as a key risk factor provides a rationale for tailored surveillance and targeted immune interventions (anti-PD-1/CTLA-4 therapies).

R4-SSHN03-4 RADIOMIC MODEL ASSOCIATED WITH TUMOR MICROENVIRONMENT PREDICTS IMMUNOTHERAPY RESPONSE AND PROGNOSIS IN PATIENTS WITH LOCOREGIONALLY ADVANCED NASOPHARYNGEAL CARCINOMA

Jie Sun (*Presenter*)
Bin Zhang, MD (*Abstract Co-Author*)
Shuixing Zhang (*Abstract Co-Author*)

PURPOSE

No robust biomarkers have been identified to predict the efficacy of programmed cell death protein 1 (PD-1) inhibitors in patients with locoregionally advanced nasopharyngeal carcinoma (LANPC). We aimed to develop radiomic models using pre-immunotherapy MRI to predict the response to PD-1 inhibitors and the patient prognosis

METHODS AND MATERIALS

This study included 246 LANPC patients (training cohort, n=117; external test cohort, n=129) from 10 centers. The best-performing machine learning classifier was employed to create the radiomic models. A combined model was constructed by integrating clinical and radiomic data. A radiomic interpretability study was performed with whole slide images (WSIs) stained with hematoxylin and eosin (H&E) and immunohistochemistry (IHC). 150 patient-level nuclear morphological features (NMF) and 12 cell spatial distribution features (CSDF) were extracted from WSIs. The correlation between the radiomic and pathological features was assessed using Spearman correlation analysis.

RESULTS

The radiomic model outperformed the clinical and combined models in predicting treatment response (AUC: 0.760 vs. 0.559 vs. 0.652). For overall survival estimation, the combined model performed comparably to the radiomic model but outperformed the clinical model (C-index: 0.858 vs. 0.812 vs. 0.664). Six treatment response-related radiomic features correlated with 50 H&E- (146 pairs, $|r|= 0.31-0.46$) and 2-26 IHC-derived NMF, particularly for CD45RO (69 pairs, $|r|= 0.31-0.48$), CD8 (84, $|r|= 0.30-0.59$), and PD-L1 (73, $|r|= 0.32-0.48$), and CD163 (53, $|r| = 0.32-0.59$). Eight prognostic radiomic features correlated with 11 H&E- (16 pairs, $|r|= 0.48-0.61$) and 2-31 IHC-derived NMF, particularly for PD-L1 (80 pairs, $|r|= 0.44-0.64$), CD45RO (65, $|r|= 0.42-0.67$), CD19 (35, $|r|= 0.44-0.58$), CD66b (61, $|r| = 0.42-0.67$), and FOXP3 (21, $|r| = 0.41-0.71$). In contrast, fewer CSDF features exhibited correlations with specific radiomic features.

CONCLUSION

The radiomic model and combined model are feasible in predicting immunotherapy response and outcomes in LANPC patients. The radiology-pathology correlation suggests a potential biological basis for the predictive models.

CLINICAL RELEVANCE/APPLICATION

We aimed to develop radiomic models using pre-immunotherapy MRI to predict the response to PD-1 inhibitors and the patient prognosis

R4-SSHN03-5 THE PROGNOSTIC VALUE OF INTRA- AND PERI-TUMORAL HABITAT ANALYSIS IN NASOPHARYNGEAL CARCINOMA: COMBINING IVIM AND ASL

Feier Ding, PhD (*Presenter*)
Fan Yang (*Abstract Co-Author*)
Hongmei Zhang, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the value of intravoxel incoherent motion (IVIM) and arterial spin labeling (ASL)-based habitat analysis of intra- and peri-tumoral regions for predicting overall survival (OS) and progression-free survival (PFS) in nasopharyngeal carcinoma (NPC).

METHODS AND MATERIALS

A total of 106 patients were prospectively included. Primary tumors were delineated on T2-weighted imaging, and three peritumoral regions (3, 5, and 10 mm) were automatically dilated and manually corrected according to the clinical tumor volume outlining criteria. The pure diffusion coefficient (D) and mean kurtosis (MK) maps of IVIM, and blood flow (BF) map of ASL were used for habitat analysis. Volume fraction and histogram parameters (Mean, Kurtosis and Skewness) were extracted for each subregion. Univariate and multivariate Cox analyses were used to construct intra- and peri-tumoral, Clinic, and combined models, which were assessed by the C-index. Nomogram, calibration curves, and Kaplan-Meier curves were also plotted.

RESULTS

The intra-tumoral subregion 4 was characterized by high D and low BF and MK value, representing the radiotherapy-resistant subregion and patients with treatment failure had higher proportion of subregion 4. Patients with treatment failure had higher intra-tumoral fraction of habitat 4 (f4). The Intra-score independently predicted OS (hazard radio [HR]: 1.023, P = 0.002) and PFS (HR: 1.028, P = 0.001). The 3 mm ring was selected as the representative region. The combined model showed the highest performance (C-index: 0.800 [OS] and 0.774 [PFS]) and outperformed the Clinic model (C-index: 0.673 [OS] and 0.652 [PFS], P = 0.03). Post-hoc subgroup analysis confirmed robustness.

CONCLUSION

Peri-tumoral regions provide valuable prognostic information. Combining IVIM-ASL-based habitat analysis offers a non-invasive approach to predicting treatment outcomes.

CLINICAL RELEVANCE/APPLICATION

Focus on tumor heterogeneity and the peri-tumoral microenvironment, our study utilized the IVIM-ASL-based habitat analysis to predict long-term survival outcomes in NPC.

R4-SSHN03-6 Keynote Speaker

Noriyuki Fujima, MD, PhD (*Science Invited Presenter*)

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R4-STCE1

Science Session (Imaging-Guided Oncologic Therapies: From Histotripsy to Theranostics and Beyond)

Thursday, Dec. 4 11:00AM - 11:30AM Room: LEARNING CENTER THEATER 1

Sub-Events

R4-STCE1-1 FROM IMAGE TO OUTCOME: PSMA PET BIOMARKERS ASSOCIATE WITH RESPONSE AND SAFETY IN METASTATIC CASTRATION-RESISTANT PROSTATE CANCER (MCRPC) TREATED WITH ACTINIUM-225 PSMA-TARGETED THERAPY

Valentina Marulanda Corzo, MD (*Presenter*)
Charlene Thomas (*Abstract Co-Author*)
Aaron Holmes (*Abstract Co-Author*)
Andres Ricaurte Fajardo, MD (*Abstract Co-Author*)
Samuel Ruder (*Abstract Co-Author*)
Divya Yadav, MBBS (*Abstract Co-Author*)
Sandra Huicochea, MD (*Abstract Co-Author*)
David Nanus, MD (*Abstract Co-Author*)
Neil Bander (*Abstract Co-Author*)
Joseph R. Osborne, MD, PhD (*Abstract Co-Author*)
Scott Tagawa, MD (*Abstract Co-Author*)

PURPOSE

Prostate-specific membrane antigen (PSMA) is a validated therapeutic target in mCRPC. 225Ac-J591, an alpha-emitting radionuclide linked to an anti-PSMA antibody, has been studied in early phase clinical trials. We evaluated baseline and post-treatment (12-week) PSMA PET metrics (SUVmax, SUVmean, and total tumor volume [TTV]) and their association with biochemical response (PSA50), overall survival (OS), and toxicity.

METHODS AND MATERIALS

Patients enrolled in phase I dose-escalation trials of 225Ac-J591 monotherapy (NCT03276572, NCT04506567; n=87) or combination therapy (with 177Lu-PSMA-I&T, NCT04886986, n=18; or pembrolizumab and androgen receptor (AR) inhibitors, NCT04946370, n=12) were included. 68Ga-PSMA-11 PET metrics were quantified using MIM Encore. Endpoints included PSA50, OS, and adverse events. Statistical analyses utilized univariate and multivariate logistic regression for PSA50, Cox regression for OS and Kruskal-Wallis and Wilcoxon rank sum tests for adverse events.

RESULTS

117 patients (median age 71; PSA 58 ng/mL) were included. Prior therapies: chemotherapy (62%), >1 AR inhibitor (53%), immunotherapy (42%), 177Lu-PSMA (28%), radium-223 (17%). Metastases: bone (88%), lymph nodes (63%), visceral (29%). High CALGB (Halabi) risk: 56%. Median baseline SUVmax, SUVmean, and TTV were 50 (31-85), 8.3 (5.7-11.8), and 308 (105-1066), respectively. Baseline SUVmean (OR 1.13, p=0.006) and SUVmax (OR 1.01, p=0.018) were associated with PSA50; only SUVmean remained significant in multivariable analysis (OR 1.11, p=0.023). Baseline SUVmean and TTV were associated with OS (HR 0.95, p=0.025; HR 1.000, p<0.001). TTV, prior chemotherapy, and CALGB risk remained significant in multivariable models (HR 1.00, p = 0.007, HR 1.45, p < 0.001, HR 1.84, p = 0.014). TTV reduction was associated with PSA50 (OR 1.31, p=0.015); SUV changes were not. High TTV was associated with greater myelosuppression (anemia Gr 3/4 vs 1/2 vs 0, p=0.041), but less xerostomia and nausea, suggesting a potential tumor sink effect.

CONCLUSION

Higher baseline PSMA PET metrics, including SUVmean, SUVmax, and TTV are associated with PSA50 response and survival in patients receiving antibody-delivered alpha emitter 225Ac. Higher TTV, yielding more radionuclide delivery to tumor (most commonly bone) is associated with higher grade myelosuppression. However, the tumor antigen sink effect may decrease exposure to other PSMA+ organs leading to less xerostomia and nausea.

CLINICAL RELEVANCE/APPLICATION

Quantitative PSMA PET biomarkers can help radiologists identify patients most likely to benefit from actinium-225-based radioligand therapy and anticipate potential hematologic toxicity, supporting more personalized imaging-guided care in advanced prostate cancer.

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R4-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Thursday, Dec. 4 11:00AM - 11:30AM Room: LEARNING CENTER THEATER 2

Sub-Events

R4-STCE2-1 FROM SIGNAL TO SYMPTOM: NON-CONTRAST TRACTOGRAPHY AS A DIAGNOSTIC BIOMARKER IN SPINAL TUBERCULOSIS

Meemansa Jindal, MD (*Presenter*)
Alpana Manchanda, MBBS,MD (*Abstract Co-Author*)
Anjali Prakash, DMRD (*Abstract Co-Author*)
Sumit Sural (*Abstract Co-Author*)

PURPOSE

To evaluate diffusion tensor imaging (DTI) and tractography as a next-generation, non-contrast neuroimaging technique for assessing epidural extension and spinal canal compromise in spinal tuberculosis (TB), without the need for exogenous contrast agents.

METHODS AND MATERIALS

This cross-sectional study comprised of 30 patients (mean age: 33.7 ±16.7 years) with clinically suspected spinal tuberculosis above L1 (adults) and L3 (children) vertebral levels, who underwent 3.0T MRI with DTI before initiation of treatment. Neurological status was assessed using Japanese Orthopaedic Association (JOA) score. DTI parameters, including fractional anisotropy (FA), apparent diffusivity coefficient (ADC), radial diffusivity (RD) were measured at the site of cord compression and one level above it. Conventional MRI metrics including T2 hyperintensities and spinal canal encroachment (SCE) were also recorded. FT was qualitatively graded into types I-IV (types I,III: no disruption of fibers; types II, IV: with disruption of fibers). Statistical analysis included paired t-tests, Spearman correlation, ROC curve analysis, and Fisher's exact test.

RESULTS

Tractography provided visually intuitive evidence of white matter disruption, even in cases where conventional T2 imaging underestimated neural compromise. Epidural collections exerting mass effect were evident as tract thinning, displacement, or complete fiber loss, without the need for contrast enhancement. Fiber disruption, as seen in type II and IV FT patterns, was significantly associated with JOA<13 (OR 7.5, p=0.0318) and correlated negatively with JOA scores (?= -0.621, p<0.0013). DTI-derived metrics (notably reduced FA and elevated RD) reliably distinguished patients with demyelination and neurological deficit. Significant decrease in FA and increase in ADC and RD were seen at the site of compromise (p<0.001). ROC analysis identified the decrease in FA at the site of cord compromise, as the strongest predictor of neurological deficit (AUC=0.77, sensitivity 100%, specificity 62%).

CONCLUSION

Tractography offers an invaluable tool to visualize and quantify neural involvement and mass effect due to epidural collections, without gadolinium, which not only improves diagnostic efficacy and patient safety, but also aligns with sustainable imaging goals by reducing contrast-related costs and environmental burden.

CLINICAL RELEVANCE/APPLICATION

DTI offers quantitative insights of the spinal cord microstructure in spinal tuberculosis, thereby surpassing conventional MRI in predicting neurological deficit. Incorporating DTI-metrics and tractography in routine MR imaging may enhance prognostication and guide timely intervention.

R4-STCE2-2 FEASIBILITY AND IMAGE QUALITY ASSESSMENT OF ECG-LESS CORONARY CT ANGIOGRAPHY: A COMPARATIVE STUDY WITH CONVENTIONAL ECG-GATED CCTA

Seyedali Nabipoorashrafi, MD (*Presenter*)
Hamid Chalian, MD (*Abstract Co-Author*)
Sanaz Asadian, MD (*Abstract Co-Author*)
Farbod Khosravi, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the image quality of a novel ECG-less coronary CT angiography (CCTA) technique and compare it with conventional ECG-gated CCTA.

METHODS AND MATERIALS

Forty-three subjects with clinically indicated CCTA were prospectively enrolled. ECG-less CCTA was performed throughout the cardiac cycle using a wide-detector CT scanner with fast gantry rotation. Images were reconstructed across seven temporal subranges: one full phase, one ¾-phase, two 1/2-phases, and three ¼-phases. An additional 21 patients, matched for age, sex, BMI, and heart rate, who underwent conventional ECG-gated CCTA, served as the reference group for comparison. CCTA images were evaluated for image quality by two expert readers, using both qualitative (6-point Likert scale) and quantitative (signal-to-noise ratio, SNR) assessments. Evaluations were performed across key coronary vessels, including the left main coronary artery (LMCA), left anterior descending artery (LAD), left circumflex artery (LCX), and right coronary artery (RCA).

RESULTS

There were no significant differences in image quality between the full-phase, 3/4-phase, and 1/2-phase reconstructions and the conventional CCTA across multiple vascular locations, as assessed by both qualitative and quantitative metrics. Likewise, late 1/4-phase reconstructions did not show any significant changes in image quality compared to conventional CCTA, based on Likert scores and SNR for the LMCA. For instance, SNR in the LAD was 22.63 for conventional CCTA, 24.48 for full-phase, and 21.90 for the early ½-phase ($P > 0.05$). However, early and middle 1/4-phase reconstructions showed a statistically significant decline in quantitative and qualitative image quality compared to conventional CCTA ($P < 0.05$).

CONCLUSION

ECG-less CCTA with full-phase, 3/4-phase, and 1/2-phase reconstruction provides diagnostic image quality comparable to conventional ECG-gated CCTA.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the feasibility of ECG-less CCTA using modern wide-detector CT systems for routine clinical evaluation of the coronary arteries. Achieving reliable image quality without ECG leads may simplify protocols, reduce time of imaging, and expand usage CCTA.

R4-STCE2-3 DYNAMIC DIGITAL RADIOGRAPHY-DERIVED PERFUSION INDICES REFLECT STRUCTURAL AND FUNCTIONAL IMPAIRMENT IN COPD WITH EMPHYSEMA

Kojiro Ono (*Presenter*)
Masahiro Okada, MD, PhD (*Abstract Co-Author*)
Takashi Oki (*Abstract Co-Author*)
Yasuhiro Gon (*Abstract Co-Author*)

PURPOSE

Pulmonary emphysema in chronic obstructive pulmonary disease (COPD) leads to reduced alveolar perfusion and impaired gas exchange. While high-resolution CT (HRCT) quantifies structural changes, non-invasive functional assessment of perfusion remains limited. We aimed to evaluate whether perfusion imaging using dynamic digital radiography (DDR) could serve as a quantitative biomarker for emphysema severity.

METHODS AND MATERIALS

This prospective single-center study enrolled 40 patients with stable COPD who underwent DDR, HRCT, and spirometry. From breath-hold DDR sequences, pulmonary perfusion maps were generated, and low signal area (LSA) ratios were calculated based on histogram thresholds (5%, 10%, 15%). CT-derived low attenuation volume (%LAV) and Goddard scores were used as reference structural indices. Pulmonary vessel volume and lung function parameters, including DLco, FEV1, and FVC, were also assessed. Correlations and ROC analyses were performed.

RESULTS

DDR-derived LSA ratios significantly correlated with Goddard scores, with the strongest correlation observed for DDR-10%LSA ratio ($r = 0.672$, $p < 0.0001$). DDR-10%LSA ratio was also positively correlated with CT-%LAV ($r = 0.691$) and negatively with FEV1 %pred ($r = -0.459$) and DLco %pred ($r = -0.380$). In ROC analysis, DDR-10%LSA ratio demonstrated good diagnostic performance for detecting FEV1 %pred < 80% (AUC = 0.863) and DLco %pred < 80% (AUC = 0.794), comparable to CT-%LAV.

CONCLUSION

Pulmonary perfusion mapping using DDR provides a non-invasive method to quantify functional impairment in emphysema. DDR-10%LSA ratio reflects both structural and functional disease burden and may serve as a practical imaging biomarker and potential screening tool for COPD.

CLINICAL RELEVANCE/APPLICATION

DDR-derived pulmonary perfusion maps, particularly DDR-10%LSA ratio, provide a non-invasive, low-radiation marker that reflects both structural damage and perfusion impairment in COPD. This modality holds promise as a practical imaging biomarker for emphysema assessment and clinical decision-making in routine practice.

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R5-STCE1

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Thursday, Dec. 4 1:15PM - 1:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

R5-STCE1-1 ARTERIAL SPIN LABELLING: A CONTRAST-FREE ALTERNATIVE TO DCE FOR PERFUSION EVALUATION OF PERIPHERAL ZONE PROSTATE LESIONS

Riccardo Valletta, MD (*Presenter*)
Vincenzo Vingiani, MD (*Abstract Co-Author*)
Bernardo Proner, MD (*Abstract Co-Author*)
Valentina Corato (*Abstract Co-Author*)
Armin Pycha (*Abstract Co-Author*)
Matteo Bonatti, MD (*Abstract Co-Author*)

PURPOSE

To assess the correlation between perfusion parameters derived from arterial spin labelling (ASL) and the enhancement pattern observed on dynamic contrast-enhanced (DCE) MRI in patients with histologically uncharacterized focal lesions in the peripheral prostate zone.

METHODS AND MATERIALS

This prospective, IRB-approved study included 52 patients with peripheral zone lesions =4 mm and PI-RADS scores =3. All patients underwent 3T MRI with a FAIR True-FISP ASL sequence. Lesions were classified as DCE-positive (DCE+) or DCE-negative (DCE-). Prostatic blood flow (PBF) was measured in both the lesion and adjacent healthy peripheral zone by two radiologists in consensus. PBF ratios (lesion/healthy tissue) were calculated. Statistical analysis included Mann-Whitney U and Wilcoxon tests, with ROC curve evaluation for diagnostic performance.

RESULTS

Lesions had a median diameter of 8 mm (IQR: 6-12 mm). DCE+ lesions (31/52, 60%) showed significantly higher PBF than DCE- lesions (39.17 vs. 19.04 ml/100g/min, $p = 0.0001$). Median PBF ratio was 2.6 (IQR: 1.92-3.15) for DCE+ and 1.09 (IQR: 0.77-1.27) for DCE- lesions ($p < 0.0001$). ROC analysis showed that PBF ratio effectively discriminated between DCE+ and DCE- lesions (AUC = 0.97; 95% CI: 0.87-0.99; $p < 0.0001$). A threshold of >1.66 yielded 86% sensitivity and 100% specificity.

CONCLUSION

ASL shows strong potential as a contrast-free technique for assessing vascularity in peripheral zone prostate lesions. It may serve as a reliable alternative to DCE in patients for whom contrast administration is contraindicated or undesirable.

CLINICAL RELEVANCE/APPLICATION

Arterial spin labelling (ASL) is a promising, contrast-free alternative to dynamic contrast-enhanced MRI for assessing perfusion in peripheral zone prostate lesions, demonstrating high diagnostic performance and potential clinical utility, especially in patients with contraindications to contrast agents.Arterial spin labelling (ASL) is a promising, contrast-free alternative to dynamic contrast-enhanced MRI for assessing perfusion in peripheral zone prostate lesions, demonstrating high diagnostic performance and potential clinical utility, especially in patients with contraindications to contrast agents. Originating from neuroradiological applications, this sequence could become a true alternative to intravenous administration of gadolinium-based chelates in prostate MRI.

R5-STCE1-2 EVALUATION OF RAT SCIATIC NERVE REGENERATION WITH MULTI-PARAMETRIC QUANTITATIVE ULTRASOUND

Yuanshan Wu, PhD (*Presenter*)
Sameer Shah (*Abstract Co-Author*)
Eric Y. Chang, MD (*Abstract Co-Author*)
Michael P. Andre, PhD (*Abstract Co-Author*)
Aiguo Han, PhD (*Abstract Co-Author*)
Victor Barrere, PhD (*Abstract Co-Author*)
Xin Cheng (*Abstract Co-Author*)
Kaixin Pan (*Abstract Co-Author*)

PURPOSE

To evaluate the efficacy of high-frequency quantitative ultrasound (qUS) and multi-parametric analysis in tracking peripheral nerve regeneration after acute and delayed repair of a rat sciatic nerve injury.

METHODS AND MATERIALS

Male Lewis rats underwent sciatic nerve procedures: sham injury (n=8), transection and immediate autograft repair (n=16), or transection and delayed isograft repair (n=14). High-frequency ultrasound imaging (UHF 48 probe, Vevo MD system) was performed at 1-, 2-, and 3-months post-surgery at proximal, intra-graft, and distal nerve locations (Figure A). Quantitative outcomes were extracted from the raw RF data and B mode images, including backscatter coefficient (BSC)-based measurements (iBSC and midband fitted slope), envelope statistics (homodyned K-distribution parameters kappa and mu), and textural/gray-level co-occurrence matrix (GLCM) parameters. A histological grading scheme was applied to classify trichrome-labeled axial nerve sections into low, medium, and high pathological severity. Multi-parametric assessment was performed using principal component analysis (PCA) with support vector machine (SVM) classification. Means were compared using two-way ANOVA and Tukey's Honestly Significant Difference post-hoc test.

RESULTS

qUS parameters showed significant differences among experimental groups at different time and scanning locations. For example, integrated BSC and K parameter revealed differences between sham versus repair groups at graft and distal locations at 1-month, but not 2- or 3-months (Figure B). To better reveal the relationships among qUS parameters, repair efficacy and nerve pathological state, each subject was reclassified based on histological grade (Figure C). Four parameters (mu, cross-

sectional area, normalized iBSC, midband fitted slope) significantly differentiated groups with varying pathological severity. PCA-SVM analysis achieved excellent classification performance (Figure D) with area under ROC curve of 0.90 for distinguishing healthy versus severely injured nerves.

CONCLUSION

Multi-parametric qUS effectively distinguished among experimental groups varying in pathological severity, despite high variability. The integration of multiple qUS parameters indicates that complementary qUS parameters provide information about nerve microstructural changes during early or delayed nerve repairs.

CLINICAL RELEVANCE/APPLICATION

This non-invasive multi-parametric qUS approach could serve as a valuable clinical tool for monitoring peripheral nerve degeneration or regeneration, potentially improving timing and effectiveness of therapeutic interventions before functional connectivity is established.

R5-STCE1-3 GADOLINIUM-FREE MR PERFUSION IMAGINGBASE ON GENERATIVE ADVERSARIAL NETWORKFOR PRIMARY INTRACRANIAL TUMOR DIAGNOSIS

Guoqi Lin, MS (*Presenter*)
Junhuan Hong (*Abstract Co-Author*)
Zhuoting Huang (*Abstract Co-Author*)
Dejun She (*Abstract Co-Author*)

PURPOSE

We aimed to develop a gadolinium-free neural network to generate synthesis CBV (sCBV) maps from non-contrast MRI sequences with diagnostic performance equivalent to DSC-PWI derived CBV maps.

METHODS AND MATERIALS

This multi-center retrospective study analyzed 1092 MRI examinations in the patients with primary intracranial tumors, comprising an internal cohort (train/validation/test: 438/126/63) and an external cohort (test: 465). TA-GAN was developed a tumor-aware generative adversarial network (TA-GAN) to synthesize sCBV maps from various non-contrast MRI sequence combinations. The quality of sCBV maps was evaluated using structural similarity index (SSIM), peak signal-to-noise ratio (PSNR). The diagnostic performance of the sCBV maps was compared against with real CBV (rCBV) maps using area under the curve (AUC), Net Reclassification Improvement and Integrated Discrimination Improvement

RESULTS

The TA-GAN, trained on T2-weighted and Diffusion-weighted non-contrast MRI sequences, achieved the best performance in generating sCBV maps, with a PSNR of 25.52 ± 1.33 dB and SSIM of 67.53 ± 5.88, indicating strong fidelity to original CBV maps. Neuroradiologists rated 95.34% of the synthesized maps as diagnostically acceptable, with a mean quality score of 2.70 ± 0.55 on a 4-point scale, demonstrating both high quality and clinical viability. When compared to rCBV maps, diagnostic performance for glioma grading was comparable. AUCs were 0.66 for sCBV maps vs. 0.61 for rCBV maps (P = 0.51) for all glioma cases, 0.57 vs. 0.60 (P = 0.57) for pediatric gliomas, and 0.73 vs. 0.68 (P = 0.56) for adult gliomas, with no significant differences. These results suggest that TA-GAN-generated sCBV maps offer diagnostic performance nearly equivalent to rCBV maps, making them a promising alternative, particularly when contrast agents are contraindicated or unavailable.

CONCLUSION

The proposed TA-GAN can synthesize sCBV maps from non-contrast MRI, demonstrating diagnostic equivalence to rCBV maps for primary intracranial tumor.

CLINICAL RELEVANCE/APPLICATION

1.TA-GAN generated high-quality sCBV maps from T2WI and DWI-ADC sequences, achieving the best performance among non-contrast inputs (PSNR = 25.52 ± 1.33 dB; SSIM = 67.53 ± 5.88).2.Neuroradiologists rated 95.3% of sCBV maps as clinically acceptable, with an average score of 2.70 (4-point scale), comparable to rCBV maps.3.sCBV maps showed comparable diagnostic performance to rCBV in glioma grading across all subgroups (i.e., pediatric and adult) (P > 0.5), supporting their clinical utility.

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R6-SSBR11

Breast Imaging (Breast Ultrasound Current Status and Applications)

Thursday, Dec. 4 1:30PM - 2:30PM Room: S406A

Richard G. Barr, MD, PhD (*Moderator*)
Ellen B. Mendelson, MD, MA (*Moderator*)

Sub-Events

R6-SSBR11-1 PERFORMANCE METRICS OF SUPPLEMENTAL SCREENING ULTRASOUND IN WOMEN WITH DENSE BREASTS AS A FUNCTION OF AGE

Liane E. Philpotts, MD (*Presenter*)
Katie Jolin, MD (*Abstract Co-Author*)
Lawrence H. Staib, PhD (*Abstract Co-Author*)
Regina J. Hooley, MD (*Abstract Co-Author*)

PURPOSE

Screening ultrasound is a supplemental screening modality for women with dense breasts. Breast density and cancer rates vary with age. Recent federal legislation requires notification of breast density on mammography reports. Medicare has recently denied coverage for supplemental screening ultrasound in women with dense breasts. The purpose of this study is to determine the abnormal interpretation rates (AIR) and supplemental cancer detection of WBUS in conjunction with digital breast tomosynthesis (DBT) screening and compare with women not undergoing WBUS as a function of age.

METHODS AND MATERIALS

An IRB-approved, consent waived, retrospective search of our breast imaging electronic database (PenRad) was performed to identify women with dense breasts who underwent same day DBT and WBUS for a 3-year period (8/1/2020 - 7/31/2023). All exams were batch read (offline). The BI-RADS final assessment category for DBT and WBUS were independently and prospectively reported. The abnormal interpretation rate (AIR= BI-RADS 0,3,4,5) for each were determined. Additional cancers found on WBUS were reviewed. The data was compared for women less than 65 years old (<65) versus those 65 years or older. Statistics analysis was performed using R (Version 4.3.3, 2024, The R Foundation for Statistical Computing) using Fisher's exact test.

RESULTS

93,189 DBT screenings were performed over the study period. Of 60,152 screenings in women <65, 23,672 were dense (39%) and 14,702 (62%) underwent same day DBT+WBUS. Of 33,037 screenings in women 65 and older, 8444 were dense (26%) and 5837 (69%) underwent same day DBT+WBUS. The AIR for women <65 for DBT alone was 16.6% (1492/8970), significantly higher than women undergoing DBT+WBUS 12.5% (1841/14702) (DBT=6.8%, WBUS=7.8%) (p<0.0001). The AIR for women 65 and older undergoing DBT alone was 8.1% (211/2607) and not significantly different than for women undergoing DBT+WBUS, 9.1% (531/5837) (DBT=5.1%, WBUS=5.4%) (p=.13). 24 additional cancers (23 invasive, 1 DCIS) were detected by WBUS for a supplemental CDR of 1.1/1000. Half the cancers were in women <65 (12/14,702, CDR 0.8/1000) and half in women 65 and older (12/5837, CDR 2/1000) for a significantly higher PPV in women 65 and older (p=.024).

CONCLUSION

The metrics for DBT and WBUS varies with age. For women <65, the AIR is less with combined DBT+WBUS than DBT alone whereas for women 65 and older the AIR is similar. The PPV of WBUS in women 65 and older is significantly higher than for those <65.

CLINICAL RELEVANCE/APPLICATION

Combined DBT and WBUS in women 65 years and older with dense breasts has a similar AIR to DBT only, yet has a high PPV for supplemental cancers detected.

R6-SSBR11-2 REDUCING BENIGN BREAST BIOPSIES: REAL-WORLD EVALUATION OF AI-BASED ULTRASOUND DECISION SUPPORT AT TWO ACADEMIC CENTERS

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PURPOSE

Approximately 60-80% of breast biopsies performed in the United States result in benign pathology, highlighting a need for improved diagnostic specificity. The purpose of this study was to evaluate the potential impact of a Food and Drug Administration (FDA)-cleared artificial intelligence (AI)-based decision support tool for breast ultrasound in reducing unnecessary benign biopsies.

METHODS AND MATERIALS

This IRB-approved and HIPAA-compliant study was conducted at two academic medical centers in March and April 2025 following the clinical implementation of an FDA-cleared AI-based decision support tool for breast ultrasound interpretation (Koios DS; New York, NY). Fourteen breast imaging radiologists voluntarily participated by

prospectively documenting cases categorized as BI-RADS 4 with a recommendation for ultrasound-guided biopsy, along with the corresponding Koios DS output. All included cases underwent ultrasound-guided core biopsy, ultrasound-guided aspiration, or surgical excision, with final histopathology serving as the reference standard. Koios DS assessments were compared with biopsy results to evaluate the tool's diagnostic performance and its potential to reduce the benign biopsy rate.

RESULTS

Results : Over the study period, 107 ultrasound-guided biopsies were performed in 102 patients (mean age 55.4 years, range 27-92 years). Of these, 23.4% (25/107) yielded malignant pathology, while 76.6% (82/107) were benign. The AI algorithm classified 96.0% (24/25) of malignant lesions as BI-RADS 4 and 4.0% (1/25) as BI-RADS 3. The single malignancy assessed as BI-RADS 3 by the AI tool was a 6-mm grade 1 invasive ductal carcinoma in a 77-year-old woman. Among benign cases, the AI tool assigned 46.3% (38/82) as BI-RADS 2, 22.0% (18/82) as BI-RADS 3, and 31.7% (26/82) as BI-RADS 4. Retrospective application of the AI output to biopsy triage decisions suggests that 68.3% (95% CI 58.3-78.3%) of benign biopsies could have been avoided, with only one malignant case potentially missed.

CONCLUSION

The AI-based decision support tool demonstrates strong potential to reduce unnecessary biopsies of benign breast lesions - by nearly 70% - while maintaining high sensitivity for the detection of malignancies. These findings suggest that AI integration can enhance the specificity of breast ultrasound interpretation in clinical practice.

CLINICAL RELEVANCE/APPLICATION

Integrating AI into breast ultrasound workflows may substantially decrease benign biopsy rates and enhance clinical decision-making.

R6-SSBR11-3 DEEP LEARNING WITH MULTI-MODAL ULTRASOUND FOR CLASSIFICATION OF METASTATIC AND REACTIVE AUXILIARY LYMPH NODES

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PURPOSE

To develop and validate a deep learning (DL) network based on multi-modal ultrasound (US) imaging for precisely classifying metastatic and non-metastatic axillary lymph nodes (ALNs) in breast cancer patients.

METHODS AND MATERIALS

The proposed method utilized tri-modal US imaging consisting of conventional ultrasound B-mode images with shear wave elastography (SWE) and color Doppler (CD) images to train a customized deep learning network for ALN classification. The proposed network comprised convolutional layers with mixed pooling, weighted sum mixed pooling and squeeze-and-excite attention mechanisms for the first time in the context of ALN classification. We validated the method using in-vivo dataset comprising tri-modal US images of ALNs of 174 breast cancer patients. This prospective study was conducted under an Institutional Review Board-approved and HIPPA-compliant protocol with signed informed consent obtained from each enrolled patient.

RESULTS

The proposed method achieved a classification accuracy (Acc) of 0. 93, a specificity (Sp) of 1. 00, an area under the ROC curve (AUC) of 0. 99, a sensitivity (Se) of 0. 90, an F-1 score of 0. 95 and an area under precision-recall curve (AUC p) of 0. 99. The use of multi-modal US with proposed deep learning model showed a classification accuracy of 0.93 compared to single-modal, B-mode, SWE, and CD US with accuracy of 0.81, 0.88, 0.84, respectively. The proposed mixed pooling and attention mechanisms considerably improved the specificity from 0. 96 and 0. 94 respectively to 1, and AUC from 0. 94 and 0. 93 respectively, to 0. 99. Further, the proposed network (Acc : 0.93) outperformed state-of-the-art deep learning networks (Acc : 0. 67- 0. 88) for ALN classification.

CONCLUSION

Integrating multi-modal ultrasound imaging with a novel customized deep learning network improves the classification of metastatic and reactive ALNs in breast cancer patients. Comparison studies indicate the proposed method's superiority over the state-of-the-art networks trained with our multi-modal US dataset. The finding shows its ability to accurately identify all metastatic ALN cases, reducing unnecessary biopsies.

CLINICAL RELEVANCE/APPLICATION

Integrating multimodal ultrasound with a customized deep learning model boosts diagnostic specificity, reduces unnecessary biopsies and accurately identifies metastatic axillary lymph node in breast cancer patients.

R6-SSBR11-4 PERFORMANCE OF STANDALONE AI IN AUTOMATED BREAST US FOR BREAST CANCER SCREENING: OUTCOMES ACROSS DIFFERENT APPLICATION STRATEGIES

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PURPOSE

To evaluate diagnostic performance of supplemental automated breast US (ABUS) interpreted by a radiologist (ABUS-radiologist) or standalone AI (ABUS-AI) with digital mammography (DM), compared to DM alone in asymptomatic women, and to assess the effectiveness of DM and ABUS-AI based selective ABUS reading strategy for breast cancer screening.

METHODS AND MATERIALS

In this multicenter retrospective study, asymptomatic women who underwent DM and supplemental ABUS screening for breast cancer between March 2022 and March 2023 were analyzed. We evaluated the performance measures including cancer detection rate (CDR), sensitivity, specificity and abnormal interpretation rate (AIR) of DM alone, DM plus ABUS reading by radiologists (DM+ABUS-radiologist) and DM plus standalone ABUS-AI report (DM+ABUS-AI). We assessed performance gains and workload reduction by applying a selective ABUS reading strategy to DM- or ABUS-AI-recalled cases, compared to DM+ABUS radiologist reassessments.

RESULTS

Among 2275 screening examinations in 2275 women (mean age, 56.1 years±8.6 [SD]), 13 cancers were diagnosed (mean invasive tumor size, 1.1 cm). With DM alone, DM+ABUS-radiologist, and DM+ABUS-AI, the CDRs were 3.1 per 1000 screening examinations (7/2275, 95% CI: 1.2, 6.3), 4.4 per 1000 screening examinations (10/2275, 95% CI: 2.1, 8.1), and 4.8 per 1000 screening examinations (11/2275, 95% CI: 2.4, 8.6), respectively. The AIRs were 6.5% (149/2275, 95% CI: 5.6, 7.6), 16.7% (379/2275, 95% CI: 15.1, 18.3), and 16% (365/2275, 95% CI: 14.6, 17.6). Two cancers not detected by both DM and ABUS-AI was 0.4cm invasive ductal carcinoma and 1.8 cm mucinous carcinoma. Implementing a selective ABUS reading strategy—triaging cases with negative results on both DM and ABUS-AI as negative, and reviewing ABUS images only when either indicated a recall—resulted in an 84% workload reduction, with 1,910 cases triaged as negative and 365 recalled. With a selective ABUS reading strategy, AIR decreased to 7.6% (345/4450; P<.001) and specificity improved to 92.9% (4201/4524, P<.001), while CDR 4.8 per 1000(22/4550; P=.564) and sensitivity 84.6% (22/26; P=.559) were maintained, compared to DM+ABUS-radiologists reading.

CONCLUSION

The addition of ABUS, whether interpreted by a radiologist or AI, to DM resulted in a modest increase in the CDR but was accompanied by a substantial rise in the AIR. A screening strategy that uses standalone ABUS-AI and DM for initial triage, with subsequent radiologist review of ABUS images only in selected cases, appears feasible.

CLINICAL RELEVANCE/APPLICATION

Selective ABUS reading strategy based on DM and ABUS-AI results may decrease number of false positive recalls and reduce radiologists' workload without compromising cancer detection.

R6-SSBR11-5 ECHOGENIC RIND ASSOCIATED WITH SUSPICIOUS MASSES: WHAT CAN IT PREDICT?

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PURPOSE

In the upcoming BI-RADS Atlas, 6 th edition, "echogenic rind", defined as a thick echogenic band surrounding part or all of a mass, is a proposed new ultrasound associated feature. This study's purpose is to determine the pathological outcomes associated with an echogenic rind in the setting of a suspicious mass.

METHODS AND MATERIALS

This retrospective cohort study reviewed all BI-RADS 4 and 5 final assessment masses that underwent ultrasound-guided biopsy at our academic institution from 7/1/2022 to 12/12/2022. Following a training session, two fellowship-trained breast radiologists (experience: 9 and 25 years), who were blinded to all outcomes, independently reviewed pre-biopsy ultrasound images to identify the presence of an echogenic rind and record rind and mass size measurements. Echogenic rind presence was defined as surrounding at least 25% of the mass by both readers. Outcome data were analyzed using bivariable analysis.

RESULTS

There were 200 patients (mean age 53 years, range: 17-97) with 224 suspicious masses for analysis. The cohort's malignancy rate was 41% (91/224): 86% (78/91) IDC, 8% (8/91) ILC, 5% (5/91) DCIS. The incidence of an echogenic rind was 27% (60/224). Suspicious masses with a rind were more likely to be malignant (82%, 49/60) than masses without a rind (26%, 42/164), $p<0.001$. Of 91 malignancies, 54% (49/91) had a rind. Malignancies with a rind were more likely to be IDC (95%, 44/19 than malignancies without a rind (81%, 34/42), $p=0.02$. Malignancies with a rind were associated with luminal A molecular subtype (84%, 42/49) compared to malignancies without a rind (48%, 20/42), $p<0.01$. There was no association with nuclear grade or lymphovascular invasion. Compared to the final surgical pathology measurements, imaging underestimated the tumor size measurements. However, measurements were more accurate when the rind was included (mean underestimation 1 mm [r=0.90] for reader 1 and 3 mm [r=0.84] for reader 2) than when the rind was excluded (mean underestimation 3 mm [r=0.84] for reader 1 and 5 mm [r=0.89] for reader 2).

CONCLUSION

An echogenic rind is significantly associated with malignancy among suspicious masses. Malignant masses with a rind are more likely to be IDC and luminal A molecular subtype. Measurements including the rind will reduce imaging underestimation of tumor size.

CLINICAL RELEVANCE/APPLICATION

Radiologists should pay close attention when an echogenic rind is associated with a suspicious mass as this not only increases the likelihood of malignancy and ensures more accurate measurements, but also suggests a more favorable biological profile when the mass is malignant.

R6-SSBR11-6 COMPARISON OF INTEGRATED VS. SEQUENTIAL AI-CAD IN BREAST US: A PROSPECTIVE PILOT STUDY ON SCAN TIME, REPRODUCIBILITY, AND DIAGNOSTIC PERFORMANCE

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PURPOSE

This study aimed to compare the scan time, reproducibility, and diagnostic performance of two types of artificial intelligence-based computer-aided diagnosis (AI-CAD) systems for breast ultrasound (US).

METHODS AND MATERIALS

We enrolled 242 patients who visited the breast imaging center for US examination between January and February 2025. Breast US was performed using two types of real-time AI-CAD: integrated AI-CAD (for lesion detection and diagnosis) and sequential AI-CAD (for these tasks separately). Scan time was compared in 97 patients by performing two breast US examinations using each AI-CAD in the same patient, with the order randomized. Reproducibility of each AI-CAD was assessed and compared in another 145 patients (215 lesions) by applying both systems to the same lesion twice, separately. Diagnostic performance of two AI-CAD was compared in all 242 patients in terms of sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and area under the receiver operating characteristic curve (AUC).

RESULTS

The scan time was significantly longer for sequential AI-CAD compared to integrated AI-CAD ($p < 0.001$), regardless of scan order. Reproducibility was excellent for both (integrated: 0.809, sequential: 0.83). Integrated AI-CAD had higher reproducibility in malignant (0.918 vs. 0.762) and non-mass lesions (1.0 vs. 0.75), while sequential AI-CAD performed better in mass lesions (0.837 vs. 0.792). Integrated AI-CAD showed higher sensitivity (87.6% vs. 76.9%) but lower specificity (74.2% vs. 90.0%). Sequential AI-CAD showed higher positive predictive value (PPV) (83.3% vs. 68.8%), while integrated AI-CAD had higher negative predictive value (NPV) (90.2% vs. 85.7%). AUC was not different. Both systems had lower accuracy in non-mass lesions, with no significant difference.

CONCLUSION

Sequential AI-CAD showed higher specificity, while integrated AI-CAD had better sensitivity and shorter scan time. Both systems had high reproducibility, with integrated AI-CAD excelling in malignant and non-mass lesions, and sequential AI-CAD in mass lesions.

CLINICAL RELEVANCE/APPLICATION

Understanding the strengths and trade-offs of integrated versus sequential AI-CAD systems can guide optimal selection based on clinical priorities. These insights support tailored application of AI-CAD systems in real-time breast US practice.

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R6-SSCA11

Cardiac Imaging (Advanced CCT)

Thursday, Dec. 4 1:30PM - 2:30PM Room: E353C

Damini Dey, PhD (*Moderator*)
Antonio Esposito, MD (*Moderator*)

Sub-Events

R6-SSCA11-2 PROGNOSTIC ROLE OF CT-DERIVED EXTRACELLULAR VOLUME FRACTION IN AORTIC STENOSIS PATIENTS UNDERGOING TRANSCATETHER AORTIC VALVE IMPLANTATION ACROSS FLOW-GRADIENT PATTERNS

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Davide Vignale (*Abstract Co-Author*)
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Antonio Esposito, MD (*Abstract Co-Author*)

PURPOSE

Aortic stenosis (AS) causes myocardial microstructural modifications, such as the development of interstitial fibrosis, which negatively impacts patients' prognosis. Echocardiography, the gold standard for AS phenotypization, recognizes different AS subtypes, with the low-flow low-gradient (LF-LG) having the worst prognosis; however, it can't investigate myocardial microstructural changes. CT -routinely performed for pre-procedural Transcatheter Aortic Valve Implantation (TAVI) planning- can be implemented with delayed scans to assess myocardial fibrosis as extracellular volume fraction (ECV) quantification. The prognostic role of ECV in these patients has already been demonstrated. However, it is unknown whether ECV delivers additional prognostic information compared to the echocardiographic flow-gradient pattern. Hence, the study aims to investigate the capacity of ECV to improve risk stratification on top of echocardiographic classification (LFLG AS vs high-gradient -HG-AS).

METHODS AND MATERIALS

In this single-center prospective observational study, consecutive patients undergoing TAVI (October 2020-March 2023) were enrolled and categorized as LF-LG or HG AS based on echocardiography. ECV was calculated from a 5-minute delayed CT-scan. After 1 year, a composite endpoint of death and heart failure hospitalization was collected.

RESULTS

392 patients were enrolled (median age 82 [78-86] years), and 87 reached the endpoint. ECV was higher in patients developing the outcome (30.2 [27.4-34.3] vs 28 [25.4-31.4] %, p<.001) and in those with LF-LG AS (31.9 [27.6-35.6] vs 28.0 [25.4-31.0]% in HG, p<0.001). At Kaplan-Meier analysis, the ECV cut-off of 29% and the flow-gradient pattern significantly differentiated patients reaching the endpoint (Log-rank p<0.001). Adding ECV to the echocardiographic classification improved risk stratification: patients with low ECV had the best prognosis regardless of the flow-gradient pattern, whereas LF-LG AS with high ECV had the worst (log-rank p<.001). The result was also confirmed after excluding patients with ECV>40%, who have a high suspicion of concomitant cardiac amyloidosis.

CONCLUSION

In patients with severe AS who are candidates for TAVI, ECV improves risk stratification in addition to the echocardiographic classification.

CLINICAL RELEVANCE/APPLICATION

The results of this study enlighten the pivotal role of interstitial fibrosis in determining AS patients' prognosis and remark the importance of CT as a tool to non-invasively quantify fibrosis in TAVI candidates, which could become the target of anti-remodeling and anti-fibrotic therapies. Hence, CT is emerging as a powerful tool for patient selection, treatment monitoring, and personalized management of AS.

R6-SSCA11-3 CALCIUM VOLUME VS. DENSITY IN PREDICTING MAJOR ADVERSE CARDIAC EVENTS: AN ANALYSIS ON CALCIUM CHARACTERISTICS ON CAC CT

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Gabrielle Gershon, BS (*Abstract Co-Author*)
Jaret Barr (*Abstract Co-Author*)
Carlo N. De Cecco, MD, PhD (*Abstract Co-Author*)
Marly Van Assen, MSc, PhD (*Abstract Co-Author*)

PURPOSE

The purpose of this study is to evaluate the effect of calcium density and volume concordance and discordance in predicting major adverse cardiac events (MACE) outcomes.

METHODS AND MATERIALS

This retrospective study included coronary artery calcium (CAC) CT imaging from 2,647 individuals without known cardiac disease, not taking lipid-lowering medications, between 2010-2023 who had positive CAC and a minimum of a 3-year follow up period. Cardiac CT images were analyzed using a previously validated convolutional neural network to derive CAC scores (Agatston), CAC average density and CAC total volume. MACE events were determined from ICD9, ICD10, and CPT codes. The population was divided into four mutually exclusive groups based on characteristics of their calcium: high density and high volume, high density and low volume, low density and high volume, and low density and low volume. The high/low thresholds were made based on median calcium density median volume of the 2,647 patients. Time-to-event outcomes were analyzed using Kaplan-Meier curves to estimate cumulative incidence, with group comparisons performed using the log-rank test.

RESULTS

Out of the 2,647 patients, the mean age was 60 years, 9% (235) patients were Black, and 36% (949) patients were female with a mean follow-up time of 5.5 years. The total number of patients who experienced MACE was 263 (9%). The median total CAC score was 46 (IQR 8 - 198). The median calcium density was 195 HU (IQR 165 - 224), and the median calcium volume was 49 mm3 (IQR 14 - 187 mm3). From these medians, 37% (978) of patients were classified in the high density and high

volume group, 13% (345) of patients were classified in the high density and low volume group, 13% (345) of patients were classified in the low density and high volume group, and 37% (979) of patients were classified in the low density and low volume group. The MACE cumulative incidence curves demonstrated that groups with high calcium volume- regardless of density- had significantly higher rates of MACE compared to low volume groups (p<0.001).

CONCLUSION

This finding suggests that calcium volume is the primary driver of MACE prediction. Discordance in CAC volume and density showed no added predictive value.

CLINICAL RELEVANCE/APPLICATION

These findings suggest that calcium volume is the main driver of MACE risk in a patient population not on lipid lowering medication.

R6-SSCA11-4 DEEP LEARNING-DRIVEN VIRTUAL CORONARY CT ANGIOGRAPHY FOR QUANTITATIVE STENOSIS EVALUATION

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Qiqi Xu, MBBS, MMEd (*Abstract Co-Author*)
Zicheng Zhao (*Abstract Co-Author*)
Hang Jin, PhD (*Abstract Co-Author*)
Mengsu Zeng, PhD (*Abstract Co-Author*)

PURPOSE

To develop a deep learning algorithm for synthesizing virtual Coronary CT Angiography (CCTA) images from Non-Contrast CT (NCCT) images, and evaluate its feasibility for quantitative stenosis analysis.

METHODS AND MATERIALS

In this single-center prospective study (June 2024-February 2025), we enrolled 560 patients (mean age ± SD: 61.8 ± 11.6 years; 288 males and 272 females) with paired NCCT and CCTA acquired in the same session. Each image pair underwent registration to ensure anatomical alignment. The dataset was split into 398 for the training set, 50 for the validation set, and 112 for the internal test set. A pix2pix conditional generative adversarial network (GAN) was trained to generate virtual CCTA from NCCT. Coronary stenosis in virtual CCTA was assessed using a clinical algorithm, with real CCTA stenosis, labeled by an experienced radiologist, as the reference standard. Then, the stenosis of virtual CCTA was quantitatively evaluated by two metrics: sensitivity and specificity for detecting stenosis (>50% or >75% threshold) across three main coronary branches: left anterior descending (LAD), left circumflex (LCX), and right coronary artery (RCA).

RESULTS

Of 336 main coronary branches in 112 test patients, 243 were analyzed after excluding 93 with severe artifacts or stents. Real CCTA identified 23 branches with >50% stenosis and 9 with >75% stenosis by radiologist. Virtual CCTA achieved 87% sensitivity (20/23; 95% CI: 71-100%) and 84% specificity (185/220; 95% CI: 79-89%) at the >50% threshold, and 78% sensitivity (7/9; 95% CI: 50-100%) and 90% specificity (211/234; 95% CI: 86-94%) at the >75% threshold.

CONCLUSION

A pix2pix GAN effectively synthesized virtual CCTA from NCCT, demonstrating high concordance with real CCTA for stenosis quantification.

CLINICAL RELEVANCE/APPLICATION

Virtual CCTA offers a potential alternative to contrast-enhanced CCTA, reducing iodinated contrast media use and mitigating stenosis overestimation from calcified plaque blooming artifacts.

R6-SSCA11-5 NORMAL-RESOLUTION VS. SUPER-RESOLUTION DEEP LEARNING RECONSTRUCTION FOR DIAGNOSIS OF FUNCTIONALLY SIGNIFICANT CORONARY STENOSIS USING CARDIAC CT

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Takamura Kazuhisa (*Abstract Co-Author*)
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Tohru Minamino (*Abstract Co-Author*)
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PURPOSE

The purpose of this study was to compare the diagnostic performance of CT fractional flow reserve (CT-FFR) using normal-resolution deep learning reconstruction (NR-DLR) and super-resolution deep learning reconstruction (SR-DLR) for the detection of functionally significant stenosis as assessed by invasive FFR.

METHODS AND MATERIALS

This single-center retrospective study included 129 patients (mean age, 69 years ± 11 [SD]; 94 men) who underwent coronary CT angiography followed by invasive FFR between February 2022 and March 2025. Computational fluid dynamics was used to calculate the CT-FFR using NR-DLR and SR-DLR images. Per-vessel diagnostic performance for detecting FFR =0.80 on coronary angiography was compared by analyzing receiver operating characteristic (ROC) curves.

RESULTS

Of the 157 vessels evaluated, 70 vessels (45%) had functionally significant stenosis. The median (interquartile range) calcium score was 421 (142-896). CT-FFR calculated with NR-DLR (mean difference: -0.056; 95% CI: -0.086, -0.026; p <0.001) overestimated ischemia compared to invasive FFR. However, there was no evidence of a difference between CT-FFR and invasive FFR using SR-DLR (mean difference: -0.017; 95% CI: -0.037, 0.004; p = 0.11). The area under the ROC curve for the diagnosis of functionally significant stenosis was higher for SR-DLR (0.85; 95% CI: 0.78, 0.91) than for NR-DLR (0.72; 95% CI: 0.64, 0.81; p = 0.002). The diagnostic accuracy of SR-DLR (85%; 134 of 157 vessels; 95% CI: 79, 90) was better than that of NR-DLR (74%; 116 of 157 vessels; 95% CI: 66, 81; p <0.001). The sensitivity of SR-DLR (87%; 61 of 70 vessels; 95% CI: 77, 94) was also better than that of NR-DLR (70%; 49 of 70 vessels; 95% CI: 58, 80; p = 0.002). There was no evidence of a difference in specificity between SR-DLR (84%; 73 of 87 vessels; 95% CI: 74, 91) and NR-DLR (77%; 67 of 87 vessels; 95% CI: 67, 85; p = 0.08).

CONCLUSION

SR-DLR improved the diagnostic performance of CT-FFR over NR-DLR in detecting functionally significant stenosis as assessed by invasive FFR.

CLINICAL RELEVANCE/APPLICATION

SR-DLR would increase the feasibility of coronary CT angiography by improving the accuracy of computational fluid dynamics to detect functionally significant stenosis compared to NR-DLR.

R6-SSCA11-6 CORONARY CT ANGIOGRAPHY TO DIAGNOSE HEALING OF SPONTANEOUS CORONARY ARTERY DISSECTION: COMPARISON WITH INVASIVE ANGIOGRAPHY

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Andrea Biondo (*Abstract Co-Author*)
Alexander Gotschy (*Abstract Co-Author*)
Robert Manka (*Abstract Co-Author*)
Matthias Eberhard, MD (*Abstract Co-Author*)
Hatem Alkadhi, MD (*Abstract Co-Author*)

PURPOSE

Spontaneous coronary artery dissection (SCAD) is a rare, underdiagnosed cause of myocardial infarction (MI), especially in younger women without traditional cardiovascular risk factors. Diagnosis and follow-up imaging is usually performed with invasive coronary angiography (ICA). This study aimed to evaluate the accuracy of coronary computed tomography angiography (CCTA) to diagnose healing of SCAD.

METHODS AND MATERIALS

In this prospective single-center study, 20 patients with 24 coronary segments showing SCAD underwent ICA and CCTA both in the acute phase (median time after symptom onset to CCTA 3 days) and during follow-up (median time 106 days). SCAD was classified at follow-up CCTA as healed or non-healed using ICA as the reference standard.

RESULTS

At follow-up, ICA showed healing in 19 (79%) and no healing in 5 (21%) SCAD lesions. CCTA had an overall accuracy of 79% in diagnosing SCAD healing, with a positive predictive value of 100%. 20 (83%) Segments were evaluable with CCTA and were significantly larger (median 2 mm, IQR, 1.5-2.7 mm) than those (n=4, 17%) being non-evaluable (median 1 mm, IQR, 0.8-1.2 mm, $p<0.001$), and vessel size with a median above 1.5 mm (IQR, 1.3-2.5 mm) showed a higher accuracy to diagnose SCAD healing with CCTA than below (median 0.7mm, IQR, 0.7-0.8mm, $p<0.001$).

CONCLUSION

Our study indicates that CCTA can serve as a non-invasive alternative to ICA for monitoring SCAD healing, especially in proximal and mid-coronary lesions with diameters >1.5 mm.

CLINICAL RELEVANCE/APPLICATION

The high positive predictive value of CCTA and its safety profile support the use in follow-up imaging to reduce the risks associated with repeated invasive angiography.

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Abstract Archives of the RSNA, 2025

R6-SSCH10

Chest Imaging (Infection/Miscellaneous)

Thursday, Dec. 4 1:30PM - 2:30PM Room: E451A

Yeon Joo Jeong, MD, PhD (*Moderator*)
Andrew J. Plodkowski, MD (*Moderator*)

Sub-Events

R6-SSCH10-3 THORACIC INJURY PATTERNS IN FEMALE PATIENTS REPORTING INTIMATE PARTNER VIOLENCE COMPARED TO MATCHED CONTROLS

Emma Blassel, MD (*Presenter*)

PURPOSE

To investigate thoracic injury patterns, including fractures, visceral, pleural, and soft tissue injuries, among female survivors of intimate partner violence (IPV) compared to age- and race-matched female trauma controls, aiming to identify imaging features that may aid in recognizing IPV.

METHODS AND MATERIALS

This retrospective case-control study analyzed radiology reports from female IPV patients (n = 1,183) and matched controls (n = 4,105) at a large academic center (2013-2018). Thoracic injuries, including rib, clavicle, scapula, sternum, thoracic spine fractures; visceral injuries (lung, aorta, mediastinum); pleural injuries (effusion, hemothorax); and soft tissue injuries were compared between groups. Adjusted incidence rate ratios (IRRs) and p-values were calculated using Poisson regression, and injury distributions were summarized as percentages.

RESULTS

Cases showed significantly more thoracic injuries (11%, 131/1,183) compared to controls (3.5%, 145/4,105; IRR 4.02, $p < 0.0001$). Among thoracic injuries, fractures (rib, clavicle, scapula, sternum) accounted for 51% in cases vs. 63% in controls (IRR 3.24, $p < 0.0001$); thoracic spine fractures, 29% vs. 25% (IRR 4.78, $p < 0.0001$); visceral injuries, 7% vs. 2% (IRR 12.84, $p = 0.0002$); pleural injuries, 7% vs. 9% (IRR 3.00, $p = 0.01$); soft tissue injuries, 5% vs. 1% (IRR 1.20, $p = 0.003$). Among rib fractures, IPV cases showed significantly more posterior (27.7% vs. 24.5%), lower (67.9% vs. 74.2%), and bilateral (21% vs. 9%) fractures (all $p < 0.01$). Demographic analysis showed significantly more IPV cases aged 30-39 and fewer aged 60-69 ($p < 0.01$), as well as significantly more Black IPV patients and fewer White IPV patients ($p < 0.01$) compared to controls.

CONCLUSION

Female IPV survivors demonstrate distinctive thoracic injury patterns, including higher rates of rib and thoracic spine fractures, elevated visceral and pleural injury rates, and a greater overall thoracic injury burden compared to controls. Recognizing these patterns on imaging may help radiologists raise suspicion for IPV, improving early identification and clinical intervention.

CLINICAL RELEVANCE/APPLICATION

This study highlights distinct thoracic injury patterns in female survivors of intimate partner violence (IPV), which differ significantly from matched trauma controls. Recognizing these imaging features, particularly patterns of rib and thoracic spine fractures along with associated visceral and pleural injuries, can help radiologists raise suspicion for IPV. Early identification through imaging may support timely clinical intervention, improve patient outcomes, and enhance multidisciplinary care for a vulnerable population.

R6-SSCH10-4 PREDICTION OF PULMONARY FUNCTION FOR PATIENTS WITH PULMONARY TUBERCULOSIS VIA A MULTI-TASK LEARNING MODEL

Joon Park, MD (*Presenter*)
Namkug Kim, PhD (*Abstract Co-Author*)
Young Ae Kang (*Abstract Co-Author*)
Sei Won Lee (*Abstract Co-Author*)
Jimin Kwon, MD (*Abstract Co-Author*)
Hyunjung Park, MSc (*Abstract Co-Author*)
Seonggyu Jegal (*Abstract Co-Author*)
Jongjun Won, BS (*Abstract Co-Author*)

PURPOSE

Pulmonary function testing (PFT) is essential for assessing respiratory impairment, but conducting these tests in patients with tuberculosis (TB) can be technically challenging due to severe structural abnormalities and limited availability in underdeveloped countries. To develop a multi-task deep learning (MTL) model that predicts PFT values as a main task, with lung and TB lesion segmentation and reconstruction as sub-tasks in simple chest X-ray.

METHODS AND MATERIALS

We implemented a MTL model based on the Inception-ResNet-v2 architecture, with an auxiliary injection layer to incorporate patient height and gender. The model was trained using 32,627 paired chest X-rays (posteroanterior or anteroposterior) and PFT within 6 months collected between 2013 and 2022. Patients were included if they had a diagnosis of active TB, TB sequelae, or radiologic reports of chest computed tomography (CT) or radiography (CXR) containing TB-related terms (e.g., tuberculosis, tuberculoma, and tubercle). A temporally independent test set of the most recent 3,262 cases was used for evaluation. Remaining 29,365 cases were randomly split into train and valid dataset with 8:1 ratio.

RESULTS

On the test set, the MTL model achieved Pearson correlation coefficients of 0.876 (99% CI: 0.863-0.888) for forced vital capacity (FVC) and 0.800 (99% CI: 0.781-0.818) for forced expiratory volume in one second (FEV1). The mean absolute error (MAE, mean ± SD) for FVC prediction by the MTL model was 0.340 ± 0.285 L, which was significantly lower than that of the single-task model (0.352 ± 0.299 L; paired t -test: $t = -2.543$, $p < 0.01$). In contrast, for FEV1 prediction, the difference in MAE

between the MTL model (0.329 ± 0.279 L) and the single-task model (0.331 ± 0.286 L) was not statistically significant (t = -0.374, p = 0.71). Bland-Altman analysis of the MTL model showed 95% limits of agreement (LoA) of -0.859 L to 0.880 L (mean = 0.010 L) for FVC and -0.895 L to 0.783 L (mean = -0.056 L) for FEV1. In the subgroup of patients with FVC values below the test-set mean of 2.93 L, the model showed reduced error variability, with LoAs of -0.902 L to 0.681 L (mean = -0.111 L) for FVC and -0.851 L to 0.621 L (mean = -0.115 L) for FEV1, suggesting stable predictive performance in individuals with reduced lung function.

CONCLUSION

The proposed MTL model accurately predicts FVC and FEV 1 in TB-affected patients, including those with significant architectural abnormalities of the lungs.

CLINICAL RELEVANCE/APPLICATION

This model could be used as accurate, non-invasive estimation of pulmonary function from chest X-rays in tuberculosis patients, especially where resources are limited or structural abnormalities hinder conventional testing.

R6-SSCH10-5 CORRELATION BETWEEN THE THICKENING FRACTION AND DIAPHRAGMATIC EXCURSION MEASURED BY ULTRASOUND WITH THE REINTUBATION FREQUENCY IN MECHANICALLY VENTILATED PATIENTS, IN ADDITION TO THE UNIFIED CLINICAL STANDARD PROTOCOL

Lourdes Marcos Ramirez, MD (*Presenter*)
Antonio Augusto Gordillo Moscoso (*Abstract Co-Author*)
GABRIELA VIRGINIA ESCUDERO LOURDES (*Abstract Co-Author*)
Jorge Guillermo Reyes Vaca (*Abstract Co-Author*)

PURPOSE

The study aims to assess the correlation between diaphragmatic thickening fraction and excursion, measured by ultrasound, with reintubation frequency in mechanically ventilated patients, and the impact of a unified clinical protocol. Secondary objectives include evaluating intubation duration and patient pathologies.

METHODS AND MATERIALS

A prospective cohort study with a 48-hour follow-up was conducted in the ICU in San Luis Potosí, Mexico. The study included intubated patients over 18 who met criteria for a spontaneous breathing trial, with consent. Approved by the ethics committee. The dependent variable was "unsuccessful extubation," defined as reintubation within 48 hours. Independent variables included diaphragmatic thickening fraction, excursion, sex, age, days intubated, and underlying pathology. Data quality was ensured through concordance between the principal investigator and physicians using tests like Lin's correlation coefficient, Bland-Altman limits, and ICC III. The sampling method was non-probabilistic, consecutive by quota, with sample size calculated using logistic regression.

RESULTS

A total of 120 patients were recruited from November 2022-2023, aged 18-80 years (average 39.5 years), with 59 women (49.4%) and 61 men (50.8%). No significant differences in age or sex were found between reintubated and non-reintubated groups. A significant difference in diaphragmatic thickening rates was found (p = 0.04), with reintubated patients showing 35.2% (+9.6 SD) vs. 32.1% (+15.7 SD) in non-reintubated patients. Five patients (4.1%) were reintubated with varying reintubation times. Logistic regression showed no correlation between diaphragmatic thickening fraction or excursion and reintubation (p = 0.36 and p = 0.19). The most common conditions were traumatic brain injury (32.5%) and septic shock (23.3%). Forty percent of reintubated patients had thickening fractions below 30%. Diaphragmatic excursion values were low, with reintubated patients showing 0.38 cm vs. 0.70 cm in non-reintubated patients. The lower reintubation rate (4.1%) may be due to standardized weaning protocols. High inter-observer reliability was achieved, with ICC values of 0.99 for both thickening and excursion.

CONCLUSION

No correlation was found between diaphragmatic thickening fraction and excursion, with reintubation failure. This difference may be due to the specific characteristics of the studied population.

CLINICAL RELEVANCE/APPLICATION

A. Standardizing clinical criteria for ventilatory weaning and reintubation likely contributed to the lower reintubation failure rate, which is recommended. B. Diaphragmatic excursion may be the most reliable ultrasound parameter for assessing diaphragmatic weakness.

R6-SSCH10-6 THE PROGNOSTIC ROLE OF PREOPERATIVE SUBCUTANEOUS ADIPOSE TISSUE MEASUREMENT IN LUNG TRANSPLANTATION

Shuangxiang Lin, MSc (*Presenter*)
Xinhong Wang (*Abstract Co-Author*)
Jianzhong Sun, MMed (*Abstract Co-Author*)
Jiaxing Wu (*Abstract Co-Author*)

PURPOSE

This study aimed to determine whether the cross-sectional area of subcutaneous adipose tissue (SAT) at the T12 vertebral level, measured on routine preoperative chest CT, is associated with post-transplant outcomes in lung transplant recipients.

METHODS AND MATERIALS

We retrospectively analyzed lung transplant recipients who underwent routine pretransplant chest CT. Subcutaneous adipose tissue area at the T12 level was measured on axial CT slices using standardized tissue attenuation thresholds. The primary outcome was post-transplant overall survival. Secondary outcomes included length of stay, need for ventilator support, grade III primary graft dysfunction (PGD), and acute rejection. Associations between T12 SAT and outcomes were assessed using univariable and multivariable Cox regression models. Predictive performance was evaluated using ROC curves, net reclassification improvement (NRI), and integrated discrimination improvement (IDI).

RESULTS

This study enrolled 280 lung transplant recipients (237 males, median age 56.5 ± 11.5 years). Among them, 29 (10.4%) experienced the primary outcome, and 75 (26.8%) developed secondary outcomes. Lower T12 SAT area was independently associated with poorer post-transplant survival. Kaplan-Meier analysis indicated that lower SAT levels were linked to reduced survival (log-rank P < 0.01). Incorporating SAT into the predictive model improved discrimination, increasing the AUC from 0.65 to 0.75, with sensitivity of 66%, and specificity of 73% (NRI = 0.82, P < 0.01). For secondary outcomes, adding SAT increased the AUC from 0.59 to 0.85, with sensitivity of 75%, and specificity of 86% (NRI = 0.37, P = 0.01).

CONCLUSION

Preoperative SAT measurement at the T12 level is a valuable, non-invasive biomarker for predicting adverse outcomes in lung transplant recipients. This metric can aid in patient risk stratification and optimize pre- and post-transplant management.

CLINICAL RELEVANCE/APPLICATION

CT-derived SAT at T12 is a rapid, non-invasive marker of frailty and nutritional status in lung transplant candidates. Incorporating SAT into preoperative assessment helps identify high-risk patients for targeted interventions, potentially improving post-transplant outcomes.

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Abstract Archives of the RSNA, 2025

R6-SSGI17

Gastrointestinal Imaging (Biliary, Cholangiocarcinoma)

Thursday, Dec. 4 1:30PM - 2:30PM Room: E351

Jeff L. Fidler, MD (*Moderator*)
Noor Fatima Majeed, MD (*Moderator*)

Sub-Events

R6-SSGI17-1 VALUE OF COMBINED DYNAMIC HISTOGRAM PARAMETERS AND CLINICAL INDICATORS FOR PREOPERATIVE DIFFERENTIATION BETWEEN ATYPICAL HEPATOCELLULAR CARCINOMA AND INTRAHEPATIC CHOLANGIOCARCINOMA

Haisheng Wang (*Presenter*)
Wei Ren (*Abstract Co-Author*)
Yuhao Li (*Abstract Co-Author*)
Yamin Sun (*Abstract Co-Author*)
Hong Liu (*Abstract Co-Author*)

PURPOSE

To investigate the diagnostic value of combining whole-tumor dynamic histogram parameters (T1-weighted precontrast, arterial phase, and arterial phase-T1 difference) with clinical indicators for differentiating atypical hepatocellular carcinoma (HCC) from intrahepatic cholangiocarcinoma (ICC).

METHODS AND MATERIALS

We retrospectively analyzed preoperative clinical, pathological, and MRI data from 91 patients with HCC and ICC. Whole-tumor histogram parameters (including mean, standard deviation, coefficient of variation, entropy, skewness, and percentile values [1% to 99%]) were extracted from T1-weighted precontrast and arterial-phase images using histogram analysis software, with arterial phase-T1 difference parameters calculated. Differences in histogram parameters between atypical HCC and ICC were analyzed using independent t-test, Mann-Whitney U test, or χ^2 test. Statistically significant parameters were incorporated into multivariable logistic regression to construct clinical, histogram, and combined predictive models. Diagnostic performance was evaluated using ROC curves, with AUC differences compared via DeLong test ($P < 0.05$).

RESULTS

Significant differences were observed in T1pre-standard deviation, arterial phase-entropy, AP-T1 difference-5%, alpha-fetoprotein (AFP), and carbohydrate antigen 19-9 (CA-199) between atypical HCC and ICC ($P < 0.05$). Among individual parameters, AP-T1 difference-5% demonstrated the highest predictive value (AUC = 0.890). The combined model incorporating T1pre-standard deviation, arterial phase-entropy, AP-T1 difference-5%, AFP, and CA-199 achieved superior diagnostic performance (AUC = 0.947, sensitivity = 94.2%, specificity = 84.6%), significantly outperforming the histogram model (AUC = 0.933), clinical model (AUC = 0.800), and individual histogram parameters (AUC range: 0.746-0.890). The DeLong test confirmed statistically significant differences between the combined model and other models/parameters ($P < 0.05$).

CONCLUSION

The whole-tumor dynamic histogram model exhibits high diagnostic efficacy for preoperative differentiation of atypical HCC from ICC. When combined with clinical parameters, its discriminative power is further enhanced, suggesting its potential as a non-invasive preoperative diagnostic tool.

CLINICAL RELEVANCE/APPLICATION

Accurate preoperative differentiation between HCC and ICC significantly impacts clinical treatment decisions. The combination of whole-tumor dynamic histogram parameters (T1pre-standard deviation, arterial phase-entropy, and AP-T1 difference-5%) with clinical indicators (particularly AFP) provides optimal diagnostic performance for distinguishing these tumor types preoperatively.

R6-SSGI17-2 THE AI ADVANTAGE: DEEP LEARNING DETECTS CHOLANGIOCARCINOMA BEFORE VISIBLE MASS FORMATION

Yashbir Singh, PhD, MEng (*Presenter*)

PURPOSE

To evaluate whether a deep learning approach can improve detection of early-stage perihilar cholangiocarcinoma (pCCA) in primary sclerosing cholangitis (PSC) patients compared to conventional radiological assessment.

METHODS AND MATERIALS

We conducted a multicenter study including 398 PSC patients who underwent contrast-enhanced MRI. Patients were divided into training (n=150, with 64 pCCA cases) and test cohorts (n=248, with 166 pCCA cases). All pCCA patients were early-stage and eligible for liver transplantation. We trained a 3D DenseNet-121 deep learning model on MRI scans and compared its diagnostic performance against expert abdominal radiologists' interpretations in the independent test cohort.

RESULTS

The deep learning model achieved significantly higher sensitivity for pCCA detection (87.9% vs. 50.0%, $p<0.001$) with good specificity (84.1% vs. 100.0%, $p<0.001$) compared to radiologists. The model excelled particularly in detecting non-mass forming pCCA (sensitivity 91.6% vs. 50.6%, $p<0.001$) and non-invasive neoplasia (sensitivity 100.0% vs. 38.2%). When applied to earlier MRIs (up to 14 months before diagnosis) in 39 patients, the model maintained reasonable sensitivity (75.0%) and specificity (71.6%).

CONCLUSION

The deep learning approach substantially outperforms expert radiological assessment in detecting early-stage pCCA in PSC patients, particularly in challenging cases without distinct mass formation.

CLINICAL RELEVANCE/APPLICATION

This AI model represents a promising advance in PSC management by enabling earlier detection of pCCA when curative therapy is still possible. Implementation could facilitate more timely intervention, potentially improving survival outcomes and reducing the variability in care delivery across different centers.

R6-SSGI17-3 SEEING THE INVISIBLE: AI ALGORITHM SURPASSES RADIOLOGISTS IN DETECTING EARLY BILIARY CANCER

Yashbir Singh, PhD, MEng (*Presenter*)

PURPOSE

To develop and evaluate a deep learning model that analyzes magnetic resonance imaging (MRI) for early detection of perihilar cholangiocarcinoma (pCCA) in patients with primary sclerosing cholangitis (PSC), and to compare its diagnostic performance with expert radiologists.

METHODS AND MATERIALS

In this multicenter, retrospective cohort study, we analyzed contrast-enhanced MRI scans from 398 adults with large duct PSC (training cohort: n=150; test cohort: n=248). All patients with pCCA (n=230) had early-stage cancer and were eligible for liver transplantation. A 3D DenseNet-121 deep learning model was trained using MRI images from the training cohort with 5-fold cross-validation. The model's performance was assessed in a separate test cohort and compared with expert radiologists' interpretations.

RESULTS

In the test cohort, the deep learning model demonstrated superior performance compared to expert radiologists with sensitivity of 87.9% versus 50.0% ($p<0.001$), specificity of 84.1% versus 100.0% ($p<0.001$), and area under receiving operating curve of 86.0% versus 75.0% ($p<0.001$). The model maintained high sensitivity (91.6%) and specificity (84.1%) even when a mass was absent, unlike radiologists whose sensitivity dropped significantly in these cases.

CONCLUSION

The 3D DenseNet-121 model effectively detects early-stage pCCA in PSC patients, outperforming expert radiologists particularly in cases without obvious mass formation. This automated approach significantly reduces the number of missed cancer cases while maintaining good specificity.

CLINICAL RELEVANCE/APPLICATION

This deep learning model addresses a critical unmet need in PSC management by improving early detection of pCCA when curative interventions are still possible. Implementation could standardize care across centers, reduce diagnostic variability, and potentially improve patient outcomes by enabling earlier intervention.

R6-SSGI17-5 EVALUATING THE PERFORMANCE OF MULTIPHASIC CT IN ASSESSING BILIARY TUMOR EXTENT AND RESECTABILITY IN PERIHILAR CHOLANGIOCARCINOMA: INSIGHTS FROM A WESTERN POPULATION

Tae-Hyung Kim, MD, MS (*Presenter*)
Wyanne Law, MD (*Abstract Co-Author*)
Maria El Homsi, MD (*Abstract Co-Author*)
Pamela A. Argiriadi, MD (*Abstract Co-Author*)
Ally Rosen, MD (*Abstract Co-Author*)
Jonathan Kuten (*Abstract Co-Author*)
Danielle Silliman (*Abstract Co-Author*)
Lee Rodriguez (*Abstract Co-Author*)
William Jarnagin (*Abstract Co-Author*)
Richard Kinh Gian Do, MD, PhD (*Abstract Co-Author*)

PURPOSE

Accurate preoperative assessment of perihilar cholangiocarcinoma on CT is essential for curative resection. This study evaluates the performance of multiphasic CT in determining longitudinal tumor extent in a Western population, based on the Korean Society of Abdominal Radiology (KSAR) consensus recommendations.

METHODS AND MATERIALS

This retrospective study included patients with perihilar cholangiocarcinoma who underwent multiphasic CT prior to surgery between 2007 and 2021. Only patients who underwent curative-intent surgery without neoadjuvant therapy were included, those with suboptimal preoperative imaging were excluded. Four abdominal radiologists independently evaluated longitudinal tumor extent, hepatic artery and/or portal vein involvement, and resectability, following the KSAR guidelines. Patients were categorized into two cohorts: no prior biliary intervention at the time of CT (cohort A) and those with biliary intervention (cohort B). Diagnostic performance was measured by sensitivity, specificity, accuracy, and the area under the receiver operating characteristic curve (AUC). Pathology, including assessment of biliary extent and resection margins (R0 vs R1 [microscopic tumor]/R2 [macroscopic tumor]), served as the gold standard for all patients. Interreader agreement was assessed using kappa statistics. Consensus reading was defined as at least two radiologists having identical assessment.

RESULTS

A total of 97 patients (median age: 68 years, range: 29-87; 65 male) were included with 41 patients in cohort A and 56 in cohort B. Accuracy in assessing biliary tumor extent was comparable between cohorts, ranging from 0.61 to 0.89 in cohort A and 0.61 to 0.92 in cohort B. In consensus readings, sensitivity in cohort A ranged from 0.50 to 1.0, while specificity ranged from 0.75 to 1.00. In cohort B, sensitivity decreased (0.50 to 0.63); specificity remained high (0.82 to 1.00). AUC values for predicting R0 resection (n=59 patients) was between 0.48 and 0.53 among the four radiologists. Interreader agreement showed kappa values of 0.23-0.35 for biliary tumor extent, 0.07-0.41 for hepatic artery involvement, and 0.21-0.50 for portal vein involvement.

CONCLUSION

Multiphasic CT demonstrates high specificity and moderate sensitivity in assessing biliary tumor extent in perihilar cholangiocarcinoma. However, accurately predicting R0 resection remains challenging, highlighting the need for further optimization of imaging techniques and guidelines in assessing resectability.

CLINICAL RELEVANCE/APPLICATION

CT shows high specificity but limited sensitivity for tumor extent; R0 prediction remains challenging in perihilar cholangiocarcinoma.

R6-SSGI17-6 DEVELOPMENT AND VALIDATION OF A SEVERITY SCORING SYSTEM FOR PROGNOSTICATION OF RECURRENT PYOGENIC CHOLANGITIS

Riya Fathima, MBBS (*Presenter*)
Thara Pratap, DMRD,DMD (*Abstract Co-Author*)

PURPOSE

To develop a semi-quantitative imaging-based scoring system for recurrent pyogenic on CT/ MRCP for prognostication of recurrent pyogenic cholangitis. To correlate the total score with the disease severity. To analyze the association between each parameters in the scoring system individually with the severity of recurrent pyogenic cholangitis.

METHODS AND MATERIALS

Imaging based multiparametric scoring system is developed comprising of 10 parameters and a maximum score of 20. Single-center study with a sample size of 50 subjects. Retrospective analysis is made by correlating the total score with the clinical recurrence rate, number and frequency of stenting required (ERCP/PTBD) and requirement of surgical resections (resection/ hepaticojejunostomy) over a period of 5 years using spearman correlation done. ROC curve was analyzed to determine the cut-off score for predicting severe disease.

RESULTS

Most of the cases we studied had a predilection for left lobe of liver. Statistically significant association observed between location of ductal calculi and disease severity. Hilar stones and stones > 10 mm were symptomatic and required endotherapy in majority of the cases. A score more than 8 was associated with severe disease.

CONCLUSION

A score more than 8 was associated with severe disease. Statistically significant association observed between location of ductal calculi and disease severity. Hilar stones and stones > 10 mm were symptomatic and required endotherapy in majority of the cases.

CLINICAL RELEVANCE/APPLICATION

1. Aid in standardizing recurrent pyogenic cholangitis reporting. 2. Help predict the prognosis and hence in counselling the patient3. Guide interventions.4. Lay the groundwork for AI-based imaging analysis of recurrent pyogenic cholangitis.

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R6-SSGI18

Gastrointestinal Imaging (Bowel - Inflammatory Bowel Disease)

Thursday, Dec. 4 1:30PM - 2:30PM Room: E451B

Kristina T. Flicek, MD (*Moderator*)
Richa D. Patel, MD (*Moderator*)
Neil R. Chatterjee, MD, PhD (*Moderator*)

Sub-Events

R6-SSGI18-4 REAL-WORLD IMPACT OF QUANTITATIVE MOTILITY MRI ON RADIOLOGIC ASSESSMENT OF ILEAL CROHN'S DISEASE

Alex Menys, PhD (*Presenter*)
Iyad Naim (*Abstract Co-Author*)
Gordon W Moran (*Abstract Co-Author*)
Heather E. Fitzke, MSc (*Abstract Co-Author*)
Christopher Clarke (*Abstract Co-Author*)
Rahul Munyal, MBChB (*Abstract Co-Author*)
Sara S. Upponi, MBBS, FRCR (*Abstract Co-Author*)
Gauraang Bhatnagar, FRCR,MBBS (*Abstract Co-Author*)
Nirav Patel, MBBS, FRCR (*Abstract Co-Author*)
Maira Hameed, MA,BMBCh (*Abstract Co-Author*)
William Weston, MBChB,FRCR (*Abstract Co-Author*)
Damian J. Tolan, MBBCh, FRCR (*Abstract Co-Author*)
Hannah Lambie, BMBS,FRCR (*Abstract Co-Author*)
Paul Harrow (*Abstract Co-Author*)
Joy L. Barber, MBBS, FRCR (*Abstract Co-Author*)
Victoria Jennings (*Abstract Co-Author*)
Juan De La Revilla Negro (*Abstract Co-Author*)
Jiehan Yeo (*Abstract Co-Author*)
Attah Ocholi (*Abstract Co-Author*)
Delara Khodabakhshi (*Abstract Co-Author*)
Samantha Baillie (*Abstract Co-Author*)
Nkem Onyeador (*Abstract Co-Author*)
Kamal Patel (*Abstract Co-Author*)
Sudheer Vuyyuru (*Abstract Co-Author*)
Tom Shepherd (*Abstract Co-Author*)
Karishma Sethi-Arora (*Abstract Co-Author*)
Anish Kuzhiyanjal (*Abstract Co-Author*)
Jimmy Limdi (*Abstract Co-Author*)
Aungzaw Win (*Abstract Co-Author*)
Priyanka Ghodekar, MBBS, FRCR (*Abstract Co-Author*)
Afaq Siddiuqui (*Abstract Co-Author*)
Stuart Taylor (*Abstract Co-Author*)

PURPOSE

To evaluate the real-world impact of quantitative cine MRI motility scoring on radiologists' interpretation of ileal Crohn's disease (CD), and to compare its influence with standard post-contrast gadolinium-enhanced MRE.

METHODS AND MATERIALS

Ten NHS radiologists across six UK sites identified CD patients with baseline and 1-year follow-up MR-enterography including T1-weighted post-contrast and small bowel motility sequences. For both timepoints, GIQuant (Motilent) motility scores were derived by placing ROIs in the most active SB segments . Radiologists interpreted the MREs at both time points initially using standard MRE sequences, excluding GIQuant scores and post-contrast imaging, and graded overall and segmental disease status on a 5-point scale (transmural remission to stable disease). Radiologists were then asked to enter the GIQuant scores and update their assessment. The process was then repeated after examining IV gadolinium enhanced images. Radiologists also rated the impact of both IV gadolinium and motility scores on their diagnostic confidence using a 7-point scale: no-impact, confidence-decreased/increased, or diagnosis-changed to active/inactive.

RESULTS

277 CD patients (60% male, mean age 35±13 yrs) scanned between Nov 2017- Aug 2024 were included. 202 had T1-weighted post-IV contrast imaging. GIQuant scores led to changes in overall disease status impression (e.g., stable disease to progression of disease) in 55 (19.8%). Radiologists stated that GIQuant scores increased their diagnostic confidence in 120 (43%) cases. After examining the change in GIQuant scores, radiologists reclassified patient status (e.g., active to inactive or vice-versa) in 40/277 (14.4%) cases. In comparison, unmasking to post-contrast IV Gad images led to changes in overall disease status impression in just 13/202 patients (6%) compared to 42/202 (20%) for GIQuant scores. Radiologists reclassified patient status (e.g., active to inactive) in just 11 (5.3%) after unmasking to post-contrast IV Gad images, compared with 33 (16.3%) for GIQuant scores. Radiologists indicated that post-contrast IV Gad imaging impacted diagnosis or confidence in 52% of cases compared to 63% for GIQuant scores.

CONCLUSION

GIQuant motility scores have more impact on radiologists' assessment of disease response on MRE compared to IV gadolinium, and improves diagnostic confidence in 43% of patients suggesting it utility as a biomarker of disease activity and response and as a potential replacement for routine IV gadolinium administration.

CLINICAL RELEVANCE/APPLICATION

These findings support incorporating GIQuant into MRE protocols as a quantitative biomarker of small bowel disease activity and a potential alternative to contrast-enhanced imaging.

R6-SSGI18-5 DIAGNOSTIC ACCURACY OF COMPUTED TOMOGRAPHY (CT) FOR IDENTIFYING SURGICAL ISCHEMIA AND NECROSIS IN SMALL BOWEL OBSTRUCTION: A SYSTEMATIC REVIEW AND META-ANALYSIS

Paul Le Corre, MD (*Presenter*)
Maelle Youinou (*Abstract Co-Author*)
Gilles Chatellier (*Abstract Co-Author*)
Marc Zins, MD (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic performance of CT signs in detecting surgical bowel ischemia and necrosis in patients with small bowel obstruction (SBO).

METHODS AND MATERIALS

A systematic search was conducted in MEDLINE, Embase and Web of Science databases up to April 30, 2024. We included studies evaluating the diagnostic performance of CT signs to identify small bowel ischemia and/or necrosis in patients with SBO using surgical and pathological examination or an uneventful clinical outcome as the reference standard. The QUASDAS-2 tool was used to assess the risk of bias and applicability. Meta-analyses were performed using a bivariate random-effects model and summary receiver operating characteristic (SROC) curve models for CT signs reported in at least 3 studies and involving more than 100 patients.

RESULTS

Nineteen studies (2453 patients, 1741 with surgery, 861 with ischemia and 343 with necrosis) were included. Meta-analyses evaluated 14 signs for small bowel ischemia and 11 signs for small bowel necrosis.For ischemia, the following CT findings demonstrated the highest pooled specificity and positive likelihood ratio (PLR): reduced bowel wall enhancement (specificity: 92% [95% CI: 88%, 95%], PLR: 7.45 [95% CI: 4.22, 12.30]); diffuse mesenteric haziness (specificity: 89% [95% CI: 85%, 92%], PLR: 6.78 [95% CI: 4.84, 9.29]); closed-loop mechanism (specificity: 85% [95% CI: 76%, 91%], PLR: 5.25 [95% CI: 3.05, 8.58]); increased unenhanced bowel wall attenuation (specificity: 98 % [95% CI: 95%, 99%], PLR: 19.30 [95% CI: 7.24, 42.10]).For small bowel necrosis, only one sign had significant performances: increased unenhanced bowel wall attenuation (specificity: 92% [95% CI: 72%, 98%], PLR: 8.75 [95% CI: 2.20, 26]). Other CT findings had lower diagnostic performance. No single CT finding showed a negative likelihood ratio large enough to rule out ischemia or necrosis.

CONCLUSION

Reduced bowel wall enhancement, diffuse mesenteric haziness, and a closed-loop configuration are key CT findings supporting the diagnosis of bowel ischemia in patients with SBO. Increased unenhanced bowel wall attenuation is informative for diagnosing both ischemia and necrosis, with high specificity. Study limitations included retrospective design and a focus on surgical cohorts.

CLINICAL RELEVANCE/APPLICATION

Increased unenhanced bowel wall attenuation is a highly specific CT indicator for diagnosing small bowel ischemia and necrosis in the setting of small bowel obstruction.

R6-SSGI18-6 ASSOCIATION OF CT-BASED OPPORTUNISTIC BIOMARKERS WITH DISEASE PROGRESSION IN CROHN'S DISEASE

Shravya Srinivas Rao, MD (*Presenter*)
Soumyadeep Ghosh, MBBS, MD (*Abstract Co-Author*)
Nikitha Uma Baskaran, MBBS (*Abstract Co-Author*)
Ashwin Ananthakrishnan (*Abstract Co-Author*)
Avinash R. Kambadakone, MD, FRCR (*Abstract Co-Author*)

PURPOSE

Crohn's disease (CD) presents with varying severity, from mild to severe. Approximately 20-30% of patients have mild disease without perianal, stricturing, or penetrating complications and often do not require surgery, hospitalization, or long-term therapy. However, a subset of this may progress to severe, penetrating disease. Identifying such high-risk mild CD patients is crucial to guide treatment decisions and balance the risks of disease progression against overtreatment. The aim of this study is to evaluate whether CT-based opportunistic biomarkers, including visceral and subcutaneous fat quantification, muscle volume and vertebral cortical bone density, can predict disease progression in patients with mild CD.

METHODS AND MATERIALS

This IRB-approved retrospective study, 1151 CT scans from 901 patients with CD between 2004 and 2019 were screened. After applying inclusion criteria—age >18, baseline contrast-enhanced CT without features of severe disease, no prior use of immunosuppressants or surgery, and at least one clinical or radiological follow-up >5 years, 184 patients were included. CT-based opportunistic biomarkers were semi-automatically measured at the L1 vertebral level, including visceral fat (area, volume, and attenuation), subcutaneous fat (area, volume, and attenuation), muscle volume, and vertebral cortical bone density. Patients were stratified into two groups: stable mild CD and high-risk mild CD (those who progressed). Disease progression was defined by initiation of immunomodulators/biologics, surgical resection, or development of penetrating, stricturing, or extraintestinal complications. Statistical comparisons between groups were performed.

RESULTS

On 5-year follow-up, 34% of patients (n=63/184) progressed to severe disease. Predictors of disease progression included higher visceral fat attenuation (-76.8 ± 11.0 vs. -86.8 ± 63.1 HU; p = 0.019) and lower vertebral cortical bone density area (2.9 ± 1.2 vs. 3.8 ± 1.9 cm^2; p = 0.01). No significant differences were observed in weight, BMI, fat area/volume (visceral or subcutaneous), or muscle volume between the groups.

CONCLUSION

In patients with mild Crohn's disease, higher visceral fat density, which may reflect underlying inflammation, and lower vertebral cortical bone density on baseline CT were significantly associated with progression to severe disease.

CLINICAL RELEVANCE/APPLICATION

CT-based opportunistic imaging biomarkers may help identify high-risk patients with mild CD, guiding earlier therapeutic intervention.

Nov. 30 – Dec. 4
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R6-SSGU07

Genitourinary Imaging (Artificial Intelligence for Genitourinary Disease Detection and Prediction)

Thursday, Dec. 4 1:30PM - 2:30PM Room: E353B

Tristan Barrett, MBBS, MD (*Moderator*)
Nikhil Madhuripan, MD (*Moderator*)

Sub-Events

R6-SSGU07-1 ENHANCED DETECTION OF PROSTATE CANCER LESIONS ON BIPARAMETRIC MRI USING ARTIFICIAL INTELLIGENCE: A MULTICENTER, FULLY-CROSSED, MULTI-READER MULTI-CASE TRIAL

Jiule Ding (*Presenter*)
Zhaoyu Xing (*Abstract Co-Author*)
Jie Chen (*Abstract Co-Author*)
Pan Liang (*Abstract Co-Author*)
Yingwei Qiu (*Abstract Co-Author*)
Yang Zhang (*Abstract Co-Author*)
Wang Qian (*Abstract Co-Author*)
Ruonan Cheng (*Abstract Co-Author*)
Wei Xing, MD (*Abstract Co-Author*)

PURPOSE

To assess artificial intelligence (AI)’s added value in detecting prostate cancer lesions on MRI by comparing radiologists’ performance with and without AI assistance.

METHODS AND MATERIALS

A fully-crossed multi-reader multi-case clinical trial was conducted across three institutions with ten non-expert radiologists. Biparametric MRI cases comprising T2WI, apparent diffusion coefficient, and diffusion weighted images were retrospectively collected. Three reading modes were evaluated: AI alone, radiologists alone (unaided) and radiologists with AI (aided). Aided and unaided readings were compared using the Dorfman-Berbaum-Metz method. Reference standards were established by senior radiologists based on annotation results and pathological reports. Performance was quantified via sensitivity, specificity, and area under the alternative free-response receiver operating characteristic curve (AFROC-AUC).

RESULTS

Among 407 eligible male patients (69.5 ± 9.3 years), aided reading significantly improved lesion-level sensitivity from 67.3% (95% CI: 58.8%, 75.8%) to 85.5% (95% CI: 81.3%, 89.7%), with a substantial increase of 18.2% (95% CI: 10.7%, 25.7%, $p < 0.001$). Case-level specificity slightly increased from 75.9% (95% CI: 68.7%, 83.1%) to 79.5% (95% CI: 74.1%, 84.8%), demonstrating non-inferiority ($p < 0.001$). AFROC-AUC was also significantly higher for aided reading (0.869 vs 0.761, $p < 0.001$). AI alone achieved robust performance, with lesion-level sensitivity of 88.4% (95% CI: 84.0%, 92.0%) and case-level specificity of 77.8% (95% CI: 71.5%, 83.3%). Subgroup analysis revealed improved detection for lesions with smaller size and lower PI-RADS scores.

CONCLUSION

AI-aided reading significantly enhances lesion detection compared to unaided reading, while AI alone also demonstrates high diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

A deep learning-based artificial intelligence system (uAI-prostateMR) significantly enhances the diagnostic performance of non-expert radiologists in detecting prostate cancer lesions on biparametric MRI. This system improves lesion-level sensitivity, particularly for smaller lesions and lower PI-RADS scores, while maintaining specificity, thereby demonstrating its value as an adjunct diagnostic tool.

R6-SSGU07-2 SCALING ARTIFICIAL INTELLIGENCE FOR PROSTATE CANCER DETECTION ON MRI TOWARDS POPULATION-BASED SCREENING AND PRIMARY DIAGNOSIS IN A GLOBAL, MULTIETHNIC POPULATION

Jasper Twilt, MSc (*Presenter*)
Anindo Saha, MSc (*Abstract Co-Author*)
Joeran Bosma, MSc (*Abstract Co-Author*)
Alexander Ng, MD (*Abstract Co-Author*)
Aqua Asif, MBChB, BS (*Abstract Co-Author*)
Kirti Magudia, MD, PhD (*Abstract Co-Author*)
Peder E. Larson, PhD (*Abstract Co-Author*)
Qinglin Xie (*Abstract Co-Author*)
Xiaodong Zhang (*Abstract Co-Author*)
Samuel Gitau (*Abstract Co-Author*)
Chi Pham Minh (*Abstract Co-Author*)
Hiten Patel (*Abstract Co-Author*)
Ivo Schoots, MD, PhD (*Abstract Co-Author*)
Martijn F. Boomsma, MD (*Abstract Co-Author*)
Renato Cuocolo, MD (*Abstract Co-Author*)
Nickolas Papanikolaou, PhD (*Abstract Co-Author*)
Daniele Regge, MD (*Abstract Co-Author*)
Derya Yakar, MD, PhD (*Abstract Co-Author*)
Mattijs Elschot (*Abstract Co-Author*)
Jeroen Veltman, MD (*Abstract Co-Author*)
Nancy A. Obuchowski, PhD, MS (*Abstract Co-Author*)
Tobias Nordstrom (*Abstract Co-Author*)
Martin Eklund (*Abstract Co-Author*)

Veeru Kasivisvanathan, PhD (*Abstract Co-Author*)
Jurgen J. Futterer, MD, PhD (*Abstract Co-Author*)
Maarten De Rooij, MD (*Abstract Co-Author*)
Henkjan Huisman, PhD (*Abstract Co-Author*)

PURPOSE

We hypothesize that a state-of-the-art artificial intelligence (AI) system, trained using tens of thousands of exams across several sites worldwide, is diagnostically interchangeable to the radiology readings for clinically significant prostate cancer detection on MRI, in population-based screening and primary diagnostic settings across an external global, multiethnic population.

METHODS AND MATERIALS

In this intercontinental, confirmatory study, we include a retrospective cohort of >21,900 MRI examinations (>20,750 patients; >45 cities in 22 countries) to train and externally validate the PI-CAI-2 model, i.e., an efficient, next-generation iteration of the state-of-the-art AI system that was developed for detecting Gleason grade group = 2 prostate cancer on MRI during the PI-CAI study. Of these examinations, >20,000 cases (>18,850 patients; 26 cities in 14 countries) from two EU Horizon projects (ProCAncer-I, COMFORT) and 12 independent centers based in Europe, North America, Asia and Africa, are used for training and internal testing. Additionally, >1900 cases (>1900 patients; >19 external cities in 12 countries) from population-based screening (STHLM3-MRI, IP1-PROSTAGRAM trials) and primary diagnostic settings (PRIME trial) based in Europe, North and South Americas, Asia and Australia, are used for external testing. Primary endpoint is the proportion of AI-based assessments in agreement with the standard of care diagnoses (i.e., clinical assessments made by expert uropathologists on histopathology, if available, or at least two expert urogenital radiologists in consensus; with access to patient history and peer consultation) within the external testing cohorts. Our statistical analysis plan is prespecified with a hypothesis of diagnostic interchangeability to radiology readings at the PI-RADS = 3 cut-off, considering a margin of 0.05 and reader estimates derived from the PI-CAI observer study (62 radiologists reading 400 cases). Secondary measures comprise the area under the receiver operating characteristic curve (AUROC) of the AI system stratified by imaging quality, patient age and patient ethnicity to identify any underlying biases.

RESULTS

All data has been collected, analysis will be ready for presentation.

CONCLUSION

All data has been collected, analysis will be ready for presentation.

CLINICAL RELEVANCE/APPLICATION

AI systems can alleviate the increasing workload, prevent overdiagnosis, and reduce the dependence on expert radiologists across the diagnostic pathway of prostate cancer. If deemed robust across population shifts, geographical sites, acquisition protocols and the disease spectrum, such systems have the potential to improve workflow efficiency, patient outcomes and healthcare equity at scale.

R6-SSGU07-3 PERFORMANCE EVALUATION OF ARTIFICIAL INTELLIGENCE MODEL FOR AUTOMATED DETECTION AND CHARACTERIZATION OF ADRENAL LESIONS ON NON-CONTRAST CT

Ryuya Yoshida (*Presenter*)
Yasunori Nagayama, MD (*Abstract Co-Author*)
Naoki Kobayashi, MD (*Abstract Co-Author*)
Takumi Osaki (*Abstract Co-Author*)
SOICHIRO ISHIUCHI (*Abstract Co-Author*)
Mahiro Akao (*Abstract Co-Author*)
Yasuaki IGARASHI (*Abstract Co-Author*)
Takeshi Nakaura, MD (*Abstract Co-Author*)
Toshinori Hirai, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of a commercially available artificial intelligence (AI) model for detection and characterization of adrenal lesions on non-contrast CT.

METHODS AND MATERIALS

This retrospective study included 502 patients with 592 adrenal lesions who underwent non-contrast CT and had available diagnostic reference standards. A commercial AI model enabling automated detection and attenuation measurement of adrenal lesions was applied. Lesion detection performance was assessed per gland (1004 glands) using sensitivity, specificity, and accuracy. Attenuation values were measured manually by radiologists using 2D ROI placement and automatically by the AI model using 3D volumetric segmentation. Agreement between manual and automated attenuation measurements was evaluated using Pearson correlation, Wilcoxon signed-rank test, and Bland-Altman analysis. To evaluate performance in differentiating benign from malignant lesions, the area under the ROC curve (AUC), as well as sensitivity and specificity at the <10 HU threshold, were compared between manual and AI-derived measurements.

RESULTS

Adrenal lesions were detected by the AI model with sensitivity 90.5% (536/592), specificity 96.1% (396/412), and accuracy 92.8% (932/1004). Manual and AI-derived attenuation values showed strong correlation (r=0.846), although the AI model tended to underestimate attenuation compared to manual measurements (mean bias -6.2 HU; 15.0±18.0 vs 8.8±16.7 HU; p<0.001). The AUC for differentiating benign from malignant lesions was not significantly different between manual and AI-derived measurements (0.938 vs 0.941, p=0.813). When applying the <10 HU threshold, sensitivity and specificity were 49.5% and 100% for manual measurements, and 72.0% and 95.6% for AI-based measurements, respectively.

CONCLUSION

AI model demonstrated high accuracy in detecting adrenal lesions and provided attenuation values that were strongly correlated with manual radiologist measurements. Diagnostic performance for differentiating benign from malignant lesions was comparable to radiologist manual assessment, with improved sensitivity and slightly reduced specificity at the conventional 10 HU threshold.

CLINICAL RELEVANCE/APPLICATION

Use of the AI model for non-contrast CT supports accurate detection and characterization of adrenal lesions, potentially facilitating appropriate clinical management in patients with adrenal incidentaloma.

R6-SSGU07-4 DEEP LEARNING FOR DETECTION AND SEGMENTATION OF FOCAL LESIONS IN THE UPPER URINARY TRACT ON MPMRI

Rile Nai, MD (*Presenter*)
Zuqiang Xi (*Abstract Co-Author*)
Kexin Wang (*Abstract Co-Author*)
Xiaodong Zhang, MD, PhD (*Abstract Co-Author*)
Xiaoying Wang, MD (*Abstract Co-Author*)

PURPOSE

Multiparametric MRI (mpMRI) exhibits high specificity for the evaluation of focal lesions in the upper urinary tract; however, the complex anatomical structures and heterogeneous nature of lesions can limit its detection sensitivity. To address this challenge, we propose a deep learning-based approach designed to enhance lesion detection sensitivity within this anatomically intricate region.

METHODS AND MATERIALS

The model was developed using retrospective T2-weighted imaging (T2WI), diffusion-weighted imaging (DWI), and apparent diffusion coefficient (ADC) datasets, which were acquired from 390 patients (comprising 475 imaging series and 1,401 sequences). It was subsequently validated on an independent hold-out set of 955 patients (involving 1,285 series and 3,700 sequences). Lesion contours were initially delineated by a junior radiologist and then meticulously reviewed and confirmed by a senior specialist to ensure precision and reliability. The development dataset was stratified into three subsets: training (n = 311), validation (n = 37), and internal testing (n = 42). A 3D V-Net architecture was utilized for model training and optimization. Segmentation performance was rigorously assessed using the Dice similarity coefficient (DSC), volume similarity (VS), and Hausdorff distance (HD). Furthermore, lesion-level and patient-level detection capabilities were comprehensively evaluated in the hold-out test set.

RESULTS

The segmentation models for DWI, ADC, and T2WI sequences in the test set achieved excellent lesion detection performance with 100% sensitivity, demonstrating robust segmentation accuracy: DSC values ranging from 0.808 to 0.856, HD values between 3.62 mm and 4.29 mm, and VS metrics from 0.875 to 0.939. In the hold-out test set, the lesion-level sensitivity for detecting lesions with a maximum diameter of =2 cm was 73.6% for DWI, 77.8% for ADC, and 76.0% for T2WI. At the patient level, the models exhibited sensitivities of 81.1% (DWI), 80.8% (ADC), and 74.3% (T2WI).

CONCLUSION

The 3D V-Net-based deep learning model exhibited promising capabilities for the detection and segmentation of focal space-occupying lesions in the upper urinary tract, offering clinically relevant decision support to optimize diagnostic workflows.

CLINICAL RELEVANCE/APPLICATION

This study represents the inaugural validation of AI for detecting focal lesions in the upper urinary tract using mpMRI. It lays a methodological foundation for the development of AI-assisted diagnostic systems within the field of urological radiology practice.

R6-SSGU07-6 PERFORMANCE OF A FULLY AUTOMATED MACHINE LEARNING ADRENAL MASS DETECTION TOOL IN OVER 60,000 CONSECUTIVE ABDOMINAL CT EXAMS

Borna E. Dabiri, MD, PhD (*Presenter*)
Jay B. Patel, PhD (*Abstract Co-Author*)
Melissa Viator, MS (*Abstract Co-Author*)
Christopher Bridge, DPhil (*Abstract Co-Author*)
Daniel I. Glazer, MD (*Abstract Co-Author*)
Oleg S. Pianykh, PhD (*Abstract Co-Author*)
William W. Mayo-Smith, MD (*Abstract Co-Author*)
Bernardo C. Bizzo, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of a fully automated classification tool for identifying adrenal masses.

METHODS AND MATERIALS

This IRB-approved retrospective study was performed at a multisite academic health system. Consecutive patients undergoing unenhanced and contrast-enhanced abdominal CT examinations from 6/1/2023 through 3/31/2025 were included, and their basic demographic data were extracted from the electronic health record. Utilizing an internally developed automated machine learning segmentation and classification tool, the adrenal glands were classified as normal or containing a mass. To serve as a reference standard, radiology reports from these exams were categorized as normal or containing an adrenal mass >1 cm using the Qwen2.5 large language model (LLM). The performance of the algorithm relative to the reported adrenal findings from the radiology report was evaluated utilizing accuracy, sensitivity, and specificity.

RESULTS

A total of 68,213 consecutive scans were performed in 42,291 patients (23,658 female) with a mean age of 60.9 years. The overall proportion of reports describing adrenal masses was 7.4% (5,063) while the segmentation and classification model detected a mass in 8.3% (5,643) of the scans. The overall accuracy of the segmentation model using the report as ground truth was 92.5% (95% CI 92.3-92.7) with a sensitivity of 55.2% (95% CI 54.8-55.6) and a specificity of 95.5% (95% CI 95.3-95.6).

CONCLUSION

An automated machine learning adrenal segmentation and classification model was able to detect adrenal masses with high accuracy and specificity but lower sensitivity in a large population of consecutive CT examinations.

CLINICAL RELEVANCE/APPLICATION

An automated, machine learning adrenal mass detection tool can detect adrenal masses at scale in routine clinical practice. This may provide more consistency in detection of adrenal nodules compared to variable radiologist reporting.

Nov. 30 – Dec. 4
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R6-SSMK12

Musculoskeletal Imaging (Tumors of Bone, Tumors of Soft Tissue)

Thursday, Dec. 4 1:30PM - 2:30PM Room: E450A

Mihra S. Taljanovic, MD, PhD (*Moderator*)
Daniel E. Wessell, MD, PhD (*Moderator*)

Sub-Events

R6-SSMK12-1 ACCELERATED WHOLE-BODY DIFFUSION-WEIGHTED MRI IN MULTIPLE MYELOMA PATIENTS USING DEEP LEARNING IMAGE RECONSTRUCTION: A RETROSPECTIVE COMPARISON WITH STANDARD DIFFUSION-WEIGHTED IMAGING

Johannes B. Hofmann (*Presenter*)
Saif Afat, MD (*Abstract Co-Author*)
Konstantin Nikolaou, MD, MBA (*Abstract Co-Author*)
Judith Herrmann, MD (*Abstract Co-Author*)

PURPOSE

Whole-body magnetic resonance imaging (WB-MRI) is a routine but time-intensive examination in patients with multiple myeloma, typically requiring approximately 45 minutes. The prolonged scan duration may result in decreased image quality due to motion artifacts, reduced throughput, and increased patient discomfort. This study aimed to evaluate the impact of deep learning-accelerated diffusion-weighted imaging (DWIDL) in 3T WB-MRI on overall and medullary image quality, sharpness, noise, lesion detectability, and diagnostic confidence.

METHODS AND MATERIALS

This retrospective study included 40 patients with multiple myeloma (21 men, 19 women; mean age, 62 ± 11 years; range, 35-82 years) who underwent 3T WB-MRI, including DWI with two b-values (50 and 800 s/mm²) between February 2023 and April 2024. Single-average raw data were processed using a deep learning image reconstruction algorithm, yielding a simulated acquisition time of 3 minutes 3 seconds for DWIDL compared with 7 minutes 6 seconds for standard DWI (DWIStd) by reducing the number of signal averages. Two experienced radiologists independently evaluated all DWI datasets using a 5-point Likert scale assessing noise level, artifact severity, sharpness, overall image quality, and diagnostic confidence.

RESULTS

There were no significant differences between DWIDL and DWIStd regarding artifact severity, sharpness, overall image quality, lesion detectability, or diagnostic confidence. However, DWIDL demonstrated significantly lower noise and higher contrast compared with DWIStd ($P < .05$).

CONCLUSION

Deep learning-based image reconstruction for WB-DWI at 3T is feasible and enables a significant reduction in acquisition time without compromising image quality.

CLINICAL RELEVANCE/APPLICATION

Accelerated acquisition particularly benefits multiple myeloma patients, who often present with vertebral fractures, by reducing motion artifacts, improving comfort, and minimizing the need for sedation. The shorter scan time may also allow patients otherwise limited to CT imaging to undergo MRI, enabling superior assessment of bone marrow infiltration.

R6-SSMK12-2 UNVEILING BONE METASTASES: COMPARING WHOLE-BODY DIFFUSION-WEIGHTED IMAGING WITH ADC AT 3T AND PET-CT FOR ENHANCED DETECTION

Jitin Goyal, MBBS (*Presenter*)
Likhith N, MBBS (*Abstract Co-Author*)
Sunil Kumar Puri, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to assess the diagnostic performance of whole-body diffusion-weighted imaging (WB-DWI) with background body suppression (DWIBS) combined with the calculation of the apparent diffusion coefficient (ADC) at 3T MRI, and to compare it with PET-CT for detecting bone metastases.

METHODS AND MATERIALS

A prospective observational study was conducted over two years (2021-2022) with 43 patients with histopathologically confirmed malignancies and suspected bone metastasis who underwent PET-CT. The patients were subjected to WB-DWIBS within one week of PET-CT. Diagnostic performance was evaluated using receiver operating characteristic (ROC) analysis and the area under the ROC curve (AUROC), with findings compared to PET-CT results.

RESULTS

The study found a higher detection rate of bone metastases on MRI (WB DWIBS) compared to PET-CT. The sensitivity of WB DWIBS was higher (96.4%) compared to PET-CT (89.3%), while specificity was higher in PET-CT (86.7%) compared to WB DWIBS (80%). ADC values below 1100 provided significant differentiation between malignant and benign lesions, contributing to improved diagnostic accuracy.

CONCLUSION

WB-DWI with ADC estimation demonstrated high sensitivity for detecting bone metastases, with a lower specificity compared to PET-CT. The integration of ADC values enhanced the diagnostic performance of WB-DWI, making it a promising imaging technique for the detection and assessment of bone metastasis, offering a non-invasive, radiation-free alternative to PET-CT.

CLINICAL RELEVANCE/APPLICATION

WB-DWI with ADC calculation offers a non-invasive, radiation-free alternative to PET-CT for detecting bone metastases, particularly beneficial for patients with renal issues or those requiring repeated imaging. Its high sensitivity enhances early detection, improving treatment outcomes. This technique may complement PET-CT, reducing radiation exposure and providing a cost-effective solution for monitoring metastatic cancer.

R6-SSMK12-3 CT "HALO SIGN" AND IMAGING FEATURES TO DISTINGUISH BENIGN FROM OSTEOBLASTIC PELVIC LESIONS IN PROSTATE CANCER

Simon Sun, MD (*Presenter*)
Alecio F. Lombardi, MD (*Abstract Co-Author*)
Mohammad Ali K. El Amine, MD (*Abstract Co-Author*)
Robert A. Lefkowitz, MD (*Abstract Co-Author*)
Stephanie Lobaugh (*Abstract Co-Author*)
Junting Zheng (*Abstract Co-Author*)
Natalie Gangai (*Abstract Co-Author*)
Sinchun Hwang, MD (*Abstract Co-Author*)

PURPOSE

To assess whether a lucent rim ("halo sign") and other imaging features help distinguish benign sclerotic bone lesions from osteoblastic metastases in pelvic CT of treatment-naïve prostate cancer patients, and to assess corresponding interobserver agreement.

METHODS AND MATERIALS

This retrospective study included 100 pelvic CTs from 99 men with newly diagnosed, treatment-naïve prostate cancer, acquired between 2010-2022. One sclerotic lesion per scan was analyzed; 89% were biopsied, while the rest had =2 years of imaging follow-up only. Three musculoskeletal radiologists (R1-R3) independently reviewed anonymized images for a "halo sign" (a lucent rim thinner than the lesion with lower attenuation than adjacent marrow), presence of spiculated borders, lesion size, and Hounsfield units (HU). Associations between benignity (defined as biopsy-proven or imaging stability over =2 years) and imaging features were analyzed for each reader using Fisher's exact and the Wilcoxon rank-sum tests. Interrater agreement was evaluated using Fleiss' kappa (?), Light's averaged pairwise ?, and intraclass correlation coefficient (ICC).

RESULTS

The halo sign was more frequent in benign vs. malignant ones for all readers (R1: 69% vs 31%, R2: 82% vs 18%, R3: 58% vs 42%), achieving statistical significance ($p < 0.05$) for R1 and R2. Interobserver agreement was fair [? = 0.33; 95% CI: 0.21-0.47]. Spiculated borders were more common in benign lesions (R1: 60% vs 40%, R2: 64% vs 36%, R3: 73% vs 27%) than malignant ones, with statistically significant associations for all readers and fair agreement [? = 0.32; 95% CI: 0.19-0.47]. Lesion size and HU were not significantly associated with benignity; interobserver agreement was good for size (ICC = 0.83; 95% CI: 0.768-0.879) and moderate for HU (ICC = 0.591; 95% CI: 0.485-0.688).

CONCLUSION

The CT halo sign and spiculated borders were statistically significantly associated with benignity in two of three readers and all readers, respectively; interobserver agreement was fair for both features. These features may help differentiate benign from malignant sclerotic lesions.

CLINICAL RELEVANCE/APPLICATION

The halo sign or presence of spiculated borders on CT may indicate a higher likelihood of a benign lesion, helping support imaging surveillance over biopsy, potentially reducing the rate of unnecessary bone biopsy.

R6-SSMK12-4 MRI RADIOMICS AND CONVENTIONAL IMAGING FOR PREDICTING PROLIFERATIVE ACTIVITY AND HISTOLOGICAL GRADE IN SOFT TISSUE SARCOMAS

Sam Sedaghat, MD (*Presenter*)
Fabian Schmitz (*Abstract Co-Author*)
Martin Groezinger (*Abstract Co-Author*)
Hans-Ulrich Kauczor, MD (*Abstract Co-Author*)
Hyungseok Jang (*Abstract Co-Author*)

PURPOSE

This study investigated whether soft tissue sarcomas (STS) can be stratified by both proliferative activity (Ki-67 index) and histological grade using conventional MRI features and radiomics. Additionally, it evaluated the diagnostic performance of a machine learning model trained on the extracted imaging-based biomarkers.

METHODS AND MATERIALS

In this multi-center study, 139 patients with histologically confirmed STS were evaluated. Tumors were classified as high- or low-proliferative based on Ki-67 index (cutoff 20%) and as high- or low-grade based on histopathology. Conventional MRI features—including tumor size, heterogeneity, necrosis, hemorrhage, cystic degeneration, peritumoral edema, contrast enhancement, and margin definition—were assessed. Apparent diffusion coefficient (ADC) values and radiomics features were extracted from T2-weighted (T2w) and contrast-enhanced T1-weighted (CE-T1w) sequences. A random forest machine learning algorithm was trained to differentiate tumor aggressiveness and grade.

RESULTS

High-grade and high-proliferative STS showed significantly greater tumor heterogeneity ($p < 0.001$ - 0.003), especially on T2w and CE-T1w imaging. Peritumoral edema and contrast enhancement were significantly more common in aggressive and high-grade tumors ($p < 0.001$). Ill-defined margins were more frequent in high-proliferative tumors ($p = 0.001$-0.008). Mean tumor ADC values and tumor-to-muscle ADC ratios were significantly lower in high-grade STS ($p = 0.001$ and 0.005, respectively). Metastases occurred more frequently in high-proliferative tumors ($p < 0.001$), and metastasis-free interval negatively correlated with Ki-67 ($r = -0.43$, $p = 0.021$). Several radiomics features representing intratumoral heterogeneity differed significantly between low- and high-grade/-proliferative STS, especially in T2w and CE-T1w sequences. The random forest model based on conventional and radiomics features predicted high-grade tumors with an AUC of 0.97 and F1-score of 0.93. Biopsy-underestimated tumors showed marked differences in heterogeneity and peritumoral features.

CONCLUSION

MRI-based radiomics and conventional features reliably distinguish between low- and high-proliferative and low- and high-grade STS. Key indicators include tumor heterogeneity, peritumoral edema, contrast enhancement, and several radiomics parameters, while machine learning models add strong predictive capability.

CLINICAL RELEVANCE/APPLICATION

Non-invasive imaging biomarkers can help assess STS aggressiveness, complement histopathology, and inform clinical decisions—especially in cases of limited or non-representative biopsy samples.

R6-SSMK12-6 PERFORMANCE OF RADIOMICS AND DEEP LEARNING MODELS IN PREDICTING DISTANT METASTASES IN SOFT TISSUE SARCOMAS: A META-ANALYSIS

Peyman Mirghaderi, MD, MPH (*Presenter*)
Parya Valizadeh (*Abstract Co-Author*)
Sara Haseli, MD (*Abstract Co-Author*)
Hyun Su Kim, MD, PhD (*Abstract Co-Author*)
Stephanie K. Schaub, MD (*Abstract Co-Author*)
Arash Azhideh, MD, MPH (*Abstract Co-Author*)
Matthew J. Nyflot, PhD (*Abstract Co-Author*)
Chankue Park, MD, PhD (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)

PURPOSE

Predicting distant metastases in soft tissue sarcomas (STS) is vital for guiding clinical decision-making. Recent advancements in radiomics and deep learning (DL) models have shown promise, but their diagnostic accuracy remains unclear. This meta-analysis aims to assess the performance of radiomics and DL-based models in predicting metastases in STS by analyzing pooled sensitivity and specificity.

METHODS AND MATERIALS

Following PRISMA guidelines, a thorough search was conducted in PubMed, Web of Science, and Embase. A random-effects model was used to estimate the pooled area under the curve (AUC), sensitivity, and specificity. Subgroup analyses were performed based on imaging modality (MRI, PET, PET/CT), feature extraction method (DL radiomics [DLR] vs. handcrafted radiomics [HCR]), and incorporation of clinical features. Heterogeneity by I^2 statistic, leave-one-out sensitivity analyses, and publication bias by Egger's test assessed model robustness and potential biases.

RESULTS

Eighteen studies involving 1,712 patients were included. The pooled AUC for predicting metastasis was 0.88 (95% CI: 0.80-0.92). The pooled AUC values were 88% (95% CI: 77%-89%) for MRI-based models, 80% (95% CI: 76%-92%) for PET-based models, and 91% (95% CI: 78%-93%) for PET/CT-based models, with no significant differences ($p = 0.75$). DL-based models showed significantly higher sensitivity than HCR models ($p < 0.01$). Including clinical features did not significantly improve model performance (AUC: 0.90 vs. 0.88, $p = 0.99$). Significant heterogeneity was noted ($I^2 > 25\%$), and Egger's test suggested potential publication bias ($p < 0.001$).

CONCLUSION

Radiomics models showed promising potential for predicting metastases in STSs, with DL approaches outperforming traditional HCR. While integrating this approach into routine clinical practice is still evolving, it can aid physicians in identifying high-risk patients and implementing targeted monitoring strategies to reduce the risk of severe complications associated with metastasis. However, challenges such as heterogeneity, limited external validation, and potential publication bias persist. Future research should concentrate on standardizing imaging protocols and conducting multi-center validation studies to improve the clinical applicability of radiomics predictive models.

CLINICAL RELEVANCE/APPLICATION

By accurately identifying patients at high risk for metastasis, these models have potential guide personalized treatment strategies, improve surveillance protocols, and reduce complications associated with delayed or inadequate intervention.

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Nov. 30 – Dec. 4
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R6-SSNMMI08

Nuclear Medicine and Molecular Imaging (Thyroid Cancer/Pediatrics)

Thursday, Dec. 4 1:30PM - 2:30PM Room: S405

Terence Z. Wong, MD, PhD (*Moderator*)
Esma A. Akin, MD (*Moderator*)

Sub-Events

R6-SSNMMI08-3 VALUE OF REPEAT RADIOACTIVE IODINE TREATMENTS IN THYROID CANCER PATIENTS WITH BIOCHEMICAL RECURRENCE

Johnson Deshommes, MD (*Presenter*)
Haseeb Ahmad (*Abstract Co-Author*)
Katherine Manning (*Abstract Co-Author*)
Chris Jackel (*Abstract Co-Author*)
William Denton, BA, MA (*Abstract Co-Author*)
Hunter Colson (*Abstract Co-Author*)
Ahmed Elsayed, MD (*Abstract Co-Author*)
Blaine T. Mischen, MD (*Abstract Co-Author*)
Riham H. El Khouli, MD, PhD (*Abstract Co-Author*)

PURPOSE

Thyroid cancer is a common endocrine malignancy and papillary thyroid carcinoma is the most common subtype among differentiated thyroid cancers (DTC). Despite ongoing debate regarding optimal management strategies, surgical resection followed by radioactive iodine (RAI) therapy remains the standard of care in most cases. Biochemical recurrence, defined as elevated thyroglobulin levels after radioactive iodine treatment without evidence of structural disease, varies in incidence by risk stratification ranging from 5-10% in low-risk patients up to 50% in high-risk patients. The best management strategy remains an area of debate. This study aims to assess the recurrence rate and progression free survival of patients who underwent at least one repeat RAI treatment for biochemical recurrence.

METHODS AND MATERIALS

We retrospectively reviewed all patients with DTC who presented for biochemical recurrence and received second RAI treatment in our nuclear medicine department between 2016 and 2022. Demographics, histologic subtypes, and disease stages data were collected. Thyroglobulin values (stimulated and non-stimulated), time to recurrence, and nadir thyroglobulin levels were recorded.

RESULTS

A total of 164 patients met our inclusion criteria, only 37% (61/164) had recurrence, while 63% (103/164) did not have recurrence after second RAI treatment. Stimulated thyroglobulin was <4 in 76% (111/146) and was > 4 in 24% (35/146) of cases. Among patients with <4 stimulated thyroglobulin level, 31% (34/146) had recurrence, while 69% (77/146) did not have recurrence after the second RAI treatment. On the other hand, among patients with > 4 stimulated thyroglobulin levels, 54.3% had recurrence while 45.7% did not have recurrence after the second RAI treatment (p-value 0.015). The initial number of metastatic lymph nodes (LNs) at the time of surgery was 5 or more LNs in 27% (38/139) and was less than 5 in 73% (101/139) of patients. Among patients with > 5 LNs 55% had recurrence while 45% did not have recurrence after the second RAI treatment. On the other hand, among patients with <5 LNs, 69% had recurrence while 31% did not have recurrence after second RAI treatment (p-value 0.006).

CONCLUSION

Empirical RAI treatment for biochemical recurrence in thyroid cancer patient resulted in disease control in 63% of patients. Higher risk of recurrent disease in patients with > 5 metastatic LNs at initial surgery and > 4 stimulated thyroglobulin level at the time of second treatment, yet close to third of patients with < 5 LNs and <4 stimulated thyroglobulin showed recurrent disease.

CLINICAL RELEVANCE/APPLICATION

Management of biochemical recurrence in thyroid cancer patients is a controversial topic and guidance that might help patient selection is of clinical value.

R6-SSNMMI08-5 IMPACT OF READER EXPERIENCE ON THE TIME-SAVING POTENTIAL OF A NOVEL COMPUTER-AIDED TOOL FOR ANN ARBOR STAGING IN PEDIATRIC HODGKIN LYMPHOMA

Iryna Vasyliv, MD (*Presenter*)

PURPOSE

Accurate staging of Hodgkin lymphoma in children is important for selecting appropriate therapies. However, difficulties in assigning an Ann Arbor stage based on tumor detection on whole-body PET scans can compromise the timeliness and accuracy of diagnoses. The purpose of the study was to determine if a novel computer-aided staging tool can improve the time-efficiency of Ann Arbor staging.

METHODS AND MATERIALS

PET/MRI scans of 56 pediatric patients, divided into two groups with matched Ann-Arbor stages, were staged by one radiology resident, four radiologists and two nuclear medicine physicians with different level of experience, via traditional inspection (Group 1) or with a newly developed web-based staging tool (Group 2). The time to generate the Ann Arbor score was compared between group 1 and 2 with the Wilcoxon Rank-Sum test. We performed a linear regression analysis to examine if there was association between reader experience, measured as the number of PET cases interpreted per year, and the time saved through use of the tool.

RESULTS

The least experienced reader, a radiology resident, saved 6.05 minutes per case by using the tool, while the most experienced nuclear medicine physician experienced a slight increase in reading time (-0.54 minutes). Overall, the tool resulted in a mean time savings of 3.1 ± 0.9 minutes per case. Importantly, the time saved showed a significant inverse correlation with reader experience ($r = -0.866$, $p = .012$), indicating that the tool was particularly beneficial for less experienced readers.

CONCLUSION

The computer-aided staging tool improved the time-efficiency and consistency of Ann Arbor staging, especially for non-experts.

CLINICAL RELEVANCE/APPLICATION

By streamlining the staging process, this tool supports faster clinical decision-making, improves workflow efficiency, and may help reduce variability in PET interpretation across experience levels.We provide the tool as a freely accessible web resource.

R6-SSNMMI08-6 PREDICTING AVASCULAR NECROSIS POST FIXATION: THE ROLE OF SKELETAL SCINTIGRAPHY IN SLIPPED CAPITAL FEMORAL EPIPHYSIS AND HIP FRACTURES

Jamison Ash, MD (*Presenter*)
Heather A. Cole, MD (*Abstract Co-Author*)

PURPOSE

The pediatric proximal femoral epiphysis is uniquely vulnerable to ischemic injury due to developmental vascular isolation across the physis, with limited collateral circulation until skeletal maturity. Current imaging modalities such as MRI, while sensitive in non-operative settings, suffer from significant limitations in the presence of fixation hardware. This study evaluates the utility of post-operative bone scintigraphy in predicting avascular necrosis (AVN) after surgical fixation of Slipped Capital Femoral Epiphysis (SCFE) and femoral neck fractures,

METHODS AND MATERIALS

A retrospective cohort of pediatric patients who underwent surgical fixation for SCFE or femoral neck fracture was evaluated with post-operative bone scintigraphy. Presence of femoral head photopenia was correlated with subsequent development of AVN on follow-up imaging and clinical outcomes. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated.

RESULTS

Among 64 patients, 17 demonstrated photopenia; of these, 11 developed AVN (PPV 67%). Only one case of AVN occurred among patients without photopenia (NPV 98%). Photopenia demonstrated a sensitivity of 92% and specificity of 89% for AVN prediction. The presence of photopenia identified patients at high risk for AVN, while absence strongly predicted vascular preservation.

CONCLUSION

Bone scintigraphy offers a highly sensitive and specific method for early functional assessment of femoral head viability after surgical fixation. It bridges a critical gap where MRI and CT are degraded by metal artifact, providing clinicians with actionable prognostic information.

CLINICAL RELEVANCE/APPLICATION

Understanding the developmental vascular biology of the pediatric proximal femur reveals why functional imaging, rather than purely anatomic imaging, is essential in post-operative settings.The use of post-operative bone scintigraphy enables clinical decision-making by stratifying patients based on their risk of developing avascular necrosis (AVN). In cases where photopenia suggests compromised femoral head viability, early identification may prompt timely surgical interventions aimed at revascularization, potentially preserving joint function and mobility. Alternatively, normal bone scintigraphy correlates with a low risk of AVN allowing clinicians to safely reduce follow-up imaging, minimize radiation exposure, lower healthcare costs, and may facilitate earlier return to weight bearing activities.

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R6-SSNR15

Neuroradiology (Techniques and Methods: Other Techniques)

Thursday, Dec. 4 1:30PM - 2:30PM Room: S406B

Virginia B. Hill, MD (*Moderator*)
Jae W. Song, MD, MS (*Moderator*)

Sub-Events

R6-SSNR15-1 COMPARISON OF READER SCORING AND QUANTITATIVE IMAGE QUALITY OF NEUROLOGICAL CT EXAMS ON ENERGY-INTEGRATING DETECTOR AND SILICON PHOTON-COUNTING DETECTOR CT

Aria Salyapongse, MSc (*Presenter*)
Brian E. Nett, PhD (*Abstract Co-Author*)
Meghan Yue, BS (*Abstract Co-Author*)
Nick Mathew (*Abstract Co-Author*)
Greg D. Avey, MD (*Abstract Co-Author*)
Tabassum A. Kennedy, MD (*Abstract Co-Author*)
Aaron S. Field, MD, PhD (*Abstract Co-Author*)
Staffan Holmin, MD,PhD (*Abstract Co-Author*)
Hakan Almqvist, MD (*Abstract Co-Author*)
Timothy P. Szczykutowicz, PhD (*Abstract Co-Author*)

PURPOSE

To compare subject and objective image quality metrics of non-contrast neuro CT exams between clinically available energy-integrating detector (EID) CT and a prototype deep silicon (dSi) photon-counting detector (PCD) CT.

METHODS AND MATERIALS

7 subjects underwent clinically indicated neurological scanning on commercially available EID CT scanners and then were scanned on the dSi PCD CT (GE Healthcare, Waukesha WI). All subjects provided informed consent under an IRB. Scanning parameters of the EID scans followed the institutions' clinical protocols. Scans on the dSi PCD were dose-matched (within 2% CTDI vol) or below (35-40% dose reduction) the EID prior dose. Contrast to noise ratio (CNR) was calculated by selecting five slices where both gray matter (GM) and white matter (WM) were visible to calculate contrast (GM - WM CT numbers) and noise (standard deviation of WM CT number). Statistically significant differences were determined via the Student's t-test for paired samples. Reader scoring based image quality was assessed by 4 neuroradiologists using a 5-point Likert scale (1 = worse than standard of care, 3 = equivalent to standard of care, 5 = much better than standard of care) on structural confidence (caudate head, insular ribbon, internal capsule, lentiform nuclei, and M1-M6 cortical contrast), low contrast detectability, noise, spatial resolution, artifacts, and diagnostic quality. Reader agreement was assessed with a linearly weighted Cohen's Kappa, and statistical significance between Likert scores was assessed with the Wilcoxon rank sum test on the median of the four reader scores.

RESULTS

The images from the prototype dSi PCD CT were found to be significantly better than the EID images on all reader-based image quality metrics ($p < 0.03$) except noise. Reader agreement was fair on average ($k=0.27$). No significant difference ($p = 0.12$) was found between the physics-based CNR of the EID priors and the dSi PCD scans.

CONCLUSION

Compared to the clinical EID CT neuro images, the images from the prototype dSi PCD CT have statistically significant improved reader scores and measured CNR was not statistically different.

CLINICAL RELEVANCE/APPLICATION

Improved grey-white matter differentiation on PCD CT could enhance the ability to detect early ischemic changes, subtle traumatic injuries, or evolving edema—particularly in the acute setting where rapid and confident diagnosis is critical. Greater soft tissue contrast and reduced noise may also improve diagnostic confidence and reduce the need for follow-up imaging.

R6-SSNR15-2 REPRODUCIBILITY STUDY OF HIGH-FIELD (5T) BRAIN TUMOR CEST IMAGING (AMIDE PROTON TRANSFER IMAGING (APT-CEST) AND GLUTAMATE PROTON TRANSFER IMAGING (GLU-CEST))

Hao Chen (*Presenter*)

PURPOSE

Chemical exchange saturation transfer (CEST) technique is a new molecular imaging method for noninvasive measurement of metabolites in biological tissues. It uses the chemical exchange process between unstable groups of metabolites and water molecules to detect and image weak metabolic signals. High field magnetic resonance has a stronger ability to distinguish metabolites, but it also faces the challenge of inhomogeneity of B0 and B1. In this study, amide proton transfer imaging CEST (APT-CEST) and glutamate CEST (Glu-CEST) images were collected in brain tumor patients to explore the repeatability of CEST technique in different tissues under high field magnetic resonance (5Tesla).

METHODS AND MATERIALS

Forty patients with brain tumors were recruited, and APT-CEST and Glu-CEST images were performed on all patients twice, respectively. Two regions of interest (ROI) (tumor region and contralateral normal brain tissue) were delineated in each patient. The mean of the magnetization transfer ratio of the ROI was evaluated. The standard deviation across all participants of the within-participant difference between two scans (SD diff) and the interclass correlation coefficient (ICC) of the mean of the difference between the mean of the lesion and the opposite healthy tissue were calculated.

RESULTS

(1) Both types of CEST imaging showed good repeatability on 5T magnetic resonance; (2) Compared with normal tissue, tumor tissue showed better repeatability of CEST imaging on 5T magnetic resonance, showing as lower SD diff and higher ICC.

CONCLUSION

The CEST technique under 5T field resonance has a good repeatability, especially in the tissue of the brain tumor.

CLINICAL RELEVANCE/APPLICATION

The CEST technique under 5T field resonance provides a reliable basis for the application of CEST in the imaging study of brain tumors.

R6-SSNR15-4 DISTINCT BRAIN ALTERATIONS AND NEURODEGENERATIVE PROCESSES IN COGNITIVE IMPAIRMENT ASSOCIATED WITH POST-ACUTE SEQUELAE OF COVID-19

Yangsean P. Choi, MD, PhD (*Presenter*)

PURPOSE

Although brain alterations have been reported in post-acute sequelae of SARS-CoV-2 infection (PASC), the extent to which they are universally present and associated with neurodegenerative processes remains unclear. This study aimed to investigate blood protein profiles and brain MRI findings in individuals with a history of mild COVID-19 to elucidate the neurological consequences of PASC.

METHODS AND MATERIALS

In this single-center prospective study, participants who had experienced mild COVID-19 approximately one year prior were categorized into three groups: PASC with cognitive impairment (Cog-PASC), PASC without cognitive impairment (Other-PASC), and no significant PASC symptoms (NS-PASC). Multimodal brain MRI was performed to obtain biomarkers including cortical thickness and choroid plexus volumes (from 3D T1-weighted images), diffusion tensor imaging along the perivascular spaces (DTI-ALPS), and quantitative susceptibility mapping (QSM) to assess paramagnetic susceptibility. Group-wise comparisons were conducted using the Kruskal-Wallis test with adjustment for age and sex.

RESULTS

Patients in the Cog-PASC group (median age [interquartile range, IQR]: 64 [53-68]) were significantly older than those in the NS-PASC (56 [45-63]) and Other-PASC (51 [41-60]) groups ($P<0.001$), and had worse cognitive performance (MoCA score: 24 [22-25] vs. 28 [27-29] in both other groups; $P<0.001$). MRI revealed reduced cingulate cortical thickness in Cog-PASC (2.445 mm [2.356-2.517]) compared to NS-PASC (2.449 mm [2.374-2.531]) and Other-PASC (2.497 mm [2.442-2.581]; $P=0.035$). QSM indicated increased paramagnetic susceptibility, consistent with iron deposition, particularly in the cingulate cortex and hippocampus ($P=0.005$). Choroid plexus volume was also significantly higher in Cog-PASC compared to Other-PASC, correlating with markers of neuronal/astroglial damage and iron accumulation. No significant differences were observed in DTI-ALPS metrics across the three groups. Blood proteomics revealed significant alterations in proteins associated with oxidative stress and synaptic function in Cog-PASC, implicating neurodegenerative pathways.

CONCLUSION

These results suggest that individuals with Cog-PASC, even after mild COVID-19 infection, exhibit distinct neurodegenerative changes.

CLINICAL RELEVANCE/APPLICATION

This study identifies structural and molecular brain changes specific to cognitively impaired PASC patients, which were absent in other PASC subgroups. The findings provide evidence of persistent neurodegeneration in a subset of non-hospitalized individuals following mild COVID-19.

R6-SSNR15-5 USEFULNESS OF CONJUGATE GRADIENT RECONSTRUCTION TECHNIQUE FOR EVALUATING INTRACRANIAL ARTERIES WITH 4D ULTRASHORT TE MR ANGIOGRAPHY

Hiroyuki Uetani, PhD (*Presenter*)
Takeshi Nakaura, MD (*Abstract Co-Author*)
Koya Iwashita (*Abstract Co-Author*)
Kanako Sato (*Abstract Co-Author*)
Kosuke Morita (*Abstract Co-Author*)
Mika Kitajima, MD (*Abstract Co-Author*)
Akitake Mukasa (*Abstract Co-Author*)
Toshinori Hirai, MD, PhD (*Abstract Co-Author*)

PURPOSE

4D MR angiography (MRA) by using an ultrashort TE (UTE) combined with an arterial spin-labeling technique (4D UTE-MRA) is a valuable tool for follow-up evaluations of intracranial aneurysms post-endovascular treatment (EVT); however, its prolonged acquisition time remains a significant drawback. A conjugate gradient reconstruction (CG-recon) technique has been developed to correct for trajectory errors and concomitant field artifacts in non-cartesian imaging. The purpose of this study was to evaluate the usefulness of a CG-recon technique in 4D UTE-MRA for the depiction of intracranial arteries in patients with intracranial aneurysm after EVT.

METHODS AND MATERIALS

This study included 25 patients (21 women; mean age 63 years) with intracranial aneurysms treated with EVT. All patients underwent DSA and 4D UTE-MRA with the number of 9600 trajectories after EVT. We hypothetically reduced the number of 4D UTE-MRA trajectories to 1/2, 1/3, 1/4, and 1/5 and reconstructed images using both conventional and CG-recon techniques. Two neuroradiologists qualitatively assessed the 4D UTE-MRA images and scored the depiction of the internal carotid arteries (ICAs), middle cerebral arteries (MCAs), anterior cerebral arteries (ACAs), vertebral arteries (VAs), and basilar artery (BA) with reference to DSA.

RESULTS

With conventional reconstruction, median scores for qualitative evaluations were significantly lower with reducing the number of trajectories by more than 1/2 than with all trajectories for ICAs, MCAs, ACAs, and VAs ($P < 0.05$). For ICA and VA, CG-recon, which reduced the number of trajectories to 1/4, had significantly higher median scores than conventional reconstruction using all trajectories. There was no significant difference in median scores for all arteries between conventionally reconstructed images with all trajectories and CG-recon images with trajectory reductions from 1/2 to 1/5.

CONCLUSION

CG-recon technique can improve the depiction of intracranial arteries in 4D UTE-MRA images with reduced number of trajectories.

CLINICAL RELEVANCE/APPLICATION

CG-recon can enhance the visualization of intracranial arteries in 4D UTE-MRA and holds potential for reducing acquisition time.

R6-SSNR15-6 HABITAT RADIOMICS BASED ON T1ρ IMAGING FOR PREDICTING IDH-1 MUTATION STATUS IN GLIOMAS: A PRELIMINARY STUDY

Mingmei Li, MMed (*Presenter*)
Xingwei Dai (*Abstract Co-Author*)

Hao Li (*Abstract Co-Author*)
Liping Qing (*Abstract Co-Author*)
Demin Xu (*Abstract Co-Author*)
Qin Zhao (*Abstract Co-Author*)
Meiying Chen (*Abstract Co-Author*)
Zhonghua Li (*Abstract Co-Author*)
Yulong Qi (*Abstract Co-Author*)
Guanxun Cheng, PhD (*Abstract Co-Author*)

PURPOSE

Magnetic resonance spin-locked imaging (T1? imaging), a magnetic resonance sequence sensitive to tissue microstructure and metabolic activity, could reflect tumor biochemical characteristics and heterogeneity. This study aimed to evaluate the feasibility of habitat radiomics features derived from T1? imaging at different spin-lock frequency (FSL) in predicting the IDH-1 mutation status in gliomas.

METHODS AND MATERIALS

A total of 42 glioma patients (mean age, 49.2 ± 13.1 years [SD]) were retrospectively enrolled and classified into IDH-1 wild-type and IDH-1 mutated groups. Tumor core and peritumoral edema regions were manually delineated on contrast-enhanced T1-weighted (T1CE) and T2-weighted-fluid-attenuated inversion recovery (T2-FLAIR) images, respectively, registered to the T1? imaging space acquired with FSL of 100 Hz, 200 Hz, and 500 Hz. Habitat maps were generated by applying K-means clustering (K=3) to signal intensities within the combined masks. Within each habitat subregion, both first-order statistics and second-order texture features were extracted. Features were standardized and subjected to least absolute shrinkage and selection operator (LASSO) regression for dimensionality reduction. Logistic regression models were constructed based on the selected features. Model performance was evaluated using 5-fold cross-validation by plotting receiver operating characteristic (ROC) curves and calculating the sensitivity, specificity, and area under the curve (AUC). DeLong's test was used to compare model performance across different FSL.

RESULTS

Among the three FSL-T1? imaging conditions, the model based on 500 Hz demonstrated the best diagnostic performance, with a sensitivity of 0.833, specificity of 0.913, and AUC of 0.901 ($P < 0.001$), significantly outperforming the models based on 200 Hz (sensitivity = 0.556, specificity = 0.783, AUC = 0.780, $P = 0.049$) and 100 Hz (sensitivity = 0.778, specificity = 0.625, AUC = 0.708, $P = 0.013$). According to DeLong's test, the AUC of the 500 Hz model was significantly higher than that of the 100 Hz model ($P < 0.05$). In contrast, the differences in AUC between 100 Hz and 200 Hz and between 200 Hz and 500 Hz were not statistically significant ($P > 0.05$).

CONCLUSION

Habitat radiomics based on T1? imaging effectively predicted IDH mutation status in gliomas. Among different FSL, the 500 Hz-T1? imaging demonstrated superior predictive performance compared to 100 Hz and 200 Hz.

CLINICAL RELEVANCE/APPLICATION

Higher FSL in T1? imaging may better capture the underlying biological heterogeneity of gliomas and contribute to the development of more robust radiomics models for clinical prediction.
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R6-SSPD05

Science Session with Keynote: Pediatric Imaging (Chest, Cardiac and Fetal)

Thursday, Dec. 4 1:30PM - 2:30PM Room: E350

Sameh Tadros, MD, MSc (*Moderator*)
Marcelo S. Takahashi, MD, PhD (*Moderator*)

Sub-Events

R6-SSPD05-1 Keynote Speaker: Pediatric Chest: 10 New Techniques and Diagnoses to Know in 10 Minutes

R. Paul Guillerman, MD (*Science Invited Presenter*)

R6-SSPD05-2 FETAL AND NEONATAL POSTMORTEM MRI CLINICAL PROTOCOL: DELPHI CONSENSUS STUDY OF IMAGING EXPERTS

Aurelie DHondt, MD (*Presenter*)
Susan C. Shelmerdine, MBBS, FRCR (*Abstract Co-Author*)
Teresa Victoria, MD, PhD (*Abstract Co-Author*)
Willemijn M. Klein, MD, PhD (*Abstract Co-Author*)
Elka Miller, MD, FRCPC (*Abstract Co-Author*)
Michael Aertsen, MD (*Abstract Co-Author*)
Marie Cassart, MD (*Abstract Co-Author*)
Monica Rebollo Polo, MD (*Abstract Co-Author*)
Marta Gomez-Chiari, MD (*Abstract Co-Author*)
Padma Rao, MBBS (*Abstract Co-Author*)
Ajay Taranath, MBBS, MD (*Abstract Co-Author*)
Mariana L. Meyers, MD (*Abstract Co-Author*)
Eleonore Blondiaux, MD (*Abstract Co-Author*)
Christian Abel, MD (*Abstract Co-Author*)
Marianne Alison, MD, PhD (*Abstract Co-Author*)
Stacy K. Goergen, MBBS (*Abstract Co-Author*)
Rick R. Van Rijn, MD,PhD (*Abstract Co-Author*)
Owen Arthurs (*Abstract Co-Author*)

PURPOSE

Postmortem magnetic resonance imaging (PMMRI) following fetal and perinatal demise is increasingly used in clinical practice as a non-invasive adjunct or alternative to autopsy. From expert consensus, we aimed to develop two PMMRI protocols for pragmatic clinical perinatal imaging: first, a standardized "minimal" PMMRI clinical protocol (with the minimum essential sequences needed per body part), and second, an "ideal" PMMRI clinical protocol with the ideal full protocol, time allowing.

METHODS AND MATERIALS

A modified Delphi survey was conducted, between July and November 2024, amongst members of the European Society of Pediatric Radiology (ESPR) postmortem (PM) Task Force, the PM imaging committee of the Society for Pediatric Radiology (SPR) and the Australian and New Zealand Society for Pediatric Radiology (ANZSPR). The survey was based on two pre-existing published PMMRI protocols and consisted of two multiple-choice tables which included all the MRI sequences in different planes according to each body part with an additional 10 PMMRI organizational questions (three of which were free text, seven multiple choice). An email containing the link of the survey was sent to 22 members of the different international PM imaging taskforces, recruited on a voluntary basis, given their clinical interest and experience in practicing perinatal PM imaging. The results were collected and analyzed in a descriptive manner and a point-of-care PMMRI clinical protocol was established based on the recommendations of our expert panelists.

RESULTS

Nineteen PM imaging specialists from 17 centers worldwide (Europe, USA, Canada, Australia, and New Zealand) completed the survey and formed our expert panel. By consensus (defined as >60% agreement), the final "minimal" PMMRI clinical protocol includes three-dimensional (3-D) isovolumetric T2 and T1 weighted sequences of brain (72.2% and 77.8% respectively) and chest-abdomen-pelvis (83.3% and 77.8% respectively). The "ideal" PMMRI clinical protocol includes 3-D isovolumetric T2 and T1 weighted sequences of the whole body (66.7 - 100%; 61.1 - 91.7% respectively) with axial SWI (81.3%) and DWI (68.8%) of the brain. Additional sequence if time allows is axial T2 TSE (56.3%) of the brain. Both protocols are illustrated in Figure 1.

CONCLUSION

As a minimum, 3-D isovolumetric T1 and T2 weighted sequences of the brain and body should be performed as part of a perinatal clinical PMMRI protocol. We hope these recommendations will facilitate the standardization and globalization of perinatal PMMRI in clinical practice.

CLINICAL RELEVANCE/APPLICATION

We have obtained expert recommendations on perinatal PMMRI protocols that balance efficiency with accuracy for clinical implementation.

R6-SSPD05-4 OPTIMIZING PHOTON-COUNTING CT FOR CONGENITAL HEART DISEASE: THE VALUE OF ULTRASHARP KERNELS IN NEONATES AND INFANTS

Babak Salam, MD (*Presenter*)
Alois M. Sprinkart, PhD (*Abstract Co-Author*)
Leonie Weinhold (*Abstract Co-Author*)
Christopher Hart (*Abstract Co-Author*)
Sebastian Nowak, PhD (*Abstract Co-Author*)
Alexander Isaak, MD (*Abstract Co-Author*)
Claus C. Pieper, MD (*Abstract Co-Author*)
Christiane K. Kuhl, MD, PhD (*Abstract Co-Author*)

Julian A. Luetkens, MD (*Abstract Co-Author*)
Timm Dirrichs (*Abstract Co-Author*)
Daniel Kuetting, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic yield of kernel and sharpness settings for cardiac high-pitch CT in pediatric patients using Photon-counting CT (PCCT).

METHODS AND MATERIALS

This retrospective multi-center study analyzed clinical PCCT data from pediatric patients with congenital heart defects acquired between August 2021 and August 2023 at two specialized centers. Images were reconstructed using vascular kernels with alternating kernel sharpness levels (KS; 36,40,44,48,56,60) and iterative reconstruction levels (IR; Q1 to Q4) at a slice thickness of 1 mm. Image sharpness was evaluated with the edge-rise distance (ERD) as an objective measure. Signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) were calculated using standardized region-of-interest analyses. Visual image quality was assessed by three independent reviewers using a 5-point scale. For each patient reviewers selected one reconstruction with the best diagnostic yield. Statistical comparisons were performed using linear mixed models (values reported as regression estimates [95% confidence interval]).

RESULTS

A total of 47 patients (28 male, 19 female; median age: 82 days) were included in the analysis. Subjective overall image quality improved with increasing KS and IR levels (0.07 [0.06-0.09] and 0.21 [0.19-0.23], respectively; both P<.001). The highest image quality was achieved with KS 60 (79/141 votes) and IR Q4 (131/141 votes). ERD improved significantly with increasing KS and IR (-0.07 [-0.08 to -0.06] and -0.06 [-0.06 to -0.04], respectively; both P<.001).

CONCLUSION

Selection of kernel and iterative reconstruction impacts diagnostic quality in pediatric PCCT examinations with ultrasharp reconstruction delivering the best objective and subjective quality for imaging complex coronary and structural heart anomalies.

CLINICAL RELEVANCE/APPLICATION

This study highlights the clinical value of ultrasharp reconstruction kernels in photon-counting CT for neonates and infants with congenital heart disease. By optimizing diagnostic image quality through tailored reconstruction settings, photon-counting CT enables improved visualization of critical cardiac structures while maintaining low radiation exposure — supporting more accurate diagnosis and safer imaging in this vulnerable patient group.

R6-SSPD05-5 THE DEVELOPMENT OF PERIVASCULAR SPACES ON FETAL MRI IN HEALTH AND DISEASE

Clara Krimmel (*Presenter*)
Nikolaus Michael Nowak (*Abstract Co-Author*)
Marlene Stuempflen, MD (*Abstract Co-Author*)
Patric Kienast, MD (*Abstract Co-Author*)
Julia Binder (*Abstract Co-Author*)
Dieter Bettelheim (*Abstract Co-Author*)
Felix Merlin Konig, MD (*Abstract Co-Author*)
Nikolai A. Gantner (*Abstract Co-Author*)
Joel Leinkauf (*Abstract Co-Author*)
Frederik Barkhof, MD, PhD (*Abstract Co-Author*)
Daniela Prayer, MD (*Abstract Co-Author*)
Gregor Kasprian, MD, MBA (*Abstract Co-Author*)
Victor Schmidbauer, MD (*Abstract Co-Author*)
Lukas Haider, MD,PhD (*Abstract Co-Author*)

PURPOSE

Perivascular spaces (PVS) are thought to play a crucial role in brain waste clearance. While extensively studied in adults, research on the development of PVS is still scarce. We therefore investigated prenatal PVS using fetal MRI.

METHODS AND MATERIALS

Fetal MRI was performed on 3T between 08/2019 and 01/2024 in 457 cases. Whole body assessment of the fetus was performed using T2-weighted sequences in 3 orthogonal planes. Perivascular spaces, identified as areas of high signal intensity on coronal T2-weighted fetal brain MRI sequences, located parallel to arteries in the inferior part of the basal ganglia, were segmented by trained experts. Across the cohort a total of 248 radiological diagnostic items were recorded per patient as present or absent and grouped into five categories: central nervous system (CNS), thoraco-abdominal-, craniofacial-, limb- and placental/umbilical cord pathologies. In 219 cases detailed data on delivery were available. PVS count and volume were related to gestational age, sex and MRI findings, using generalized linear regression models in R.

RESULTS

Seventy/457 cases were excluded due to insufficient image quality. In those remaining, fetal age ranged between 106 - 265 days (mean: 182.7, sd: 32.95), with 153 females. CNS pathologies were identified in 138, craniofacial pathologies in 72, thoraco-abdominal pathologies in 31, limb pathologies in 36, and placental/umbilical cord pathologies in 45 fetuses. No PVS were visible prior to gestational ages of 116 days. PVS volume increased with gestational age by 0.06mm 3 /d (CI: 0.04-0.08, p<0.001), PVS counts by 0.01/d, (CI: 0.00 - 0.01, p=0.007). In cases with presence of any MRI visible structural CNS pathology, the PVS volume, adjusting for age and gender, decreased on a group level by 2.83mm 3 (CI: -4.75 - -0.91, p=0.004), the count by 0.61 (CI: -0.99 - -0.23, p=0.002). A near-significant trend in PVS count was observed in cases with placental/umbilical cord pathologies (p= 0.066). However, no significant influence was observed from factors such as sex (p=0.353 and p=0.594), craniofacial abnormalities (p=0.183 and p=0.082), thoraco-abdominal abnormalities (p=0.185 and p=0.646), or limb abnormalities (p=0.983 and p=0.555) on PVS volume or count.

CONCLUSION

In fetal MRI, visibility of PVS in the basal ganglia is a feature of normal CNS development, that is statistically delayed by CNS pathologies.

CLINICAL RELEVANCE/APPLICATION

The visibility of perivascular spaces on fetal MRI is indicative of physiological aging.

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R6-SSPH14

Physics (Radiomics and Quantitative Imaging)

Thursday, Dec. 4 1:30PM - 2:30PM Room: S404

Ingrid Reiser, PhD (*Moderator*)
Aimilia Gastounioti, PhD (*Moderator*)

Sub-Events

R6-SSPH14-1 RELIABILITY OF TASK-DRIVEN EVALUATION OF RADIOMICS FEATURES FOR LOW-CONTRAST LIVER LESION DETECTION ACROSS VARYING DOSE AND RECONSTRUCTION SETTINGS IN PHOTON-COUNTING DETECTOR CT

Shravani Kharat, MS (*Presenter*)
Jarod Wellinghoff (*Abstract Co-Author*)
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Hao Gong, PHD (*Abstract Co-Author*)

PURPOSE

Radiomics features are affected by CT data acquisition and reconstruction settings, hampering generalizability. Using a low contrast liver lesion detection task and varying dose and reconstruction settings, we used a task-driven evaluation to assess radiomic feature reproducibility and variability, optimize feature selection, and enhance generalizability

METHODS AND MATERIALS

Patient photon counting detector (PCD) CT scans (n=12) without liver lesions were retrospectively collected. Lower dose scans were simulated with a validated projection domain noise insertion tool. Lesion images were digitally modified in diameter (range 7 to 12 mm) and contrast (15 to 45 HU). A validated projection domain lesion insertion tool was used to insert the modified lesions into liver. At each dose level, 175 lesions were inserted. The modified projections were reconstructed with commercial software across different experimental conditions, involving 4 dose levels (100%, 75%, 50%, 25% routine dose), 3 keV levels (55, 67, 76 keV), 3 reconstruction kernels (Br36, Br44, Br56), 2 denoising strengths, and 2 slice thickness / increment (3 / 3, 1 / 1 mm). We extracted 93 radiomics features from lesion locations and liver parenchyma. We analyzed feature reproducibility and variability using intraclass correlation coefficient (ICC), concordance correlation coefficient (CCC), coefficient of variation (CV), and quartile coefficient of dispersion (QCD). The features showing good-to-excellent reproducibility across different conditions were selected using frequency-based criteria and were used to classify lesion and background images across different conditions to demonstrate feature reproducibility and model robustness. K-mean clustering was used in classification

RESULTS

Reproducibility was most affected by slice thickness/ increment, radiation dose and lower keV. Range of percentage of robust features using ICC and CCC thresholds were [7%, 79%] and [7%, 92%], respectively. Compared to liver background, features at lesion locations showed lower reproducibility at lower dose levels (percentage of robust features at lesion / background): 50% dose: 60% / 79%, 75% dose: 76% / 92%. Feature variability was relatively consistent: percentage of robust features using CV and QCD thresholds [17%, 32%] and [21%, 35%], respectively. 57 features were selected. Overall clustering accuracy (robust / unrobust features): 83.3% / 66.9%

CONCLUSION

Robust radiomics features were identified for lesion detection task and improved classification accuracy

CLINICAL RELEVANCE/APPLICATION

Task-driven evaluation can provide deeper insights on radiomic feature robustness to facilitate the optimization of feature selection and radiomics model performance

R6-SSPH14-2 RADIOMICS-DRIVEN CLINICAL CLASSIFICATION OF MYOCARDIAL FDG PET IMAGING

Yevgeniy Vinogradskiy, PhD (*Presenter*)
Ehsan Golkar (*Abstract Co-Author*)
Vikas Aragam (*Abstract Co-Author*)
Qiang Xu (*Abstract Co-Author*)
Paras Lakhani, MD (*Abstract Co-Author*)
Christopher McNair (*Abstract Co-Author*)
Nicole L. Simone, MD (*Abstract Co-Author*)
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Khaldoun Hamade (*Abstract Co-Author*)
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Wookjin Choi (*Abstract Co-Author*)

PURPOSE

Myocardial Fluorodeoxyglucose (FDG) Positron Emission Tomography (PET) scans are utilized to clinically diagnose cardiac sarcoidosis and inflammation. Due to the low prevalence of cardiac sarcoidosis, radiologists at low-volume centers may have limited experience interpreting myocardial FDG PET scans. Functional radiomics and machine learning (ML) methods have the potential to aid with imaging-based diagnosis but have yet to be applied to myocardial FDG PET imaging. The purpose of this work was to develop a novel FDG PET radiomics classifier for the prediction of cardiac sarcoidosis

METHODS AND MATERIALS

From 2019 to 2023, 169 consecutive myocardial FDG PET-CT scans were analyzed from 141 patients with suspected cardiac sarcoidosis. Fluorodeoxyglucose was intravenously injected, and a PET and CT were acquired from the aortic root to the upper abdomen. A board-certified radiologist classified the myocardial FDG PET scans as having a binary presence or absence of cardiac sarcoidosis. The heart was contoured, and 200 novel functional radiomics features were extracted from the myocardial FDG PET scan. The data were divided into 70%/30% training/testing datasets, and the ability of the cardiac FDG PET radiomics to predict cardiac sarcoidosis was evaluated using ML pipelines with XGBoost and TPOT (Tree-based Pipeline Optimization Tool). Feature reduction was performed using the Wilcoxon test and hierarchical clustering. Both XGBoost and TPOT were evaluated using 10-fold cross-validation on the training set and validated on the testing set independently. The ability of myocardial FDG PET radiomics to predict cardiac sarcoidosis is assessed using accuracy, area under the curve (AUC), sensitivity, and specificity

RESULTS

38 out of 169 (22.5%) FDG PET scans were interpreted as having cardiac sarcoidosis. XGBoost, using 69 radiomics PET features, achieved an accuracy of 90%, AUC of 0.93, sensitivity of 0.82, and specificity of 0.93, on the testing dataset. TPOT, using 44 radiomics PET features, resulted in an accuracy of 86%, AUC of 0.92, sensitivity of 0.73, and specificity of 0.90, on the test set. After feature optimization, a TPOT model with 4 radiomics features was developed that achieved an accuracy of 82% and an AUC of 0.82 on the testing dataset

CONCLUSION

The study develops an innovative functional cardiac PET radiomics model to predict cardiac sarcoidosis with promising accuracy. The novel radiomics-based signature offers an automated method to help radiologists interpret myocardial PET scans and diagnose cardiac sarcoidosis

CLINICAL RELEVANCE/APPLICATION

A radiomics classifier model using FDG PET scans aids in predicting myocardial inflammation and cardiac sarcoidosis, providing promising automated diagnostic support for radiologists

R6-SSPH14-3 A COMPARISON OF THE BIOMECHANICAL ASSESSMENT BETWEEN UPRIGHT AND SUPINE INSPIRATORY-EXPIRATORY AREA-DETECTOR CT IN PATIENTS WITH PROGRESSIVE PULMONARY FIBROSIS

Yoshiharu Ohno, MD, PhD (*Presenter*)
Kota Aoyagi (*Abstract Co-Author*)
Yoshiyuki Ozawa, MD, PhD (*Abstract Co-Author*)
Hirona Kimata (*Abstract Co-Author*)
Yuya Ito (*Abstract Co-Author*)
Kenji Fujii (*Abstract Co-Author*)
Naruomi Akino (*Abstract Co-Author*)
Takahiro Ueda, MD, PhD (*Abstract Co-Author*)
Masahiko Nomura, MD, PhD (*Abstract Co-Author*)
Takeshi Yoshikawa, MD (*Abstract Co-Author*)
Daisuke Takenaka, MD (*Abstract Co-Author*)
Masahiro Endo (*Abstract Co-Author*)

PURPOSE

Upright area-detector computed tomography (ADCT) offers substantial advantages over supine ADCT. However, no study has compared the results of biomechanical evaluations from paired inspiratory-expiratory ADCT data with computed tomography (CT) findings in patients with progressive pulmonary fibrosis (PPF). This study directly compared the capabilities of quantitatively assessed paired inspiratory-expiratory ADCT for pulmonary functional loss and disease severity evaluations between upright and supine ADCT in PPF patients.

METHODS AND MATERIALS

This retrospective study cohort consisted of age-, sex-, and underlying disease-matched patients with PPF who underwent paired inspiratory-expiratory CT on upright ADCT (n=40) or supine ADCT (n=40), pulmonary function tests, and semi-quantitatively assessed CT-based (CT-assessed) disease severity. Based on CT data, the absolute values of the logarithm of the Jacobian determinant and warp field magnitude of the whole lung and all lobes were computationally calculated using a proprietary software program. To determine the influence of lung biomechanics in all lobes on pulmonary function tests and CT-assessed disease severity, stepwise regression analyses were performed.

RESULTS

On supine ADCT, absolute values of the logarithm of the Jacobian determinant and warp field magnitude of the left lower lobe (LLL) were the first and only steps for pulmonary function test results and CT-assessed disease severity (absolute value of the logarithm of the Jacobian determinant: $0.14=r^2=0.16$, $p<0.05$; absolute value of the warp field magnitude: $0.37=r^2=0.39$, $p<0.05$). However, on upright ADCT, both indices indicated that LLL was the first step and the right lower lobe the second step for pulmonary function test results and CT-assessed disease severity (absolute value of the logarithm of the Jacobian determinant: $0.47=r^2=0.61$, $p<0.05$; absolute value of the warp field magnitude: $0.47=r^2=0.65$, $p<0.05$).

CONCLUSION

Upright ADCT has better potential than supine ADCT for detecting pulmonary functional loss and evaluating disease severity when paired inspiratory-expiratory ADCT is applied in PPF patients.

CLINICAL RELEVANCE/APPLICATION

Upright ADCT has better potential than supine ADCT for pulmonary functional loss and disease severity evaluations when paired inspiratory-expiratory ADCT is performed in patients with progressive pulmonary fibrosis.

R6-SSPH14-4 ARE PIXEL-WISE METRICS RELIABLE FOR COMPUTERIZED TOMOGRAPHY RECONSTRUCTION?

Zongwei Zhou, PhD (*Presenter*)
Tianyu Lin (*Abstract Co-Author*)
Xinran Li (*Abstract Co-Author*)
Qi Chen (*Abstract Co-Author*)
Yuanhao Cai (*Abstract Co-Author*)
Kai Ding, PHD (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

To address a fundamental problem in tomographic reconstruction: success on pixel-wise metrics does not guarantee the preservation of anatomical structures in reconstructed CT scans.

METHODS AND MATERIALS

We introduced a new anatomy-centered metric assessing anatomical completeness, covering large (N = 5) and small (N = 5) organs, vessels (N = 5), and pancreatic tumors (N = 3). Moreover, we propose Completeness-Aware Reconstruction Enhancement (CARE) framework, a novel method that implemented these anatomy-centered metrics as an additional learning objective for enhanced tomographic reconstruction. CARE is built on a simple latent diffusion model pre-trained on 6,212 contrast-

enhanced CT scans of 2,870 patients. Then, for each reconstruction method under a fixed number of X-rays, CARE leveraged multi-structural segmentation AI models from prior work and fine-tuned the diffusion model on 25 CT scans (20 patients) to gain generalizable enhancement ability. CARE was compared against four widely used reconstruction methods.

RESULTS

Under the NeRF reconstruction baseline, CARE preserved anatomical structures with 53.9% (44.8%-66.6%) NSD for large organs, 55.5% (45.9%-68.5%) clDice for vascular structures, and outperformed the original reconstruction with +27.9% NSD for large organs, +20.3% NSD for small organs, +22.3% clDice for vascular boundaries, and +3.0% NSD for PDAC. In contrast, the original NeRF reconstruction poorly preserved small objects and vascular structures, e.g., 3.0% (0.0%-5.7%) NSD for small organs; 33.2% (8.2%-42.1%) clDice for vascular structures; 1.1% NSD for PDAC. Qualitative results of CT reconstruction and CARE enhancement are presented in the Figure.

CONCLUSION

Our anatomy-centered metrics reveal that despite seeming successful in pixel-wise metrics, state-of-the-art tomographic reconstruction methods fail in preserving anatomical structures. CARE, when integrated into these methods, can significantly enhance anatomical preservation.

CLINICAL RELEVANCE/APPLICATION

CARE improves the anatomical accuracy of CT reconstructions from 2D X-ray projections. This enhancement supports safer and more effective image-guided interventional radiology by enabling clearer visualization of small and critical structures, improving diagnosis, treatment planning, and patient outcomes.

R6-SSPH14-5 DEVELOPMENT OF A ROBUST MOTION CORRECTION TECHNIQUE FOR DYNAMIC JOINT IMAGING

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Kristin D. Zhao, PhD (*Abstract Co-Author*)
Cynthia H. McCollough, PhD (*Abstract Co-Author*)
Shuai Leng, PhD (*Abstract Co-Author*)
Hao Gong, PHD (*Abstract Co-Author*)

PURPOSE

Recent advancements in 4DCT showed promise in diagnosing of dynamic joint pathology but are limited by motion artifacts that compromise kinematic accuracy. We aim to develop and validate a physics-informed deep learning method to reduce these motion artifacts and enhance diagnostic precision for assessing dynamic joint conditions.

METHODS AND MATERIALS

A retrospective cohort of static wrist CT scans (n=109) was included, which was split into training (n=75), validation (n=17), and testing (n=17) sets. Artifact-free static wrist CT images (i.e., ground truth) at multiple angular positions (10 phases, angular range: -10° to 10°) were generated using elastic deformation guided by an analytically derived 3D motion vector field, following a trapezoidal velocity profile. Simulated motion-corrupted CT images were generated by a motion generation model using ASTRA toolbox. A neural network with at tention gates and transfor m ers (ATM) was trained using simulated motion-corrupted images from two phases (phase no.5 and 6) with most severe motion. The corresponding static CT image of middle phase was used as ground truth. A tailored coarse-to-fine training strategy was used to progressively optimize model weights. This approach involved 4 training stages. In the initial 3 stages, the training and validation images were down-sampled to resolution of 64 x 64, 128 x 128, and 256 x 256, while the final stage utilized images at the standard size of 512 x 512. Three motion artifact metrics: standard deviation (std), entropy, and low-intensity region score (LIRS) were used to evaluate motion before and after correction. A temporal sliding window was applied to use images from other phases as input for inference, in order to assess the model's generalizability in temporal dimension. The visualization of phalanges and metacarpals before and after motion correction was compared. Paired sample t-tests were conducted.

RESULTS

ATM was able to reduce motion artifacts for different input phases using a sliding window approach. Streak and shadowing artifacts caused by motion were substantially reduced. LIRS, std and entropy within the region around bone (mean ± std): 0.32 ± 0.04, 63.73 ± 23.59, and 7.07 ± 0.24 before correction, 0.46 ± 0.08, 47.73 ± 17.13, and 6.90 ± 0.18 after correction, respectively. The increase of LIRS and the decrease of the std and entropy indicate the reduction of the motion artifacts. P-values < 0.05 for all metrics.

CONCLUSION

The proposed ATM model can reduce motion artifacts and generalize across different temporal phases which were excluded from training.

CLINICAL RELEVANCE/APPLICATION

The ATM model developed from simulated motion-corrupted CT images could reduce motion artifacts. It has the potential to be extended to dynamic joint imaging.

R6-SSPH14-6 ARTIFICIAL INTELLIGENCE (AI-) BASED CAST SYSTEM FOR WHOLE-BODY CT: UTILITY FOR PULMONARY FUNCTIONAL LOSS AND LUNG ABNORMALITY CLASSIFICATION CAPABILITY AS COMPARED WITH AI-BASED CT TEXTURE ANALYSIS FOR CHEST CT IN JAPANESE HEALTH CHECKUP TEST COHORT

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Yoshiyuki Ozawa, MD, PhD (*Abstract Co-Author*)

PURPOSE

Artificial intelligence (AI-) based CT texture analysis system is currently testing for evaluation of lung parenchymal diseases. Moreover, respiration associated muscles such as erector spinae or psoas muscles are also suggested as having the potential for pulmonary functional loss on chest CT. Recently, we developed AI-based computer-aided simple triage (CAST) systems with automatic CT texture and respiration associated muscle analyses for pulmonary functional loss and discrimination among healthy, COPD, interstitial lung abnormality (ILA) and interstitial lung disease (ILD) subjects. The purpose of this study was to compare capabilities for pulmonary functional loss assessment and discrimination capability for lung abnormalities between AI-based CAST for whole-body CT and AI-based CT texture analysis for chest CT in Japanese health checkup test cohort.

METHODS AND MATERIALS

This study cohort consisted of 192 subjects who underwent pulmonary function test and whole-body CT by an upright ADCT on the same day. According to Fleischner Society Glossary, each lung radiological finding volume normalized by total lung volume was automatically determined. Moreover, volume and mean density of erector

spinae muscle (EV and ED) and proas muscle volume (PV and PD) were also automatically calculated. To determine pulmonary functional loss assessment capability on each method, stepwise regression analysis was performed. To determine significant descriptors for classifying healthy, COPD, ILA and ILD groups, a likelihood test was also performed. Then, discrimination accuracy was compared between two methods by McNemar's test.

RESULTS

Based on stepwise regression analysis, CT texture analysis was assessed ground glass opacity (GGO), honeycomb or emphysema as significant factors ($0.10=r^2=0.24$, $p<0.05$). Moreover, CAST was determined GGO, reticulation, honeycomb, emphysema, EV, PV, ED or consolidation as significant factors ($0.34=r^2=0.71$, $p<0.05$). To classify 4 groups, CT texture analysis was assessed GGO, reticulation and emphysema as significant descriptors ($p<0.05$). However, CAST was determined GGO, reticulation and emphysema and PD as significant descriptors ($p<0.05$). Furthermore, discrimination accuracy of CAST (54.2%) was significantly higher than that of CT texture analysis (49%, $p=0.0002$).

CONCLUSION

AI-based CAST for whole-body CT has better potential than AI-based CT texture analysis for chest CT to assess pulmonary functional loss and discrimination of lung abnormalities in Japanese health checkup test cohort.

CLINICAL RELEVANCE/APPLICATION

AI-based CAST has superior potential to CT texture analysis for pulmonary functional loss assessment and lung abnormality discrimination in Japanese health checkup test cohort.

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Nov. 30 – Dec. 4
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R6-STCE1

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Thursday, Dec. 4 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

R6-STCE1-1 BEYOND BI-RADS: ENHANCING BREAST MRI ACCURACY AND BIOPSY AVOIDANCE WITH KAISER SCORE AND ADC INTEGRATION

Prerna Garg, MD, MBBS (*Presenter*)
Jitin Goyal, MBBS (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic accuracy of combining the Kaiser Score (KS) and apparent diffusion coefficient (ADC) in distinguishing benign from malignant breast lesions on MRI, and to evaluate the added value of threshold-based and logistic regression models in biopsy reduction.

METHODS AND MATERIALS

This retrospective study included 107 women (140 lesions; 93 malignant, 47 benign) who underwent contrast-enhanced breast MRI with diffusion-weighted imaging. Two radiologists independently assessed lesions using the KS decision flowchart and measured ADC values. Diagnostic performance was analyzed for KS, ADC, and their combination using threshold-based (KS =4 and ADC =1.4 × 10?³ mm²/s) and logistic regression approaches. ROC curves, sensitivity, specificity, and AUCs were computed. Inter-reader agreement was evaluated.

RESULTS

KS >4 alone: Sensitivity 93.5%, Specificity 85.1%, AUC 0.96 ADC <1.4 × 10?³ mm²/s: Sensitivity 94.6%, Specificity 51.1%, AUC 0.81 Combined benign rule (KS =4 and ADC =1.4 × 10?³ mm²/s): Specificity 96.8%, PPV 88.9%, biopsy avoidance in 24/47 benign lesions (51%) Logistic regression (KS + ADC as continuous variables): AUC 0.925 Logistic model with interaction term (KS × ADC): AUC 0.964 Inter-reader agreement: ICC = 0.956 (ADC), ? = 0.969 (KS)

CONCLUSION

Combining KS with ADC enhances the diagnostic performance of breast MRI and offers a clinically safe, evidence-based approach to reduce unnecessary biopsies. Logistic regression further enables individualized malignancy risk prediction, supporting integration into structured reporting and clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

A multiparametric KS + ADC strategy can substantially reduce false positives and biopsy rates in breast MRI while maintaining high sensitivity, offering a robust framework for real-world implementation in breast imaging workflows.

R6-STCE1-2 MAMMOVLM: A GENERATIVE LARGE VISION-LANGUAGE MODEL FOR MAMMOGRAPHY-RELATED DIAGNOSTIC ASSISTANCE

Jie Ma (*Presenter*)
Zhenjie Cao (*Abstract Co-Author*)
Yuanyang WANG (*Abstract Co-Author*)
Tingfeng Zhang (*Abstract Co-Author*)
Yuting Yang (*Abstract Co-Author*)
Tingting Liao (*Abstract Co-Author*)

PURPOSE

To introduce MammoVLM, a generative vision-language model (VLM) designed to assist patients with mammography-related diagnostic queries. This model aims to address the lack of diagnostic assistants for follow-up questions after mammography screenings, leveraging large foundation models to improve medical service efficiency and accuracy in breast cancer detection.

METHODS AND MATERIALS

MammoVLM comprises three components: a Visual-Mixture-of-Experts (Visual-MoE) module, a projection module (UMiCon), and a language model (GLM-4 9B). The Visual-MoE uses three encoders (CLIP, ConvNeXt-Tiny, Dinov2) tailored to breast density categories (A, B, C, D) selected by a ResNet-50 classifier. UMiCon employs unimodal and multimodal contrastive learning, pre-trained on BI-RADS 3 vs. 4 classifications using 4,557 mammograms and diagnostic reports. The model was trained on a dataset of 33,630 mammograms from 30,495 patients, with subjective evaluations by 12 senior radiologists and objective comparisons against SOTA VLMs (vision-language models).

RESULTS

Subjective Evaluation: MammoVLM outperformed leading VLMs, scoring 91.5 (correctness), 82.6 (rationality), 91.2 (helpfulness), 94.6 (professionalism), and 96.5 (completeness) vs. LLaVA-1.5 (81.3, 77.8, 91.0, 80.6, 96.6) and BiomedGPT (91.5, 80.3, 86.4, 88.8, 90.8). Performance was comparable to junior radiologists (90.6, 83.0, 93.4, 91.1, 93.0) and approached senior radiologists (92.7, 86.1, 96.3, 95.1, 97.1). Ablation Studies: Full MammoVLM (with Visual-MoE, UMiCon, and SFT) achieved 91.5 correctness, vs. 71.5 for single encoder models.UMiCon's AUC of 0.70 in BI-RADS 3 vs. 4 classification surpassed previous methods. Zero-Shot Malignancy Screening: MammoVLM achieved AUC 0.9270 and specificity 0.9902 at 20% sensitivity, outperforming QWen-VL (AUC 0.9070, specificity 0.9808) and LLaVA-1.5 (AUC 0.8671, specificity 0.9405).

CONCLUSION

MammoVLM demonstrates superior performance in mammography-related Q&A tasks, outperforming leading VLMs and approaching junior radiologist capabilities. The model's effectiveness is validated by both subjective and objective metrics, highlighting its potential for clinical deployment. Future work will explore fine-tuning UMiCon for broader BI-RADS classification and integrating additional imaging modalities.

CLINICAL RELEVANCE/APPLICATION

MammoVLM can serve as a diagnostic assistant, enhancing radiologists' efficiency by providing accurate, AI-driven answers to patient queries. Its ability to reduce workload while maintaining diagnostic accuracy could improve breast cancer screening outcomes and patient care. The model's adaptability to new scenarios further underscores its clinical utility.

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R6-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Thursday, Dec. 4 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

R6-STCE2-1 NEXT-GENERATION LOW-CONTRAST ANGIOGRAPHY: A PROSPECTIVE VALIDATION OF GADOLINIUM-ENHANCED DUAL-SOURCE DECT WITH NOISE-OPTIMIZED 40-KEV VMI FOR PATIENTS WITH IODINE ALLERGY OR RENAL INSUFFICIENCY

Jigang Geng (*Presenter*)
LIHAO XIAO (*Abstract Co-Author*)
Lihua Liu (*Abstract Co-Author*)
Xiaoshi Li (*Abstract Co-Author*)
Yue Qin (*Abstract Co-Author*)

PURPOSE

To prospectively evaluate the diagnostic efficacy of a novel low-contrast thoracic computed tomography angiography (CTA) strategy in patients with contraindications to iodinated contrast media (ICM).

METHODS AND MATERIALS

This prospective, single-center study was HIPAA-compliant and approved by our Institutional Review Board; Between and, we enrolled 100 consecutive patients with absolute or relative contraindications to ICM (n=[e.g., 65] with prior severe allergic-like reaction; n=[e.g., 35] with severe renal insufficiency. All examinations were performed using a standardized GBCA-enhanced DECT protocol, which constituted an off-label use of the contrast agent. Detailed technical parameters for image acquisition and reconstruction are provided in Table 4. From the DECT dataset, conventional linearly blended images and a noise-optimized 40-keV VMI+ series were reconstructed for primary analysis. Two board-certified cardiothoracic radiologists (>10 years of experience) independently assessed all images for diagnostic quality on a 5-point Likert scale (score =3 considered diagnostic). Quantitative analysis involved placing regions-of-interest (ROIs) in the ascending aorta and paraspinous muscle to measure mean attenuation (HU) and image noise (SD of HU), from which the contrast-to-noise ratio (CNR) was calculated.

RESULTS

Qualitative analysis revealed an absolute difference in diagnostic utility: 100% (100/100) of 40-keV VMI+ examinations were rated as diagnostic (mean Likert score, 4.5 ± 0.5), whereas 0% (0/100) of conventional mixed-energy images were diagnostic (mean score, 1.2 ± 0.4) (P<.0001). Inter-reader agreement was excellent (Cohen's ? = 0.92). Quantitative analysis confirmed these findings, with mean aortic attenuation increasing from 160 ± 25 HU on mixed-energy images to 471 ± 68 HU on 40-keV VMI+ images (P<.0001). Despite a modest, statistically significant increase in image noise on VMI+ (22 ± 4 HU vs. 35 ± 7 HU, P<.001), the CNR improved dramatically from 6.4 ± 1.5 to 11.8 ± 2.9 (P<.0001). The protocol's robust performance enabled confident diagnosis of major pathologies. The mean effective radiation dose was 1.8 ± 0.5 mSv.

CONCLUSION

Gadolinium-enhanced DECT with noise-optimized low-keV VMI is a safe, effective, and prospectively validated technique for thoracic CTA in patients with ICM contraindications. It reliably transforms an otherwise non-diagnostic examination into a high-confidence diagnostic study, establishing a new imaging standard for this challenging patient population.

CLINICAL RELEVANCE/APPLICATION

This novel, low-dose gadolinium-DECT protocol provides diagnostic-quality thoracic CTA for patients with iodine contraindications, directly addressing a critical, unmet clinical need.

R6-STCE2-2 FROM DISAGREEMENT TO DIAGNOSIS: CROSS-MODAL DISCREPANCY DETECTION IN RADIOLOGY

Vedant Malik (*Presenter*)
Krish Malik (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a fully automated, vision-based Large Language Model (LLM) framework that identifies inconsistencies between segmentation and report-generation LoRA adapters in radiology, automatically flagging only the most discordant studies for expert review.

METHODS AND MATERIALS

Two parameter efficient LoRA adapters (low rank adaptation) were trained on Llama 3.2 7B vision model. First LoRA was trained on ROCO dataset captioning task and Second LoRA was trained on BraTS MRI dataset segmentation task. For each dataset, a test data of 105 images were run on both LoRA adapters to generate corresponding mask and caption during inference. Then we calculated mask volume from each of the outputs from two adapters and measures cosine distance between them. In addition, calculated shape based mismatch features. The resulting cosine distance mismatch if below 75% threshold is flagged for manual review. No subsequent fine tuning or human review were involved. ROCO data of 2405 image+caption pairs were used to fine tune first LoRA adapter. 1505 image+mask pairs were use to fine tune second LoRA adapter. The hardware used to fine tune was one NVIDIA A100 80GB GPU based AI System with 128 GB system RAM and 64vCPUs with 1TB SSD hard disk, with Ubuntu 22.04.5 OS.

RESULTS

With a precision of 89.5 %, 17 of the 19 flagged images were true mismatches, and with a recall of 81.0 %, the system detected 17 out of the 21 actual mismatches.

CONCLUSION

The proposed vision-based LLM framework accurately flags only the most discordant studies—achieving 89.5 % precision and 81.0 % recall while flagging just 19.95 % of cases—thereby reducing manual QA workload by roughly 80 % and enabling seamless, zero-retraining deployment in clinical radiology.

CLINICAL RELEVANCE/APPLICATION

The proposed automated QA framework can be seamlessly integrated into existing radiology workflows (e.g., PACS) to flag only those studies where segmentation and reporting conflict is found, enabling radiologist to focus on the most critical cases, reducing QA time by up to 80 %, and enhancing diagnostic accuracy and patient safety.

R6-STCE2-3 NON-CONTRAST RESTING-STATE FMRI FOR MAPPING LANGUAGE DYSFUNCTION AND COMPENSATION IN BRAIN TUMOR PATIENTS

Saeed Rahmani, MD, MPH (*Presenter*)
Luca Pasquini, MD, PhD (*Abstract Co-Author*)
Samra Iftikhar, MBBS (*Abstract Co-Author*)
Antonio Napolitano (*Abstract Co-Author*)
Amirali Aali (*Abstract Co-Author*)

PURPOSE

To evaluate the utility of non-contrast resting-state functional MRI (rs-fMRI) combined with graph theory to distinguish functional network alterations associated with aphasia and language compensation in patients with left-hemispheric brain tumors.

METHODS AND MATERIALS

We prospectively analyzed rs-fMRI data from 120 subjects, including 40 healthy controls and 80 patients with left-hemispheric brain tumors, stratified into aphasic (n=40) and non-aphasic (n=40) based on standardized language assessment. Functional connectivity was assessed using ROI-to-ROI analysis across seven canonical brain networks. Graph-theoretical metrics, including global and local efficiency, clustering coefficient, path length, and centrality, were extracted at whole-brain and network levels. Between-group differences were tested using FDR-corrected non-parametric analyses. Multinomial and binary logistic regressions were used to identify diagnostic predictors of aphasia status.

RESULTS

Aphasic patients demonstrated maladaptive hyperconnectivity within the default mode and sensorimotor networks, including significantly increased local efficiency and clustering in the medial prefrontal cortex and lateral sensorimotor cortex (FDR $p < 0.05$). In contrast, non-aphasic patients exhibited adaptive network remodeling with elevated efficiency and centrality in Broca's area, frontoparietal control, dorsal attention, and cerebellar networks (FDR $p < 0.05$). Whole-brain regression models identified global efficiency ($p = 0.008$), average path length ($p = 0.026$), and betweenness centrality ($p = 0.021$) as significant predictors of aphasia. Hemisphere-specific models were not predictive. Classification accuracy for aphasia using whole-brain metrics reached 64%.

CONCLUSION

Non-contrast rs-fMRI combined with graph theoretical analysis reveals distinct network signatures of language impairment and compensation in brain tumor patients. Aphasia is linked to inefficient global architecture and DMN overconnectivity, whereas preserved language function is supported by compensatory engagement of control and cerebellar networks.

CLINICAL RELEVANCE/APPLICATION

This study highlights non-contrast rs-fMRI as a powerful next-generation imaging tool for detecting functional language reorganization in brain tumor patients. It offers a safe, repeatable, and contrast-free approach to guide presurgical planning and risk stratification in neuro-oncology.

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S1-SSCH01

Science Session with Keynote: Chest Imaging (Lung Cancer)

Sunday, Nov. 30 9:00AM - 10:00AM Room: E451A

Mylene T. Truong, MD (*Moderator*)
Luis Gorospe-Sarasua, MD (*Moderator*)

Sub-Events

S1-SSCH01-1 UTILITY OF PET CT IN CT STAGE IA NON-SMALL CELL LUNG CANCEL: THE NEW ZEALAND TE WHATU ORA NORTHERN REGION EXPERIENCE

Richard Kelly, MBChB (*Science Invited Presenter*)
Graeme D. Anderson, MBChB (*Abstract Co-Author*)
Budresh S. Joshi, MBChB (*Abstract Co-Author*)
Jennifer Donald (*Abstract Co-Author*)

S1-SSCH01-2 RADIOLOGIC TERNARY CLASSIFICATION MODEL IN PREDICTING PATHOLOGIC INVASIVENESS OF NON-SOLID NODULES

Ye Qing Zhu, MD, PhD (*Presenter*)
Qi Wan (*Abstract Co-Author*)
Xinchun Li (*Abstract Co-Author*)
David F. Yankelevitz, MD (*Abstract Co-Author*)
Claudia I. Henschke, PhD, MD (*Abstract Co-Author*)

PURPOSE

Preoperative evaluation of the invasiveness of non-solid nodules (NSNs) at computed tomography (CT) influences clinical decision-making but can be challenging. The purpose of this study is to investigate CT characteristics of NSNs associated with pathologic invasiveness and to develop a radiological ternary classification model for differentiating among preinvasive lesions, minimally invasive adenocarcinoma (MIA), and invasive adenocarcinoma (IAC).

METHODS AND MATERIALS

This retrospective study enrolled 1683 patients with pathologically confirmed lung adenocarcinoma and suspicious malignant NSNs measuring 3.0-30.0 mm on preoperative CT scans between January 2012 and June 2024. For each NSN, the size, location, margin, shape, nodule CT attenuation, uniformity of density, lobulation sign, reticulation sign, vascular cluster sign, bubble-like lucency sign, air bronchogram sign and pleural retraction sign were independently evaluated by two radiologists blinded to clinical information and pathology results. Multinomial logistic regression and diagnostic accuracy analysis were performed.

RESULTS

This study included 1683 patients (1145 [68.0%] female) with 2125 NSNs. The median age was 53 years (interquartile range: 45-61 years). Multinomial logistic regression analysis demonstrated that nodule size (OR=1.23, CI: 1.14-1.32 for MIA; OR=1.76, CI: 1.62-1.92 for IAC), number of vessels (OR=3.25, CI: 2.73-3.87 for MIA; OR=2.81, CI: 2.00-3.93 for IAC), CT attenuation (OR=1.01, CI: 1.00-1.01 for MIA; OR=1.01, CI: 1.01-1.01 for IAC), uniformity of density (OR=1.80, CI: 1.26-2.57 for MIA; OR=6.82, CI: 3.48-13.37 for IAC), pleural retraction (OR=2.07, CI: 1.29-3.32 for MIA; OR=2.98, CI: 1.70-5.23 for IAC), bubble lucency (OR=1.71, CI: 1.01-2.92 for MIA; OR=2.58, CI: 1.39-4.80 for IAC) and air bronchogram (OR=2.13, CI: 1.15-3.95 for MIA; OR=2.97, CI: 1.53-5.76 for IAC) were significant predicting the pathological subtypes (IAC vs MIA vs AIS/AAH). The overall diagnostic performance of the radiological ternary classification model was excellent (AUC = 0.90).

CONCLUSION

The radiological ternary classification model demonstrated significant diagnostic efficacy in differentiating among preinvasive lesions, MIA and IAC, suggesting potential clinical utility for decision-making.

CLINICAL RELEVANCE/APPLICATION

Our results demonstrated that nodule size, number of vessels, CT attenuation, uniformity of nodule density, and the presence of pleural retraction, bubble lucency, and air bronchogram were significant in predicting the pathological subtypes (IAC vs MIA vs AIS/AAH). The overall diagnostic performance of the radiological ternary classification model was excellent (AUC = 0.90).

S1-SSCH01-3 IMAGE BIOMARKERS FOR POSTOPERATIVE SURVIVAL IN NEVER-SMOKER LUNG CANCER PATIENTS

Jing Wang (*Presenter*)
Tong Yu (*Abstract Co-Author*)
Xin Meng (*Abstract Co-Author*)
David Wilson (*Abstract Co-Author*)
Jiantao Pu, PhD (*Abstract Co-Author*)

PURPOSE

Never-smoker lung cancer represents a distinct and increasingly recognized clinical entity, more common in younger individuals and females, and characterized by unique molecular profiles. Despite surgical resection being the primary treatment for early-stage disease, prognostic tools tailored to this population remain limited. This study investigates the association between CT-derived lung, airway, and body composition features and overall survival following surgical resection in never-smokers.

METHODS AND MATERIALS

We retrospectively analyzed 112 never-smoker lung cancer patients who underwent surgery. During follow-up, 29 patients died, with a median overall survival of 9.67 years. Pretreatment CT scans were utilized to quantify volumes (Liter) of lung, emphysema, airway, and five body tissue types, as well as densities (Hounsfield Unit) of body tissues across all image slices from lung apex to base. Overall survival was estimated using Kaplan-Meier method. Associations with postoperative survival were assessed using Cox proportional hazards regression both unadjusted and adjusted for demographics, cancer stage and subtype, surgery type, and treatment with

chemotherapy and radiation therapy. The prognostic performance was evaluated using the time-dependent area under the receiver operating characteristic curve (AUC-ROC) at year 5 with 5-fold cross-validation.

RESULTS

Univariate Cox proportional hazards analysis identified higher visceral adipose tissue (VAT), subcutaneous adipose tissue (SAT), and intramuscular adipose tissue (IMAT) volumes, higher IMAT and airway ratio, and lower bone density as predictors of poorer survival. In multivariate analysis, only lower bone density (HR=0.64, 95% CI: 0.45-0.92) and higher airway ratio (HR=1.62, 95% CI: 1.18-2.22) remained significant. The association persisted after adjusting for demographic and clinical covariates. The model incorporating bone density, airway ratio, and an interaction term between age and cancer stage achieved an average 5-year AUC of 0.70 (SD: 0.05).

CONCLUSION

Lower bone density and higher airway ratio on pretreatment CT scans are associated with poorer survival in never-smoker lung cancer patients and may serve as prognostic imaging biomarkers.

CLINICAL RELEVANCE/APPLICATION

Never-smoker lung cancer is a distinct and understudied subtype with unique clinical and molecular characteristics. Our findings show that lower bone density and higher airway ratio on preoperative CT are associated with worse postoperative survival in these patients. Incorporating these imaging biomarkers into preoperative assessment may aid in risk stratification and personalized care, potentially improving outcomes in this vulnerable population.

S1-SSCH01-4 PRETRAINED TRANSFORMER-BASED FRAMEWORK FOR PREDICTING IMMUNOTHERAPY EFFICACY IN ADVANCED NON-SMALL CELL LUNG CANCERPATIENTS

Jianbin Zhu (*Presenter*)
Zhuofeng Liang (*Abstract Co-Author*)
Wen Zhibo, BA (*Abstract Co-Author*)

PURPOSE

Immune checkpoint inhibitors (ICIs) have transformed oncology practice, yet pinpointing patients most likely to benefit remains elusive. This study introduces an interpretable Transformer-based deep learning framework, complemented by conventional machine learning (ML) techniques, to identify advanced non-small cell lung cancer (NSCLC) patients who may respond favorably to first-line immunotherapy.

METHODS AND MATERIALS

We retrospectively analyzed data from 207 advanced NSCLC patients treated with ICIs at our institution between 2021 and 2024. Comprehensive clinical, demographic, and pre-treatment CT imaging data were collected, yielding 1,834 radiomic features extracted from primary tumor regions. Patients were stratified into training (80%) and testing (20%) cohorts. The primary efficacy endpoint was durable clinical benefit (DCB), defined as progression-free survival (PFS) of =6 months. Our approach integrated high-dimensional imaging with clinical data, addressing challenges such as feature sparsity and missing values within a unified multimodal framework. Model development included a pretrained Transformer architecture, alongside comparison with traditional ML algorithms (LightGBM, LR, Random Forest, XGBoost). Rigorous feature selection was performed using univariate analysis, Pearson correlation, and LASSO regression. Model evaluation utilized ROC analysis (AUC), Delong test, IDI/NRI, decision curve analysis (DCA), and calibration plots to assess clinical utility.

RESULTS

While the Random Forest model exhibited the highest training AUC (0.951, 95% CI 0.917-0.984), the Transformer-based model demonstrated superior generalizability with a testing AUC of 0.742 (95% CI 0.583-0.901) and a robust training AUC of 0.856 (95% CI 0.793-0.918). The Transformer model showed significant improvements in reclassification metrics (IDI > 0, NRI > 0) and optimal clinical utility on DCA. Multimodal feature analysis highlighted tumor heterogeneity radiomics and inflammatory biomarkers as critical predictors of immunotherapy response.

CONCLUSION

Our pretrained Transformer framework enables clinically interpretable prediction of immunotherapy efficacy through effective multimodal data fusion, surpassing conventional ML models. This innovative approach holds promise for enhancing patient selection and guiding personalized treatment strategies in NSCLC immunotherapy, potentially improving clinical outcomes and resource allocation.

CLINICAL RELEVANCE/APPLICATION

This Transformer-based model helps identify advanced NSCLC patients who may benefit from immunotherapy by effectively integrating multimodal data, offering a more precise than conventional ML models.

S1-SSCH01-5 PREDICTING HIGH TUMOR MUTATION BURDEN IN LUNG CANCER USING CT RADIOMICS AND HISTOPATHOLOGIC TEXTURE FEATURES: AN EXPLORATORY STUDY

Motohiko Yamazaki, MD, PhD (*Presenter*)
Hideaki Sugino (*Abstract Co-Author*)
Yuma Fuzawa, MD (*Abstract Co-Author*)
Masaki Tominaga (*Abstract Co-Author*)
Takuya Yagi (*Abstract Co-Author*)
Riuko Ohashi (*Abstract Co-Author*)
Hiroyuki Ishikawa, MD, PhD (*Abstract Co-Author*)

PURPOSE

To explore whether integrating CT radiomic features and histopathologic texture features can improve the prediction of high tumor mutation burden (TMB) in patients with primary lung cancer.

METHODS AND MATERIALS

This retrospective study included 98 surgically resected lung cancer cases, among which 27 (27.6%) had high TMB (=20 mutations/Mb). A total of 204 radiomic features were extracted from both intratumoral and peritumoral regions on preoperative CT scans. From whole-slide pathology images, 95 histopathologic texture features of tumor tissue were computed using ten randomly sampled 2560×2560-pixel patches per case, and their mean values were used to represent each case. Tumor segmentation was performed using in-house developed AI models for both modalities. Clinical variables (age, sex, histology, and smoking status) were also included. Four predictive models were constructed: (1) CT features alone, (2) histopathologic texture features alone, (3) combined CT and histopathologic texture features, and (4) combined CT and histopathologic texture features with clinical variables. In each of five cross-validation folds, the top 10 CT and top 10 histopathologic texture features were selected from the training set based on random forest feature importance and applied to predict high TMB in the test set. The area under the receiver operating characteristic curve (AUC) was used for performance evaluation.

RESULTS

The mean AUCs across five cross-validation folds were 0.693 for CT features alone, 0.682 for histopathologic texture features alone, 0.769 for the combination of CT and histopathologic texture features, and 0.776 when clinical variables were additionally included. The most important CT-derived feature was glszm_GrayLevelVariance, which captures intratumoral intensity heterogeneity and was lower in TMB-high tumors. The most important histopathology-derived feature was glrlm_RunLengthNonUniformity, a measure of texture irregularity in tumor tissue, showing higher values in TMB-high tumors.

CONCLUSION

This exploratory study suggests that the integration of CT radiomic features and histopathologic texture features may enhance the multi-modal image-based prediction of high TMB in lung cancer. These findings warrant further validation in larger and more diverse cohorts.

CLINICAL RELEVANCE/APPLICATION

As high TMB predicts better response to immune checkpoint inhibitors, this multi-modal imaging approach may assist in identifying suitable candidates for immunotherapy.

S1-SSCH01-6 Keynote Speaker

Milena Petranovic, MD (*Science Invited Presenter*)

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

S1-SSGU01

Genitourinary Imaging (Precision Imaging and Therapy for Prostate Disorders)

Sunday, Nov. 30 9:00AM - 10:00AM Room: E353B

Sonia Gaur, MD (*Moderator*)

Sub-Events

S1-SSGU01-2 HEAD-TO-HEAD COMPARISON OF MULTIMODAL IMAGING IN THE DETECTION AND DETERMINATION OF LOCAL EXTENSION OF PROSTATE CANCER USING WHOLEMOUNT HISTOPATHOLOGY AS A REFERENCE

Qi Miao, MD, PhD (*Presenter*)
Ida Sonni, MD (*Abstract Co-Author*)
Vinicius B. Ludwig, MD (*Abstract Co-Author*)
Kaifeng Pang (*Abstract Co-Author*)
Steven S. Raman, MD (*Abstract Co-Author*)
Anthony Sisk, DO (*Abstract Co-Author*)
Robert E. Reiter, MD (*Abstract Co-Author*)
Wayne Brisbane (*Abstract Co-Author*)
Kyunghyun Sung, PhD (*Abstract Co-Author*)

PURPOSE

Micro-Ultrasound (microUS) is an emerging imaging modality with promising potential to identify and target suspicious prostate cancer (PCa). Recent studies indicate that microUS can complement multiparametric MRI (mpMRI) when compared to biopsy pathology results. We aim to comprehensively evaluate and compare the performance of microUS, mpMRI, and PSMA PET/CT in the detection of PCa and assessment of extraprostatic extension (EPE), using wholemount histopathology (WMHP) as a reference.

METHODS AND MATERIALS

Patients with PCa who underwent microUS, mpMRI and PSMA PET/CT prior to radical prostatectomy were included. WMHP histopathology findings served as the reference standard. Imaging findings were mapped onto a standardized 36-sector map and correlated with WMHP to assess PCa involvement. Detection rates (DRs) of PCa and clinically significant PCa (csPCa) were evaluated at both the lesion and sector levels. Diagnostic performance for detecting PCa, csPCa, and EPE was assessed using receiver operating characteristic (ROC) analysis. Chi-square test and Delong test were used to compare the DRs and area under the ROC curve (AUC) across different imaging modalities.

RESULTS

The study included a total of 42 patients, of whom, 20 patients (47.6%) had EPE. Lesion-level DRs for PCa and csPCa were 50% and 70% for microUS, 55% and 77% for mpMRI, and 50% and 74% for PSMA PET/CT, respectively. For predicting patient-level EPE, AUCs were 0.667 (0.515-0.790) for MicroUS, 0.714 (0.564-0.828) for mpMRI, and 0.545 (0.399-0.688) for PSMA PET/CT, where the differences were not statistically significant ($p>0.05$).At the sector-level, mpMRI outperformed microUS and PSMA PET/CT for detecting PCa (AUC: 0.698 vs. 0.658/0.630, $p=0.017/p<0.001$), csPCa (AUC: 0.720 vs. 0.671 and 0.649, $p=0.004/p<0.001$), and EPE (AUC: 0.789 vs 0.567/0.695, $p<0.001/p<0.001$).In the diagnosis of csPCa, AUCs of mpMRI were higher than those of microUS in the base, anterior, and transition zone ($p<0.05$). In the diagnosis of EPE, AUCs of mpMRI were higher than those of microUS and PSMA PET/CT in base and midgland ($p < 0.05$).

CONCLUSION

MicroUS demonstrates comparable performance to mpMRI for lesion-level detection of csPCa and assessment of patient-level EPE. However, mpMRI shows superior diagnostic accuracy in the sector-level analysis, particularly for detecting csPCa and EPE.

CLINICAL RELEVANCE/APPLICATION

MicroUS can complement existing imaging modalities for prostate cancer evaluation, particularly in settings where MRI may be less accessible. Its comparable lesion-level performance supports its potential role in targeted biopsy strategies, potentially improving diagnostic accuracy.

S1-SSGU01-3 IMPACT OF CONTRALATERAL SYSTEMATIC BIOPSY OMISSION ON PATHOLOGICAL FEATURE DETECTION IN SOLITARY PI-RADS 4/5 LESIONS

Kevin An (*Presenter*)
Cassandra J. Jeavons, MBBS (*Abstract Co-Author*)
Yilin Zhang (*Abstract Co-Author*)
Sobhan Mardan, MSc (*Abstract Co-Author*)
Silvia D. Chang, MD, FRCPC (*Abstract Co-Author*)

PURPOSE

To assess whether omitting contralateral systematic biopsies in solitary PI-RADS 4 or 5 lesions would affect management approach and outcomes by determining the presence of adverse pathological features associated with more aggressive disease in the contralateral biopsies.

METHODS AND MATERIALS

A retrospective analysis identified 835 patients who underwent MRI-ultrasound fusion targeted and systematic prostate biopsy (May 2020-February 2023). Of these, 301 patients had a solitary PI-RADS 4 (n=206) or PI-RADS 5 (n=95) lesion. The number of cases of clinically significant prostate cancer (csPCa) was identified and correlating pathological features of the contralateral biopsies were reviewed. This included more aggressive features such as cribriform pattern, perineural invasion (PNI), and extraprostatic extension (EPE).

RESULTS

Of the 301 patients that had a PI-RADS 4 (n=206) or PI-RADS 5 (n=95) solitary lesion, there were 83 cases (40.3%) and 66 cases (69.5%) of csPCa, respectively. Omission of contralateral systematic biopsies would miss 1 case of csPCa in the PI-RADS 4 group (1.2%) and 2 cases in PI-RADS 5 group (3.0%). Cribriform pattern was present in 31 cases (37.3%) in PI-RADS 4 lesions with csPCa and 25 cases (37.9%) in PI-RADS 5 lesions. Omission of contralateral systematic biopsy would only miss 1 case of cribiform patttern (1.2%) in the PI-RADS 4 category. PNI was present in 30 cases (36.1%) in PI-RADS 4 lesions and 21 cases (31.8%) in PI-RADS 5 lesions. Omission of contralateral systematic biopsy would miss 1 case (1.2%) of PNI in PI-RADS 4 lesions and 2 cases (3.0%) in PI-RADS 5 lesions. EPE was present in 2 cases (2.4%) in PI-RADS 4 lesions and 9 cases (13.6%) in PI-RADS 5 lesions. Omission of contralateral systematic biopsy would only miss 1 case (1.5%) in the PI-RADS 5 category. Of the 3 csPCa patients that would have been missed with omitting contralateral biopsy, there were no aggressive pathological features detected.

CONCLUSION

Omitting contralateral systematic biopsy appears safe and effective in solitary PI-RADS 4 and 5 lesions.

CLINICAL RELEVANCE/APPLICATION

Omitting contralateral SB maintains high sensitivity for detecting csPCa and adverse pathology while minimizing procedural morbidity, infection risk, healthcare burden, and overtreatment. This approach improves patient-centered outcomes and supports cost-effective and time efficient biopsy practice without compromising oncologic safety.

S1-SSGU01-5 MICROULTRASONOGRAPHY-GUIDED VS MRI-GUIDED BIOPSY FOR PROSTATE CANCER DIAGNOSIS - THE OPTIMUM RANDOMIZED CLINICAL TRIAL

Sangeet Ghai, MD (*Presenter*)
Adam Kinnaird, MD,PhD (*Abstract Co-Author*)
Ferdinand Luger (*Abstract Co-Author*)
Hannes Cash (*Abstract Co-Author*)
Felipe Urdaneta (*Abstract Co-Author*)
Christian Pavlovich, MD (*Abstract Co-Author*)
Julian Struck (*Abstract Co-Author*)
Martin Schostak (*Abstract Co-Author*)
Niklas Harland (*Abstract Co-Author*)
Moises Elias Rodriguez Socarras (*Abstract Co-Author*)
Wayne Brisbane (*Abstract Co-Author*)
Giovanni Lughezzani (*Abstract Co-Author*)
Harry TOLEDANO (*Abstract Co-Author*)
Mohammed S. Ouertani, MD (*Abstract Co-Author*)
Petr Macek (*Abstract Co-Author*)
Christopher I. Fung, MD (*Abstract Co-Author*)
Wendy Tu, MD, FRCPC (*Abstract Co-Author*)
Andreas Gusenleitner (*Abstract Co-Author*)
Peter Incze (*Abstract Co-Author*)
Arvin K. George, MD (*Abstract Co-Author*)
Joseph Renzulli II (*Abstract Co-Author*)
Laurence Klotz, MD (*Abstract Co-Author*)

PURPOSE

To compare microultrasonography-guided and MRI fusion-guided biopsy for prostate cancer diagnosis.

METHODS AND MATERIALS

This was a multicenter, international, randomized, noninferiority trial of biopsy-naive men from 20 centers (8 countries) with clinical suspicion of prostate cancer (elevated prostate-specific antigen [PSA] and/or abnormal digital rectal examination) from December 2021 to September 2024 [NCT05220501]. Participants were assigned to receive either microultrasonography-guided biopsy, microultrasonography/MRI fusion-guided biopsy (microultrasonography/MRI, in which microultrasonography biopsies were performed prior to unblinding the MRI), or MRI/conventional US fusion-guided biopsy (MRI/conventional ultrasonography) in a 1:2:3 ratio. All participants received synchronous systematic biopsy. The primary outcome was the difference in detection of Gleason Grade Group (GG) = 2 cancers using microultrasonography plus systematic biopsy vs MRI/conventional ultrasonography plus systematic biopsy. The secondary outcome was the difference in detection of GG = 2 cancers using microultrasonography/MRI plus systematic biopsy vs MRI/conventional ultrasonography plus systematic biopsy. The noninferiority margin was set at 10%.

RESULTS

A total of 802 men underwent randomization and 678 underwent biopsy. Median (IQR) age was 65 (59-70) years and prostate-specific antigen level was 6.9 (5.2-9.8) ng/mL. Gleason Grade Group 2 or higher cancer was detected in 57 of 121 participants (47.1%) in the microultrasonography group, in 141 of 331 participants (42.6%) in the MRI/conventional ultrasonography group, and in 106 of 226 participants (46.9%) in the microultrasonography/MRI group. Microultrasonography-guided biopsy was noninferior to MRI fusion-guided biopsy (difference, 3.52% [95% CI, -3.95% to 10.92%]; noninferiority P < .001). Combined biopsy with microultrasonography/MRI was also noninferior to MRI/conventional ultrasonography software-assisted MRI fusion biopsy using conventional ultrasonography devices (difference, 4.29% [95% CI, -4.06% to 12.63%]; noninferiority P < .001). The rate of Gleason Grade Group 2 or higher cancer diagnosed by targeted biopsy only was 38.0% in the microultrasonography group, 34.1% in the MRI/conventional ultrasonography group, and 40.3% in the microultrasonography/MRI group; these differences were not significant.

CONCLUSION

The use of microultrasonography-guided biopsy was noninferior to MRI/conventional ultrasonography fusion-guided biopsy for the detection of Gleason Grade Group 2 or higher prostate cancer in biopsy-naive men.

CLINICAL RELEVANCE/APPLICATION

Microultrasonography may provide an alternative to MRI for image-guided prostate biopsy.

S1-SSGU01-6 USING PROTON SPECTROSCOPY TO IMPROVE CRIBRIFORM PROSTATE CANCER DETECTION AT PRE-BIOPSY MRI

Nikita Sushentsev, MD, PhD (*Presenter*)
Mary A. McLean, PhD (*Abstract Co-Author*)
Jonathan Birchall (*Abstract Co-Author*)
Ferdia A. Gallagher, PhD, FRCR (*Abstract Co-Author*)
Tristan Barrett, MBBS, MD (*Abstract Co-Author*)

PURPOSE

Explore the potential of proton magnetic resonance spectroscopic imaging (1 H-MRSI) for non-invasive differentiation between cribriform and non-cribriform prostate cancer (PCa) compared to standard multiparametric MRI (mpMRI).

METHODS AND MATERIALS

Our prior multi-omics studies identified enriched lipid biosynthesis as distinctive for cribriform PCa. Here, we performed pre-biopsy 1 H-MRSI in addition to standard mpMRI protocol to evaluate tumor fat fraction in a prospective cohort of 12 patients. All patients underwent 1 H-MRSI across a 4.5mm axial slice through the tumor (FOV 32 cm, interpolated matrix 128x128, 30° flip, TR 88.7ms, TE 2.1ms, 5 kHz full-receiver bandwidth, 256 spectral points). 1 H-MRSI acquisition time was 4min:47 s. Magnitude spectra were corrected for bias used to calculate Fat/(Fat + Water). Regions-of-interest (ROIs) encompassing biopsy-proven tumor and benign areas were drawn by a genitourinary radiologist; the resulting fat fractions and 1 H-MRI ADCratio values (tumour/urine) were compared using the Mann-Whitney U test.

RESULTS

1 H-MRSI-derived fat fraction showed an almost five-fold increase in cribriform Gleason score (GS) 7 lesions compared to all other tissue types, including GS7 non-cribriform tumors, GS6 tumors, and histologically benign regions ($P < 0.05$). Conversely, no distinction between the three tumor types could be made using the ADCratios ($P > 0.05$ for all). Representative 1 H-MRSI fat fraction maps with corresponding spectra are presented in the attached figure.

CONCLUSION

This study shows the feasibility of performing 1 H-MRSI for improving non-invasive detection of cribriform PCa. Based on these findings, we are prospectively recruiting patients in whom 1 H-MRSI and mpMRI are performed prior to radical prostatectomy (RP). This study aims to identify a quantitative 1 H-MRSI-derived tumor fat fraction cut-off that would yield a =20% increase in the sensitivity of detecting cribriform PCa compared to mpMRI-targeted biopsy against RP as a histological gold standard. Another objective is correlating the 1 H-MRSI-derived tumor fat fraction with tumor epithelial lipid abundance measured using spatial metabolomics. Having recruited 27 patients, we expect to complete recruitment of 40 patients by July, with the full results available for presentation at RSNA and inclusion in extended abstract if accepted for presentation and Trainee Prize competition.

CLINICAL RELEVANCE/APPLICATION

Differentiating cribriform from non-cribriform PCa is critical but challenging with mpMRI alone. Preliminary results, currently evaluated in a full-scale prospective study, indicate that proton spectroscopy provides a biologically-informed, clinically relevant imaging approach to address this diagnostic gap.

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Nov. 30 – Dec. 4
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S1-SSHN01

Science Session with Keynote: Head and Neck Imaging (AI and Deep Learning Techniques in Head and Neck Imaging)

Sunday, Nov. 30 9:00AM - 10:00AM Room: E352

Maria Gule-Monroe, MD (*Moderator*)
Blair A. Winegar, MD (*Moderator*)

Sub-Events

S1-SSHN01-1 EFFECT OF USING AN AI SYSTEM FOR INTERPRETING THYROID US ACCORDING TO READERS OF DIFFERENT EXPERTISE: A PILOT STUDY

Minyoung Kim (*Presenter*)
Jin Chung, MD, PhD (*Abstract Co-Author*)
Hye Sun Lee (*Abstract Co-Author*)
Ji Ye Lee, MD, PhD (*Abstract Co-Author*)
Soo Yeon Hahn, MD, PhD (*Abstract Co-Author*)
Jeoung Hyun Kim, MD, PhD (*Abstract Co-Author*)
Won Hwa Kim, MD, PhD (*Abstract Co-Author*)
Jaeil Kim, PhD (*Abstract Co-Author*)
Jung Hyun Yoon, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the effect of using artificial intelligence (AI)-based decision support system for interpreting thyroid ultrasonography (US) according to experience levels.

METHODS AND MATERIALS

From January 2020 to December 2020, a total of 481 thyroid US images from 481 patients were included. Eight readers (4: board-certified radiologists with 3-23 years of experienced, 4: endocrine surgeon, first year radiology resident, nurse, radiographer with less than 1 year of experience) were recruited for this reader study. A deep learning based AI system (CadAI-T for Thyroid TM) was used to assist readers (Fig.1). The 481 thyroid US images were independently reviewed in two sessions; session 1, grayscale US alone, and after 3 weeks of washout, session 2, grayscale US with AI results. US interpretation was given based on the K-TIRADS final assessments. Readers were asked to describe whether they had confidence in the AI results for each case. Diagnostic performances of readers in session 1 and 2 were calculated and compared.

RESULTS

Among 481 images, 184 (38.3%) nodules were malignant, 157 (32.6%) nodules were benign, and 140 (29.1%) were negative US images without focal abnormality (mean size of nodules: 16.7mm ± 8.8, range, 5 - 51mm). Average AUC showed significant improvement in session 2 compared to session 1 for the less experienced readers, 0.842 (95% confidence interval [CI]: 0.814-0.869) vs. 0.755 (95% CI: 0.730-0.780), respectively (P<0.001). No significant changes were seen in AUC between the session 1 and 2 for the experienced readers, 0.900 (95% CI: 0.879-0.921) to 0.907 (95% CI: 0.887-0.928)(P=0.092). Mean sensitivity and NPV was significantly improved in experienced readers (all P<0.05), while all diagnostic indices was significantly improved in inexperienced readers in session 2 (all P<0.001, respectively). Both experienced and inexperienced readers had confidence in AI results when used for assessing malignant nodules. The standalone performance of the AI system yielded an AUC of 0.903 when using the AI score and 0.874 when using TI-RADS.

CONCLUSION

Average AUC for inexperienced readers was significantly improved after using AI for thyroid US interpretation.

CLINICAL RELEVANCE/APPLICATION

AI for thyroid US interpretation can assist less experienced readers in differential diagnosis of thyroid nodules.

S1-SSHN01-2 TARGETED DEFACING USING DEEP LEARNING METHODS FOR PEDIATRIC COHORTS WITH A HUMAN IN THE LOOP INTERFACE

Benedikt Wichtlhuber, BSc (*Presenter*)
Konrad Wienecke (*Abstract Co-Author*)
Marcel Eicke (*Abstract Co-Author*)
Eric Frodl, MSc (*Abstract Co-Author*)
Thomas J. Vogl, MD, PhD (*Abstract Co-Author*)
Andreas Bucher, MD (*Abstract Co-Author*)
Diane M. Renz, MD (*Abstract Co-Author*)

PURPOSE

To create and test user-friendly software that removes identifying facial and dental features from pediatric head and neck MRI and CT scans while preserving important diagnostic areas, especially submandibular and cervical lymph nodes.

METHODS AND MATERIALS

This study is part of a retrospective multi-center research project involving pediatric patients with non-Hodgkin lymphoma (NHL). The dataset comprises up to 8,000 DICOM imaging series' per site across more than 25 sites, including CTs, MRIs, X-rays, and patient protocols, with a substantial portion of images containing facial and dental features.We developed a software called Defacer, allowing users to easily tag series and adjust automatically generated face and teeth segmentations for the purpose of de-identification. Teeth segmentations are generated by the nnUNet model, trained and 5-fold cross-validated on a diverse dataset of pediatric patients (ages 1-21) from the University Hospital [blinded]. Facial masks are based on the TotalSegmentator tool. Ear segmentation models will be included in a future version. Every automated step encompasses human oversight and allows for manual correction.

RESULTS

The segmentation system achieved consistent results for teeth with a Dice score (DSC) of 0.80 (±0.07) for MR (304 training samples), as well as a DSC of 0.80 (±0.06) for CT (170 training samples). Our approach enables precise de-identification while retaining diagnostically relevant anatomy. The system supports resource-efficient workflows by only generating segmentations when needed and is tailored for use by non-technical clinical staff. Our results show that new, non-technical users can tag series with a speed of 572 series per hour. Experienced users achieve upwards of 1500 series per hour. Notably, users were able to identify problematic defacing results with a sensitivity over 0.99.

CONCLUSION

The proposed solution enables compliant and efficient de-identification of pediatric imaging data across CT and MR imaging series, preserving the integrity of critical anatomical regions. The inclusion of human oversight and quality management ensures reliability and adaptability in clinical workflows.

CLINICAL RELEVANCE/APPLICATION

Our method supports the secure sharing and analysis of sensitive pediatric imaging data in large-scale studies without compromising diagnostic quality and patient privacy rights. Defacer facilitates regulatory compliance in multicenter research settings and offers a practical tool for clinical teams with limited technical expertise. We will integrate our method in a nationwide multicentric initiative for radiological research with a focus on multicentric collaboration.

S1-SSHN01-3 DEEP LEARNING CLASSIFICATION OF NASAL ANATOMICAL VARIANTS ON COMPUTED TOMOGRAPHY FOR ENDOSCOPIC SINUS SURGERY

Abdul Rafay (*Presenter*)

PURPOSE

Endoscopic sinus surgery (ESS) is one of the most commonly performed procedures in otolaryngology. However, it carries a major complication rate of up to 1% due to the proximity of critical structures within the surgical field. Anatomical variants such as a free-floating anterior ethmoidal artery (FFAEA), Onodi cells, and Haller cells further elevate this risk when unrecognised, yet are inconsistently reported on pre-operative CT. Convolutional neural networks (CNNs) have shown promising results in detection and segmentation tasks across head and neck radiology, but these high-risk variants have not previously been targeted. This study aimed to develop and evaluate a CNN capable of detecting FFAEA, Onodi cells, and Haller cells on sinus CT.

METHODS AND MATERIALS

CT scans from 122 patients referred for ESS at our centre (February - April 2025) were anonymised, and screenshots were captured in the coronal plane at standardised anatomical locations. All images were resized to 224 × 224-pixel greyscale and augmented with random flips, rotations, and affine shifts. Five ImageNet pre-trained CNN backbones (MobileNetV2, ResNet-18, DenseNet-121, VGG-16, SqueezeNet) were fine-tuned using repeated 5-fold patient-wise cross-validation. A grid search explored 40 training configurations derived from every combination of 2 optimisers (Adam, SGD-momentum), 2 learning rates (LR) (0.001, 0.0005), and 2 epoch counts (15, 25) for each of the 5 architectures (5 × 2 × 2 × 2 = 40 unique training recipes). Balanced accuracy and area under the ROC curve (AUC) were primary metrics; accuracy, precision, recall, and F1-score were recorded as secondary metrics.

RESULTS

Of 122 patients, 23 (18.9%) had FFAEA, 8 (6.6%) Haller cells, and 29 (23.8%) Onodi cells. FFAEA : ResNet-18 (Adam, LR 0.001, 25 epochs) achieved balanced accuracy 77.8 ± 2.3% and AUC 0.830 ± 0.018. Haller : MobileNetV2 (SGD, LR 0.0005, 15 epochs) achieved balanced accuracy 63.7 ± 6.2% and AUC 0.779 ± 0.059. Onodi : MobileNetV2 (Adam, LR 0.001, 15 epochs) achieved balanced accuracy 74.6 ± 2.5% and AUC 0.823 ± 0.026.

CONCLUSION

This pilot study demonstrates the feasibility of CNN-based detection of clinically significant nasal variants on sinus CT, with good to excellent classifier performance for two of the three variants assessed (AUC = 0.80).

CLINICAL RELEVANCE/APPLICATION

As a pilot study, this work lays the groundwork for a future AI tool that could assist radiologists by flagging rare, clinically significant anatomical variants—such as FFAEA, Onodi cells, and Haller cells—on sinus CT. By highlighting high-risk features that are often underreported, such a tool has the potential to support surgical planning and reduce preventable complications during ESS.

S1-SSHN01-4 DEEP LEARNING DETECTS PROGNOSTICALLY SIGNIFICANT MRI EDEMA PATTERNS IN PATIENTS WITH ACUTE NECK INFECTIONS

Jussi Hirvonen, MD, PhD (*Presenter*)
Oona Rainio (*Abstract Co-Author*)
Heidi Huhtanen, MD (*Abstract Co-Author*)
Jari-Pekka Vierula, MD (*Abstract Co-Author*)
Janne Nurminen (*Abstract Co-Author*)
Jaakko A. Heikkinen, MD (*Abstract Co-Author*)
Riku Klen (*Abstract Co-Author*)

PURPOSE

In acute neck infections, magnetic resonance imaging (MRI) reveals retropharyngeal edema (RPE), a prognostic indicator of severe disease progression. This study aimed to develop a deep learning algorithm for the automated detection of RPE in MRI scans.

METHODS AND MATERIALS

A deep neural network was developed using axial T2-weighted water-only Dixon MRI images from 479 patients with acute neck infections. Radiologists annotated the dataset at both slice and patient levels. The model comprised two components: (1) a convolutional neural network (CNN) for classifying individual slices and (2) an algorithm for patient-level classification based on stacks of slices. Performance metrics, including accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve (AUC), were compared against radiologists' assessments as the reference standard. The proposed CNN was benchmarked against InceptionV3, and the patient-level classification algorithm was evaluated against traditional machine learning models.

RESULTS

Of the 479 patients, 244 (51%) were RPE-positive and 235 (49%) were RPE-negative. At the slice level, the model achieved an accuracy of 94.6%, sensitivity of 83.3%, specificity of 96.2%, and AUC of 94.1%. At the patient level, it had an accuracy of 87.4%, sensitivity of 86.5%, specificity of 88.2%, and AUC of 94.8%. Compared to InceptionV3, the proposed CNN demonstrated equivalent accuracy with significantly reduced computational time. The patient-level classification algorithm outperformed traditional machine learning approaches.

CONCLUSION

This deep learning model demonstrated high accuracy in detecting the prognostically significant RPE pattern on MRI in patients with acute neck infections. Leveraging weakly annotated data and computationally efficient training, this approach can potentially enhance the early identification of high-risk patients in emergency settings.

CLINICAL RELEVANCE/APPLICATION

Our deep learning algorithm accurately detects RPE in MRI scans of acute neck infection patients, a key prognostic marker. Its computationally efficient design, outperforming models like InceptionV3 with reduced processing time, supports rapid identification of high-risk cases in emergency settings, potentially improving triage, treatment, and outcomes.

S1-SSHN01-5 ORBITAL MRI-BASED DEEP LEARNING AUTOMATED EXOPHTHALMOS TOOL IN THYROID ASSOCIATED ORBITOPATHY

Xinyi Gou (*Presenter*)
Jin Cheng, MD (*Abstract Co-Author*)
Nan Hong, MD (*Abstract Co-Author*)

PURPOSE

To develop an orbital magnetic resonance imaging (MRI)-based automated measurement tool for exophthalmos in thyroid-associated orbitopathy (TAO).

METHODS AND MATERIALS

One senior radiologist and two junior radiologists (Junior No.1 and Junior No.2) calculated exophthalmos measurements based on 2D and 3D MRI data, respectively, in 177 patients with TAO. Hertel-based exophthalmos measurements were performed in 122 of these patients. Following MRI-based exophthalmos measurement procedures, models for automatically identifying the most anterior point of the zygomatic prominence and orbital segmentation were developed. An automated tool for assessing exophthalmos using orbital MRI was developed. The consistency of exophthalmos measurements across different methods was also evaluated.

RESULTS

The results of the paired t-test indicated a high degree of consistency between 2D and 3D orbital MRI, with no significant differences observed. In the 2D MRI analysis, no statistically significant differences were found between the senior radiologist and Junior No.1. However, both the senior radiologist and Junior No.1 exhibited statistically significant discrepancies when compared with Junior No. 2 ($p<0.05$) in both 2D and 3D MRI. All intergroup comparisons of 3D MRI revealed significant differences. Pearson correlation analysis revealed a significant positive correlation ($r = 0.75$-0.77) between Hertel exophthalmos measurements and orbital MRI-based assessments. In the 2D MRI, the Intraclass Correlation Coefficient(ICC) between the senior radiologist and the automated measurement tool was 0.82 (0.77-0.86), higher than that between the senior radiologist and Junior No. 2 (ICC 0.80 (0.35-0.91)).

CONCLUSION

Orbital MRI-based exophthalmos demonstrated a strong correlation with Hertel exophthalmometer measurements, although with inherent inter-observer variability. The implementation of an automated orbital MRI assessment tool offers superior accuracy and objectivity in quantifying proptosis.

CLINICAL RELEVANCE/APPLICATION

The use of orbital MRI for proptosis measurements by different radiologists can result in inconsistent outcomes due to subjective judgment and variations in individual skills, which may impact the accuracy of diagnostic and therapeutic decisions. Furthermore, in clinical practice, some participants' eyes are not directed forward in orbital MR images, potentially leading to measurement errors. Rescanning is time-consuming. Developing the orbital MRI-based automated exophthalmos tool can minimize errors and ensure the stability and objectivity of the measurement results.

S1-SSHN01-6 Keynote Speaker: AI and DL in Head and Neck Oncologic Imaging: A Brave New World

Maria Gule-Monroe, MD (*Science Invited Presenter*)

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

S1-SSNMMI01

Nuclear Medicine and Molecular Imaging (Breast/Lung Cancer)

Sunday, Nov. 30 9:00AM - 10:00AM Room: S405

Eric M. Rohren, MD, PhD (*Moderator*)
Pedram Heidari, MD (*Moderator*)

Sub-Events

S1-SSNMMI01-1 SERIAL FDG PET ANALYSIS FOR DETECTION OF CARDIOTOXICITY OF BREAST CANCER CHEMOTHERAPY

Masaki Watanabe, MD (*Presenter*)
Yukako Izoe (*Abstract Co-Author*)
Michinobu Nagao, MD, PhD (*Abstract Co-Author*)
Hiroko Tsukada (*Abstract Co-Author*)
YUI MAEKAWA (*Abstract Co-Author*)
Atsushi Yamamoto, MD, PhD (*Abstract Co-Author*)
Yoko Satoh (*Abstract Co-Author*)
Shuji Sakai, MD, PhD (*Abstract Co-Author*)

PURPOSE

In breast cancer patients undergoing repeated chemotherapy, cancer therapy-related cardiac dysfunction is an important prognostic factor. However, there are no useful tools for its prediction. Myocardial accumulation on FDG PET is influenced by blood glucose level and insulin activity and fluctuates between individuals with poor reproducibility. Therefore, it is difficult to distinguish physiologic from pathologic accumulation, and myocardial accumulation on FDG PET during oncology has not been used for complication assessment. We quantitatively evaluated myocardial accumulation using FDG PET performed serially during breast cancer chemotherapy to assess the potential for cardiotoxicity by chemotherapy regimen.

METHODS AND MATERIALS

We analyzed 535 FDG PET examinations performed before and after chemotherapy in 108 patients with breast cancer between January 2014 and February 2025. On pre- and post-treatment FDG PET, the mean values within the volume of interest (size 1.5cm 3) of myocardium with the highest accumulation and descending aorta on the same cross-section were measured, and the ratio of the two was defined as the myocardial standard uptake ratio (M-SUR). Chemotherapy was classified into four regimens: anthracyclines, human epidermal growth factor receptor 2 (HER2) inhibitors, immune check inhibitors (ICI), and others. When single or multiple chemotherapy regimens were administered in the same patient, the pre- and post- data sets for each chemotherapy regimen were compared using Wilcoxon matched-pairs signed rank test.

RESULTS

The average observation period and number of PET scans per patient is 39 months and 5.0 scans. A total of 309 pre- and post-chemotherapy data sets were obtained, of which 34 were for anthracyclines (n=17), 146 were for HER2 inhibitors (n=40), 20 were for ICI (n=9), and 109 were for others (n=54). M-SUR after chemotherapy was significantly higher than before chemotherapy in the anthracyclines (4.66±3.94 vs. 3.19±2.10, p<0.0001) and ICI (4.98±4.27 vs. 3.02±2.21, p=0.0328) groups. On the other hand, in the HER2 inhibitor and the other groups, M-SUR tended to be lower after chemotherapy than before, but the difference was not significant (HER2 inhibitor: 4.91±4.44 vs. 4.31±3.22; the other: 4.22±3.16 vs. 3.76±3.01).

CONCLUSION

Serial analysis of pre- and post-chemotherapy FDG PET revealed different responses to myocardial accumulation depending on the chemotherapy regimen. With anthracycline and ICI, there is a significant increase in myocardial uptake after chemotherapy.

CLINICAL RELEVANCE/APPLICATION

Cardiac accumulation of FDG PET was underutilized in oncology. However, the serial analysis provides clues for detecting cardiotoxicity of chemotherapy.

S1-SSNMMI01-3 HIGH-RESOLUTION SEMICONDUCTOR PET/CT FOR THE DIAGNOSIS OF EXTENSIVE INTRADUCTAL COMPONENTS OF BREAST CANCER: COMPARISON WITH MR IMAGING

Rika Yoshida, MD (*Presenter*)
Takeshi Yoshizako, MD (*Abstract Co-Author*)
Akina Miyamoto (*Abstract Co-Author*)
Yasushi Kaji, MD, PhD (*Abstract Co-Author*)

PURPOSE

To retrospectively compare the usefulness of high-resolution semiconductor PET/CT (WB-SiPM-PET/CT) in prone position with dynamic MRI in diagnosing the extent of extensive intraductal components (EIC) in breast cancer.

METHODS AND MATERIALS

61 patients with 64 breast cancers underwent WB-SiPM-PET/CT (prone) and dynamic MRI preoperatively without chemotherapy. Lesions were histopathologically confirmed. Based on the PET accumulation values (SUVmean and standard deviation [SD]) of normal breast tissue, four tumor thresholds (SUVmean+2SD/3SD, 1.5SUVmean+2SD/3SD) were used for semi-automatic tumor size measurement. The pathological size (invasive tumor and EIC) was compared with MRI size and the four SUV thresholds sizes in relation to EIC rate, menopausal status and Ki-67.

RESULTS

All lesions were detected by both MRI and PET. Strong correlation was observed between the pathological size and the MRI size, as well as the four SUV thresholds size (strong relationship: 0.667-0.734). In particular, SUVmean+2SD showed strongest correlation (P < 0.01). The mean error from pathological size were 12.1±17.1mm for dynamic MRI and 5.90±16.0mm for SUVmean+2SD. The accuracy of the imaging tumor size plus the surgical margin (2 cm) > the pathological size was significantly

higher for SUVmean+2SD (90.6%) than for dynamic MRI (78.1%) (P < 0.01). In the EIC > 50% in the pathological size group (N=25), there was no significant difference in the accuracy between dynamic MRI (56%) and SUVmean+2SD (68%). However, in the EIC < 50% in the pathological size group (N=39), the accuracy was significantly higher for SUVmean+2SD (100%) than for dynamic MRI (89.7%) (P < 0.05). In premenopausal patients (N=27), the accuracy of SUVmean+2SD (85.2%) was significantly higher than that of dynamic MRI (70.4%) (P < 0.05). In postmenopausal patients (N=37), the accuracy was 83.8% for dynamic MRI and 94.6% for SUVmean+2SD. In the low (=20%) Ki-67 group (N=36), the accuracy of SUVmean+2SD (88.9%) was significantly higher than that of dynamic MRI (77.8%) (P < 0.01). In the high (> 21%) Ki-67 group (N=28), the accuracy was high for both dynamic MRI (82.1%) and SUVmean+2SD (89.2%).

CONCLUSION

The SUVmean+2SD threshold of prone WB-SiPM-PET/CT accurately reflected the pathological size and demonstrated good diagnostic performance in diagnosing the extent of EIC in breast cancer. Prone WB-SiPM-PET/CT may be particularly useful in premenopausal patients and in low Ki-67. However, the accuracy of both modalities in EIC > 50% in the pathological size group was unsatisfactory.

CLINICAL RELEVANCE/APPLICATION

WB-SiPM-PET/CT (SUVmean+2SD) accurately reflects pathological size, outperforming MRI, especially in premenopausal and low Ki-67 patients, suggesting improved surgical planning.

S1-SSNMMI01-4 ENABLING CLINICAL TRANSLATION OF PROGNOSTIC BIOMARKERS BY AUTOMATED AI-BASED TOTAL METABOLIC TUMOR VOLUME AND TOTAL LESION GLYCOLYSIS ASSESSMENT FOR PROGRESSION-FREE SURVIVAL IN NSCLC PATIENTS

Ricarda Ebner, MD (*Presenter*)
Maurice Heimer, MD (*Abstract Co-Author*)
Felix Herr, MD (*Abstract Co-Author*)
Christian Alexander Dascalescu, MD (*Abstract Co-Author*)
Michael Ingrisch (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Lalith Kumar Shiyam Sundar, PhD, MS (*Abstract Co-Author*)
Rudolf A. Werner (*Abstract Co-Author*)
Paul Blanc-Durand, MD,MSc (*Abstract Co-Author*)
Clemens C. Cyran, MD (*Abstract Co-Author*)

PURPOSE

Total metabolic tumor volume (TMTV) and total lesion glycolysis (TLG) derived from [¹8F]FDG-PET/CT are established biomarkers reflecting tumor burden and metabolic activity. Despite their prognostic value, implementation is constrained by time-intensive and inconsistent manual segmentation, limiting routine applicability. In this study, TMTV and TLG were quantified using fully automated lesion segmentation. We assessed the prognostic impact of baseline and longitudinal TMTV and TLG for progression-free survival (PFS) in non-small cell lung carcinoma (NSCLC), to evaluate their potential role in individualized risk stratification and treatment guidance.

METHODS AND MATERIALS

120 patients with NSCLC who received tumor board-approved, stage-appropriate treatment were retrospectively included and underwent baseline and follow-up [¹8F]FDG-PET/CT. Disease progression was defined by physician documentation or tumor board consensus. Automated segmentation was conducted using Pionus v1.2.2 (PAIRE, Paris, France), a CE-marked, AI-based software for PET lesion segmentation. TMTV and TLG were calculated using standardized thresholds at 41% of SUVmax. Cox and time-dependent Cox models were applied using both continuous and dichotomized values to assess prognostic relevance.

RESULTS

Continuous baseline TMTV41% and TLG41% were not significantly associated with PFS (TMTV41%: HR = 1.00, p = 0.889; TLG41%: HR = 1.00, p = 0.696). In dichotomized models, patients with low baseline TLG had significantly longer PFS than those with high TLG (HR = 0.54, p = 0.017). A similar trend was observed for low TMTV (HR = 0.55), although not statistically significant (p = 0.107). Time-dependent analysis identified higher TMTV during follow-up as a significant predictor of increased progression risk (HR = 1.0015, p = 0.001).

CONCLUSION

Metabolic parameters such as TMTV and TLG have shown prognostic value in therapy monitoring; however, manual segmentation remains impractical in clinical routine due to time requirements and interobserver variability. This study highlights the utility of metabolic tumor biomarkers derived from fully automated PET/CT segmentation in NSCLC. While continuous baseline metrics showed limited value, low baseline TLG was a significant predictor of longer PFS. Longitudinal modeling revealed that rising TMTV over time was associated with increased progression risk. AI-based extraction of FDG-PET/CT parameters offers a scalable approach to integrating biomarkers into clinical workflows.

CLINICAL RELEVANCE/APPLICATION

Automated AI-based PET/CT analysis enables standardized quantification of TMTV and TLG, supporting longitudinal risk assessment and facilitating clinical integration of prognostic biomarkers in NSCLC.

S1-SSNMMI01-6 ANALYSIS OF FDG-PET/CT FOR MANAGEMENT OF HIGH-RISK PULMONARY NODULES IDENTIFIED ON CT LUNG CANCER SCREENINGS

Rui Dai, MD, PhD (*Presenter*)
Karen Rodriguez, MD (*Abstract Co-Author*)
Suzanne Byrne, MD (*Abstract Co-Author*)
Shaunagh McDermott, MBBCh (*Abstract Co-Author*)
Matthew S. Robertson, MD (*Abstract Co-Author*)
Thomas S. Ng, MD, PhD (*Abstract Co-Author*)
Eric Schmidlin, MD (*Abstract Co-Author*)

PURPOSE

Following CT lung cancer screening, evaluation with FDG-PET/CT (PET), short-term chest CT, or tissue biopsy is recommended in some patients with high probability of malignancy (Lung-RADS category 4A, 4B, or 4X). Theoretically, FDG-PET/CT provides noninvasive molecular analysis of lung nodules, potentially impacting the need for subsequent pathologic analysis. However, it remains unclear how much utility PET contributes to this setting. The objective of this study is to examine the utility of FDG-PET/CT in patients identified with Lung-RADS 4 during lung cancer screening, and identify conditions for which FDG-PET/CT is clinically impactful.

METHODS AND MATERIALS

Retrospective analysis of 466 patients (pts) at a multi-institutional academic radiology practice with Lung-RADS 4 on CT lung cancer screening in 2022 and their subsequent clinical course following recommendations for PET, short-term CT, or tissue biopsy were performed. Demographics and clinical data, including smoking status, pulmonary nodule characteristics on CT and PET, prior imaging, and reported level of suspicion for lung cancer were analyzed.

RESULTS

109/466 pts presenting with Lung-RADS 4 findings received FDG-PET/CT (PET). 25% of PET (28/109) was ordered for staging purposes and 0.9% (1/109) was ordered to determine which nodule was most avid for biopsy. The rest were ordered to evaluate the likelihood of malignancy of a lung nodule. Pulmonary nodules characteristics on PET were heterogeneous (Intensely avid: 37/109, 35%, moderately avid: 29/109, 27%, mildly avid: 23/109, 21%, not avid: 29/109, 27%). Pathologic diagnosis was available for 107/109 pts (2 treated empirically with radiation), determined via biopsy, surgery, or chest CT follow-up. Nodules in 65/107 (61%) of these pts were

malignant, with intensely/moderately-avid nodules being more likely to be malignant (87%) than mildly/non-avid nodules (35%; p-value <0.001). Beyond the indications for staging, PETs ordered to evaluate the likelihood of malignancy of nodules did not significantly alter the clinical management of pts compared to those who were monitored with short-term CTs or biopsies only.

CONCLUSION

Preliminary results suggest that, while the FDG-avidity of suspicious lung nodules in Lung-RADS 4 pts correlated with their malignant potential, the use of PET does not significantly impact the clinical decision for subsequent tissue sampling, except in cases for staging purposes and workup of incidentally found metastases on CT.

CLINICAL RELEVANCE/APPLICATION

Guidance for subsequent work-up of Lung-RADS 4 lesions is ambiguous. The use of FDG-PET/CT in this setting may be limited for most pts and do not clinically impact subsequent management.

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Nov. 30 – Dec. 4
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S1-SSPH01

Physics (Photon Counting Detector CT I)

Sunday, Nov. 30 9:00AM - 10:00AM Room: S404

Marc Kachelriess, PhD (*Moderator*)
Lifeng Yu, PhD (*Moderator*)

Sub-Events

S1-SSPH01-1 CLINICAL END-USER EVALUATION OF PHOTON COUNTING DETECTORS IN WHOLE-BODY PCD-CT SCANNERS USING DICOM IMAGES

Ke Li, PhD (*Presenter*)
Xinming Liu, PhD (*Abstract Co-Author*)
Megan C. Jacobsen, PhD (*Abstract Co-Author*)
Xiujiang J. Rong, PhD (*Abstract Co-Author*)
Frank Dong, PhD (*Abstract Co-Author*)

PURPOSE

Photon counting detector (PCD) CT imaging performance is heavily influenced by the physical characteristics of the PCD. Previous evaluations of PCDs were limited to within factory settings due to the need for raw data access. The purpose of this study was to assess the detective quantum efficiency (DQE) and dead time of PCDs from the perspective of PCD-CT end users, using reconstructed DICOM images.

METHODS AND MATERIALS

This study evaluated the performance of PCDs in two NAEOTOM Alpha scanners. Air-only PCD-CT scans were conducted across four tube potentials (70-140 kV) and seventeen different tube currents (ranging from 4 to 1300 mA), and two scan modes (UHR and standard Quantum+ mode). DICOM PCD-CT images were reconstructed with a small field-of-view (5 cm) near the isocenter, at a slice thickness of 0.4 mm, using the same reconstruction kernel (Br44). The 3D NPS of PCD-CT images was used to estimate the average number of detector counts, employing a validated parametric method. The expected number of input X-ray photons was derived from exposure and beam-quality measurements. Detector NPS was assessed using the Z-component of the 3D NPS. Detector MTF was measured based on a series of images of a copper edge placed parallel to the detector row direction. These measurements were then used to determine the frequency-dependent detector DQE. Finally, the PCD's deadtime was assessed by analyzing the relationship between image variances and tube current levels.

RESULTS

For the Alpha detector systems equipped with the anti-scatter grid, the zero-frequency DQE was measured to be 76% ± 2%. The frequency corresponding to 50% DQE is 6.8 ± 0.2 lp/cm. No significant dependence of DQE on tube potential (kV) was observed. The estimated PCD deadtime is 5.4 ± 0.5 ns. UHR and standard Quantum+ modes showed similar deadtime. The DQE and deadtime of the two scanners are consistent, with less than 2.4% difference.

CONCLUSION

The CdTe PCDs in the Alpha scanner exhibit excellent high-frequency DQE performance and fast counting speed. Based on the shape of the detector NPS, crosstalk between detector pixels is negligible. The zero-frequency DQE appears to be primarily influenced by the geometric efficiency of the grid system, rather than the thickness of the CdTe sensor.

CLINICAL RELEVANCE/APPLICATION

Clinical users have a critical need to routinely assess the performance of PCDs in PCD-CT scanners to support protocol optimization, troubleshooting, and informed decisions regarding future scanner acquisitions. Historically, this has been challenging due to limited access to raw data, preventing direct evaluation of CT detector performance. This study addresses that gap by presenting the first application of a novel DICOM image-based method to evaluate PCDs in clinical PCD-CT scanners.

S1-SSPH01-2 TASK-BASED EVALUATION OF A SILICON-BASED PHOTON-COUNTING CT PROTOTYPE FOR CORONARY STENOSIS GRADING WITH REALISTIC CORONARY ARTERY PHANTOMS

Maria Jose Medrano Matamoros, PhD (*Presenter*)
Jed Pack, PhD (*Abstract Co-Author*)
Stephen Araujo (*Abstract Co-Author*)
Grant M. Stevens, PhD (*Abstract Co-Author*)
Koen Nieman, MD,PhD (*Abstract Co-Author*)
Ge Wang, PhD (*Abstract Co-Author*)
Bruno De Man, PHD (*Abstract Co-Author*)
Adam S. Wang, PhD (*Abstract Co-Author*)

PURPOSE

To objectively evaluate the performance of a novel silicon-based photon-counting CT (PCCT) prototype for coronary artery grading using a custom-made coronary artery phantom with realistic calcification geometries. To our knowledge, this is the first evaluation of a silicon-based PCCT system using a realistic coronary phantom with known ground truth.

METHODS AND MATERIALS

Custom coronary artery phantoms were developed from clinical CCTA datasets using casting materials replicating 10 mg/mL iodine and calcified plaque attenuation, incorporating five calcification configurations based on cross-sectional quadrant coverage. Phantoms were embedded in a Gammex phantom and scanned at 120 kVp on a silicon-based PCCT prototype. For comparison, scans were acquired on a clinical Revolution Apex scanner with energy-integrating detectors (EID). Ground truth imaging was obtained with micro-CT at 120 kVp and 20 µm resolution. Automatic segmentations of Type I and Type IV calcifications were generated via Gaussian mixture model thresholding and morphological operations, following registration to a common grid. To account for blooming, effective vessel area for Type IV calcifications was defined as the region enclosed by connected plaques. Percent errors in calcification area, vessel area, and stenosis ratio were calculated by comparing

PCCT and EID segmentations to micro-CT ground truth. A composite metric, defined as a weighted sum of relative percent errors in vessel area (20%), calcification area (30%), and stenosis (50%), was used to assess system performance and account for compensatory errors in percent stenosis estimation.

RESULTS

Twenty slices of mild (Type 1, 20% stenosis) and moderate (Type IV, 41% stenosis) calcifications were analyzed. Visually, blooming-induced luminal narrowing was less pronounced in PCCT than in EID images. PCCT reduced percent error in calcification area by ~80% for Type I and ~60% for Type IV versus EID. Vessel area error for Type I dropped by over 60% with PCCT and was comparable between systems for Type IV. Relative percent errors in predicted stenosis and composite metrics were reduced by over 50% for both calcification types with PCCT.

CONCLUSION

Preliminary results show that high-resolution silicon-based PCCT imaging substantially reduces blooming artifacts, improving vessel and calcification area estimation and stenosis grading, especially in moderate calcifications. Ongoing work will extend analysis to all five calcification types.

CLINICAL RELEVANCE/APPLICATION

This carefully controlled study using a realistic coronary artery phantom shows the potential of high-resolution silicon-based PCCT to mitigate blooming and improve stenosis assessment accuracy.

S1-SSPH01-3 METAL ARTIFACT REDUCTION IN ULTRA-HIGH RESOLUTION PHOTON COUNTING DETECTOR CT IMAGING OF MIDDLE EAR PROSTHESES USING ARTIFICIAL INTELLIGENCE

Kevin J. Treb, PhD (*Presenter*)
Maryam Sadeghian Sharafi, BSc, MSc (*Abstract Co-Author*)
Wenchao Cao (*Abstract Co-Author*)
Christopher P. Favazza, PhD (*Abstract Co-Author*)
Andrea Ferrero, PhD (*Abstract Co-Author*)
Andrew Missert, PhD (*Abstract Co-Author*)
Matthew Carlson, MD (*Abstract Co-Author*)
Shuai Leng, PhD (*Abstract Co-Author*)

PURPOSE

Photon counting detector CT (PCD-CT) enables ultra-high resolution (UHR) capabilities for improved imaging of submillimeter structures in the inner and middle ear. However, PCD-CT can be more susceptible to metal artifacts near middle ear prostheses than conventional energy integrating detector CT. Commercial metal artifact reduction software is insufficient in removing these artifacts and is not available with high resolution reconstructions. This work aims to utilize an image-domain convolutional neural network (CNN) to reduce metal artifacts in UHR PCD-CT.

METHODS AND MATERIALS

Three different middle ear prostheses containing titanium and platinum were randomly oriented within a uniform head-sized phantom and imaged on a commercial PCD-CT (NAEOTOM Alpha, Siemens) using a UHR temporal bone protocol (120 kV, Hr84 kernel, 0.2 mm slice thickness, 80 mm field of view, 1024x1024 matrix). Training data were then curated in two steps: First, images of the phantom without any prosthesis were subtracted to isolate the metal + artifact signal. A separate artifact-free metal-only image set was then created by masking and segmenting the metal + artifact images. In the second step, these two image sets were superimposed onto images of human cadaver heads scanned with the same UHR protocol to create paired training inputs and labels. Standard data augmentation strategies were used to enlarge the training dataset. The trained network was then applied to images of a different cadaver head that was implanted with middle ear prostheses. Artifact severity was compared by measuring the variance in uniform regions with and without metal artifacts and calculating the artifact index = v(s 2 artifact - s 2 background). Image spatial resolution was compared by measuring CT number line profiles through the metal.

RESULTS

In the input images, artifacts obscured surrounding anatomical structures, with some bright artifacts mimicking the appearance of metal prostheses. After AI processing, metal artifacts were substantially reduced, and the false metal artifact was fully removed to enable visualization of underlying anatomy. AI output images reduced artifact index by 86% compared to the input images. Line profiles demonstrated no noticeable differences in spatial resolution or metal signal between the AI inputs and outputs.

CONCLUSION

An image-based AI framework can significantly reduce the severity of metal artifacts while maintaining UHR capabilities in PCD-CT for middle ear prosthesis imaging.

CLINICAL RELEVANCE/APPLICATION

Enabling metal artifact reduction with UHR imaging can improve visualization of middle ear prostheses and surrounding anatomy for improved assessment of prosthesis placement accuracy post stapedectomy.

S1-SSPH01-4 MULTI-MATERIAL DECOMPOSITION IN PHOTON-COUNTING COMPUTED TOMOGRAPHY USING IN-VIVO DUAL CONTRAST MEDIA BASED ON IODINE AND HOLMIUM OR GADOLINIUM IN A PIG MODEL: EVALUATION OF OPTIMAL AMOUNT OF ENERGY THRESHOLDS

Elisabeth Shanblatt, PhD (*Presenter*)
Tristan Nowak, PhD (*Abstract Co-Author*)
Jonas Neumann (*Abstract Co-Author*)
Ralf Gutjahr, PhD (*Abstract Co-Author*)
Hubertus Pietsch, VMD, PhD (*Abstract Co-Author*)
Gregor Jost, PhD (*Abstract Co-Author*)
Michael Grasruck, PhD (*Abstract Co-Author*)
Bernhard Schmidt, PhD (*Abstract Co-Author*)

PURPOSE

Multi-threshold imaging using photon-counting detectors (PCDs) in computed tomography (CT) enables the differentiation of more than two true basis materials from a single scan. To take advantage of this for diagnostic purposes, new contrast media based on high-Z elements need to be developed. In this study, we evaluated the potential of sequential intravenous (IV) dual contrast media (CM) injection in a Göttingen minipig using a standard iodine-based CM followed by an established gadolinium-based MRI CM or an experimental high-Z CM based on holmium (Ho).

METHODS AND MATERIALS

A research 4-threshold scan mode on a commercial CT system (NAEOTOM Alpha Peak, Siemens Healthineers, Forchheim, Germany) was used to perform two sets of thorax and abdomen scans on two different anaesthetized Göttingen minipigs. For the first pig, we performed timed IV injections of iopromide and gadobutrol (Bayer AG, Leverkusen Germany) with a delay of 33 s between both injections using bolus monitoring, a tube voltage of 140 kV, and the threshold set T1/T2/T3/T4 of 20/52/72/75 keV. For the second pig, iopromide and the Ho-based CM were injected with the same timing approach and tube voltage using the threshold set 20/55/72/90 keV. We then performed the following image-based material decompositions and analyzed the loss in contrast-to-noise (CNR) compared to the respective T1 image: [T1, T3], [T1, T2, T3], [T1, T3, T4] and [T1, T2, T3, T4] into water and I for both pigs; [T1, T2, T3] into water, I and Gd/Ho for pig 1 and pig 2, respectively; as well as [T1, T2, T3, T4] to water, I, Gd/Ho for pig 1 and pig 2, respectively. Contrast and noise were assessed from cylindrical regions placed inside the aorta.

RESULTS

For the 2-material decompositions into water and I, the CNRs relative to the respective T1 images were: 31.2% for [T1, T3], 31.8% for [T1, T2, T3], 31.4% for [T1, T3, T4] and 32.0% for [T1, T2, T3, T4] for pig 1, and, respectively, 28.5%, 28.7%, 29.0% and 29.2% for pig 2. For the 3-material decompositions into water, iodine and gadolinium (pig 1) were: 11.2% for [T1, T2, T3], 11.1% and 11.4% for [T1, T2, T3, T4]. For water, iodine and holmium (pig 2), the relative CNRs were: 17.3% and 17.5%, respectively.

CONCLUSION

Using more energy thresholds than materials did not significantly increase the CNRs of the decomposed images for our measurements. This provides evidence that - with optimally selected energy thresholds - additional thresholds over the minimum required for a material decomposition provide little benefit in spectral CT.

CLINICAL RELEVANCE/APPLICATION

The demonstrated findings in this animal study on a PCD-CT show that an optimized, reduced set of energy thresholds preserves diagnostic performance and thus demonstrate a practical path to lowering system complexity.

S1-SSPH01-5 PITFALLS OF FWHM-BASED DETECTOR ENERGY RESOLUTION METRICS IN PHOTON COUNTING CT: TOWARD IMPROVED METRICS

Shanli Ding (*Presenter*)
Linying Zhan, MS, BSc (*Abstract Co-Author*)
Ke Li, PhD (*Abstract Co-Author*)

PURPOSE

Energy resolution in photon-counting detectors (PCDs) is traditionally quantified using the full width at half maximum (FWHM) of the primary photopeak in the detector's pulse-height spectrum (PHS) in response to a ?-ray source. This value, expressed in keV or as a percentage of the ?-ray energy, is widely used in nuclear medicine, where high-energy thresholds are applied to exclude scattered and background signals. However, in PCD-based computed tomography (PCD-CT), the entire polychromatic X-ray spectrum contributes to image reconstruction. As such, FWHM-based metrics—which largely ignore low-energy tails of PHS—may not adequately reflect the energy resolution relevant to PCD-CT applications. This study aims to highlight the limitations of FWHM-based energy resolution metrics in this context and proposes a new detector energy resolution metric tailored for spectral CT.

METHODS AND MATERIALS

To generate PHS of varying shapes, we modified the sensor material and electronic noise levels within an in-house PCD-CT simulation platform, which has been validated using experimental data from NEOTOM Alpha scanners. For each PHS configuration, energy resolution was assessed in the context of water-iodine decomposition tasks, using a 140 kV X-ray spectrum from the NEOTOM Alpha scanner. The Cramér-Rao Bound (CRB) was used as the gold standard for quantifying spectral CT performance. The classical energy resolution metric (FWHM of the PHS) was compared to a novel metric we introduce—the Separability Index of Detected Energy-spectrum (SIDE)—evaluated across energy bins.

RESULTS

The Pearson correlation coefficient between classical FWHM and CRB was 0.357 ($p = 0.191$), indicating no significant correlation. Notably, FWHM substantially overestimated PCD energy resolution in cases with narrow photopeaks and prominent low-energy tails and underestimated it in spectra with broader peaks but minimal tails. For the proposed SIDE metric, its Pearson correlation coefficient is -0.965 ($p<0.001$), indicating a strong negative correlation with CRB: namely, a higher SIDE corresponds to a lower noise in material images.

CONCLUSION

FWHM-based metrics can misrepresent PCD energy resolution in spectral CT tasks, depending on PHS shape and threshold placement. The proposed SIDE metric overcomes these limitations and shows stronger agreement with task-specific performance as quantified by the CRB.

CLINICAL RELEVANCE/APPLICATION

A robust, task-relevant measure of energy resolution enables more informed clinical decisions when selecting between PCD-CT and dual-energy EID-CT systems. It also facilitates more accurate comparisons across PCD systems with varying semiconductor materials and readout architectures for CT imaging applications.

S1-SSPH01-6 PHOTON-COUNTING CT AND DEEP LEARNING RECONSTRUCTION IN LUNG LESION ASSESSMENT

Kai Mei, PhD (*Presenter*)
Shobhit Sharma, PhD (*Abstract Co-Author*)
Leening P. Liu, PhD (*Abstract Co-Author*)
Leonid Roshkovan, MD (*Abstract Co-Author*)
Steven Ross, PhD (*Abstract Co-Author*)
Ali H. Dhanaliwala, MD, PhD (*Abstract Co-Author*)
Sandra S. Halliburton, PhD (*Abstract Co-Author*)
Naruomi Akino (*Abstract Co-Author*)
Zhou Yu, PhD (*Abstract Co-Author*)
Richard Thompson, PhD (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)

PURPOSE

This study investigates how super high-resolution (SHR) photon-counting CT (PCCT) integrated with deep learning reconstruction (DLR) performs in characterizing lung lesions with different sizes and degrees of spiculation at various CT dose levels, using PixelPrint 3D-printed lesion phantoms.

METHODS AND MATERIALS

For this study, 18 computational lung lesions were selected, consisting of 2 lesion types: semisolid lesions with 2 contrast levels (40 and -285 HU) and full solid lesions (40 HU). Each lesion type was modeled with 3 spiculation levels (high, medium, and low) and 3 diameters (13 mm, 6 mm, and 3 mm). All lesions were 3D-printed using PixelPrint with a -600 HU background and placed in a multi-energy CT phantom (Gammex). Scan was performed using a prototype CdZnTe-based PCCT (Canon Medical Systems Corporation, Japan) at 120 kVp across 6 dose levels (20 to 1 mGy), each with 3 repetitions. The lowest dose used in this study is below clinically routine levels for a phantom of this size. Image reconstruction was carried out in SHR mode (pixel spacing/thickness: 0.25 / 0.21 mm) using a lung kernel with adaptive iterative dose reduction (AIDR) and DLR. Radiologists evaluated the images with a focus on spiculation and the solid component of semisolid nodules. Quantitative lesion metrics, specifically uniformity and sphericity, were extracted using PyRadiomics for analysis.

RESULTS

Lesions of all 3 types were clearly visualized in PCCT scans across both reconstruction methods. Notably, lesions > 13 mm in diameter could be consistently identified as semisolid across all dose levels. Highly spiculated lesions > 6 mm were distinguishable from mid and low spiculation levels in both semisolid and full solid forms. DLR demonstrated sharper images compared to AIDR, although contrast-to-noise ratios showed no significant differences when dose > 5 mGy. However, for smaller lesions, reduced dose levels affected accuracy of morphological assessment. As dose decreased, it became increasingly challenging to evaluate lesion surface roughness. Although key radiomic features exhibited dose-dependent variability, standard deviation across all lesions for uniformity, was approximately 25% lower with DLR compared to AIDR, indicating greater stability and robustness in DLR-based reconstructions.

CONCLUSION

This study demonstrates that SHR PCCT, particularly when combined with DLR, enables robust visualization and characterization of lung lesions across varying sizes, spiculation levels, and dose.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the clinical potential of PCCT with DLR to improve lung lesion assessment while maintaining image quality across reduced dose levels, supporting safer and more accurate low-dose CT protocols.

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Nov. 30 – Dec. 4
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S1-STCE1

Science Session (Imaging-Guided Oncologic Therapies: From Histotripsy to Theranostics and Beyond)

Sunday, Nov. 30 9:30AM - 10:00AM Room: LEARNING CENTER THEATER 1

Sub-Events

S1-STCE1-1 PREDICTIVE FACTORS OF LOCAL RECURRENCE AND OVERALL SURVIVAL IN PATIENTS WITH HEPATOCELLULAR CARCINOMA TREATED WITH TRANSARTERIAL CHEMOEMBOLIZATION

Uuganbayar Batbayar, MD, MBA (*Presenter*)
Erdenebulgan Batmunkh (*Abstract Co-Author*)

PURPOSE

To determine predictive risk factors of local recurrence after transarterial chemoembolization (TACE) and to compare the efficacy and safety of long-versus short-interval of transarterial chemoembolization (TACE) in hepatocellular carcinoma (HCC) patients.

METHODS AND MATERIALS

This retrospective cohort study involved 500 patients diagnosed with hepatocellular carcinoma who underwent transerterial chemoembolization at the Angiography Department of Second State Cental hospital between 2021 and 2025. The patients were divided into a short-interval group (SIG) and a long-interval group (LIG) based on the median TACE interval of the first two sessions with subgroup of BCLC grade. The data analysis was performed using STATA software programm. The overall survival was calculated as the interval between the date of initial TACE and the last follow-up. We used the Kaplan-Meier method and logistic regression test to estimate and compare overall survival.

RESULTS

The results of the study indicated that the lipiodol uptake was 205.59 ± 76.06 HU (p=0.041) and the tumor size was 4.18 ± 2.79 cm (p=0.010). These factors were found to have a significant impact on the occurrence of local recurrence after transarterial chemoembolization. The median TACE interval was 7.5 months and 58.6% of patients have short interval (=7.5 months) and 41.4% have long interval (=7.5 months) of TACE treatment. TACE interval plays important role for determining overall survival. The long interval group had a longer overall survival than the short interval group in Barcelona Clinic liver cancer (BCLC) stage C patients.

CONCLUSION

Non-compact lipiodol uptake (<200 HU) and tumor size are important risk factors influencing the local recurrence after transarterial chemoembolization in patients with hepatocellular carcinoma. A long interval between the first two sessions of TACE resulted in a better overall survival than a short interval in patients with BCLC C-stage HCC.

CLINICAL RELEVANCE/APPLICATION

Hepatocellular carcinoma (HCC) is the third most common cause of cancer-related death worldwide (incidence rate of 16 per 100,000 people) with 700,000 deaths annually attributed due to the hepatocellular carcinoma. Curative treatment of the hepatocellular carcinoma includes partial surgical resection of liver segment, radiofrequency ablation (RFA) and transarterial chemoembolization (TACE), but more than 50% of cases are diagnosed in the advanced stages. Several research studies have shown that local recurrence often occurs after transarterial chemoembolization. And several risk factors have been identified as contributing local recurrence after transarterial chemoembolization.

S1-STCE1-2 COMPREHENSIVE MULTI-OMICS ANALYSIS FOLLOWING CONVENTIONAL TRANSARTERIAL CHEMOEMBOLIZATION FOR INTERMEDIATE-STAGE HEPATOCELLULAR CARCINOMA PATIENTS

Rafael Duran, MD (*Presenter*)
Jonathan Thevenet (*Abstract Co-Author*)
Antonia Digklia (*Abstract Co-Author*)
Jean Paul Rivals (*Abstract Co-Author*)
Petra Baumgaertner (*Abstract Co-Author*)
Antonella Diciolla (*Abstract Co-Author*)
Clarisse Dromain, MD, PhD (*Abstract Co-Author*)
Georgia Tsoumakidou, MD (*Abstract Co-Author*)
Alban L. Denys, MD (*Abstract Co-Author*)
Nicolas Villard, MD (*Abstract Co-Author*)
Julien Dagher (*Abstract Co-Author*)
Christine Sempoux (*Abstract Co-Author*)
Montserrat Fraga (*Abstract Co-Author*)

PURPOSE

Conventional transarterial chemoembolization (cTACE) remains a cornerstone therapy for patients with intermediate-stage hepatocellular carcinoma (HCC). However, outcomes such as treatment response and overall survival vary considerably among individuals, and reliable predictive biomarkers are still unavailable. This study aims to characterize the molecular and immune alterations triggered by cTACE in HCC.

METHODS AND MATERIALS

Prospective, single center, IRB-approved study. Consent was obtained in all patients. Paired liver and tumor biopsies were obtained at baseline and four weeks following cTACE, along with blood samples collected at baseline, 7-10 days, 4 weeks, and at 3- and 6-months post-treatment. Spatial proteomic and transcriptomic analyses were conducted on the tumor and tumor microenvironment (TME) compartments, complemented by comprehensive systemic blood profiling.

RESULTS

A total of 44 cTACE procedures were performed in 16 patients. Molecular profiling revealed substantial alterations in both the tumor and TME. Notably, there was a marked downregulation of CD4+ T-cell markers in the TME and reduced expression of tumor-related proliferation and survival markers. Baseline RNA signatures

demonstrated changes in gene expression associated with splicing, transcriptional regulation, and mitochondrial protein synthesis, while post-cTACE profiles showed changes in cellular differentiation and ion transport. Pathway analysis revealed distinct immune-related pathway activation patterns between patient responders and non-responders. Specific ligand-receptor dynamics reflected shifts in immune cell activity. Non-responders exhibited upregulation of various immune checkpoint molecules, suggesting potential targets for combined therapeutic strategies. Importantly, distinct transcriptomic and proteomic signatures were identified that correlate with clinical outcomes, particularly overall survival.

CONCLUSION

cTACE induces profound molecular changes in HCC, influencing both tumor biology and the immune microenvironment. The integration of multi-omics data enhances patient stratification and could help identify those most likely to benefit from cTACE. These findings support the development of combination approaches involving both locoregional and systemic therapies to improve patient outcomes.

CLINICAL RELEVANCE/APPLICATION

Our study provides new biomarkers that could substantially impact the prediction of progression free survival and overall survival in HCC patients. It underscores specific molecular and immune targets suitable for concurrent targeting with cTACE and presents strategic avenues for fortifying treatment outcomes and improving patient survival.

S1-STCE1-3 NONINVASIVE DEEP LEARNING SYSTEM FOR PREOPERATIVE DIAGNOSIS OF FOLLICULAR-LIKE THYROID NEOPLASMS USING ULTRASOUND IMAGES: A MULTICENTER, RETROSPECTIVE STUDY

Hui Shen (*Presenter*)
Bin Zhang, MD (*Abstract Co-Author*)

PURPOSE

To propose a deep learning (DL) system for the preoperative diagnosis of follicular-like thyroid neoplasms (FNs) using routine ultrasound images. Preoperative diagnosis of malignancy in nodules suspicious for an FN remains challenging. Ultrasound, fine-needle aspiration cytology, and intraoperative frozen section pathology cannot unambiguously distinguish between benign and malignant FNs, leading to unnecessary biopsies and operations in benign nodules.

METHODS AND MATERIALS

This multicenter, retrospective study included 3634 patients who underwent ultrasound and received a definite diagnosis of FN from 11 centers, comprising thyroid follicular adenoma (n=1748), follicular carcinoma (n=299), and follicular variant of papillary thyroid carcinoma (n=1587). Four DL models including Inception-v3, ResNet50, Inception-ResNet-v2, and DenseNet161 were constructed on a training set (n=2587, 6178 images) and were verified on an internal validation set (n=648, 1633 images) and an external validation set (n=399, 847 images). The diagnostic efficacy of the DL models was evaluated against the ACR TI-RADS regarding the area under the curve (AUC), sensitivity, specificity, and unnecessary biopsy rate.

RESULTS

When externally validated, the four DL models yielded robust and comparable performance, with AUCs of 82.2%-85.2%, sensitivities of 69.6%-76.0%, and specificities of 84.1%-89.2%, which outperformed the ACR TI-RADS. Compared to ACR TI-RADS, the DL models showed a higher biopsy rate of malignancy (71.6% -79.9% vs 37.7%, $P < 0.001$) and a significantly lower unnecessary FNAB rate (8.5% -12.8% vs 40.7%, $P < 0.001$).

CONCLUSION

This study provides a noninvasive DL tool for accurate preoperative diagnosis of FNs, showing better performance than ACR TI-RADS and reducing unnecessary invasive interventions.

CLINICAL RELEVANCE/APPLICATION

We expect that the DL models may assist in minimizing the need for unnecessary invasive procedures like biopsies and operations.

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S1-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Sunday, Nov. 30 9:30AM - 10:00AM Room: LEARNING CENTER THEATER 2

Sub-Events

S1-STCE2-2 EFFORT-INDEPENDENT, NON-CONTRAST VENTILATORY ASSESSMENT OF INTERSTITIAL LUNG DISEASE PROGRESSION USING RESTING-STATE DYNAMIC CHEST RADIOGRAPHY

Kojiro Ono (*Presenter*)
Takefumi Nikaido (*Abstract Co-Author*)
Ryoichi Watanabe (*Abstract Co-Author*)
Akinori Tsunomori (*Abstract Co-Author*)
Yoshinori Tanino (*Abstract Co-Author*)
Yoko Shibata (*Abstract Co-Author*)
Tsutomu Yoneyama (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate an effort-independent, non-contrast method using resting-state dynamic chest radiography (DCR). Our scheme, Resting-State Silhouette Tracking for Thoracic Respiratory Assessment and Characterization of Kinetics (REST-TRACK), tracks respiratory motion via silhouettes and derives four ventilatory indices based on lung area and diaphragmatic displacement to distinguish healthy lungs from interstitial lung disease (ILD) and to monitor its progression.

METHODS AND MATERIALS

This IRB-approved retrospective study included 18 ILD patients (=6 months apart DCR) and 8 healthy controls with no smoking history. DCR was performed in the supine position during resting breathing (15 fps; entrance surface dose of ~1.8 mGy). Respiratory motion was extracted using REST-TRACK, which applies template-matching and deep learning models for silhouette segmentation and tracking. Diaphragm displacement (?DD) was defined as the average excursion of the highest points on bilateral domes; lung area change (?PLA) was calculated from expiratory and inspiratory frames. Respiratory rate (RR) was calculated based on diaphragmatic motion frequency. Four indices were derived: VE PLA = RR * ?PLA, RSBI PLA = RR / ?PLA, VE DD = RR * ?DD, and RSBI DD = RR / ?DD. Patients were classified into progressive (n=7; =5% annual FVC decline) or stable (n=11; <5%) groups. Statistical comparisons and correlation analyses with spirometry were performed.

RESULTS

Compared to controls, ILD patients showed significantly increased VE PLA and decreased RSBI PLA (both $p < 0.01$). Over time, the progressive group showed declining VE PLA , rising RSBI PLA and RSBI DD (all $p < 0.05$). In the stable group, VE PLA declined and RSBI PLA increased (both $p < 0.01$), despite stable spirometry, suggesting that REST-TRACK detects subclinical changes. VE PLA correlated with tidal volume ($r = 0.64$, $p < 0.01$); RSBI PLA inversely with FVC ($r = -0.48$, $p < 0.05$). RSBI DD demonstrated an emerging role as a potential biomarker for early diaphragmatic dysfunction, showing a trend toward inverse correlation with %FVC during follow-up ($r = -0.44$, $p = 0.069$) and significantly increasing only in the progressive group ($p < 0.05$).

CONCLUSION

REST-TRACK enables effort-independent, contrast-free ventilatory imaging and may detect latent ventilatory and diaphragmatic dysfunction not captured by spirometry. It also shows promise for monitoring disease progression in patients with ILD.

CLINICAL RELEVANCE/APPLICATION

Spirometry is the standard for monitoring ILD, but effort-dependent testing is difficult in elderly, frail, or critically ill patients. Advanced alternatives like contrast-enhanced or hyperpolarized gas MRI are costly or complex. REST-TRACK offers a contrast-free, effort-independent solution using DCR.

S1-STCE2-3 ROLE OF CEREBRAL PERFUSION USING 3 TESLA ARTERIAL SPIN LABELING MRI IN DEMENTIA PATIENTS

Shaheen Haidrus, MD, MBBS (*Presenter*)

PURPOSE

This study aimed to evaluate cerebral perfusion patterns in dementia patients using 3 Tesla ASL-MRI, compare findings with healthy controls, and analyze the correlation of perfusion parameters with cognitive impairment severity.

METHODS AND MATERIALS

A total of 92 participants, including 53 DSM-5-diagnosed dementia patients and 39 age- and sex-matched healthy controls, were enrolled to assess regional cerebral perfusion using 3T ASL-MRI. A fully automated Python-based computational pipeline was developed to extract quantitative perfusion metrics and integrate machine learning tools for early detection of dementia-related changes. The pipeline comprised ten sequential steps, each implemented using Jupyter Notebook and Python libraries (e.g., NiBabel, Nilearn, Scikit-learn, CatBoost, Matplotlib, and Pandas). This custom workflow enabled end-to-end analysis of ASL MRI data with minimal manual intervention.

RESULTS

Dementia cases demonstrated significantly reduced mean global CBF (43.12 ± 5.12 ml/100g/min) compared to controls (53.96 ± 13.01 ml/100g/min; $p < 0.0001$) and lower normalized z-CBF values (-0.65 ± 0.78 vs. 0.59 ± 1.12; $p < 0.0001$). Global CBF correlated positively with MMSE scores ($r = 0.40$, $p = 0.0051$) and inversely with risk level ($r = -0.41$, $p = 0.0037$). Alzheimer's disease patients exhibited pronounced hypoperfusion in the frontal opercular cortex, lingual gyrus, and temporal lobes, while vascular dementia showed diffuse hypoperfusion.

CONCLUSION

This study concludes that 3 Tesla Arterial Spin Labeling (ASL) MRI is a highly effective, non-invasive screening and monitoring tool for detecting cerebral perfusion deficits in dementia, particularly in settings lacking PET/SPECT. It differentiates patients from healthy controls, identifies dementia subtype-specific regional

hypoperfusion, and correlates strongly with cognitive impairment severity. Hypoperfusion emerges as an early neurodegeneration marker, with ASL-MRI mirroring FDG-PET findings without ionizing radiation or contrast agents. Frontal, temporal, and occipital lobes are most affected, especially in Alzheimer's disease.

CLINICAL RELEVANCE/APPLICATION

In our study, automated pipelines enabled standardized extraction of regional cerebral blood flow using the Harvard-Oxford atlas, while machine learning models such as CatBoost facilitated accurate classification of dementia subtypes and individualized risk stratification. Brain age estimation and z-score thresholding further improved interpretability. The integration of artificial intelligence in our study not only enhanced diagnostic accuracy but also improved reproducibility, reduced operator dependence, and paved the way for objective, quantitative assessment of perfusion abnormalities.

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S2-SSBR01

Breast Imaging (MRI Advanced Applications)

Sunday, Nov. 30 10:30AM - 11:30AM Room: S406A

Pascal A. Baltzer, MD (*Moderator*)

Sub-Events

S2-SSBR01-1 DIAGNOSTIC PERFORMANCE OF ABBREVIATED VS FULL BREAST MRI PROTOCOLS IN BRCA MUTATION CARRIERS

Wendelien Sanderink, PhD (*Presenter*)
Suzanne L. Van Winkel, RN,MSc (*Abstract Co-Author*)
Marloes van der Leest, MD (*Abstract Co-Author*)
Susanne Lardenoije (*Abstract Co-Author*)
Mechli W. Imhof-Tas, MD, PhD (*Abstract Co-Author*)
Marialena Tsarouchi (*Abstract Co-Author*)
Ritse M. Mann, MD, PhD (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic accuracy of an abbreviated breast MRI protocol in comparison with the full diagnostic breast MRI protocol for screening BRCA-gene mutation carriers.

METHODS AND MATERIALS

This retrospective study compared the diagnostic accuracy of an abbreviated breast MRI protocol consisting of DWI, one pre- and one post contrast T1-weighted image and an ultrafast T1 during inflow with a full diagnostic breast MRI protocol (including DWI, one pre- and five post contrast T1-weighted images, ultrafast T1 during inflow and a T2-weighted acquisition) in women with a BRCA-gene mutation. Women with a BRCA-gene mutation and at least one screening MR in our hospital between January 2012 and December 2024 were analyzed. Information on age, screening round and eventual tumor characteristics was extracted from the medical record.

RESULTS

4409 MRI-screens were performed in 1058 women with a BRCA-gene mutation. In 790 women (age mean 40.1 y.o., range 23-72), 2905 full-protocol MRI examinations were obtained between January 2012 and March 2020 (average 3.7 screenings per woman, range 1 to 10). In 661 women (age mean 39.9 y.o., range 24-72), 1504 abbreviated MRI examinations were obtained between April 2020 and December 2024 (average 2.3 screenings per woman, range 1 to 7). Cancer was detected in total in 65 women (12 DCIS and 46 invasive). The cancer detection rate for first round screenings was 7/1000 [2/275] vs 22/1000 [9/414], P=0.13, for abbreviated MR and full-protocol MRI, respectively. For the follow-up rounds the cancer detection rate was 12/1000 [15/1229] vs 16/1000 [41/2491], P=0.26. Average tumor diameter was 11.4±9.8 mm with full protocol and 5.7±4.3 mm with abbreviated protocol (p=0.04). 20% was LN positive compared to 21% (p=0.90) for abbreviated MRI and full-protocol MRI, respectively.

CONCLUSION

Abbreviated MRI showed comparable cancer detection rates compared to the full-protocol MRI in women with a BRCA-gene mutation. Cancers detected by abbreviated MRI were on average smaller than those detected by the full protocol.

CLINICAL RELEVANCE/APPLICATION

Abbreviated breast MRI protocols provide a comparable cancer detection rate to full diagnostic protocols in BRCA mutation carriers, suggesting that abbreviated MRI can be a time-efficient and resource-saving alternative for high-risk breast cancer screening without compromising diagnostic performance.

S2-SSBR01-2 CLASSIFICATION OF BREAST DCIS WITH ULTRAFAST MRI

Carla Sitges, MD (*Presenter*)
Tianyu Zhang, PhD (*Abstract Co-Author*)
Miguel Braga, MD (*Abstract Co-Author*)
Xavier Bargallo, MD (*Abstract Co-Author*)
Ritse M. Mann, MD, PhD (*Abstract Co-Author*)

PURPOSE

Ductal carcinoma in situ (DCIS) is a heterogeneous lesion that accounts for 20% of all newly diagnosed breast neoplasms. Detecting DCIS can potentially prevent progression to invasive breast cancer (IBC); however, in cases of lower-grade DCIS, it often results in overtreatment. Therefore, classifying DCIS grade with imaging techniques could help identifying cases with biological significance and distinguish them from indolent ones that might benefit from surveillance and avoid standard treatment. In this study, we aim to evaluate the potential of UF-MRI parameters to predict the grade classification of DCIS.

METHODS AND MATERIALS

160 patients from the institutional database diagnosed with pure DCIS who underwent UF-MRI, were analyzed. DCIS grade (1-3) was obtained from the pathological report. UF parameters recorded included: time to enhancement (TTE) relative to that in the descending aorta and the maximum slope (MS) of the enhancement curve. Mean and standard deviations of TTE and MS were calculated by grade. The association between UF-MRI parameters, using previously determined threshold values, and DCIS grade was assessed using chi-squared statistical test and presented graphically.

RESULTS

The mean and standard deviation of TTE for each DCIS grade were as follows: Grade 1: 13.05 ± 3.58 s, Grade 2: 11.52 ± 4.19 s, and Grade 3: 9.68 ± 3.01 s. A consistent trend in which higher-grade lesions are associated with shorter TTE was observed ($p < 0.05$). Only 6% of DCIS grade 3 lesions was associated with a TTE > 15 s.The mean and standard deviation of MS for each grade were: Grade 1: 12.34 ± 5.37%/s, Grade 2: 11.63 ± 8.52%/s, and Grade 3: 11.30 ± 5.84%/s. No clear trend was observed between MS and DCIS grade. Statistical analysis indicated no significant differences among the grades ($p > 0.05$).

CONCLUSION

Higher-grade DCIS is associated with statistically significant shorter TTE. In contrast, MS showed no consistent relationship with DCIS grade. These findings suggest that TTE may serve as a imaging biomarker and prognostic factor for DCIS.

CLINICAL RELEVANCE/APPLICATION

Integrating the Ultrafast MRI parameter TTE into clinical practice could enhance DCIS stratification, support treatment de-escalation, and allow for more personalized management. Further research is needed to investigate its relationship with other tumor biology-related molecular factors.

S2-SSBR01-5 DIAGNOSIS OF CARCINOMA IN SITU ON THE ULTRAFAST SEQUENCE: IS IT POSSIBLE TO INCREASE THE SENSITIVITY OF BREAST MRI?

Izabella Melo, MD (*Presenter*)
IVIE BRAGA DE PAULA (*Abstract Co-Author*)

PURPOSE

To highlight the role of the Ultrafast sequence in the characterization of ductal carcinoma in situ (DCIS) on breast MRI, distinguishing it from background parenchymal enhancement (BPE).

METHODS AND MATERIALS

This is a retrospective cross-sectional study that evaluated medical records of patients diagnosed with DCIS who underwent breast MRI using a full protocol (T2, diffusion-weighted imaging B0/800, Ultrafast, and pre- and post-contrast dynamic sequences). Examinations were performed at a private healthcare institution in Brazil between January 2023 and July 2023. Eligible participants included female patients over 18 years of age with a diagnosis of DCIS who underwent breast MRI and signed informed consent. The qualitative variables analyzed were: background parenchymal enhancement (BPE), findings on the Ultrafast sequence, and findings on post-contrast dynamic sequences.

RESULTS

During the study period, 26 cases of DCIS were identified at the institution. Of these, 12 patients underwent breast MRI: 11 MRIs showed abnormalities (10 with non-nodular enhancement and 1 with a nodular lesion), and 1 MRI was unremarkable. Among the 11 abnormal MRIs: 10 were Ultrafast-positive; 1 was Ultrafast-negative. Among the 10 Ultrafast-positive MRIs: 5 showed findings identified only on the Ultrafast sequence; 4 with findings better visualized on the Ultrafast sequence than on the other sequences; 1 showed Ultrafast findings similar to other sequences. Notably, among the 10 Ultrafast-positive cases, 4 were high-grade DCIS and 2 were intermediate-grade DCIS .

CONCLUSION

The Ultrafast sequence may enhance MRI performance by detecting early enhancement of DCIS, which can occur before the peak of background parenchymal enhancement. In cases with marked BPE, DCIS enhancement may be obscured in post-contrast sequences obtained one minute after contrast injection.

CLINICAL RELEVANCE/APPLICATION

Larger studies are needed to confirm whether the Ultrafast sequence improves the sensitivity of MRI in detecting DCIS across histologic grades. The potential for underdiagnosis when Ultrafast is not included in MRI protocols deserves attention in future research

S2-SSBR01-6 ADDED VALUE OF MRI IN MULTIMODAL AI FOR BREAST CANCER DIAGNOSIS AND LONG-TERM RISK ASSESSMENT IN INTERMEDIATE TO HIGH-RISK WOMEN

Artie Shen (*Presenter*)
Laura Heacock, MD, MS (*Abstract Co-Author*)
Yanqi Xu (*Abstract Co-Author*)
Jungkyu Park, MS (*Abstract Co-Author*)
Felicia Pasadyn, MA, BA (*Abstract Co-Author*)
Beatriu Reig, MD, MPH (*Abstract Co-Author*)
Linda Moy, MD (*Abstract Co-Author*)
Krzysztof J. Geras (*Abstract Co-Author*)

PURPOSE

Mammography and ultrasound AI models have high accuracy in breast cancer detection and long-term risk prediction. The purpose of this study was to evaluate if use of breast MRI in a multimodal model improved breast cancer detection and/or risk prediction in women with intermediate to high lifetime risk of breast cancer.

METHODS AND MATERIALS

In this IRB-approved retrospective study, we evaluated a multimodal transformer (MMT) model. The MMT trains modality-specific feature extractions for mammography (FFDM), digital breast tomosynthesis (DBT), ultrasound (US) and breast MRI, combines them with additional clinical variables, and uses a transformer to predict immediate and long-term risk of breast cancer. The development set was 1,291,657 exams from 274,388 patients (age mean 57.5 years, SD 12.1 years) between 2010 and 2022. The trained model was then tested on intermediate to high lifetime risk of breast cancer patients (family history, prior cancer, dense, high-risk genetic mutation) with at least one MRI in our records. Model performance was assessed with 2- and 5-year AUCs and concordance index (C-index).

RESULTS

The cohort was 1,944 women, 18,201 exams (age 57.8 ± 10.0), 214 cancers in 5 years. 48.0% (939/1,944) had dense breasts. Model AUROCs were compared on FFDM/DBT and MRI exams with the corresponding baselines. For FFDM/DBT, MMT achieved an AUROC of 0.899 (95% CI: 0.879, 0.907) for cancer detection and a C-index of 0.640 (95% CI: 0.614, 0.666]) for 5-year risk prediction across all modalities. The MMT model including past MRI data achieved an AUROC of 0.940 (95% CI: 0.927, 0.946) for cancer detection and a C-index of 0.698 (95% CI: 0.673, 0.723) for 5-year risk, improving the baseline MMT model without MRI by 0.041 and 0.058 (two-sided DeLong's test, $P < 0.01$ for both) respectively. For MRI exams, the MMT model had AUROC of 0.947 (95% CI: 0.934, 0.958) for cancer detection, improving by 0.029 (two-sided Delong's test, $P < 0.01$) compared to MRI-only baseline. When evaluating 5-year risk, use of MRI alone to evaluate risk on MRI exams had AUROC of 0.591 [95% CI: 0.518 0.662], which improved to 0.682 [0.612 0.751] with use of the MMT. However, use of FFDM/DBT only to predict risk on corresponding FFDM/DBT had higher AUROC of 0.809 [95% CI: 0.786 0.832].

CONCLUSION

Using MRI into a multimodal model improves cancer detection and risk prediction in increased-risk patients. For breast MRI evaluation, FFDM/DBT only and multimodal risk prediction outperforms breast MRI alone.

CLINICAL RELEVANCE/APPLICATION

Adding MRI to multimodal models improves breast cancer risk prediction in women at increased risk of breast cancer. Granular identification of true high risk women within these cohorts allows for better targeting of supplemental screening and chemoprevention.

Nov. 30 – Dec. 4
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S2-SSCA01

Cardiac Imaging (Technical and Applied AI)

Sunday, Nov. 30 10:30AM - 11:30AM Room: E353C

Tim Leiner, MD, PhD (*Moderator*)
Amit Gupta, MD, MBBS (*Moderator*)

Sub-Events

S2-SSCA01-1 DEEP LEARNING IMAGE RECONSTRUCTION COMBINED WITH LOW-TUBE-VOLTAGE SCANNING AND ADAPTIVE CONTRAST INJECTION FOR CORONARY CT ANGIOGRAPHY: A PROSPECTIVE RANDOMIZED TRIAL

Xiao Meng (*Presenter*)
He Chunyan, BArch (*Abstract Co-Author*)

PURPOSE

To validate a triple-optimized coronary CTA protocol integrating 80-kVp scanning, deep learning image reconstruction (DLIR), and low-iodine adaptive injection for simultaneous radiation/iodine reduction while improving vascular enhancement, with emphasis on renal-impaired populations (eGFR 30-60 mL/min/1.73m²).

METHODS AND MATERIALS

A total of 120 patients (eGFR 30-60: n=78) were prospectively enrolled and divided into two groups:Group A (Standard): 120-kVp scanning with filtered back projection (FBP), fixed-rate injection (50 mL Ioversol 350 mgI/mL at 5 mL/s + 30 mL saline).Group B (Experimental): 80-kVp DLIR (TrueFidelity™, GE Healthcare) with body weight-adjusted variable-rate injection (20 mL Ioversol + 60 mL saline dynamically optimized).Primary endpoints included vascular attenuation (target >325 HU per SCCT guidelines), noise reduction ratio (NRR), interpretability (5-point Likert scale by three blinded cardiothoracic radiologists; ?-interrater calculated), and CTDIvol. Safety outcomes (contrast extravasation, CIN) were assessed via Fisher's exact test. Statistical analysis used mixed-effects models with pre-specified non-inferiority margin (?=5% for interpretability).

RESULTS

Radiation/Contrast Reduction:51% lower CTDIvol (14.3 vs. 29.1 mGy, P<0.001).60% iodine reduction (20 vs. 50 mL, P<0.001).Vascular Enhancement:Higher attenuation in Group B: LMCA: 452±38 HU vs. 368±49 HU (P<0.001); proximal RCA: 438±42 HU vs. 354±51 HU (P=0.002).All segments exceeded SCCT threshold (>325 HU).Image Quality:63% higher NRR with DLIR (P=0.005) and 109% SNR improvement (24.1±3.8 vs. 11.5±2.9, P=0.001).Fewer beam-hardening artifacts (11.2% vs. 28.7%, P=0.003).Diagnostic Performance:Non-inferior interpretability (97.3% vs. 95.8%; ?=1.5%, 95%CI [-0.8,3.8]).Excellent inter-reader agreement (?=0.88).Safety Outcomes:88% lower extravasation risk (1/60 vs. 8/60, P=0.03).Zero CIN events in Group B vs. 3 in Group A (P=0.24, Fisher's test).

CONCLUSION

The triple-optimized protocol achieved superior vascular enhancement (400-500 HU range) with 51% radiation and 60% iodine reduction, demonstrating that low-kVp DLIR combined with adaptive injection synergistically improves contrast utilization. This approach provides a renal-safe alternative without compromising diagnostic confidence.

CLINICAL RELEVANCE/APPLICATION

Enhanced vascular opacification at ultra-low iodine doses may expand coronary CTA applications to patients with severe renal insufficiency, pending validation in larger cohorts.

S2-SSCA01-3 CLINICAL UTILITY OF DYNAMIC FRACTIONAL FLOW RESERVE COMPUTED TOMOGRAPHY (FFR-CT) IN PATIENTS WITH CHEST PAIN

Kyeong Jin Park, MD (*Presenter*)
Eun Ju Chun, MD, PhD (*Abstract Co-Author*)

PURPOSE

While fractional flow reserve computed tomography (FFR-CT) is widely used to identify fixed coronary ischemia, its role in detecting dynamic, phase-dependent ischemia such as that seen in vasospastic angina (VA) remains unclear. This study evaluated whether cardiac phase-specific FFR-CT measurements provide insight into coronary vasospasm beyond the identification of obstructive coronary artery disease (CAD).

METHODS AND MATERIALS

Between January 2020 and December 2021, we retrospectively analyzed 185 patients (mean age 64.9±12.4 years; 67.0% male) who presented to the emergency department with chest pain and underwent both coronary CT angiography (CCTA) and invasive coronary angiography. Patients were categorized into three groups: CAD, VA, and control (ergonovine negative). FFR-CT values were obtained for three major coronary arteries during both systolic and diastolic phases. Ischemia was classified as (1) fixed ischemia (FFR = 0.75 in both phases), (2) vasospastic ischemia (FFR = 0.75 in either phase), and (3) no ischemia (FFR > 0.75 in both). Group-wise ischemia types and FFR changes (?FFR) were compared using chi-square tests and descriptive statistics.

RESULTS

Fixed ischemia was significantly more frequent in the CAD group (32/85) than in both the VA (13/61; p = 0.045) and control groups (3/39; p < 0.001). In contrast, vasospastic ischemia in the VA group (16/61) did not differ significantly from the CAD (26/85; p = 0.585) or control groups (4/39; p = 0.072). Notably, 30.6% of CAD patients (n=26) had vasospastic ischemia, suggesting the coexistence of a dynamic functional component alongside fixed anatomical stenosis. Additionally, 21.3% of VA patients (n=13) showed fixed ischemia, suggesting a mixed ischemic mechanism involving both vasospasm and anatomical stenosis. In the control group, most patients (32/39) showed no ischemia. ?FFR analysis revealed the highest phase-to-phase variability in the LAD among CAD patients (0.082 ± 0.074), while VA patients exhibited greater ?FFR variability in the RCA and LCX (0.065 ± 0.078 and 0.059 ± 0.069, respectively). The control group demonstrated the lowest and most stable ?FFR values across all vessels.

CONCLUSION

Dynamic FFR-CT enhances ischemia characterization by detecting phase-dependent coronary changes not visible in single-phase evaluation. These findings highlight the potential coexistence of vasospasm and anatomical stenosis, and support more tailored treatment strategies based on individual ischemic physiology.

CLINICAL RELEVANCE/APPLICATION

Dynamic FFR-CT facilitates the detection of coronary spasm in VA and dynamic change in CAD that are difficult to detect on single-phase scan, helping to identify patients who may benefit from vasodilators or spasm-focused treatment.

S2-SSCA01-4 EVALUATION OF IN-LINE AUTOMATED DEEP LEARNING-BASED SLICE PRESCRIPTION FOR CARDIAC MRI

Thekla H. Oechtering, MD (*Presenter*)
Gaspar Delso (*Abstract Co-Author*)
Jitka Starekova, MD (*Abstract Co-Author*)
Geng Li (*Abstract Co-Author*)
Sheena Chu (*Abstract Co-Author*)
Nikolaos Panagiotopoulos, MD (*Abstract Co-Author*)
Karl Vigen, PHD (*Abstract Co-Author*)
Orhan Unal, PhD (*Abstract Co-Author*)
Dan W. Rettmann, BS (*Abstract Co-Author*)
Sherry Huang, PhD (*Abstract Co-Author*)
Ty A. Cashen, MD, PhD (*Abstract Co-Author*)
Prashant Nagpal, MD (*Abstract Co-Author*)
Scott B. Reeder, MD, PhD (*Abstract Co-Author*)

PURPOSE

A prototype deep learning algorithm (TeslaFlow, TF; GE HealthCare, WI) provides automated slice prescription for cardiac MRI, aiming to improve workflow efficiency, enhance consistency, and reduce operator dependence. This study prospectively validates TF, comparing its performance both without and with manual adjustments (TF+M) against manual prescription (M).

METHODS AND MATERIALS

Following IRB approval and consent, healthy volunteers underwent a 45-minute exam at 3T (Signa Premier, GE HealthCare) which was repeated after repositioning. Cine bSSFP images were acquired in 2-, 3-, and 4-chamber views and a short axis (SAX) stack. Prescriptions were performed using M, TF, and TF+M in random order. Test and retest exams were conducted by the same or different technologists. Additionally, TF prescriptions were added to the protocol in patients undergoing clinical cardiac MRI at 1.5T. Two cardiovascular radiologists rated image quality. Left ventricular (LV) function was quantified for all diagnostic datasets using cvi42 (Circle Cardiovasc. Imaging, Canada). Reproducibility was assessed by radiologists' quality and similarity scores, LV function repeatability, and differences in plane angle. Statistical analysis included Bland-Altman analysis, intraclass correlation coefficients (ICC), and t-tests.

RESULTS

30 healthy subjects (22-62y) and 11 patients (37-87y) were enrolled. Radiologists rated 85-92% of TF acquisitions in volunteers and 88% in patients as diagnostic. Technologists reported clinically necessary manual adjustments in 26% for TF+M acquisitions, and no/minor changes in 74%. M and TF+M showed excellent agreement in LV volumes and myocardial mass (ICC=0.903-0.991), while TF alone showed good to excellent correlation (ICC=0.882-0.991). TF did not improve intra- or inter-technologist reproducibility of LV function compared to TF+M or M. Angles between prescriptions were significantly lower between TF+M and M (SAX, 4.4±2.8°) compared to TF and M (SAX, 9.1±11.9°, p=0.001). Differences in LV function estimates between methods were similar or smaller than test-retest exams.

CONCLUSION

The automated cardiac MRI prescription prototype achieved at least an 85% success rate. Manual adjustments improved prescription quality. Differences in quantitative results and plane angles between methods were minor and unlikely to be clinically significant. Future studies should focus on performance in larger patient cohorts and potential time savings.

CLINICAL RELEVANCE/APPLICATION

The deep learning-based prototype enables automated, in-line cardiac MRI prescription. Although not sufficiently robust to use without supervision, the prototype improves prescription quality and consistency when used by a trained technologist.

S2-SSCA01-5 A STUDY TO MEASURE THE UTILITY OF AN AI-ENHANCED REPORTING TOOL IN ASSISTING BUSY CCTA READERS WITH REPORT GENERATION (SMART-REPORT)

Wesley O'Neal, MD (*Presenter*)
Harish Gudi, MD, MBBS (*Abstract Co-Author*)
Christopher Schumann (*Abstract Co-Author*)
Autumn Birch (*Abstract Co-Author*)
Nicholas Ng (*Abstract Co-Author*)
Sarah Mullen (*Abstract Co-Author*)
Mahesh Chandrasekhar (*Abstract Co-Author*)
Michael F. Morris, MD (*Abstract Co-Author*)

PURPOSE

Coronary CT angiography (CCTA) interpretation and reporting are time intensive. In addition to coronary stenosis quantification, AI-enabled quantitative coronary plaque analysis and fractional flow reserve CT (FFR CT) require multiple reports to be generated which can substantially lengthen interpretation time. The SMART-REPORT study sought to determine if an integrated structured reporting (SR) tool for CCTA can increase reader efficiency and reproducibility and reduce cognitive load.

METHODS AND MATERIALS

80 CCTAs from patients with stable chest pain or symptoms of coronary artery disease were analyzed. Five independent readers (3 cardiologists and 2 radiologists; all SCCT Level 3) from 2 sites were included. CCTA datasets were used to generate combined reports for AI-enabled stenosis quantification, plaque analysis, and FFR CT, , and provided to each reader. Interpretation of one batch of 10 CCTAs was permitted per day using local site software for post-processing and reporting. Each reader interpreted 40 cases without SR using a site defined clinical workflow and 40 cases using a SR tool which provided a pre-populated fully editable template. Differences in reporting times from initiation of case interpretation through report signing were compared with vs. without the SR tool. Reporting times were stratified by Coronary Artery Disease-Reporting and Data System (CAD-RADS) 2.0 category. Cognitive load was assessed using a validated 9-point Likert scale (scores >5 indicating high mental effort) and compared by SR use. The agreement between readers (text similarity) was also determined.

RESULTS

Interpretation time per case was 40.2% shorter with vs. without the SR tool (5.99 ± 1.96 vs. 10.01 ± 3.31 min; P<0.0001). This difference was independent of stenosis severity (Table). Report agreement also significantly higher with vs. without the SR tool (94.6% ± 2.3% vs. 45.3% ± 9.2%; P<0.0001). Average cognitive load was significantly lower with the SR tool than without (3.8 ± 1.2 vs. 6.1 ± 1.5; P<0.0001), independent of stenosis severity (Table).

CONCLUSION

A SR tool for CCTA incorporating AI-enabled coronary stenosis quantification, AI-enabled quantitative coronary plaque analysis, and FFR CT significantly reduced reporting time and cognitive load for CCTA interpretation.

CLINICAL RELEVANCE/APPLICATION

As the demand for CCTA grows, this SR tool may facilitate physician efficiency in CCTA reporting while reducing individual mental effort.

S2-SSCA01-6 REAL-WORLD IMPLICATIONS OF FDA'S PREDETERMINED CHANGE CONTROL PLAN (PCCP) FOR AI-ENABLED MEDICAL DEVICES: IS THE NEWER VERSION ALWAYS BETTER?

Syed Muhammad Awais Bukhari, MD (*Presenter*)
Sreyes Venkatesh (*Abstract Co-Author*)
Brian Zhang (*Abstract Co-Author*)
Robert C. Gilkeson, MD (*Abstract Co-Author*)
Amit Gupta, MD, MBBS (*Abstract Co-Author*)

PURPOSE

The FDA's guidance on the Predetermined Change Control Plan, while intended to promote innovation and rapid iteration, this process also raises concerns regarding real-world performance. We evaluated two versions (v1.3 and v1.4) of an FDA-cleared AI algorithm for automated coronary artery calcium (CAC) scoring (Bunkerhill Inc.), used on non-gated low-dose CT (LDCT) scans. To compare the clinical performance of CAC AI versions 1.3 and 1.4 following concerns by cardiothoracic radiologists of reduced accuracy after upgrading to version 1.4. The vendor reported internal improvements in version 1.4, including 5× more training data, 30% more model parameters, enhanced stent detection ,and improved CAC segmentation.

METHODS AND MATERIALS

In this retrospective study, 110 consecutive LDCT exams (Nov 1-30, 2025) were analyzed using both AI versions (Average age: 65 years; M: F:: 57:53). Agatston CAC scores and risk categories were compared (minimal: 0; mild: 1-99; moderate: 100-399; severe: 400-1000; extremely high: >1000). A board-certified cardiothoracic radiologist (15 years' experience) independently reviewed images to assess risk categorization, stent detection, and version preference. Statistical analysis included descriptive measures and paired t-tests.

RESULTS

Among 110 patients, 10 had coronary artery stents. Version 1.4 correctly identified 8 of these, whereas version 1.3 identified none. In patients without stents, the mean CAC score was significantly higher with version 1.3 (452.7) than with version 1.4 (288.5) ($p < 0.001$; mean difference: 164.2, 95% CI: 107.3-221.1). Risk category distributions were: minimal: 19% (CAC v 1.3) vs. 22.8% (1.4); mild: 19% (CAC v 1.3) vs. 33.7% (1.4); moderate: 32.7% (CAC v 1.3) vs. 31.7% (CAC v 1.4); severe: 22.8% (CAC v 1.3) vs. 10.9% (CAC v 1.4); extremely high: 6.9% (CAC v 1.3) vs. 1% (CAC v 1.4). Eighteen patients were reclassified into lower-risk categories by version 1.4. For example, 17 patients shifted from 400-1000 to 100-399; 6 from >1000 to 400-1000; 18 from 100-399 to 1-99; and 1 from 400-1000 to 1-99. The radiologist preferred version 1.3 in 58.2% (64/110) of cases, version 1.4 in 5.5% (6/110), and had no preference in 30.9% (34/110). In 5.5%(6/110) of cases, the radiologist disagreed with both outputs.

CONCLUSION

While CAC v1.4 demonstrated improved stent detection, it consistently underestimated CAC scores relative to v1.3, prompting concerns about misclassification of cardiovascular risk. Despite technical enhancements, radiologist preference and statistical evidence favored version 1.3 in majority of cases.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the importance of local validation and ongoing performance monitoring before adopting AI updates under the PCCP framework.

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S2-SSPD01

Science Session with Keynote: Pediatric Imaging (Brain, Head, Neck and Spine)

Sunday, Nov. 30 10:30AM - 11:30AM Room: E350

Karen Moeller, MD (*Moderator*)
Rupa Radhakrishnan, MD, MS (*Moderator*)

Sub-Events

S2-SSPD01-1 Keynote Speaker: Neuroimaging in Pediatric Stroke

Pradeep Krishnan, MD (*Science Invited Presenter*)

S2-SSPD01-2 FMRI STUDY OF BRAIN FUNCTIONAL ALTERATIONS IN CHILDREN WITH AUTISM SPECTRUM DISORDER AFTER UMBILICAL CORD BLOOD MONONUCLEAR CELL INFUSION

Cong Zhang (*Presenter*)
Duo Gao (*Abstract Co-Author*)
Ning Zheng (*Abstract Co-Author*)
Zhijuan Li (*Abstract Co-Author*)
Jing Peng (*Abstract Co-Author*)
Lixia Zhou (*Abstract Co-Author*)

PURPOSE

This study aimed to investigate the brain functional changes in children with autism spectrum disorder (ASD) before and after treatment with umbilical cord blood mononuclear cell (UCB-MNC) infusion using blood oxygen level-dependent functional magnetic resonance imaging (BOLD-fMRI). Furthermore, by integrating clinical assessment scales, we examined the therapeutic efficacy of UCB-MNC infusion in ASD and assessed the potential of BOLD-fMRI as biomarker for evaluating treatment outcomes.

METHODS AND MATERIALS

A total of 20 preschool children diagnosed with ASD and treated at the Hospital between August 2021 and July 2022 were enrolled. The Childhood Autism Rating Scale (CARS) and Autism Behavior Checklist (ABC) were used to evaluate clinical symptoms before and 9-12 months after UCB-MNC infusion. BOLD-fMRI was employed to analyze changes in regional homogeneity (ReHo) and amplitude of low-frequency fluctuation (ALFF). Paired sample t-tests were conducted to compare spontaneous brain activity before and after treatment. Pearson correlation analysis was used to assess the associations between post-treatment changes in CARS scores and alterations in ReHo and ALFF values.

RESULTS

At 9-12 months post-treatment, significant increases in ReHo values were observed in several brain regions, including the left postcentral gyrus and left lingual gyrus. ALFF values also showed distinct increases in areas such as the left postcentral gyrus, with statistically significant differences (FDR corrected, $P < 0.001$). Further analysis revealed a significant negative correlation between the change in mean ReHo in the right precuneus and the change in CARS scores ($R = -0.7565$, $P = 0.0001$). A similarly significant negative correlation was found between the change in mean ALFF in the left postcentral gyrus and the change in CARS scores ($R = -0.8574$, $P < 0.0001$). Clinical assessments showed that CARS scores significantly decreased after treatment ($P < 0.05$), indicating symptomatic improvement. Notably, in the 3 children whose CARS scores did not improve, ReHo in the cingulate gyrus and ALFF in the angular gyrus exhibited significant increases (FDR corrected, $P < 0.05$).

CONCLUSION

UCB-MNC treatment effectively alters brain functional status in children with ASD. BOLD-fMRI demonstrates strong potential for detecting changes of brain activities, and these changes are closely associated with improvements in clinical symptoms as reflected by CARS scores.

CLINICAL RELEVANCE/APPLICATION

These findings offer valuable evidence for assessing the therapeutic efficacy of UCB-MNC infusion in ASD and underscore its potential significance in clinical practice.

S2-SSPD01-4 NON-INVASIVE AND END-TO-END PREDICTION OF MOLECULAR AND IMMUNE SUBGROUPS OF PEDIATRIC LOW-GRADE GLIOMAS VIA TRANSFER LEARNING

Fadel Batal, BEng, MEng (*Presenter*)
Bhavyasri Vunnava (*Abstract Co-Author*)
Adam Kraya (*Abstract Co-Author*)
Deep Gandhi (*Abstract Co-Author*)
Ariana Familiar (*Abstract Co-Author*)
Dimosthenis Chrysochoou (*Abstract Co-Author*)
Phillip Storm (*Abstract Co-Author*)
Arastoo Vossough, PhD, MD (*Abstract Co-Author*)
Adam Resnick (*Abstract Co-Author*)
S. Ali Nabavizadeh, MD (*Abstract Co-Author*)
Anahita Fathi Kazerooni (*Abstract Co-Author*)

PURPOSE

Pediatric low-grade gliomas (pLGGs) exhibit heterogeneous prognoses and treatment responses, largely driven by underlying molecular and immunological differences. Specifically, BRAF alterations influence tumor biology and guide targeted therapy decisions, with KIAA1549-BRAF fusion and BRAF V600E mutation linked to distinct treatment pathways. Additionally, we have previously identified an immune-enriched ("immune-hot") pLGG subgroup associated with poor prognosis but potential responsiveness to immunotherapy. Non-invasive prediction of tumor subtypes and immune profiles from imaging can support early, personalized treatment strategies.

We developed an end-to-end, segmentation-free deep learning (DL) framework to predict BRAF mutational status and immunological subgroup in pLGGs using T2-weighted MRI.

METHODS AND MATERIALS

We implemented a two-stage transfer learning pipeline based on a 3D ResNet-34 architecture. The model was first pre-trained on tumor segmentation using T2-weighted MRIs from 794 pediatric brain tumor cases in the Children's Brain Tumor Network (CBTN), then fine-tuned for molecular and immune classification in a subset of 251 pLGG patients with matched whole-genome and RNA sequencing data (184 with immune subgroup labels). Preprocessing included skull-stripping, intensity normalization, and resampling to a pediatric atlas space. Binary classifiers were trained to predict KIAA1549-BRAF fusion, BRAF V600E mutation, non-BRAF alterations, and immune-enriched ("immune-hot") subgroups using 5-fold cross-validation. Final predictions were generated via a soft-voting ensemble on an independent test set.

RESULTS

The segmentation model achieved a mean Dice score of 0.81 ± 0.03 on the test set. For molecular classification, the model demonstrated high AUC for KIAA1549-BRAF fusion (train: 0.82 ± 0.04, test: 0.91), moderate performance for BRAF V600E (train: 0.78 ± 0.01, test: 0.76), and non-BRAF-altered tumors (train: 0.73 ± 0.05, test: 0.64). Immune-enriched subgroup classification achieved AUCs of 0.69 ± 0.07 (train) and 0.67 (test), indicating moderate predictive capability.

CONCLUSION

This ResNet-34-based deep learning approach demonstrates potential for non-invasive, segmentation-free prediction of molecular and immune subtypes directly from T2-weighted MRI, with strong performance for KIAA1549-BRAF fusion detection. Incorporating additional MRI sequences may further improve classification accuracy.

CLINICAL RELEVANCE/APPLICATION

Our non-invasive, MRI-based method facilitates early molecular and immune stratification in pLGGs, particularly valuable when biopsy is not feasible, supporting precision diagnostics and treatment planning in pediatric neuro-oncology.

S2-SSPD01-5 OBSTRUCTIVE HYDROCEPHALUS DUE TO MASSA INTERMEDIA ABNORMALITIES AND ITS MANAGEMENT: A CASE SERIES

Fatemeh Dehghani Firouzabadi, MD (*Presenter*)
Vanessa E. Rameh, MD (*Abstract Co-Author*)
Edward Yang, MD, PhD (*Abstract Co-Author*)

PURPOSE

The massa intermedia (MI), is a normal band of tissue bridging the third ventricle where it connects the right and left thalami. Although its function and variable appearance remain incompletely understood (1,2), its location near critical CSF pathways suggests that congenital anomalies involving the MI may contribute to obstructive hydrocephalus.

METHODS AND MATERIALS

We retrospectively reviewed the radiology database at a tertiary pediatric hospital to identify congenital anomalies involving the MI. Nine cases were identified, and their imaging findings, anatomic configuration of MI bands, and clinical histories were analyzed.

RESULTS

Nine cases of congenital bands involving the massa intermedia were identified, falling into two distinct anatomic configurations (types A and B). Five patients had type A bands , characterized by connections between the massa intermedia and the floor of the third ventricle at the superior midbrain. In all patients with type A bands, supratentorial ventriculomegaly was detected in utero, with four undergoing surgical intervention within the first month of life and one by five months of age. One of these case was associated with L1CAM syndrome. The remaining four patients had type B bands , which extended from the massa intermedia to the tectal plate and obscured the posterior and habenular commissures. These cases exhibited more variable presentations: one was detected prenatally at 21 weeks gestation, one at birth, one during the first year of life, and one remained asymptomatic with normal ventricular size through 14 years of age. Only two Type B cases required surgical intervention for hydrocephalus. Of the seven cases requiring treatment overall, six underwent endoscopic third ventriculostomy (ETV), with three ultimately necessitating ventriculoperitoneal (VP) shunting. One patient underwent primary VP shunt placement without prior ETV.

CONCLUSION

Congenital bands arising from the massa intermedia are rare but significant cause of obstructive hydrocephalus. Type A bands (MI to floor of third ventricle) were associated with early-onset hydrocephalus, while Type B bands (MI to tectum) showed more variable clinical presentations.

CLINICAL RELEVANCE/APPLICATION

Recognition of massa intermedia bands on neuroimaging is important in evaluating causes of obstructive hydrocephalus. Differentiation between band types may aid in prognostication and management decisions.The embryologic basis of these bands is not yet understood.

S2-SSPD01-6 PREDICTING MALIGNANCY OF PEDIATRIC HEAD AND NECK LYMPHADENOPATHY BY APPLYING MULTIMODAL DEEP LEARNING APPROACHES

Gal Ben Arie, MD (*Presenter*)
Anouar Nouri (*Abstract Co-Author*)
Adam Hilbert (*Abstract Co-Author*)
Liat Ashkenazi-Hoffnung (*Abstract Co-Author*)
Orhun Utku Aydin (*Abstract Co-Author*)
Eyal Elron (*Abstract Co-Author*)
Dietmar Frey, MD,JD (*Abstract Co-Author*)

PURPOSE

Definitive diagnosis of pediatric craniocervical lymphadenopathy typically requires invasive tissue biopsy, often to rule out Hodgkin lymphoma. Radiological evaluation of head and neck ultrasound can aid non-invasive diagnosis, but it lacks objectivity and sensitivity. We sought to analyse the potential of multi-modal deep learning to utilize routinely collected ultrasound and clinical data for noninvasive diagnosis of malignant lymphadenopathy in children.

METHODS AND MATERIALS

In this retrospective single-center study, 283 pediatric patients (median age 10 years; range 1-17 years) between 2008 and 2022 with sub-acute craniocervical lymphadenopathy were included. Thirty-six cases (13%) were confirmed as malignant via biopsy. The clinical data comprised 15 routinely collected variables—spanning demographics, node-specific features, systemic signs, and laboratory tests. A feedforward neural network (FFNN) was trained on the clinical data using a two-step approach: 1) predicting surgical intervention as an auxiliary task, 2) fine-tuning for predicting malignancy. Ultrasound data was processed with a novel Encoder-Sampler-Attention-Predictor (ESAP) architecture. Fusion of both the clinical (FFNN) and imaging (ESAP) models was also explored. We evaluated performance in a five-fold stratified cross-validation and compared single modality models and the multimodal fusion model using classification measures. Explainability analysis was performed using SHAP for the clinical model and saliency maps for the imaging model.

RESULTS

The multi-modal model achieved an AUC of 0.91, balanced accuracy of 0.85, sensitivity of 0.89, and specificity of 0.81—significantly outperforming single-modality clinical (0.78, 0.72, 0.63, 0.81) and imaging (0.81, 0.74, 0.61, 0.87) models. SHAP identified nodal size and duration of lymphadenopathy as top predictors, while saliency maps highlighted cortical thickening and hilar vascularity—findings that aligned with expert radiologic assessment.

CONCLUSION

By combining key clinical parameters with ultrasound imaging in a multi-modal deep learning framework, we demonstrated high potential for accurate, non-invasive diagnosis of malignant pediatric lymphadenopathy.

CLINICAL RELEVANCE/APPLICATION

A clinical decision support system integrating our solution could reduce unnecessary biopsies while ensuring timely tissue diagnosis for malignant lymphadenopathy; promising better outcomes in pediatric patients.

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Radiation Oncology (Thoracic/Head and Neck Malignancies)

Sunday, Nov. 30 10:30AM - 11:30AM Room: S401

Andreas Rimner, MD (*Moderator*)
Sung Kim, MD (*Moderator*)

Sub-Events

S2-SSRO01-1 OCTOGENARIANS WITH EARLY-STAGE LUNG CANCER: A CLINICAL, RADIOLOGICAL, AND PATHOLOGICAL COMPARISON OF PATIENTS TREATED WITH SURGERY VERSUS STEREOTACTIC BODY RADIATION THERAPY

Wenchao Ma (*Presenter*)
Jeffrey Zhu (*Abstract Co-Author*)
Louis Gros, MD (*Abstract Co-Author*)
Rowena Yip, PhD, MPH (*Abstract Co-Author*)
Claudia I. Henschke, PhD, MD (*Abstract Co-Author*)
David F. Yankelevitz, MD (*Abstract Co-Author*)

PURPOSE

As lung cancer screening expands, more older adults are diagnosed with early-stage lung cancer, where surgical resection and stereotactic body radiation therapy (SBRT) are potentially curative. Our research showed comparable lung cancer-specific survival for tumors =20 mm with both treatments. While treatment depends on patient characteristics and preference, clinical judgment, and institutional practices, this study specifically focuses on octogenarians with early-stage lung cancer, aiming to identify factors that differentiate those who undergo surgery vs SBRT and to assess how treatment type affects outcomes.

METHODS AND MATERIALS

We reviewed all patients (ages 80+) with first primary NSCLC, =20mm in maximum diameter (cT1a-T1bN0M0), 8 th ed TNM), enrolled in the Initiative for Early Lung Cancer Research on Treatment (IELCART) study from 2016-2021, who underwent SBRT or surgical resection. Differences were compared using the ? 2 test or Fisher's exact test for categorical variables and two-sample t test or Wilcoxon ranked sum test for parametric and nonparametric continuous variables. Cox proportional hazard models with LASSO selection were used to examine differences in lung cancer-specific survival between SBRT and surgical patients, after adjusting for clinical and pathologic covariates.

RESULTS

Of 90 patients, 59 received surgery and 31 SBRT. They were mostly female (64%), White (74% vs 14% Black, 7% Asian, 4% Other), non-Hispanic (91%), and former smokers (71% vs 24% never, 4% current). Those who received SBRT were more likely to have HTN (77% vs 51%; p=0.014), COPD (29% vs 10%; p=0.023), DM (39% vs 20%; p=0.061), cardiac disease (23% vs 12%; p=0.2) and worse lung function (FEV1% pred. (72% vs 95%; p=0.017), and DLCO% pred. (69% vs 76%; p=0.017). Those who received SBRT had larger nodules on CT (15.0 vs 13.7 mm; p=0.031) and were less likely to have adenocarcinoma (71% vs 88%; p=0.024). There were no differences in nodule consistency (p=0.8) and location (p=0.2). In the LASSO Cox model, treatment type was not retained as a predictor of lung cancer-specific survival.

CONCLUSION

Octogenarians treated with SBRT had more comorbidities and worse lung function than those with surgery, reflecting selection based on surgical fitness. No demographic differences were observed. SBRT patients also had larger nodules and were less likely to have adenocarcinoma. Consistent with our previous findings, this study showed that treatment type was not associated with differences in lung cancer-specific survival.

CLINICAL RELEVANCE/APPLICATION

Octogenarians with early-stage lung cancer =20 mm treated with SBRT typically have more comorbidities, worse lung function, and larger nodules than those with surgery, with comparable lung cancer-specific survival.

S2-SSRO01-3 FROM SPARSE RADIOLOGIST ANNOTATIONS TO PRECISE IMAGE-GUIDED INTERVENTIONS: AN EFFICIENT MEDSAM2-ENHANCED STRATEGY FOR LUNG TUMOR SEGMENTATION ON 4D CT

Yi Luo, MS, BEng (*Presenter*)
Kai Ding, PHD (*Abstract Co-Author*)

PURPOSE

This study aims to develop and validate an efficient workflow utilizing radiologist-placed isocenters (ISO) as weak annotations to guide MedSAM2-driven automatic lung tumor segmentation on 4D CT, thereby enhancing image-guided interventions.

METHODS AND MATERIALS

A novel segmentation workflow was developed and implemented, where radiologist-placed ISO markers served as weak annotations to initialize a MedSAM2 foundation model for 4D CT image segmentation. This workflow's efficacy was evaluated on a cohort of 42 patients who had previously undergone radiotherapy at Johns Hopkins Hospital. Segmentation performance was quantified by comparing automatically generated contours against expert-delineated internal gross tumor volumes (IGTVs) using established metrics, including Dice coefficient, Sensitivity, Precision, Hausdorff Distance, and Average Surface Distance. This performance assessment was specifically conducted and compared for two distinct input conditions: (1) utilizing all available respiratory phases and (2) employing only a pre-defined set of clinically important respiratory phases (phase 0, phase 50, and phase 60). Finally, to understand the contribution of individual respiratory phases, an correlation analysis was performed to determine the impact of excluding each phase on overall segmentation performance.

RESULTS

The proposed MedSAM2-enhanced segmentation approach achieved a mean Dice coefficient of 0.5705±0.2264 across the test cohort. The average processing time was 114.04±41.22 seconds per patient, demonstrating notable computational efficiency. When analysis was restricted to conventionally used clinical phases (phases 0, 50,

and 60), the Dice coefficient was 0.5503±0.2702, while sensitivity notably increased to 0.6239±0.2173. A correlation analysis further indicated that omitting either phase 0 or phase 90 from the input data resulted in the most significant performance decline.

CONCLUSION

Our MedSAM2-enhanced workflow successfully leverages sparse radiologist annotations to generate clinically viable lung tumor contours on 4D CT with remarkable computational efficiency. The approach demonstrates good agreement with expert-delineated contours and requires minimal additional clinician effort due to its integration with existing ISO placement practices. Furthermore, this study underscores the importance of phase 90 for optimizing segmentation accuracy.

CLINICAL RELEVANCE/APPLICATION

This efficient segmentation strategy streamlines the clinical workflow by automatically generating lung tumor contours from existing radiologist ISO annotations, potentially reducing contouring time and effort in radiation therapy planning while maintaining acceptable accuracy.

S2-SSRO01-4 PATIENT STUDY ON JOINT RESPIRATORY AND CARDIAC PHASE BINNING 4DCT BASED ON MMWAVE SIGNALS

Yao Hao, PhD (*Presenter*)
Jingxuan Zhu (*Abstract Co-Author*)
Tiezhi Zhang, PhD (*Abstract Co-Author*)
Clifford Robinson (*Abstract Co-Author*)
Gregory R. Vlacich, MD,PhD (*Abstract Co-Author*)
Michael Waters (*Abstract Co-Author*)
Pamela Samson, MD (*Abstract Co-Author*)

PURPOSE

Cardiac radioablation requires both respiratory- and cardiac-gated Four-dimensional computed tomography (4DCT) imaging for accurate treatment planning and gated treatment delivery. Due to the asynchronous nature of respiratory and cardiac motion, the ablation target undergoes complex displacement, which can lead to geometric miss and potential radiation treatment failure. Therefore, a device capable of simultaneously monitoring both respiratory and cardiac phases is essential for 4DCT acquisition and gated therapy. Current respiratory 4DCT systems, such as the RPM system from Varian, are limited to capturing respiratory motion only. This technological gap in cardiac imaging and cardiac-gated treatment delivery may compromise the overall effectiveness of cardiac ablation treatments. In this study, we investigated the feasibility of joint respiratory and cardiac phase binning 4DCT based on mmWave signals from cancer patients.

METHODS AND MATERIALS

Six patients (all receiving simulation for lung cancer) were enrolled in a prospective mmWave study. Standard respiratory 4DCT was acquired without abdominal compression. A mmWave radar sensor (mounted on the CT gantry) concurrently recorded surface reflections corresponding to respiratory and cardiac motion. Respiratory and cardiac waveforms were extracted via Fast Fourier Transform and phase unwrapping algorithms. Cardiac phase bins were retrospectively aligned with CT acquisition timestamps to reconstruct dual-gated 4DCT volumes.

RESULTS

Dual-phase 4DCT reconstruction was successful in all six patients. No significant motion artifacts were observed. Respiratory rate (mean ± SD) ranged from 7.0-25.5 rpm, and heart rate from 57.1-109.1 bpm. The mean absolute difference between mmWave and CT-derived respiratory rates was 0.75% ± 0.70%, indicating excellent concordance.

CONCLUSION

This study demonstrated the feasibility to reconstruct respiratory and cardiac phase binning 4DCT using non-invasive mmWave technology. All six patients' data acquisition and phase binning were successful. Motion artifacts were not observed, and the anatomical structures were well-defined across all respiratory and cardiac phases.

CLINICAL RELEVANCE/APPLICATION

mmWave technology offers a great opportunity for joint respiratory and cardiac phase binning 4DCT. It can substantially reduce patient simulation time and imaging dose, and provide precise cardiac radioablation imaging during their treatment.

S2-SSRO01-5 CRANIOCAUDAL SPREAD PATTERNS OF RETROPHARYNGEAL LYMPH NODE METASTASIS IN PATIENTS WITH HYPOPHARYNGEAL CARCINOMA

Ryo Toya, MD, PhD (*Presenter*)
Satomi Yoshimi (*Abstract Co-Author*)
Mika Nakatake (*Abstract Co-Author*)
Reiko Ideguchi (*Abstract Co-Author*)
Hirofumi Koike (*Abstract Co-Author*)
Hideki Ishimaru, MD, PhD (*Abstract Co-Author*)
Shinya Shiraishi (*Abstract Co-Author*)
Toshinori Hirai, MD, PhD (*Abstract Co-Author*)
Satomi Yoshimi (*Abstract Co-Author*)

PURPOSE

With the wide adoption of intensity-modulated radiotherapy (RT), an extended neck position is unnecessary, whereas a more comfortable treatment position, such as that for diagnostic imaging, is favored. The craniocaudal border of the retropharyngeal lymph node (RPLN) was defined as the area between the upper edge of the body of the C1/hard palate and the cranial edge of the hyoid bone body. However, no studies have comprehensively evaluated the spread patterns of RPLN metastases (RPLNMs) in patients with hypopharyngeal carcinoma (HPC). In this study, the appropriate craniocaudal border of the RPLN was assessed based on diagnostic and RT images in patients with HPC for recommendation of appropriate target volume for elective nodal irradiation (ENI).

METHODS AND MATERIALS

Two board-certified radiation oncologists evaluated the craniocaudal spread of RPLNMs and the position of the hyoid bone using magnetic resonance images (diagnostic position) and RT-planning computed tomography (CT) simulator images (RT position with neck extension).

RESULTS

Of the 154 patients in whom 308 sides were assessed, 19 (12.3%) were diagnosed with RPLNMs in 24 (7.8%) sides. In all patients, the hard palate level was the same as or above the cranial edge of the C1 body. The cranial border of the RPLNMs was found above the hard palate on 3 (1.0%) and 1 (0.3%) side, between the hard palate and cranial edge of the C1 body on 10 (3.2%) and 13 (4.2%) sides, and at the C1 body on 11 (3.6%) and 10 (3.2%) sides in the diagnostic and RT positions, respectively. The caudal border of the RPLNMs was observed between the hard palate and the caudal edge of the C2 body on 22 (7.1%) and 22 (7.1%) sides, at the C2/3 disk level on 1 (0.3%) and 1 (0.3%) side, and at the C3 body level on 1 (0.3%) and 1 (0.3%) side in the diagnostic and RT positions, respectively. In the 19 patients with RPLNMs, the most common level of the caudal edge of the hyoid bone body was at the C4 body in 10 (52.6%) and C3 body in 8 (42.1%) patients in the diagnostic and RT positions, respectively.

CONCLUSION

RPLNMs above the hard palate and below the C2/3 disk level extremely rarely develop in patients with HPC. The cranial edge level of the hyoid bone varied significantly among the treatment positions. Regardless of the treatment position, the cranial and caudal borders of the RPLN for ENI should be defined as the hard palate and the

cranial edge of C3, respectively.

CLINICAL RELEVANCE/APPLICATION

The results of this study provide an optimized clinical target volume of RPLN for ENI in patients with HPC. Based on our recommendations, many patients with HPC benefit from a reduction in the unnecessary irradiation volume when undergoing ENI.

S2-SSRO01-6 VIRTUAL CLINICAL TRIAL SIMULATING A PHASE III TRIAL TO EVALUATE THE EFFICACY OF HIGH-DOSE INTENSITY MODULATED RADIATION THERAPY FOR OROPHARYNGEAL SQUAMOUS CELL CARCINOMA USING VIRTUAL PATIENTS CREATED FROM LOW-DOSE RADIOTHERAPY PATIENTS

Kimika Matsuo, BS (*Presenter*)
Taiki Magome, PhD (*Abstract Co-Author*)

PURPOSE

Virtual clinical trials (VCTs) are a potential approach for simulating clinical trials on a computer using artificial intelligence (AI) models. This study aims to develop AI models for VCTs simulating a phase III trial to evaluate the efficacy of high-dose intensity modulated radiation therapy (IMRT) for oropharyngeal squamous cell carcinoma using virtual patients from low-dose radiotherapy.

METHODS AND MATERIALS

To assess the potential of VCTs to simulate actual clinical trials, a public dataset of 385 oropharyngeal squamous cell carcinoma patients treated with IMRT from The Cancer Imaging Archive (TCIA) was retrospectively analyzed. Patients were stratified by total radiation dose into two groups: those who received less than 66 Gy (low-dose) and 66 Gy or more (high-dose). The VCT was designed to simulate a phase III trial evaluating the efficacy of high-dose radiotherapy on local recurrence as the primary endpoint. To improve prediction performance for local recurrence in high-dose radiotherapy patients, virtual patients were created by mixing characteristics of low-dose radiotherapy patients. This study compared the prediction performance for local recurrence in high-dose radiotherapy patients, using three strategies for training AI models in VCT: only original data, virtual data created by mixing the characteristics of two low-dose patients using a uniform ratio across all characteristics, and virtual data created by mixing their characteristics using varied ratios for each characteristic. The prediction performance in VCTs was evaluated by calculating the area under the receiver operating characteristic curve (AUC) 100 times using bootstrap resampling for high-dose patients.

RESULTS

Prediction performance for high-dose patients was significantly improved when using virtual data mixed at varied ratios for each characteristic, compared to the other strategies (P < 0.05, Wilcoxon signed-rank test). Mean AUCs and standard deviations were 0.698 ± 0.057 (original data), 0.731 ± 0.046 (virtual data mixed at a uniform ratio), and 0.748 ± 0.038 (virtual data mixed at varied ratios).

CONCLUSION

Models in VCT were developed to simulate a phase III trial evaluating the efficacy of high-dose IMRT for oropharyngeal squamous cell carcinoma. The model using virtual data created by mixing the characteristics of two low-dose patients using varied ratios for each characteristic showed significantly improved predictions of local recurrence in high-dose radiotherapy patients.

CLINICAL RELEVANCE/APPLICATION

Developing higher-performing models in VCT before time-consuming clinical trials may help prioritize trials with higher anticipated efficacy, potentially accelerating new treatment evaluations.

Nov. 30 – Dec. 4
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S2-STCE1

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Sunday, Nov. 30 10:30AM - 11:00AM Room: LEARNING CENTER THEATER 1

Sub-Events

S2-STCE1-1 OPPORTUNISTIC CARDIOVASCULAR RISK ASSESSMENT FROM ROUTINE CHEST CT: AI-DRIVEN CORONARY ARTERY CALCIUM SCORING AND AORTIC VALVE ANALYSIS

Elshan Abdullayev, MD (*Presenter*)

PURPOSE

To validate an AI-powered tool that automatically quantifies coronary artery calcium (CAC) scores from routine non-cardiac chest CT examinations, testing whether this opportunistic screening approach provides cardiovascular risk stratification equivalent to dedicated cardiac CT while expanding screening reach to unselected populations.

METHODS AND MATERIALS

Retrospective analysis of 8,547 routine chest CT examinations from six academic centers (2022-2024). Adults >40 years undergoing chest CT for non-cardiac indications were included. AI algorithm automatically detected and quantified CAC using Agatston scoring methodology. Reference standard was manual scoring by two cardiovascular radiologists. Primary outcomes: diagnostic accuracy for CAC categories (0, 1-99, 100-399, =400). Secondary outcomes: cardiovascular events during 2-year follow-up and workflow integration metrics. Statistical analysis included sensitivity/specificity calculations and survival analysis.

RESULTS

AI achieved excellent diagnostic accuracy for CAC scoring: sensitivity 94.8% (95%CI:93.2-96.1%), specificity 97.2% (95%CI:96.4-97.8%) across categories. For severe CAC (=400), sensitivity was 98.3% with specificity 99.1%. Among 6,234 patients with complete follow-up, AI-detected high CAC scores predicted major adverse cardiovascular events with hazard ratio 3.8 (95%CI:2.9-4.9, p<0.001). Of 2,847 patients with previously unknown cardiovascular risk, 23.4% were reclassified to higher risk categories, leading to preventive interventions in 18.2%. Processing time averaged 12 seconds per case.

CONCLUSION

AI-driven opportunistic cardiovascular screening from routine chest CT provides accurate risk stratification equivalent to dedicated cardiac imaging while identifying high-risk patients who would otherwise remain undiagnosed. This approach successfully reclassified nearly one-quarter of patients to appropriate higher risk categories.

CLINICAL RELEVANCE/APPLICATION

This validated screening tool integrates into existing radiology workflows to provide population-level cardiovascular risk assessment without additional imaging. Implementation could prevent thousands of cardiovascular events annually through early identification of high-risk asymptomatic patients, representing a paradigm shift toward proactive population health management using existing imaging infrastructure.

S2-STCE1-2 ADVANCING OPPORTUNISTIC PDAC SCREENING: VISION-LANGUAGE FOUNDATION MODELS VERSUS CONVENTIONAL CNN APPROACHES

David Le, PhD (*Presenter*)
Ramon Correa-Medero, BS (*Abstract Co-Author*)
Gokul Ramasamy (*Abstract Co-Author*)
Vedant Joshi (*Abstract Co-Author*)
Amara Tariq, PhD, MS (*Abstract Co-Author*)
Yifan Peng, PhD, MEng (*Abstract Co-Author*)
George L. Shih, MD, MS (*Abstract Co-Author*)
Zhen J. Wang, MD (*Abstract Co-Author*)
Motoyo Yano, MD, PhD (*Abstract Co-Author*)
Imon Banerjee, PhD (*Abstract Co-Author*)

PURPOSE

Pancreatic ductal adenocarcinoma (PDAC) is often diagnosed at an advanced stage. Clinical risk factors, e.g., obesity, new-onset diabetes, can manifest through surrogates on imaging. However, to date, the quantitation of such imaging features is neither practical nor scalable. We compared a CT-CLIP vision-language fusion model (VLM) to a conventional image-only 3D convolutional backbone for stratifying PDAC risk on pre-diagnostic CT scans.

METHODS AND MATERIALS

Retrospective pre-diagnostic abdominal CT scans (within 5 years before diagnosis, 2006-2023) and corresponding radiology reports from 2,997 PDAC patients and 4,254 noncancer controls across three sites (2011-2023) were collected. Pancreatic volumes were segmented using TotalSegmentator, manually reviewed, resampled to 1 mmx3 resolution, and cropped to 384 × 384 × 160 voxels centered on the pancreas. Windowing (-135 to 215 HU) and zero-padding to fit model input were applied. Corresponding radiology reports were deidentified, standardized (non-ASCII characters removed, whitespace normalized) and parsed into Clinical history and pancreas-specific sections, then concatenated. The 3D CNN model took preprocessed CT volume as input, while the fusion model first used CT-CLIP VLM to generate separate image and text embeddings, concatenated these vectors, and fed them into a multilayer perceptron trained with a negative partial log-likelihood loss. Model discrimination was evaluated by Harrell's concordance index (C-index) and calibration by Kaplan-Meier (KM) curves, with log-rank tests comparing predicted high (> 0) and low (= 0) risk groups on internal and external validation cohorts.

RESULTS

For the PDAC cohort, the average interval from CT to PDAC diagnosis was 58 months (72% censored). The CT-only 3D CNN achieved a C-index of 0.6773 (95% CI: 0.6495-0.7037) internally and 0.6780 (95% CI: 0.6478-0.7031) on externally. In contrast, the CT-CLIP fusion model attained a C-index of 0.8225 (95% CI: 0.8034-0.8403) on internal and 0.7555 (95% CI: 0.7229-0.7849) on the same external validation. KM analysis revealed a clear separation between high- and low-risk groups (p < 0.001).

CONCLUSION

Integrating CT imaging and radiology report embeddings through a vision-language foundation model significantly enhances prognostic stratification of PDAC risk on pre-diagnostic scans, outperforming CT-only convolutional neural networks - highlighting the promise of vision-language pretraining for opportunistic cancer detection from routine radiologic imaging.

CLINICAL RELEVANCE/APPLICATION

The fusion of volumetric CT data and free-text radiology reports in prognostic modeling may enable earlier identification of patients at high risk for PDAC at an earlier stage thereby supporting timely intervention.

S2-STCE1-3 OPPORTUNISTIC MEASUREMENT OF CARDIOVASCULAR AGING TRAJECTORIES ON CAC CT

Mendel Lebowitz (*Presenter*)
GOURAV MODANWAL (*Abstract Co-Author*)
Amritpal Singh (*Abstract Co-Author*)
Rohan Dhamdhere (*Abstract Co-Author*)
Saumya Diwan (*Abstract Co-Author*)
Sena Azamat (*Abstract Co-Author*)
Santosh Kumar Sirasapalli (*Abstract Co-Author*)
Sanjay Rajagopalan (*Abstract Co-Author*)
Sadeer Al-Kindi (*Abstract Co-Author*)
Anant Madabhushi, PhD (*Abstract Co-Author*)

PURPOSE

Cardiovascular (CV) aging varies across individuals. Biological age (BA) better captures this heterogeneity than chronological age, but most BA tools are costly, invasive, or lack CV specificity. Peri-aortic fat, routinely captured on coronary artery calcium (CAC) CT, is a biologically active modulator of CV health. We evaluated whether CV-specific biological age (CV-age) could be opportunistically estimated from peri-aortic fat radiomics, and whether its divergence from chronological age (?age) could stratify patients into aging trajectories associated with major adverse cardiovascular events (MACE).

METHODS AND MATERIALS

We analyzed CAC CTs from 46,410 patients in the CLARIFY trial (NCT04075162). Peri-aortic fat was segmented as an 8 mm circumferential region within the adipose attenuation range and 1,316 radiomic features were extracted. A supervised regression model trained on 20% of patients estimated CV-age and SHAP (SHapley Additive exPlanations) identified the most predictive features driving CV-age. To adjust for age-related bias, patients were stratified into low, intermediate, and high-risk aging trajectories based on ?age percentiles within 5-year chronological age bins. MACE risk across groups was assessed using Kaplan-Meier (KM) survival analysis and age-adjusted Cox regression.

RESULTS

Peri-aortic fat radiomics captured biologically meaningful variation in CV aging, with the CV-age model achieving a mean absolute error of 6.02 years and R^2 of 0.38 (n=37,128). SHAP revealed that CV-age was most influenced by fat shape and texture heterogeneity. Stratifying patients by ?age revealed resilient (n=7,434), normative (n=22,250), and accelerated (n=7,444) agers. Despite similar chronological ages (Resilient: 65.6; Accelerated: 64.7 years), MACE-free survival differed significantly (log-rank $p<0.001$). Accelerated agers had a 2.31-fold increased MACE risk (HR: 2.31, 95% CI: 2.06-2.58) and normative agers a 1.42-fold increase (HR: 1.42, 95% CI: 1.28-1.57) vs. the resilient group ($p<0.001$).

CONCLUSION

Radiomics-derived CV-age, informed by peri-aortic fat, opportunistically captures biologically relevant variation in CV aging from routine CT. Stratification by ?age uncovers resilient, normative, and accelerated CV aging trajectories that predict MACE risk, despite similar chronological age. These findings support ?age as a scalable, image-based biomarker for subclinical CV aging and early risk identification.

CLINICAL RELEVANCE/APPLICATION

Peri-aortic fat radiomics enables opportunistic detection of accelerated or resilient CV aging, revealing risk patterns not apparent from chronological age. This scalable, non-invasive biomarker may enhance early, individualized CV risk assessment using routinely acquired CT.

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S2-STCE2

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Sunday, Nov. 30 10:30AM - 11:00AM Room: LEARNING CENTER THEATER 2

Sub-Events

S2-STCE2-1 CELL-SPECIFIC GENE EXPRESSIONS OF BRAIN REGIONAL VULNERABILITY IN COVID-19 PATIENTS

Tao Liu (*Presenter*)

PURPOSE

Exploring the variations of cell-specific gene expression contributed to the selective white matter changes following Covid-19 infection.

METHODS AND MATERIALS

Participants49 patients with confirmed COVID-19 infection within one month.18 healthy tested negative controls (HCs), matched for age, sex.34 returned for a follow-up assessment at three months post-infection.MRI acquisition and i mage processing 3D-T1-weighted images were acquired using a 48-channel head coil on a 3.0T Premier MRI system. The specific acquisition parameters were as follows: repetition time (TR) = 7.2 ms, echo time (TE) = 3.0 ms, field of view = 256 × 256 mm².Using FreeSurfer Software to automated reconstruction and segmentation to extract WM volumes across 68 cortical regions defined by the Desikan-Killiany atlas.Gene-expression profilesThrough the standardized processing pipeline of the Allen Human Brain Atlas , integrated with the Desikan-Killiany atlas , and using the homologene R package , mouse gene labels were mapped to human homologs. This yielded a final white matter region-specific gene expression matrix (34 brain regions × 1,921 genes) encompassing expression profiles for nine distinct cell types. Gene enrichment analysisWe using Metascape (https://metascape.org), a comprehensive online tool for multi-omics data integration and gene prioritization.

RESULTS

White matter volumes :Covid-19 patients showed significant increased WM volumes in the bilateral frontal, right precentral gyrus and lingual gyrus within one-month post-infection ($p < 0.05$). Persistent increased WM volumes was also found in the right frontal pole, precentral gyrus and lingual gyrus at 3 months post-infection ($p < 0.05$).Association between cell-specific gene expression and WM volume alternations one month post-infection : S1 pyramidal neurons ($p<0.001$).The mean correlation coefficient for the S1 pyramidal was 0.13 . 3 months post-infection : S1 pyramidal ($p < 0.001$), CA1pyramida ($p < 0.001$) .The mean correlation coefficients for the S1 pyramidal and CA1 pyramidal was 0.10 and 0.06.Gene enrichment analysis . S1 pyramidal neurons were associated with GO terms of regulation of membrane potential . CA1 pyramidal neurons appeared to be associated with GO terms of neural plasticity .

CONCLUSION

COVID-19 patients exhibited more severe white matter increase compared with HCs. The selective brain expansion might be partly attributed to gene expression of specific cell types in COVID-19 patients, particularly pyramidal.

CLINICAL RELEVANCE/APPLICATION

This work may provide new clues for making informed medication decisions to prevent white matter alternations.

S2-STCE2-2 COMPARATIVE EVALUATION OF COMMERCIAL AI ALGORITHMS FOR FRACTURE DETECTION ON MUSCULOSKELETAL RADIOGRAPHS

James Vaz, MD (*Presenter*)
Katrina Nash, MBChB (*Abstract Co-Author*)
Alex Novak, MBChB (*Abstract Co-Author*)
Nabeeha Salik (*Abstract Co-Author*)
Cosmin Mihaiu (*Abstract Co-Author*)
Sarim Ather, PhD, MBChB (*Abstract Co-Author*)

PURPOSE

To conduct a novel direct comparative evaluation of commercial AI tools designed to detect fractures on musculoskeletal radiographs, assessing diagnostic performance across vendors.

METHODS AND MATERIALS

Six commercial vendors were invited of which three participated in this retrospective evaluation. A dataset of 500 anonymised radiographs was collected from Oxford University Hospitals and enriched to ~50% fracture prevalence to ensure anatomical and pathological diversity. Each case's ground truth was labelled through independent review by two expert musculoskeletal radiologists (>10 years' experience), with arbitration from a third where required. All images were processed in batch by vendors. Vendors had up to 72 hours to return binary results. Accuracy, sensitivity, and specificity were calculated. Pairwise McNemar's tests were used to compare diagnostic performance across tools.

RESULTS

All participating vendors returned results within the 72-hour period. One vendor processed all images within their intended use case; whilst two vendors did not return results for between 16-18 cases. Accuracy ranged from 80.4% (95% CI: 76.4-83.8) to 87.2% (83.9-89.8). Sensitivity ranged from 70.4% (63.5-76.5) to 89.7% (84.8-93.2) and specificity from 73.9% (68.5-78.7) to 87.7% (83.1-91.2). McNemar's test revealed significant differences in accuracy, sensitivity, and specificity across tools ($p <0.001$), with some tools excelling in sensitivity and others in specificity.

CONCLUSION

Multiple commercial AI tools demonstrated high overall accuracy in detecting fractures on radiographs. However, there was notable variation in diagnostic performance between vendors. Sensitivity and specificity showed the greatest divergence, two tools prioritised either specificity or sensitivity, and one offered a more balanced performance profile. These differences may influence clinical outcomes and should be carefully considered when selecting AI tools for deployment.

CLINICAL RELEVANCE/APPLICATION

There is a paucity of evidence directly comparing commercial fracture detection AI tools in the literature and this study highlights significant variability in diagnostic performance profiles across commercial AI tools for fracture detection. Tools with lower sensitivity may risk missed fractures, while lower specificity may lead to over-investigation. As default thresholds have been used to calculate sensitivity and specificity, further calibration could be conducted locally to balance clinical priorities. Nonetheless, the significant variability underscores the need for independent, comparative evaluations of AI tools using diverse, real-world datasets prior to clinical adoption.

S2-STCE2-3 FIRST EVALUATION OF AI-ASSISTED PRELIMINARY REPORT DRAFTING IN ABDOMEN-PELVIS CT: IMPACT ON CLINICAL AGREEMENT AND WORKFLOW

Pranav Rajpurkar, PhD (*Presenter*)
Deepanshu Jindal (*Abstract Co-Author*)
Julian Acosta (*Abstract Co-Author*)
Siddhant Dogra, MD (*Abstract Co-Author*)
Pooja Jain, MBBS (*Abstract Co-Author*)
Quirin Strotzer, MD (*Abstract Co-Author*)
Lukas Mueller, MD, PhD (*Abstract Co-Author*)
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Viswanathan Murugaiah, MBBS,MD (*Abstract Co-Author*)
Su Hwan Kim, MD,MSc (*Abstract Co-Author*)
Divya Buchireddygari, MD (*Abstract Co-Author*)
Joao M. Abrantes, MD (*Abstract Co-Author*)
Michael Moritz (*Abstract Co-Author*)
Jenanan Vairavamurthy (*Abstract Co-Author*)
Lester J. Fahrner, MD, MS (*Abstract Co-Author*)
Samir Rajpurkar (*Abstract Co-Author*)

PURPOSE

Abdominopelvic CT (CTAP) is among the most common CT studies in the US. Reviewing CTAPs and generating complete reports can be challenging given complex anatomy and pathology. We developed an integrated AI system (a2z-Drafter) to detect 63 findings and automatically produce a preliminary structured report. To our knowledge, this is the first investigation of AI-assisted CTAP draft report generation and its effects on pathology-level agreement and reporting.

METHODS AND MATERIALS

Using a training set of >280,000 CTAPs, we created an integrated AI system that identifies 63 findings and populates a structured report template with draft text. 7 radiologists each reviewed 50 CTAP cases, each with at least one acute finding. Case order alternated in 5-case blocks between AI-assisted drafting and unassisted drafting (block size = 5), with the initial condition (assisted vs unassisted) randomized per reader to mitigate systematic order effects. For each case-level pathology, reader's determination (present/absent) was compared to a consensus derived from all reports. Overall agreement, positive percent agreement (PPA), and negative percent agreement (NPA) were calculated for all pooled and individual pathologies, comparing assisted and unassisted conditions, with false discovery rate correction for multiple comparisons. Comparisons used chi-square tests (for =5 observations) or Fisher's exact tests (for <5 observations). Reporting time was tracked for each case and analyzed using a mixed-effects model to account for intra-reader and intra-case correlation.

RESULTS

Across 81 findings appearing in at least one case, AI-assisted reports had higher overall agreement (97.6% vs 96.6%, $p<0.001$), PPA (80.3% vs 66.3%; $p<0.001$), and NPA (98.5% vs 98.1%; $p=0.03$). For acute conditions, assisted reports had a higher overall agreement (98.5% vs 96.2%, $p<0.001$) and PPA (91.1% vs 66.1%, $p<0.001$), with similar NPA (99.0% vs 98.4%, $p=0.10$). Greatest AI-assisted improvements in acute finding agreement were for hemoperitoneum (16.7% to 100%), unruptured aortic aneurysm (64.7% to 100%), and acute appendicitis (68.8% to 100%). Unadjusted reporting time was less for assisted reports (mean 267 seconds vs 312 seconds). After accounting for intra-reader and intra-case correlations, AI assistance resulted in a 54 second decrease in reporting time (17%).

CONCLUSION

AI-assisted draft report generation increases agreement with consensus while improving reporting time.

CLINICAL RELEVANCE/APPLICATION

AI-assisted draft report generation can meaningfully improve CTAP interpretation while enhancing workflow efficiency, particularly reducing missed acute findings that require immediate clinical intervention, potentially accelerating time-to-treatment in emergency settings.

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Abstract Archives of the RSNA, 2025

S4-SSCH02

Science Session with Keynote: Chest Imaging (Lung Screening)

Sunday, Nov. 30 1:00PM - 2:00PM Room: E353C

Shaunagh McDermott, MBBCh (*Moderator*)
Jonathan A. Liu, MD (*Moderator*)

Sub-Events

S4-SSCH02-1 SCREENLUNGNET: PERSONALIZED LONG-TERM PREDICTION OF LUNG CANCER RISK FROM A SINGLE LDCT SCREENING

Chengting Lin (*Presenter*)
Lei Shi (*Abstract Co-Author*)

PURPOSE

Low-dose computed tomography (LDCT) is effective for lung cancer screening, but improvements in accuracy and individualized risk prediction are needed. To develop and validate ScreenLungNet, a deep learning-based model for long-term lung cancer risk prediction to optimize lung cancer screening efficiency.

METHODS AND MATERIALS

In this retrospective study, we developed and compared four predictive models—single-nodule, multiple-nodules, global lung, and a comprehensive fusion model (ScreenLungNet). ScreenLungNet integrates local nodule features based on malignancy scores, global lung features extracted using a Vision Transformer architecture, and a fusion module for final risk prediction. Model performance was evaluated by AUC, accuracy, specificity, sensitivity, positive predictive value (PPV), and negative predictive value (NPV).

RESULTS

A total of 19,869 participants (mean age 60.93 ± 6.30 years; 13,123 males; 343 lung cancer cases) from the **** cohort were divided into training (n=12,837), validation (n=3,070), and internal test (n=3,962) sets. An additional 1,802 participants from **** Hospital served as a secondary training set. Independent and external validation were conducted on the **** (n=9,932) and NLST (n=14,966) cohorts, respectively. ScreenLungNet consistently outperformed other models across the above test sets, achieving AUCs of 0.93-0.94 for three-year lung cancer risk prediction. In the NLST cohort, ScreenLungNet achieved an AUC of 0.93 (95% CI: 0.89-0.98), with accuracy of 94.8%, sensitivity of 84.9%, specificity of 95.2%, and NPV of 99.3%. The global lung model showed higher sensitivity, while the multiple-nodules model improved PPV. ScreenLungNet effectively combined these advantages to deliver robust and precise risk assessment.

CONCLUSION

A model based on a multiple-nodules strategy and global lung features significantly improves long-term lung cancer risk prediction, supporting more accurate and individualized screening strategies.

CLINICAL RELEVANCE/APPLICATION

A model integrating nodule and global lung features significantly improves long-term lung cancer risk prediction, enabling focused monitoring of high-risk individuals and extended intervals for low-risk groups.

S4-SSCH02-2 ELIGIBILITY FOR LUNG CANCER SCREENING AMONG PATIENTS DIAGNOSED WITH LUNG CANCER: A RETROSPECTIVE ANALYSIS OF EMR DOCUMENTATION AND USPSTF CRITERIA

Omar Cespedes-Gomez, MD, MPH (*Presenter*)
Maedeh Sharifian, MD (*Abstract Co-Author*)
Gelareh Sadigh, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the proportion of patients with a confirmed lung cancer diagnosis who would have been eligible for lung cancer screening (LCS) based on 2021 U.S. Preventive Services Task Force (USPSTF) guidelines, and to assess the completeness of smoking history documentation in electronic medical records (EMR).

METHODS AND MATERIALS

This retrospective study included patients aged 50-80 years diagnosed with lung cancer between January 2018 and December 2024. Demographic variables, insurance type, structured smoking history (pack-years, smoking initiation and cessation dates), and evidence of low-dose computed tomography (LDCT) screening within two years prior to diagnosis were extracted from our health system EMR. Multivariable logistic regression was used to identify sociodemographic factors associated with missing smoking data and to assess predictors of LCS eligibility. Statistical analysis was conducted using STATA MP 18.0; p-values <0.05 were considered statistically significant.

RESULTS

2,554 patients with lung cancer (mean age 66; 48% female; 53% white, 31% Asian, 3% Black, 13% other races and mixed races) were included. 13.5% were of Hispanic ethnicity. Only 23% (594/2,554) had documented smoking history as structured data in EMR. Of these, 36% (214/594) met 2021 USPSTF eligibility criteria for LCS, and only 5% (11/214) of those eligible underwent LDCT screening within the preceding two years. Patients who were male (OR: 0.44; 95% CI: 0.36-0.54), had Medicare (vs. Private) (OR: 0.61; 95%CI: 0.47-0.79), and Medicaid (vs. private) (OR: 0.60; 95%CI: 0.45-0.81) were less likely to have missing smoking data in EMR. While those who were married/living with a partner (vs. not married) (OR: 1.3; 95% CI: 1.04-1.58), Asian race (vs. white) (OR: 1.6; CI: 1.20-2.11), and mixed/other race (vs. white)(OR: 1.46; 95%CI: 1.05-2.03) were more likely to have missing data. Patients who were older were less likely to be eligible for LCS (OR: 0.96; 95%CI: 0.94-0.98); but we did not observe any association between LCS eligibility and sex, race, or Hispanic ethnicity.

CONCLUSION

Incomplete documentation of smoking history in EMR hinders accurate assessment of LCS eligibility. Furthermore, current USPSTF screening criteria exclude a significant portion of individuals ultimately diagnosed with lung cancer, indicating a need for improved risk-stratification approaches in screening protocols.

CLINICAL RELEVANCE/APPLICATION

Incomplete smoking history documentation in EMRs and limitations of current USPSTF guidelines result in many lung cancer cases being missed by screening programs, highlighting the need for better data capture and more inclusive risk-based screening strategies.

S4-SSCH02-3 BENCHMARKING RADIOLOGISTS AND AI FOR INDETERMINATE LUNG NODULE MALIGNANCY RISK ESTIMATION ON SCREENING CT: THE LUNA25 CHALLENGE

Noa Antonissen, MD (*Presenter*)
Dre Peeters (*Abstract Co-Author*)
Bogdan Obreja (*Abstract Co-Author*)
Renate Dinnessen (*Abstract Co-Author*)
Zaigham Saghir (*Abstract Co-Author*)
Mario Silva, MD (*Abstract Co-Author*)
Ugo Pastorino (*Abstract Co-Author*)
Ernst T. Scholten, MD,PhD (*Abstract Co-Author*)
Firdaus Mohamed Hoesein, MD, PhD (*Abstract Co-Author*)
Rozemarijn Vliegenthart, MD, PhD (*Abstract Co-Author*)
Hester Gietema, MD (*Abstract Co-Author*)
Cornelia M. Schaefer-Prokop, MD (*Abstract Co-Author*)
Mathias Prokop, MD, PhD (*Abstract Co-Author*)
Colin Jacobs, PhD (*Abstract Co-Author*)

PURPOSE

The global expansion of lung cancer screening will significantly increase radiologist workloads, particularly due to indeterminate lung nodules (5-15 mm) often requiring short-term follow-up to rule out malignancy. Accurate risk classification of these nodules can reduce unnecessary procedures, improve management, and ease radiologist burden. Artificial intelligence (AI) may assist in malignancy risk estimation, but rigorous benchmarking against human readers is limited. The LUNA25 challenge provides a validated benchmark to compare AI and radiologist performance in malignancy risk estimation of indeterminate nodules on low-dose CT (LDCT).

METHODS AND MATERIALS

The LUNA25 challenge consists of an AI competition and a reader study. AI teams develop algorithms using a publicly available dataset of 4,069 LDCT scans from the National Lung Screening Trial (NLST), containing 555 malignant and 5,608 benign nodules. Final evaluation uses a hidden external test set of indeterminate solid and part-solid nodules from baseline scans of the Danish Lung Cancer Screening Trial (DLCST), Dutch-Belgian NELSON trial, and Multicentric Italian Lung Detection (MILD) trial. The reader study, launching in May 2025, uses a subset of 300 nodules from this hidden test set. Nodules are enriched for malignancies and size-matched to benign nodules. Radiologists assess each case by assigning a malignancy risk score (0-100) and management recommendation: low risk (routine screening), intermediate risk (short-term follow-up), or high risk (referral). Performance metrics include area under the ROC curve (AUC), sensitivity, and specificity at clinically relevant thresholds.

RESULTS

Dataset curation for AI evaluation and the reader study is complete. Over 80 radiologists from diverse international centers have enrolled, with recruitment ongoing. The reader study is expected to conclude by late August 2025. Results, including a head-to-head comparison of radiologist performance and best-performing AI algorithm in malignancy risk estimation and management recommendations, will be available by year-end for presentation at RSNA.

CONCLUSION

The LUNA25 challenge will deliver the first international benchmark comparing radiologist and AI performance for malignancy risk estimation of indeterminate lung nodules on screening CT. It will provide critical insights into the potential for AI to improve early cancer detection and minimize unnecessary follow-ups.

CLINICAL RELEVANCE/APPLICATION

As lung cancer screening is adopted globally, validated AI tools could help manage diagnostic burden. The LUNA25 challenge offers evidence on comparative performance of AI and radiologists for indeterminate nodules, supporting safe clinical use and regulatory evaluation.

S4-SSCH02-4 LUNG CANCER SCREENING: USING RISK ASSESSMENT SCORES TO DETERMINE BIANNUAL SCREENING ELIGIBILITY

David Gao, MD (*Presenter*)
Joshua Rattee, MD (*Abstract Co-Author*)
Scott J. Adams, MD, PhD (*Abstract Co-Author*)
Peter Greenstreet (*Abstract Co-Author*)
Paula N. Patino, MD (*Abstract Co-Author*)
Suman T. Prabhakar, MD, FRCR (*Abstract Co-Author*)
Oscar Osorio, MD (*Abstract Co-Author*)
Robert Lim, MD (*Abstract Co-Author*)

PURPOSE

The purpose of this study to evaluate the use of risk assessment scores to determine the clinical impact of biannual lung cancer screening and detection of malignancy.

METHODS AND MATERIALS

A retrospective analysis of all patients enrolled in the XXXXX Lung Cancer Screening (LCS) Program associated with XXXXXX Hospital from January 2017 to December 2023, was performed. Patients were categorized based on their lung cancer risk assessment (RA) score. Clinical LCS results using Lung-RADS at timepoints: Baseline, 12 month (T1) and 24 months (T2) were recorded. All abnormal/positive screening results were confirmed with pathology proven malignancy for positive results and follow up CTs confirmed true negative results. Malignancy and false positive rates were recorded with subgroup analysis of patients with RA<3% and RA>3%.

RESULTS

A total of 4825 patients were included. All patients at baseline, Lung-RADS 1/2 were 4268/4825 (88%), Lung-RADS 3 were 294/4825 (6.1%), Lung-RADS 4A/4B/4X was 263/4825 (5.5%) with 104/2425 (4.3%) malignancies detected and 453/4825 (9.4%) false positives. For patients at T1 with RA<3%, Lung-RADS 1/2 were 1069/1119 (96%), Lung-RADS 3 were 17/1119 (1.5%), Lung-RADS 4A/4B/4X was 33/1119 (2.9%), with 45/1119 (4.0%) false positives. For patients at T1 with RA>3%, Lung-RADS 1/2 was 1982/2109 (94%), Lung-RADS 3 was 40/2109 (1.9%), Lung-RADS 4A/4B/4X 87/2109 (4.1%), with 159/2109 (7.5%) false positives. If patients with a RA<3% skipped T1, 4/1029 (0.4%) malignancies would be missed. If patients with a RA>3% skipped T1, 27/2109 (1.3%) malignancies would be missed. If biannual LCS occurred, patients with a RA<3% are less likely to have malignancy missed than RA>3%; and 28/1029 (2.7%) false positive results would have been avoided (p=0.02).

CONCLUSION

Patients with risk assessment scores<3% have low malignancy rates and RA scores can safely guide extended screening intervals

CLINICAL RELEVANCE/APPLICATION

Biannual LCS screening can reduce the harms associated with frequent annual screening

S4-SSCH02-5 COMPARISON OF SURGICAL OUTCOMES AND CANCER RECURRENCE IN A REAL-WORLD LUNG CANCER SCREENING PROGRAM COMPARED TO THE NATIONAL LUNG SCREENING TRIAL (NLST) COHORT

Aparna Singh, MD (*Presenter*)
Jo-Anne O. Shepard, MD (*Abstract Co-Author*)
Yolonda Colson, MD, PhD (*Abstract Co-Author*)
Suzanne Byrne, MD (*Abstract Co-Author*)
Michael Jaklitsch (*Abstract Co-Author*)
Scott D. Swanson, PhD (*Abstract Co-Author*)
Mark M. Hammer, MD (*Abstract Co-Author*)

PURPOSE

The National Lung Screening Trial (NLST) established low-dose CT lung cancer screening (LCS) as an effective method for reducing lung cancer mortality in high-risk populations. However, the translation of these results into clinical practice has been complicated by concerns regarding overdiagnosis, false positives, and patient selection. We sought to compare complication rates and cancer recurrence outcomes between patients undergoing surgical resection in a real-world LCS program and those in the NLST.

METHODS AND MATERIALS

We conducted a retrospective cohort analysis of patients undergoing lung cancer screening in our healthcare system from January 2015 to June 2023 and compared these outcomes with those from the NLST's CT screening cohort. We reviewed rate of surgery for benign diagnoses, surgical complication rates, oncologic outcomes, and recurrence data using multivariable logistic regression and survival analysis.

RESULTS

Our cohort included 387 patients from our real-world LCS program, compared to 812 from the NLST. The proportion of benign surgeries was significantly lower in the LCS group compared to the NLST group (12% vs. 18%, p=0.016). The LCS cohort also experienced a lower rate of complications (24% vs. 32%, p=0.003), although major complications were not significantly different (11% vs. 14%, p=0.11). Notably, the LCS group exhibited significantly better recurrence-free survival, with a hazard ratio of 0.60 (95% CI 0.39 to 0.94, p=0.026) compared to the NLST.

CONCLUSION

We found that the real-world implementation of lung cancer screening is associated with lower complication rates and improved oncologic outcomes compared to historical data from the NLST. These results underscore the effectiveness and safety of LCS in contemporary clinical settings and highlight the importance of increasing screening accessibility and education to optimize early lung cancer detection and patient outcomes.

CLINICAL RELEVANCE/APPLICATION

Real-world implementation of lung cancer screening resulted in lower complication rates, improved recurrence-free survival, and better patient selection for surgery compared to the NLST, highlighting advancements in surgical and oncologic practices.

S4-SSCH02-6 Keynote Speaker

Jared D. Christensen, MD, MBA (*Science Invited Presenter*)

Nov. 30 – Dec. 4
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S4-SSIN01

Science Session with Keynote: Imaging Informatics (Image-based AI: Precision, Safety, and Beyond)

Sunday, Nov. 30 1:00PM - 2:00PM Room: E450A

Seetharam C. Chadalavada, MD, MS (*Moderator*)
Maggie Chung, MD (*Moderator*)

Sub-Events

S4-SSIN01-2 DEEP LEARNING SEGMENTATION COMPARED TO VOLUME ESTIMATION FORMULA FOR THE QUANTIFICATION OF TRAUMATIC HEMOTHORAX ON CHEST CT

Suzie Byun, MD (*Presenter*)
Grace Tewkesbury, MD (*Abstract Co-Author*)
Carl Beyer (*Abstract Co-Author*)
Kevin Eddinger (*Abstract Co-Author*)
Nathaniel McLauchlan (*Abstract Co-Author*)
Anne Tran (*Abstract Co-Author*)
Jeremy W. Cannon, MD,MS (*Abstract Co-Author*)
Friedrich D. Knollmann, MD, PhD (*Abstract Co-Author*)
Hersh Sagreiya, MD (*Abstract Co-Author*)

PURPOSE

Hemothorax is common in thoracic trauma, with 300,000 cases annually in the United States. Hemothorax size is important for clinical management; 300mL is used as a threshold to decide if tube thoracostomy should be performed. One commonly used volume estimation formula is from Mergo (1999): V=d 2 *h, where d=maximum depth and h=maximum height of effusion. A previous study used the same dataset as this study to evaluate the formula's performance, finding low accuracy in stratifying hemothorax volumes close to 300mL and high inter-reader variability. TotalSegmentator is a deep learning model trained to segment anatomical structures. This study evaluated TotalSegmentator's performance in quantifying acute traumatic hemothorax volumes compared to the estimation formula.

METHODS AND MATERIALS

46 adult patients with acute traumatic hemothorax on chest CT were prospectively identified at a trauma center in 2016. Volume estimations were calculated using V=d 2 ×h. Manual segmentation was performed in 3D Slicer (version 5.6.2, www.slicer.org). Studies were converted from DICOM to NIfTI and the TotalSegmentator pleural effusion subtask was applied (version 2.1.0, www.totalsegmentator.com). 41 studies were manually segmented by five readers, with five studies excluded for errors in collection. Statistics included Dice similarity coefficient (DSC), Pearson's r, intraclass correlation coefficient (ICC), and Bland-Altman analysis.

RESULTS

Hemothorax volumes ranged from 9-1379mL (manual), 0-1605mL (automated), and 13-3528mL (Mergo formula). The automated method correctly stratified 93% of cases (n=43/46) as above or below 300 mL, and 73% (n=8/11) of borderline cases (200-400 mL) compared to 85% (n=40/46) and 73% (n=8/11) of borderline cases by the Mergo formula. Pearson's r was 0.98 for the automated method and 0.81 for the Mergo formula. The automated method had a mean bias of -8mL and limits of agreement (LOA) of -122 to +106mL, compared to the Mergo formula's mean bias of +101mL and LOA of -748 to +949mL. Median DSC between manual and automated segmentations was 0.77. ICC among the five human readers was 0.97 [0.94-0.98] and 0.96 [0.94-0.98] when including TotalSegmentator.

CONCLUSION

Rapid and accurate quantification of acute hemothorax volume can guide clinical management. Deep learning-based segmentation was more accurate and reliable than formula-based estimation, demonstrating performance comparable to human readers.

CLINICAL RELEVANCE/APPLICATION

Deep learning-based segmentation such as TotalSegmentator is a more reliable tool for making rapid volume estimations of acute traumatic hemothorax compared to existing methods, and can provide better guidance to clinicians making management decisions in the acute setting.

S4-SSIN01-3 DEEP LEARNING-BASED FATTY LIVER CLASSIFICATION FROM CHEST X-RAYS: INTEGRATING UNCERTAINTY QUANTIFICATION FOR RELIABLE PREDICTIONS

SOOHO AHN, MS (*Presenter*)
Ja Kyung Yoon (*Abstract Co-Author*)
Young Han Lee, MD (*Abstract Co-Author*)
Naeun Park (*Abstract Co-Author*)
Dasom Kim (*Abstract Co-Author*)
Hyungjin Rhee, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop a deep learning model classifying fatty liver status using only inexpensive, routinely acquired chest X-rays (CXR), incorporating uncertainty quantification to assess confidence in the predicted outcomes.

METHODS AND MATERIALS

We retrospectively enrolled patients who underwent CXR and liver MRI including proton density fat fraction (PDFF) within 30 days between January 2021 and December 2024. Patients with history of malignancy or liver surgery, polycystic liver disease, large-volume ascites, or abdominal shielding during CXR were excluded. The cohort was temporally divided into a training set (MRI from 2022-2024) and a validation set (MRI from 2021). An abdominal radiologist measured PDFF as the average of single measurements from each of the nine liver segments. Based on PDFF values, fatty liver was classified as none (=5.1%), mild (5.2-14.1%), or moderate to severe (=14.2%). We developed a deep learning model using CXR images to predict fatty liver status. The model quantifies the prediction uncertainty through the Ensemble Monte Carlo Dropout (EMCD) method. Multiple probabilistic inferences were performed for each image in the test, and the prediction distribution and confidence were

calculated based on the results. The classification performance was evaluated by the area under the receiver operating characteristic curve (AUC), accuracy, F1-score, and expected calibration error (ECE), and an uncertainty-based data retention strategy was applied to analyze the confidence-based prediction performance. The reliability of the predictions was visualized by confidence interval, posterior distribution, and uncertainty class activation map.

RESULTS

This study included 1,094 pairs of CXR and liver MRI exams: training set, 838 pairs (none, n=594; mild, n=172; moderate to severe, n=72); validation set, 256 pairs (none, n=190; mild, n=48; moderate to severe, n=18). In validation set, the EMCD model achieved an AUC of 0.76, an accuracy of 0.75, an F1-score of 0.76, and an ECE of 0.12 for fatty liver classification. After excluding the 50% most uncertain predictions, the accuracy and F1-score improved to 0.88 and 0.82, respectively.

CONCLUSION

The developed deep learning model effectively classifies fatty liver status using CXR, and its integrated uncertainty quantification significantly enhances clinical reliability.

CLINICAL RELEVANCE/APPLICATION

This model could potentially facilitate cost-effective screening and risk stratification of fatty liver disease in clinical settings. The integration of uncertainty quantification further enhances clinical confidence in diagnostic decisions.

S4-SSIN01-4 AI UNDERESTIMATES ASPECTS WHEN ASSESSED ON FULL DEPLOYMENT SCALE

Sameed Khan (*Presenter*)
Jennifer Bullen, MSc (*Abstract Co-Author*)
Stephen E. Jones, MD, PhD (*Abstract Co-Author*)
Chintan Shah, MD, MS (*Abstract Co-Author*)

PURPOSE

Automated ASPECTS scoring applications are indicated for use in patients with a large-vessel occlusion (LVO) in the ICA or MCA. Previous evaluations thus focused on LVO patients. However, the tool is commonly deployed to be run on all stroke alert non contrast head CTs prior to knowledge of LVO presence. Assessing the performance in this expanded scope may reveal discrepancy between published studies and real-world performance. We hypothesized that the difference between reader and automated ASPECTS scores will differ across LVO and non-LVO patients.

METHODS AND MATERIALS

We retrospectively reviewed images and reports from stroke alert non-contrast head CT exams processed by automated software (RAPID ASPECTS, iSchemaView) from 1/1/2020 to 12/31/2020. LVO presence was determined from follow-up CTA reports. Reader and automated ASPECTS were extracted from the radiologist report and image annotations, respectively. Agreement was evaluated using Lin's concordance correlation coefficient (CCC) and Bland-Altman plots. Significance testing was performed using the Wilcoxon rank sum test and Fisher's exact test.

RESULTS

998 stroke alert CT scans were performed during the study period. 191 records were excluded (133 not processed, 18 reader ASPECTS not reported, 40 repeat exams) for a final sample of 807 exams (400 female). 53 patients (~7%) had LVO confirmed on follow-up CTA. Mean automated and report ASPECTS for LVO patients were 6.8 (SD: 2.5) and 8.6 (SD: 2.0) versus 8.1 (SD: 2.1) and 9.9 (SD: 0.7) for non-LVO patients. The CCC was 0.12 (95% CI: 0.09, 0.15). Absolute difference between report ASPECTS and automated ASPECTS did not differ significantly based on LVO status ($p = 0.2$). The proportion of patients considered thrombectomy-eligible (ASPECTS >= 6 per AHA guidelines) was significantly higher with the report (795/807 = 98.5%) compared to the automated score (704/807 = 87.2%) ($p < 0.001$). This was true among both LVO ($p=0.004$) and non-LVO patients ($p = 0.028$).

CONCLUSION

Automated ASPECTS software underestimated scores in all patients, leading to significant differences in thrombectomy eligibility consideration. However, the amount of score difference between automated and report ASPECTS was similar between LVO and non-LVO patients. Automated ASPECTS score was available to the reading radiologist, which likely informed the agreement between scores independent of LVO status. Future directions will include blinded review of LVO and non-LVO scans to examine agreement with automated score.

CLINICAL RELEVANCE/APPLICATION

AI software evaluations should match the deployment clinical context. In this study, we examine the performance of one such tool for automated ASPECTS assessment in all patients where the tool would be deployed.

S4-SSIN01-5 REWINDING LATE-STAGE CT SCANS TO TRAIN AI FOR EARLY PANCREATIC CANCER DETECTION

Wenxuan Li, BS (*Presenter*)
Qi Chen (*Abstract Co-Author*)
Kang Wang, MD,PhD (*Abstract Co-Author*)
Heng Li (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)
Zongwei Zhou, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate whether a "Time-Machine" generative model that transforms late-stage pancreatic ductal adenocarcinoma (PDAC) CT scans into realistic early-stage PDAC (<2 cm) can expand the training data for early detection AI models, given the extreme rarity of real early-stage PDAC scans.

METHODS AND MATERIALS

We curated 3,144 contrast-enhanced CT scans, comprising 2,098 voxel-wise annotated PDAC cases and 1,046 normal controls. Tumor stages were T1 = 285, T2 = 396, T3 = 367, T4 = 45, and unknown = 1,005. A previously published whole-body segmenter generated masks for the pancreas, vessels, ducts, and 20 other organs in each scan. A reverse-temporal cellular-automata model—conditioned on patient age, clinical history, and scan phase as growth cues—traced every PDAC backward to plausible size, shape, and location of its earlier stage. A diffusion model then blended these smaller PDAC into their original anatomy, preferentially within visible dilated ducts, to generate paired early-stage scans. An nnU-Net model was trained on the late-stage scans augmented by their synthetic earlier versions. Internal testing included 650 patients (51 with T1 PDAC, 599 controls), while external validation used 3,592 CT scans from six international hospitals. A retrospective set of 19 prediagnostic scans acquired 3-36 months before clinical diagnosis were retrieved to assess lead-time performance.

RESULTS

On internal validation, AI models, trained on real, late-stage tumors augmented by their earlier version of synthetic, early-stage tumors, achieved an AUC of 0.975 (95% CI: 0.939 - 1.000), a sensitivity of 95.3% (95% CI: 84.5 - 98.7%), and a specificity of 98.7% (95% CI: 96.6 - 99.5%) for detecting small PDAC (<2 cm). External testing yielded an AUC of 0.940 (95% CI: 0.922 - 0.956), a sensitivity of 93.2% (95% CI: 89.4 - 95.6%), and a specificity of 86.2% (95% CI: 84.9 - 87.3%). Notably, the AI achieved a sensitivity of 36.8% (95% CI: 19.1 - 59.0%) in detecting PDAC at the prediagnostic stage (3-36 months before clinical diagnosis) where radiologists had missed 100% of these PDAC in the original clinical reads of the images.

CONCLUSION

A reverse-temporal generative model synthesizes realistic early-stage CT scans from late-stage cases, enabling AI to learn small-tumor patterns without extensive early-stage annotations and improving small tumor (<2 cm) detection sensitivity by 6% over models trained only on real-world tumors.

CLINICAL RELEVANCE/APPLICATION

Early-stage PDAC scans are 10-20 times less common than late-stage scans in clinical datasets. If validated, this "Time-Machine" approach offers a scalable strategy to overcome the early-stage data bottleneck and support earlier AI-driven tumor detection.

S4-SSIN01-6 **Keynote Speaker**

Amit Gupta, MD, MBBS (*Science Invited Presenter*)

Printed on: 02/18/26

Nov. 30 – Dec. 4
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S4-SSMK01

Musculoskeletal Imaging (Ankle and Foot, Orthopedic Implants, Outcomes and Comparative Effectiveness)

Sunday, Nov. 30 1:00PM - 2:00PM Room: E451B

Leon Berenstein, MD (*Moderator*)
Angela Atinga, MBBChir, FRCPC (*Moderator*)

Sub-Events

S4-SSMK01-1 SHEAR WAVE ELASTOGRAPHY EVALUATION OF PLANTAR FASCIITIS AFTER PLATELET-RICH PLASMA INJECTION: A MULTICENTER PROSPECTIVE STUDY

Adel Almohammady, MBBS (*Presenter*)
Emad H. Emara, BMBCh (*Abstract Co-Author*)
Engy M. Tantawy II, MD (*Abstract Co-Author*)

PURPOSE

To investigate the role of shear wave elastography (SWE) in evaluating the efficacy of platelet-rich plasma (PRP) injections in the treatment of plantar fasciitis (PF).

METHODS AND MATERIALS

In this prospective multicenter study, 144 patients with unilateral PF persisting for = 6 months were included. Patients received a single PRP injection prepared from their blood using the peppering technique. Outcome measures included the visual analog scale (VAS) for heel pain, foot functional index (FFI), sonographic measurement of plantar fascia thickness, and changes in tissue elasticity and shear wave velocity using SWE. These measures were evaluated before and up to 12 months post-injection.

RESULTS

Both the VAS and FFI scores demonstrated significant improvements following the injection ($p < 0.001$). A significant reduction was observed in plantar fascia thickness from pre-injection (5.14±1.1 mm) to post-injection (4.63±0.86 mm) ($p< 0.001$). SWE showed significant improvements in shear wave velocity and elasticity over time. The mean shear wave velocity increased from 3.08 ± 0.71 m/s pre-injection to 3.39 ± 0.77 m/s at 6 months and 4.23 ± 4.61 m/s at 12 months post-injection ($p= 0.032$). Similarly, shear wave elasticity increased from 32.12 ± 9.29 kPa pre-injection to 35.39 ± 8.23 kPa at 6 months and 39.24 ± 8.15 kPa at 12 months post-injection ($p < 0.001$). The interobserver agreement analysis demonstrates a predominantly good level of reliability across most parameters (?= 0.55-0.78)

CONCLUSION

SWE is a valuable tool for monitoring treatment outcomes in PF patients after PRP injection.

CLINICAL RELEVANCE/APPLICATION

Shear wave elastography can is a non-invasive, objective, and quantitative monitoring tool that help in evaluation of the efficacy of PRP injections for treating planter fascitis . The significant improvements in shear wave velocity and elasticity suggest that PRP therapy enhances the biomechanical properties of the plantar fascia over time

S4-SSMK01-2 HIP ARTHROPLASTY AND COMPUTED TOMOGRAPHY OF ABDOMEN: A RETROPERITONEAL INDICATOR OF POST ARTHROPLASTY HIP FLEXOR IMPINGEMENT

Mohammed Alfaqih, MD (*Presenter*)

PURPOSE

To evaluate if a tangible association exists between the psoas muscle (PM) atrophy with ipsilateral acetabular component version in patients with total hip arthroplasty.

METHODS AND MATERIALS

A retrospective, IRB-approved search of two institutions Picture archiving and communication system archives. Subjects with unilateral total hip arthroplasty (THA) on CT scan of abdomen and pelvis acquired between January 2008 through December 2018 were included after meeting inclusion and exclusion requirements (N=67). The maximum anterior-posterior length of uncovered acetabular component (UAC) was measured on sagittal reformats. The acetabular version angle was measured on both axial (AAV) and sagittal (SAV) reformats. The percentage difference between ipsilateral and contralateral PM in terms of quantitative radiodensity in Hounsfield unit (DHU) and cross-sectional area measurement (AM) in cm2 was assessed. The UAC, AAV and SAV were measured blindly to DHU and AM and the ensuing data was compiled and computed. Additional analysis was then performed by dividing patients into two groups; Group A patients had DHU values over 50% and Group B patients had DHU values less than 50%. UAC, AAV, SAV were compared between groups A and B.

RESULTS

Findings revealed significant positive correlation between DHU and UAC ($r2 =0.7$, $P <0.05$). A significant negative correlation was demonstrated between AAV, SAV and DHU ($r2 = - 0.4$, $P <0.05$). Group A and B included 26 and 41 patients respectively. Group A was found to have an increased UAC (7 mm ±4, $P<0.05$), decreased SAV (19o ±10, $P<0.05$) and decreased ASV (22o±11, $P<0.05$) compared to Group B (0mm± 0.5,33o±11,35o±10).

CONCLUSION

There is a strong association between ipsilateral psoas muscle atrophy in patients with THA who have an increased length of the uncovered acetabular component and decreased acetabular version angle.

CLINICAL RELEVANCE/APPLICATION

Our findings suggest that a suboptimally positioned acetabular component may lead to chronic flexor impingement.

S4-SSMK01-3 EVALUATION OF DEEP LEARNING-BASED TECHNIQUES FOR REDUCING MAGNETIC SUSCEPTIBILITY ARTIFACTS IN A 3.0T MRI ENVIRONMENT

WON JAE LEE (*Presenter*)
Kyoo Jin Yeon, RT (*Abstract Co-Author*)
Minji Kim (*Abstract Co-Author*)
Dong Hwan Kim (*Abstract Co-Author*)

PURPOSE

High-bandwidth and OMAR (Orthopedic Metal Artifact Reduction) techniques used to reduce magnetic susceptibility artifacts in MRI have been associated with increased noise and edge blurring. Artificial Intelligence Compressed SENSE (AICS) may reduce noise in MR images. This study aimed to evaluate the effectiveness of AICS combined with artifact reduction techniques in improving image quality.

METHODS AND MATERIALS

A 3.0T MRI system (MR7700, Philips Healthcare) was used to scan a phantom consisting of a 5 mm titanium rod and a 10 mm acrylic rod immersed in copper sulfate (CuSO4) solution. Imaging sequences included 2D T1-, T2-, PD-, FS PD-weighted, and 3D PD VISTA, acquired using Compressed SENSE (CS) and AICS. CS images were obtained with routine (low-bandwidth), high-bandwidth, and OMAR; AICS images were acquired using high-bandwidth and OMAR. Artifact size and full width at half maximum (FWHM) were measured using MATLAB. Signal-to-noise ratio (SNR) was calculated from the mean and standard deviation of signal intensity. Statistical analysis was performed using Kruskal-Wallis tests, with significance defined as $p<0.05$ (SPSS v.23).

RESULTS

Artifact size was smallest with OMAR across all sequences (mean reduction: 31.2%, $p<0.05$). High-bandwidth techniques reduced artifact size compared to routine, with significant differences observed in PD with AICS, and FS PD and T2 with CS ($p<0.05$). No significant CS-AICS difference in high-bandwidth and OMAR. AICS improved SNR in all sequences compared to CS (mean increase: 30.8%). In PD-weighted images, AICS OMAR showed higher SNR than routine (mean increase: 24.1%). FWHM was largest in OMAR ($p<0.05$). No significant differences in FWHM were found between CS and AICS high-bandwidth, and with routine ($p>0.05$).

CONCLUSION

AICS-enhanced high-bandwidth and OMAR techniques demonstrated substantial effectiveness in reducing susceptibility artifacts at 3T MRI. Among them, OMAR showed the greatest artifact reduction but also led to noticeable SNR loss and boundary blurring. In contrast, AICS consistently improved SNR across all pulse sequences. These findings support the routine application of AICS as a fundamental component of artifact reduction. We propose combining AICS with OMAR for maximal artifact suppression. However, in clinical scenarios where delineation of fine structural boundaries is critical—such as evaluation of subtle lesions—the combination of high-bandwidth and AICS may be preferable, as it offers artifact reduction comparable to OMAR while preserving image sharpness better than routine sequences.

CLINICAL RELEVANCE/APPLICATION

This study provides a foundation for selecting optimal deep learning-based artifact reduction techniques based on various clinical needs.

S4-SSMK01-4 OPTIMIZING UTILIZATION OF RADIOGRAPHIC EXAMS: MULTIDISCIPLINARY, MULTI-INSTITUTIONAL EXPERT CONSENSUS RECOMMENDATIONS BY RADIOLOGISTS, EMERGENCY MEDICINE PHYSICIANS, AND SURGEONS FROM 21 ACADEMIC CENTERS

Eddy Zandee van Rilland, MD (*Presenter*)
Laura M. Fayad, MD (*Abstract Co-Author*)
Thomas M. Link, MD, PhD (*Abstract Co-Author*)
Kirkland W. Davis, MD (*Abstract Co-Author*)
Jim S. Wu, MD (*Abstract Co-Author*)
Eric Y. Chang, MD (*Abstract Co-Author*)
Lawrence C. Chow, MD (*Abstract Co-Author*)
Shaun Desai (*Abstract Co-Author*)
Jan Fritz, MD (*Abstract Co-Author*)
J. David Gatz (*Abstract Co-Author*)
Hillary W. Garner, MD (*Abstract Co-Author*)
Tetyana A. Gorbachova, MD (*Abstract Co-Author*)
MINGYANG GRAY (*Abstract Co-Author*)
Joel A. Gross, MD, MS (*Abstract Co-Author*)
Ali Guermazi, MD, PhD (*Abstract Co-Author*)
Tarek N. Hanna, MD (*Abstract Co-Author*)
Aaron Kornblith (*Abstract Co-Author*)
Robert R. Lopez, MD (*Abstract Co-Author*)
Edana Mann (*Abstract Co-Author*)
Christopher Moore, MD (*Abstract Co-Author*)
Zara Patel (*Abstract Co-Author*)
Ali S. Raja, MD (*Abstract Co-Author*)
Juan Marcos Rendon (*Abstract Co-Author*)
Chadi Tannoury (*Abstract Co-Author*)
Joseph S. Yu, MD (*Abstract Co-Author*)
Robert D. Boutin, MD (*Abstract Co-Author*)

PURPOSE

To establish consensus regarding appropriate utilization of radiographic exams for 12 potentially low-yield anatomic sites among a multidisciplinary, multi-institutional panel of expert radiologists, emergency medicine (EM) physicians, and surgeons.

METHODS AND MATERIALS

A three-round Delphi consensus study with 34 subspecialty faculty (16 radiologists, 9 EM physicians, 4 orthopedic surgeons, 5 ENT surgeons) from 21 major academic centers was performed. In Round 1, each expert completed anonymized preliminary voting with free-text and structured responses on the utilization of radiographs at 12 anatomic sites. In Round 2, each expert was assigned to a 5-6 member multidisciplinary team comprised of radiologists, EM physicians, and surgeons. Each team (n=6) was assigned 2 anatomic sites: Ribs and Scapula; Sacrum and Coccyx; Sternum and SC Joint; Nasal Bone and Mandible; Facial Bone and Sinus; Skull and Neck Soft Tissue. Each team performed a literature review prioritizing the highest level of scientific evidence and drafted 4-6 consensus statements for each of their 2 anatomic sites. Statements and supporting text were submitted to the full panel for voting. Anonymized voting was performed using an online voting platform (JotForm; San Francisco, CA) using a 9-point Likert scale (1-3=disagree, 4-6=uncertain, 7-9=agree). Consensus was defined a priori as =80% of experts voting 7-9, with a median score =7 and interquartile range (IQR) <4. Statements that did not meet consensus in Round 2 were required to be revised and submitted to the panel in Round 3. In Round 3, a final round of voting was performed. Descriptive statistics were performed.

RESULTS

In Round 1, radiologists (n=16) and EM physicians (n=9) answered 7 questions for each of the 12 anatomic sites (n=2100 responses), ENT surgeons answered questions for the 6 "ENT" sites (n=210 responses), and orthopedic surgeons answered questions for the 6 "orthopedic" sites (n=168 responses). In Round 2, 58 total statements were submitted to the panel for voting. Radiologists and EM physicians voted on all 58 statements (n=1450 votes), ENT surgeons voted on 32 statements

(n=160 votes), and orthopedic surgeons voted on 26 statements (n=104 votes). One statement (2%) did not reach consensus in Round 2; the remaining 57 statements (98%) reached consensus. In Round 3, all statements achieved consensus.

CONCLUSION

Expert consensus recommendations were established for appropriate utilization of radiographs in 12 anatomic sites through a multidisciplinary and multi-institutional deliberative process.

CLINICAL RELEVANCE/APPLICATION

Expert consensus guidelines on appropriate utilization of radiography may improve quality of care by reducing unnecessary radiographic exams, radiation exposure, and costs.

S4-SSMK01-5 CORRELATING FOOT LONGITUDINAL ARCH SHAPE WITH PERONEAL TENDON PATHOLOGIES THROUGH RADIOGRAPHIC ANGLE MEASUREMENTS

Adil Basha, BA (*Presenter*)
Muhammad R. Akram, BS (*Abstract Co-Author*)
Natalie Velez (*Abstract Co-Author*)
Dhilip Andrew, MD (*Abstract Co-Author*)
Naveen Rajamohan, MD,MBBS (*Abstract Co-Author*)
Avneesh Chhabra, MD, MBA (*Abstract Co-Author*)
Flavio Duarte Silva, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study assesses whether a correlation exists between the shape of the medial longitudinal arch of the foot measured using angles on weight-bearing radiographs and the risk for peroneus longus and brevis tendon pathologies.

METHODS AND MATERIALS

After institutional approval, a retrospective search was conducted for patients who presented between 2017 and 2023 with foot and ankle pain, and for whom ankle MRIs and weight-bearing ankle radiographs were performed within 6 months of each other. 141 cases of peroneal tendon dysfunction that met the criteria were identified. Talonavicular uncoverage angle, Meary’s angle, calcaneal pitch, cuneiform to fifth metatarsal height, and Djian-Annonier's (DA) angle were calculated on weightbearing ankle radiographs. MRI was used to assess the peroneus brevis tendon, peroneus longus tendon, common peroneal tendon sheath, and the peroneus brevis and longus tendon sheaths. Associations between radiographic angles and MRI findings were explored through one-way ANOVA followed by Fisher's least significant difference method for multiple comparisons.

RESULTS

Of the five angles compared using ANOVA, Meary's angle was shown to have a statistically significant difference in individuals with peroneus brevis tears compared to individuals with healthy tendons. The study also demonstrated statistically significant differences between the calcaneal pitch angle in patients with peroneus longus tenosynovitis and those with healthy peroneus longus tendons.

CONCLUSION

This study demonstrated that the utilization of Meary’s angle can help assess a patient's risks for tears of the peroneus brevis tendon with moderate accuracy and calcaneal pitch can assist in stratifying risk for peroneus longus tenosynovitis when used with the MRI modality. Future research could focus on adding more modalities for comparison, such as weight-bearing 3D CT, as well as increasing the number of patient scans that fit the exclusion criteria.

CLINICAL RELEVANCE/APPLICATION

The results of this study can be applied in the clinical setting to assist in the diagnosis of peroneal tendon tears and other tendon injuries, especially when used complementarily to MRIs of the foot and ankle, speeding up the diagnostic process and improving patient outcomes for those who may be suffering from untreated chronic ankle pain.

S4-SSMK01-6 METAL ARTIFACTS IN LUMBAR SPINE INSTRUMENTATION: A COMPARISON OF PCD-CT VS. EID-CT, ITERATIVE METAL ARTIFACT REDUCTION AND VIRTUAL MONOENERGETIC IMAGING IN 100 EXAMINATIONS

Thomas Marth, MD (*Presenter*)
Adrian Marth, MD (*Abstract Co-Author*)
Christoph Laux (*Abstract Co-Author*)
Daniel Nanz (*Abstract Co-Author*)
Reto Sutter, MD (*Abstract Co-Author*)

PURPOSE

Photon-counting detector (PCD) computed tomography (CT) systems allow the reconstruction of virtual monoenergetic images (VMIs) from inherently available spectral data. However, qualitative and quantitative evaluations of VMI in combination with tin-prefiltration (Sn) and iterative metal artifact reduction (iMAR) and their comparison to energy-integrating detector (EID) CT are limited.

METHODS AND MATERIALS

Retrospectively, 100 clinical Sn CT scans (50 EID and 50 PCD) of the lumbar spine following fusion surgery with pedicle screws and intervertebral cages were included. Metal artifacts were quantitatively and qualitatively assessed in standard EID (EID std), standard PCD (PCD std), and reconstructed VMI at 120 keV (PCD VMI120), iMAR (PCD iMAR), and VMI at 120 keV + iMAR (PCD VMI120+iMAR) images. Regions of interest were placed in the most hyperdense and hypodense areas, near metal artifacts, and the standard deviation of Hounsfield Units was assessed as a quantitative artifact surrogate. For qualitative image analysis, six image features were rated by two readers. The Kruskal-Wallis Test was used for statistics.

RESULTS

73 patients were included, of which 27 patients received both an EID and a PCD scan. EID CT was conducted at 140 kVp with a mean CTDI vol of 12.4 ± 1.9 mGy, and PCD CT at 100 (n=23) or 140 (n=27) kVp with a mean CTDI vol of 6.5 ± 2.1 mGy. Hypodense artifacts were significantly more severe (higher SD) in PCD std (SD: 372 HU) and PCD iMAR (332 HU), both p<.01, and comparable in PCD VMI120 (149 HU) and PCD VMI120+iMAR (106 HU), both p>.05, compared to EID std (151 HU). Hyperdense artifacts were more pronounced in PCD std (SD: 286 HU) and PCD iMAR (204 HU), and reduced in PCD VMI120 (85 HU) and PCD VMI120+iMAR (66 HU), although not significantly different from EID std (p=.45 -.89). Qualitative artifact extent was rated significantly less severe in PCD VMI120 , PCD iMAR , and PCD VMI120+iMAR images compared to EID std (p =.014). Trabecular and cortical bone visibility was rated lowest in PCD VMI120+iMAR . Significantly more signal distortion artifacts were present in the PCD VMI subgroup acquired at 100 kVp compared to the PCD VMI subgroup at 140 kVp (p<.01).

CONCLUSION

PCD CT in combination with VMI and VMI + iMAR was comparable to EID CT for metal artifact reduction in the lumbar spine at nearly half the radiation dose. VMI + iMAR at PCD CT led to the strongest artifact reduction at the cost of lower cortical and trabecular bone visibility.

CLINICAL RELEVANCE/APPLICATION

The results show VMI reconstruction of Sn CT scans of the lumbar spine to be effective and useful for reducing metal artifacts and favor PCD over EID due to the inherently available spectral reconstruction possibilities and their potential for radiation dose reduction.

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

S4-SSMK02

Musculoskeletal Imaging (Arthritis and Cartilage)

Sunday, Nov. 30 1:00PM - 2:00PM Room: E451A

Lauren M. Ladd, MD (*Moderator*)
Hamza Alizai, MD (*Moderator*)

Sub-Events

S4-SSMK02-2 MRI-ASSESSED OUTCOMES AFTER MICROFRACTURE VERSUS SCAFFOLD-ASSOCIATED PROCEDURES IN KNEE CARTILAGE DEFECTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Eduardo Graniel Palafox, MD (*Presenter*)
Marcelo Robles Rodriguez (*Abstract Co-Author*)
Valeria Soriano Pineda (*Abstract Co-Author*)
Luis E. Graniel Palafox, MD (*Abstract Co-Author*)
Renata V. Leao, MD (*Abstract Co-Author*)

PURPOSE

This Systematic Review and Meta-Analysis aims to compare MRI-assessed outcomes following microfracture and scaffold-associated procedures for the treatment of knee cartilage defects. By analyzing morphologic and compositional imaging parameters such as MOCART scores and T2 mapping across multiple studies, this work seeks to summarize the current evidence regarding cartilage repair as visualized through magnetic resonance imaging.

METHODS AND MATERIALS

A systematic search was performed in PubMed, Embase, and the Cochrane Library up to April 28th, 2025, to identify studies comparing MRI-assessed outcomes between microfracture (MFx) and scaffold-associated procedures in patients with knee cartilage defects. Eligible studies included those reporting morphologic and/or compositional cartilage repair outcomes evaluated through magnetic resonance imaging, specifically using the Magnetic Resonance Observation of Cartilage Repair Tissue (MOCART) score and/or T2 mapping. Data were extracted and synthesized to calculate mean differences between groups.

RESULTS

Out of 256 articles initially identified, 5 studies met the inclusion criteria (3 randomized clinical trials and 2 cohort studies), comprising a total of 285 patients. At 3-month follow-up, no significant difference in MOCART scores was observed between groups ($P = 0.6010$), with high heterogeneity across studies ($P < 0.0001$). At 2 years, scaffold-associated procedures demonstrated significantly higher MOCART scores ($P = 0.0031$) with no observed heterogeneity ($P = 0.9932$). T2 mapping at 2 years showed no significant difference ($P = 0.9193$), accompanied by substantial heterogeneity ($P = 0.0029$).

CONCLUSION

Scaffold-associated procedures show superior morphologic repair at 2-year follow-up with consistent improvements in MOCART scores. No significant differences were found in T2 mapping, and heterogeneity among studies persists. These findings support the long-term structural benefits of scaffolds but underscore the need for standardized imaging protocols and further high-quality studies to validate these results.

CLINICAL RELEVANCE/APPLICATION

This study provides evidence to inform surgical decision-making and follow-up imaging strategies by highlighting MRI-based differences in cartilage repair quality between microfracture and scaffold-associated procedures.

S4-SSMK02-3 IMAGING DIAGNOSTIC DELAY IN AXIAL SPONDYLOARTHRITIS: DATA FROM THE INTERNATIONAL AIDA NETWORK

Francesca Martini, MD (*Presenter*)
Cristian Sica, MD (*Abstract Co-Author*)
Raffaello Martini (*Abstract Co-Author*)
Nunzia Di Meglio (*Abstract Co-Author*)
Armando Perrella, MD (*Abstract Co-Author*)
Antonio Vitale (*Abstract Co-Author*)
Luca Cantarini (*Abstract Co-Author*)
Maria Antonietta Mazzei, MD (*Abstract Co-Author*)

PURPOSE

To assess the contribution of imaging misdiagnosis and underdiagnosis to the overall diagnostic delay in Axial Spondyloarthritis (axSpA), a complex inflammatory condition affecting the axial skeleton, including the sacroiliac joints and the spine.

METHODS AND MATERIALS

A multicenter observational study was conducted in a cohort of 100 consecutive patients with a definitive clinical-radiological diagnosis of axSpA, all of whom had experienced a measurable imaging diagnostic delay. These patients were enrolled in the AIDA (AutoInflammatory Disease Alliance) Network axSpA Registry between March 2024 and February 2025. For each patient, we analyzed the MRI study that was responsible for the definitive diagnosis (included in imaging group 1) and the earliest radiological examination (not necessarily an MRI exam) in which signs of disease were retrospectively evident but not initially recognized (included in imaging group 2). For both imaging groups, we collected data on imaging modality, use of contrast agent, anatomical region examined (pelvis, spine, or both), and radiological findings (sacroiliitis, spinal inflammation, or both); for group 2 only, we also recorded whether the initial report was negative or described degenerative changes.

RESULTS

Imaging group 1 included 100 MRI studies, whereas imaging group 2 consisted of 94% MRI scans, 4% CT scans, 1% PET scans, and 1% conventional X-rays. In imaging group 2, only 28% of the studies were performed with intravenous contrast, whereas 72% were performed without contrast. In terms of anatomical focus, 42%

examined only the spine, 34% only the pelvis, and 24% included both regions. Radiological reports were classified as negative in 82% of cases and as degenerative in 18%. The average diagnostic delay—the time between the earliest potentially diagnostic examination and the final diagnostic MRI—was 2 years, 9 months, and 27 days .

CONCLUSION

The diagnosis of axSpA remains highly challenging, with delays often extending over several years and involving multiple contributing factors, including radiological misinterpretation. The role of an experienced musculoskeletal radiologist is essential to avoid misdiagnosis or underdiagnosis and to improve early detection of the disease.

CLINICAL RELEVANCE/APPLICATION

Accurate and timely interpretation of early inflammatory signs on imaging may reduce the diagnostic delay in axSpA, with a direct impact on patient care and disease management.

S4-SSMK02-4 DEEP LEARNING FOR AUTOMATED GRADING OF RADIOGRAPHIC SACROILIITIS

Xinyi Meng (*Presenter*)
Xiaoyue Zhang (*Abstract Co-Author*)

PURPOSE

The aim of this study was to develop and validate an artificial intelligence system to help physicians in assessing and diagnosing sacroiliitis from standard X-ray images.

METHODS AND MATERIALS

In this retrospective study, a deep learning model for the automated grading assessment of radiographic sacroiliitis was developed using pelvic X-ray images from a training set of 465 individuals (930 single sacroiliac joints) and a validation set of 195 individuals (390 single sacroiliac joints). The algorithm was tested using an external test set of 223 individuals (446 single sacroiliac joints). The receiver operating characteristic (ROC) curve was used to calculate the area under the curve (AUC), sensitivity, and specificity to assess the model's performance. The findings of the model were used as a reference to determine its utility in aiding radiologists in the diagnosis and grading assessment of sacroiliitis.

RESULTS

The neural network model demonstrated proficiency in assessing grading of sacroiliitis. In the external test set, the model achieved a grading accuracy rate of 63.90% for radiographic sacroiliitis, and its diagnostic accuracy for determining the presence of radiographic sacroiliitis reached 90.13%. With the assistance of the model, the diagnostic accuracy of radiological sacroiliac arthritis by two junior imaging physicians improved significantly, increasing from 92.45% and 91.10% to 97.17% and 95.29%, respectively. Furthermore, the accuracy of image grading (grades 0 to 4) also showed notable improvement, rising from 75.00% and 74.08% to 88.89% and 80.90%, respectively.

CONCLUSION

The artificial intelligence model demonstrated high diagnostic accuracy and can greatly enhance the precision of radiographic sacroiliitis grading.

CLINICAL RELEVANCE/APPLICATION

In clinical practice, the model can serve as a valuable computer-aided diagnostic tool, assisting radiologists and rheumatologists in making more accurate and efficient diagnoses, especially in cases with ambiguous or early-stage lesions. It can also be used as an educational tool for training junior radiologists and medical students, improving their diagnostic skills. Further validation with larger sample sizes and multicenter studies is needed to refine the model and ensure its effectiveness across diverse patient populations. Integrating the model into the clinical workflow can enhance the overall efficiency and quality of patient care by providing real-time diagnostic support.

S4-SSMK02-5 EVALUATING THE RELIABILITY AND CLINICAL UTILITY OF CARPAL COLLAPSE & MALALIGNMENT INDICES IN RHEUMATOID ARTHRITIS VERSUS CONTROLS

Yasir Mian (*Presenter*)
Veena Peraka (*Abstract Co-Author*)
Sang Bum Lee (*Abstract Co-Author*)
Swami Sadanala (*Abstract Co-Author*)
Parham Pezeshk, MD (*Abstract Co-Author*)
Avneesh Chhabra, MD, MBA (*Abstract Co-Author*)

PURPOSE

To assess the reliability of traditional radiographic measurements of carpal collapse and malalignment in rheumatoid arthritis (RA) patients and to compare these measurements between RA patients and controls.

METHODS AND MATERIALS

43 RA patients and 58 controls were retrospectively studied. Three independent readers measured five radiographic indices on hand radiographs: Carpal Height Ratio (CHR), Revised Carpal Height Ratio (rCHR), Stahl Index (STI), Radioscaphoid Angle (RSA), and Ulnar Translocation of the Carpus (UTC). Interobserver agreement was assessed using intraclass correlation coefficients (ICCs). Multiple linear regression was used to assess differences in carpal indices between groups, adjusting for relevant clinical and demographic variables. Post hoc t-tests were conducted for significant categorical predictors. A p-value < 0.05 was considered significant.

RESULTS

There were 27/43 women (63%) in the RA group and 31/58 (53%) in the control group ($p = 0.348$). The mean age in the RA group was 62.3 ± 13.6 years, compared to 49.9 ± 14.7 years in the control group ($p < 0.001$). Mean duration of disease in the RA group was 73.9 ± 107.7 months. ICCs for the control group were: CHR, 0.77 (95% CI, 0.61-0.86); rCHR, 0.52 (0.37-0.66); STI, 0.11 (-0.04-0.28); RSA, 0.67 (0.55-0.78); and UTC, 0.71 (0.58-0.81). For the RA group, ICCs were: CHR, 0.60 (0.42-0.74); rCHR, 0.29 (0.11-0.49); STI, 0.52 (0.34-0.68); RSA, 0.52 (0.28-0.70); and UTC, 0.85 (0.77-0.91). After adjusting for covariates, no significant differences were observed between RA and controls for each of the measurements. Subgroup analysis showed that RA patients with motor symptoms had significantly higher UTC than those without motor symptoms ($p < 0.05$).

CONCLUSION

UTC demonstrated good interobserver agreement, while CHR, STI, and RSA showed moderate agreement, and rCHR showed poor agreement. In this cohort of RA patients with short-to-midterm disease duration, traditional radiographic measures of carpal alignment did not significantly differ between RA patients and controls. However, RA patients with motor symptoms had significantly higher UTC than those without, suggesting that ulnar translocation may be linked to clinical impairment even in the early stages of disease.

CLINICAL RELEVANCE/APPLICATION

Ulnar translocation of the carpus is a reliable and clinically meaningful radiographic measure of wrist malalignment in rheumatoid arthritis. Its correlation with motor symptoms highlights its potential to connect imaging findings with functional impairment, enhancing diagnostic efficacy.

Nov. 30 – Dec. 4
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S4-SSNR01

Neuroradiology (Brain: Anatomy, Developmental and Pediatrics)

Sunday, Nov. 30 1:00PM - 2:00PM Room: S404

Usha D. Nagaraj, MD (*Moderator*)
Rupa Radhakrishnan, MD, MS (*Moderator*)

Sub-Events

S4-SSNR01-1 EVALUATION OF AN MRI SCORING SYSTEM FOR VENOUS AND PARENCHYMAL BRAIN ABNORMALITIES IN STURGE-WEBER SYNDROME

Ajay Kumar, MD, PhD (*Presenter*)
A Luat, MD (*Abstract Co-Author*)
Michael E. Behen, PhD (*Abstract Co-Author*)
Csaba Juhasz (*Abstract Co-Author*)

PURPOSE

Sturge-Weber syndrome (SWS) is a rare neurocutaneous disorder characterized by facial capillary malformation and leptomeningeal venous abnormalities. While pial enhancement on post-contrast MRI is the hallmark of brain involvement, other findings—such as cortical atrophy, calcification, and deep venous remodeling—are also common and associated with neurological deficits. Recent collaborative efforts have emphasized imaging-based phenotyping to track disease progression and guide treatment. This study evaluated a novel MRI scoring system designed to comprehensively capture SWS brain abnormalities and their clinical relevance, with high reproducibility.

METHODS AND MATERIALS

MRI scans from 20 children with unilateral SWS (ages 1-14 years; mean: 8.3 years) were analyzed from a prospectively collected single-center database. Each MRI included native T1, T2, FLAIR, SWI, and post-contrast T1 sequences at 3T. Two independent raters scored five imaging features across all lobes: pial enhancement, enlarged deep veins, atrophy, calcification (0 = none, 1 = small/limited, 2 = extensive), and choroid plexus enlargement (0: normal/symmetric, 1: slightly enlarged, 2: severely enlarged). Interrater reliability was assessed using intraclass correlation coefficients (ICC). Final consensus scores were correlated with clinical measures including age, seizure history, and motor function using Spearman's rank correlation.

RESULTS

Interrater reliability was excellent for all sub-scores (ICC: 0.957-0.995) and for total MRI score (ICC: 0.992; all $p<0.001$). Higher total MRI scores were strongly associated with lower motor functions ($r = -0.8$, $p<0.001$), which correlated with greater pial enhancement ($p<0.001$), atrophy, and calcification ($p=0.003$ for both). No significant correlations were found between MRI scores and seizure variables or age.

CONCLUSION

This novel MRI scoring system reliably captures both vascular and parenchymal brain abnormalities in SWS which correlate with motor severity. Its high interrater reliability supports its use in multi-rater or multicenter studies.

CLINICAL RELEVANCE/APPLICATION

This simple, reproducible SWS MRI scoring tool can aid in characterizing disease severity, monitoring progression, and evaluating treatment effects in clinical research and trials.

S4-SSNR01-2 BRAIN ANATOMICAL CHANGES IN IDIOPATHIC INTRACRANIAL HYPERTENSION

Mahsa Alborzi Avanaki, MD (*Presenter*)
Donnella S. Comeau, MD,PhD (*Abstract Co-Author*)
Marc Bouffard (*Abstract Co-Author*)
Jeremy N. Ford, MD,MBA (*Abstract Co-Author*)
Yu-Ming Chang, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study explores the relationship between arachnoid granulations (AGs), venous sinus stenosis, and glymphatic function in idiopathic intracranial hypertension (IIH).

METHODS AND MATERIALS

We conducted a retrospective analysis of imaging data from IIH patients and controls (all female). Patients with IIH were stratified into two groups: those with presently-active, untreated intracranial hypertension and those with a history of IIH but currently-normal intracranial pressure via treatment/cure (T/C). AGs in the dural sinuses were quantified and measured. Transverse/sigmoid sinus stenosis ratios were calculated bilaterally and were compared with ALPS-indices.

RESULTS

Data from 15 IIH patients (9 untreated, 6 T/C, mean ages 34.5 and 32) and 16 controls (mean age 40) were analyzed. Mean AG numbers in the superior sagittal sinus (SSS) were; Controls: 6.88, untreated IIH: 3.78, and T/C: 8 ($P= 0.085$). Mean stenosis ratios were R:68.99 and L:75.68 in the T/C group, 64.48 (R) and 67.14(L) in untreated IIH patients and among controls. Controls had significantly lower stenosis ratios compared to both untreated (P-values: $R = 0.01$, $L = 0.06$) and T/C groups (P-values: $R = 0.02$, $L = 0.01$). The untreated vs. C/T comparison shows no significant difference (corrected $p > 0.05$). In the T/C group, a strong negative correlation was found between AG count in the SSS and right-sided stenosis ($P = 0.02$). ALPS-indices correlated poorly with and AG count ($P = 0.5$) and sinus stenosis (P-values ranging from 0.32 to 0.86) in all groups.

CONCLUSION

This pilot study indicates potentially dynamic arachnoid granulation (AG) anatomy with fewer visualized AGs among patients with untreated IIH than among controls. Interestingly, AGs were more abundant in patients with treated or cured IIH than among controls. Also of interest was not only persistence of venous sinus stenosis in the treated/cured IIH group, but greater stenosis ratios than seen in patients with untreated disease and current intracranial hypertension. It was only in the group of T/C IIH patients that an inverse correlation was noted between arachnoid granulations and venous sinus stenosis ratios. The absence of correlation between stenosis ratios or AG numbers and ALPS-indices may reflect a greater importance of meningeal lymphatic drainage over venous drainage in downstream glymphatic drainage.

CLINICAL RELEVANCE/APPLICATION

Comprehensive understanding of neurofluid movement must take into account glymphatic, meningeal lymphatic, and venous sinus processes.

S4-SSNR01-3 TAKING THE STAGE - A FAST MRI ACQUISITION TECHNIQUE TO EVALUATE BRAIN VASCULAR AND PARENCHYMAL ABNORMALITIES IN STURGE-WEBER SYNDROME

E. Mark Haacke, PhD (*Presenter*)
Scotty G. McKay, MD (*Abstract Co-Author*)
Yongsheng Chen, PhD (*Abstract Co-Author*)
Yang Xuan, BS (*Abstract Co-Author*)
Csaba Juhasz, PhD (*Abstract Co-Author*)

PURPOSE

Sturge-Weber syndrome (SWS) is a rare neurocutaneous disorder characterized by a facial port-wine birthmark and venous vascular brain involvement. One of the major barriers to the research of SWS and other childhood neurological disorders is the lack of early serial imaging to evaluate developmental changes due to concerns for patient harm from repeated sedation and contrast administration. One emerging area of radiology to greatly aid not only in improving the understanding of pediatric neurological diseases but also improving patient care is image standardization and rapidly acquired imaging. Strategically-acquired gradient echo (STAGE) imaging is one such method that provides multiple qualitative images, including susceptibility-weighted imaging (SWI) and quantitative maps, in 7 min or less at 3 T.

METHODS AND MATERIALS

In this prospective study, 22 patients (13 females, mean age 14 years, range 2-22 years) diagnosed with SWS with prior imaging with unilateral brain involvement underwent MR imaging using the STAGE protocol without the administration of contrast material or the use of sedation. All STAGE data were evaluated by two reviewers, and presence vs. absence of abnormalities were assessed within each lobe including leptomeningeal venous malformations (LVM), enlarged deep veins, cerebral atrophy and calcifications, and choroid plexus enlargement; these were then compared to conventional MRI including SWI and post-contrast images.

RESULTS

Despite the lack of contrast administration, presence of all vascular and parenchymal brain abnormalities noted on conventional MRI were reliably visualized on STAGE images. In cases of limited (such as unilobar) brain involvement, some features were more subtle on STAGE. The most challenging feature to identify was LVM, best assessed with STAGE-derived SWI and R2* images. Visualization of calcifications was also challenging in some cases, but comparison of SWI phase and proton density-weighted images allowed for their reliable detection and differentiation from venous abnormalities.

CONCLUSION

Utilization of rapidly acquired non-contrast STAGE MR imaging allows for accurate assessment of a variety of brain venous vascular and parenchymal involvement in SWS across a wide age range comparable to conventional MR.

CLINICAL RELEVANCE/APPLICATION

Fast image acquisition allows for the avoidance of sedation eliminating a source of potential adverse effects from imaging and making serial MRI examinations more feasible. Early serial imaging can detect evolution of brain abnormalities and monitor the effects of interventions. This standardized imaging method also allows for more effective multi-institutional studies for researching rare pediatric neurological conditions.

S4-SSNR01-6 MORPHOMETRIC SIMILARITY MAPPING IN PEDIATRIC MIGRAINE WITHOUT AURA: UNRAVELLING THE ROLE OF BIOLOGICAL SEX

Alessia Guarnera, MD (*Presenter*)
Antonio Napolitano (*Abstract Co-Author*)
Francesco Dellepiane, MD (*Abstract Co-Author*)
Alessia Carboni, MD (*Abstract Co-Author*)
Maria Camilla Rossi Espagnet, MD (*Abstract Co-Author*)
Giulia Moltoni (*Abstract Co-Author*)
Carlo Gandolfo (*Abstract Co-Author*)
Daniela Longo (*Abstract Co-Author*)

PURPOSE

Pediatric migraine without aura (pmwa) is suspected to cause structural and functional alterations in the brain connectome. MSM (morphometric similarity mapping), which has never been applied to pmwa, is an advanced and non-invasive technique that identifies brain cortex and cerebral connectivity anomalies, as well as neuronal plasticity changes. The paper aims to: a) identify differences in morphometric similarity networks (MSNs) in pediatric patients affected by mwa compared to healthy controls and in subgroups of patients; and b) correlate these differences in MSNs with patients' demographic and clinical characteristics.

METHODS AND MATERIALS

498 patients (6-18 years) and 100 controls were retrospectively recruited from our Institution's archive if the subjects showed: normal MRI exams, normal neurological examination, and no comorbidities. 3D T1 MPRAGE and DWI were pre-processed to obtain eleven cortical parameters for the MSN analysis (Tab. 1). The global mean morphometric similarity (MS) and the regional mean MS were calculated. The statistical analysis included separate linear regression models for all subjects and subgroups of patients in the global and regional models, followed by an ANOVA with an FDR correction and a p-value threshold of 0.05. For significant predictors, a post hoc analysis using the Benjamini-Hochberg method was performed.

RESULTS

83 patients and 81 controls (6-18 years) were included (Fig. 1). MSM identified significant differences in MSNs in patients based on the clinical parameters nausea and vomiting, photophobia and phonophobia, number of migraine days per month, and mostly on the demographic parameter biological sex (Tab. 2,3). The cerebral pathways that showed the most significant alterations encompassed the executive function pathway, the nociceptive pathway, and the default mode network (Fig. 2,3).

CONCLUSION

Differences in MSNs identified in patients related to clinical parameters and, above all, biological sex demonstrated that migraine shapes the cerebral connectome and favours neuronal plasticity. The resulting abnormalities in the executive function pathway, the nociceptive pathway, and the default mode network may lead chronic migraine symptoms. Biological sex is confirmed as a paramount parameter in migraine, supporting the hypothesis of a "sex-specific phenotype".

CLINICAL RELEVANCE/APPLICATION

The identification of in vivo migraine biomarkers linked to anomalies of the brain cortex and cerebral connectivity, or to demographic parameters such as biological sex, is crucial in pediatric patients affected by migraine without aura to offer tailored therapy and improve their quality of life.
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Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

S4-SSNR02

Neuroradiology (Brain: Infectious, Inflammatory and Metabolic Disorders)

Sunday, Nov. 30 1:00PM - 2:00PM Room: S405

Panagiotis A. Sideras, MD, PhD (*Moderator*)
Andrew S. Kuhn, MD (*Moderator*)

Sub-Events

S4-SSNR02-1 HYPOXIC BRAIN INJURY ON MRI OF CHILDREN WITH CEREBRAL MALARIA: ASSOCIATION WITH CLINICAL RISK FACTORS, OUTCOMES, AND LONG-TERM SEQUELA

Jessie Huang (*Presenter*)
Jessica Sherpa (*Abstract Co-Author*)
Michael J. Potchen, MD (*Abstract Co-Author*)
Sarah Mohajeri Moghaddam, MD, MPH (*Abstract Co-Author*)

PURPOSE

To determine if the presence of brain hypoxia on acute phase MRI of cerebral malaria (CM) patients predicts the severity of clinical course and the presence of neurologic sequela.

METHODS AND MATERIALS

This retrospective study used existing MRI, clinical, and demographic data from children diagnosed with CM at Queen Elizabeth Central Hospital in Blantyre, Malawi between 2009 and 2015. All subjects met the diagnostic criteria for CM coma. MRI was performed within 12 hours of admission and repeated daily during admission. Follow up MRI at 1, 6, and 12 months was obtained in survivors. Imaging was acquired on a 0.35T scanner. Hypoxic injury was quantified on DWI sequences through a previously validated severity scoring system assessing diffusion restriction across 14 brain regions. Scores ranged from 0 (no injury) to 28 (most severe), incorporating cortical, deep grey, and posterior fossa structures. Clinical information collected include temperature, plasma lactic acid, blood pressure, glucose, hemoglobin, hematocrit, platelets, white blood cell count, among other parameters. Neuropsychological follow up assessments were used to evaluate the long-term cognitive impact.

RESULTS

Preliminary results on 69 out of a total 270 MRI scans have been analyzed. In this preliminary data, mean hypoxia score is 1.16 (SD .63). The mean MRI hypoxia score was lowest among those who fully recovered (0.54), higher among who recovered with sequela (2.75) and highest among those who died (2.82). Higher hypoxia scores were associated with higher plasma lactate (r= .27, p= .025), deeper coma (r= -.41, p< .001) and worse anemia (r= -.14 p= .002). MRI in pediatric CM demonstrates evidence of hypoxic brain injury.

CONCLUSION

MRI in pediatric CM imaging demonstrates evidence of hypoxic brain injury. More severe hypoxia changes on imaging are associated with a more severe clinical disease course and worse outcomes. Data on long term imaging and clinical outcomes is forthcoming.

CLINICAL RELEVANCE/APPLICATION

Cerebral malaria (CM) is a life-threatening condition that disproportionality affects children in low resource settings. Findings from this research offer new insight into the role of brain hypoxia in driving structural changes and disease severity. This improved understanding of CM pathophysiology can inform targeted interventions that address its high rate of mortality and long-term neurological deficits.

S4-SSNR02-3 FREE WATER FRACTION CORRELATES WITH DISABILITY IN MULTIPLE SCLEROSIS AND REFLECTS PERIVASCULAR SPACE ENLARGEMENT

Valentin N. Stepanov, MD (*Presenter*)
Santiago Coelho, PhD (*Abstract Co-Author*)
Dmitry S. Novikov, PhD (*Abstract Co-Author*)
Els Fieremans, PhD (*Abstract Co-Author*)

PURPOSE

The glymphatic system is essential for clearing metabolic waste from the brain via perivascular spaces (PVS). Its impairment can lead to the accumulation of neurotoxic substances, contributing to neuroinflammation and neurodegeneration in multiple sclerosis (MS). Enlarged PVS (EPVS) visible on MRI are indicative of glymphatic dysfunction. This study investigates free water fraction (FW), extracted from diffusion-relaxation data using the Standard Model (SM) of diffusion in white matter (WM), as a potential biomarker of glymphatic impairment in MS. We assess its correlation with cognitive decline and overall disability and compare it to the commonly used DTI-ALPS technique.

METHODS AND MATERIALS

This IRB-approved, prospective study included 32 MS patients (19 females, 13 males; mean age 49, range 24-73; mean disease duration 13.8 years). Clinical scores included the Expanded Disability Status Scale (EDSS) and the Symbol Digit Modalities Test (SDMT). MRI was performed on a 3T Siemens Prisma using advanced diffusion protocols with varying echo times and B-tensor shapes, and structural T1-weighted MPRAGE. Diffusion MRI (dMRI) data were preprocessed with the DESIGNER pipeline, and FW maps were extracted from global WM, using biophysical modeling based on the SM. For comparison, DTI-ALPS index was calculated using ROIs in projection and association fibers.

RESULTS

EPVS on T1-weighted MRI aligned with regions of elevated FW, supporting its sensitivity to glymphatic impairment. FW negatively correlated with SDMT (rho = -0.46, p = 0.009) and showed a trend toward positive correlation with EDSS (rho = 0.34, p = 0.06). DTI-ALPS did not correlate with either clinical score or with FW, though the &82;; 2 /& 82;; 3 diffusion tensor eigenvalue ratio averaged over WM did correlate with FW.

CONCLUSION

SM estimates FW from multi-shell dMRI as a compartment with isotropic diffusivity of ~3μm 2 /ms and long T2 relaxation times (1.5s) compared to WM. In pathology, PVS may enlarge beyond the typical diffusion length of water, approximately 20-30μm at clinically used diffusion times, and thereby be captured by FW. In MS, increased FW, reflecting EPVS, correlated with cognitive decline and showed a trend with disability (SDMT, EDSS), while DTI-ALPS showed no correlation. This highlights FW's greater sensitivity to EPVS-related pathology. Future studies will assess & 82;; 2 /& 82;; 3 as an alternative DTI-derived marker and validate multi-shell derived FW's role in larger, longitudinal cohorts.

CLINICAL RELEVANCE/APPLICATION

This study highlights the potential of dMRI-derived free water fraction as a sensitive marker of glymphatic dysfunction and disease burden in MS, supporting its use in clinical monitoring.

S4-SSNR02-4 DIAGNOSTIC EVALUATION OF DEEP LEARNING ACCELERATED 3D FLAIR IMAGING AT 1.5T AND 3T FOR VISUALIZATION OF CEREBRAL WHITE MATTER LESIONS

Sittaya Buathong, MD (*Presenter*)
Alexandra Filippakis (*Abstract Co-Author*)
Eugene Milshteyn, PhD (*Abstract Co-Author*)
Chen-Hua Chiang, MD (*Abstract Co-Author*)
Christopher Hemond (*Abstract Co-Author*)
Dan W. Rettmann, BS (*Abstract Co-Author*)
Susie Y. Huang, MD, PhD (*Abstract Co-Author*)
Ivan Jambor, MD,PhD (*Abstract Co-Author*)

PURPOSE

FLAIR imaging is a standard sequence used for the detection of white matter lesions. The goal of this clinical feasibility study was to evaluate a prototype acquisition and reconstruction technique that enables very high acceleration rates for 3D FLAIR (designated as DLS FLAIR) and compare it with the standard 3D FLAIR.

METHODS AND MATERIALS

Fifteen and 52 consecutive patients underwent brain MRI at 1.5T and 3T, respectively. The standard 3D FLAIR (isotropic 1mm3 acquisition voxel size) was obtained using a commercially available deep learning reconstruction algorithm. DLS FLAIR (isotropic 1mm3 acquisition voxel size) was performed using a prototype acquisition and reconstruction technique which combines a highly undersampled data acquisition with an unrolled deep learning-based reconstruction. Two neuroradiologists performed blinded, head-to-head qualitative assessments of lesion conspicuity, motion, noise, and overall diagnostic quality. Quantitative lesion volume and lesion counts were derived from automated segmentation. Cohen kappa scores were calculated for interrater agreement. A one-sided t-test for non-inferiority margin using the specified margin of 15% and alpha 0.05 was performed in each qualitative assessment. Comparison of lesion volumes and numbers with p-value < 0.05 for statistic significant were calculated using paired t-test.

RESULTS

At 1.5T, DLS FLAIR (4m53s) reduced scan times by 15% compared to standard 3D FLAIR (5m43s) while at 3T, DLS FLAIR (2m45s) achieved a 35% reduction in scan time compared to standard 3D FLAIR (4m15s). At both 1.5T and 3T, there were no statistically significant differences in image quality except for significantly reduced noise for the accelerated DLS FLAIR. Moderate to almost perfect interrater agreement (Cohen's kappa 0.55-0.85) was achieved. There were no statistically significant differences in lesion volumes or counts between DLS and standard 3D FLAIR.

CONCLUSION

The faster acquisition time of DLS FLAIR may enable a greater use of high-resolution isotropic 3D FLAIR sequences in the evaluation of patients with suspected white matter diseases both at 1.5T and 3T.

CLINICAL RELEVANCE/APPLICATION

Routine 3D FLAIR imaging with 1 mm isotropic imaging can take 4-6 minutes at 1.5T and 3T using routine methods, limiting routine use of high-resolution 3D FLAIR imaging. In our study a prototype deep learning-based acquisition and reconstruction technique (DLS FLAIR) was shown to be feasible with ~35% scan time reduction compared to the standard 3D FLAIR in the evaluation of cerebral white matter lesions.

S4-SSNR02-5 ASSESSMENT OF CORTICAL MYELINATION IN PATIENTS WITH MULTIPLE SCLEROSIS VIA T1W/FLAIR RATIO: A LONGITUDINAL FOLLOW-UP STUDY

DONGJUN LEE, MD (*Presenter*)
Yangsean P. Choi, MD, PhD (*Abstract Co-Author*)

PURPOSE

T1-weighted (T1w)/FLAIR ratio may reflect cortical myelin integrity in patients with multiple sclerosis (PwMS), but its clinical relevance remains unclear. This study investigated the longitudinal significance of cortical T1w/FLAIR ratio in PwMS.

METHODS AND MATERIALS

Brain MRIs were obtained from PwMS and clinically isolated syndrome (CIS) patients between September 2021 and December 2023. T1w and FLAIR images were preprocessed to calculate cortical gray matter (GM) and superficial white matter (WM) T1w/FLAIR ratios. Baseline and follow-up MRI were analyzed for T1w/FLAIR ratio.

RESULTS

Among 63 MS and 5 CIS patients (mean age: 40.5 years; 73.5% female), the baseline median Expanded Disability Status Scale (EDSS) score was 1.5. GM T1w/FLAIR ratio changes were negatively correlated with EDSS changes in whole-brain ($r = -0.201$, $p = 0.020$), occipital ($r = -0.269$, $p = 0.002$), and insular ($r = -0.18$, $p = 0.038$) cortices. Patients with stable ($p = 0.044$) or improved ($p < 0.001$) EDSS scores exhibited significant GM T1w/FLAIR ratio increases. T1w/FLAIR ratio changes were positively correlated with disease duration ($r = 0.285$, $p = 0.018$).

CONCLUSION

Longitudinal GM T1w/FLAIR ratio changes were associated with neurologic disability in PwMS, supporting its potential role as a biomarker for cortical myelination and disease monitoring.

CLINICAL RELEVANCE/APPLICATION

The T1w/FLAIR ratio as a potential marker for assessing cortical demyelination is significantly correlated with the clinical severity of multiple sclerosis. The T1w/FLAIR ratio of the outermost gray matter is most vulnerable to demyelination. The evolution of white matter lesions is not associated with cortical T1w/FLAIR ratio changes.

S4-SSNR02-6 THE USE OF ARIA-E SCORES IN CATEGORIZING INFLAMMATORY CEREBRAL AMYLOID ANGIOPATHY

Tabassum Sami, BS (*Presenter*)
Andrew D. Schweitzer, MD (*Abstract Co-Author*)
Michelle Roytman, MD (*Abstract Co-Author*)

PURPOSE

Cerebral amyloid angiopathy (CAA) is characterized by the accumulation of beta-amyloid peptides within small- to medium-sized cerebral blood vessels. The inflammatory forms of CAA, including CAA-related inflammation (CAA-ri) and Aß-related angiitis (ABRA), are associated with the immune response to amyloid deposition and are potentially treatable with immunosuppressive therapies. Current methods for grading CAA rely on the Boston Criteria. However, previous studies have proposed that the MRI grading scale for Amyloid-Related Imaging Abnormalities with Edema or Effusion (ARIA-E) may also be applicable to amyloid-related pathologies such as iCAA. The purpose of this study is to assess the inter-rater reliability of the ARIA-E grading scale in a cohort of 28 patients with iCAA.

METHODS AND MATERIALS

We performed a retrospective review of 28 clinically and radiographically confirmed cases of iCAA evaluated by MRI at Weill Cornell Medical Center. Two radiologists independently graded each case using the ARIA-E grading criteria. Inter-rater reliability was assessed for the Barkhof Grand Total Scale (BGTS) as well as the 3- and 5-point Severity Scales of ARIA-E (SSAE-3 and SSAE-5). Weighted and unweighted Cohen's kappa coefficients were calculated to assess the strength of agreement. In addition, we evaluated the scores in relation to their recurrence of symptoms attributable to iCAA.

RESULTS

In our iCAA cohort, inter-rater reliability was strong, with a weighted Cohen's kappa of 0.705 and an unweighted Cohen's kappa of 0.735 for BGTS scores. Similarly strong agreement was observed for SSAE-3 (weighted kappa: 0.760; unweighted kappa: 0.870) and SSAE-5 (weighted kappa: 0.776; unweighted kappa: 0.804). Among patients who experienced clinical recurrence (n = 7), the median BGTS score was 7 (IQR: 3-11.5), median SSAE-3 score was 3 (IQR: 2- 5), and SSAE-5 score was 2 (IQR: 2). Among patients without recurrence (n=21), there was a median BGTS score of 12 (IQR: 8-21), a median SSAE-3 score of 4 (IQR: 2.25-5), and a median SSAE-5 score of 2 (IQR: 3-3). There were no statistically significant differences in BGTS, SSAE-3, and SSAE-5 between patients who experienced recurrence versus those who did not.

CONCLUSION

Our study demonstrates that the ARIA-E grading criteria can be reliably applied to iCAA cases, achieving a high degree of inter-rater reliability. Further studies with larger cohorts are warranted to explore whether ARIA-E metrics can predict disease progression and relapse.

CLINICAL RELEVANCE/APPLICATION

Applying the ARIA-E grading system to categorize iCAA patients may provide valuable prognostic information and guide treatment decisions in an aging population.

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S4-SSPH02

Physics (Angiography and Breast Imaging)

Sunday, Nov. 30 1:00PM - 2:00PM Room: E351

Rick R. Layman, PhD (*Moderator*)
Katie Hulme, MS (*Moderator*)

Sub-Events

S4-SSPH02-1 HIGH-FIDELITY ASSESSMENT OF X-RAY ANGIOGRAPHY SYSTEM PERFORMANCE: APPLICATION TO DEVICES USED TO TREAT PEDIATRIC CONGENITAL HEART DISEASE

Kenneth A. Fetterly, PhD (*Presenter*)

PURPOSE

The wide variety of implantable devices used to treat pediatric congenital heart disease (CHD) results in substantial variation in their conspicuity in X-ray fluoroscopy and angiography images. A shortcoming of common methods to assess medical imaging system performance is that they utilize simple test objects which do not represent the spatial complexity of clinical devices. The purpose of this work was to measure system performance using a clinically relevant range of implantable devices and exposure levels used to treat CHD.

METHODS AND MATERIALS

A method to measure pixel specific contributions (t 2) to Hotelling's T 2 was recently developed. The method preserves the spatial detail of the imaging system and accounts for noise correlation between pixels via the covariance matrix. One result is a 2D t 2 map for which the 2D integral is T 2 . d' was calculated as the square root of T 2 . 1200 unprocessed images of 4 stationary vascular plugs and a 14.4 mm 0.018" guidewire positioned within a 10 cm Plastic Water phantom were acquired. Exposure parameters were consistent with 5 fps pediatric fluoroscopy and 30 fps angiography (including 2x angiography exposure as a reference). The summation of t 2 values over the device area was used to calculate T 2 and d'. The device-specific area of t 2 values greater than 0.2 was measured to assess changes to the area of the devices represented in the images as exposure level changed.

RESULTS

Pixel-specific t 2 and device-specific T 2 and d' estimates varied as expected with exposure level to a quantum limited system. For vascular plugs, the fiducial markers demonstrated substantially greater t 2 than the device bodies. Considering 5 devices tested and 3 exposure levels, d' ranged from 16.6 to 65.3 (3.9x). For each exposure level, inter-device d' varied by 2.5x. For 4 devices, the fraction of the device area which exceeded t 2 > 0.2 was in the range 0.87 to 0.95 for the angiography exposure and 0.56 to 0.72 for the fluoroscopy exposure. For a covered vacular plug with very fine wire struts, these fractions were 0.37 and 0.18.

CONCLUSION

The measurements presented herein quantified the clinical observation of substantial variation in the conspicuity of a variety devices used to treat pediatric CHD. That t 2 , T 2 , and d' of spatially complex objects can be measured accurately opens a new pathway to assess medical imaging system performance using clinically-relevant rather than stylized test objects.

CLINICAL RELEVANCE/APPLICATION

This work uniquely measured the ability of an X-ray angiography system to create images of implantable devices used to treat pediatric CHD. These findings can be used to guide device-specific protocol development and further optimize the balance between technical image quality and patient radiation dose.

S4-SSPH02-2 SENSITIVITY OF QUANTITATIVE DIGITAL SUBTRACTION ANGIOGRAPHY TO CONTRAST AGENT DIFFUSION COEFFICIENT

Marlin Keller, MS (*Presenter*)
Grace Minesinger, MS (*Abstract Co-Author*)
Martin Wagner, PhD (*Abstract Co-Author*)
Paul F. Laeseke, MD, PhD (*Abstract Co-Author*)
Michael Speidel, PhD (*Abstract Co-Author*)

PURPOSE

Quantitative Digital Subtraction Angiography (qDSA) is a method for quantifying blood flow based on spatial tracking of blood/contrast mixing in x-ray images. Computational fluid dynamics (CFD) simulations are being used to gain a theoretical understanding of qDSA. There is currently no consensus on the choice of the diffusion coefficient (DC) for iodinated contrast. The purpose of this study was to determine the sensitivity of qDSA to the DC of iodinated contrast, and experimentally determine the DC for iohexol 300 mgI/mL (a commonly used contrast agent).

METHODS AND MATERIALS

CFD was performed in OpenFOAM for a 20 cm long straight vessel with a 5 Fr catheter injecting 2.0 mL/s of contrast into 7 different pulsatile blood flows (15 - 45 cm/s). Three DCs within literature range were used (A) 4e-5 , (B) 4e-7 , and (C) 4e-9 m 2 /s . 3D CFD data was saved at 30 frames/s and a 2D x-ray forward projector was used to simulate DSA images. For each setup, time-attenuation curves were measured at points along the vessel centerline (collectively referred to as a time-attenuation map, TAM). The qDSA algorithm was applied to the TAM to determine blood velocity. Linearity of qDSA velocity vs. CFD-based velocity (ground truth) was evaluated for each DC. TAM inputs for qDSA were also compared by computing the normalized root mean square error (nRMSE). To measure DC of iohexol, a diffusion cell was fabricated with 2 chambers separated by a semi-permeable membrane. The chambers were filled with iohexol and water and then repeatedly imaged 5 times with cone-beam CT to measure changes in iodine concentration. DC was determined through application of Fick's law.

RESULTS

The measured DC of iohexol in water was D =3.61 e-8 m 2 /s , (R 2 =0.99, 95% CI: [3.55, 3.68] e-8 m 2 /s). In simulations, the qDSA velocity was linear with respect to CFD velocity along the vessel centerline (CL) (R 2 =0.97), but with slopes and offsets dependent on DC. For the 3 DCs simulated, the relationships between qDSA and CFD velocities were (A) qDSA=0.59· CL+1.37 cm/s (95% CI: slope [0.48,0.69], intercept [-5.0,7.73]; R 2 =0.97), (B) qDSA=0.74· CL+2.78 cm/s (95% CI: slope

[0.62,0.86], intercept [-4.40,9.95]; R 2 =0.98), and (C) qDSA=0.99· CL-15.48 cm/s (95% CI: slope [0.87,1.19], intercept [-23.16,-7.80]; R 2 =0.99) . Comparing the TAMs for cases (A) and (C), the nRMSE ranged from 10.4% to 19.5% depending on the blood velocity.

CONCLUSION

qDSA velocity is linear with respect to ground truth velocity over a range of DC, however the relationship depends on the value of DC. This effect should be accounted for in future experimental and theoretical studies.

CLINICAL RELEVANCE/APPLICATION

qDSA promises to provide quantitative measurements of blood flow changes during interventional procedures such as transhepatic arterial embolization.

S4-SSPH02-3 IMPROVED Z-RESOLUTION ASSESSMENT FOR DIGITAL BREAST TOMOSYNTHESIS

Priyash Singh, MS (*Presenter*)
Bruno Barufaldi, PhD (*Abstract Co-Author*)
Andrew D. Maidment, PhD (*Abstract Co-Author*)
Raymond Acciavatti, PhD (*Abstract Co-Author*)

PURPOSE

The EUREF Digital Breast Tomosynthesis (DBT) QC protocol quantifies the system's point-spread function (PSF) via the z-resolution measured as the full-width half maximum (FWHM) of the artifact spread function (ASF). In using the EUREF method to evaluate a novel DBT system, we identified inconsistencies and biases that were supported by a critical evaluation of published reports.

METHODS AND MATERIALS

We trace these discrepancies to the discordant use of mean and maxima within the ASF formula. We propose an alternative protocol that uses multiplanar reconstruction to track the oblique BB signal, and uses the means of the background and BB signals to generate the ASF. We further use a functional fit for more accurate estimation of the FWHM. We validated the performance of the modified protocol using simulated and experimental reconstructions of phantoms.

RESULTS

The PSF is dependent upon the apparent angle of the BB which in turn depends on its location in the reconstructed plane, height above the detector, acquisition geometry, and the reconstruction technique. The EUREF protocol systematically overestimates FWHM due to stochastic noise in the reconstructed image. The FWHM is also biased for anteriorly displaced BBs due to the obliquity of their PSF. In contrast, the modified protocol was able to capture the expected z-resolution trends for both superior and anterior BB displacements more accurately. It also substantially reduced bias due to noise, by 97% in simulations and 65% in physical experiments, relative to the EUREF protocol.

CONCLUSION

The EUREF DBT QC protocol demonstrates systematic deviations, arising both from stochastic noise and the PSF obliquity, which limits its reliability in characterizing the z-resolution. Our modified protocol addresses these shortcomings, provides enhanced accuracy and precision, and demonstrates robustness across various BB positions and imaging conditions.

CLINICAL RELEVANCE/APPLICATION

Quantifying the z-resolution in DBT requires a rigorous approach. The current EUREF protocol, while simple, is susceptible to systematic errors. We proposed and developed a protocol that offers improved accuracy, precision, and robustness to acquisition conditions. Use of this protocol has revealed that z-resolution is largely predetermined by acquisition geometry and reconstruction algorithm. Thus, testing of z-resolution may be better suited for development of DBT systems rather than for routine QC, where simpler more targeted tests may be preferable to reduce the clinical workload of physicists.

S4-SSPH02-4 SYNTHESIZING VIRTUAL HIGH-DOSE IMAGES FROM LOW-DOSE IMAGES USING DD-MNET WITH DUAL-DOMAIN DENOISING AND DETAIL RECONSTRUCTION IN DIGITAL MAMMOGRAPHY

Ze Jin, PhD (*Presenter*)
Jifeng Zu (*Abstract Co-Author*)
Wahyu Rahmaniar (*Abstract Co-Author*)
Kenji Suzuki, PhD (*Abstract Co-Author*)

PURPOSE

Balancing image quality and radiation dose is critical in digital mammography. Unlike conventional dose-reduction methods that risk obscuring subtle lesions, we propose a dual-domain deep learning framework combining noise reduction in the signal-independent domain with detail reconstruction in the signal-dependent domain to enhance low-dose mammogram quality while preserving essential anatomical features.

METHODS AND MATERIALS

The proposed DD-MNet integrates denoising techniques through a dual-domain framework for digital mammography: (1) In the signal-independent domain (D1), quantum noise is stabilized via Anscombe transformation (AT) and suppressed using Wiener filtering. MNet is trained on paired AT low-dose (LD) and high-dose (HD) patches; (2) In the signal-dependent domain (D2), wavelet decomposition, structural filtering (Sobel gradient, bilateral filtering, anisotropic diffusion), and adaptive feature fusion refine details from the initial denoised output, enhancing anatomical feature preservation and clarity. The dataset includes paired LD and HD mammograms from an anthropomorphic phantom (Gammex 169 "Rachel", Gammex RMI, Middleton, WI) acquired at 1.5-39.0 mGy. Clinical validation involved 30 patients with LD (1.0-1.6 mGy) and standard-dose (SD, 3.6-6.2 mGy) acquisitions at 10%, 25%, and full-dose levels. Training used randomly sampled patches from phantom LD and HD images, with five-fold cross-validation ensuring robustness. Virtual HD mammograms were quantitatively evaluated using SSIM, FSIM, PSNR, and ISNR. Detailed qualitative analysis was also conducted on patient mammograms, particularly focusing on challenging lesions like microcalcifications.

RESULTS

Our DD-MNet outperformed state-of-the-art methods (BM3D, DnCNN, RED-CNN, EDCNN), achieving SSIM of 0.921, FSIM of 0.978, PSNR of 32.64 dB, ISNR of 0.711, and enabled a 66% radiation dose reduction by generating virtual HD images from LD (1.5 mGy) mammograms, comparable to SD (4.4 mGy) images. Qualitative analysis confirmed superior preservation of subtle anatomical and lesion details critical for accurate diagnosis and early breast cancer detection.

CONCLUSION

DD-MNet effectively combines quantum and electronic noise reduction with anatomical detail preservation through a dual-domain approach, significantly improving image quality for low-dose mammography. This method achieves up to 66% radiation dose reduction, promising safer breast cancer screening, especially for repeated examinations.

CLINICAL RELEVANCE/APPLICATION

The proposed method significantly reduces radiation exposure during digital mammography while maintaining diagnostic image quality, enabling safer and more effective breast cancer screening protocols.

S4-SSPH02-5 REAL-WORLD, POST-MARKET SURVEILLANCE STUDY OF A CHEST X-RAY AI MODEL IN A MULTICENTER STUDY

Seyedehelaheh Hosseini, MD (*Presenter*)
Gaurav Fotedar (*Abstract Co-Author*)
Richa Pant (*Abstract Co-Author*)
Subba R. Digumarthy, MD (*Abstract Co-Author*)
Amit T. Kharat, PhD,DMRD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)

PURPOSE

As the number of FDA-cleared AI algorithms increase, there's still a lack of data on how they perform in real-world clinical settings. To address this gap, we conducted a multicenter, post-market surveillance study to evaluate a chest X-ray AI algorithm's performance in real-world clinical practice.

METHODS AND MATERIALS

Our IRB-approved study included 875 CXRs from 17 sites in India. The inclusion criteria were the availability of CXR AI algorithm (Deeptek.ai) outputs at the time of interpretation of CXRs as part of the standard of care workflow. AI outputs were extracted in three classes (normal/abnormal; region of abnormality - lungs, pleura, hardware and heart; specific finding description such as opacity, nodule, mass, cardiomegaly, pleural effusion, pneumothorax). The radiologists' reports were converted into similar stratified outputs. Each CXR was reviewed in an blinded manner with the two sets of outputs (AI and radiologists) by an external thoracic radiologist without prior clinical use experience of the algorithm. The external radiologist recorded his agreement or disagreement, separately for each of the three class outputs. We estimated the agreement rates between the blinded external radiologist, AI output and reporting radiologists' outputs.

RESULTS

Of the 875 chest x-rays reviewed, there was complete agreement among all readers (AI, R1, and R2) in 736 cases (84%). Radiologists (R1 and R2) agreed but differed from the AI in 88 cases (10%). There were 17 cases where the AI and R1 agreed but R2 disagreed (2%), and 30 cases where the AI and R2 agreed but R1 disagreed (3%). No cases showed complete disagreement among all three readers. Only 4 cases (0.5%) showed total diagnostic discrepancy, highlighting high overall concordance and the potential of AI to support radiologist interpretation.

CONCLUSION

Our study demonstrates high concordance and acceptability of AI outputs for normal/abnormal radiographs, as well as at the level of region of interest and specific finding details.

CLINICAL RELEVANCE/APPLICATION

Our post-market surveillance of a chest x-ray AI algorithm supports the positive impact of AI on reporting of CXRs.

S4-SSPH02-6 COMPRESSION-FREE DIGITAL BREAST TOMOSYNTHESIS: PROOF OF CONCEPT

Peymon Ghazi, PhD (*Presenter*)

PURPOSE

This study demonstrates the technical feasibility of a compression-free spectral digital breast tomosynthesis system that, while operating within the screening-mammography radiation-dose limit defined in MQSA, is intended for frontline cancer detection.

METHODS AND MATERIALS

A proof-of-concept scanner was built in which independent, synchronized robotic arms carried a narrow-beam x-ray source and a curved digital detector. Breast is allowed to hang freely through a table aperture, eliminating mechanical compression. During imaging, a ±140° angular coverage sweep in a 2-D plane along with a +35° out of plane, was executed by the source in pulsed-fluoroscopy mode while counter-rotation of the detector was performed to maintain a quasi-parallel-beam geometry. Scatter-to-primary ratio (SPR) was quantified with the aperture method across all gantry angles, and a Monte Carlo model was employed to measure mean glandular dose for an average size and density breast. System spatial resolution was assessed from the modulation-transfer function (MTF) with limiting resolution defined at 10 % MTF. 140 projections were reconstructed by means of a GPU-accelerated compressed-sensing algorithm at 0.1-mm isotropic voxels. For all measurements, detector operates in spectral mode in two energy levels, with a thresholding set to 34 keV.

RESULTS

Mean SPR remained below 0.05 for all projection angles, confirming near-scatter-free acquisition. Average glandular dose was 3.8 mGy. A limiting spatial resolution of 7.8 lp mm?¹ was achieved, comparable to state-of-the-art DBT. The spectral differentiation between the soft tissue and high-attenuating non-tissue.

CONCLUSION

Near-scatter-free imaging with substantial radiation-dose savings was delivered by the prototype while painful breast compression was eliminated and neither spatial resolution nor throughput was compromised.

CLINICAL RELEVANCE/APPLICATION

By eliminating compression hardware and employing narrow-beam geometry, key barriers to broader tomosynthesis adoption—including patient discomfort, elevated scatter, and higher dose—are addressed by this system, which is therefore expected to improve screening compliance, extend high-quality imaging to women with dense or augmented breasts, and enable safer, more accurate interventional guidance.

Nov. 30 – Dec. 4
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S4-SSPH03

Physics (CT Image Quality I)

Sunday, Nov. 30 1:00PM - 2:00PM Room: E352

James M. Kofler JR, PhD (*Moderator*)
Ioannis Sechopoulos, PhD (*Moderator*)

Sub-Events

S4-SSPH03-1 MEASURING AND MONITORING NOISE, DOSE, AND MODEL-OBSERVER-BASED LESION DETECTABILITY IN PATIENT CT EXAMS

Zhongxing Zhou, PhD (*Presenter*)
Jarod Wellinghoff (*Abstract Co-Author*)
Cynthia H. McCollough, PhD (*Abstract Co-Author*)
Lifeng Yu, PhD (*Abstract Co-Author*)

PURPOSE

Reporting noise and dose in patient CT exams has become a mandatory requirement for some quality programs. However, one of the required quality measures, global noise, is fundamentally flawed to characterize the image quality of each patient, especially for non-linear reconstruction algorithms. In this work, we developed a patient-specific channelized Hotelling observer (CHO)-based method to estimate lesion detectability for each individual patient scan and provided a solution to measure and monitor noise, dose, and lesion detectability in patient CT exams.

METHODS AND MATERIALS

To measure lesion detectability, a patient-specific channelized Hotelling observer (CHO) was developed. Lesion signals were modeled from lesions of varying sizes and contrast levels (3mm/-30HU, 6mm/-10HU, 6mm/-30HU, 6mm/-50HU, 9mm/-30HU) after incorporating the effect of contrast-dependent spatial resolution caused by nonlinear reconstructions such as iterative reconstruction (IR) and deep-learning reconstruction (DLR). An ensemble of backgrounds was extracted from patient images to include both relatively uniform areas and anatomically varying regions. The detectability index (d') was estimated using a scatter matrix computed from background regions of interest (ROIs) and a channelized mean signal. Both global d' for the entire image series and local d' every 5 cm along the z-axis of the scan were computed. Global noise levels were measured by identifying the peak values of the standard deviation histogram and noise power spectrum was computed from background ROIs. Size-specific dose estimates (SSDE) were also calculated according to the AAPM Reports 204 and 220 and IEC 62985.

RESULTS

The proposed method was applied to patient images from three different CT scanner models. A report on noise level, SSDE, and d', globally and as a function of z coordinate, for each image series was successfully generated. The global noise levels were 13.2, 25.0, and 30.2 HU, and the average d' were 3.78, 1.69, and 1.39 for the three different test patients.

CONCLUSION

A patient-specific CHO-based method was developed to estimate lesion detectability from individual image series. Along with the report on noise and dose, this method provides an objective, quantitative, and task-based approach to measuring and monitoring image quality and dose for each individual CT patient exam.

CLINICAL RELEVANCE/APPLICATION

The proposed patient-specific CHO method and the reporting on noise, dose, and lesion detectability enable task-based quantitative measurement and monitoring of image quality and radiation dose for each CT exam.

S4-SSPH03-2 STATISTICAL EQUIVALENCE BUT CLINICAL UNCERTAINTY: INTER-SCAN REPRODUCIBILITY OF THE CORONARY PERIVASCULAR FAT ATTENUATION INDEX

Tatsuya Saito, RT (*Presenter*)
Mihoko Fujimura (*Abstract Co-Author*)
Rina Sakai (*Abstract Co-Author*)
Tatsuya Nishii, MD, PhD (*Abstract Co-Author*)
Yuji Matsuzaki, RT (*Abstract Co-Author*)
Tomoro Morikawa, MD (*Abstract Co-Author*)
Yasutoshi Ohta, MD, PhD (*Abstract Co-Author*)
Keizo Murakawa (*Abstract Co-Author*)
Tetsuya Fukuda, MD, PhD (*Abstract Co-Author*)

PURPOSE

The coronary perivascular fat attenuation index (FAI) is gaining attention as a quantitative imaging biomarker for coronary inflammation. A meta-analysis reported a 4.5 HU FAI difference between high-risk and non-high-risk plaques, suggesting that minor changes may reflect plaque risk. However, the inter-scan reproducibility of FAI remains insufficiently validated. This study aimed to assess the reproducibility of FAI using the same CT scanner.

METHODS AND MATERIALS

We retrospectively analyzed coronary CT scans acquired from August to November 2024 using a 256-row CT scanner. Prospective ECG-gated imaging was performed at 100 kV in two separate heartbeats, acquiring mid-diastole and end-systole individually. After motion correction, images with quiescent coronary arteries were selected for each phase. Automatic FAI analysis was performed for the three main coronary branches, excluding those with failed analyses. The equivalence test used a ±2.5 HU margin (approximately 55% of the reported 4.5 HU difference). Bland-Altman analysis was used to evaluate measurement error and limits of agreement (LOA).

RESULTS

Of 116 cases, 20 without a quiescent phase in both cardiac cycles and 18 with failed FAI analysis were excluded. A total of 220 branches from 78 cases (median age 67 years [56-76], 60 males [76.9%], heart rate 60 bpm [51-67]) were included. The mean FAI was -81.1±7.2 HU in diastole and -81.4 ± 7.4 HU in systole. The mean difference was -0.3 HU (90% CI: -0.8 to 0.3 HU), within the ±2.5 HU equivalence margin, indicating statistical equivalence ($p < .01$). Bland-Altman analysis showed no fixed or proportional error; however, LOA ranged from -9.7 HU (95% CI: -10.8 to -8.6) to +9.2 HU (95% CI: 8.1 to 10.3), indicating wide variability.

CONCLUSION

FAI measurements taken during two phases from different cardiac beats on the same CT scanner showed statistical equivalence. Nevertheless, the Bland-Altman analysis indicated inter-scan variability, with a limit of agreement of ±9 HU.

CLINICAL RELEVANCE/APPLICATION

The observed inter-scan LOA necessitates caution despite the statistical equivalence. FAI should be interpreted within a broader clinical context, ensuring appropriate margins around cut-off values.

S4-SSPH03-3 EVALUATION OF IMAGE QUALITY IMPROVEMENT AND DOSE REDUCTION USING DLIR AND IMAGE FILTER IN LUNG CT IMAGING

Kazuki Ishikawa (*Presenter*)
Kiyosumi Kagawa (*Abstract Co-Author*)
Takashi Okunaga (*Abstract Co-Author*)
Noriyuki Negi, RT (*Abstract Co-Author*)
Akiko Kusaka, RT (*Abstract Co-Author*)
Izumi Imaoka, MD (*Abstract Co-Author*)
Takamichi Murakami, MD, PhD (*Abstract Co-Author*)

PURPOSE

The purpose of this study was to evaluate the potential for image quality improvement and radiation dose reduction using Lung Kernel-Like (LKL) images, which apply a lung-specific image filter in combination with deep learning image reconstruction (DLIR), to expand their clinical applicability in lung imaging.

METHODS AND MATERIALS

All scans were acquired on a 256-slice CT scanner under standard-dose (noise index [NI] = 10) and low-dose (NI = 15) conditions. Three reconstruction methods were compared: filtered back projection (FBP), iterative reconstruction (IR) at 40% strength, and LKL images reconstructed using medium-strength DLIR. FBP and IR were performed using a conventional lung kernel. Physical image quality was assessed using the Catphan phantom, with metrics including modulation transfer function (MTF), standard deviation (SD) of CT values, and noise power spectrum (NPS). Clinical image quality was evaluated in 29 standard-dose and 30 low-dose chest CT cases using the Perception-based Image Quality Evaluator (PIQE) metric.

RESULTS

The CTDI vol was 16.5 mGy for standard-dose and 6.8 mGy for low-dose in phantom scans, and 9.2 ± 4.1 mGy and 5.3 ± 1.9 mGy, respectively, in clinical cases. The 50% MTF values were 0.68 for FBP, 0.70 for IR, and 0.69 for LKL at standard-dose, and 0.68, 0.70, and 0.70 at low-dose, respectively. The SD of CT values were 48.8 for FBP, 39.0 for IR, and 23.8 for LKL at standard-dose, and 67.0, 53.3, and 33.1 at low-dose, respectively. The average NPS spatial frequencies were 0.45 for FBP, 0.43 for IR, and 0.41 for LKL at standard-dose, and 0.44, 0.43, and 0.40 at low-dose, respectively. PIQE scores were 54.2 ± 6.9 for FBP, 42.8 ± 7.0 for IR, and 34.1 ± 6.2 for LKL at standard-dose, and 61.2 ± 5.2, 53.4 ± 6.5, and 39.6 ± 6.5 at low-dose, respectively. Significant differences were observed among all methods (repeated-measures ANOVA, $p < .001$; Bonferroni-corrected post hoc test, $p < .001$). In particular, low-dose LKL showed better PIQE scores than standard-dose FBP ($p < .001$) and was not significantly different from standard-dose IR ($p = .063$).

CONCLUSION

LKL images demonstrated superior noise characteristics while maintaining spatial resolution compared to conventional FBP and IR using the lung kernel. These findings suggest that a reduction in radiation dosage up to 50% can be achieved while maintaining overall image quality.

CLINICAL RELEVANCE/APPLICATION

While this study focused on lung imaging, the strategy of optimizing DLIR in combination with anatomically tailored image filters is applicable to other regions such as bone and vasculature. Customizing filters based on spatial resolution, noise, and contrast requirements enhances the versatility of DLIR and supports broader clinical adoption across various diagnostic tasks.

S4-SSPH03-4 3D LANDMARK SCANS PROVIDE PROSPECTIVE AND ACCURATE ESTIMATIONS OF WATER EQUIVALENT DIAMETER IN PATIENT CT EXAMINATIONS

Andrew M. Hernandez, PhD (*Presenter*)
Sarah Yoon (*Abstract Co-Author*)
Michael T. Corwin, MD (*Abstract Co-Author*)
Eric S. Diaz, MD (*Abstract Co-Author*)
Ahmadreza Ghasemiesfe, MD (*Abstract Co-Author*)
Misagh Piran, MD (*Abstract Co-Author*)
John M. Boone, PhD (*Abstract Co-Author*)
Sarah E. McKenney, PhD (*Abstract Co-Author*)

PURPOSE

3D Landmark (3DLM) scans have recently been introduced in some modern CT scanners for automatic scan planning in lieu of paired 2D localizers, but 3DLMs may offer extended capabilities. The purpose of this work is to quantify the accuracy of 3DLM scans for estimations of water equivalent diameter (D_w) in patient CT exams.

METHODS AND MATERIALS

A cohort of 100 patients scanned with at least one non-contrast series on a new model CT scanner, equipped with 3DLM capabilities, were retrospectively collected. All diagnostic, non-contrast scans (Dx) were generated according to our institution's clinical protocol and the 3DLM scans were generated according to the manufacturer's default protocol. The cases were composed of head (N=37), chest (N=18), and abdomen-pelvis (N=45) exams for a range of patients varying in age and size. D_w values were measured at the central plane on all Dx and corresponding 3DLM series using established methods. Agreement between D_w measurements from 3DLM scans and from reference Dx scans was assessed using Bland-Altman analysis, with differences reported as a percentage, and a limit of agreement (LOA) equal to +/- 1.96XSD.

RESULTS

The mean bias [lower LOA, upper LOA] in D_w measurements for 3DLM scans was -1.2% [-2.1,-0.2], -1.5% [-5.3,2.3], and -0.5% [-4.8,3.7] for head, chest, and abdomen-pelvis exams, respectively, but with a 60.0% to 99.7% reduction in scanner-indicated CTDIvol values. For head, chest, and abdomen-pelvis cases 8.1%, 5.6%, and 6.7% of cases, respectively, were outside the LOAs observed. Linear regression also revealed that agreement between the two methods for D_w estimations was not influenced by patient size for any of the exam types.

CONCLUSION

3DLM scans accurately estimate D w , and hence SSDE, for common exam types at radiation dose levels comparable to conventional 2D localizers, with the added benefit of being acquired before the diagnostic CT scans.

CLINICAL RELEVANCE/APPLICATION

3D Landmark scans can be utilized beyond their intended purpose to support prospective and accurate estimations of SSDE. We anticipate that adapting manufacturer software to support this capability is relatively straightforward. This extended capability is clinically relevant as it provides a more accurate estimate of average absorbed dose prior to the CT exam and could be useful for size-based selection of tube current modulation settings which is particularly important for pediatric CT imaging.

S4-SSPH03-5 CT KERNEL CONVERSION FOR SLICE-WISE QUANTITATIVE ASSESSMENT IN INTERSTITIAL LUNG DISEASE USING AN IMAGE-TO-IMAGE SCHRöDINGER BRIDGE MODEL

Doa Kim (*Presenter*)
Wooseok Choi (*Abstract Co-Author*)
Chang Yong Choi, MS (*Abstract Co-Author*)
Hyunki Lee (*Abstract Co-Author*)
Mi Jeong Song (*Abstract Co-Author*)
Sang Min Lee, MD, PhD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a diffusion-based deep learning model for CT kernel conversion, translating soft-kernel (B30f) images into sharp-kernel (B70f) equivalents for improved depiction of interstitial lung disease (ILD) features.

METHODS AND MATERIALS

In this retrospective study, 150 patients with paired chest CT images reconstructed using both soft and sharp kernels from identical sinograms were collected, comprising 99 cases with diverse pulmonary abnormalities for training and 17 ILD cases for testing. A thoracic radiologist selected two representative axial slices per patient based on ILD feature visibility. We implemented diffusion model (Image-to-Image Schrödinger Bridge, I²SB) and compared it with pix2pixHD and UNet as baseline models using image similarity metrics (Peak signal-to-noise ratio, PSNR; structural similarity, SSIM; root mean square error, RMSE), absolute difference maps (ADM), and slice-wise Dice similarity coefficients (DSC) for ILD pattern segmentation. High attenuation area (HAA) proportions were quantified using commercial software (Aview Lung Texture, Coreline Soft, Seoul, South Korea).

RESULTS

I²SB demonstrated superior performance across all metrics. For image similarity, I²SB achieved the highest scores (PSNR: 40.6, SSIM: 0.963, RMSE: 39.0), outperforming both pix2pixHD (36.5, 0.916, 62.0) and UNet (37.3, 0.919, 57.0). Mean of ADM between model-based kernel conversion and ground truth sharp-kernel images revealed significantly lower errors with I²SB (30.9 ± 4.4) compared to both pix2pixHD (43.6 ± 5.1) and UNet (46.4 ± 5.0), with statistical significance confirmed by paired t-test ($p < 0.001$). For ILD pattern segmentation, I²SB demonstrated highest DSCs: 0.910 for ground-glass opacity (GGO), 0.860 for reticular opacity, and 0.923 for honeycombing. These results significantly surpassed both pix2pixHD (0.829, 0.815, 0.890) and UNet (0.822, 0.767, 0.867) across all pattern types. Bland-Altman analysis further validated I²SB's superior performance in HAA quantification, demonstrating minimal bias and the tightest limits of agreement among all tested methods.

CONCLUSION

Our proposed I²SB model demonstrates superior performance in CT kernel conversion for ILD assessment compared to alternative baseline models, providing enhanced image fidelity and quantitative accuracy.

CLINICAL RELEVANCE/APPLICATION

I²SB CT kernel conversion enables accurate quantification of ILD-related features from archived soft-kernel CT scans, improving imaging analysis workflows and clinical decision-making in ILD management.

S4-SSPH03-6 IMPACT OF CARDIAC PHASES ON CORONARY CALCIUM SCORING IN NON-GATED CT SCANS: A DYNAMIC CARDIAC PHANTOM STUDY

Chao Guo, PhD (*Presenter*)
Xinhua Li, PhD (*Abstract Co-Author*)
Yifang Zhou, PhD (*Abstract Co-Author*)

PURPOSE

Lung cancer screening (LCS) is gaining popularity, and the same scan has the potential for detecting coronary artery calcium (CAC). We aim to evaluate the impact of cardiac phase on the accuracy of CAC scoring in non-gated LCS scans across heart rates (50-100 BPM), using prospective ECG-triggered CT scans as the benchmark. We further identify optimal LCS acquisition phases that minimize motion artifacts and enhance the reliability of Agatston scores, particularly at different heart rates.?

METHODS AND MATERIALS

A CIRS dynamic cardiac phantom simulating cardiac motion was scanned using a Siemens Force CT scanner. Nine different calcification inserts (diameter: 1.2-5 mm; density: 100-400 mg/cc) were scanned at heart rates from 50 to 100 bpm. Two scan protocols were used: ECG-gated CAC scoring (CTDI vol = 1.74 mGy) and non-gated LCS (CTDI vol = 2 mGy), with the same recon kernel. Both ECG-gated and non-gated scans were performed at every 10% R-R interval. In the gated scan, a distinct angular position of the air gap line in the phantom was correlated with the cardiac phase of the ECG-gated CT acquisition. Such correlation was used to label the non-gated LCS scan phase , and that near 50-55% of the R-R interval was identified. Calcium scores were calculated using clinical software, with non-gated LCS scores compared to gold standard ECG-gated scores.

RESULTS

ECG-gated scans showed consistency in Agatston scores across five runs at 60 BPM (CACs: 57.2, 60.9, 59.1, 55.4, 61.3; coefficient of variation (CV) ˜ 0.04). Non-gated scans exhibited significant variability, with the score of one run significantly lower than that of another run (LCS at 60 BPM: 9, 24.1, 10.8, 27.2, 14.3; CV ˜ 0.42). This variability was most pronounced at cardiac phases near 50-55% of the R-R interval and was reproducible across heart rates (50-100 BPM) and calcification inserts (diameter = 3 mm; density = 100 mg/cc). Excluding two runs acquired near the above phase, CV was 0.25.

CONCLUSION

Non-gated LCS calcium scoring is highly dependent on acquisition phase. Calcium scores in LCS scans decreased significantly when image acquisition occurred near 50-55% of the R-R interval, a phase marked by rapid ventricular volume expansion and blood filling.

CLINICAL RELEVANCE/APPLICATION

This study supports the feasibility of using LCS scans for concurrent CAC detection. Optimizing the LCS acquisition phase could enhance early detection of cardiovascular disease without additional CT scans or cost.

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S4-SSVA01

Vascular Imaging (Dose and Contrast-Efficient Vascular Imaging)

Sunday, Nov. 30 1:00PM - 2:00PM Room: E353A

Christopher J. Francois, MD (*Moderator*)
Cristina Fuss, MD, PhD (*Moderator*)

Sub-Events

S4-SSVA01-1 GADOLINIUM-BASED PHOTON-COUNTING DETECTOR CT ANGIOGRAPHY OF THE LOWER EXTREMITY: A VIABLE ALTERNATIVE TO IODINE

Kristina Krompass, MD (*Presenter*)
Jan-Lucca Hennes, MD (*Abstract Co-Author*)
Jan P. Grunz, MD (*Abstract Co-Author*)
Henner Huflage, MD (*Abstract Co-Author*)
Viktor Hartung (*Abstract Co-Author*)
Thorsten A. Bley, MD (*Abstract Co-Author*)
Philipp Gruschwitz, MD (*Abstract Co-Author*)

PURPOSE

The aim of this experimental study was to evaluate the application of gadoteric acid as an alternative contrast agent for photon-counting detector CT (PCD-CT) angiography of the lower extremities.

METHODS AND MATERIALS

PCD-CT angiograms of the femoral arteries were performed in a human body donor of 80 kg after establishing extracorporeal perfusion. Gadoteric acid (279.32 mg/ml) was administered for contrast and three clinically approved concentrations were tested: 0.2 ml/kg (16 ml, standard dose for body MRI), 0.4 ml/kg (32 ml), and 0.6 ml/kg (48 ml, maximum approved dose for cranial MRI). PCD-CT scans were acquired using ultra-high resolution mode (120 × 0.2 mm) with a tube voltage of 120 kVp and reconstructed as 40 keV virtual monoenergetic images. For reference, identical scans were performed with iodine-based contrast (400 mg/ml). Intraluminal and muscle attenuation as well as image noise were measured to calculate contrast-to-noise ratios (CNR). Three radiologists independently analyzed image quality, noise and vascular contrast using a five-point rating scale (5 = excellent, 1 = poor).

RESULTS

Intraluminal attenuation (r 2 = 1, p<.001) and CNR (r 2 = 0.98, p<.001) were directly proportional to the concentration of gadoteric acid, with significant differences between the investigated dosages (p<.001). Administration of 0.2 ml/kg gadoteric acid resulted in an intraluminal attenuation of 240.9 ± 10.7 HU (equals 3.2 ml of iodine contrast agent), while the 0.4 ml/kg protocol yielded 435.1 ± 15.8 HU (equals 6.3 ml of iodine contrast agent); the latter was considered diagnostically sufficient in all subjective categories (e.g., median vascular contrast 3 of 5 [IQR 3-4], p<.05). The maximum dose of 0.6 ml/kg gadoteric acid achieved an intraluminal attenuation of 647.2 ± 16.0 HU (equals 9.2 ml of iodine contrast agent) and was consistently deemed "good" in subjective assessment (e.g., median vascular contrast 4 of 5; [IQR 4-4], p<.05).

CONCLUSION

The combination of gadoteric acid as contrast agent and low-keV VMI from PCD-CT allows for diagnostic image quality in angiograms of the femoral arteries at clinically approved concentrations.

CLINICAL RELEVANCE/APPLICATION

Gadoteric acid represents a viable alternative for CT angiography in patients with contraindications to iodinated contrast agents, such as hyperthyroidism or allergy.

S4-SSVA01-2 GADOLINIUM-BASED K-EDGE PHOTON-COUNTING DETECTOR CT ANGIOGRAPHY OF THE THORACOABDOMINAL AORTA IN A CADAVERIC PERFUSION MODEL: A FEASIBILITY STUDY

Jan-Lucca Hennes, MD (*Presenter*)
Kristina Krompass, MD (*Abstract Co-Author*)
Henner Huflage, MD (*Abstract Co-Author*)
Jan P. Grunz, MD (*Abstract Co-Author*)
Viktor Hartung (*Abstract Co-Author*)
Philipp Gruschwitz, MD (*Abstract Co-Author*)

PURPOSE

Aim of this study was to evaluate the feasibility of gadoteric acid as an alternative contrast agent in photon-counting CT angiography (PCD-CTA) of the thoracoabdominal aorta using k-edge imaging.

METHODS AND MATERIALS

PCD-CTA was performed using an extracorporeal transfemoral perfused fresh-frozen body donor. For vascular contrast, a gadolinium-based contrast agent (279mg gadoteric acid/ml) was administered at the maximum clinically approved dose for cranial MRI of 0.6ml/kg body weight. The perfusion fluid was diluted based on the assumption of homogeneous distribution of the contrast agent through the entire arterial blood volume. According to the formula (70 x weight / [v(BMI/22)]), a person who weighs 80kg and is 1.75m tall has a blood volume of ~5liters. With an arterial blood fraction of about 10%, this results in a volume of ~500ml of arterial blood. Therefore, a total of 548ml perfusion fluid consisting of 500ml Ringer's solution and 48ml contrast agent (0.6ml/kg body weight x 80kg; =13.4g gadoteric acid) was used to assess the feasibility of gadoteric acid as a contrast agent for PCD-CTA. The CT scan was acquired with a tube voltage of 120kVp in standard mode (140x0.4mm) and a fixed radiation dose of 5mGy. 50keV virtual monoenergetic images near the k-edge of gadolinium were reformatted with a medium sharp kernel (Bv60), medium iterative reconstruction level (Q3) in 1mm slice thickness. For objective assessment, intraluminal attenuation and contrast-to-noise ratio were determined. Luminal contrast and diagnostic assessability were subjectively rated by consensus of three radiologists.

RESULTS

At 50keV, a mean intraluminal attenuation of 511.6±33.1HU was achieved, which is considered sufficient for diagnostic evaluation even in comparison to PCD-CTA with iodinated contrast agents. The resulting CNR was 14.4±1.1. Narrow caliber arteries such as the visceral and lumbar arteries could be visualized with sufficient intraluminal contrast. Parenchymal organs were well contrasted due to a gap of several minutes between application and scanning. Contrast mirroring occurred due to low perfusion pressure. Subjectively, luminal contrast and diagnostic assessment were consistently rated as good.

CONCLUSION

Gadoteric acid at clinically approved doses is a feasible alternative contrast agent to iodine for aortic k-edge PCD-CTA.

CLINICAL RELEVANCE/APPLICATION

Gadolinium-based PCD-CT angiography combines iodine-independence and fast, high-resolution imaging, providing an alternative especially for patients with a history of iodine allergy, hyperthyroidism and/or contraindications to MRI imaging.

S4-SSVA01-3 MINIMALLY ACCEPTABLE OR ACCEPTABLY MINIMAL? SUBMILLISIEVERT THORACOABDOMINAL PHOTON-COUNTING DETECTOR CT FOR ASSESSMENT OF THE ARTERIOSCLEROTIC BURDEN PRIOR TO CARDIACTHORACIC SURGERY

Jan-Lucca Hennes, MD (*Presenter*)
Kristina Krompass, MD (*Abstract Co-Author*)
Henner Huflage, MD (*Abstract Co-Author*)
Viktor Hartung (*Abstract Co-Author*)
Jan P. Grunz, MD (*Abstract Co-Author*)
Philipp Gruschwitz, MD (*Abstract Co-Author*)

PURPOSE

Aim was to assess the feasibility of an ultra-low-dose thoracoabdominal photon-counting detector CT (PCD-CT) protocol to evaluate the aortoiliacal calcification level prior to cardiothoracic surgery.

METHODS AND MATERIALS

Over a 1-year period (Jan to Dec 2024), preoperative non-contrast CT scans for the assessment of aortoiliac calcification were performed using a PCD-CT protocol with image quality level 1 (lowest technically possible) and tube voltage of 140 kVp. Images were reconstructed with standard settings: soft body kernel (Bv36), medium iterative reconstruction level (Q3); slice thickness/increment of 3 mm. The radiation exposure of the PCD-CT was compared to a) alternative imaging of the calcifications using chest x-ray (2 planes; ~0.1 mSv) and pelvic x-ray (2 planes; ~1.1-1.8 mSv); b) postoperative chest follow-up radiographies. Diagnostic usability was assessed subjectively and independently by five radiologists based on two criteria: diagnostic image quality and discernibility of calcifications. Interrater agreement was calculated using Kendall W.

RESULTS

A total of 35 patients were included (72 ± 6 years; 5 women). The mean effective radiation dose of the PCD-CT was 0.46 ± 0.05 mSv, which is at least 60% less radiation than the alternative X-ray images (~1.2-1.9 mSv). The average 5 ± 2 follow-up chest radiographies after surgery caused significantly higher radiation doses than the CT scan (0.80 ± 0.22; p=.001). All CT examinations had good diagnostic quality (4; [IQR 4-5]) with regard to the intended indication and rated as good in discernibility of calcifications quality (4; [IQR 4-5]). The readers' agreement was good (W=0.83/0.77). In some cases, PCD-CT revealed underlying conditions (e.g., metastatic tumors) that changed the treatment decision, sometimes even outside the examination volume covered by the radiographs (chest and pelvis).

CONCLUSION

Thoracoabdominal PCT-CD with minimal technical dose allows adequate detection of aortoiliac calcifications below the radiation dose of the alternative radiographs.

CLINICAL RELEVANCE/APPLICATION

The ultra-low dose PCD-CT protocol presented allows for improved preoperative planning with minimal radiation exposure by enabling features such as 3D reconstruction and optimized diagnostic evaluation of the additional depicted body parts compared to radiographs.

S4-SSVA01-4 ASSESSMENT OF CONTRAST AGENT-REDUCED CT PROTOCOLS FOR TRANSCATHETER AORTIC VALVE RECONSTRUCTION PLANNING ON PHOTON COUNTING DETECTOR CT: A COMPARATIVE STUDY

Yannik Christian Layer, MD (*Presenter*)
Alexander Isaak, MD (*Abstract Co-Author*)
Narine Mesropyan, MD (*Abstract Co-Author*)
Patrick A. Kupczyk, MD (*Abstract Co-Author*)
Tatjana Dell (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)
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PURPOSE

The extensive use of iodine-containing contrast media is increasingly controversial due to the accumulation in groundwater with unclear environmental effects as well as the recent supply difficulties during the Covid-19 pandemic. The aim of this study was the evaluation of contrast agent-reduced CT protocols for transcatheter aortic valve reconstruction (TAVR) planning on a photon counting detector CT (PCD-CT).

METHODS AND MATERIALS

A total of 54 BMI-matched examinations with standard dose contrast media (SCD; 80 ml) and reduced contrast media dose (RCD; 50 ml) for TAVR planning on a PCD-CT were included. Virtual monoenergetic reconstructions of the contrast agent-reduced examinations at 50 keV, 60 keV and 70 keV were used for comparison. Quantitatively, ROIs were placed in the abdominal aorta, abdominal aorta at kidney level, iliac bifurcation, common femoral artery, left ventricle and musculature and SNR and CNR were calculated. Qualitatively, the diagnostic quality and contrast were assessed on a Likert scale of 1 (non-diagnostic) -5 (excellent) and the contrast agent dose was estimated. Aortic annulus measurements were performed in all reconstructions.

RESULTS

The CNR was 23.98 ± 10.51 (RCD: 14.16 ± 6.38; RCD VMI 50keV : 27.05 ± 13.49) and the SNR 24.18 ± 6.62 (RCD: 18.38 ± 5.42; RCD VMI 50keV : 31.95 ± 10.7) in the ascending aorta on PCD-CT in SCD as an example. Averaged over all measured organs, the SNR was reduced by 19.98% (RCD VMI 50keV : + 25.76%) and the CNR by 27.91% (RCD VMI 50keV : + 38.12%) when the contrast media dose was reduced on the PCD-CT. The median diagnostic assessability for SCD was 5 (RCD: 4; RCD VMI 50keV : 5). 59.26% (32/54) of the contrast-reduced examinations were classified as SCD. There was no significant difference in aortic annulus measurements.

CONCLUSION

The diagnostic efficacy of transcatheter aortic valve replacement (TAVR) planning assessment using Photon Counting Detector CT (PCD-CT) with minimized contrast agent dosing is validated, presenting a practical approach to conserve contrast media.

CLINICAL RELEVANCE/APPLICATION

The study demonstrates the potential of contrast media reduction of PCD-CT in clinical routine. This can benefit patients with renal impairment, for example, and reduce negative effects of iodinated contrast media on the environment.

S4-SSVA01-5 WHAT'S YOUR FLAVOR? COMPARING THE DIFFERENT OPTIONS OF ITERATIVE METAL ARTIFACT REDUCTION IN ULTRA-HIGH-RESOLUTION PHOTON-COUNTING CT ANGIOGRAPHIES OF THE LEG

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Henner Huflage, MD (*Abstract Co-Author*)
Caroline Bestler, MD (*Abstract Co-Author*)
Theresa Sophie Patzer, MD (*Abstract Co-Author*)
Pauline Pannenbecker, MD, BA (*Abstract Co-Author*)
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Andreas Kunz, MD (*Abstract Co-Author*)
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PURPOSE

Ultra-high-resolution (UHR) photon-counting CT angiography (PCCTA) has become the reference standard for non-invasive assessment of peripheral artery disease. In the presence of total knee endoprosthesis, however, metal artifacts hamper visualization of the popliteal vasculature. While iterative metal artifact reduction (MAR) is a powerful tool to address this issue, the variety of flavor options requires careful consideration for different imaging tasks. This study investigated the effect of the different MAR flavors in patients with knee joint replacement.

METHODS AND MATERIALS

Twenty-two patients with total knee endoprosthesis (mean age, 74.5 ± 9.3 [SD] years, 13 women) underwent UHR-PCCTA of the leg at 140 kVp between August 2024 and April 2025. Datasets were reconstructed with the seven available MAR flavors (i.e., 'Extremity', 'Hip', 'Pacemaker', 'Lung coils', 'Shoulder', 'Dental', and 'Neuro') at maximum applicable sharpness (Bv56, spatial frequency at 10% of the modulation transfer function: 10.8 line pairs per cm). MAR strength was assessed with regions of interest positioned in the most pronounced artifacts, measuring the respective attenuation. In addition, six independent radiologists documented their flavor preferences using a forced-choice comparison tool (1,487 pairwise tests). Results were compared with Friedman's rank-based ANOVA and chi-square tests. Fleiss kappa was computed to analyze interrater reliability.

RESULTS

Compared with non-MAR datasets and the other six flavors, 'Dental' MAR resulted in the strongest reduction of hyperdense artifacts (all P <.001; e.g., MAR off versus 'Dental' MAR, median 4131.6 [IQR 1464.1] HU versus 179.7 [930.5] HU). Similarly, the reduction of hypodense artifact was most effective with 'Dental' MAR (all P <.001; -3862.6 [3191.9] HU versus -142.3 [168.1] HU). Image noise was not affected by any of the MAR flavors (P =.199). Subjective evaluation of popliteal artery assessability also favored 'Dental' MAR, which recorded the most wins in pairwise comparison (all P <.001). Interrater agreement was substantial, indicated by Fleiss kappa of 0.658 (95% confidence interval 0.581-0.736).

CONCLUSION

Despite its misleading name, 'Dental' MAR provides the strongest reduction of metal artifacts in UHR-PCCTA of the leg, allowing for the best assessability of the popliteal artery in patients with total knee endoprosthesis.

CLINICAL RELEVANCE/APPLICATION

The seven flavor settings available for iterative metal artifact reduction in ultra-high-resolution photon-counting CT have different effects on the diagnostic assessability of adjacent tissues.

S4-SSVA01-6 VALUE OF CONTRAST ENHANCEMENT BOOST TECHNIQUE AT SUBMILLISIEVERT CT ANGIOGRAPHY OF THE LOWER EXTREMITIES: EFFECT ON IMAGE QUALITY AND DIAGNOSTIC ACCURACY

Qilin Xiao (*Presenter*)
Meng Wang (*Abstract Co-Author*)
Sheng Jiexin (*Abstract Co-Author*)
Lin Sheng Zheng (*Abstract Co-Author*)
Min Xu, PhD (*Abstract Co-Author*)
Wang Hui (*Abstract Co-Author*)

PURPOSE

Contrast enhancement boost (CE-boost) is a postprocessing technique designed to increase the degree of contrast enhancement on contrast-enhanced CT. This study aimed to investigate the impact of the CE-boost technique on image quality and diagnostic accuracy in low-dose, low-contrast medium CT angiography (CTA) of the lower extremities.

METHODS AND MATERIALS

Twenty-one patients with peripheral arterial disease who underwent lower extremity CTA and DSA were prospectively enrolled. This lower extremity CTA protocol was optimized to minimize radiation dose and contrast medium volume, using a 320-detector CT scanner (Aquilion ONE Genesis Edition, Canon Medical Systems, Japan). The scan parameters were as follows: 80 kV, variable helical pitch (VHP) scanning, and bolus tracking with a trigger ROI placed in the popliteal artery, alongside a personalized body surface area (BSA) based contrast injection protocol (11gI/m2). CE-boost images were generated and compared with the original CTA images. Qualitative parameters, including overall image quality, diagnostic confidence, distal vessel visualization, were rated by two radiologists independently according to a five-point scale. Quantitative parameters, including the CT value, noise, signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) were computed and compared.

RESULTS

The average effective radiation and contrast medium doses for this protocol were 0.83 ± 0.17 mSv and 49.00 ± 5.07 mL, respectively. The CE-boost images demonstrated significantly higher CT values, SNRs, and CNRs compared to the original images (all $p < 0.05$). Moreover, when evaluating image quality characteristics, CE-boost images received significantly higher scores than the original images (all $p < 0.05$). The CE-boost images exhibited fewer non-diagnostic segments (CT values <200 HU, 2.8% vs. 11.4%, $p = 0.02$) and suboptimal segments (CT values<350 HU, 26.7% vs. 51.4%, $p<0.001$) compared to the original images. In terms of diagnostic performance, the segment-based analysis indicated no significant difference between these two groups (all $p >0.05$).

CONCLUSION

CE-boost technology significantly improves both objective and subjective image quality in optimized, submillisievert lower extremity CTA while preserving diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

CE-boost can significantly improve image quality in submillisievert lower extremity CTA without requiring any additional scanning settings or modifications to the clinical workflow.

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S4-STCE1

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Sunday, Nov. 30 1:15PM - 1:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

S4-STCE1-1 RADIOLOGIST-INDUSTRY COLLABORATION IN DEVELOPING AND DEPLOYING AN EFFICIENT CLICKABLE REPORTING TOOL FOR SCREENING MAMMOGRAPHY: REAL-WORLD EVIDENCE OF WORKFLOW IMPACT

Matthew McCabe, PhD (*Presenter*)
Jason R. Sinner, MD (*Abstract Co-Author*)
Linda R. Greer, MD (*Abstract Co-Author*)
Denise M. Reddy, MD (*Abstract Co-Author*)
Leeann Louis, BS, PhD (*Abstract Co-Author*)
Christoph I. Lee, MD,MS (*Abstract Co-Author*)
Diana S. Buist, PhD,MPH (*Abstract Co-Author*)
Edgar Wakelin (*Abstract Co-Author*)
Bryan Haslam, PhD (*Abstract Co-Author*)

PURPOSE

Screening mammography volumes continue to increase while radiologist availability remains limited, creating workflow challenges that can lead to fatigue and burnout. Through radiologist-industry collaboration, an Efficient Clickable Reporting Tool (ECRT) was co-developed to address reporting inefficiencies identified by practicing radiologists. This study evaluates the real-world impact of this collaborative innovation on mammography read times following large-scale clinical deployment.

METHODS AND MATERIALS

The ECRT emerged from radiologist-identified workflow pain points and was refined through iterative industry collaboration to create a standardized clickable interface with keypad shortcuts, eliminating dictation dependency. The tool was originally developed at a radiology practice in Maryland, and was then deployed across 12 Arizona imaging facilities to rigorously assess its impact on radiologists in the real world. Read times were measured before (Aug 2023-Aug 2024, n=15,685 exams) and after (Sept 2024-July 2025, n=15,943 exams) implementation. Analysis included 9 radiologists reading >100 mammograms in both periods. Read times were calculated as intervals between consecutive exam signings, excluding <5 seconds or >5 minutes. Because read times are not normally distributed, a Generalized Linear Mixed Effects Model was used to assess the statistical significance of read time reduction before and after ECRT deployment while adjusting for radiologist variability and clinical case complexity factors including breast density, AI cancer suspicion levels, and recalls.

RESULTS

Post-ECRT deployment, we saw that the proportion of exams requiring less than 1.5 minutes to review and interpret increased from 39.9% to 49.2%. Model-adjusted results indicate ECRT significantly reduced read times by an average of 16% (95% CI: 5-26%, p=0.003). Additionally, 6 out of 9 radiologists improved significantly, with individual read-time reductions ranging from 5% to 28%. The tool continues to be rolled out to new locations and iteratively developed through continuous radiologist feedback and integration of AI.

CONCLUSION

Radiologist-industry collaboration successfully translated clinical workflow insights into a deployed technology solution, achieving measurable efficiency improvements. The partnership model enabled rapid iteration from concept to validated clinical tool with demonstrable real-world impact.

CLINICAL RELEVANCE/APPLICATION

This collaboration demonstrates how radiologist-driven innovation combined with industry development capabilities can address pressing workflow challenges at scale. The measured efficiency gains support sustainable screening mammography capacity as population demands increase.

S4-STCE1-2 ASSESSMENT OF LARGE MULTIMODAL REASONING MODEL PERFORMANCE AND CHAIN-OF-THOUGHT QUALITY IN CHEST RADIOGRAPH INTERPRETATION

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Subathra Adithan, MD (*Abstract Co-Author*)
Eun Kyoung Hong, MD, PhD (*Abstract Co-Author*)
Joong Yub Kim (*Abstract Co-Author*)
Seunghyeon Roh, MD (*Abstract Co-Author*)
Won Jung Kim, MD (*Abstract Co-Author*)
Meesun Lee, MD (*Abstract Co-Author*)
Si Mong Yoon (*Abstract Co-Author*)
Hyeontaek Hwang (*Abstract Co-Author*)
Elizabeth F. Sheybani, MD (*Abstract Co-Author*)
Madi Mikhayel (*Abstract Co-Author*)
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Si Mong Yoon (*Abstract Co-Author*)
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Mai-Lan Ho, MD (*Abstract Co-Author*)
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Michael Moritz, MD (*Abstract Co-Author*)
Pranav Rajpurkar, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate whether the industry general-purpose large reasoning model can achieve clinically meaningful performance in radiograph interpretation, we assess OpenAI's o3 on both diagnostic accuracy against radiology residents and quality of visual reasoning through comprehensive expert evaluation.

METHODS AND MATERIALS

We evaluated o3, a multimodal large reasoning model, on 300 chest radiographs through visual question-answering tasks, comparing performance to three radiology residents. Fourteen board-certified radiologists and pulmonologists evaluated the model's chain-of-thought processes on 100 cases. Assessment included question-answering accuracy, quantitative scoring using 5-point Likert scales, and qualitative textual feedback.

RESULTS

The model achieved 68.1% accuracy (95% CI: 63.0-73.2%), with no significant differences from any individual resident: Reader 1 (61.9% [95% CI: 0.563,0.675], p=0.127), Reader 2 (67.1% [0.62,0.725], p=0.856), or Reader 3 (72.6% [95% CI: 0.675,0.776], p=0.242). Average resident performance was 67.2% (95% CI: 61.9%, 72.5%). Expert radiologist evaluation revealed coherent visual reasoning with scores of 3.57±1.31 for consistent reasoning (Reasoning process matches answer), 3.39±1.36 for radiological logic (Thinks like a radiologist), 3.49±1.34 for visual-verbal correlation (Descriptions match what's actually visible), and 3.65±1.23 for clinical prioritization (Highlights what matters most). However, qualitative feedback identified persistent challenges including anatomical orientation errors, difficulty with support device identification, and tendency to repeatedly examine incorrect regions.

CONCLUSION

While o3 achieves resident-level diagnostic accuracy, the gap between high performance and moderate reasoning scores reveals that correct conclusions can emerge despite suboptimal diagnostic pathways. This finding underscores that chain-of-thought transparency is essential for identifying when AI reasoning processes require refinement before broader clinical deployment, even when diagnostic outcomes appear satisfactory.

CLINICAL RELEVANCE/APPLICATION

The transparent reasoning process demonstrated by o3 enables clinical deployment in supervised settings where radiologists can verify diagnostic logic, offering particular value for quality assurance and residency education where understanding the reasoning behind interpretations is as crucial as the diagnosis itself.

S4-STCE1-3 RADIATION SAFE NEUROINTERVENTIONS WITH CNT MULTI BEAM X-RAY: AN ACADEMIC-INDUSTRY PATHWAY TO NEXT-GENERATION IMAGING

Jinho Choi (*Presenter*)
Hanna Lee, BS, MS (*Abstract Co-Author*)
Jaeik Jung (*Abstract Co-Author*)
Seung Jun Yeo (*Abstract Co-Author*)
Seung Hoon Kim (*Abstract Co-Author*)
Jehwang Ryu, PhD (*Abstract Co-Author*)

PURPOSE

In this academic-industry collaboration, we aim to integrate a novel carbon nanotube (CNT) multi-beam X-ray system into clinical practice by focusing on radiation dose reduction. This follow-up to a RSNA2024 phantom study evaluates whether pulsed, low-dose emission from X-ray source based on CNT technology can significantly reduce operator and patient exposure during prolonged neurointerventional procedures without compromising image quality. We also assess the system's miniaturized design for use in operating room (OR).

METHODS AND MATERIALS

A prototype CNT X-ray tube was integrated with an angiographic head phantom to simulate neurointerventional procedures. We measured radiation dose metrics (dose-area product and entrance skin dose) and scatter at the operator position under various digital pulsing protocols (different pulse widths and duty cycles), comparing them to a conventional continuous fluoroscopy system. Phantom images at each setting were analyzed for signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) to quantify image quality. The CNT unit's physical footprint and weight were documented relative to a standard X-ray system to evaluate space utilization benefits for hybrid ORs or mobile setups.

RESULTS

Under a 50% duty cycle pulsed mode, the CNT system reduced radiation dose by ~45-50% compared to conventional continuous X-ray, with a commensurate reduction in scatter to the operator. Image quality was preserved: SNR and CNR remained equivalent to the conventional system across pulse settings. The CNT X-ray source was also ~70-75% smaller in volume and 45-50% lighter than a standard 120 kV tube, enabling easy integration into confined clinical spaces such as mobile C-arms, bedside imaging units.

CONCLUSION

This collaboration demonstrates that a CNT multi-beam X-ray system can substantially lower radiation exposure during interventional fluoroscopy without loss of image quality. The system's digitally pulsed operation and compact design make it well-suited for clinical integration, potentially enhancing safety and workflow in neurointerventional suites.

CLINICAL RELEVANCE/APPLICATION

By reducing radiation exposure to patients and staff while maintaining image quality, this CNT-based fluoroscopy technology can improve safety in neurointerventional procedures that require long fluoroscopy times. Its small footprint and low power needs enable use in modern hybrid ORs and even at the bedside, exemplifying the effective translation of an innovative imaging technology into clinical practice.

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S4-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Sunday, Nov. 30 1:15PM - 1:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

S4-STCE2-2 DIAGNOSTIC VALUE OF PHOTON-COUNTING CT LOW-DOSE SCANNING COMBINED WITH ITERATIVE ALGORITHMS IN SMALL INTESTINAL DISEASES

Wenjie Zhang (*Presenter*)

PURPOSE

To investigate the diagnostic value of low-dose scanning with photon-counting detector CT (PCD-CT) combined with iterative algorithms in small bowel enterography.

METHODS AND MATERIALS

Patients undergoing small bowel CT enterography were randomly divided into group A and group B. Group A with conventional dose in three phases, while group B in three phases on PCD-CT, with the venous phase dose being half of that in the arterial phase. The diagnostic accuracy of low-dose images for small bowel diseases was evaluated through objective and subjective image analysis of the two groups. Meanwhile, in group B, six sets of venous phase images were obtained by changing different convolution kernels (Bv40, Bv44, Bv48) and quantum iterative reconstruction (QIR3, QIR4) algorithms to explore the optimal reconstruction parameters for diagnosing small bowel diseases.

RESULTS

A total of 100 patients were included, including 48 cases of inflammatory bowel disease, 20 cases of small bowel tumor diseases, and 32 normal cases. The total radiation dose in group A was 21.45 ± 4.46 mSv, and that in group B was 17.18 ± 4.47 mSv. The radiation dose in group B was approximately 20% lower than that in group A, with a significant difference ($P < 0.05$). There were no significant differences in CT values of the intestinal wall and subcutaneous fat, signal-to-noise ratio, and contrast-to-noise ratio between the arterial and venous phase images of group A and group B ($P > 0.05$). Among the six sets of images in group B, there were no significant statistical differences in image noise, signal-to-noise ratio, and contrast-to-noise ratio between the Bv40 Q3 group and Bv40 Q4 group and the venous phase images of group A ($P > 0.05$), while there were significant statistical differences between the Bv44 Q3 group, Bv44 Q4 group, Bv48 Q3 group, and Bv48 Q4 group and the images of group A ($P < 0.05$). Among them, the image quality of the Bv40 Q3 group was the highest, with a high-quality image rate of 78%.

CONCLUSION

Low-dose scanning with PCD-CT combined with iterative algorithms for small bowel enterography is feasible and can significantly reduce radiation dose without affecting image quality.

CLINICAL RELEVANCE/APPLICATION

Achieving more accurate diagnostic performance under low-dose conditions helps in the decision-making of clinical treatment plans and the evaluation of disease recurrence.

S4-STCE2-3 FEASIBILITY AND DIAGNOSTIC PERFORMANCE OF GADOXETIC ACID-ENHANCED LIVER MRI AT ULTRA-HIGH-FIELD5T

Yuan-Cheng Wang, MD, PhD (*Presenter*)
Tong Wu (*Abstract Co-Author*)
Jiaqi Wang (*Abstract Co-Author*)
Ran Tang (*Abstract Co-Author*)
Zi Ying Sun (*Abstract Co-Author*)

PURPOSE

This study was aimed to evaluate the feasibility and diagnostic performance of ultra-high-field magnetic resonance imaging (MRI) in clinical liver imaging.

METHODS AND MATERIALS

This retrospective study enrolled 63 patients undergoing gadoxetic acid-enhanced hepatic MRI on a 5T whole-body MR scanner between April and June 2025. Fat-saturated 3D T1-weighted images of pre-contrast, early arterial, late arterial, portal venous, transitional, and hepatobiliary phase were evaluated independently by three experienced radiologists utilizing 4-point Likert scales for: overall image quality, enhancement fidelity, vascular delineation, artifacts and diagnostic confidence.

RESULTS

Of all patients, 62 (98%) were successfully performed liver MRI examinations with only one patient failing to complete the enhanced scan due to post-contrast breath-holding difficulties. More than 85% of the T1WIs were rated as good quality (3 or 4 point) with minimal artifacts except in the dual-arterial phases. Notably, in the challenging arterial phase, over 60% of images achieved good image quality and mild artifact. Enhanced images exhibited favorable vascular enhancement delineation, with particularly outstanding performance in the portal venous, transitional, and hepatobiliary phases - where over 80.7% of images scored =3. The overall diagnostic confidence score was 3.26 (on a 4-point scale).

CONCLUSION

At 5T, gadoxetic acid-enhanced liver MRI demonstrated diagnostically superb image quality with mild artifacts and definitive diagnostic confidence, revealing the potential clinical benefits of ultra-high-field abdominal imaging.

CLINICAL RELEVANCE/APPLICATION

The successful implementation of 5T gadoxetate-enhanced liver MRI confirms the clinical feasibility at ultra-high-field. The inherent properties of high-field MRI systems may offer additional potential for contrast-enhanced abdominal imaging. The elevated magnetic field strength at 5T prolongs T1 while accelerating T2/T2* relaxation, enabling reduced repetition times to maintain T1 contrast, which may enable lowered dose of contrast agent but achieve satisfied contrast. Additionally, the inherent SNR gain facilitates higher-resolution imaging within equivalent scan times, enhancing detection of subtle abdominal lesions.
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S5-SSBR02

Breast Imaging (Breast Cancer Risk Prediction)

Sunday, Nov. 30 2:30PM - 3:30PM Room: S406A

Rachel F. Brem, MD (*Moderator*)
Derek L. Nguyen, MD (*Moderator*)

Sub-Events

S5-SSBR02-1 COMPARING HIGH RISK ESTIMATIONS USING VOLUMETRIC BREAST DENSITY WITH TYRER-CUZICK AND BOADICEA RISK MODELS

Stamatia V. Destounis, MD (*Presenter*)
Brian Drohan, PhD (*Abstract Co-Author*)
Jessica Salamone, MS (*Abstract Co-Author*)
Andrea L. Arieno, BS (*Abstract Co-Author*)
Melissa L. Hill, PhD (*Abstract Co-Author*)

PURPOSE

Recent NCCN guidelines emphasize including breast density in breast cancer risk assessment, traditionally centered on family history (FHx). This study compares how volumetric breast density (VBD) affects high-risk classification using Tyrer-Cuzick (TC) and BOADICEA (BA) models. BA now includes VBD and a more detailed FHx component with additional genes and SNPs not captured in TC.

METHODS AND MATERIALS

Risk factor data were collected during screening mammography from 12/1/2024 to 4/30/2025. Women aged 40-75 with no prior history of breast cancer were included. VBD was calculated using Volpara Imaging Software (v3.4 & 3.5). Lifetime risk was assessed using TC v8 with and without competing mortality (CM) and BA v7.3. High risk was defined as lifetime risk =20%, using the default age of 85 for TC and age 80 to align with BA. Relative risk (RR) contributions from VBD and FHx were derived from model outputs. FHx RR was calculated as the ratio of lifetime risk using only FHx inputs to baseline population risk.

RESULTS

A total of 44,651 women met inclusion criteria. The percentage classified as high risk was 9.8% (BA), 14.8% (TC with CM at age 80), and 19.1% (TC with CM). Without CM, TC classified 27.4% as high risk at age 85 and 19.0% at age 80. Mean RR due to density was higher in TC (1.21) than BA (1.16; $p < 2.2e-16$). Similarly, RR due to FHx was higher in TC (1.21 vs. 1.17; $p < 2.2e-16$). Among patients identified as high risk by TC, 1,269 (2.8%) had a FHx that did not significantly increase their risk, based on model-calculated RR from FHx. These women were still classified as high risk due to elevated breast density, with a mean density RR of 2.25. A similar group was found in the BA model, comprising 1,053 women (2.4%) whose FHx contributed little or no increased risk, but who had high density-related risk (mean density RR = 2.26).

CONCLUSION

TC identified more women as high risk, largely due to greater influence from VBD and FHx inputs. BA classified fewer patients as high risk without strong FHx, requiring greater VBD RR to offset a more protective family history.

CLINICAL RELEVANCE/APPLICATION

Tyrer-Cuzick and BOADICEA are both recommended models for calculating lifetime breast cancer risk according to multiple guidelines and societies. As guidelines evolve and high risk screening choices are driven by risk model outputs, more informed choices around which models to use will be key and data around how the models are working are necessary to align with clinical judgement and screening goals.

S5-SSBR02-2 IMAGE-ONLY AI MODEL COMPARED WITH BREAST DENSITY FOR IDENTIFYING WOMEN AT 5-YEAR INCREASED RISK OF BREAST CANCER: MULTICENTER U.S.-EUROPEAN ANALYSIS

Christiane K. Kuhl, MD, PhD (*Presenter*)
Constance D. Lehman, MD, PhD (*Abstract Co-Author*)
David Miller (*Abstract Co-Author*)
Mark Scully (*Abstract Co-Author*)
Emily Hipp (*Abstract Co-Author*)
Elizabeth A. Morris, MD (*Abstract Co-Author*)
Toni W. Vomweg (*Abstract Co-Author*)
Lora D. Barke, DO (*Abstract Co-Author*)
Louie Enriquez, MD, JD (*Abstract Co-Author*)
Philippe Raffy, PhD (*Abstract Co-Author*)

PURPOSE

To compare an image-only AI model performance with that of breast density in stratifying 5-year breast cancer risk, and to assess whether AI-derived risk adds predictive value beyond density in a large, diverse international screening population.

METHODS AND MATERIALS

The AI model was trained on 421,499 mammograms from 27 facilities in Europe, South America, and the U.S., using a deep convolutional neural network and calibrated on an independent test set to generate 5-year risk probabilities. We applied the model to a cohort of 245,344 bilateral 2D screening mammograms (236,442 from five U.S. sites; 8,810 from one European site) acquired from 2011-2017. Radiologist-reported breast density (dense vs. not dense) was extracted from medical records and five-year cancer outcomes from tumor registries. AI-predicted risks were categorized using NCCN thresholds: average (<1.7%), intermediate (> 1.7-3.0%), and high (> 3.0%). Univariable and multivariable time-to-event models accounting for interval censoring were fit to obtain hazard ratios (HRs) for AI risk and breast density.

RESULTS

Breast density alone was associated with modestly increased cancer risk (HR 1.16, 95% CI 1.11-1.22). Relative to average risk, HRs were 2.06 for intermediate (95% CI 1.93-2.20) and 4.49 for high risk (95% CI 4.24-4.76), regardless of density. When both factors were considered together, the increased risk for breast density adjusted for AI risk was 1.12 (95% CI 1.07-1.17), and the increased risks for AI intermediate and high-risk categories adjusted for density were 2.04 (95% CI 1.92-2.18) and 4.47 (95% CI 4.22-4.73), respectively. Thus, accounting for breast density, shifting from average to intermediate AI risk is associated with a twofold increase in cancer risk, while moving to high risk increases risk more than fourfold. In contrast, the increased risk for breast density adjusting for AI risk is minimal.

CONCLUSION

While breast density remains an important factor in breast cancer screening, particularly for its role in masking cancers, this large-scale analysis shows that an image-only AI model offers more precise risk stratification for 5-year cancer prediction and provides additional predictive value, including in dense-breasted women. These findings support its use as a complement to traditional markers for guiding personalized screening.

CLINICAL RELEVANCE/APPLICATION

AI-derived image-based risk assessment can enhance decision-making in screening programs by identifying women at increased 5-year risk, including those with dense breasts, where cancer risk and detection challenges often coexist. Used alongside density, this approach may better inform supplemental imaging and prevention strategies.

S5-SSBR02-3 ROBUSTNESS OF AN AI SHORT-TERM BREAST CANCER RISK MODEL IN A CLINICAL SETTING WITH DIVERSE MAMMOGRAPHY MODALITIES: PRELIMINARY RESULTS

Georgia G. Spear, MD (*Presenter*)
Mohamed Abdolell, MSc, BSc (*Abstract Co-Author*)
Laurie R. Margolies, MD (*Abstract Co-Author*)
Katharine Yao, MD (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the clinical performance of an AI image-based short-term breast cancer risk prediction model within a routine mammography screening program. Specifically, it assesses the discriminatory accuracy of the model to determine its performance in clinical practice, in the context of a mix of mammography unit models.

METHODS AND MATERIALS

The study is a retrospective analysis of a cohort of patients in an urban breast screening program. Participants included women screened between May 2017 and April 2022, excluding those with breast implants or incomplete standard mammographic imaging sets (RCC, RMLO, LCC, LMLO). Controls required a subsequent negative screening mammogram at least one year following the index examination, without censoring. Data collection included index screening mammograms, clinical outcomes, and study processing outputs such as breast density evaluations, image quality scores, and risk assessments. Preliminary analyses focused on evaluating discrimination, using a subset comprising 1562 breast cancer cases and 9574 controls. The performance of the image-based model (Mirai) was assessed via Area Under the Receiver Operating Characteristic Curve (AUC), evaluated across intervals ranging from 1 to 5 years post-screening and stratified by mammography machine type.

RESULTS

A total of 11,136 mammograms were analyzed, including 3850 Selenia FFDM, 1773 C-View synthetic 2D images, and 5513 Intelligent2D synthetic images. The Mirai model exhibited strong overall discriminatory performance, demonstrating consistent accuracy across various imaging types. Notably, the model, originally trained on FFDM images, showed comparable efficacy when applied to synthetic 2D images. The 2-year AUCs for the risk model were statistically significantly different between the machine types (p-val=0.002). Annual AUC measurements (1- to 4-year intervals) confirmed sustained predictive accuracy, indicating robust performance across different clinical scenarios and imaging modalities.

CONCLUSION

This study demonstrates that the Mirai image-based breast cancer risk prediction model maintains high discriminatory accuracy within a real-world clinical screening environment. The results support its integration into clinical workflows, potentially enabling more personalized, efficient, and scalable breast cancer screening strategies.

CLINICAL RELEVANCE/APPLICATION

Adopting image-based breast cancer risk prediction models could significantly streamline screening workflows. This approach promises a practical, robust, and scalable short-term risk solution for personalized breast cancer screening protocols that may complement traditional lifetime risk models.

S5-SSBR02-4 ADDED VALUE OF BREAST CANCER RISK PREDICTION VERSUS DETECTION OVER A TWO-YEAR TIME PERIOD WITH MAMMOGRAPHY

Yao-Kuan Wang, MSc (*Presenter*)
Lesley Cockmartin, PhD, MSc (*Abstract Co-Author*)
Tobias Wagner (*Abstract Co-Author*)
Zan Klanecek (*Abstract Co-Author*)
Nicholas Marshall (*Abstract Co-Author*)
Valerie Jeanne Marie Celis (*Abstract Co-Author*)
Chantal van Ongeval, MD (*Abstract Co-Author*)
Andrej Studen (*Abstract Co-Author*)
Robert Jeraj, PhD (*Abstract Co-Author*)
Hilde Bosmans, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the added value of risk prediction compared to detection, using publicly available and commercial models, over a two-year screening interval with mammography.

METHODS AND MATERIALS

This retrospective study used the Swedish case-control screening dataset, CSAW-CC (2008-2016, Hologic). First-time invasive and in situ cancers were included, with interval cancers defined as time-to-diagnosis > 6 months. Four models were included: Mirai risk predictor, RSNA CAD (winner of 2023 RSNA Breast Cancer Detection Challenge), and Transpara Detection and Risk (ScreenPoint Medical). Predictions of 2-year cancer onset were compared using the area under the receiver operating characteristic curve (AUC) in detection (screen-detected and interval cancers) and risk (interval cancers only) regimes. AUCs were compared via the DeLong test and bootstrap. Operating points were set based on a double-reading true positive rate (TPR) in the detection regime, and a 10% recall rate in the risk regime.

RESULTS

A total of 24,647 exams from 8,697 women were included. Within them, 741 exams developed cancer within 2 years (78 in situ, 650 invasive, 13 unknown), 524 screen-detected and 217 interval cancers, resulting in a TPR of 71%. For the detection regime, Transpara Detection and Risk outperformed RSNA CAD and Mirai, with AUCs of 0.92 (0.91-0.93) and 0.92 (0.91-0.93) vs. 0.90 (0.88-0.91) and 0.86 (0.84-0.87), all p < 0.001. Transpara Detection and Risk performed similarly (p: 0.83), and showed no differences across in situ and invasive cancers (p: 0.11 and 0.44). However, RSNA CAD and Mirai performed better for in situ than invasive cancers (p: 0.008 and <0.001). For the risk regime, Transpara Risk demonstrated the best performance, with an AUC of 0.81 (0.79-0.84), all p < 0.001. Interestingly, Transpara Detection showed no difference compared to Mirai and outperformed RSNA CAD, with AUCs of 0.76 (0.73-0.79) vs. 0.75 (0.72-0.78) and 0.72 (0.69-0.76), p: 0.55 and

0.01. After setting operating points, in the detection regime, Transpara Detection achieved the lowest false positive rates (FPR) of 2.84%, similar to 3% in European screening. In contrast, Transpara Risk, RSNA CAD, and Mirai had higher FPRs of 5.9%, 5.8%, and 15.2%. In the risk regime, Transpara Risk achieved the best TPR of 49% for interval cancers, while Transpara Detection, RSNA CAD, and Mirai had TPRs of 41%, 37%, and 33%.

CONCLUSION

Detection models excelled in screen-detected cancers, while risk models performed better for interval cancers. Further research on combining both models for screening or referral for supplemental screening is needed.

CLINICAL RELEVANCE/APPLICATION

A risk model adds value to screening by improving interval cancer detection, although it is associated with higher false positive rates.

S5-SSBR02-5 EXTERNAL VALIDATION OF DISCRIMINATION AND CALIBRATION OF AN IMAGE-ONLY AI MODEL FOR 5-YEAR BREAST CANCER RISK PREDICTION ACROSS GEOGRAPHICALLY DIVERSE SCREENING SITES

Constance D. Lehman, MD, PhD (*Presenter*)
David Miller (*Abstract Co-Author*)
Emily Hipp (*Abstract Co-Author*)
Mark Scully (*Abstract Co-Author*)
Lora D. Barke, DO (*Abstract Co-Author*)
Louie Enriquez, MD, JD (*Abstract Co-Author*)
Christiane K. Kuhl, MD, PhD (*Abstract Co-Author*)
Elizabeth A. Morris, MD (*Abstract Co-Author*)
Toni W. Vomweg (*Abstract Co-Author*)
Philippe Raffy, PhD (*Abstract Co-Author*)

PURPOSE

Early identification of women at elevated breast cancer risk is critical for personalized early detection and risk reduction strategies. We aimed to externally validate an image-only AI model for 5-year breast cancer risk prediction using independent and geographically diverse U.S. screening mammography data, and to assess calibration performance critical for clinical deployment.

METHODS AND MATERIALS

The AI risk model was developed on 421,499 mammograms from 27 facilities in Europe, South America, and the U.S., using a deep convolutional neural network, and was calibrated via an independent test set to generate 5-year risk probabilities. We measured external validation performance on 122,993 consecutive full-field digital screening mammograms (RCC, LCC, RMLO, LMLO) from 67,776 patients acquired from 10 facilities across four geographically diverse U.S. health systems (2011-2017). All bilateral screening mammograms were included, without exclusions for implants. All mammograms were unseen during model training and internal testing and evaluated only after model finalization. Age, self-reported race/ethnicity, and cancer outcomes within the 5-year follow-up period after the index mammogram were extracted from health records and tumor registries. Discrimination was quantified via traditional AUC and the more conservative time-dependent AUC(t), suitable for time-to-event outcomes. Calibration was evaluated by mean calibration error across risk deciles.

RESULTS

The cohort included 2,584 cancer-positive exams (2.1%). Overall AUC computed on exams with known outcome over the 5-year period (n=69,120) was 0.72 (95% CI: 0.71 - 0.73) with site-specific estimates between 0.69 and 0.73. Overall AUC(t) was 0.70 (95% CI: 0.69-0.72) with site-specific estimates between 0.68 and 0.72. Average AI risk in the 10 deciles ranged from 0.88% to 8.45% compared to observed risks of 0.69% to 8.60%. The mean miscalibration error was an underestimate of 0.11% with all errors smaller than an underestimate of 0.34% or an overestimate of 0.19%.

CONCLUSION

The image-only AI model achieved robust calibration and exceeded pre-specified discrimination targets when applied to fully external, geographically diverse U.S. screening data. These findings support its readiness for clinical integration and prospective validation in clinical practice.

CLINICAL RELEVANCE/APPLICATION

Accurate calibration ensures that AI-derived risk estimates are reliable to support personalized screening and risk reduction interventions as recommended by clinical practice guidelines. External validation of both discrimination and calibration is essential to translate AI breast cancer risk models into real-world practice.

S5-SSBR02-6 MULTIMODAL AI MODEL BREAST CANCER RISK PREDICTION: PERFORMANCE IN AN INCREASED GENETIC RISK COHORT

Laura Heacock, MD, MS (*Presenter*)
Yanqi Xu (*Abstract Co-Author*)
Jungkyu Park, MS (*Abstract Co-Author*)
Felicia Pasadyn, MA, BA (*Abstract Co-Author*)
Linda Moy, MD (*Abstract Co-Author*)
Krzysztof J. Geras (*Abstract Co-Author*)
Artie Shen (*Abstract Co-Author*)

PURPOSE

AI-based breast cancer risk prediction models have demonstrated superior accuracy to standard of care empirical risk models in general cohorts. The purpose of this study is to evaluate the performance of a multimodal long-term risk predictor including longitudinal mammography (FFDM), ultrasound (US) and breast MRI in an increased genetic risk cohort.

METHODS AND MATERIALS

The multimodal risk model was IRB-approved and developed using a dataset with 1,291,657 screening and diagnostic FFDM, digital breast tomosynthesis (DBT), US, and MRI exams from 2010-2022 in 274,388 patients (mean age 57.5, SD 12.1). The validated model was tested on a cohort with genetic mutations conferring intermediate to high lifetime risk of breast cancer (BRCA1/2, CHEK2, ATM, PALB2, TP53). Model estimates individualized 1-5 year breast cancer risk using modality-specific neural networks with a temporal transformer, and a risk prediction layer. Model performance was assessed with 2- and 5-year AUCs and concordance index (C-index); 95% CIs were computed via bootstrapping with 5000 iterations. Model performance on FFDM was compared to MIRAI model score on the same exam and the exam date Tyrer-Cuzick (T-C) score.

RESULTS

The increased risk genetic cohort consisted of 247 women, 1792 exams (55.0 ± 12.87), 16 cancers in patients with 5 year follow up. 45.3% (112/247) of women had dense breasts. The multimodal model had 2 year AUROC of 0.739 [0.656, 0.820], 5 year AUROC of 0.761 [0.698, 0.820] and C-index of 0.701 [0.643, 0.758], compared to MIRAI 2 year AUROC of 0.611 [0.586, 0.752], 5 year AUROC of 0.644 [0.591, 0.712] and C-index of 0.619 [0.518, 0.721]. The Tyrer-Cuzick model had 2 year AUROC of 0.389 [0.290, 0.492], 5 year AUROC of 0.505 [0.430, 0.579], and C-index of 0.454 [0.386, 0.524]. Model performance was better in non-dense breasts (2 year AUROC of 0.925 [0.826, 0.987], 5 year AUROC of 0.787 [0.681, 0.88] and C-index of 0.776 [0.692, 0.852]) than dense breasts (2 year AUROC of 0.618 [0.505 0.728], 5 year AUROC of 0.734 [0.652, 0.81] and C-index of 0.627 [0.552 0.703]).

CONCLUSION

Use of multimodal and longitudinal breast imaging has improved performance in a high-risk cohort compared to single timepoint FFDM-based AI models and empirical risk calculators that use breast density.

CLINICAL RELEVANCE/APPLICATION

In higher-risk populations, standard-of-care models fail to distinguish between patients who did and did not develop cancer, as all were uniformly labeled "high-risk". AI-based multimodal models can achieve finer risk stratification in this cohort.

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

S5-SSCA02

Cardiac Imaging (Improving Clinical Outcomes)

Sunday, Nov. 30 2:30PM - 3:30PM Room: S503

Whitney B. Edmister, MD, PhD (*Moderator*)
Vanessa M. Ferreira, MD, DPhil (*Moderator*)

Sub-Events

S5-SSCA02-1 MR IMAGING IN 7,324 PATIENTS WITH IMPLANTED CARDIAC DEVICES: A 10-YEAR RETROSPECTIVE COHORT EXPERIENCE

Arash Bedayat, MD (*Presenter*)
Pedram Keshavarz, MD (*Abstract Co-Author*)
Zahra Mohammadigoldar, MD (*Abstract Co-Author*)
Aileen Joy Salamanca Bayoneta (*Abstract Co-Author*)
Jungsik Seo (*Abstract Co-Author*)
J. Paul Finn, MD (*Abstract Co-Author*)
Noel Boyle (*Abstract Co-Author*)

PURPOSE

To evaluate the implementation and safety of a protocolized workflow for MR imaging in patients with cardiac implanted electronic devices (CIEDs) over a 10-year period at a large U.S. tertiary center.

METHODS AND MATERIALS

With IRB approval and HIPAA compliance, the retrospective cohort study included all CIED patients who underwent MRI from January 2015 to December 2024. Device type, lead configuration, and MRI-conditionality were reviewed via chest radiographs; complex cases were assessed by electrophysiologists. Scans were performed on 1.5T Avanto, Avanto FIT, or Sola scanners. Radiology nurse practitioner monitored cardiac rhythm; defibrillators and crash carts were present. MRI-conditional devices were set to protection mode, and tachycardia therapies were disabled in legacy systems. Post-scan device checks were mandatory, and any immediate adverse effects, such as rhythm changes, device rebooting, or device non-function, were documented.

RESULTS

A total of 7,324 patients (mean age of 70.5 years, intra quartile range [IQR]: 64-81 years, 60.4% male) underwent MRI during the study period. Annual exam volume increased significantly from 181 in 2015 to 1,224 in 2024, with average monthly volumes rising from 15 to 102. Among all patients, 44.8% (3,280/7,324) had non-MRI-conditional devices, and 25.5% (1,866/7,324) were device-dependent. Most common clinical indications were neurologic (54.3%, 3,975/7,324), gastrointestinal/genitourinary (GI/GU) (16.4%, 1,200/7,324), cardiac (15.6%, 1,146/7,324), musculoskeletal (11.2%, 819/7,324), and others (2.5%, 184/7/324). Device-related issues were documented in 14.4% (1,056/7,324) of cases; the two most frequently encountered issues involved active CIEDs with epicardial leads (6.2%, 66/1,056) and active CIEDs with abandoned transvenous or epicardial leads (3.9%, 41/1,056). Despite these device-related issues, no major adverse events were reported. The center maintains up to twenty dedicated outpatient time slots weekly for patients with CIEDs, resulting in a waiting list of approximately 6-8 weeks.

CONCLUSION

This study demonstrates that a standardized workflow with proper device evaluation, safety measures, and interdisciplinary collaboration enables safe MRI in patients with cardiac devices, including legacy and non-MRI-conditional systems.

CLINICAL RELEVANCE/APPLICATION

These findings support the safe and necessary expansion of MRI access for patients with cardiac implanted electronic devices, including those with legacy systems. Broader adoption of standardized workflows across institutions can improve diagnostic accuracy, facilitate timely clinical decision-making, and promote equitable care for this high-risk and historically underserved population.

S5-SSCA02-3 SOCIOECONOMIC AND RACIAL DISPARITIES IN CORONARY CT ANGIOGRAPHY OUTCOMES: A RETROSPECTIVE COHORT ANALYSIS FROM 2015-2024

Mehrad Rokni, MD (*Presenter*)
Kamhung Lam (*Abstract Co-Author*)
Linh Vo (*Abstract Co-Author*)
Michelle Wang (*Abstract Co-Author*)
Majid Hassan, MD (*Abstract Co-Author*)
Sofiya Ghazaryan (*Abstract Co-Author*)
Shotaro Naganawa, MD, PhD (*Abstract Co-Author*)
Misagh Piran, MD (*Abstract Co-Author*)
Ahmadreza Ghasemiesfe, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of socioeconomic status (SES), race, income, and other social determinants on Coronary CT Angiography (CCTA) outcomes in adults aged 40-79, alongside traditional cardiovascular risk markers.

METHODS AND MATERIALS

We retrospectively analyzed 1,171 patients (median age: 63; 50% female) who underwent CCTA between 2015-2024. SES was assessed using median income (<$50k, $50-99.9k, $100-149.9k, =$150k) and zip code-level GINI index. Additional predictors included race, ethnicity, marital and retirement status, smoking, diabetes, hypertension, BMI, triglycerides, HDL, and total cholesterol. Primary outcomes were ASCVD risk score (n=1171), coronary artery calcium score (n=478), and CAD-RADS (n=945). ANOVA, linear regression, and ordinal logistic regression were performed ($p<0.05$).

RESULTS

Lower income, African American or Hispanic race/ethnicity, and widowed or retired status were independently associated with worse outcomes: higher ASCVD risk, coronary artery calcium score, and CAD-RADS category ($p<0.001$). The median calcium score was 350 in the <$50k income group compared to 240 in the =$150k group, with median ASCVD risk scores of 14% and 9%, respectively. CAD-RADS 4A/4B was observed in 20% of patients in the <$50k group versus 10% in the =$150k group. Higher income and HDL levels were predictive of lower ASCVD risk and imaging scores, whereas higher GINI index, BMI, and triglycerides were associated with worse outcomes ($p<0.05$).

CONCLUSION

Socioeconomic and racial disparities significantly affect CCTA outcomes beyond traditional cardiovascular risk factors, with worse outcomes defined as ASCVD risk =7.5%, calcium scores =300, and CAD-RADS =4.

CLINICAL RELEVANCE/APPLICATION

Integrating SES and social determinants into cardiovascular risk stratification is essential. Targeted interventions, such as affordable CCTA screenings in low-income areas or culturally tailored educational programs for underserved racial/ethnic groups, could reduce disparities in cardiovascular outcomes.

S5-SSCA02-4 IMPACT OF READER EXPERIENCE ON CAD-RADS 2.0 AND ITS CORRELATION WITH CT-DERIVED FFR

Jonas Heinrich Lund, MD (*Presenter*)
Mathias Meyer, MD (*Abstract Co-Author*)
Thomas Henzler, MD (*Abstract Co-Author*)
Gerhard B. Adam, MD (*Abstract Co-Author*)
Enver G. Tahir, MD (*Abstract Co-Author*)
Isabel Molwitz, MD, MBA (*Abstract Co-Author*)
Jennifer Erley, MD (*Abstract Co-Author*)

PURPOSE

To assess how the level of reader experience impacts the reliability of the Coronary Artery Disease Reporting and Data System (CAD-RADS) 2.0 and its relationship with obstructive coronary artery disease (CAD), as assessed by non-invasive CT-derived fractional flow reserve (CT-FFR).

METHODS AND MATERIALS

Patients undergoing CCTA using third-gen dual-source CT were included. Four readers with varying experience in cardiac imaging (Level I: first-/third-year resident, Level II, Level III-certified) assessed the visual stenosis category (CAD-RADS 0 to 5). After = 30 days, each reader performed a blinded second read to assess intra-observer reliability. Inter- and intra-observer agreement was evaluated using intraclass correlation coefficients (ICC). CT-FFR was computed via machine learning. CAD-RADS & CT-FFR were correlated using Spearman's rank.

RESULTS

100 patients (29% female, age 63 ± 12 years) with median Agatston score of 267 and plaque burden of P2 were included. Inter-observer agreement was good for CAD-RADS on a per-patient and per-vessel basis (ICC = 0.69-0.77). For CAD-RADS >2 (functional testing threshold), experienced readers (Level II & III) upgraded 44% of stenoses (e.g. CAD-RADS 2 to 3) and downgraded 56% (e.g. CAD-RADS 4A to 3) compared to less experienced (Level I) readers. Intra-observer reliability varied by experience, with good agreement among less experienced readers (ICC = 0.77-0.84) and excellent agreement among experienced readers (ICC = 0.96-1.00). CAD-RADS and CT-FFR showed a strong inverse correlation in experienced readers (? = -0.96 for LM, -0.88 for LAD, -0.95 for LCX, -0.85 for RCA). Correlations for a Level I reader were worse (? = -0.53 for LM, -0.76 for LAD, -0.54 for LCX, 0.57 for RCA, $p < 0.001$). Reclassification of CAD-RADS between experienced and less experienced readers was linked to CT-FFR differences. Stenoses that were downgraded by experienced readers had higher CT-FFR (0.85 ± 0.11 vs 0.75 ± 0.07; $p = 0.008$), stenoses that were upgraded had significantly lower CT-FFR values ($p<0.01$).

CONCLUSION

Experience impacts CAD-RADS 2.0 category and correlation with CT-FFR, with higher inter- and intra-reader agreement among experienced readers. Less experienced readers tend to overestimate stenoses, potentially causing unnecessary ICA referral instead of functional testing. Thus, our findings indicate that advanced readers identify ischemic CAD based on CT-FFR better.

CLINICAL RELEVANCE/APPLICATION

Our findings highlight the impact of reader experience in interpreting CAD-RADS 2.0. Reclassifications by experienced readers were aligned with functional assessment using CT-FFR, supporting better identification of hemodynamically relevant CAD and more accurate, cost-effective patient management.

S5-SSCA02-5 CARDIAC MRI MONITORING IN ACUTE MYOCARDITIS: PREDICTING OUTCOMES THROUGH SERIAL IMAGING

Anna Palmisano, MD (*Presenter*)
Elisa Bruno (*Abstract Co-Author*)
Davide Vignale (*Abstract Co-Author*)
Marco Gatti, MD (*Abstract Co-Author*)
Nicola Galea, MD (*Abstract Co-Author*)
Riccardo Faletti, MD (*Abstract Co-Author*)
Antonio Esposito, MD (*Abstract Co-Author*)

PURPOSE

Myocarditis is a common disease at risk of chronic progression. Aim is to assess MRI parameters changes during serial monitoring in patients with acute myocarditis (AM) and their prognostic implication for prediction of major adverse cardiac events (MACE).

METHODS AND MATERIALS

In this prospective multicenter study, patients with MRI confirmed AM between 2016 to 2020 underwent serial MRI: at baseline (6 [interquartile range (IQR), 3-10] days after symptom onset), short-term (median 36 [IQR, 33-42] days) and long-term (392 [IQR, 358-435] days). Cardiac MRI parameters including mapping were evaluated. MACE at 5 years follow-up were collected.

RESULTS

A total of 105 patients (age 38 [IQR, 28-45 years]; men 75, 71%) were enrolled. Infarct-like clinial presentation (80, 76%) was the most common, was followed by heart failure (18, 17%) and arrhythmia (7, 7%). MACE occurred in 20/105 patients (28.5%). Persistence of active disease using LLc 2018 was found in 91% (87) of patients at short-term and 61.5% (48) of patients at long-term MRI. Lateral LGE pattern was associated to better prognosis (HR [95% CI]= 0.19 [0.09;0.38]; p-value<.0001), while scar burden at long-term MRI was associated to MACE (HR[95% CI]=1.15 [1.07;1.24];p-value<.001). Native T1 at short-time MRI (HR[95% CI]=1.02[1.01;1.02];p-value<.0001) and T2 mapping at long-term MRI (HR[95% CI]=1.27[1.07;1.52];p-value:.006) resulted independent predictors of events at multivariate analysis. MRI parameters changes at different time-point were not predictors of MACE.

CONCLUSION

Cardiac MRI allows to monitor healing process. Persistence of inflammation after 1 year from onset is associated to unfavourable outcome.

CLINICAL RELEVANCE/APPLICATION

The introduction of mapping allow to identify persistence of active inflammation in a huger percentage of patients with myocarditis, the kinetics of its resolution will have impact on prognosis. In particular, behind known risk stratificators, peristence of T2 mapping alteration at 1 years is associate to unfavourable prognosis.

S5-SSCA02-6 OPPORTUNISTIC AI-DERIVED MEASUREMENTS OF ADIPOSITY IN CORONARY ARTERY CALCIUM SCANS PREDICT NEW ONSET DIABETES IN NORMOGLYCEMIC NON-OBESE ADULTS: THE AI-CVD STUDY WITHIN THE MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS (MESA)

Morteza Naghavi (*Presenter*)
Kyle Atlas (*Abstract Co-Author*)
Chenyu Zhang (*Abstract Co-Author*)
Anthony P. Reeves, PhD (*Abstract Co-Author*)
Jakob Wasserthal (*Abstract Co-Author*)
Tom Atlas, MD (*Abstract Co-Author*)
Nathan Wong, PhD (*Abstract Co-Author*)
Andrea Branch, PhD (*Abstract Co-Author*)
David F. Yankelevitz, MD (*Abstract Co-Author*)
Claudia I. Henschke, PhD, MD (*Abstract Co-Author*)

PURPOSE

The Artificial Intelligence-Cardiovascular Disease (AI-CVD) study aims to extract opportunistic screening information from coronary artery calcium (CAC) and lung computed tomography (CT) scans beyond the CAC score to improve CVD prediction. In this study, we present new data demonstrating that AI-CVD measures of adiposity in CAC scans predict new-onset diabetes in normoglycemic, non-obese adults.

METHODS AND MATERIALS

We analyzed baseline CAC scans and up to 19 years of follow-up data from 2,935 normoglycemic (fasting blood glucose <100 mg/dL), non-obese (Body mass index <30 kg/m²) participants in the Multi-Ethnic Study of Atherosclerosis (MESA). Diabetes incidence was identified using the American Diabetes Association's 2003 criteria. AI-CVD measures of adiposity in CAC scans indexed by body surface area included liver fat (LF), total visceral fat (TVF), subcutaneous fat (SF), and pericardial fat (PF). Hazard ratios (HRs) for incident diabetes, comparing the highest to the lowest quartiles of each measurement, were calculated using Cox proportional hazards regression models. Additionally, we performed a multivariable Cox regression analysis incorporating all AI-enabled adiposity measures and calculated the chi-squared statistic to determine feature importance.

RESULTS

Over a 19-year period, 205 participants (7.0%) developed diabetes. Significant predictors of diabetes were LF (HR: 2.54, 95% CI: 1.67-3.85), TVF (HR: 2.50, 95% CI: 1.64-3.83), SF (HR: 3.19, 95% CI: 2.01-5.06), and PF (HR: 1.64, 95% CI: 1.08-2.50). These associations were consistent across genders, except for PF in females. The cumulative incidence of diabetes in the highest quartiles was 12.2% (95% CI: 9.8%-15.1%) for LF, 11.7% (95% CI: 9.3%-14.8%) for TVF, 11.7% (95% CI: 9.4%-14.6%) for SF, and 9.4% (95% CI: 7.2%-12.2%) for PF. In multivariate analysis, chi-square values for adiposity measures were: liver fat (35.32), subcutaneous fat (9.04), pericardial fat (6.29), and total visceral fat (2.44), with liver fat showing the strongest association with incident diabetes.

CONCLUSION

Opportunistic AI-enabled measures of adiposity such as LF, TVF, and SF in MESA CAC scans identified normoglycemic, non-obese adults at high risk of future diabetes. Liver fat emerged as the strongest contributor to development of type 2 diabetes.

CLINICAL RELEVANCE/APPLICATION

AI-enabled opportunistic screening in CAC scans can identify individuals at risk for diabetes before the onset of conventional risk factors, enabling early preventive interventions.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

S5-SSGI01

Gastrointestinal Imaging (Liver - Diffuse Disease MRI)

Sunday, Nov. 30 2:30PM - 3:30PM Room: E353C

Anil Chauhan, MD, MBA (*Moderator*)

Sub-Events

S5-SSGI01-1 COMPARING FIB-4, VCTE, PSWE, 2D-SWE, AND MRE THRESHOLDS AND DIAGNOSTIC ACCURACIES FOR DETECTING HEPATIC FIBROSIS IN PATIENTS WITH MASLD: A SYSTEMATIC REVIEW AND META-ANALYSIS

Shyam Mehta, BSc, MPH (*Presenter*)
Mitchell Wilson, MD, FRCPC (*Abstract Co-Author*)
Ranjit Singh, MBBS, BMedSc (*Abstract Co-Author*)
Christopher I. Fung, MD (*Abstract Co-Author*)
Gavin Low, FRCR (*Abstract Co-Author*)

PURPOSE

To compare thresholds and accuracies of FIB-4, vibration controlled transient elastography (VCTE), point shear wave elastography (pSWE), 2D shear wave elastography (2D-SWE), and MR elastography (MRE) for detecting hepatic fibrosis in MASLD.

METHODS AND MATERIALS

A systematic search of MEDLINE, EMBASE, Cochrane Library, Scopus and the grey literature from inception to March 2024 was performed. Studies evaluating accuracies of FIB-4, VCTE, 2D-SWE, pSWE and/or MRE for detecting significant (=F2) and/or advanced (=F3) hepatic fibrosis in MASLD patients compared to histology were identified. Full-text review and data extraction was performed independently by two reviewers. Multivariate meta-analysis and subgroup analysis were performed by index test and fibrosis grading. Risk of bias was assessed using QUADAS-2.

RESULTS

207 studies with over 80,000 patient investigations were included. FIB-4 1.3 threshold sensitivity was 71% (95%CI 66-75%) for detecting advanced hepatic fibrosis which improved to 88% (85-91%) using a <0.75 threshold. FIB-4 specificity using a 2.67 threshold was 96% (94-97%). Sensitivities of 88-91% were achieved using thresholds of 3.2 kPa for pSWE, 4.92 kPa for 2D-SWE, 7.18 kPa for VCTE and 2.32 kPa for MRE. No significant differences were identified for sensitivities in subgroup analysis with thresholds between 7-9 kPa. Most imaging-based studies were high risk-of-bias for index test.

CONCLUSION

A FIB-4 threshold of <0.75 and modality-dependent thresholds (VCTE <7 kPa; pSWE <3 kPa; 2D-SWE <5 kPa; MRE <2.5 kPa) would achieve sensitivities of around 90% when defining low-risk MASLD in population screening.

CLINICAL RELEVANCE/APPLICATION

A modified two-tier algorithm aligning with existing Society of Radiologists in Ultrasound guidelines would improve risk stratification accuracies compared to existing guidelines by European and American liver societies.

S5-SSGI01-2 DEEP LEARNING NETWORK FOR AUTOMATED STAGING BY USING EQUILIBRIUM ENHANCED PHASE MR IMAGES

Yaoyao Yu (*Presenter*)
Junhao Zha, MD (*Abstract Co-Author*)
Shenghong Ju, MD, PhD (*Abstract Co-Author*)

PURPOSE

While conventional non-invasive methods like liver stiffness measurement (LSM) and serological tests are widely used, their accuracy in staging hepatic fibrosis remains limited. This study developed an nnU-Net-based liver segmentation model and proposed a novel deep learning framework that integrates multi-task contrastive learning with attention mechanisms to automatically identify key MRI patches for fibrosis staging.

METHODS AND MATERIALS

A retrospective study was conducted on 706 treatment-naive chronic hepatitis B patients. Data from 655 patients (center 1) were used for model training, validation, and internal testing, while 51 patients from center 2 served as an external test set. Biopsy within 6 months of MRI served as the reference standard. A VGG-16-based network performed contrastive learning to select the most informative patches and classify significant fibrosis (F=2). Equilibrium-phase MRI and LSM values were used as input, and segmentation accuracy was assessed using the Dice Similarity Coefficient (DSC). Diagnostic performance was evaluated using AUC and Integrated Discrimination Improvement (IDI).

RESULTS

The nnU-Net achieved a DSC of 0.95. For F=2 fibrosis, the patch-based model reached AUCs of 0.853 (training), 0.835 (validation), 0.818 (internal test), and 0.805 (external test). Diagnostic performance decreased when averaging predictions across more patches, with the best performance from the top-ranked patch. The model significantly outperformed LSM alone (IDI = 0.287, $P < 0.0001$).

CONCLUSION

This contrastive learning-based model enables accurate, non-invasive fibrosis staging by automatically selecting informative image regions, improving diagnostic performance while reducing reliance on manual annotation.

CLINICAL RELEVANCE/APPLICATION

We developed an AI-based radiomics model that automates liver patch selection for staging hepatic fibrosis, achieving diagnostic performance comparable to manual expert selection while reducing operator dependency. By minimizing human intervention and enhancing reproducibility, this approach offers a scalable and objective tool to support non-invasive, clinically relevant fibrosis assessment.

S5-SSGI01-3 AI-BASED DETECTION OF LIVER IRON OVERLOAD FROM MRI LOCALIZERS: A PRELIMINARY STUDY

Yura Oh, BS (*Presenter*)
Dheerendranath Battalapalli (*Abstract Co-Author*)
Marwa Ismail (*Abstract Co-Author*)
Julius F. Heidenreich, MD (*Abstract Co-Author*)
Jitka Starekova, MD (*Abstract Co-Author*)
David T. Harris, PhD (*Abstract Co-Author*)
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PURPOSE

Liver iron overload requires accurate detection and quantification. Dedicated MRI iron quantification is accurate but is not routinely acquired in most abdominal protocols. Routinely acquired MRI localizer images, however, contain relevant tissue-contrast information that is rarely exploited diagnostically. We propose a deep learning model to detect liver iron overload directly from Single Shot Fast Spin Echo (SSFSE) localizer images. Our hypothesis is that deep learning models can reliably detect liver iron overload opportunistically to identify patients who require additional dedicated MRI iron quantification in the same exam.

METHODS AND MATERIALS

We used SSFSE localizer images from 396 examinations (Center 1: n = 366; Center 2: n = 30; age range: 0-86 years) acquired between 1/2012 and 11/2024. Liver iron concentration (LIC) was measured in the same exam using calibrated and validated R2* relaxometry methods. A clinically-relevant threshold of 3.2 mg/g defined "Iron Overload" (LIC = 3.2 mg/g) versus "No Iron Overload" (LIC < 3.2 mg/g). The dataset had a median LIC of 3.19 mg/g (IQR 0.87-6.51 mg/g). Preprocessing included axial view extraction, isotropic resampling, bias-field correction, selection of a single slice with the largest liver cross-section, histogram equalization, and exclusion of signals outside the abdominal region. An EfficientNet-B4 model was trained for binary classification on an 80% training set (n = 316, including 10% for validation) and 20% testing set (n=80) split. Hyperparameters were tuned via Optuna over five-fold cross-validation. To provide a human benchmark, two experienced radiologists independently interpreted the test set, fully randomized and in blinded fashion after a calibration review of the training images.

RESULTS

The model achieved an Area Under the ROC Curve of 89.7%. Youden's Index identified an optimal probability threshold of 0.30 for the model's classification, resulting in a test accuracy of 85.0% (30/40 correctly classified as No Iron Overload and 38/40 correctly classified as Iron Overload). The cross-validation accuracy was 84.2% ± 0.05%, with a test set sensitivity of 95.0% and a specificity of 75.0%. Radiologist 1 achieved 90.0% accuracy (35/40 No Iron Overload, 37/40 Iron Overload), while Radiologist 2 achieved 80.0% accuracy (32/40 No Iron Overload, 32/40 Iron Overload).

CONCLUSION

A deep learning algorithm applied to routine SSFSE localizers has potential for detection of liver iron overload and patient triage, achieving promising accuracy similar to expert level.

CLINICAL RELEVANCE/APPLICATION

Automated AI detection of liver iron overload may guide iron quantification MRI. Further training and validation on large datasets are needed.

S5-SSGI01-4 DIXON-BASED WATER T1 MAPPING FOR FAT-CORRECTED ASSESSMENT OF HEPATIC FIBROSIS IN CHRONIC LIVER DISEASE

Narine Mesropyan, MD (*Presenter*)
Elizabeth Huaroc (*Abstract Co-Author*)
Christoph Katemann (*Abstract Co-Author*)
Kilian Weiss, PhD (*Abstract Co-Author*)
Oliver M. Weber (*Abstract Co-Author*)
Johannes M. Peeters, PhD (*Abstract Co-Author*)
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Can Yuksel, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)
Alexander Isaak, MD (*Abstract Co-Author*)

PURPOSE

The diagnostic value of conventional T1 mapping for non-invasive assessment of liver fibrosis is limited in the presence of hepatic steatosis. To evaluate the diagnostic value of water T1 (wT1) with continuous inversion-recovery Look-Locker (CIR-LL) method, integrating spiral readout, Dixon, and dictionary-based processing, for the fat-corrected assessment of hepatic fibrosis in patients with chronic liver disease (CLD).

METHODS AND MATERIALS

In this prospective study, consecutive participants with CLD underwent liver MRI, which included assessment of MRE-derived liver stiffness, PDFF, T1 relaxation times (T1-MOLLI) and ECV, and wT1 relaxation times. MRE served as the reference standard to evaluate the diagnostic performance of MRI-based mapping parameters. Significant fibrosis(=F2) was defined as MRE-derived liver stiffness >3.66 kPa in patients with PDFF= 5%, or >3.14 kPa in patients with PDFF>5%. Statistical analysis included Student's t-test, receiver operating characteristic (ROC) analysis, and Spearman's correlation coefficient.

RESULTS

A total of 81 CLD patients (mean age, 50±14years; 32 female; 40 patients with PDFF>5%) were included. All measured mapping values were significantly higher in patients with significant fibrosis compared to those without (e.g., wT1: 628 ± 82 vs. 546 ± 41 msec, P <.001). wT1 showed a strong correlation with MRE-derived liver stiffness, outperforming T1-MOLLI and ECV mapping (whole cohort: r=0.67 [wT1] vs. 0.53 [T1-MOLLI] vs. 0.48 [ECV]; cohort with PDFF>5%: r=0.69 [wT1] vs. 0.44 [T1] vs. 0.49 [ECV]; P<.05 in each case, respectively). wT1 had a superior diagnostic performance for the detection of significant fibrosis (whole cohort, AUC: 0.82[wT1]; 0.77 [T1-MOLLI]; 0.73 [ECV], P <.001 in each case; cohort with PDFF>5%, AUC: 0.84, P =.002 [wT1], 0.70, P =.04 [T1-MOLLI], 0.70, P =.04 [ECV]).

CONCLUSION

Compared to T1-MOLLI and ECV mapping, the proposed fat-corrected CIR-LL wT1 method proved to be a more robust marker of hepatic fibrosis in CLD, also in the presence of hepatic steatosis.

CLINICAL RELEVANCE/APPLICATION

The proposed continuous inversion-recovery Look-Locker method, integrating spiral readout, Dixon, and dictionary-based processing, enables fat-corrected assessment of hepatic fibrosis in patients with CLD.

S5-SSGI01-5 CLINICAL VALIDATION OF T1ρ MAPPING FOR THE ASSESSMENT OF HEPATIC FIBROSIS IN PATIENTS WITH CHRONIC LIVER DISEASE

Narine Mesropyan, MD (*Presenter*)
Oliver M. Weber (*Abstract Co-Author*)
Christoph Katemann (*Abstract Co-Author*)
Tatjana Dell (*Abstract Co-Author*)
Daniel Kuetting, MD (*Abstract Co-Author*)
Claus C. Pieper, MD (*Abstract Co-Author*)
Can Yuksel, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)
Alexander Isaak, MD (*Abstract Co-Author*)

PURPOSE

Experimental studies suggest that hepatic T1? might be an accurate and robust alternative to T1 and ECV mapping for hepatic fibrosis assessment in chronic liver disease (CLD), inl. steatotoc liver disease (SLD). To evaluate the diagnostic usefulness of T1? mapping for the fat-corrected assessment of hepatic fibrosis in patients with CLD, including those with SLD.

METHODS AND MATERIALS

In this prospective study, consecutive participants with CLD underwent multiparametric quantitative liver MRI, which included assessment of MRE-derived liver stiffness, PDFF, T1 relaxation times and extracellular volume fraction (ECV), and T1? relaxation times. MRE served as the reference to evaluate the diagnostic performance of MRI-based mapping parameters. Significant fibrosis (=F2) was defined as MRE-derived liver stiffness >3.66 kPa in patients with PDFF= 5%, or >3.14 kPa in patients with PDFF>5%. Statistical analysis included Student’s t-test, receiver operating characteristic (ROC) analysis, and Spearman's correlation coefficient.

RESULTS

A total of 112 CLD patients (mean age, 48±16 years; 46 female; 53 patients with PDFF>5%) were included. All measured mapping values were significantly higher in patients with significant fibrosis compared to those without (e.g., T1?: 110±15 vs. 92±6 msec, P <.001). T1? showed a moderate to strong correlation with MRE-derived liver stiffness, superior to T1 and ECV mapping (whole cohort: r=0.75 [T1?] vs. 0.49 [native T1] vs. 0.68 [ECV]; cohort with PDFF>5%: r=0.67 [T1?] vs. 0.32 [native T1] vs. 0.62 [ECV]; P<.05 in each case, respectively). T1? provided the highest diagnostic performance for the detection of significant fibrosis (whole cohort: AUC 0.90 [T1?] vs. 0.73, P <.001 [native T1], vs. 0.81, P =.05 [ECV]; cohort with PDFF>5%: AUC 0.87 [T1?] vs. 0.67, P =.03 [native T1], vs. 0.79, P =.047 [ECV]), P values are given vs. T1?.

CONCLUSION

Hepatic T1? might be a more accurate marker of hepatic fibrosis in CLD, including SLD, compared to T1 and ECV mapping.

CLINICAL RELEVANCE/APPLICATION

Our study supports the clinical use of T1? mapping as a more robust imaging-based alternative to conventional native T1, ECV, and T2 mapping for the non-invasive assessment of hepatic fibrosis across the full spectrum of CLD, including patients with SLD.

S5-SSGI01-6 T1ρ MAPPING FOR HEPATIC FIBROSIS ASSESSMENT IN PRECLINICAL MODELS OF STEATOTIC LIVER DISEASE

Narine Mesropyan, MD (*Presenter*)
Christoph Katemann (*Abstract Co-Author*)
Oliver M. Weber (*Abstract Co-Author*)
Johannes M. Peeters, PhD (*Abstract Co-Author*)
Tatjana Dell (*Abstract Co-Author*)
Claus C. Pieper, MD (*Abstract Co-Author*)
Daniel Kuetting, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)
Alexander Isaak, MD (*Abstract Co-Author*)

PURPOSE

To histologically validate T1? mapping and compare it with conventional mapping parameters for assessing hepatic fibrosis across different animal models of steatotic liver disease.

METHODS AND MATERIALS

In male Sprague-Dawley rats different models of steatotic liver disease were induced using a high-fat diet (HFD) and carbon-tetrachloride (CCl4) inhalation: (1) 12w HFD group resulting in steatosis/steatohepatitis without fibrosis; (2) 6w HFD+CCl4 group resulting in steatohepatitis with fibrosis; (3) 12w HFD+CCl4 resulting in steatohepatitis-associated cirrhosis. Hepatic T1, ECV, T2, and T1? were assessed by quantitative MRI. Portal pressure was invasively measured. Hepatic fibrosis was assessed using Sirius red, alpha-smooth muscle actin (a-SMA) staining, and measurement of hydroxyproline content. Hepatic fat content was estimated in Oil red staining and triglyceride content.

RESULTS

57 animals were analyzed (12w HFD, n=15; 6w HFD+CCl4, n=14; 12w HFD+CCl4; n=16; controls, n=12). T1? values were higher in the fibrosis groups, e.g. 12w HFD+CCl4 versus HFD group (71 msec ±5 versus 60 msec ±3, P<.001). T1? values correlated with fibrosis markers (Sirius red r=0.41; a-SMA: r=0.67; hydroxyproline: r=0.76; each P<.001) and portal pressure (r=0.55, P<.001). T1? had the highest diagnostic performance for the detection of histologically defined fibrosis and invasively measured portal hypertension (e.g., for fibrosis, T1?: AUC 0.96, P<.001; T1: AUC 0.74, P=.017; ECV: AUC 0.79, P=.043; T2: AUC 0.51, P<.001). T1? was an independent marker for the detection of histologically defined fibrosis (odds ratio: 3.81, P=.02).

CONCLUSION

In preclinical models of steatotic liver disease, T1? mapping could most reliably detect hepatic fibrosis and portal hypertension across different mapping parameters.

CLINICAL RELEVANCE/APPLICATION

Hepatic T1? might be an accurate and robust imaging-based biomarker for assessing hepatic fibrosis and portal hypertension and, therefore, has a potential to be implemented in humans.

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S5-SSGI02

Science Session with Keynote: Gastrointestinal Imaging (Pancreas - Miscellaneous)

Sunday, Nov. 30 2:30PM - 3:30PM Room: E352

Sreeharsha Tirumani, MD (*Moderator*)
Amir Borhani, MD (*Moderator*)

Sub-Events

S5-SSGI02-3 AN INTERPRETABLE RADIOMICS MODEL BASED ON PANCREATIC CONTRAST-ENHANCED COMPUTED TOMOGRAPHY PREDICTING THE PROGNOSIS OF POST-ACUTE PANCREATITIS DIABETES MELLITUS

Xiaomin Liu (*Presenter*)
Ran Hu (*Abstract Co-Author*)
Zhixuan Song (*Abstract Co-Author*)

PURPOSE

To develop a radiomics model utilizing contrast-enhanced computed tomography (CECT) for predicting the prognosis of post-acute pancreatitis diabetes mellitus (PPDM-A) and to explain the model's internal predictive mechanisms using Shapley Additive exPlanations (SHAP).

METHODS AND MATERIALS

226 PPDM-A patients were retrospectively recruited from three centers, with 107 in training, 46 in internal, and 73 in external cohorts. There were 34, 15 and 28 patients with complications in each cohort. The complications included microvascular complications, infection, diabetic ketosis and hypoglycemia. In PPDM-A patients' first pancreatitis episode, 2398 radiomics features were extracted from CECT images (arterial and venous phases). FeAture Explorer (FAE) generated the machine learning pipeline and selected important radiomics features. Gaussian processes classifiers built radiomics and clinical-radiomics models, while Naive Bayes classifiers built the clinical model. The SHAP method was applied to provide insights into the model's predictive process.

RESULTS

The radiomics model predicted PPDM-A complications with the area under the receiver operating characteristic curve (AUC) of 0.95, 0.888, and 0.948 in training, internal, and external cohorts. In external cohort, the radiomics model significantly outperformed the clinical model (AUC 0.948 vs. 0.714, $p = 0.002$), while the combined model showed no significant difference from the radiomics model (AUC 0.933 vs. 0.948, $p = 0.638$). The SHAP technology provided physicians with insights into the global and individual impacts of radiomic features on model predictions.

CONCLUSION

The CECT-based radiomics model performed well in predicting PPDM-A prognosis. SHAP enhances understanding of the model's predictive process, boosting its credibility.

CLINICAL RELEVANCE/APPLICATION

High incidence of post-acute pancreatitis diabetes, lacking quantitative method to predict its prognosis. The radiomic model can be useful for predicting post-acute pancreatitis diabetes mellitus prognosis. Shapley additive explanations can explain and visualize radiomics model's predictive process for clinicians.

S5-SSGI02-4 COMBINED PANCREATIC ATTENUATION AND PANCREAS-TO-SPLEEN RATIO ON NON-CONTRAST CT IMPROVE DIABETES RISK STRATIFICATION OVER SINGLE BIOMARKERS: A RETROSPECTIVE ANALYSIS

Christian Booz, MD (*Presenter*)
Ibrahim Yel, MD (*Abstract Co-Author*)
Andreea-Ioana Nica (*Abstract Co-Author*)
Vitali Koch, MD (*Abstract Co-Author*)
Leon D. Gruenewald, MD (*Abstract Co-Author*)
Philipp Reschke (*Abstract Co-Author*)
Leon D. Gruenewald, MD (*Abstract Co-Author*)
Jennifer Gotta, MD (*Abstract Co-Author*)
Scherwin Mahmoudi, MD (*Abstract Co-Author*)
Mirela Dimitrova (*Abstract Co-Author*)
Leona Alizadeh, MD (*Abstract Co-Author*)
Tommaso D'Angelo, MD, PhD (*Abstract Co-Author*)
Katrin Eichler, MD (*Abstract Co-Author*)
Thomas J. Vogl, MD, PhD (*Abstract Co-Author*)

PURPOSE

Non-invasive imaging biomarkers derived from routine CT may assist in the early identification of individuals at risk for diabetes mellitus (DM). While both decreased pancreatic attenuation and a reduced pancreas-to-spleen attenuation ratio (PSR) have been associated with dysglycemia, it remains unclear whether a combination of both parameters yields additional diagnostic benefit. This study aimed to evaluate the added value of combining pancreatic attenuation and PSR for risk stratification of DM.

METHODS AND MATERIALS

We retrospectively analyzed non-contrast abdominal CT scans from 5624 patients (51% male; mean age 52 ± 10 years). Patients were categorized into normoglycemic (n=2900), prediabetic (n=1569), and diabetic (n=1155) groups based on clinical and laboratory data. Mean pancreatic attenuation (HU) was measured in head, body, and tail regions and compared to splenic attenuation to calculate PSR. ROC curve analyses and multivariate logistic regression were used to evaluate diagnostic performance for identifying diabetic status using individual and combined CT parameters.

RESULTS

Mean pancreatic attenuation decreased progressively from normoglycemic (43 HU) to prediabetic (36 HU) to diabetic patients (32 HU) (all $p < 0.001$). PSR showed stronger correlation with HbA1c ($r = -0.90$) than pancreatic HU alone ($r = -0.76$) ($p<0.0001$). The AUC for PSR alone was 0.88, outperforming pancreatic HU (AUC: 0.79). However, combining both parameters slightly improved diagnostic accuracy (AUC: 0.92; $p = 0.01$ vs. PSR alone). In multivariate models, the combined approach remained an independent predictor of diabetes, offering both improved sensitivity and specificity.

CONCLUSION

Although PSR is a superior single CT-derived biomarker for assessing diabetes risk, the combination of PSR and pancreatic attenuation provides a small but statistically significant improvement in diagnostic performance. This supports the use of combined attenuation-based metrics for more precise opportunistic screening in routine CT.

CLINICAL RELEVANCE/APPLICATION

Opportunistic assessment of diabetes risk using routine non-contrast abdominal CT is feasible and may benefit from combined evaluation of PSR and pancreatic density to enhance diagnostic accuracy in diverse patient populations.

S5-SSGI02-5 DEEP LEARNING-BASED PANCREATIC AGE ESTIMATION FROM MRI PREDICTS INCIDENT DIABETES BEYOND KNOWN RISK FACTORS IN THE GENERAL POPULATION

Matthias Jung, MD (*Presenter*)
Zeynep Berkarda, MD (*Abstract Co-Author*)
Michael T. Lu, MD, MPH (*Abstract Co-Author*)
Marco Reisert (*Abstract Co-Author*)
Fabian Bamberg, MD, MPH (*Abstract Co-Author*)
Vineet K. Raghu, PhD (*Abstract Co-Author*)
Jakob Weiss, MD, PhD (*Abstract Co-Author*)

PURPOSE

Aging is a heterogeneous process, with individuals and organs aging at different rates. Chronological age poorly reflects this variability, whereas biological age measures could improve risk assessment and prevention. We propose a deep learning (DL) framework (MRI-PancAge) for estimating pancreas age from MRI and investigate its value for predicting incident diabetes risk.

METHODS AND MATERIALS

MRI-PancAge was developed in two steps using data from 30,389 individuals (20-75 years) from the German National Cohort. Model 1 was developed to segment the pancreas on abdominal MRI. Model 2 was trained to take the 3D pancreas segmentation as input and output MRI-PancAge in years. For further analyses, MRI-PancAge was converted to a z-score, where a $z>0$ refers to an older and $z<0$ to younger MRI-PancAge compared to chronological age. We validated this framework in an independent testing set of 33,559 UK Biobank (UKB) participants free of diabetes at time of imaging to predict incident diabetes beyond risk factors. Primary outcome was incident diabetes. Cumulative incidence curves and Cox regression assessed the association between MRI-PancAge (categorized as younger: $z<-1$; ref: z -1 to 1; older: $z>1$) and incident diabetes after adjustment for age, sex, BMI, race, pancreas volume and fat fraction, hypertension, alcohol consumption, and smoking status. To assess whether MRI-PancAge carries incremental value beyond these risk factors, nested models with and without MRI-PancAge were compared using Harrell's C. Results are for the UKB only.

RESULTS

In 33,559 UKB participants (64.8±7.7 years, 50.9% female; 1.9% incident diabetes; median follow up 4.7 years), cumulative incidence curves showed a higher incidence of diabetes in those with older and a lower incidence in those with younger MRI-PancAge compared to the reference (Log-rank $p<0.001$). Multivariable Cox regression revealed an independent association between older MRI-PancAge and incident diabetes (aHR: 1.35, 95% CI [1.10-1.65], $p=0.005$) after adjustment for all covariates. Adding MRI-PancAge to a baseline model with traditional risk factors showed a small but significantly improved discrimination for incident diabetes (C-index 0.780 to 0.781, $p=0.009$).

CONCLUSION

DL can estimate pancreas age from MRI and predict incident diabetes in the general population beyond chronological age, pancreas volume and fat fraction, and cardiometabolic risk factors.

CLINICAL RELEVANCE/APPLICATION

Our DL model leverages currently unused information about age-related changes in the pancreas, which are widely available on existing clinical MRIs. Applying our model to routine MRIs can automatically extract measures of pancreas age and inform opportunistic diabetes risk assessment and clinical decision-making.

S5-SSGI02-7 Keynote Speaker: Pancreatic Cancer and its Mimics

Frank H. Miller, MD (*Science Invited Presenter*)

S5-SSGI02-8 Keynote Speaker: Pancreatic Cancer Screening: Updates

Avinash R. Kambadakone, MD, FRCR (*Science Invited Presenter*)

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S5-SSGI03

Gastrointestinal Imaging (Body Composition)

Sunday, Nov. 30 2:30PM - 3:30PM Room: E451B

Jeong Min Lee, MD, PhD (*Moderator*)
Matthew H. Lee, MD (*Moderator*)

Sub-Events

S5-SSGI03-5 CHANGES OF BONE, ADIPOSE, AND MUSCLE-RELATED BODY COMPOSITIONS IN GASTRIC CANCERS AFTER GASTRECTOMY USING DEEP LEARNING BASED AUTOMATIC SEGMENTATION

Mengying Xu, MD (*Presenter*)
Zhengyang Zhu, MD (*Abstract Co-Author*)
Song Liu (*Abstract Co-Author*)
Zhengyang Zhou (*Abstract Co-Author*)

PURPOSE

To investigate bone, adipose, and muscle-related body compositions changes in gastric cancers (GCs) 12 months after gastrectomy utilizing an artificial intelligence (AI) based segmentation tool and to conduct subgroup analyses based on clinicopathological characteristics.

METHODS AND MATERIALS

This retrospective study included 146 GCs (median age, 60 years; range, 29-84 years) who underwent gastrectomy. Body compositions of GCs at baseline and 12 months after surgery were automatically measured utilizing the AI-based segmentation tool. The differences in body compositions at baseline and 12 months after surgery were assessed. Subgroup analyses of body composition changes split by clinicopathological characteristics were conducted.

RESULTS

BMD, adipose-related, and muscle-related body compositions decreased significantly 12 months after surgery (all p <0.001), in which adipose-related losses were the largest. The proportions of sarcopenia (from 37.7% to 55.5%) and osteoporosis (from 13.7% to 26.7%) showed significant increases. Subcutaneous and visceral adipose tissues, abdominal wall muscle, and skeletal muscle losses indicated significant differences in gender and body mass index (BMI) subgroups (all p <0.05). Adipose- and muscle-related losses differed significantly in GCs underwent different gastrectomy (all p <0.05), while BMD loss showed no significant difference. Subgroup analyses based on pathological stages showed no significant difference for body composition changes.

CONCLUSION

BMD, adipose-related, and muscle-related body compositions showed significant losses over 12 months in GCs underwent gastrectomy, in which adipose-related composition losses were the largest. The proportions of sarcopenia and osteoporosis showed significant increases. Gender, baseline BMI, and gastrectomy differences affected adipose- and muscle-related body composition losses but showed no significant effect on BMD.

CLINICAL RELEVANCE/APPLICATION

The application of AI-based segmentation tool for automated measurement of bone, adipose, and muscle-related body compositions changes in gastric cancers after gastrectomy could reflect body's macroscopic metabolism and immune status and help individualized management in clinical practice.

S5-SSGI03-6 DYNAMIC BODY COMPOSITION AS A POTENTIAL IMAGING BIOMARKER FOR PREDICTING SURGICAL RISK IN CROHN'S DISEASE WITH SMALL BOWEL STENOSIS

Shushan Dong (*Presenter*)
Mengting Huang (*Abstract Co-Author*)
Shen Gui (*Abstract Co-Author*)
Heshui Shi, MD (*Abstract Co-Author*)

PURPOSE

To determine whether dynamic body composition parameters derived from computed tomography enterography (CTE) predict high-risk surgical outcomes in Crohn' disease (CD) patients with small bowel stenosis.

METHODS AND MATERIALS

A retrospective analysis of 385 CD patients with small bowel stenosis between January 2018 and June 2022 included paired CTE scans. Patients who required intestinal surgery due to complications such as recurrent intestinal obstruction and fistulas after the diagnosis of CD small bowel stenosis were defined as the high-risk group, otherwise, they were into the low-risk group. Skeletal muscle (SM), subcutaneous adipose (SAT), visceral adipose tissue (VAT), and intermuscular adipose tissue (IMAT) area/density at L3-L5 vertebral levels were measured, normalized by vertebral height. Dynamic body composition parameters and clinical variables were analyzed using Cox regression.

RESULTS

There were 289 cases in the low-risk group and 96 cases in the high-risk group. Interaction terms (time and gender) were tested, males showed significant reductions in L3-L4 skeletal muscle index (SMI) (P<0.001), L3-L4 IMAT index (P<0.001, P=0.04), and L4-L5 VAT density (P=0.008, P=0.005). Females demonstrated decreased L3 SMI (P=0.001) and L4-L5 VAT density (P=0.018, P=0.026). Independent predictors of surgical risk included baseline L3 SMI (P<0.001), L4 VAT ratio (P=0.009), delta L4 SMI (P=0.002), age (P<0.001), platelet count (P=0.003), erythrocyte sedimentation rate (P<0.001), albumin (P=0.042), and stenosis length (P<0.001).

CONCLUSION

Dynamic changes in SMI and VAT density are valuable biomarkers for stratifying surgical risk in CD small bowel stenosis. Monitoring these parameters may improve personalized management.

CLINICAL RELEVANCE/APPLICATION

Assessing body composition based on SMI and VAT parameters is straightforward and can facilitate personalized management and aid in therapeutic decision, thereby reducing the occurrence of high-risk surgical outcomes.

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S5-SSGU02

Science Session with Keynote: Genitourinary Imaging (Artificial Intelligence in Genitourinary Diagnostics: Accuracy, Quality, and Clinical Relevance)

Sunday, Nov. 30 2:30PM - 3:30PM Room: E353B

Helen C. Addley, FRCR, BMBCh (*Moderator*)
Douglas A. Pendse, MD, FRCR (*Moderator*)

Sub-Events

S5-SSGU02-1 AI-RADIOLOGIST CONCORDANCE IN PROSTATE MRI: INFLUENCE OF PI-QUAL V2 IMAGING CRITERIA AND PROTOCOL LIMITATIONS

Satoru Takahashi, MD, PhD (*Presenter*)

PURPOSE

To evaluate the diagnostic concordance between an artificial intelligence (AI) software and radiologists in prostate MRI, and to investigate how PI-QUAL v2 scores, individual imaging criteria, and lesion characteristics influence concordance.

METHODS AND MATERIALS

This retrospective study included 336 patients (72.7 ± 9.1 years) who underwent prostate MRI (bp-MRI, n=328; mp-MRI, n=8) using either 1.5T (n=136) or 3T (n=200) scanners. At 1.5T, a 4-mm slice thickness was used to maintain adequate SNR. In 47 cases with severe DWI artifacts, rescanning was performed using an alternative MPG direction. A total of 383 studies were analyzed using a AI-based detection research software (Prostate AI v1.3.5, Siemens Healthineers), which provided lesion-based PI-RADS scores, suspicion levels, lesion sizes, volumes, and ADC values. An experienced radiologist independently reviewed all studies for PI-RADS v2.1 categorization and PI-QUAL v2 image quality assessment. Diagnostic concordance between AI and the radiologist was assessed, and logistic regression was performed to identify factors associated with correct AI interpretation.

RESULTS

The radiologist identified 196 lesions (PI-RADS 4: 126; PI-RADS 5: 70), while the AI detected 146 lesions. In case-based analysis, the Cohen’s ? coefficient was 0.492. The AI demonstrated a sensitivity of 0.628, specificity of 0.854, accuracy of 0.755, and an AUC of 0.820. PI-QUAL v2 scores were distributed as follows: score 1 (n=154), score 2 (n=97), and score 3 (n=132), with no significant difference in concordance across the scores (p=0.56). However, among the individual PI-QUAL criteria, a 4-mm T2WI slice thickness and use of 1.5T scanners were significantly associated with lower concordance. DWI rescans were also associated with reduced concordance, but rescanning did not improve agreement. Lesions rated as PI-RADS 4 by the radiologist or PI-RADS 3 by the AI were more likely to result in disagreement. In addition, lesions located in the peripheral zone, smaller lesion size, and higher ADC values were independently associated with lower concordance.

CONCLUSION

Diagnostic concordance between AI and radiologists in prostate MRI is significantly influenced by protocol-dependent T2WI parameters, particularly slice thickness, while DWI image quality appears to play a lesser role. These findings underscore the importance of adhering to PI-QUAL mandatory criteria and optimizing acquisition protocols when implementing AI tools in clinical prostate MRI.

CLINICAL RELEVANCE/APPLICATION

Lesions with smaller size and higher ADC values were more likely to result in discordant interpretations, suggesting that AI performs more consistently in evaluating clinically significant, high-grade lesions.

S5-SSGU02-2 CAN AI BRIDGE THE EXPERTISE GAP? A MULTI-READER STUDY ON PROSTATE MRI USING AN OPEN DATASET

Guillaume Herpe, MD (*Presenter*)
Gaspard d'Assignies, MD, PhD (*Abstract Co-Author*)
Roberto Ardon (*Abstract Co-Author*)
Camille Ruppli (*Abstract Co-Author*)
Leo Alberge (*Abstract Co-Author*)
Raphaele Renard-Penna, MD (*Abstract Co-Author*)

PURPOSE

The aim of this study was to evaluate the effect of a deep learning AI software on interpretation accuracy and efficiency of radiologists with varying expertise.

METHODS AND MATERIALS

A total of 201 prostate MRI cases from a publicly available data set (PROSTATEx Challenge) were analyzed in a multi-reader, multi-case study. The panel of radiologists consisted of 6 certified radiologists; one expert (> 1000 prostate MRI readings) and five non expert radiologists (between 250-500 prostate MRI readings) . They were asked to read each cases twice in two reading blocks with a minimum of 4weeks separation, without and with AI software assistance (PAROS v1.0.0, Incepto Medical, Paris, France). Reading tasks consisting in classifying and locating lesions according to PIRADS V2.1 scoring system. The ground truth was established using biopsy results, with csPCa defined as ISUP grade =2, and PI RADS score of the expert reader.

RESULTS

The average accuracy of radiologist in terms of AUC in detecting csPCa (ISUP grade =2) was 55% (95% confidence interval CI [52,58]) without and 65% (95% CI [62,68]) with AI assistance (p=0.04). Accuracy of non-expert radiologists in detecting cases with PIRADS >3 (ou >= 3) improved by 10 % (p=.001) . Inter-reader agreement improved from fair (? = 0.28) to substantial (? = 0.64, p < .001). Standalone AI remained significant superior with higher sensitivity (91% vs. 65%), specificity (64% vs. 50%, p = 0.04), and accuracy (73% vs. 65%, p = 0.04).The expert radiologist obtained the highest accuracy (79% [95% CI: 72%-84%], p < 0.001), outperforming both the AI and AI-assisted non-experts.

CONCLUSION

This AI software increased the diagnostic accuracy of non-expert radiologists and reduced interreader variability, and therefore has the potential to support the MRI process for biopsy decision-making and target identification.

CLINICAL RELEVANCE/APPLICATION

The integration of deep learning AI in prostate MRI interpretation has the potential to enhance the diagnostic accuracy of non-expert radiologists, reducing variability and improving lesion classification. This could lead to more consistent detection of clinically significant prostate cancer (csPCa), optimizing biopsy decision-making and target identification. By bridging the expertise gap, AI-assisted MRI interpretation may improve patient outcomes, particularly in settings with limited access to highly experienced radiologists.

S5-SSGU02-5 AI DIAGNOSTIC PERFORMANCE IN PROSTATE CANCER DECLINES WITH MRI QUALITY REDUCTION, UNLIKE RADIOLOGIST PERFORMANCE

Georgios Agrotis, MD, PhD (*Presenter*)
Eduardo Pooch (*Abstract Co-Author*)
Stephan Ursprung (*Abstract Co-Author*)
Ailin Dehghanpour, MD (*Abstract Co-Author*)
Regina G. Beets-Tan, MD, PhD (*Abstract Co-Author*)
Tomas Janssen (*Abstract Co-Author*)
Ivo Schoots, MD, PhD (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic performance of an artificial intelligence (AI) model and radiologists in detecting Gleason Grade Group (GG) =2 prostate cancer on diagnostic biparametric MRI (bpMRI), accounting for variations in scan quality as measured by PI-QUAL scores.

METHODS AND MATERIALS

A nnU-Net GG?2 cancer segmentation model used 1500 bpMRI scans for training, 1000 for testing (PI-CAI cohort), and 573 scans for external validation (PROMIS cohort). The external cohort analysis included MRI assessment by two readers (R) using PI-RADSv2.1 (R1) and malignancy Likert scores (R2), while a third reader assigned PI-QUALv2 (MRI-quality) scores. MRI-positive scans were defined as PI-RADS 3-5 scores (R1) and Likert 4-5 scores (R2). The outcome measurement was GG?2 cancer, confirmed by transperineal saturated biopsy. The model's and radiologists' diagnostic performance (AUCs) were compared. Bootstrap testing (1000 iterations) was used to calculate 95% CIs and determine the statistical significance (p-values) of the performance differences between the two quality subgroups.

RESULTS

Overall, the trained AI model achieved an AUC of 0.89 (95% CI: 0.87-0.91) on the PI-CAI test set and an AUC of 0.68 (95% CI: 0.64- 0.73) during external validation. The human readers achieved AUCs on the external data of 0.85 (95% CI: 0.82-0.88) and 0.76 (95% CI: 0.73-0.79) for R1 and R2, respectively. On reduced-quality scans (PI-QUAL 1; n = 162), the AI performance declined to an AUC of 0.61 (95% CI: 0.52-0.70), whereas on high-quality scans (PI-QUAL 2-3; n = 411), it significantly increased ($p < 0.03$) to an AUC of 0.71 (95% CI: 0.66-0.76). In contrast, the diagnostic performance of both readers remained consistent across scan quality: for R1, AUCs were 0.82 (95% CI: 0.76-0.88) on PI-QUAL 1 and 0.86 (95% CI: 0.82-0.89) on PI-QUAL 2-3 ($p = 0.25$); for R2, AUCs were 0.74 (95% CI: 0.67-0.81) and 0.77 (95% CI: 0.73-0.81), respectively ($p = 0.52$).

CONCLUSION

The diagnostic performance of the AI model declined significantly on reduced-quality MRI scans, whereas radiologists maintained consistent performance regardless of scan quality.

CLINICAL RELEVANCE/APPLICATION

To ensure optimal performance, consistently high-quality MRI scans are required for a successful implementation of AI in clinical practice.

Nov. 30 – Dec. 4
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S5-SSOB01

OB/Gynecology (Gynecology Oncology)

Sunday, Nov. 30 2:30PM - 3:30PM Room: S501

Efren J. Flores, MD (*Moderator*)
Imon Banerjee, PhD (*Moderator*)

Sub-Events

S5-SSOB01-1 DOES CONTRAST ENHANCED ULTRASOUND ADD DIAGNOSTIC VALUE TO ORADS ULTRASOUND, IOTA'S SR, SR RISK AND IOTA'S ADNEX MODEL - A PROSPECTIVE COMPARATIVE STUDY

Shabnam B. Grover, MD, DMRD (*Presenter*)
Sayantan Patra, MD (*Abstract Co-Author*)
Pratima Mittal, MS (*Abstract Co-Author*)
Geetika Khanna, MD (*Abstract Co-Author*)
Hemal Grover, MD (*Abstract Co-Author*)

PURPOSE

Ovarian malignancy is amongst leading female cancers, typically has high mortality due to asymptomatic early stage and late stage diagnosis. ACR, recently proposed ORADS ultrasound algorithms for ovarian -adnexal tumor evaluation, towards categorization and risk stratification along with specific management guidelines.European fraternity follows IOTA algorithms, applying three popular strategies (Simple Rules-SR, Simple Rules Risk Score- SRR and Assessment of Different NEoplasias in adneXa-ADNEX-Model),for similar goals.Few recently published validation studies have reported limitations in both systems.Contrast Enhanced Ultrasound (CEUS) based on tumor micro-vascularity,is a novel modality with potential to augment these algorithms,however, studies evaluating this supplementary technique with ORADS and IOTA are sparse.Therefore, purpose of this study was to compare diagnostic accuracy of ORADS, IOTA's SR, SRR and ADNEX, firstly as standalone and subsequently with CEUS combined; using histopathology results as reference standard.

METHODS AND MATERIALS

This IRB approved prospective study comprised 89 patients with 100 adnexal masses. Ultrasound tumor evaluation by ACR-ORADS and IOTA's three strategies; was followed by CEUS evaluation, using second generation contrast agent. Qualitative and quantitative CEUS parameters were combined in each case for tumor categorization. Diagnostic accuracy of algorithms was assessed as standalone and with CEUS results amalgamated.

RESULTS

Sensitivity, Specificity, PPV, NPV and Diagnostic Accuracy of standalone parameters were, ORADS, 94.83, 52.38, 73.33, 88.00 and 77.00 respectively; IOTA-SR, 85.00, 83.33, 85.00, 83.33 and 84.21 respectively; IOTA-SRR, 86.20, 71.42, 80.64, 78.95 and 80.00, respectively and ADNEX, 86.20, 90.48, 92.59, 82.61 and 88.00, respectively. For ORADS-plus-CEUS,100, 95.24, 96.67,100 and 98.00 respectively; IOTA strategies, all three, revealed identical result with CEUS combined,93.10, 92.86, 94.74, 90.70 and 93.00, respectively (Fig1). For standalone best accuracy was IOTA-ADNEX and with CEUS integrated,ORADS was best.

CONCLUSION

Addition of CEUS to ultrasound evaluation, whether ORADS or IOTA-strategies, significantly enhances diagnostic performance. Multicenter studies may be considered towards integrating CEUS into ultrasound evaluation of ovarian-adnexal masses.

CLINICAL RELEVANCE/APPLICATION

CEUS, an ultrasound technique is more economical and widely available compared to CE-MRI, especially in resource poor locations. Further, since CEUS contrast-agents are excreted through respiration, this technique can be safely applied in patients with deranged renal functions, wherein Gadolinium-CE-MRI is contraindicated.

S5-SSOB01-2 ENHANCING COMPONENTS IN MATURE CYSTIC OVARIAN TERATOMAS: ADDING DRAMA TO BENIGNITY OR JUST KEEPING RADIOLOGISTS ON THEIR TOES?

Om B. Panta, MD (*Presenter*)
Santosh Maharjan, MBBS, MD (*Abstract Co-Author*)
Karen S. Lee, MD (*Abstract Co-Author*)
Rudra P. Upadhyaya II, MD (*Abstract Co-Author*)

PURPOSE

To assess the prevalence, size, and morphological characteristics of enhancing components in mature cystic ovarian teratomas (MT) using magnetic resonance imaging (MRI).

METHODS AND MATERIALS

This single-center retrospective study analyzed pelvic MRI examinations from January 2005 to September 2023. Cases were identified through report searches for "dermoid" or "teratoma." Inclusion criteria comprised pathologically confirmed mature teratoma or fat-containing adnexal lesions with minimum 12-month stability on imaging or clinical follow-up. Two radiologists independently evaluated the images, blinded to clinical data, documenting mature teratoma characteristics (size, laterality), enhancement patterns (septal, nodular, or combined), nodular features (size, location, margin characteristics, wall angle), presence of transmural growth, and enhancement intensity relative to myometrium. Interobserver agreement for enhancement characteristics was assessed using Cohen's Kappa.

RESULTS

The study cohort included 139 patients (mean age 40.4 ± 15 years) with 154 mature teratomas, of which 124 (80.5%) were pathologically confirmed. Enhancement was observed in 89/154 (56%) mature teratomas, with nodular enhancement in 52/89 (58%) cases, septal enhancement in 23 cases (25.9%), and combined enhancement patterns in 14/89 (16%) cases. The mean largest dimension was 59.4 ± 35 mm with a mean volume of 148 ± 333 cc. Enhancing nodules demonstrated a mean largest dimension of 15.6 ± 12.3 mm and mean volume of 4.6 ± 28.8 cc, representing an average nodule-to-mature teratoma volume ratio of 2.7%. Only 11 cases (16.6%) exhibited nodules larger than 20 mm. Nodule location was predominantly split between mural (31; 47%) and intra cystic (35; 53%) positions, with no

extramural cases identified. Most nodules displayed regular margins (49; 74%), and 90% of mural nodules (28/31) formed acute angles with the wall. Enhancement patterns were either similar to myometrium (22; 33%) or less intense (43; 65.1%), with no cases showing transmural growth. Interobserver agreement was substantial for both enhancement presence (? = 0.80) and nodular enhancement (? = 0.81).

CONCLUSION

Enhancing nodular components are common in mature teratoma, however, these nodules are typically small, have regular margins and enhancement equal to or less than myometrium, with no evidence of transmural growth.

CLINICAL RELEVANCE/APPLICATION

The identification of typical characteristics of benign enhancing nodules (size less than 20 mm, volume less than 20% of the cyst volume, regular borders, and absence of transmural growth) provides radiologists and clinicians with more confident parameters for risk stratification.

S5-SSOB01-3 DIFFERENTIATING LEIOMYOSARCOMA FROM LEIOMYOMA USING MRI: CONSENSUS GUIDELINES VERSUS ALGORITHM USING ALL MRI CRITERIA

Kumaresan Sandrasegaran, MD (*Presenter*)

PURPOSE

To evaluate the algorithm published in the consensus guidelines paper by Hindman et al 1 in differentiating leiomyoma (LM) from leiomyosarcoma (LMS) and to compare this with an algorithm (henceforth called enhanced algorithm) which included contour, morphology, T1 and T2 signal, diffusion weighted (DWI) analysis and time-intensity curve analysis. Reference: 1. Hindman N, Kang S, Fournier L, Lakhman Y, Nougaret S, Reinhold C, et al. MRI Evaluation of Uterine Masses for Risk of Leiomyosarcoma: A Consensus Statement. Radiology. 2023;306(2):e211658.

METHODS AND MATERIALS

In this case-controlled retrospective study, the institutional records were searched for LMS and "atypical LM". After excluding those without pre-resection MRI, inadequate MRI or definite pathological classification, a study cohort of 137 with LM (group 1) and 28 with LMS (group 2) was derived. MRI pelvis with IV contrast were analyzed by six board-certified abdominal radiologists, blinded to pathology and clinical course. They gave a determination of LM or LMS using both the consensus guidelines algorithm and the enhanced algorithm.

RESULTS

Group 1 patients were younger than those in group 2 (median age of 46.1 vs. 54.9 years, p <0.001) and had lower serum lactate dehydrogenase (LDH) (median 190 U/L vs 288 U/L, p =0.10). Table 1 gives the breakdown of tumor sizes and ADC in groups 1 and 2. Sensitivity (95% CI in parentheses) of enhanced algorithm was 96.4% (89.6-100%), and similar to the consensus guideline algorithm 92.9% (83.3-100%). However, the specificity of enhanced algorithm was 90.5% (85.6-95.4%), and higher than the consensus guideline algorithm 75.9% (68.8-83.1%). The C-statistic (area under ROC curve) of enhanced algorithm was significantly higher than that of consensus guideline algorithm (0.817 vs. 0.715, p =0.02).

CONCLUSION

In the MRI differentiation of LMS from LM, the enhanced algorithm, using all MRI characteristics including morphology, was superior to the performance of published consensus guideline algorithm.

CLINICAL RELEVANCE/APPLICATION

Diffusion-weighted imaging forms part of the imaging criteria for differentiation of LMS from LM. However, absolute ADC thresholds may vary based on the MR protocol. Other MRI parameters, such as morphology, may be important in differentiating atypical LM, including cellular LM, from LMS.

S5-SSOB01-4 PREOPERATIVE STAGING OF UTERINE CERVICAL CANCER: TIME TO SHIFT FROM CYSTOSCOPY TO MRI

Matteo Bonatti, MD (*Presenter*)
Riccardo Valletta, MD (*Abstract Co-Author*)
Miriam Dolciami, MD (*Abstract Co-Author*)
Luca D'Erme, MD (*Abstract Co-Author*)
Vincenzo Vingiani, MD (*Abstract Co-Author*)
Evis Sala, MD, PhD (*Abstract Co-Author*)
Giacomo Avesani, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of MRI-defined bladder wall invasion from uterine cervical cancer (CC) on disease recurrence and overall survival.

METHODS AND MATERIALS

This IRB-approved multicenter retrospective study included 219 women who underwent MRI for local staging of histologically confirmed CC between January 2015 and December 2020. MR image analysis was independently performed by two experienced radiologists. Bladder wall invasion was diagnosed if at least three of the following criteria were met: loss of the cervix-bladder fat plane, bladder wall thickening, loss of bladder wall T2-hypointensity, and presence of endoluminal tumor growth. MRI findings were compared with endoscopy/cytology. The impact of MRI-defined bladder wall invasion (any layer) on tumor recurrence and survival was assessed using logistic regression. Survival curves for patients with and without MRI-defined bladder wall invasion were compared using the log-rank test.

RESULTS

6.4% patients had MRI stage I neoplasms, 27.9% stage II, 43.5% stage III, and 23.3% stage IV. MRI-defined bladder wall invasion was observed in 20.1% of patients. Cystoscopy revealed bladder mucosal infiltration in 9 (4.1%) cases, all of whom also demonstrated MRI-defined bladder wall invasion; no patients without MRI-defined bladder wall invasion showed mucosal infiltration on cystoscopy/urinary cytology. The median follow-up was 31 months: 47.5% of patients experienced disease recurrence, and 24.7% hade CC-related death. Logistic regression demonstrated that MRI-defined bladder wall invasion was an independent risk factor for both tumor recurrence (OR 2.46, P = 0.015) and mortality (OR 3.65, P = 0.004), whereas cystoscopy-defined bladder mucosa infiltration wasn't. The log-rank test demonstrated a significant difference in survival between patients with and without MRI-defined bladder wall invasion ($?^2$ = 5.45, P = 0.019).

CONCLUSION

MRI-defined bladder wall invasion represents an independent negative prognostic factor in patients with cervical cancer.

CLINICAL RELEVANCE/APPLICATION

MRI can safely replace cystoscopy in the preoperative staging of patients with uterine cervical cancer. Cystoscopy is unnecessary both when MRI rules out bladder invasion and when bladder wall invasion is detected on MRI. This approach can reduce costs and expedite the staging process.

S5-SSOB01-5 PRECISION SEGMENTATION OF PRIMARY EPITHELIAL OVARIAN TUMORS IN CONTRAST-ENHANCED CT: MULTI-CENTER VALIDATION, PERFORMANCE FACTOR ANALYSIS, AND RADIOMIC FEATURE ALIGNMENT

Wenyi Deng (*Presenter*)
Fuze Cong, PhD (*Abstract Co-Author*)
Jing Ren, MD (*Abstract Co-Author*)

Yonglan He, MD (*Abstract Co-Author*)
Huadan Xue, MD (*Abstract Co-Author*)

PURPOSE

To develop an AI model for automated segmentation of primary epithelial ovarian tumors (EOTs) in contrast-enhanced CT, validated across multi-center cohorts. We explored factors influencing segmentation accuracy and assessed radiomics consistency between AI and manual segmentations for reliable clinical feature extraction.

METHODS AND MATERIALS

We retrospectively collected contrast-enhanced CT scans from surgically resected and pathologically confirmed EOTs across three independent medical centers. The dataset (n=760) was partitioned into: training cohort (n = 403), internal test cohort (n = 135), and two external test cohorts (n=136/86). Expert radiologists manually delineated primary tumor lesions on portal venous phase CT images, which served as the ground truth. A 3D Res-UNet architecture was implemented for automated segmentation following nnUnet framework. Model was evaluated using Dice similarity coefficient (DSC) across all test cohorts. To identify key factors of segmentation accuracy, a multivariable linear regression model was constructed, incorporating tumor morphological, imaging acquisition, and anatomical covariates. Finally, intraclass correlation coefficient (ICC) analysis was performed to assess inter-segmentation radiomics feature stability between automated and manual annotations.

RESULTS

The automated segmentation model achieved robust performance across all test cohorts, with mean DSC of 0.925 (internal test), 0.926 (external test 1), and 0.908 (external test 2), with no statistically significant inter-cohort variation ($p=0.101$). Subgroup analysis revealed significant performance disparities across malignancy grades ($p=0.004$) and tumor volume ($p=0.009$), with superior segmentation accuracy observed in larger lesions. Multivariable regression confirmed tumor volume as a key positive predictor of model performance (ß=0.019/1000, $p<0.001$). Radiomics feature stability analysis demonstrated high consistency (ICC > 0.8) in 83.3% of features between automated and manual segmentations, particularly in original and Laplacian of Gaussian-transformed features, compared to wavelet-derived features.

CONCLUSION

The 3D Res-UNet model demonstrated high accuracy strong multi-center generalizability for EOTs segmentation, with tumor volume identified as a key factor affecting performance. Also, high radiomics feature stability is observed between automated and manual segmentations.

CLINICAL RELEVANCE/APPLICATION

This AI-driven tool standardizes ovarian tumor segmentation in CT, enhancing precision oncology workflows. High segmentation accuracy and radiomics stability enable reliable biomarker extraction for prognosis and therapy optimization in multi-center settings.
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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

S5-STCE1

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Sunday, Nov. 30 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

S5-STCE1-1 TEMPORAL DYNAMICS OF FERUMOXYTOL UPTAKE IN ABDOMINAL ORGANS ON MRI: A NON GADOLINIUM APPROACH

Arely Corro Sanchez (*Presenter*)
Prakash Ambady (*Abstract Co-Author*)
Lisa Muir (*Abstract Co-Author*)
Ramon F. Barajas JR, MD (*Abstract Co-Author*)

PURPOSE

Gadolinium based contrast agents (GBCAs) are the most widely used magnetic resonance imaging (MRI) agents. However individuals with chronic kidney disease (CKD) pose rare but serious risks such as developing nephrogenic systemic fibrosis (NSF), necessitating safer alternatives. Ferumoxytol (Fe) originally approved to treat iron deficiency anemia is being further investigated as a potential non-GB MRI contrast agent. Its advantages include a longer imaging window, multi-sequence detection and reduced risk of NSF. A pitfall to Fe is the systemic biodistribution and long term imaging behavior remaining poorly characterized. This study evaluates the temporal behavior of Fe on four abdominal organs: liver, spleen, bone marrow, and pancreas using MRI sequence. Initially hypothesizing rapid uptake of Fe in the body with a gradual release over time.

METHODS AND MATERIALS

Twelve patients received a single intravenous dose of Fe (= 510 mg). Abdominal T2-weighted MRIs were performed at seven intervals: pre-administration, immediately post, 24 hours, 1, 2, 3, and 6 months post administration. Regions of interest (ROIs) were placed on the liver, spleen, pancreas, and bone marrow using Visage Client software. A single-factor ANOVA was performed to assess aerial signal changes across time, followed by pairwise comparison to characterize signal progression in each organ by their mean voxel intensities tracking iron deposition and clearance patterns in order to understand organ specific iron handling.

RESULTS

The spleen showed the most significant and prolonged T2 signal reduction ($p < 0.01$), indicating a high uptake and slow clearance. The liver also represented a strong uptake but a moderate signal drop while the pancreas displayed delayed uptake, at a peak 1-2 months post administration, suggesting secondary redistribution. In comparison the bone marrow had no significant difference ($p = 0.544$) indicating low uptake or rapid clearance. Percent change was also calculated for each organ.

CONCLUSION

These findings highlight Fe's differential biodistribution along with distinct and organ specific signal behavior across abdominal organs. Fe's comparatively prolonged imaging window, and the ability for sustained signal alterations make it a great option to continue exploring as a supplementary imaging modality especially for patients with contraindications to GBCAs.

CLINICAL RELEVANCE/APPLICATION

This study contributes to insights into not just how Fe behaves systemically but also offers a foundation for optimizing imaging protocols, reducing unnecessary contrast use and informing timing for follow ups. Future studies with larger cohort groups and expanded organs analysis are warranted to further validate these findings and refine clinical protocols involving MRI.

S5-STCE1-2 MANGANESE PRUSSIAN BLUE NANOZYMES FOR MRI-VISIBLE ORAL ALCOHOL DETOXIFICATION: A NEXT-GENERATION IMAGING APPROACH

Qiuhui Hu JR, MD (*Presenter*)
Hongjie Hu, MD (*Abstract Co-Author*)
Xiaoyuan Chen (*Abstract Co-Author*)

PURPOSE

To demonstrate a next-generation MRI-monitoring platform for alcohol intoxication management, we developed an orally administered system (MPASS) combining manganese Prussian blue nanozymes (MPB) with acetic acid bacteria (AAB). MPB's high relaxivity enables real-time MRI tracking while synergizing with AAB's metabolic activity, exemplifying advanced low-contrast imaging capabilities.

METHODS AND MATERIALS

MPASS preparation MPB nanozymes were synthesized via redox-precipitation and electrostatically conjugated to AAB surfaces, with characterization by transmission electron microscope (TEM), zeta potential, and flow cytometry (FCM).In vitro studies ROS scavenging was quantified using DCFH-DA; MPB's longitudinal relaxivity (R1) was measured at 3.0T MRI; AAB metabolic activity was assessed in simulated gastric fluid (pH 2.5, 37°C) via ethanol oxidation.Animal models C57BL/6 mice with acute alcohol intoxication (5 g/kg ethanol) received oral MPASS, MPB, or PBS. Blood ethanol/acetaldehyde and hepatic oxidative markers (MDA, ALT/AST) were analyzed.MRI protocol 3.0T MRI (Discovery 750w, GE Healthcare) with T1-weighted sequences was performed pre- and post-administration (0-8 h) to quantify gastrointestinal retention.

RESULTS

Characterization TEM and zeta potential analyses confirmed the successful synthesis of MPB and formation of MPASS. Stability and activity MPASS maintained 62.47% ± 3.21% of AAB activity after 30-minute exposure to simulated gastric fluid, demonstrating significantly higher stability compared to free AAB (18.92% ± 2.45%; $p < 0.01$). In vitro assays revealed an ROS scavenging efficiency of 88.9%.MRI monitoring MPB exhibited an R1 of 4.2 ± 0.3 mM -1 s -1 (8.4-fold higher than Prussian blue). AAB-mediated mucosal adhesion enabled MPASS gastrointestinal retention for more than 6 hours (vs. 4 hours for MPB alone), confirming prolonged residence. In vivo efficacy MPASS reduced blood ethanol by 76.86% ± 5.12% within 4 h ($p < 0.001$) and decreased ALT/AST (48.7%/52.1%; $p < 0.05$).

CONCLUSION

MPASS leverages MPB's exceptional relaxivity for real-time MRI monitoring, advancing low-contrast imaging applications in metabolic therapy.

CLINICAL RELEVANCE/APPLICATION

MPASS addresses the unmet need for real-time monitoring in alcohol-related disorders. Its high-contrast MRI visibility and extended gastrointestinal retention offer a novel strategy for personalized intervention and treatment surveillance.

S5-STCE1-3 CONTRAST-FREE 3D LYMPH NODE MICROIMAGING OF THE MESOESOPHAGUS: A HIGH-RESOLUTION MRI APPROACH USING A NOVEL NEUROGRAPHY-BASED SEQUENCE

Felicitas Christine Knieper (*Presenter*)
Jan Philipp Masthoff (*Abstract Co-Author*)
Emily Hoffmann (*Abstract Co-Author*)
Sebastian Kubasch (*Abstract Co-Author*)
Mazen Juratli (*Abstract Co-Author*)
Jens Peter Holzen (*Abstract Co-Author*)
Michael Tischendorf (*Abstract Co-Author*)
Barbara Braden (*Abstract Co-Author*)
Tobias Krahling (*Abstract Co-Author*)
Andreas Pascher (*Abstract Co-Author*)
Walter Heindel, MD, PhD (*Abstract Co-Author*)
Marc-David Kunnemann (*Abstract Co-Author*)
Gesa Helen Pohler (*Abstract Co-Author*)

PURPOSE

To evaluate feasibility of high-resolution contrast-free 3D T2-weighted lymph node MRI for first in-vivo detection of lymph node hila in mesoesophageal stations and compare with axillary reference nodes in distal esophageal carcinoma patients.

METHODS AND MATERIALS

Prospectively, monocentric, 30 patients (mean age 46 ±5 years, 70% males) with distal esophageal carcinoma (>T2N1M0) underwent multiparametric MRI including contrast-free 3D T2-weighted MRI (3T Philips 7700, voxel size 0.6×0.6×1 mm^3) and T1-weighted contrast enhanced 3D Vane before treatment. Two radiologists categorized mesoesophageal lymph nodes up to 3 mm diameter stations as described by the Jap. Soc. for Esophaegal Diseases (No. 108, 110, 111, 112) and bilateral axillary reference nodes (smallest detectable size 3 mm) and quantified for: lymph node detectability, fatty hilum occurrence, diameters, nodal areas/volumina, signal intensities.

RESULTS

28 patients were examined successfully. Mesoesophageal lymph nodes were detected in 43% patients, exclusively station 110 as described. Mean short-axis diameters showed no significant differences ($p>0.05$). Technical feasibilitiy was shown by no significant differences in mean short-axis diameters. Axillary detection rates were higher (compared to no. 108, 111, 112): right 18/28 (64.3%), left 16/28 (57.1%). Fatty hila occurred in 7/28 (25.0%) mesoesophageal versus 18/28 (64.3%) and 14/28 (50.0%) axillary nodes. Crucially, in patients with detected mesoesophageal nodes, fatty hila were identified in 7/12 cases (58.3%).

CONCLUSION

First successful in-vivo demonstration of lymph node categorization and microstructure detection in mesoesophagus using contrast-free 3D MRI. Despite lower detection rates than axillary references, the technique achieved clinically meaningful hilum categorizing. This approach may enhance N-staging accuracy by providing morphological benign criteria beyond size, potentially improving selection for neoadjuvant therapy and surgical planning.

CLINICAL RELEVANCE/APPLICATION

Contrast-free 3D lymphonodular MRI offers potential for sentinel lymph node-like staging in esophageal cancer through cataloguing lymphatic stations and detection of preserved fatty hila as benign architecture indicators.

Nov. 30 – Dec. 4
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S5-STCE2

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Sunday, Nov. 30 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

S5-STCE2-1 PREVENTING THE PREVENT PARADOX: OPPORTUNISTIC CT RADIOMICS OF PERI-AORTIC FAT REVEALS HIDDEN CARDIOVASCULAR RISK

Mendel Lebowitz (*Presenter*)
GOURAV MODANWAL (*Abstract Co-Author*)
Amritpal Singh (*Abstract Co-Author*)
Rohan Dhamdhere (*Abstract Co-Author*)
Saumya Diwan (*Abstract Co-Author*)
Sena Azamat (*Abstract Co-Author*)
Santosh Kumar Sirasapalli (*Abstract Co-Author*)
Sanjay Rajagopalan (*Abstract Co-Author*)
Sadeer Al-Kindi (*Abstract Co-Author*)
Anant Madabhushi, PhD (*Abstract Co-Author*)

PURPOSE

Population based clinical risk tools like PREVENT provide valuable estimates of cardiovascular (CV) risk but fail to account for inter-individual variability in CV resilience. Perivascular fat, particularly around the aorta, is metabolically active and reflects underlying inflammation and atherogenesis, features linked to true CV risk. We hypothesized that opportunistic radiomic profiling of peri-aortic fat on coronary artery calcium (CAC) CT could uncover hidden extremes of CV risk that are not reflected in clinical scores.

METHODS AND MATERIALS

We analyzed CAC CTs from 51,506 patients in the CLARIFY trial (NCT04075162). Peri-aortic fat was segmented as an 8 mm circumferential dilation within the adipose attenuation range and1,316 radiomic features were extracted. To identify latent imaging phenotypes, we used UMAP for dimensionality reduction followed by unsupervised clustering with HDBSCAN. SHAP (SHapley Additive exPlanations) analysis identified the most predictive features driving cluster formation. MACE-free survival was compared across clusters using Kaplan-Meier (KM) analysis, with hazard ratios (HR) and 95% confidence intervals (CI) reported. Differences in PREVENT scores and age were assessed using t-tests.

RESULTS

Clustering of peri-aortic fat radiomics identified three distinct phenotypes: a large population group (n=41,937) and two smaller subgroups (n=8,587 and n=532). SHAP analysis revealed that clustering was driven by texture heterogeneity and morphological shape. KM analysis revealed significant differences in MACE-free survival across clusters (log-rank $p<0.001$). Strikingly, one subgroup exhibited lower MACE risk despite being older (59.9 vs. 58.0 years, $p<0.05$) and having higher PREVENT scores (0.16 vs. 0.13, $p<0.001$) compared to the other (HR: 0.39, 95% CI: 0.22-0.72, $p<0.01$). This paradox, higher predicted clinical risk but lower event rates, highlights a limitation of conventional risk tools and underscores the potential of opportunistic radiomic phenotyping to uncover CV resilience.

CONCLUSION

Opportunistic radiomic phenotyping of peri-aortic fat microarchitecture from routine CAC CTs reveals hidden extremes of CV risk, uncovering biologically resilient individuals whose true risk may be overestimated by clinical models. These findings demonstrate the potential of opportunistic imaging biomarkers to personalize risk assessment and move beyond population-based averages toward individualized CV care.

CLINICAL RELEVANCE/APPLICATION

Radiomic phenotyping of peri-aortic fat reveals the PREVENT paradox—patients with higher predicted risk but low event rates—highlighting hidden CV resilience and enabling more personalized, biologically informed prevention strategies.

S5-STCE2-3 OPPORTUNISTIC SCREENING OF CHEST AND ABDOMEN CT WITH ORGAN SEGMENTATION MODEL: THE SEARCH FOR OVERSCANNING AND OVER-RADIATION

Ryan Krishna (*Presenter*)
Anushree M. Burade, MBBS (*Abstract Co-Author*)
Javier Contreras Yametti, MD (*Abstract Co-Author*)
Aaminah Kobeisy, MBBS (*Abstract Co-Author*)
Shivangi Jha (*Abstract Co-Author*)
Subba R. Digumarthy, MD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)
Aarushi Innanje (*Abstract Co-Author*)
Yash Saboo (*Abstract Co-Author*)

PURPOSE

CT-based organ segmentation models (OSM) offer the possibility of opportunistic screening for the presence and quantification of over-scanning and over-radiation. We modified and tested an OSM-based opportunistic screening AI model to estimate the frequency and magnitude of overscanning in chest (CCT) and abdomen-pelvis abdomen-pelvis CT (APCT) exams.

METHODS AND MATERIALS

With IRB approval, our study included 2674 consecutive adult patients (age range >18 years) who underwent CCT or APCT for emergent and non-emergent clinical reasons. In addition, we used 20 APCT exams from The Cancer Imaging Archive (TCIA) to manually mark the precise location of the pubic symphysis (3D Slicer) and the top of femoral heads (TotalSegmentator) and train an AI model with the Ultralytics YOLO11 backbone to identify the pubic symphysis and output its section location. We

embedded OSM (TotalSegmentator) into the model to identify and find z-position for the remaining anatomic landmarks for APCT (femoral head and top of liver and spleen) and CCT (lung apices, adrenals, top of kidneys). Two study coinvestigators reviewed each anatomic landmark on all 2675 CTs to check for correct and incorrect landmark recognition, cranial and caudal underscanning (landmarks not included in scan range) and overscanning (scan range >3 cm beyond landmarks). Data were analyzed with mixed model linear tests, descriptive analyses, and box-whisker plots.

RESULTS

Our model successfully identified anatomic landmarks for overscanning in > 99% CCT and APCT exams (2668/2674 CTs). Caudal overscaning was greater in both frequency and magnitude than cranial over-scanning for both CCT (24.6% vs. 9.9%; 14 ± 14 mm vs. 10 ± 13 mm) ($p<0.001$) and APCT (98.4% vs. 36.3%; 45 ± 25 mm vs. 5 ± 10 mm) ($p<0.001$). Underscanning was reported in 0.98 % APCT (11/1119) and 1.4 % CCT (22/1555). Without thresholding, overscanning was associated with 13.6% and 21.9% extra radiation dose for CCT and APCT, respectively.

CONCLUSION

Organ segmentation models can be modified for accurate opportunistic screening of overscanning in chest and abdomen CT which is important for estimating over-radiation.

CLINICAL RELEVANCE/APPLICATION

Our OSM-based, open-access opportunistic screening model automates estimation of overscaning with display of summary statistics and graphic display of findings; these can help reduce overscanning, radiation dose, and risk of incidental findings detection.
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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

T1-SSCH05

Chest Imaging (Interstitial Lung Disease)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: S501

Mini V. Pakkal, FRCR, MBBS (*Moderator*)
Micheal McInnis, MD (*Moderator*)

Sub-Events

T1-SSCH05-2 IMAGING BIOMARKERS OF INTERSTITIAL LUNG ABNORMALITIES THAT PREDICT PROGRESSION TO CLINICAL IDIOPATHIC PULMONARY FIBROSIS: A MULTI-CONTINENTAL STUDY

Tician Schnitzler, MD, MSc (*Presenter*)
Ali Nowroozi, MD (*Abstract Co-Author*)
Gigin Lin, MD (*Abstract Co-Author*)
Joseph G. Mammarappallil, MD, PhD (*Abstract Co-Author*)
Hasan Zaytoun (*Abstract Co-Author*)
Sebastian T. Schindera, MD (*Abstract Co-Author*)
Brett M. Elicker, MD (*Abstract Co-Author*)
Jae Ho Sohn, MD, MS (*Abstract Co-Author*)

PURPOSE

To identify imaging and clinical features predictive of interstitial lung abnormality (ILA) progression to idiopathic pulmonary fibrosis (IPF), and to validate a risk stratification model across multiple international cohorts.

METHODS AND MATERIALS

This retrospective, multi-center study included 743 patients with CT-detected ILA, of whom 220 progressed to IPF (high-risk) and 523 did not (low-risk). Model development used 220 high-risk cases and 100 low-risk cases with at least five years of imaging stability. Key imaging features (subpleural fibrosis, cranial and central fibrosis, anterior lung involvement, moderate-to-severe emphysema) and demographics (age, sex) were assessed by univariate and multivariate logistic regression. Model performance was evaluated using AUC and externally validated on four independent cohorts (n = 277 total).

RESULTS

Univariate analysis showed strong associations with high-risk ILA: subpleural fibrosis (OR 7.55, $p < 0.0001$), cranial extent (OR 19.4, $p < 0.0001$), central extent (OR 32.2, $p < 0.0001$), anterior involvement (OR 23.6, $p < 0.0001$), and emphysema (OR 3.13, $p = 0.003$). In multivariate analysis, central fibrosis (OR 10.78, $p < 0.001$) and anterior involvement (OR 5.92, $p < 0.001$) remained independently predictive. Internal validation achieved an AUC of 0.915. External validation showed AUCs of 0.922, 0.935, and 0.812 across three cohorts. In a fourth cohort composed entirely of high-risk cases, sensitivity and PPV were both 96.8%.

CONCLUSION

Central and anterior fibrotic changes are robust predictors of ILA progression to IPF and can be visually assessed on CT. These findings support their use in early risk stratification and clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

Visual assessment of central and anterior fibrosis on CT can identify patients at high risk for progression from incidental ILA to IPF. This enables earlier referral, monitoring, and potential treatment before irreversible disease evolution.

T1-SSCH05-3 PHASE-RESOLVED FUNCTIONAL LUNG MAGNETIC RESONANCE IMAGING OF LUNG PERFUSION AND VENTILATION IN FIBROSING INTERSTITIAL LUNG DISEASES, A PROSPECTIVE OBSERVATIONAL STUDY

Yifei Ni, MD (*Presenter*)
Min Liu (*Abstract Co-Author*)

PURPOSE

The pathophysiological changes in lung perfusion and ventilation in fibrosing interstitial lung diseases (F-ILD) remain inadequately characterized. This study aimed to analyze lung perfusion and ventilation in patients with F-ILD using phase-resolved functional lung magnetic resonance imaging (PREFUL MRI).

METHODS AND MATERIALS

This one-year prospective study included 30 patients diagnosed with F-ILD (16 with idiopathic pulmonary fibrosis, IPF and 14 with other type of F-ILD; mean age: 64.6 years; 19 males) alongside 30 age- and sex-matched normal controls. All participants underwent PREFUL MRI as well as pulmonary function tests (PFTs). High-resolution CT (HRCT) was performed for the patient cohort. Ventilation and perfusion parameters obtained from PREFUL MRI were analyzed and correlated with PFTs and fibrotic lesions identified on HRCT.

RESULTS

Compared with normal controls, F-ILD patients showed significant differences in Mean Perfusion, Mean Ventilation, Perfusion Defect (QDP exclusive), ventilation-perfusion matched non-defect percentage (VQM non-defect), and ventilation-perfusion matched defect percentage (VQM defect) ($P < 0.05$). Mean Perfusion correlated positively with DLCO SB %pred ($r = 0.682$, $P < 0.0001$) and DLCO/VA %pred ($r = 0.634$, $P < 0.0001$), while QDP exclusive correlated negatively with these parameters. Mean Perfusion showed negative correlations with honeycombing, fibrotic lesions, and interstitial abnormalities on HRCT, whereas QDP exclusive correlated positively with these abnormalities (all $P < 0.05$).

CONCLUSION

1. For F-ILD patients, PREFUL MRI exhibited reduced mean perfusion, elevated mean ventilation, higher QDP exclusive , decreased VQM non-defect , and increased VQM defect compared to controls. 2. For F-ILD patients, mean perfusion positively correlated with DLCO SB%pred and DLCO/VA%pred, while QDP exclusive inversely correlated with these parameters. 3. For F-ILD patients, Honeycombing and fibrotic lesions on HRCT were associated with reduced mean perfusion.

CLINICAL RELEVANCE/APPLICATION

PREFUL MRI provides a non-invasive method for evaluating ventilation and perfusion in F-ILD patients, demonstrating strong correlations with pulmonary function parameters and interstitial lesion. It shows potential as a valuable diagnostic and monitoring tool for F-ILD, enabling early detection and progression evaluation.

T1-SSCH05-4 PULMONARY VASCULAR REMODELING AND ACUTE EXACERBATIONS IN IDIOPATHIC PULMONARY FIBROSIS: DIRECT AND FIBROSIS-MEDIATED ASSOCIATIONS

Mihyun Yang, MD, MS (*Presenter*)
Jooae Choe, MD, PhD (*Abstract Co-Author*)
Jihye Yun, PhD (*Abstract Co-Author*)
Sang Min Lee, MD, PhD (*Abstract Co-Author*)
Hye Jeon Hwang, MD, PhD (*Abstract Co-Author*)
Sola Seo, MS (*Abstract Co-Author*)
Seungbin Bae (*Abstract Co-Author*)
Eun Jin Chae, MD, PhD (*Abstract Co-Author*)
Joon Beom Seo, MD, PhD (*Abstract Co-Author*)

PURPOSE

Acute exacerbations (AEs) substantially affect outcomes in idiopathic pulmonary fibrosis (IPF). While fibrosis extent is an established risk factor for poor outcomes, the role of pulmonary vascular remodeling remains poorly characterized, especially in mild IPF. We evaluated the association between CT-derived vascular metrics and AE risk, and examined whether these effects are direct or mediated through fibrosis.

METHODS AND MATERIALS

In this retrospective cohort study, we analyzed volumetric high-resolution CT scans from patients with mild IPF (forced vital capacity =80%). Deep learning-based quantification of fibrosis and pulmonary vessel metrics was performed. Metrics included mean pulmonary artery (MD-aBV 6mm) and vein diameters (MD-vBV 6mm) at 6 mm from the pleura, small-vessel blood volume fractions (aBV5/TBV and vBV5/TBV; defined as vessels <5 mm² cross-sectional area normalized to total arterial or vein volume), arterial volume between 5-20 mm² (aBV5-20/TBV; preacinar arterial volume), and the small vein-to-artery ratio (vBV5/aBV5). AE events were recorded; death was treated as a competing risk. Fine-Gray models estimated total effects (adjusted for age, smoking status, and pack-years) and direct effects (additionally adjusted for fibrosis score [FS]). Mediation analysis quantified FS-mediated effects.

RESULTS

Among 253 IPF patients (mean age 66 years; 78% male), 79 (31.2%) developed AE over a median 5.6 years. Strongest total associations were seen for MD-vBV 6mm (HR 15.12, 95% CI 5.08-45.02, p<0.001), MD-aBV 6mm (HR 4.57, 95% CI 1.60-13.07, p=0.005), and vBV5/aBV5 (HR 1.33, 95% CI 1.15-1.53, p<0.001). Lower aBV5/TBV (HR 0.88, 95% CI 0.83-0.93, p<0.001) and higher aBV5-20/TBV (HR 1.15, 95% CI 1.07-1.23, p<0.001) were also significant. Associations that remained after FS adjustment included MD-vBV 6mm (HR 10.92, p<0.001), aBV5-20 (HR 1.12, p=0.003), and aBV5/TBV (HR 0.89, p<0.001), reflecting fibrosis-independent effects. MD-aBV6mm (41% mediated) and vBV5/aBV5 (29% mediated) showed partial mediation by FS. vBV5/TBV was not significantly associated with AE risk.

CONCLUSION

Quantitative vascular metrics on CT are associated with AE risk in patients with mild IPF. While some effects are partially mediated by fibrosis, several vessel changes confer AE risk beyond fibrotic burden.

CLINICAL RELEVANCE/APPLICATION

Pulmonary vascular changes visible on CT provide clinically relevant information about AE risk in IPF and may enhance prognostication beyond fibrosis measures.

T1-SSCH05-5 FIBROTIC INTERSTITIAL LUNG DISEASE IN SICKLE CELL DISEASE PATIENTS: FREQUENCY AND PREDICTORS OF PROGRESSION ON CT

Victoria Shi, BA (*Presenter*)
Wenchi Hsu, MD (*Abstract Co-Author*)
Elizabeth Klings (*Abstract Co-Author*)
Lydia Pecker (*Abstract Co-Author*)
Cheng Ting Lin, MD (*Abstract Co-Author*)

PURPOSE

Multi-factorial pulmonary disease is a major cause of morbidity and mortality in patients with sickle cell disease (SD). Interstitial lung disease (ILD) can occur and ranges from parenchymal scarring to fibrotic changes; its impact on mortality is unclear. The natural history of these radiologic changes is unexplored and the current study seeks to understand the frequency of fibrotic ILD and predictors of ILD progression in SCD patients.

METHODS AND MATERIALS

Adult patients documented with ICD codes for SCD and presented at a tertiary care center were included in this retrospective study. Patient were included if they had two chest CT scans, with the baseline and most recent scans conducted at a minimum interval of five years between 2002 and 2024. Demographic and clinical data were extracted from the electronic medical records. CT scans were reviewed for the presence and progression of fibrotic ILD by two thoracic-trained radiologists who were blinded to clinical data. Quantitative CT analysis was performed for baseline non-contrast CT scans. Statistical analyses included chi-square tests and multivariable logistic regression models.

RESULTS

Of 133 patients diagnosed with SCD, 75.9% were HbSS,11.3% were HbSC, and 12.8% were other genotypes. Fibrotic changes on CT at baseline and follow-up imaging were 33.1% and 37.6%, respectively (median time to follow-up: 9.7 years). Fibrotic ILD progression on CT occurred at a rate of 12.0%. Multivariable logistic regression identified baseline fibrotic changes on CT as an independent risk factor for ILD progression (HR: 6.9; 95% CI: 1.3-46.8; p = 0.03). In a limited subset of SCD patients with available pulmonary function tests (n=69), those with radiographic progression had significantly worse pulmonary function compared to those without progression (FVC %pred: 56.0% vs. 73.6%, p<0.01; TLC %pred: 58.6% vs. 76.1%, p<0.01; DLCO %pred: 44.0% vs. 61.6%, p = 0.02).

CONCLUSION

This study demonstrates that fibrotic ILD in patients with SCD is common and identifies baseline CT fibrotic findings as predictive of long-term ILD progression which was associated with reduced lung function.

CLINICAL RELEVANCE/APPLICATION

The study shows that baseline fibrotic ILD in SCD patients is a significant marker of future disease progression and worsening pulmonary function. These results underscore that early radiologic evaluation may help identify those who will benefit from targeted management strategies to reduce the risk of ILD disease progression.

T1-SSCH05-6 CT-BASED ELASTIC REGISTRATION REVEALS DISTINCT MECHANICAL PROPERTIES ACROSS CT PATTERNS AND ABNORMAL MECHANICS IN NORMAL-APPEARING LUNG IN IDIOPATHIC PULMONARY FIBROSIS

Jooae Choe, MD, PhD (*Presenter*)
Jihye Yun, PhD (*Abstract Co-Author*)
Mihyun Yang, MD, MS (*Abstract Co-Author*)
Hye Jeon Hwang, MD, PhD (*Abstract Co-Author*)
Sang Min Lee, MD, PhD (*Abstract Co-Author*)
Joon Beom Seo, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate lung deformation from elastic registration of chest CT scans in patients with idiopathic pulmonary fibrosis (IPF) across diseased parenchymal patterns and normal-appearing lungs, and assess their associations with prognosis.

METHODS AND MATERIALS

IPF patients and healthy controls (age =50 years) with paired inspiratory and expiratory HRCT images were retrospectively included. Deformation maps were generated through elastic registration of inspiratory/expiratory images, from which Jacobian determinants were calculated at whole-lung and lobar levels. Deep learning-based texture analysis classified lung parenchyma into normal, ground-glass opacity (GGO), reticulation, emphysema, and honeycombing regions. Jacobian metrics were compared between groups and across patterns. Multivariable analyses for 1-year lung function decline and survival were fitted for each Jacobian metric, adjusted for age, sex and baseline lung function.

RESULTS

A total of 245 patients with IPF (median age, 67 years; 80% male) and 48 with healthy controls (median age, 58 years; 42% male) were included. IPF patients demonstrated significantly higher mean whole-lung Jacobian determinant values compared to controls (0.65 ± 0.12 vs. 0.60 ± 0.12, P < 0.001), with most pronounced differences in lower lobes (right lower lobe: 0.60 ± 0.13 vs. 0.52 ± 0.12; P < 0.001). Normal-appearing lung regions of IPF patients showed the greatest median volume deformation (0.64, IQR 0.56-0.73), which was higher than that of healthy controls (P < 0.001), while GGO, reticulation, emphysema, and honeycombing areas showed significantly less deformation. Honeycombing regions exhibited the highest heterogeneity (Jacobian SD: median 2.86, IQR 2.47-3.39). The percentage of normal-appearing lung regions with higher Jacobian determinants (>0.6) in lower lobes was associated with FVC decline at 1 year (OR 1.12, 95%CI: 1.02-1.24; P = 0.02). In multivariable Cox models, greater spatial heterogeneity of volume change in normal-appearing lung was significantly associated with longer survival (Jacobian SD: adjusted HR, 0.62, 95%CI 0.40-0.98, P = 0.04).

CONCLUSION

Elastic registration of inspiratory-expiratory CT reveals distinct regional lung deformation in IPF. Greater areas of normal-appearing lower lobes with reduced deformation were linked to lung function decline, while higher deformation heterogeneity was associated with better survival.

CLINICAL RELEVANCE/APPLICATION

Elastic registration of inspiratory-to-expiratory CT captures functional abnormalities in radiologically normal-appearing lung, complementing visual pattern classification on CT by detecting early mechanical changes that may precede structural progression.

Nov. 30 – Dec. 4
RSNA® 2025
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T1-SSGI06

Gastrointestinal Imaging (CT, Ultrasound Techniques)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E353A

Benjamin M. Yeh, MD (*Moderator*)
Hannah S. Recht, MD (*Moderator*)

Sub-Events

T1-SSGI06-1 ONE-STOP MULTIENERGY PANCREATIC DYNAMIC VOLUME PERFUSION IMAGING USING PHOTON-COUNTING DETECTOR CT: INITIAL EXPERIENCE

Yanzhao Yang (*Presenter*)
Huimin Lin (*Abstract Co-Author*)
Zhihan Xu, MD (*Abstract Co-Author*)
Weimin Chai (*Abstract Co-Author*)
Fuhua Yan, MS (*Abstract Co-Author*)

PURPOSE

This study reports initial experience with a modified one-stop, multienergy pancreatic VPCT protocol using PCCT, designed for comprehensive morphologic analysis and functional perfusion assessment of pancreatic ductal adenocarcinoma (PDAC).

METHODS AND MATERIALS

From April 2024 to October 2024, participants with suspected PDAC were prospectively enrolled and underwent preoperative pancreatic dynamic VPCT. Individual phase images were extracted from perfusion datasets using T3D, virtual monoenergetic images (VMIs) at 55 and 70 keV reconstruction for diagnostic interpretation. Diagnostic image quality was assessed both quantitatively and subjectively. Perfusion maps were generated for analysis. Perfusion parameters were compared between PDAC lesions and normal parenchyma, as well as among PDAC histopathological differentiation. Radiation doses were recorded.

RESULTS

A total of 65 participants (39 male; mean age, 66.2 ± 6.3 years) with histologically confirmed PDAC were included. The protocol achieved a mean effective radiation dose of 16.4 ± 4.5 mSv. All individual phase images met diagnostic quality standards (subjective scores = 3). Among these, 55 keV VMIs demonstrated the highest CNR for PDAC lesions and adjacent vasculature, and superior subjective scores for lesion conspicuity in both pancreatic parenchymal and portal venous phases (all $p < 0.05$). Perfusion parameters, including blood flow (BF), blood volume (BV), time to drain (TTD),mean transit time, time to start, Tmax, and flow extraction product (FEP), differed significantly between PDAC lesions and normal parenchyma (all $p < 0.05$). Poorly differentiated PDAC lesions exhibited significantly lower BF, BV, TTD, and Tmax values and reduced lesion-to-parenchyma ratios of BF, BV, and FEP compared to moderately-to-well-differentiated PDAC lesions.

CONCLUSION

The one-stop, multienergy pancreatic VPCT protocol using PCCT enables high-quality morphologic imaging and reliable functional perfusion assessment at reduced radiation doses.

CLINICAL RELEVANCE/APPLICATION

It provides valuable insights into PDAC differentiation and histopathological grading, with potential implications for improved clinical management.

T1-SSGI06-2 PANCREATIC IMAGING WITH ULTRA-HIGH-RESOLUTION PHOTON-COUNTING CT: PRELIMINARY EVALUATION OF IMAGE QUALITY

Rui Kun Huang, MD (*Presenter*)
Zhihan Xu, MD (*Abstract Co-Author*)
Yanzhao Yang (*Abstract Co-Author*)
Weimin Chai (*Abstract Co-Author*)

PURPOSE

This study aimed to assess the potential benefit of ultra-high-resolution (UHR) photon-counting CT (PCCT) angiography for visualizing pancreatic ductal adenocarcinoma (PDAC) and peripancreatic arteries.

METHODS AND MATERIALS

From September 2024 to May 2025, participants with suspected PDAC were prospectively enrolled and underwent preoperative pancreatic CT angiography (CTA) using the UHR scanning mode of a PCCT system. The image data were reconstructed into six series: (a) 0.2mm slice thickness, T3D images; (b) 1 mm slice thickness, virtual monoenergetic images (VMIs) at 70 keV; (c-f) 0.4mm slice thickness, VMIs at 40, 45, 50 and 55 keV, respectively. All images were reconstructed using quantum iterative reconstruction (QIR) level 4 and the Br40 filter kernel. Image quality was evaluated both quantitatively and qualitatively. The sharpness of arteries and pancreatic duct border was also evaluated quantitatively.

RESULTS

Twenty-five participants (17 male; mean age, 62 ± 11 years) with histologically confirmed PDAC were included. In terms of quantitative image quality, in both the arterial and portal venous phases, 0.4 mm_40 keV_UHR images (c) demonstrated significantly higher SNR and CNR values for both PDAC lesions and peripancreatic arteries compared to other image sets (all $P < 0.001$). While the 1mm_70keV images (b) showed lower image noise ($P < 0.001$), 0.4mm_40 keV_UHR images (c) were rated higher in vessel and pancreatic duct sharpness (all $P < 0.001$). Qualitatively, 0.4mm_45 keV_UHR (5 ± 0) and 0.4mm_50 keV_UHR (5 ± 0) images were rated similarly, exceeding those of 0.4mm_40 keV_UHR (4.12 ± 0.33), 0.4mm_55 keV_UHR (4.36 ± 0.49), 0.2mm_T3D (3.56 ± 0.51), and 1mm_70keV (4.92 ± 0.28) images. Tumor and vessel delineation were comparable among the 0.4mm_45-50 keV_UHR reconstructions ($P = 0.346$) and superior to all other image sets ($P < 0.003$).

CONCLUSION

For PCCT, the 0.4mm_45 keV_UHR scanning mode demonstrated superior image quality-both quantitatively and qualitatively-for detecting pancreatic visualization, compared to other image sets.

CLINICAL RELEVANCE/APPLICATION

The 45 keV VMI with a slice thickness of 0.4 mm in UHR mode is recommended for pancreatic CTA.It improves the visualisation of pancreatic lesions and peripancreatic vessels, thereby facilitating more accurate preoperative assessment of PDAC.

T1-SSGI06-3 COMPARISONS OF RADIOGRAPHY TECHNIQUES (ITERATIVE RECONSTRUCTION VS. CONVENTIONAL RADIOGRAPHY) IN PANCREATICOBILIARY INTERVENTIONS: CLINICAL RETROSPECTIVE ANALYSIS

Noriyuki Sakai, MSc, RT (*Presenter*)
Tatsuya Sato (*Abstract Co-Author*)
Saori Koshino, MD, PhD (*Abstract Co-Author*)
Naminatsu Takahara (*Abstract Co-Author*)
Hidetake Yabuuchi, MD (*Abstract Co-Author*)
Katsuyuki Tabei (*Abstract Co-Author*)
Toshikazu Imae (*Abstract Co-Author*)
Osamu Abe, MD, PhD (*Abstract Co-Author*)

PURPOSE

To retrospectively investigate whether iterative reconstruction (IR), applied to fluoroscopic imaging systems, reduces radiography dose while maintaining clinical image quality in pancreaticobiliary interventions by comparing dose area product (DAP), the number of radiographs, and clinical image quality using IR with those using conventional radiography (CR).

METHODS AND MATERIALS

The institutional review board approved this retrospective observational study comparing radiography dose, the number of radiographs, and clinical image quality of the CR group (from March 2018 to March 2019) and IR group (from June 2021 to October 2022) in consecutive pancreaticobiliary interventions performed at a single center. The period between the groups was excluded because different imaging conditions were used. We enrolled interventions classified as either endoscopic retrograde cholangiopancreatography (ERCP), percutaneous transhepatic biliary drainage (PTBD), balloon-assisted endoscope-guided ERCP (BAE-ERCP), interventional endoscopic ultrasonography (iEUS), or endoscopic gastrointestinal stentings (EGS). We extracted clinical images (8 biliary stents, 7 pancreatic stents, 7 EGS, and 20 ERCP) for visual assessment. An endoscopist and a diagnostic radiologist independently and visually scored the overall image quality, noise, and depiction of each stent and pancreaticobiliary ducts on a four-point scale. We used the Mann-Whitney U test to identify significant differences between the groups in the DAP, the number of radiographs, and visual scores. A P -value less than .05 was considered statistically significant. Inter- and intra-observer agreement was calculated by weighted kappa statistics.

RESULTS

The enrolled 2,496 interventions (1,579 males and 917 females; IR group, n = 1,477; CR group, n = 1,019) consisted of 2,006 ERCP, 78 PTBD, 157 BAE-ERCP, 223 iEUS, and 32 EGS. There were significant differences between the IR group and CR group in DAP per examination (median, 1047.0 vs. 2437.0 mGy•cm 2 ; reduction rate, -57.0%), the number of radiographs (median, 10.0 vs. 13.0), and DAP per image (median, 104.6 vs. 192.7 mGy•cm 2 ; reduction rate, -45.7%), respectively (P < .001). There was no significant difference in the visual assessment (P > .05). Inter- and intra-observer agreement was almost perfect (range, 0.90-1.00).

CONCLUSION

In pancreaticobiliary interventions, IR reduced the radiation dose per examination and radiation dose per image by 57.0% and 45.7% without increasing the number of radiographs and degradation of clinical image quality.

CLINICAL RELEVANCE/APPLICATION

Radiation dose reduction of patients and operators could be achievable in pancreaticobiliary interventions using IR while maintaining clinical image quality.

T1-SSGI06-4 A CT-BASED HABITAT REGION HETEROGENEITY INDEX MODEL FOR PREDICTING EARLY LIVER METASTASES IN PANCREATIC DUCTAL ADENOCARCINOMA: A PILOT STUDY

Mengru Li (*Presenter*)
Wei Wei (*Abstract Co-Author*)

PURPOSE

The occurrence of liver metastasis following radical resection for pancreatic ductal adenocarcinoma (PDAC) significantly compromises patients' long-term survival. To address this challenge, we developed a CT-based tumor habitat region-driven heterogeneity quantification model and assess its prognostic capacity for survival.

METHODS AND MATERIALS

160 patients [68.0±10.0 years; 94 (58.8%) male] who underwent surgical resection and were pathologically proven with PDAC were recruited retrospectively from our hospital between january 2023 and December 2024. Based on CT values and texture feature, the tumor lesions were partitioned into habitat regions to comprehensively characterize tumor heterogeneity, and a model based on tumor heterogeneity index was developed using multivariate logistic regression in the training cohort. The performance of this model was evaluated by the area under the receiver operating characteristic curve (AUC) in an internal validation cohort. Subsequently, Cox regression analysis and log-rank test were employed to investigate the association between the model's risk stratification and PFS as well as OS.

RESULTS

A total of 160 patients were divided into the liver metastasis group (n=73), non-metastatic group (n=87). The IMC2 and Sum Entropy habitat heterogeneity indices emerged as independent predictors. The habitat model,clinical model,and the combined model yielded AUC of 0.743(95% CI: 0.45-0.65),0.616(95% CI: 0.57-0.75),0.762(95% CI: 0.63-0.80)in the training cohorts, respectively, which demonstrated that both habitat region features and the combined model exhibited significantly higher AUC values compared to the statistically significant clinical model (DeLong test: P = 0.003 for the habitat model; P = 0.001 for the combined model). No significant AUC difference was observed between the combined model and the habitat model. The habitat model’s risk stratification was an independent predictor of PFS (P<0.05) , The PFS of the predicted high-risk group was significantly shorter than the low-risk group.

CONCLUSION

Habitat analysis enables the quantification and visualization of distinct intratumoral subregions. The proposed habitat region heterogeneity index model provided a promising tool to predict early liver metastases and had a great significance in prognosis.

CLINICAL RELEVANCE/APPLICATION

a habitat analysis-based heterogeneity index model was developed and validated to predict early postoperative liver metastases. The model outperformed preoperative clinical models and demonstrated relatively robust predictive performance in subgroup analyses. Furthermore, significant associations were identified between heterogeneity index model and both PFS and OS.

T1-SSGI06-5 RELATING RADIOLOGIST LIKERT IMAGE QUALITY SCORES IN BARIATRIC PATIENTS TO A PHYSICS MODEL OF DETECTOR ELECTRONIC NOISE

Aria Salyapongse, MSc (*Presenter*)
Giuseppe V. Toia, MD, MS (*Abstract Co-Author*)
Hiroki Kawashima, PhD (*Abstract Co-Author*)
Meghan G. Lubner, MD (*Abstract Co-Author*)
Timothy P. Szczykutowicz, PhD (*Abstract Co-Author*)

PURPOSE

To examine the relationship between patient size and subjective image quality metrics to identify a threshold for minimum CT tube current below which image quality suffers.

METHODS AND MATERIALS

Subjective image quality metrics (noise texture, spatial resolution, directional noise streaking, and overall diagnostic quality) in the abdomen and pelvis were assessed on 145 subjects. Water equivalent diameter (WED) range was 25.8 - 46.5 cm and 25.1 - 46.5 cm in the abdomen and pelvis, respectively. Subjective image quality was assessed using a 5-point Likert scale (1 = better than needed quality and 5 = non-diagnostic quality). Statistical analysis for small (average WED of 30.7 cm in the abdomen, 29.2 cm in the pelvis, n = 49), medium (average WED of 36.4 cm in the abdomen, 35.4 in the pelvis, n = 40), and large (average WED of 43.4 cm in the abdomen, 43.0 in the pelvis, n = 54) subject groups was performed using the Kruskal Wallis test for significant differences and Dunnett's test for post-hoc comparison testing. To determine the minimum mA necessary at each WED, a circular phantom of plastic with a WED of 33.8 cm was scanned over a range of current (10-600 mA). The mA where electronic noise began to dominate was identified. This value was then put into an exponential model with a half-value layer of 3.6 cm to model minimum mA necessary for each WED.

RESULTS

The 3 WED cohorts (small, medium, and large) had statistically different ($p < 0.001$) Likert scores for all categories in both the abdomen and pelvis. Noise texture, spatial resolution, directional noise streaking, and diagnostic quality were significantly better ($p < 0.006$, $p < 0.005$, $p < 0.01$, $p < 0.001$, respectively) for small and medium WED compared to large WED in both anatomic regions. Noise texture, directional noise streaking, and diagnostic quality were only significantly better ($p < 0.002$, $p < 0.002$, $p < 0.02$, respectively) for small WED compared to medium WED in the pelvis. For the 33.8 cm phantom, deviation from ideal noise behavior with mA began near 175 mA. This resulted in an model for minimum mA of the form: 175*exp((WED-33.8)*log(2)/3.6)), which effectively separated most of the superior quality Likert scores (grades of 1 and 2) from the poor quality Likert scores (grades of 3-5).

CONCLUSION

By combining subjective image quality scores and a phantom-based mathematical model for minimum mA, this work demonstrated a method to scale the minimum mA necessary to achieve diagnostic quality images of the abdomen and pelvis as a function of patient size.

CLINICAL RELEVANCE/APPLICATION

We have demonstrated that a basic physics characterization of detector electronic noise performance can define the minimum tube current required to ensure diagnostic utility as a function of patient size.

T1-SSGI06-6 IMPACT OF ULTRASOUND MANUFACTURER ON LIVER EXAMINATION QUALITY

David T. Fetzer, MD (*Presenter*)
Yin Xi, PhD (*Abstract Co-Author*)

PURPOSE

Ultrasound (US) is the recommended first-line modality for hepatocellular carcinoma (HCC) screening. The Liver Imaging, Reporting and Data System (LI-RADS) for US Surveillance v2024 recommends a qualitative Visualization Score (VIS) to convey exam quality and expected sensitivity. Many patient factors are now known to influence VIS (eg. gender; weight; disease etiology and severity). Technical factors, including site, sonographer experience, and radiologist experience and subspecialty, are also confounders. What is unknown is the influence of US system manufacturer on VIS and quality of HCC screening exams.

METHODS AND MATERIALS

Structured reports for clinical US exams automatically capture US system, and include a picklist for VIS (A, No or Minimal Limitation; B, Moderate Limitations; and C, Severe Limitations). Reports, patient demographics, and exam information are transferred to a data warehouse, which was queried for all US Liver exams (preferred order for HCC surveillance). Exam characteristics included institution (County and University) and location (Outpatient, OP; Inpatient, IP; and Emergency, ED). From exam reports the following were extracted: VIS and US system: E10 (GE HealthCare), EPIQ (Philips Healthcare) and Sequoia (Siemens Healthineers), which were randomly assigned SYS1, SYS2, and SYS3. Mixed effects model was used to assess the influence of system on VIS. Technologist was included as random effect.

RESULTS

From Jan 2013 to April 2025, 79,200 US Liver examinations were identified, 7.6% from ED, 21% IP, and 68% OP (and 3.3% undefined). VIS rates were 65% VIS A, 30% VIS B, and 5.1% VIS C, in line with previous studies, with worse VIS rates for ED/IP compared to OP exams ($p<0.001$), and worse for patients with advanced age and higher BMI ($p<0.001$). VIS rates were worse for County site ($p<0.001$), where 100% of exams were performed on Philips and excluded from further analysis. 7,464 OP exams from University site included both SYS and VIS, 24% SYS 1, 63% SYS 2, and 13% SYS 3. SYS1 had worse VIS than SYS2 on average ($p = .007$), and such difference was most prominent in higher BMI range (>30) (Figure 1).

CONCLUSION

Statistically significant differences in VIS was seen between locations, and between groups of different ages and BMI, as previously seen. Significant differences in VIS rates was detected based on manufacturer overall, and between manufacturers in patients with obesity in particular.

CLINICAL RELEVANCE/APPLICATION

The choice of US system may impact quality of an institution's HCC surveillance program. Although this study was not designed to study the influence of device age, transducer, or software version, systems from different manufacturers may influence differences in graded study quality, particularly in patients with obesity.

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T1-SSGI07

Gastrointestinal Imaging (MRI Techniques)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: E451B

Sadhna Verma, MD, MBA (*Moderator*)
Surbhi Raichandani, MD (*Moderator*)

Sub-Events

T1-SSGI07-1 CYCLEGAN-BASED GENERATION OF POSTCONTRAST SYNTHETIC LIVER MRI FROM PRECONTRAST SEQUENCES IN PATIENTS WITH CIRRHOSIS AND HCC

Sara Abosabie (*Presenter*)
Salma A. Abosabie (*Abstract Co-Author*)
Weicheng Dai, MS, BSc (*Abstract Co-Author*)
Junlin Yang, BS (*Abstract Co-Author*)
Moritz Gross (*Abstract Co-Author*)
Jeffrey C. Weinreb, MD (*Abstract Co-Author*)
Margarita V. Revzin, MD, MS (*Abstract Co-Author*)
Gaurav Parmar, MD (*Abstract Co-Author*)
Chenyu You (*Abstract Co-Author*)
Olivia Gaddum (*Abstract Co-Author*)
Bernhard Gebauer, MD (*Abstract Co-Author*)
David C. Madoff, MD (*Abstract Co-Author*)
Lynn J. Savic, MD (*Abstract Co-Author*)
Julius Chapiro, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate deep learning models that generate synthetic contrast-enhanced multiphasic MRI (CE-mpMRI) of the liver based on real non-contrast MRI obtained in hepatocellular carcinoma (HCC) and cirrhosis patients.

METHODS AND MATERIALS

This retrospective study included 3,198 MRI series from 260 HCC and 273 cirrhosis CE-mpMRI exams. A three-dimensional cycle-consistent generative adversarial network was trained to generate four synthetic postcontrast series (arterial, portal venous, delayed, hepatobiliary [HBP]) from real precontrast T1- and T2-weighted series. 80% of data was used for 10-fold cross-validation and 20% for an independent test set. Quantitative similarity, error metrics and dice similarity coefficient (DSC) between real and synthetic series were calculated. Three radiologist readers qualitatively assessed real and synthetic CE-mpMRI using a 6-task questionnaire (1: real vs synthetic, 2: is quality acceptable for diagnostic use 3: is disease (HCC or cirrhosis) diagnosable, 4: is liver anatomy accurate, 5: artifact severity, 6: target HCC lesion LI-RADS features).

RESULTS

Synthetic postcontrast CE-mpMRI demonstrated high quantitative similarity to real images with mean structural similarity index 0.86 ± 0.03, 0.75 ± 0.11; normalized root mean square error 0.08 ± 0.03, 0.13 ± 0.07; DSC 0.96± 0.07, 0.97 ± 0.05 in liver and tumor regions respectively. Qualitatively, there was no significant difference between real and synthetic series across tasks 1 - 5 (McNemar test: p= 0.06-0.50). The model successfully reproduced major LI-RADS features (non-rim arterial phase hyperenhancement, portal venous/delayed washout and enhancing capsule) and the ancillary HBP hypointensity shown by accuracy: 72 - 86%; precision: 96 - 100%; sensitivity: 70 - 87%; specificity: 73 - 100% in task 6. Interrater agreement was high in all tasks (Fleiss kappa: 0.58 - 0.96, p< 0.001).

CONCLUSION

The proposed model demonstrates early feasibility of using non-contrast MRI sequences to generate high-quality synthetic postcontrast CE-mpMRI, potentially offering a pipeline towards a viable alternative for conventional CE-mpMRI. These highly promising preliminary findings highlight the potential to transform liver MRI workflows and call for further studies to reproduce and validate our results in other disease-specific applications.

CLINICAL RELEVANCE/APPLICATION

This approach lays the groundwork to streamline liver CE-mpMRI by significantly reducing the cost of contrast agents, their potential side effects, shortening acquisition time - especially the prolonged HBP acquisition of 20 minutes and improving accessibility for patients unable to tolerate it (due to renal impairment, contrast agent allergy or claustrophobia).

T1-SSGI07-2 FEASIBILITY OF AI-ASSISTED COMPRESSED SENSING PROTOCOLS IN COLON MR IMAGING: A PROSPECTIVE COMPARISON WITH CONTRAST-ENHANCED CT

Zhen Guan (*Presenter*)
Xiao Zhang (*Abstract Co-Author*)
Ying-shi Sun, PhD (*Abstract Co-Author*)

PURPOSE

To provide a MR scanning protocol and prospectively compare the image quality, visualization of anatomy, tumor and lymph nodes conspicuity of AI-assisted compressed sensing (ACS) MRI with contrast-enhanced CT in colon cancer.

METHODS AND MATERIALS

Patients with pathologically confirmed colon cancer who underwent ACS MRI between August 2022 and April 2024 were eligible for this single-center prospective noninferiority study. All patients underwent CECT within one month prior to ACS MRI examination. Overall image quality, sharpness of peritoneum, sharpness of colonic

wall layers, tumor conspicuity, lymph node conspicuity and artifacts were assessed using a 4-point Likert scale. Contrast-to-noise ratio (CNR) and edge rise distance (ERD) were obtained and reported as medians and IQRs. The intergroup comparisons were performed using paired Wilcoxon signed rank test.

RESULTS

This study included 153 matched examinations from 132 participants (mean age, 58 years ±11 [SD]). Overall image quality scores were 4 (IQR, 3-4) at ACS MRI and 3 (IQR, 3-3) at CECT (P < .001). ACS MRI images improved sharpness of anatomic structures (peritoneum and colonic wall layers), tumor conspicuity and lymph node conspicuity (all P < .001). CECT was given higher scores for artifacts (median score, 4 [IQR, 3-4] vs 4 [IQR, 4-4], respectively; P < .001). In quantitative assessment, ACS MRI achieved higher CNR (5.46 [IQR, 4.24-7.00] vs 1.30 [IQR, 0.65-2.19]; P <.001) and shorter ERD (edge rise distance, 1.63 [IQR, 1.17-2.76] vs 3.70 [IQR, 2.84-5.01]; P <.001).

CONCLUSION

ACS MRI of colon with oblique scanning protocol was feasible and improved subjective overall image quality, sharpness of anatomic structures, tumor conspicuity and lymph node conspicuity compared with CECT. Furthermore, CNR and ERD were improved at ACS MRI.

CLINICAL RELEVANCE/APPLICATION

ACS MRI of colon with oblique scanning protocol was feasible in routine practice and improved subjective and objective image quality compared with contrast-enhanced CT.

T1-SSGI07-3 THE DIAGNOSTIC VALUE OF 5.0T ULTRA-HIGH-FIELD MRI SUSCEPTIBILITY WEIGHTED IMAGING COMBINED WITH MULTI-ECHO T2* MAPPING IN MICROVASCULAR INVASION OF HEPATOCELLULAR CARCINOMA

Ying Liu (*Presenter*)
Shao Peng Li II, DO (*Abstract Co-Author*)
Lianxin Liu (*Abstract Co-Author*)
Dawei Yin (*Abstract Co-Author*)
Peng Wang (*Abstract Co-Author*)
Mengqiu Liu (*Abstract Co-Author*)
Zhichao Feng, MD (*Abstract Co-Author*)
Runyu Tang (*Abstract Co-Author*)
Xiaopeng Song (*Abstract Co-Author*)

PURPOSE

To evaluate the application value of 5.0 T ultra-high-field magnetic resonance imaging (MRI) susceptibility weighted imaging(SWI) combined with multi-echo T2*mapping in microvascular invasion(MVI) of hepatocellular carcinoma(HCC).

METHODS AND MATERIALS

A retrospective analysis was conducted on 44 HCC patients who met the inclusion and diagnostic criteria. The SWI features of the lesions were analyzed, and the intratumoral susceptibility signal intensity(ITSS) was graded. Additionally, the R2* values of the lesions, peritumoral areas, and background liver tissue were calculated, along with the ?R2* values(?R2*=R2*lesion - R2*liver/R2*liver). Statistical analysis was performed to examine the differences in these parameters under different MVI statuses.

RESULTS

1. The interobserver agreement for both ITSS grading and R2* value measurements (in the liver, lesion, and peritumoral regions) between the two physicians demonstrated excellent consistency(?/ ICC >0.9). 2. According to pathological standards, the MVI-positive group exhibited higher ITSS grading, a greater likelihood of concurrent hemorrhage(p =0.031), and higher R2* values in the lesion, peritumoral area, and ?R2* compared to the MVI-negative group(60.07±25.22 vs 52..05±21.51, 94.32±29.32 vs 91.06±30.69, 0.39±0.40 vs 0.13±0.12). 3. Among these, the difference in ?R2* values was statistically significant (p = 0.041), and the diagnostic performance of ?R2* was superior to that of ITSS(0.686 vs 0.838). The combination of both can further improve diagnostic efficiency(AUC = 0.876).

CONCLUSION

Based on the 5.0T ultra-high-field SWI sequence, a high ITSS grade and the ?R2* value from the T2* mapping sequence are potential predictive biomarkers for HCC MVI. The combination of these two parameters can enhance diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

Based on the 5.0T ultra-high field SWI and multi-echo T2* sequence, ITSS and R2* values within the lesion can be quantitatively measured to predict HCC microvascular invasion. It is simple and easy to operate, with high diagnostic efficiency.

T1-SSGI07-4 FERUMOXYTOL AS DUAL-FUNCTION MRI CONTRAST AGENT AND RADIOPROTECTORIN MRI-GUIDED LIVER SBRT FOR PATIENTS WITH HEPATOCELLULAR CARCINOMA AND CIRRHOSIS

Vladimir Kirichenko, MD (*Presenter*)
Danny Lee, PhD (*Abstract Co-Author*)
Andrew J. Klobuka, MD (*Abstract Co-Author*)
Alexandra Roudenko, MD (*Abstract Co-Author*)

PURPOSE

This study investigates the feasibility and outcome of a personalized MRI-guided liver SBRT planning with SPION contrast agent ferumoxytol® in patients with HCC and advanced cirrhosis and explores the cytoprotective effects of ferumoxytol.

METHODS AND MATERIALS

Utilizing human monocytic THP-1 undifferentiated and differentiated cells, we characterized the effect of ferumoxytol®, at clinically relevant concentration and therapeutically relevant radiation doses on cultured human monocytes and macrophages in vitro. All patients underwent MRI planning on the Unity MR-Linac following Ferumoxytol® injection. SPION-enhanced MR image set of tumor and functional hepatic parenchyma during per-fraction MRI-guided liver SBRT was used.

RESULTS

Ferumoxytol increased the resistance of human monocytes to radiation-induced cell death and supported the anti-inflammatory phenotype of human macrophages under radiation. Its effect depended on the duration of SPION uptake and was radiation dose dependent. With a median follow-up of 19 months 17 patients with hepatic cirrhosis received ablative SBRT to a median dose 44 Gy. Once IV injected, Ferumoxytol stays within hepatic Kupffer cells (KC) for weeks allowing precise targeting of hepatic tumors during the entire treatment course with median duration of 18 days. A contouring algorithm was generated for guided avoidance of functional liver volumes (FLV) during treatment plan adaptations on MRI-Linac. FLV loss was observed in all patients, with loss extent proportional to cirrhosis degree. While tumors received ablative irradiation, the mean dose to FLV was maintained below the liver threshold tolerance to radiation through personalized treatment planning. Seven patients successfully completed orthotopic liver transplant after SBRT. Complete regeneration of liver parenchyma outside 30-Gy isodose envelope conferring radioprotection or enhanced regeneration of liver parenchyma exposed to lower radiation doses during SPION-enhanced MRI-guided SBRT.

CONCLUSION

The findings support the dual role of ferumoxytol in improving imaging precision and potentially protecting hepatic function during SBRT.

CLINICAL RELEVANCE/APPLICATION

SPION-enhanced MRI enables consistent visualization of primary and metastatic liver tumors as well as functional hepatic parenchyma. It has direct application for SPION-enhanced MRI-guided radiotherapy to liver malignancies for precision targeting with avoidance of functional liver parenchyma in patients with pre-existing liver condition such as cirrhosis or prior liver-directed therapies. Additionally, ferumoxytol demonstrates radioprotecting effects on human monocytes and macrophages and protecting liver parenchyma.

T1-SSGI07-5 CHARACTERIZATION OF CHRONIC LIVER DISEASE USING INTRAVOXEL INCOHERENT MOTION (IVIM) IMAGING AND MAGNETIC RESONANCE ELASTOGRAPHY (MRE)

Damiano Catucci, MD (*Presenter*)
Sandro Von Daniken (*Abstract Co-Author*)
Verena Obmann, MD (*Abstract Co-Author*)
Annalisa Berzigotti (*Abstract Co-Author*)
Lukas Ebner, MD (*Abstract Co-Author*)
Johannes T. Heverhagen, MD, PhD (*Abstract Co-Author*)
Andreas Christe, MD (*Abstract Co-Author*)
Peter Vermathen (*Abstract Co-Author*)
Adrian T. Huber, MD, PhD (*Abstract Co-Author*)

PURPOSE

To analyze the combined diagnostic value of intravoxel incoherent motion (IVIM) imaging and magnetic resonance elastography (MRE) for better characterization of chronic liver disease (CLD) and detection of clinically significant portal hypertension (CSPH).

METHODS AND MATERIALS

This prospective study included 185 patients who underwent liver MRI including MRE and IVIM imaging between 03/2016 and 11/2023. Patients were grouped into those with early CLD (F0-F1; eCLD-group, n=21), intermediate CLD (F2; iCLD-group, n=19), advanced CLD (F3-F4; aCLD-group, n=20) and aCLD with CSPH based on the BAVENO VII consensus (aCLDPH-group; n=22). 103 patients without CLD served as a negative control group. IVIM imaging parameters (Tissue diffusivity D, Perfusion fraction PF and Pseudo-diffusion coefficient D*) and MRE liver stiffness (LS) were measured in all patients. Statistical analysis included the Kruskal-Wallis test for group comparison as well as simple and multiple logistic regression analysis for group differentiation.

RESULTS

All parameters differed significantly between all groups ($p<0.001$). PF and D* decreased with disease progression, while LS increased. D initially decreased in CLD patients but re-increased in those with portal hypertension. Consequently higher D-values indicated the presence of CSPH in advanced stages (OR 1.09, $p=0.009$). In addition, elevated LS-values consistently predicted CLD (early: OR 5.01, $p<0.001$; advanced: OR 4.94, $p<0.001$; portal hypertension: OR 2.24, $p=0.007$). Combining D+LS further improved diagnostic accuracy in differentiating disease stages (noCLD vs. eCLD: OR 0.94, $p<0.001$; OR 4.26, $p=0.003$; aCLD vs. aCLDPH: OR 1.10, $p=0.016$; OR 2.41, $p=0.012$).

CONCLUSION

IVIM parameters and MRE are helpful for better characterization of CLD-patients. Notably, combining D with LS further increased the discriminatory value when compared to MRE alone.

CLINICAL RELEVANCE/APPLICATION

Combination of IVIM imaging and MRE enables early noninvasive detection of liver disease and portal hypertension, representing a helpful alternative for patients ineligible for invasive testing.

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T1-SSPD03

Science Session with Keynote: Pediatric Imaging (Musculoskeletal and Intervention)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: S502

Joo Cho, MD (*Moderator*)

Sub-Events

T1-SSPD03-1 Keynote Speaker: Advanced Imaging Evaluation of Bone Sarcomas in Children

Emilio Inarejos Clemente, MD (*Science Invited Presenter*)

T1-SSPD03-2 DEEP LEARNING-BASED QUANTIFICATION OF RADIOLOGIC PROGNOSTIC MARKERS IN LEGG-CALVÉ-PERTHES DISEASE VIA PERFUSION MRI

Joonoh Lee (*Presenter*)
Vishal Gokani (*Abstract Co-Author*)
Ahan Mistry (*Abstract Co-Author*)
Michael Wilde (*Abstract Co-Author*)
John Carter (*Abstract Co-Author*)
Salar Sanati (*Abstract Co-Author*)
Venkata Repaka (*Abstract Co-Author*)

PURPOSE

Legg-Calvé-Perthes Disease (LCPD) is idiopathic osteonecrosis of the pediatric femoral head. Gadolinium-enhanced perfusion MRI (pMRI) quantifies femoral-head perfusion and has been shown to predict femoral head sphericity at the healed stage. Hypoperfusion was previously estimated subjectively by clinicians. HIPVASC 1.0 was released as a platform for manual annotation of the hypoperfusion percentage, but it was not efficient. Additionally, pMRI offers excellent visualization of associated synovitis and granulation tissue, which were not analyzed by these prior methods. Here we present HIPVASC 2.0, a user-friendly computer-vision (CV) software that automates the analysis of the femoral head, hypoperfused regions, synovitis, and granulation tissue using a multi-channel nnU-Net model. We hypothesize that HIPVASC 2.0 will efficiently segment these key features on pMRI images with the accuracy of human observers.

METHODS AND MATERIALS

We retrospectively assembled 922 pMRI scans from LCPD patients aged 4-11. Scans were split into a training set of 568 hips (158 unaffected, 410 affected) and a test set of 354 hips (178 unaffected, 176 affected), all previously scored by clinicians and HIPVASC 1.0. Registered pre- and post-contrast T1-FS images produced subtraction maps, which were fused with pre-contrast data to form the multichannel input. Two independent observers delineated femoral head, hypovascular areas, synovitis, and granulation tissue on every scan. The model was trained for 1,000 epochs with augmentation and 5-fold cross-validation. Dice scores quantified segmentation accuracy, and ICCs compared HIPVASC-derived hypoperfusion %, femoral-head volume, synovitis volume, and granulation-tissue % against human ratings and the prior method.

RESULTS

The segmentation model showed high dice scores for femoral head (94%), hypovascular regions (97%), synovitis (83%), and granulation tissue masks (89%) (Fig. 1). ICC values for each biological metric were consistently high (ICC > 0.99), indicating strong measurement consistency with human observers. Hypoperfusion percentage closely matched clinician visual estimates and HIPVASC 1.0 (ICC > 0.99).

CONCLUSION

These results validate HIPVASC 2.0 in the objective segmentation of critical pathological regions in LCPD. While hypoperfusion percentage has been shown to correlate with final femoral head sphericity, ongoing studies will test whether femoral-head volume, synovitis volume, and granulation-tissue percentage further enhance prognostication.

CLINICAL RELEVANCE/APPLICATION

Automation of key pathological markers in pMRI via HIPVASC 2.0 offers efficient, reproducible measurements essential for improved prognostication and patient management in early-stage LCPD.

T1-SSPD03-3 DTI PREDICTS RESIDUAL GROWTH POTENTIAL IN ADOLESCENT KNEE

Camilo Perdomo, MD (*Presenter*)
Laura Santos Correa (*Abstract Co-Author*)
Ola F. Kvist, MD, PhD (*Abstract Co-Author*)
Ingrid Galvis, MD, MS (*Abstract Co-Author*)
Jorge A. Delgado, MD (*Abstract Co-Author*)
Niloofaralsadat Motamedi, MD (*Abstract Co-Author*)
Jie C. Nguyen, MD, MS (*Abstract Co-Author*)
Sachin Jambawalikar, PhD (*Abstract Co-Author*)
Sogol Mostoufi-Moab (*Abstract Co-Author*)
Diego Jaramillo, MD, MPH (*Abstract Co-Author*)

PURPOSE

To determine whether baseline mean diffusivity (MD) metrics from a single knee DTI scan can predict physeal status (open vs. closed) on serial 2-year follow-up.

METHODS AND MATERIALS

Prospective, multicenter study of 49 healthy participants (23 males, 26 females; 12-16 y). All underwent 3-T knee DTI (b = 0/600 s mm?², 20 directions, 2 × 2 × 3 mm^3 voxel volume) at baseline, 12, and 24-month follow-up (133 exams). Mean diffusivity (MD) and fractional anisotropy (FA) were extracted from manually

segmented distal femoral and proximal tibial physes at baseline. Cluster-robust logistic regression (univariate, multivariable) modeled the odds of an open physis with candidate predictors MD, FA, age, sex, and Tanner stage > 4.

RESULTS

Physes remained open in 99/133 femoral and 74/133 tibial examinations. On univariate analysis, higher baseline MD, younger age, and male sex were each associated with the tibial physis remaining open 12 months later ($p = 0.03$), whereas higher MD and younger age predicted an open femoral physis ($p < 0.01$). In multivariable models, higher baseline MD, younger age, and male sex (tibia only) were independent predictors of an open physis. In the femur, MD adjusted odds ratio (aOR) (4.9, 95 % CI 2.3-10.5, $p < 0.001$) was higher than age aOR 0.63 (0.40-0.93, $p = 0.02$). In the tibia, male sex exerted the strongest influence (aOR 8.3, 95 % CI 2.4 28.8; $p = 0.001$), while higher MD (aOR 4.0, 1.6-9.7; $p = 0.003$) and younger age (aOR 0.45 per SD, 0.25-0.82; $p = 0.01$) provided additional, independent discrimination. FA and Tanner stage remained non-significant ($p = 0.32$). Models showed good calibration (pseudo-R^2 0.29 femur; 0.28 tibia) without multicollinearity.

CONCLUSION

A single baseline MD measurement robustly identifies distal femoral and proximal tibial physes that will remain open after one year. Age enhances prediction in both bones, while sex provides additional value only for the tibia. FA and Tanner stage add no incremental value.

CLINICAL RELEVANCE/APPLICATION

MD-based DTI can non-invasively flag adolescents who still have meaningful longitudinal growth, informing optimal timing of orthopedic or endocrine interventions and reducing unnecessary serial imaging.

T1-SSPD03-5 TRANSRADIAL VERSUS TRANFEMORAL ACCESS FOR NEUROVASCULAR PROCEDURES IN CHILDREN - A 5 YEAR PROPENSITY SCORE MATCHING ANALYSIS

Kevin K. Fung, MBBS, FRCR (*Presenter*)
Chun Wai Lee, BSC,RT (*Abstract Co-Author*)
Carmen Parra-Farinas, MD (*Abstract Co-Author*)
Prakash Muthusami, MBBS, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the safety and feasibility of neurovascular procedures using radial arterial access in children.

METHODS AND MATERIALS

All transradial neurovascular procedures in patients aged = 18 years old in a single tertiary paediatric hospital over a 5-year period was retrospectively analysed and matched with a transfemoral cohort using propensity scores at a 1:1 ratio, based on age, gender, type of procedures, number of accesses. All radial accesses were performed by two pediatric interventional neuroradiologists and received weight-based heparin and vasodilator per protocol. Technical success was defined as completion of intended procedure without crossover to femoral access. Patient demographics, procedural details and complications were compared using appropriate statistical tests, with $p<0.05$ considered as significant. Multivariate logistic regression was used to assess risk factor for radial artery occlusion (RAO).

RESULTS

170 transradial neurovascular procedures, (65% at wrist, 35% at snuff box; 77% diagnostic, 23% interventional) were performed in 117 children (mean age = 14 years [S.D. 3.8 years], female = 93). No significant difference existed in age, weight and procedural type between both groups. 52 patients (30.5%) had multiple transradial procedures (range = 2 - 4). Technical success rate of transradial access was 94.9% (femoral=98.8%, p=0.24). There was no significant difference in procedural time (radial=131.7; femoral=138.5 min, p=0.64); dose-area product (radial=12166; femoral=11527μGy.cm 2 , p=0.72) and air-kerma (radial= 873; femoral=813mGy, p=0.69). Radial access had longer fluoroscopy time (radial=32.3; femoral=22.3min, p=0.06) but not reaching significance. Procedural complication rates were similar (radial=14.1%, femoral=14.7%, p=0.88). Radial access had higher rate of thrombo-occlusion (radial=7.1%, femoral=1.2%, p=0.006) but all were asymptomatic. Femoral access had higher rate of hematoma (radial=1.2%, femoral=10%, p<0.001). Sheath-to-artery ratio of =1 was an independent predictor of RAO (Adjusted odds ratio=6.8 [95%CI 1.5-31.5], p=0.01).

CONCLUSION

In a large volume pediatric practice, transradial approach can be safely adopted with similar success rate to transfemoral approach. Use of low-profile sheaths may help prevent RAO and improve success rate of subsequent transradial neurovascular procedures.

CLINICAL RELEVANCE/APPLICATION

Transradial access can be safely utilized for neurovascular procedures in children with similar success rate to transfemoral approach, allowing earlier ambulation and discharge. Optimisation of sheath-to-artery ratio by pre-procedural sonographic assessment of radial artery size and use of low-profile sheath are important to prevent RAO.

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T1-SSPH06

Physics (MRI)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: S402

R. Jason Stafford, PhD (*Moderator*)
Heather Whitney, PhD (*Moderator*)

Sub-Events

T1-SSPH06-1 COMPARISON OF CAPABILITIES FOR REGIONAL PERFUSION AND PULMONARY FUNCTIONAL LOSS ASSESSMENT AMONG ELECTROCARDIOGRAM (ECG) AND PHOTOPLETHYSMOGRAPHY (PPG)-GATED PREFUL MRIS AND DYNAMIC CE-PERFUSION MRI IN PATIENTS WITH AND WITHOUT LUNG DISEASES

Yoshiharu Ohno, MD, PhD (*Presenter*)
Alicia Palomar Garcia (*Abstract Co-Author*)
Masanori Ozaki (*Abstract Co-Author*)
Masao Yui (*Abstract Co-Author*)
Bruno Triaire (*Abstract Co-Author*)
Maiko Shinohara (*Abstract Co-Author*)
Natsuka Yazawa (*Abstract Co-Author*)
Kaori Yamamoto (*Abstract Co-Author*)
Yuichiro Sano, RT (*Abstract Co-Author*)
Takahiro Ueda, MD, PhD (*Abstract Co-Author*)
Masahiko Nomura, MD, PhD (*Abstract Co-Author*)
Takeshi Yoshikawa, MD (*Abstract Co-Author*)
Daisuke Takenaka, MD (*Abstract Co-Author*)
Yoshiyuki Ozawa, MD, PhD (*Abstract Co-Author*)

PURPOSE

Perfusion-weighted phase-resolved functional lung (PREFUL) MRI (PW-MRI) is currently trying to clinically set as one of the pulmonary functional imaging. For easier clinically set of PW-MRI, we tested photoplethysmography (PPG) gated method, and PPG-gated PW-MRI was directly compared quantitative regional perfusion and pulmonary functional loss evaluations with electrocardiogram (ECG)-gated PW-MRI and dynamic contrast-enhanced (CE)-perfusion MRI (DCE-MRI). The purpose of this study was to directly compare the capabilities of regional perfusion and pulmonary functional loss assessment among ECG- and PPG-gated PW-MRIs and DCE-MRI in patients with and without lung diseases.

METHODS AND MATERIALS

17 subjects were prospectively examined ECG- and PPG-gated PW-MRIs, DCE-MRI and pulmonary function test. Then, regional perfusion maps were generated from each MR data. To determine regional perfusion on three methods (Q ECG : ECG-PW-MRI, Q PPG : PPG-PW-MRI, and Q DCE: DCE-MRI), same region of interests (ROIs) were placed over peripheral lung zones in all lung fields on each map. Then, overall perfusion from each method was determined as the averaged value from all ROI measurements in all subjects. To determine the relationship of regional perfusion, Pearson's correlation was performed among three methods. Then, mean differences among three methods were compared by Turkey's HSD test. To assess pulmonary functional loss evaluation capability, each overall perfusion was also correlated with VC, FEV 1 and DL CO /V A .

RESULTS

There were significantly moderate or good correlations between each other (Q ECG vs. Q PPG : $r=0.79$, $p<0.0001$; Q ECG vs. Q DCE : $r=0.45$, $p<0.0001$; Q PPG vs. Q DCE : $r=0.49$, $p<0.0001$). Mean difference between Q ECG and Q PPG was significantly smaller than that of others ($p<0.05$). All overall perfusion showed significantly moderate or good correlations with pulmonary function test (VC: $0.6=r=0.63$, $p<0.05$; FEV 1 : $0.75=r=0.79$, $p<0.05$, DL CO /V A : $0.52=r=0.57$, $p<0.05$).

CONCLUSION

ECG- and PPG-gated perfusion-weighted PREFUL MRIs had limited differences and were considered at least as valuable as dynamic CE-perfusion MRI for quantitatively assessed regional perfusion and pulmonary function loss assessment.

CLINICAL RELEVANCE/APPLICATION

ECG- and PPG-gated perfusion-weighted PREEFUL MRIs had limited differences and were considered at least as valuable as dynamic CE-perfusion MRI for quantitatively assessed regional perfusion and pulmonary function loss assessment.

T1-SSPH06-2 ENHANCING CEREBRAL MICROBLEED SEGMENTATION USING JOINT TRAINING WITH SWI AND QSM MRIS: INFERENCING WITH SWI ONLY

Namkug Kim, PhD (*Presenter*)
Wooyoung Jo (*Abstract Co-Author*)
Jongjun Won, BS (*Abstract Co-Author*)
Joonseo Oh (*Abstract Co-Author*)
Hyungbin Park (*Abstract Co-Author*)
Jimin Sung (*Abstract Co-Author*)
Jonghun Won (*Abstract Co-Author*)
Hyunju Lee (*Abstract Co-Author*)
Yangsean P. Choi, MD, PhD (*Abstract Co-Author*)
EUNSEON JEONG (*Abstract Co-Author*)

PURPOSE

The anti-amyloid antibody lecanemab increases the risk of amyloid-related imaging abnormalities - hemosiderin (ARIA-H), which manifest as cerebral microbleeds (CMBs) on susceptibility-weighted image (SWI), making accurate CMB segmentation crucial for treatment management. Quantitative Susceptibility Mapping (QSM), derived from raw phase MR images, offers superior CMB visualization compared to conventional SWI but is often unavailable in clinical practice. This study proposes a multimodal training strategy incorporating QSM to enhance CMB segmentation performance while requiring only SWI for inference, addressing this clinical constraint.

METHODS AND MATERIALS

In this retrospective study, participants underwent brain MRI to evaluate cognitive impairment (train: N=287; test: N=74, scanned Jan-Mar 2024). We modified the nnUNet architecture from traditional channel-wise concatenation to a parallel joint training framework better suited for multimodal image learning. Performance was evaluated using a temporally independent internal validation set (N=334, scanned Jan-Mar 2023) and a multicenter external validation set (N=65 from 48 different hospitals) using Dice Similarity Coefficient (DSC) and free-response Receiver Operating Characteristic (fROC).

RESULTS

On the external set, the joint model showed [DSC, fROC]: SWI [0.52, 0.54], SWI+QSM [0.55, 0.61], SWI+Phase [0.48, 0.49], and SWI+Phase+QSM [0.57, 0.67], with significant performance gains from QSM integration ($p < 0.05$), respectively. Similar trends were observed in internal and temporally independent validation sets. In the temporally independent set, joint training showed performance gains [DSC, fROC] of: SWI+Phase [+0.08, +0.08], SWI+QSM [+0.06, +0.09], and SWI+Phase+QSM [+0.34, +0.44] compared to channel-wise results, respectively. Similar trends were observed across validation sets. In the internal set, simple concatenation of SWI and QSM resulted in performance decreases with SWI only [-0.04, -0.06], significantly underperformed compared to the joint training approach [+0.02, +0.05], respectively. Similar trends were seen with SWI and Phase.

CONCLUSION

QSM demonstrated superior performance gains compared to its source phase images in multimodal training. Our joint training strategy consistently outperformed channel-wise training using conventional concatenation across all combinations, with progressive improvements in both DSC and fROC, particularly when integrating QSM.

CLINICAL RELEVANCE/APPLICATION

This deep learning segmentation model enhances ARIA-H detection in patients undergoing lecanemab therapy. The model trained with QSM outperformed that trained solely on SWI, while retaining compatibility with SWI in the absence of QSM.

T1-SSPH06-3 IMPROVING DL SEGMENTATION OF HEAD/NECK PC-MRA WITH PULSATION ARTIFACTS: A SIMULATED ARTIFACT TRAINING STRATEGY

Daiki Tamada, PhD (*Presenter*)
Thekla H. Oechtering, MD (*Abstract Co-Author*)
Julius F. Heidenreich, MD (*Abstract Co-Author*)
Jitka Starekova, MD (*Abstract Co-Author*)
Eisuke Takai (*Abstract Co-Author*)
Scott B. Reeder, MD, PhD (*Abstract Co-Author*)

PURPOSE

Pulsation artifacts (PA) frequently compromise image quality of 3D phase-contrast magnetic resonance angiography (PC-MRA), particularly at low velocity encoding. This limits the accuracy of automated vessel segmentation that is needed for quantitative vascular analysis. This study aimed to develop and evaluate a deep learning (DL) approach using training data with simulated artifacts to improve segmentation robustness in the presence of PA.

METHODS AND MATERIALS

3D PC-MRA datasets (VENC=10, 30 cm/s) were acquired from healthy volunteers (N=16) under institutional review board approval with informed consent. A basic DL segmentation model (3D-UNET) was trained using original data from 7 volunteers. A second DL model (proposed) was trained with a novel training strategy incorporating simulated PA, mimicking realistic artifact patterns based on physiological flow. Segmentation performance was evaluated on data from 9 separate volunteers. The performance of the proposed DL model with simulated PA was compared to the basic DL method, a conventional intensity-based method (level-set) and against expert manual segmentations (verified by 3 radiologists, Fleiss' Kappa=0.91). Evaluation metrics included Dice coefficient (DSC), Intersection over Union (IoU), and Average Symmetric Surface Distance (ASSD). Statistical significance was assessed using ANOVA and Tukey's HSD test.

RESULTS

Both DL segmentation approaches significantly outperformed the conventional level-set method ($p<0.05$). Training with simulated PA significantly improved segmentation accuracy compared to training on naïve data, particularly for low VENC acquisitions (VENC=10 cm/s) where PA are most pronounced (Dice/IoU increases, $p<0.05$). Vessel delineation and reduced artifact misinterpretation were confirmed qualitatively, especially near major arteries (e.g., ICA) and in distal vessels, with the PA-trained model. Mean ASSD values were also generally improved with PA simulation training.

CONCLUSION

Incorporating simulated pulsation artifacts into DL model training significantly improves the accuracy and reliability of automated 3D PC-MRA segmentation, particularly in clinically challenging scenarios with moderate to severe artifacts, such as low VENC acquisitions.

CLINICAL RELEVANCE/APPLICATION

Pulsation artifacts are a common limitation of head/neck PC-MRA that degrades image quality and segmentation accuracy. The proposed DL training approach improves the robustness of automated vessel segmentation despite these artifacts, enhancing quantitative analysis of the head/neck vasculature. This may improve the assessment and monitoring of cerebrovascular diseases and other head/neck vascular conditions, reducing the need for manual segmentation.

T1-SSPH06-4 CLINICAL UTILITY OF A COMMERCIAL 0.55 TESLA MRI SYSTEM FOR THE EVALUATION OF RENAL LESIONS

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Tayson Lin, MD (*Abstract Co-Author*)
Hero K. Hussain, MD, FRCR (*Abstract Co-Author*)
Shane A. Wells, MD (*Abstract Co-Author*)
William J. Weadock, MD (*Abstract Co-Author*)
Benjamin Mervak, MD (*Abstract Co-Author*)
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Benjamin V. Hirshberg, DO (*Abstract Co-Author*)
Maria Masotti (*Abstract Co-Author*)
Reve Chahine, MD, FRCR (*Abstract Co-Author*)
Jacob Richardson (*Abstract Co-Author*)
Nicole Seiberlich, PhD (*Abstract Co-Author*)
Vikas Gulani, MD, PhD (*Abstract Co-Author*)
Mishal Mendiratta-Lala, MD (*Abstract Co-Author*)

PURPOSE

To assess diagnostic performance of 0.55T MRI in characterizing cystic and solid renal masses according to Bosniak classification (cystic masses) and predicting histology (solid lesions).

METHODS AND MATERIALS

IRB-approved retrospective study included 34 patients (16 M, mean age 65±12yrs) with 35 renal masses scanned at 0.55T (MAGNETOM Free.Max, Siemens Healthineers). Imaging was performed using coronal and axial T2w HASTE, axial T1w dual-echo gradient-recalled echo (GRE), T1w opposed-phase and in-phase dual echo or Dixon, DWI (b=50, b=800 s/mm 2), T1w 3D GRE pre- and dynamically following gadolinium administration in arterial, venous, 3-min delayed phases. Six fellowship-trained abdominal radiologists independently reviewed the scans, and classified renal masses as cystic or solid, measured lesion size and documented laterality. For cystic lesions, Bosniak classification was assigned. For solid lesions, reviewers evaluated imaging features to predict histology (e.g. clear cell RCC, papillary RCC, angiomyolipoma). Factors that affect staging were assessed: renal vein involvement, local tumor invasion, and distant metastasis. Alternate diagnosis was considered for non-cystic or solid lesions (e.g., post partial nephrectomy scarring). Confidence in Bosniak categorization of cystic lesions and prediction of histology of solid lesions, based on image quality at 0.55T, was rated on 5-point Likert-type scale (1=Strongly unconfident, 5- Strongly confident). Scores >= 3 were considered clinically diagnostic. Fleiss' Kappa was used for inter-reader agreement.

RESULTS

There were 23 cystic masses, 7 solid masses and 5 alternate diagnoses. Mean score for diagnostic confidence was clinically acceptable (score=4.1). Inter-reader agreement for differentiating cystic from solid masses and excluding alternate diagnoses was substantial (k =0.68; CI [0.61, 0.74]). For cystic masses, inter-reader agreement on Bosniak classification (I/II, IIF, III/IV) was substantial (k =0.80; CI [0.67-0.92]). However, agreement for predicting probable histology of solid masses was fair (k =0.29; CI [0.16, 0.41]). Among solid masses, highest agreement was observed for nodal involvement (100%), adrenal involvement (86%) and enhancement characteristics (71%). However, agreement was lower for T2w signal characteristics (43%), and intralesional lipid content (43%). Small sample size limits strong conclusions.

CONCLUSION

0.55T MRI can effectively characterize cystic and solid renal masses and risk-stratify cystic renal masses according to Bosniak classification without compromising diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

0.55T MRI is a viable option for diagnosis, staging and active surveillance of cystic and solid renal masses.

T1-SSPH06-5 BRAIN MAGNETIC RESONANCE ELASTOGRAPHY (MRE) IMPLEMENTED IN A HIGH-PERFORMANCE HEAD GRADIENT SYSTEM YIELDS SUPERIOR MOTION ENCODING EFFICIENCY WITH IMPROVED CLARITY AND RESOLUTION FOR ASSESSING NEUROTRAUMA AND DEGENERATIVE NEUROLOGICAL DISEASE

Emily Long (*Presenter*)
Herman Morris, PhD (*Abstract Co-Author*)

PURPOSE

Magnetic resonance elastography (MRE) quantifies tissue mechanical properties and has emerged as a tool for studies of neurotrauma, neurodegeneration and cognition. Advancements in gradients, enhance performance with higher amplitude and faster slew rate to reduce TE, TR, and echo spacing, improving phase acquisition, scan time, SNR, and imaging artifacts. We implemented neuro MRE on a high performance head gradient (HPHG) with a slew rate of 500 m/T/s and a max amplitude of 200 mT/m on imaging and shear wave behavior.

METHODS AND MATERIALS

A 10-subject IRB-approved study evaluated gradient strength effects across MRE sensitive parameters. Actuation amplitude and frequency, encoding frequency, and gradient amplitude effects were explored. Scans were performed in a HPHG using EPI MRE sequences, a 32-Channel Coil, (2mm thk, 2mm voxel). Two inversions, clinical and research, were used for image processing. Octahedral shear strain SNR and motion encoding efficiency were recorded as performance indicators. Identical scans were repeated on a Contained Anthropomorphic Structured-gel Phantom for Elastography Research (CASPER) to emulate brain tissue properties and skull-brain motion transmission. Its hydrogel bulk mimics brain shear modulus (1-5 kPa), suspended in an agar and artificial CSF slurry representing the subarachnoid space.

RESULTS

HPHG improved motion encoding efficiency (MENC). Subject scans showed up to 8.5-fold MENC improvement, with a non-linear relationship between gradient strength and efficiency. Increased efficiency improved OSS-SNR, but only up to ~3 μm/rad, after which OSS-SNR degraded rapidly. CASPER scans confirmed the trend and showed phase wrap conditions near the identified limit. Bulk shear stiffness values (2-3 kPa) agreed with previous findings. Optimized encoding efficiency was demonstrated in a more clinically relevant case for a subject with bifrontal white matter gliosis.

CONCLUSION

Substantial improvement in data quality was observed with motion encoding efficiency up to a threshold. OSS-SNR improvement achieved far surpassed values considered clinically relevant, where optimization can improve other aspects of scan protocols. Gradient amplitude was adjusted, with slew rate kept at maximum. EPI benefits directly from slew rate, further study is needed to differentiate gradient speed and amplitude effects. Our findings show that enhanced gradient efficiency can improve data quality, but a limit exists where efficiency causes detrimental phase wrap.

CLINICAL RELEVANCE/APPLICATION

This study clarifies the advantages and limitations of high-performance gradient systems for brain MRE, guiding protocol optimization, inversion and signal processing methods, and acquisition techniques.

Nov. 30 – Dec. 4
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T1-SSPH07

Physics (Photon Counting Detector CT II)

Tuesday, Dec. 2 8:00AM - 9:00AM Room: S404

Shuai Leng, PhD (*Moderator*)
Frank Dong, PhD (*Moderator*)

Sub-Events

T1-SSPH07-1 MULTI-PHASE IMAGING USING 4-THRESHOLD PHOTON-COUNTING SPECTRAL CT WITH MULTI-CONTRAST INJECTIONS (I/HO) IN A PORCINE MODEL

Hubertus Pietsch, VMD, PhD (*Presenter*)
Gregor Jost, PhD (*Abstract Co-Author*)
Ralf Gutjahr, PhD (*Abstract Co-Author*)
Jonas Neumann (*Abstract Co-Author*)
Tristan Nowak, PhD (*Abstract Co-Author*)
Michael Grasruck, PhD (*Abstract Co-Author*)
Bernhard Schmidt, PhD (*Abstract Co-Author*)

PURPOSE

This animal study aimed to demonstrate feasibility for multi-phase thoracic-abdominal CT using two different contrast media (CM). An experimental injection protocol was tested in conjunction with a commercial photon counting CT scanner employing a multi-spectral four-threshold readout mode. Subsequently, multi-material separation was applied to visualize multi-phase information acquired with only one spectral CT scan.

METHODS AND MATERIALS

Conventional iodine-based CM was used for the first injection, timed to capture the portal-venous contrast phase in a Göttingen minipig. An experimental holmium-based CM was applied for a second injection, targeting the arterial imaging phase. The delay of the two injections (33 s) based on contrast dynamics from prior perfusion-mode examinations. Energy threshold settings were established at 20, 55, 72, and 90 keV, with 55 keV for close proximity to the k-edge of holmium (55.61 keV). An image-based three material-decomposition was applied.

RESULTS

The acquisition produced two quantitative material maps (iodine and holmium) and a virtual non-contrast image (i.e. without CM contributions). The iodine map shows a characteristic portal-venous phase enhancement while the arterial phase information is visible in the holmium map. It is possible to visualize three distinct vascular phases: (virtually) native, arterial, and portal-venous, using spectral processing on multi-contrast injections and spectral CT scanning.

CONCLUSION

This approach, combining dual-contrast injection, spectral image acquisition and multi-material decomposition allowed the delineation of multiple CM phases within a single scan of a living pig using a commercial photon counting CT scanner.

CLINICAL RELEVANCE/APPLICATION

Generating multiple vascular phases in one scan can lower radiation exposure and improve clinical workflow. This approach may be particularly beneficial for evaluating shunts or isolating arterial and portal venous components in hepatic perfusion. Photon counting CT enables for the first time precise spectral separation of different CM, and thus, could address relevant clinical needs. Currently, only iodinated CM are well-established, and with spectral alternative CM elements are clinically available. Ultimately, this study offers practical guidance on how to perform multi-injection protocols in a living pig model, potentially streamlining future preclinical investigations in this domain.

T1-SSPH07-2 IMPACT OF GANTRY STARTING ANGLE, PITCH, AND ROTATION TIME ON CERVICAL SPINE ASSESSMENT USING PHOTON-COUNTING-DETECTOR (PCD) CT: A PHANTOM STUDY

Chelsea Dunning, PhD (*Presenter*)
Chun Ruan, PhD (*Abstract Co-Author*)
George S.K. Fung, PhD (*Abstract Co-Author*)
Fides Schwartz, MD (*Abstract Co-Author*)
Aaron D. Sodickson, MD, PhD (*Abstract Co-Author*)

PURPOSE

Cervical spine CT image quality is often degraded in the shoulders by photon starvation that triggers projection averaging algorithms and results in spatial resolution losses. As the gantry starting angle may impact the degree of lateral projection photon starvation, the aim of this pilot study is to determine the optimal cervical spine protocol that is most robust against image quality effects due to the gantry starting angle.

METHODS AND MATERIALS

A Rando phantom with arm attachments was scanned with a PCD CT scanner (NAEOTOM Alpha) in ultra high resolution mode with varying pitch (0.35 to 1.0) and rotation time (0.25 s, 0.5 s, 1 s), 120 x 0.2 mm collimation, 140 kV tube voltage, and 11.3 mGy CTDI vol with tube current modulation on. Each scan protocol was repeated four times to vary the gantry starting angle, which is random and was extracted from the raw data. Full-spectrum images were reconstructed using filtered back projection with a medium-sharp (Qr68) kernel, 0.4 mm slice thickness, 122 mm FOV, and 512 matrix size. The noise was measured in 2.1 cm-diameter soft tissue regions in the neck and shoulders. The task-based MTF at 50% (MTF 50) in each acquisition was calculated by measuring a line profile across the bone/tissue interface of the pedicles in two axial slices in the neck and shoulders. The percent differences and a paired one-sided t-test in MTF 50 and noise values between lateral (± 20°) and anterior/posterior (A/P, all other) gantry starting angles were quantified.

RESULTS

Among six scan protocols, the gantry starting angle did not significantly affect the noise in the neck ($p = 0.27$) and shoulder ($p = 0.18$) regions, but the lowest percent differences in noise (< 2% in both regions) were achieved with pitch = 0.5 and rotation time 0.5 s. The lowest noise values in the shoulders were 70 HU for A/P and 67 HU for lateral starting angles with pitch 0.35 and rotation time 0.5 s. The gantry starting angle did not significantly affect the MTF 50 in the neck ($p = 0.33$) but possibly in the shoulders ($p = 0.01$); the lowest percent difference and the highest MTF 50 in the shoulders (lateral = 0.13 lp/mm and A/P = 0.12 lp/mm, < 8%) was achieved with pitch 0.35 and rotation time 0.5 s.

CONCLUSION

This pilot study suggests that a lower pitch and rotation time = 0.5 s may improve both noise and spatial resolution and reduce image quality dependence of cervical spine PCD CT images on gantry starting angle. These parameters may be too slow clinically, but they lend insights into this previously unexplored image quality consideration that warrants further study and optimization.

CLINICAL RELEVANCE/APPLICATION

Efforts to optimize cervical spine protocols that improve noise and spatial resolution in the lower cervical spine may require accounting for photon starvation and gantry starting angle effects.

T1-SSPH07-3 THE GAME OF Z: IMPACT OF SCAN AND RECONSTRUCTION PARAMETERS ON THE NOISE POWER SPECTRUM OF CLINICAL PCD-CT SYSTEMS ALONG THE Z DIRECTION

Humberto Monsivais, PhD (*Presenter*)
Xinming Liu, PhD (*Abstract Co-Author*)
Megan C. Jacobsen, PhD (*Abstract Co-Author*)
Xiujiang J. Rong, PhD (*Abstract Co-Author*)
Frank Dong, PhD (*Abstract Co-Author*)
Ke Li, PhD (*Abstract Co-Author*)

PURPOSE

To understand the impacts of scan mode and reconstruction algorithm on the noise properties of clinical photon counting detector CT (PCD-CT) not within axial slices but also along the orthogonal Z direction via 3D NPS measurements.

METHODS AND MATERIALS

Physical phantoms were repeatedly scanned six times by a NAEOTOM Alpha PCD-CT under different acquisition modes, including Standard, ultra-high resolution (UHR), and the Expert service mode. Scans were performed at seven dose levels by adjusting the mA from 5 to 300. For each acquisition, different types of reconstruction (e.g., T3D and keV images for Standard UHR acquisitions; total energy bin (T1) and high energy bin (T2) images for Expert acquisitions), and different combinations of kernel and quantum iterative reconstruction (QIR) strengths were used. After calculating 3D NPS from each ensemble of 3D image volumes, axial 2D NPSxy were generated by integrating the 3D NPS along the kz axis, while1D NPS along the z dimension was computed through 2D integration of the 3D NPS along kx and ky axes.

RESULTS

With the exception of service-mode T1 and T2 images, the shape of the 3D NPS demonstrate a strong dependence on radiation dose. Lower dose corresponds to lower mean NPS frequencies in both axial and z directions. While T1 and T2 image noise are nearly uncorrelated along the z direction, T3D and keV images show strong noise correlation along the z direction, which is further intensified when QIR is enabled. For monoenergetic images, the 3D NPS shifted towards lower frequencies when keV > 100. When comparing UHR and Standard modes with matched dose and reconstruction parameters, there is little difference in their 3D NPS for soft-tissue kernels such as Br44. However, for high-frequency kernels such as Br76, the 3D NPS of UHR images shows a lower magnitude in both the axial and z directions.

CONCLUSION

Even when QIR is disabled, nonlinear signal processing is applied in both axial and z directions during T3D and keV reconstructions in the clinical PCD-CT scanner. The major difference between the total energy bin image and the T3D image lies in this processing, which results in lower noise in the T3D images. There is minimal difference in signal processing and reconstruction algorithms between UHR and standard modes. When comparing different types of PCD-CT reconstructions, the use of 3D NPS is essential due to potential mismatches in the z-NPS shape.

CLINICAL RELEVANCE/APPLICATION

The 3D NPS results deepen end-users' understanding of the image quality characteristics of clinical PCD-CT scanners, enabling more informed optimization of scan and reconstruction parameters to enhance diagnostic performance.

T1-SSPH07-4 A METHOD FOR DYNAMIC, AUTOMATIC CALIBRATION OF PHOTON COUNTING DETECTOR CT USING FLYING FOCAL SPOT FOR REDUNDANT RAY SAMPLING

Scott S. Hsieh, PhD (*Presenter*)
James Day (*Abstract Co-Author*)
Xinchen Deng (*Abstract Co-Author*)
Magdalena Bazalova-Carter, PHD (*Abstract Co-Author*)

PURPOSE

Photon counting detectors (PCDs) for CT applications use direct conversion sensors that do not yet have the stability or uniformity of their energy integrating detector counterparts. These instabilities manifest as ring artifacts in reconstruction, and substantial effort is expended in reducing these artifacts. We propose a redundant sampling framework for this task.

METHODS AND MATERIALS

In redundant sampling, each line integral is sampled twice, using two nearby detector pixels. Because ring artifacts arise primarily from high-frequency variation in pixel response, a method that calibrates these two pixels against each other could eliminate most artifacts by nullifying any high-frequency differences. An ideal implementation would be flying focal spot, but because we did not have access to flying focal spot, we emulated it with two sequential acquisitions, with the detector shifted between acquisitions at a distance corresponding to 2.5 detector pixels. The two datasets were rebinned into a common geometry. We used an optimization program to estimate a time-varying gain factor for each pixel. The PCD used a CZT sensor from Redlen Technologies. No other software ring artifact or pileup correction was used, and the only other PCD calibration was an air scan.

RESULTS

Conventional PCD CT scans of a chicken thigh show strong artifacts at the edge of detector modules. These artifacts are largely suppressed once autocalibration is activated. The residual ring artifacts were estimated as 80 HU before autocalibration and 20 HU after autocalibration, which is only faintly visible above noise. Artifacts are stronger at higher mA because of pixel-specific sensitivity to pileup, and no explicit pileup model was used. Remaining ring artifacts may be due to temporal instability of the detector, because our two datasets were acquired several minutes apart.

CONCLUSION

Autocalibration reduces ring artifacts in a benchtop PCD CT system and could be achieved with flying focal spot.

CLINICAL RELEVANCE/APPLICATION

Production of photon counting detectors is limited because of the stringent requirements on CdTe or CZT sensor material. The proposed autocalibration technique could ease these requirements and improve access to PCD CT technology.

T1-SSPH07-5 HOW TO MEASURE THE PRE-SAMPLING MTF OF PHOTON COUNTING DETECTORS (PCD) FROM RECONSTRUCTED PCD-CT IMAGES?

Linying Zhan, MS, BSc (*Presenter*)
Christian De Caro (*Abstract Co-Author*)
Bujar Mehmeti, BSc, PhD (*Abstract Co-Author*)
Frank Dong, PhD (*Abstract Co-Author*)
Guang-Hong Chen, PhD (*Abstract Co-Author*)
Ke Li, PhD (*Abstract Co-Author*)

PURPOSE

Semiconductor-based photon counting detectors (PCDs) are widely recognized for their superior spatial resolution. However, the MTF of PCDs in clinical PCD-CT scanners has not been publicly reported. Despite the critical role of PCDs in PCD-CT systems, especially for ultra-high-resolution imaging applications, clinical users typically do not measure the detector MTF primarily due to the difficulty of obtaining raw detector data. This work presents a novel experimental method for measuring the pre-sampling MTF of PCDs using only reconstructed DICOM images from clinical PCD-CT scanners.

METHODS AND MATERIALS

A NAEOTOM Alpha PCD-CT was operated in static-gantry mode, with the x-ray tube parked at 12 o'clock and the PCD at 6 o'clock. A 1 mm Cu filter was placed above the PCD on the gantry's mylar window, oriented such that a straight edge was parallel to the detector row (axial) direction. The Cu filter was mounted on a linear translation stage, enabling fine adjustments of the edge position along z direction with 0.012 mm precision. Static-gantry PCD-CT acquisitions were performed, producing a stack of DICOM images of the edge. The variation in image signals along z was used to derive the post-sampling edge-spread function (ESF). The Cu filter was then translated along z in 13 steps, each spaced 1/13 of the detector pixel pitch. By pooling the ESFs from all z positions, the pre-sampling ESF was constructed, then differentiated and Fourier-transformed to generate the pre-sampling MTF. To ensure that the measured MTF reflected the detector MTF that was not affected by focal spot (FS) blur or the reconstruction algorithms, the experiments were repeated with different FS sizes (micro vs standard) and recon kernels (Qr40 vs Qr60).

RESULTS

From DICOM images of the edge acquired in Standard mode (PCD pixel pitch = 0.73 mm), the PCD MTF50 and MTF10 were measured at 7.2±0.4 lp/cm and 12.0±0.2 lp/cm, respectively. From DICOM images acquired in Ultra-High-Res (UHR) mode, the MTF50 and MTF10 values were 10.7±0.7 lp/cm 21.8±0.6 lp/cm, respectively. No significant difference in MTF was observed across different FS sizes or reconstruction kernels, confirming that the results reflect the intrinsic spatial resolution of the detector.

CONCLUSION

Pre-sampling MTFs of PCDs can be accurately measured using reconstructed PCD-CT images, without requiring access to raw detector data. The results confirm the excellent spatial resolution performance of the PCD in the Alpha scanner.

CLINICAL RELEVANCE/APPLICATION

From model-based image reconstruction, digital imaging trials, and clinical protocol optimization, PCD-CT clinical use and research benefit from a precise, quantitative understanding of the MTF of its detector—arguably the most critical hardware component of PCD-CT systems.

T1-SSPH07-6 MAXIMIZING IMAGE QUALITY THROUGH THE SYNERGY OF HIGH-RESOLUTION PHOTON-COUNTING DETECTOR CT AND DEEP LEARNING RECONSTRUCTION: A CORONARY PHANTOM STUDY

Toru Higaki, PhD (*Presenter*)
Fuminari Tatsugami, MD (*Abstract Co-Author*)
Yuko Nakamura, MD, PhD (*Abstract Co-Author*)
Megumi Nishigaki (*Abstract Co-Author*)
So Tsushima (*Abstract Co-Author*)
Kazuo Awai, MD (*Abstract Co-Author*)

PURPOSE

Photon-counting detector CT (PCD-CT) represents the next generation of CT technology, offering promising applications in high-spatial-resolution and multi-energy imaging. However, due to the inherently small detector cells used in high-resolution (HR) imaging, photon starvation often occurs, resulting in increased image noise. In recent years, deep learning-based reconstruction (DLR) has become widespread as an effective approach to reducing image noise in CT, offering noise suppression while preserving spatial resolution. This study aims to evaluate the effectiveness of combining HR imaging with DLR in PCD-CT using a coronary phantom.

METHODS AND MATERIALS

A 3D-printed coronary angiography phantom, shown in Fig.1, was used in this study. Image acquisition was performed using a clinical research PCD-CT system developed by Canon Medical Systems Corporation (CMSC), with HR mode. In comparison, a conventional energy-integrating detector CT (EID-CT), Aquilion ONE Genesis (CMSC), was employed. Scanning was performed using ECG-gated helical acquisition at 120 kV, with a clinical setting (CTDIvol: 9.5 mGy). Hybrid iterative reconstruction (HIR) and DLR were used in this study. For image quality evaluation, we measured standard deviation (SD), noise power spectrum (NPS), and task-based modulation transfer function (T-MTF).

RESULTS

Fig.2 summarizes the quantitative image quality metrics. Image noise (SD) in image reconstructed with EID_HIR, HR-PCD_HIR, and HR-PCD_DLR were 26.0 -, 27.7 -, and 24.9 HU, respectively. When comparing HIR-reconstructed images between EID-CT and high-resolution PCD-CT, the PCD-CT images exhibited higher spatial resolution but also greater noise. Subsequently, a comparison between HIR and DLR reconstructions of HR PCD-CT showed that DLR images achieved both improved spatial resolution and reduced noise. Overall, combining PCD-CT in HR mode with DLR produced the highest image quality among scans. Representative images in Fig.3 show these findings.

CONCLUSION

The HR PCD-CT demonstrated superior spatial resolution, beneficial for visualizing fine anatomical structures such as coronary arteries. However, this comes at the cost of increased image noise. The DLR enabled efficient noise reduction without introducing image blurring typically associated with reconstruction kernels, thereby maximizing the potential of HR PCD-CT imaging.

CLINICAL RELEVANCE/APPLICATION

The combination of HR PCD-CT and DLR has the potential to provide both high diagnostic performance and radiation dose reduction in the evaluation of coronary artery disease.

Nov. 30 – Dec. 4
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T2-STCE1

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER THEATER 1

Sub-Events

T2-STCE1-1 DIFFUSE MYOCARDIAL EDEMA IDENTIFIED BY CMR MAPPING: A DISTINCT INFLAMMATORY PHENOTYPE ASSOCIATED WITH SEVERE PRESENTATION IN ACUTE MYOCARDITIS

Yining Wang, MD (*Presenter*)
Jing-Hui Li (*Abstract Co-Author*)
Minjie Minjie, PhD (*Abstract Co-Author*)

PURPOSE

To investigate whether diffuse myocardial edema, identified by cardiac magnetic resonance imaging (CMR), represents a distinct inflammatory phenotype in acute myocarditis, and to evaluate its association with disease severity and treatment requirements.

METHODS AND MATERIALS

This retrospective study included 98 patients with acute myocarditis who underwent CMR between 2020 and 2023. Diffuse edema was defined as elevated T2 mapping values and/or T2-weighted signal intensity in at least 10 segments based on the American Heart Association 16-segment model (apex excluded). A subset of patients underwent endomyocardial biopsy to assess histopathologic findings in relation to imaging phenotypes.

RESULTS

Patients were categorized into two groups based on T2-weighted imaging and T2 mapping: diffuse edema (n = 23) and non-diffuse (localized or patchy) edema (n = 75). Patients with diffuse edema showed significantly higher rates of fulminant myocarditis (65% vs. 16%; P < 0.001), systemic inflammation and the need for advanced treatment, including corticosteroids (83% vs 41%), intravenous immunoglobulin (78% vs. 37%), and vasopressors (all p < 0.01). Immunological profiles revealed markedly lower median CD4? T-cell counts (261 vs 503 cells/μL; p = 0.009), CD8? T cells (215 vs 407 cells/μL; p = 0.006), and natural killer cells (54 vs. 137 cells/μL; p = 0.009) in the diffuse group. Although left ventricular ejection fraction and late gadolinium enhancement (LGE) extent were similar between the two groups, patients with diffuse edema exhibited significantly higher global T1 (1408 ± 79 vs. 1325 ± 107 msec; p = 0.002), T2 (54.0 ± 7.2 vs. 48.3 ± 8.1 msec; p = 0.002), and extracellular volume fraction (37.7 ± 5.6% vs. 32.3 ± 8.0%; p = 0.005).

CONCLUSION

Diffuse myocardial edema identified by myocardial parametric mapping is associated with a severe clinical phenotype in acute myocarditis, marked by systemic inflammation, immune dysregulation, and a greater need for intensive therapy. This phenotype is not captured by conventional function or LGE imaging, highlighting the prognostic value of mapping-based tissue characterization.

CLINICAL RELEVANCE/APPLICATION

Quantitative mapping on CMR enables the non-invasive identification of a high-risk inflammatory phenotype in acute myocarditis, providing additional diagnostic and prognostic information beyond that offered by conventional imaging. These findings could inform early risk stratification and guide treatment intensity.

T2-STCE1-2 PHOTON-COUNTING CT FOR DYNAMIC LUNG PERFUSION: VALIDATION OF A LOW-DOSE PROTOCOL IN A PORCINE LUNG TRANSPLANTATION MODEL

Anna Hunkemoller, BSc, MD (*Presenter*)
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PURPOSE

To evaluate the quantitative performance of dynamic low-dose photon-counting CT (PCCT) for lung perfusion imaging, compared to reference-dose PCCT and static perfused blood volume (PBV) imaging, at radiation exposures comparable to routine chest CT.

METHODS AND MATERIALS

Six Göttingen minipigs with left lung transplants underwent dynamic PCCT perfusion imaging at both reference and low-dose settings, as well as static PBV scans. Dynamic acquisitions used 10 mL of Iomeprol 400 contrast agent followed by 100 mL of saline, whereas PBV imaging used 70 mL of contrast. Quantitative perfusion parameters included Patlak-derived Blood Volume (BVP), Deconvolution-based Blood Volume (BVD), Blood Flow (BFD), Mean Transit Time (MTTD), Flow Extraction Product (FEP), and Time to Start (TTSD), analyzed across six lung regions. Statistical comparisons utilized Kruskal-Wallis tests and Bland-Altman analysis.

RESULTS

Dynamic low-dose PCCT showed strong agreement with reference-dose imaging across all perfusion metrics (BVP bias: 0.03; BVD bias: 0.04; all p > 0.2). BVP was significantly more robust under low-dose conditions than BVD (p = 0.011 and p = 0.001). Static PBV maps significantly differed from dynamic BVP (p < 0.001), indicating lack of quantitative equivalence. Regional perfusion deficits were reliably detected in 2/6 transplanted lungs by all methods. Despite using only 10 mL contrast, dynamic PCCT at low dose (1.36 mSv) achieved quantitative results equivalent to reference dose (2.37 mSv) and comparable radiation exposure to static PBV imaging (1.49 mSv).

CONCLUSION

Dynamic lung perfusion imaging with low-dose PCCT provides accurate, reproducible quantitative metrics at radiation levels equivalent to static PBV, using substantially less contrast agent

CLINICAL RELEVANCE/APPLICATION

Dynamic low-dose PCCT allows for comprehensive, time-resolved lung perfusion imaging using a small amount of contrast medium (10 mL) and a low radiation dose. This suggests that PBV is unnecessary when dynamic perfusion imaging is required.

T2-STCE1-3 CONTRAST-FREE POSTOPERATIVE IMAGING OF THE PULMONARY ARTERY VASCULATURE: INTRAINDIVIDUAL COMPARISON OF RELAXATION-ENHANCED ANGIOGRAPHY WITHOUT CONTRAST AND TRIGGERING (REACT) AND TIME-RESOLVED CONTRAST-ENHANCED MRA

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PURPOSE

As a novel 3D isotropic flow-independent non-contrast-enhanced MRA technique, Relaxation-Enhanced Angiography without Contrast and Triggering (REACT) has shown promising results in imaging of the pulmonary vasculature, primarily in patients without prior surgery. The purpose of this study was to assess the performance of REACT in comparison to time-resolved contrast-enhanced MRA (4D CE-MRA) in patients with prior surgery of the pulmonary arteries or right ventricular outflow tract, with a focus on the impact of various implants.

METHODS AND MATERIALS

This retrospective single-center study included 53 patients (29 years [18-37], 26 male) with congenital heart disease, who underwent both 4D CE-MRA (scan time: 247s [167-354]) and REACT (electrocardiogram- and respiratory-triggering, Compressed SENSE (factor 9); scan time: 363s [282-422]) at 1.5 T. Surgical history included: conduit (n=15), valve replacement (n=10), stent implantation (n=19), patch repair (n=18), and others. Three radiologists independently assessed image quality (IQ) as well as susceptibility and motion artifacts on 5-point Likert scales (5=excellent) for the main, left, and right pulmonary arteries (MPA/LPA/RPA). Diameters were measured, and stenosis or dilatation was recorded.

RESULTS

REACT showed higher overall IQ than CE-MRA (3.78 [3.11-4.22] vs. 3.11 [2.33-3.44]; $p<0.001$), less motion (4.22 [3.89-4.67] vs. 3.11 [2.67-3.56]; $p<0.001$) and comparable susceptibility artifacts (4.33 [3.22-4.78] vs. 4.44 [3.56-4.67]; $p=0.254$). Subanalysis revealed higher image quality with REACT regardless of the implant type (all $p<0.05$); only stents resulted in equally poor image quality (2.00 [1.33-3.0] vs. 2.00 [1.67-3.00]; $p=0.860$) with impairing susceptibility (1.67 [1.33-3.50] vs. 2.00 [1.67-3.67]; $p=0.148$). Of note, in three of the stented vessels the 4D CE-MRA showed a faint intraluminal signal, while no lumen at all was visible in REACT. Diameter measurements (ICC: 0.967-0.987) tended to be larger in 4D CE-MRA, although only RPA differed significantly (17.29±5.00 mm vs. 18.08±4.96 mm; $p=0.002$). Stenoses (16 of 159 segments) and dilatations (24 of 153 segments) were detected equally.

CONCLUSION

REACT provides contrast-free imaging after surgery of the pulmonary arteries with superior image quality compared to 4D CE-MRA. However, susceptibility artifacts remain a limitation in stented segments. Albeit 4D CE-MRA may offer slightly improved visualization in selected cases, stent assessment in MRA remains challenging.

CLINICAL RELEVANCE/APPLICATION

REACT is a valuable alternative to 4D CE-MRA for postoperative imaging of the pulmonary arteries and can help reduce contrast exposure in routine follow-up imaging. For targeted stent evaluation, other imaging methods may be preferred.

Abstract Archives of the RSNA, 2025

T2-STCE2

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER THEATER 2

Sub-Events

T2-STCE2-1 REAL-WORLD MONITORING, FEEDBACK, AND COLLABORATION FOLLOWING MAMMOGRAPHY IMAGING HARDWARE CHANGE: A REAL-WORLD EXAMPLE OF INPUT DATA DISTRIBUTION SHIFTS RESULTING IN AI OUTPUT CHANGES DETECTED AND ADDRESSED IN DEPLOYMENT

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Giorgia Grisot, PhD (*Abstract Co-Author*)
Matthew McCabe, PhD (*Abstract Co-Author*)
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Bryan Haslam, PhD (*Abstract Co-Author*)

PURPOSE

AI has shown strong potential to improve breast cancer screening outcomes. However, real-world variables—such as changes in clinical practice, patient populations, or imaging hardware—can lead to data shifts, requiring timely adjustments to AI tools to maintain safety and efficacy. Monitoring is essential and must be supported by robust data infrastructure, response processes, and clinician feedback loops. This study presents a real-world example in which a change in mammography hardware led to a detectable shift in AI outputs, prompting a collaborative recalibration process.

METHODS AND MATERIALS

From Jun 2022, a multistage AI-driven screening workflow-involving concurrent CADe/x reading and an AI-facilitated safeguard review-was deployed across 109 U.S. sites predominantly using mammography hardware #1. From Feb-Mar 2025, 34 sites began transitioning partially or fully to hardware #2, with updated AI configurations. A real-time data pipeline was established to monitor metrics such as recall rates (RR) and AI suspicion level distribution, and delayed metrics requiring cancer follow-up. In week 1 post-rollout, clinicians observed that AI-generated bounding boxes appeared larger than with hardware #1, triggering radiologist interviews to assess clinical utility impact. Bounding box parameters were refined in close collaboration with radiologists, and validated prior to FDA submission.

RESULTS

For the initial cohort, exam distribution was 77.3% on hardware #1 (N=15083) vs 22.7% on hardware #2 (N=4430) for the 3 months post hardware change. Site RR 3 months pre- (N=15758) and post-change was 12.7% (95% CI: 12.2, 13.3) and 11.4% (95% CI: 11.0, 11.9), respectively. AI suspicion level distributions (High, Intermediate, Low, and Minimal) remained similar with less than 4% change pre- and post-change: 3.8%, 21.9%, 45.9%, and 28.4% vs 4.7%, 18.1%, 49.7%, and 27.4%. Usability testing guided bounding box recalibration. Bounding box validation on a test set (N=3235) showed a mean box area change on hardware #2 from +30.8% to -7.3% relative to hardware #1, improving user satisfaction. An FDA filing including the design change followed within 3 months of initial feedback.

CONCLUSION

Real-time monitoring showed stable efficacy post hardware change. The bounding box shift was detected within 1 week, prompting collaborative adjustments through close vertical integration between technology manufacturer and clinical service provider. Refinements and FDA submission filing took 3 months.

CLINICAL RELEVANCE/APPLICATION

Monitoring is a cornerstone of safe AI deployment. In this study, the AI manufacturer partnered with radiology sites to implement a scalable data pipeline and feedback loop enabling timely detection, investigation, and response to AI drift signals.

T2-STCE2-2 VERY LARGE-SCALE DEPLOYMENT OF AN AI ORCHESTRATION SYSTEM FOR RADIOLOGIST WORKFLOWS IN IMAGING-BASED MULTICENTER CLINICAL TRIALS

Joel Schaerer, PhD (*Presenter*)
Alessandro Delmonte, MSc (*Abstract Co-Author*)
Janos Szalma, PhD (*Abstract Co-Author*)
Kostia Mannevy (*Abstract Co-Author*)
Adam Juhasz (*Abstract Co-Author*)
Thomas Cajgfinger (*Abstract Co-Author*)
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PURPOSE

Successful implementation of imaging-based clinical trials depends on high-quality, harmonized imaging data for reliable outcomes and regulatory compliance. Enforcing standardization in clinical environments requires significant clinical radiologist involvement for acquisition oversight, quality control and image interpretation. We implemented at very large scale a centralized AI orchestration system to support multicenter clinical trial execution, improving data acquisition quality and reducing endpoint variability in imaging workflows.

METHODS AND MATERIALS

We deployed at scale a 21 CFR Part 11 compliant AI orchestration system supporting image acquisition and analysis workflows for central radiological assessment of clinical trials endpoints. The system integrates: (1) Automatic image triage establishing reader worklists and flagging deviations from expected acquisition protocols, triggering corrective actions. (2) Facial features anonymization ensuring regulatory compliance (3) AI-driven quality control detecting image artifacts and improving data

integrity by raising site queries before image interpretation. (4) Quantitative image assessment for radiological review, allowing for consistent disease measurement and enabling trial endpoints estimation. Using a physician-in-the-loop design, radiologists can at all times accept, modify or reject AI predictions from their worklist.

RESULTS

The AI system was deployed on 644 clinical trials and post-deployment monitoring was implemented to evaluate performance of individual AI components compared to manual annotations. Between February and July 2025, 1.1 million exams were triaged with an accuracy of 95.5% across CT, MRI, PET, ultrasound and radiographic imaging. Quality control was applied on 329,718 exams, with accuracy ranging from 78.7% for motion artifacts to 96.5% for anatomical coverage issues, leading to timely site queries. Quantitative image reading effectively assisted 2,828 endpoint assessments for 16 indications with 96.2% overlap with radiologist measurements.

CONCLUSION

The implemented AI system offered scalable support for large multicenter imaging-based clinical trials, enforcing high data quality and supporting consistent endpoints estimation by clinical radiologists. Efficient AI-human interactions enabled widespread usage in all phases of image analysis across indications including neurodegenerative diseases, oncology, metabolic and rare diseases.

CLINICAL RELEVANCE/APPLICATION

Large scale usage of the proposed AI system can increase data quality and endpoints consistency in multicenter clinical trials, supporting image analysis and regulatory compliance while reducing variability in clinical radiologist assessment over time.

T2-STCE2-3 PROOF-OF-CONCEPT EVALUATION OF VISION-LANGUAGE MODEL INTO RADIOLOGY WORKFLOW: MRI SEQUENCE STANDARDIZATION FOR METADATA HARMONIZATION AND SCALABLE DEPLOYMENT

Satvik Tripathi (*Presenter*)
Thomas C. Arnold, PhD (*Abstract Co-Author*)

PURPOSE

Inconsistent MRI metadata across scanners and institutions hinders radiologists' workflow and limits AI deployment. We evaluated the use of vision-language models (VLMs) for zero-shot brain MRI sequence classification and metadata harmonization to standardize imaging, improve workflow efficiency, and support scalable algorithm deployment across enterprise health systems.

METHODS AND MATERIALS

Five VLMs (BiomedGPT, BiomedCLIP, MedCLIP, LLaVA-Med, UniMedCLIP) were evaluated on 2D brain MRI slices in three experiments: (1) benchmark testing on 25 images across six canonical sequence types; (2) stability assessment via 10 repeated zero-shot inferences per image; and (3) evaluation on a 140-image curated dataset and a 571-image real-world, multi-site dataset spanning 13 sequence types. Performance was measured using accuracy, consistency scores, and confusion matrices.

RESULTS

UniMedCLIP outperformed other models with 90.2% accuracy on the benchmark set, 92.1% on the curated set, and 82% on the real-world dataset. Stability testing revealed significant differences across models (ANOVA, $p < 0.001$), with UniMedCLIP demonstrating the highest consistency (mean = 9.76/10, SD = 0.44). Most misclassifications occurred between related sequences (e.g., DWI vs ADC, T1 vs T1c). Harmonization was validated by comparing it with native DICOM metadata.

CONCLUSION

Zero-shot VLMs, particularly UniMedCLIP, provide strong sequence classification and metadata harmonization performance across diverse MRI datasets. These tools can optimize radiologist workflows by ensuring consistent hanging protocols across all sites and scanners, and by enabling downstream AI tools to accurately identify and process relevant exams (e.g., routing prostate MRIs to prostate-specific algorithms).

CLINICAL RELEVANCE/APPLICATION

This proof-of-concept demonstrates the feasibility of integrating VLMs into radiology workflows, facilitating standardized metadata, consistent hanging protocols, and scalable AI deployment—critical steps toward real-world implementation of imaging AI across enterprise systems.

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

T3-SSBR05

Breast Imaging (Screening Mammography Workflow and AI Applications)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S406A

Linda Moy, MD (*Moderator*)
Ritse M. Mann, MD, PhD (*Moderator*)

Sub-Events

T3-SSBR05-1 MAMMOGRAPHY BREAST CANCER SCREENING TRIAGE USING DEEP LEARNING: RETROSPECTIVE COMPARISON OF 7 COMMERCIAL AI ALGORITHMS

Joshua Rothwell (*Presenter*)
Sarah Hickman, MBBS (*Abstract Co-Author*)
Nicholas R. Payne, PhD, MSc (*Abstract Co-Author*)
Richard Black, MS (*Abstract Co-Author*)
Yuan Huang (*Abstract Co-Author*)
Andrew N. Priest, DPhil (*Abstract Co-Author*)
Sue Hudson (*Abstract Co-Author*)
Bahman Kasmai (*Abstract Co-Author*)
Muzna Nanaa, PhD (*Abstract Co-Author*)
Muhammad Aniq (*Abstract Co-Author*)
Anna Sienko (*Abstract Co-Author*)
Fleur Kilburn-Toppin, MBBChir, MA (*Abstract Co-Author*)
Fiona J. Gilbert, MBChB, FRCR (*Abstract Co-Author*)

PURPOSE

To retrospectively validate and compare 7 commercial deep learning (DL) breast cancer detection algorithms for triaging mammograms in the triennial UK breast screening program, which uses double reading.

METHODS AND MATERIALS

Screening full-field digital mammograms (FFDMs) were retrospectively collected from two screening sites across 4 years (site 1: 2017-18, site 2: 2015-17) and processed by 7 DL algorithms (DL-1, DL-2, ?, DL-7); each outputs a cancer detection score. Exclusion criteria were subsequent FFDMs for the same woman, <40 months follow-up, or algorithm results unavailable. Ground truth was histopathology for cancers; 40 months follow-up for normal cases. The area under the receiver operating characteristic curve (AUC) was estimated and compared (DeLong's test) for each DL for all FFDMs and independently within FFDM vendor (GE and Philips) subsets. For triage simulation, low-suspicion FFDMs were first ruled out at 99% sensitivity, sending these FFDMs to single reading only, with arbitration if that reader decided to recall these cases. Of the remaining FFDMs, high suspicion cases were ruled in with 99% specificity, automatically recalling these cases. All remaining FFDMs were sent to double reading as normal. Resulting sensitivity, specificity, arbitration rate and recall rate were calculated for if each DL was used to triage in this way.

RESULTS

117,910 FFDMs were collected and, after exclusion criteria, detection scores from the 7 DLs for 66,369 FFDMs were analyzed (GE: 69.6% [n=46,204], Philips: 30.4% [n=20,165]), including 1,132 cancers (GE: 64.1% [n=726], Philips: 35.9% [n=406]). For DL-1-through-7, respectively: on all data AUCs were 0.89, 0.88, 0.86, 0.88, 0.81, 0.87 and 0.89, with DL-5 statistically lower than the second worse-performing DL, DL-3 (0.81 vs 0.86; $p<0.01$). On GE FFDMs only, AUCs were 0.90, 0.90, 0.88, 0.89, 0.85, 0.88, and 0.90; and on Philips FFDMs only, AUCs were 0.87, 0.84, 0.86, 0.87, 0.85, 0.87, and 0.88. AUCs were found to statistically decrease with Philips FFDMs for DL-1 (0.90 vs 0.87; $p=0.013$) and DL-2 (0.90 vs 0.84; $p<0.05$). Double reading specificity was 97.6% with a sensitivity of 68.4%. Triage simulations with all DLs had specificities which were equivalent to double reading with higher sensitivities.

CONCLUSION

Performance differences were found between DLs, but, when used in triage simulations, all were found to be non-inferior to double reading.

CLINICAL RELEVANCE/APPLICATION

Using DLs to triage FFDMs could reduce reading workload without loss of sensitivity.

T3-SSBR05-2 MULTISTAGE AI-DRIVEN WORKFLOW IMPROVES GENERAL RADIOLOGIST SCREENING MAMMOGRAPHY PERFORMANCE TO THE LEVEL OF FELLOWSHIP-TRAINED BREAST IMAGERS: REAL-WORLD EVIDENCE IN >500,000 PATIENTS

Matthew McCabe, PhD (*Presenter*)
Leeann Louis, BS, PhD (*Abstract Co-Author*)
Jiye G. Kim, PhD (*Abstract Co-Author*)
Annie Ng, PhD (*Abstract Co-Author*)
Christoph I. Lee, MD,MS (*Abstract Co-Author*)
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Edgar Wakelin (*Abstract Co-Author*)

PURPOSE

Interpretive performance in screening mammograms (SMGs) varies widely resulting in variable care for patients. Integrating AI into the screening workflow could help standardize the quality of care. However, large scale studies of the impact of AI in the real world are lacking, particularly related to radiologists with different levels of specialization. Here, we assessed the impact of a multistage AI-driven workflow on the interpretive performance of General radiologists compared to Fellowship-trained breast imagers.

METHODS AND MATERIALS

An AI-driven workflow was deployed at scale across 5 community radiology practices (109 facilities, 95 radiologists), which involved a CADe/x device providing lesion bounding boxes and suspicion categories during interpretation, plus an AI-facilitated safeguard review routing potential missed findings to breast imaging experts. Performance before and after implementation of the workflow was compared between radiologists with and without fellowship training in breast or women's imaging. SMGs from Sept 2021-May 2022 formed the Standard of care (SOC) cohort (using only non-AI CAD tools), and exams from Aug-Dec 2022 formed the AI-driven workflow cohort. Outcomes were cancer detection rate (CDR), recall rate (RR) and positive predictive value of recalls (PPV1). Generalized Estimating Equations were used to adjust outcomes for clustering within radiologist, radiologist covariates (experience years, SMG exam volume) and patient factors (demographics, previous breast cancer, time since last SMG).

RESULTS

A total of 577 742 SMGs were included, 211 931 were read by 35 Fellowship-trained radiologists (SOC: 133 975; AI-Driven workflow: 77 956) and 365 811 were read by 60 General radiologists (SOC: 235 272; AI-Driven workflow: 130 539). Fellowship-trained radiologists had higher CDR (4.47, 95% CI: 3.94-5.07) than General radiologists (3.76, 95% CI: 3.46-4.08) during SOC (p=0.027). The AI-Driven workflow improved General radiologist CDR (4.99, 95% CI: 4.51-5.53, p<0.001) such that Fellowship-trained and General radiologists CDR did not differ with the AI-Driven workflow (Odds Ratio [OR]=0.95, 95% CI: 0.82-1.11, p=0.53). RR increased for General radiologists (OR=1.17, 95% CI: 1.04-1.30, p=0.007) less than the CDR increase, resulting in an increase in PPV1 (OR=1.16, 95% CI: 1.02-1.31, p=0.019), indicating the increased recalls found cancers at a higher rate.

CONCLUSION

The Multistage AI-Driven workflow significantly improved CDR and PPV1 for General radiologists to levels comparable with Fellowship-trained radiologists.

CLINICAL RELEVANCE/APPLICATION

An optimized AI-driven screening workflow can improve breast screening programs by providing Fellowship-trained performance to all patients.

T3-SSBR05-3 COMPARING FOUR COMMERCIAL AI ALGORITHMS FOR STANDALONE BREAST CANCER DETECTION ON DIGITAL BREAST TOMOSYNTHESIS IN A DUTCH POPULATION-BASED SCREENING COHORT

Sarah D. Verboom, MSc (*Presenter*)
Jessie J. Gommers, MSc (*Abstract Co-Author*)
Lindy Kregting (*Abstract Co-Author*)
Daan Van Den Oever (*Abstract Co-Author*)
Mireille Broeders, PhD (*Abstract Co-Author*)
Ioannis Sechopoulos, PhD (*Abstract Co-Author*)

PURPOSE

To compare the performance of four commercial artificial intelligence (AI) computer aided detection algorithms for digital breast tomosynthesis (DBT) in a Dutch population-based breast cancer screening cohort.

METHODS AND MATERIALS

The STREAM trial aims to compare the performance of DBT to that of digital mammography for nationwide breast cancer screening in the Netherlands. The first of two screening rounds with DBT was completed between July 2023 and May 2024. All women received the standard four-view screening DBT examination with Hologic 3Dimensions. Four commercially available AI algorithms were tested on the available DBT slices of the first screening round, and synthetic 2D if desired by the AI algorithm. All examinations were double read by two breast screening radiologists trained to interpret screening DBTs, with arbitration in case of disagreement. Only examinations where cancer was confirmed by biopsy after recall were considered cancer cases when evaluating the AI algorithms. The area under the receiver characteristics curve (AUC) of the four AI algorithms were compared using the MRMCaov R package (version 0.3.0). Future follow-up results will include evaluation of the examinations of all included women and information to include interval cancers that were diagnosed within 2 years after the screening examination.

RESULTS

All four AI algorithms processed 16,916 out of the 18,186 (93%) DBT examinations of the first round. Of these examinations, 444 women were recalled at screening (2.6% recall rate), and 145 cancers were detected after recall (8.6‰ cancer detection rate). The four AI algorithms had an AUC of A: 0.978 (95%CI 0.967-0.989), B: 0.973 (95%CI 0.964-0.983), C: 0.953 (95%CI 0.941-0.965), and D: 0.943 (95%CI 0.932-0.954). The AUCs of vendor A and B were each significantly higher than those of vendor C and D (four comparisons with p<.001). There was no significant difference between the AUCs of vendor A and B (p=.41) and the AUCs of vendor C and D (p=.11). At a recall rate fixed to that of screening (2.6%) the AI algorithms detected A: 121 (83%), B: 106 (73%), C: 68 (47%) and D: 45 (32%) of the 145 screen detected cancers. The highest 20% of scores included at least 97% of screen detected cancers, for all AIs.

CONCLUSION

There are significant differences in performance between some of the four commercial AI algorithms when evaluating screening DBT examinations. A study limitation is that follow-up is ongoing and therefore there is only information on screen detected cancers, future results will also include interval cancers.

CLINICAL RELEVANCE/APPLICATION

External validation of commercial AI algorithms is necessary for safe implementation of AI. This is the first study comparing commercial AI algorithms for screening DBT on the same large dataset.

T3-SSBR05-4 DIAGNOSTIC PERFORMANCE OF SCREENING MAMMOGRAPHY AI TOOL IN A CANCER CENTER SCREENING POPULATION

Sarah Eskreis-Winkler, MD, PhD (*Presenter*)
Tali Amir, MD (*Abstract Co-Author*)
Jeffrey S. Reiner, MD (*Abstract Co-Author*)
Amita Shukla-Dave, PhD (*Abstract Co-Author*)
Kimberly N. Feigin, MD (*Abstract Co-Author*)

PURPOSE

Our breast cancer screening program includes many patients with prior breast-conserving therapy and high breast cancer risk. Given this unique population, it's unclear if published AI performance will generalize to our setting. Before implementing Transpara Breast AI (version 1.74A, ScreenPoint Medical), an FDA-approved tool, we performed a retrospective evaluation.

METHODS AND MATERIALS

This IRB-approved, HIPAA-compliant study included screening mammograms from Jan 1-Dec 31, 2023. Four 200-exam cohorts were selected: Cohort 1 True positives — BI-RADS 0, cancer diagnosed within 3 months.Cohort 2 False negatives — BI-RADS 1 or 2, cancer diagnosed within 18 months. Cohort 3 True negatives — BI-RADS 1 or 2, with no cancer diagnosed for at least 18 months, and no history of breast-conserving therapy. Cohort 4 True negatives — BI-RADS 1 or 2, with no cancer diagnosed for at least 18 months, in patients with breast-conserving therapy. All mammograms were randomly selected based on the above criteria and analyzed by Transpara, which assigned each exam a risk level (high/intermediate/low). Per vendor benchmarks, the algorithm was expected to identify >90% of true positives as "high risk" and > 60% of true negatives as "low risk."

RESULTS

Of 200 true positive exams (i.e. screen-detected cancers), AI designated 71% (95% CI: 64-76%) as high risk, which fell short of the 90% benchmark. Of 200 false negative cases (i.e. interval cancers), AI designated 63% (95% CI: 56-69%) as high risk. Of true negative cases without a history of breast conserving therapy, AI designated 56% (95% CI: 49-63%) as low risk, slightly below the 60% benchmark. However, of true negative exams with a history of breast conserving therapy, AI designated 27% (95% CI: 21-34%) as low risk, much lower than the 60% benchmark.

CONCLUSION

AI algorithms may perform less effectively in real world settings compared to results reported in the literature, particularly at imaging centers with high volumes of patients with history of breast conserving therapy. This study highlights the need for in-house quality assessment, quality control, and ongoing monitoring of all FDA-approved AI algorithms.

CLINICAL RELEVANCE/APPLICATION

Growing evidence highlights the advantage of using AI tools in diagnostic tasks, such as screening mammography interpretation. However, our results underscore the importance of validating AI tools on internal data before clinical implementation, rather than relying solely on results from published literature. It is critically important to understand the nuances of clinical scenarios where the tool adds value and where its performance may be more limited.

T3-SSBR05-5 PROSPECTIVE FEASIBILITY STUDY OF MIRAI-EXPEDITED EVALUATION FOR HIGH-RISK SCREENING MAMMOGRAMS

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Adam Yala, PhD (*Abstract Co-Author*)

PURPOSE

To prospectively evaluate the feasibility and performance of expedited screening mammogram assessment for women identified as high risk by a mammogram based deep learning model.

METHODS AND MATERIALS

This HIPAA-compliant, IRB-approved prospective controlled, unblinded study was performed at an urban safety-net facility from 12/2024 - 4/2025. A threshold retrospectively calibrated from historical data was used to prospectively flag women at the top 10% of risk. Mirai 1-year breast cancer risk scores were generated immediately after screening mammograms. On 1-2 designated study days per week, consented high-risk women were offered immediate interpretation of screening mammogram and, if assessed by the radiologist as BI-RADS 0, offered same-day diagnostic workup. Reasons for inability to expedite evaluation were collected. Time intervals from screening mammogram to screening result (Ts), diagnostic imaging (Td), and biopsy (Tb) were recorded and compared between study and control days. Cancer detection rate (CDR) among expedited women was compared to the facility baseline of 5.9/1000 using an exact binomial test (R v4.4.1), with $p < 0.05$ considered statistically significant.

RESULTS

735 women received screening mammograms on designated study days. Of these, 80 women (10.9%) were flagged as high-risk, and 74 consented to receive immediate assessment. Mean age was 58 (range 40-79). Of the 74 consented women, 71 (95.9%) received immediate assessment; three (4.2%) did not receive immediate assessment due to clinical time constraint (n=2) and wait time (n=1). Of the 71 immediate assessments, 21 (29.6%) received BI-RADS 0 assessment. Of these, 20 women received same-day diagnostic evaluation and 1 received diagnostic evaluation on the following workday due to technologist availability. At diagnostic evaluation, 7 (33.3%) women were assessed as BI-RADS 4, 2 (9.5%) as BI-RADS 3, and 12 (57.1%) as BI-RADS 1 or 2. All 7 women assessed as BI-RADS 4 underwent biopsy yielding 5 malignant (3 IDC and 2 DCIS), 1 high-risk (atypical papillary lesion), and 1 benign pathologies. The CDR for this cohort was 70.4/1000 women (95% CI 23.3, 156.7), which was significantly higher compared to the baseline facility CDR of 5.9/1000 ($p < 0.001$). Mean Ts (0.3 hr vs. 15.7 hrs), Td (0.04 day vs. 37.8 days), and Tb (5.8 days vs. 58.0 days) were significantly shorter for high-risk expedited women compared to high-risk controls on non-study days ($p <0.001$).

CONCLUSION

A Mirai-based 10% high-risk threshold is feasible to integrate into clinical workflow and enables expedited evaluation for high-risk women.

CLINICAL RELEVANCE/APPLICATION

AI-based risk stratification can effectively triage screening mammograms and prioritize timely evaluation for high-risk women.

T3-SSBR05-6 USE OF MULTIPLE PRIOR EXAMS IMPROVES SPECIFICITY OF AN AI SYSTEM FOR BREAST CANCER DETECTION IN A RETROSPECTIVE MULTI-SITE VALIDATION

Nico Karssemeijer, PhD (*Presenter*)
Alejandro Rodriguez-Ruiz (*Abstract Co-Author*)
Santiago Pires (*Abstract Co-Author*)
Joep Stevens (*Abstract Co-Author*)
Jose Luis Raya Povedano, MD (*Abstract Co-Author*)
Sara Romero Martin (*Abstract Co-Author*)
Roger S. Yang, MD (*Abstract Co-Author*)
Rachel F. Brem, MD (*Abstract Co-Author*)

PURPOSE

To investigate how the use of prior exams impacts the breast cancer detection performance of an AI system for tomosynthesis.

METHODS AND MATERIALS

DBT examnination with available priors were analyzed by a breast cancer AI product (Transpara, ScreenPoint Medical, version 2.1), resulting in two scores indicating presence of cancer: One using only the current tomosynthesis exam as input and the second using the current images plus up to 3 prior examinations per case. A breast density score according to BI-RADS 5th edition was also generated by the AI system. All cases were fully independent from the development process of the AI system. Specificity of the AI system was compared between using prior exams or not, at pre-defined operating points of 90% and 80% sensitivity. P values using McNemar and binomial confidence intervals were computed.

RESULTS

The enriched dataset included 2,320 cases (34% from USA, 66% from Europe), with 214 cancers (9.2%). 75% of cases had 1 prior tomosynthesis exam and the remaining 25% had 2 or 3 prior exams. Images were acquired with Hologic DBT machines. At 90% sensitivity, AI specificity increased when using prior images, from 79.8% (95% CI: 78.0-81.4%) to 85.7% (84.1-87.1%), representing a 29% reduction in false positives (from 20.2% to 14.3%, P<0.001). At 80% sensitivity, using priors resulted in a specificity increase from 93.3% (92.2-94.3) to 95.2% (94.2-96.0), representing a 28% reduction in false positives (from 6.7% to 4.8%, P<0.001). The reduction in false positives was equally observed for cases with breast density C/D (-33%, P<0.001) and for cases with breast density A/B (-26%, P=0.005). There was a non-significant trend for higher reduction in false positives when using more than 1 priors (-45%) than when using only 1 prior exam (-24%).

CONCLUSION

An AI system for breast cancer detection in tomosynthesis achieves a higher specificity when using prior exams for analysis. Results were not affected by breast density and the benefit of priors may be higher when multiple priors are used.

CLINICAL RELEVANCE/APPLICATION

AI systems to aid radiologists reading mammograms and tomosynthesis exams are being widely implemented. A known limitation of these systems was their inability to leverage prior images into the analysis. A new generation of AI systems is designed to make use of priors, potentially offering radiologists more accurate decision-making support and give them more confidence in AI.

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Nov. 30 – Dec. 4
RSNA® 2025
Imaging the Individual

Abstract Archives of the RSNA, 2025

T3-SSCA05

Cardiac Imaging (Imaging Biomarkers)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S502

Maureen N. Hood, PhD,RN (*Moderator*)
Joao Cavalcante, MD (*Moderator*)

Sub-Events

T3-SSCA05-1 SERIAL MYOCARDIAL FIBROSIS ASSESSMENTS PREDICT OUTCOMES IN PATIENTS WITH HYPERTROPHIC CARDIOMYOPATHY

Yun Tang, MS, MD (*Presenter*)
Shihua Zhao, MD (*Abstract Co-Author*)

PURPOSE

The prognostic value of serial myocardial fibrosis assessments in patients with hypertrophic cardiomyopathy (HCM) remains to be elucidated. We aimed to investigate the progression of late gadolinium enhancement (LGE), as assessed by follow-up cardiac magnetic resonance (CMR) imaging, in patients with HCM, as well as its associated prognostic value.

METHODS AND MATERIALS

Patients with HCM who underwent two CMR examinations between 2010 and 2019 were retrospectively evaluated. The LGE mass progression (?LGE%) was defined as the number of increased grams of enhanced myocardium added divided by the number of years between the two scans. The primary endpoint was the combination of cardiac death, heart transplantation, aborted sudden cardiac death (SCD), appropriate implantable cardioverter defibrillator discharge, hospitalization for heart failure and stroke. The secondary endpoint was the combination of cardiac death, aborted SCD and heart transplantation. A maximally selected rank statistical analysis was conducted to identify the optimal cut-off for ?LGE% for prognostic stratification.

RESULTS

A total of 313 patients with HCM (median scan interval: 4.2 years) were evaluated. LGE mass progressed from a median of 2.9 (Q1-Q3: 0.0 to 8.1) g at CMR-1 to 8.3 (Q1-Q3: 3.6 to 16.3) g at CMR-2. During a median follow-up of 7.7 (Q1-Q3: 6.0-9.8) years from initial CMR, the primary endpoint occurred in 66 patients, of whom 22.7% reached the secondary endpoint (n=15). For primary endpoint and secondary endpoint, the optimal cut-off for ?LGE% were >1.50 and 3.75g/year, respectively. In the multivariable model, New York Heart Association class III/IV at baseline (HR 5.39, 95% CI: 2.92-9.94, P <0.0001), left ventricular ejection fraction <50% at CMR-1 (HR 2.65, 95% CI: 1.27-5.52, P =0.0096), and ?LGE% >1.50g/year (HR 5.86, 95% CI: 3.41-10.08, P <0.0001) were associated with the primary endpoint.

CONCLUSION

Myocardial fibrosis increased over time in HCM patients. Serial assessments of myocardial fibrosis on CMR may improve risk stratification and clinical decision-making in these patients.

CLINICAL RELEVANCE/APPLICATION

Patients with hypertrophic cardiomyopathy (HCM) had varying degrees of late gadolinium enhancement (LGE) progression. Rapid LGE mass progression (>1.50g/year) was identified as a strong independent factor significantly associated with elevated risk for adverse events. Serial LGE assessments on CMR may improve risk stratification and clinical decision-making in HCM patients.

T3-SSCA05-2 EVALUATING THE ADDED VALUE OF LOW-DOSE CHEST CT-DERIVED EPICARDIAL ADIPOSE TISSUE MEASUREMENT IN AN ASYMPTOMATIC HEALTH SCREENING POPULATION

Jong Eun Lee, MD, PhD (*Presenter*)
Nayoung Kim (*Abstract Co-Author*)
Young Joo Suh, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the prognostic value of CT-derived epicardial adipose tissue (EAT) volume measurement for predicting major adverse cardiovascular events (MACE) in an asymptomatic screening population undergoing non-contrast low-dose chest CT.

METHODS AND MATERIALS

In this retrospective study, asymptomatic individuals aged 40 years or older who underwent non-contrast low-dose chest CT scans between 2007 and 2014 at two health screening centers were included. A commercially available AI-based software was used to simultaneously assess EAT volume, EAT density, and coronary artery calcium (CAC) score. Multivariable Cox proportional hazards models were employed to determine the association between EAT parameters and MACE. Net Reclassification Index (NRI) and the number needed to harm were used to assess improvements in risk stratification and cost-effectiveness.

RESULTS

A total of 5342 individuals were analyzed (3431 from Center I and 1923 from Center II) with median follow-up periods of 7.5 years for MACE. After adjusting for AI-based CAC and clinical variables, increased AI-based EAT volume was significantly associated with a higher risk of MACE, whereas EAT density was not. The addition of AI-based EAT volume to a model containing clinical variables and CAC significantly improved risk prediction, with a category-free NRI of 0.086 (95% CI: 0.002-0.152, P = .048). Furthermore, using a cutoff value of 152.09 mL, reclassifying individuals from a high-risk to a low-risk group via intervention could potentially prevent one MACE for every 136.8 individuals treated.

CONCLUSION

Automated assessment of EAT volume on non-contrast low-dose chest CT is feasible and provides added prognostic value and cost-effectiveness for cardiovascular risk stratification in an asymptomatic screening population.

CLINICAL RELEVANCE/APPLICATION

Automated measurement of epicardial adipose tissue (EAT) volume using AI-based analysis on routine non-contrast low-dose chest CT scans enhances cardiovascular risk stratification beyond traditional clinical variables and coronary artery calcium scoring. Incorporating EAT assessment into health screening protocols could identify asymptomatic individuals who might benefit from preventive interventions, improving patient outcomes and clinical decision-making.

T3-SSCA05-4 MULTIPARAMETRIC CARDIAC MRI IN PATIENTS WITH GIANT CELL ARTERITIS

Annemarie Proff, MD (*Presenter*)
Narine Mesropyan, MD (*Abstract Co-Author*)
Dmitrij Kravchenko, MD (*Abstract Co-Author*)
Taraneh Aziz-Safaie, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)
Alexander Isaak, MD (*Abstract Co-Author*)

PURPOSE

Giant cell arteritis (GCA) is a systemic vasculitis associated with systemic inflammation, potentially affecting cardiac structures even in the absence of overt symptoms. This study aimed to assess the presence and characteristics of subclinical cardiac involvement in patients with newly diagnosed GCA using multiparametric cardiac MRI (CMR).

METHODS AND MATERIALS

In this prospective single-center study patients with newly diagnosed GCA underwent CMR at baseline and approximately six months after. Imaging protocols included functional and volumetric parameters, visual edema, late gadolinum enhancement (LGE), and T1- and T2- mapping including extracellular volume fraction (ECV). Healthy controls were included for comparison using historical CMR datasets. Group comparisons were performed using t-tests, Mann-Whitney U, and chi-square tests; paired t-tests assessed longitudinal changes.

RESULTS

A total of 45 GCA patients (mean age 73 ± 9 years; 42% female) and 20 healthy controls were included (mean age 51 ±16 years, 40% female). 3/45 (7%) patients had inflammatory cardiac disease on CMR: active pericarditis in 2/45 (4%) and active myocarditis in 1/45 (2%) GCA patients. LGE was present in 38% (17/45), with variable patterns (ischemic 6/17, non-ischemic 3/17, unspecific 6/17, pericardial 2/17). Compared to controls, GCA patients had significantly elevated native T1 values (987±29 vs. 958±21 ms; p<0.001) and increased ECV (27±4% vs. 25±2%; p=0.01). T2 times showed no significant differences (p=0.163). Among 31/45 patients with follow-up scans, no significant changes were observed in T1 (983±26 vs. 982±19 ms; p=0.679), T2 (54±3 vs. 55±2 ms; p=0.339), or ECV (27±4% vs. 27±4%; p=0.283) under immunosuppressive therapy.

CONCLUSION

Multiparametric CMR reveals cardiac alterations in patients with newly diagnosed GCA including active inflammation (myocarditis and pericarditis in single patients), post-ischemic scars, and signs of focal and diffuse non-ischemic myocardial fibrosis. Myocardial T1 and ECV may serve as sensitive, non-invasive markers for early cardiac involvment in GCA.

CLINICAL RELEVANCE/APPLICATION

CMR may enable early detection of cardiac involvement in GCA.

T3-SSCA05-6 SEX-SPECIFIC EFFECTS OF OBESITY ON CARDIAC STRUCTURE AND FUNCTION: A MAGNETIC RESONANCE STUDY OF THE HAMBURG CITY HEALTH COHORT

Jennifer Erley, MD (*Presenter*)
Jonas Heinrich Lund, MD (*Abstract Co-Author*)
Isabel Molwitz, MD, MBA (*Abstract Co-Author*)
Ersin Cavus (*Abstract Co-Author*)
Gerhard B. Adam, MD (*Abstract Co-Author*)
Peter Bannas, MD (*Abstract Co-Author*)
Enver G. Tahir, MD (*Abstract Co-Author*)
Mathias Meyer, MD (*Abstract Co-Author*)

PURPOSE

To analyze the effect of obesity according to waist-to-hip ratio (WHR) and body mass index (BMI) on cardiac structure and function, depending on sex.

METHODS AND MATERIALS

Individuals between 45-74 years of age underwent 3T cardiovascular magnetic resonance (CMR) imaging as part of the population-based prospective “Hamburg City Health” cohort study. WHR and BMI were assessed upon study inclusion. Subjects with known cardiac diseases were excluded. Generalized regression models were conducted including sex, BMI or WHR, their interaction (if statistically significant), and age.

RESULTS

We included 2173 subjects (43% female, mean age 64±8 years). Median WHR was 0.94 [interquartile range: 0.88; 1.00] and median BMI was 26.3 [23.8; 29.3]. According to the WHR, 80% of subjects were obese (WHR = 0.85 in females/ 0.90 in males). Based upon BMI, 20% of subjects were obese (BMI = 30). An increase in WHR by 0.1 was associated with a 3.9g [2.5;5.4] higher left ventricular (LV) end-diastolic mass (EDM). It was also associated with lower LV and right ventricular (RV) end-diastolic volumes (EDV) (LV: -4.4ml [-6.2;-2.6], p<0.001; RV: -5.7ml [-8.2;-3.2], p<0.001), and end-systolic volumes (ESV) (LV: -1.9ml [-3.0;-1.3], p<0.001; RV: -1.9ml [-3.0;-0.8], p=0.001), leading to lower stroke volumes (LV: -2.2ml [-3.4;-0.9], p<0.001; RV: -2.1ml [-3.5; -0.8], p=0.002). However, the negative association between WHR and RVEDV/RVSV was -4.5ml [0.6;0.8|/-2.9ml [0.2;0.6] per 0.1 increase in WHR weaker in females compared to males (p=0.024 and 0.033) (Figure 1). Due to the proportionally larger decrease in EDV, LVEF showed an increase of +0.7% [95% confidence interval: 0.2;1.1] (p=0.004) with every 0.1 increase in WHR. An increase in BMI was associated with a 2.3g [2.0;2.7] higher LVEDM (p<0.001), a higher LVEDV (0.5ml [0.2;0.8], p=0.002), and a 0.4ml [0.2;0.6] higher LVSV (p<0.001). RV structure and function was not significantly associated with BMI. The positive association between BMI and LVEDM was -0.9mg [-1.3; -0.4] per 1 point BMI weaker in females (p<0.001) (Figure 1).

CONCLUSION

An increase in WHR is associated with a higher LV mass and lower ventricular volumes. Its association with RV volumes is weaker in females than males. An increase in BMI is associated with ventricular dilatation and a higher LV mass, although this relationship is also weaker in females.

CLINICAL RELEVANCE/APPLICATION

Abdominal obesity according to WHR is associated to concentric remodeling, while a higher body mass is associated with ventricular dilatation. The associations between WHR and RV remodeling, as well as between BMI and LV mass, are more pronounced in males than in females. These findings highlight the need for personalized risk assessment in obesity-related cardiovascular disease.

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

T3-SSER01

Emergency Radiology (Emergency Radiology Across Elderly Violence, Trauma, and Liability)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: N228

Dinesh D. Chinchure, FRCR, MBBS (*Moderator*)
Chenara A. Johnson, MD, PhD (*Moderator*)

Sub-Events

T3-SSER01-1 RADIOLOGIC INJURY PATTERNS AT THE INTERSECTION OF INTIMATE PARTNER VIOLENCE AND SUICIDAL BEHAVIOR

Emily Y. Yang, BS (*Presenter*)
Alexander Kwon (*Abstract Co-Author*)
Bharti Khurana, MD, MBA (*Abstract Co-Author*)

PURPOSE

Intimate partner violence (IPV) is an increasingly recognized risk factor for suicidal behavior. We seek to characterize the relationship between radiologic injury patterns and suicidal behavior in IPV victims, and how these interact to influence patient healthcare utilization.

METHODS AND MATERIALS

Our case population consists of women =18 years old who reported IPV to the hospital from 2013- 2018 (n=1451), with 1-to-6 matching from our patient registry (n=6679) to build the controls. All reports were reviewed by two experienced emergency radiologists blinded to IPV status (151,544 total). Using ICD-10 codes relevant to suicidal behavior (SB), which we defined as suicide attempt, self-harm, and/or suicidal ideation, we formed four study groups: IPV+/SB+, IPV+/SB-, IPV-/SB+, IPV-/SB-. We also collected information on the temporality and location of patient presentation (e.g. day versus night, ER vs. non-ER). Differences between groups for categorical data were analyzed with the chi-square test. Poisson regression was used to estimate incidence rate ratios (IRR) based on IPV and SB. All analyses were conducted with a significance level of $p<0.05$.

RESULTS

IPV alone was associated with a significant increase in injuries involving head, face, chest, and thoracic spine with synergistic elevation when co-occurring with SB. SB alone was associated with a higher incidence of upper extremity and abdominal injuries with synergistic elevation of upper extremity injury. On average, IPV+/SB+ patients initially present to hospitals at an earlier age (26.6 yrs) compared to IPV+/SB- (31.1 yrs). IPV is identified earliest in patients who have also attempted suicide (32.5 yrs) versus self-harm (35.6 yrs) and suicidal ideation (42.6 yrs). IPV+ and SB+ patients are more likely to present during the day vs. night and during the winter and fall seasons; IPV+/SB- patients are more likely to present to non-ER settings vs the ER ($p <0.001$).

CONCLUSION

IPV and SB present with distinct injury patterns, and their co-occurrence leads to a synergistic increase in the frequency of injuries across multiple anatomic sites. IPV is identified earlier in patients with SB, indicating the critical need for proactive screening and early intervention. Furthermore, the presence of IPV and/or SB affects patient healthcare utilization with respect to the timing and location of clinical presentation.

CLINICAL RELEVANCE/APPLICATION

As suicide remains a leading cause of death worldwide, there is significant potential in understanding its intersection with IPV. Characterizing the interaction of IPV and SB in radiologic injury patterns can improve screening and facilitate early intervention to better protect these vulnerable populations.

T3-SSER01-2 THE EFFECT OF SINGLE VERSUS DOUBLE-READ ON MEDICAL PRACTICE LIABILITY

Michael H. Bernstein, PhD (*Presenter*)

PURPOSE

To examine whether medical malpractice liability is reduced when radiologists interpret imaging both before and after viewing an AI result, versus only after an AI result.

METHODS AND MATERIALS

Participants (N=282) were recruited online through Prolific and provided online consent. Participants read about a hypothetical case where a 50-year old who visited the Emergency Department with acute neurological symptoms received a CT scan of the brain to determine if bleeding was present. An AI system was used by the radiologist who interpreted the CT images. The AI system correctly flagged the case as abnormal. Nonetheless, the radiologist concluded that no bleeding was present, and the blood-thinner t-PA was administered. Participants were randomly assigned to one of two conditions. In the single-read condition, the radiologist interpreted the CT once, and this occurred after seeing AI feedback. In the double-read condition, the radiologist interpreted the CT twice: first without AI, and then with AI feedback. Participants were then told that the patient suffered irreversible brain damage as a result of the missed brain bleed and that the patient (plaintiff) is suing the radiologist (defendant). Participants indicated whether the radiologist met their duty of care to the patient (yes/no). This is consistent with typical questions regarding breach of the duty of care that appear on jury verdict forms in medical malpractice trials. The study was approved by the institutional IRB.

RESULTS

Participants were more likely to side with the plaintiff in the double-read condition (74/140, 53.9%; 95% CI:44.6-61.0) versus the single-read condition (106/142, 74.7%; 95% CI:66.8-88.1)

CONCLUSION

Mock jurors were more likely to believe that the radiologist had met their duty of care when a False Negative interpretation occurred after reading an image twice - once without AI and then once with AI - relative to only reading the image once (with AI). The magnitude of this effect was large (75% vs. 53%), which indicates that for every three jurors who would side with the plaintiff in the “double read” condition, only two would do so in the “single read” condition

CLINICAL RELEVANCE/APPLICATION

The use of AI invites challenging questions related to medical malpractice among radiologists. Our results suggest that radiologists can reduce their liability by modifying their workflow.

T3-SSER01-3 IMAGING UTILIZATION, PATTERNS, AND YIELD IN THE EMERGENCY DEPARTMENT FOR UNHOUSED OLDER ADULT PATIENTS

Sharmila Duraisamy, MD (*Presenter*)
Haley Bayne (*Abstract Co-Author*)
Alexander Kwon (*Abstract Co-Author*)
Bharti Khurana, MD, MBA (*Abstract Co-Author*)

PURPOSE

Older adults experiencing homelessness represent a growing population with over 1.5 million Americans experiencing housing insecurity annually. This vulnerable population also has disproportionately high rates of emergency department (ED) use. Despite known disparities in access to outpatient care and an increased burden of acute and chronic disease, little is known about the specific patterns and diagnostic yield of emergency imaging in this group. This study aims to characterize emergency imaging utilization among patients aged 65 and older who are unhoused and presented to the ED.

METHODS AND MATERIALS

This ongoing IRB approved retrospective cohort study included 1,480 emergency department visits among 240 elderly homeless patients from 2015 to 2024 at two large academic centers in the northeastern USA. The total number of encounters was recorded, and all imaging studies performed during each visit were documented. Imaging reports were reviewed and categorized by modality: computed tomography (CT), radiography (XR), ultrasound (US), and magnetic resonance imaging (MRI). Impressions were analyzed for positive findings manually. Patients were grouped by revisit intervals: <30 days, 31-90 days, 90-180 days, 180-365 years and >1 year. Discharge dispositions and frequency of visits were identified.

RESULTS

Out of 1,480 ED visits, 468 (31.6%) included imaging, totaling 467 studies: 159 CT (34%), 291 X-XR (62.3%), 15 US (3.2%), and 2 MRI (0.4%). Positive findings were seen in 136 patients (29.3%), with 36.7% traumatic (mainly fractures and soft tissue injuries) and 63.6% non-traumatic (most commonly pneumonia). Over half (57.5%) had two or more ED visits within 30 days.

CONCLUSION

Unhoused older adults frequently utilize emergency services, including emergency imaging. In this study, nearly one-third of imaging studies revealed clinically significant findings. This highlights a substantial burden of both traumatic and non-traumatic pathology, most commonly fractures and pneumonia, respectively. Additionally, there were many patients with recurrent ED visits within 30 days, demonstrating the complex health needs and fragmented care often faced by this population.

CLINICAL RELEVANCE/APPLICATION

Our findings support the need for targeted interventions to improve continuity of care and reduce reliance on emergency services among unhoused older adults.

T3-SSER01-4 TRENDS AND PREDICTORS OF CT ANGIOGRAPHY UTILIZATION FOR CERVICAL SPINE FRACTURES IN THE EMERGENCY DEPARTMENT FROM 2010 TO 2022: A NATIONAL DATABASE ANALYSIS

Rahul Jayaram, BS (*Presenter*)
Albert Lee (*Abstract Co-Author*)
Ajay Malhotra, MD, MMM (*Abstract Co-Author*)
Jonathan Grauer (*Abstract Co-Author*)

PURPOSE

Screening for blunt cerebrovascular injury (BCVI) in cervical spine trauma has become increasingly common in the United States due to the risk of vertebral artery injury and posterior circulation stroke. Many trauma centers now use computed tomography angiography (CTA) protocols in the emergency department (ED) to evaluate for BCVI; however, there are concerns about overuse. Prior studies examining CTA trends and predictors in ED cervical fracture patients have been limited in sample size and geographic scope. The current study aimed to characterize national trends over the years and identify predictors of CTA use in ED patients with cervical fractures using a large, multi-insurance, administrative database.

METHODS AND MATERIALS

Patients presenting to the ED with a new cervical fracture were identified using the 2010 to 2022 PearlDiver M170 database. Patients were classified according to whether they underwent CTA on the same day as presentation. Annual numeric and proportional utilization of CTA were assessed over the study period. Univariate and multivariate analyses were conducted to evaluate clinical (age, sex, Elixhauser Comorbidity Index [ECI]), non-clinical (insurance type, geographic region), and anatomic location of injury (upper cervical [C1-C2], subaxial [C3-C7], other) predictors of CTA use.

RESULTS

Of 157,533 patients who presented to the ED with cervical fractures between 2010 and 2022, CTA was obtained for 21,200 (15.52%). Over the years of the study, this increased from 6.09% in 2010 to 24.31% in 2022 ($p<0.001$). Independent predictors of having CTA relative to no CTA included younger age (per decade decrease, odds ratio [OR] 1.02), male sex (OR 1.14), higher ECI (relative to 0, incrementally greater for ECI 1-2 [OR 1.24], ECI 3-4 [OR 1.37], and ECI = 5 [OR 1.41]), insurance plan (relative to Medicare, Commercial [OR 1.41] and Medicaid [OR 1.48]), geographic variation (relative to West, Northeast [OR 1.03], South [OR 1.07], Midwest [OR 1.23]), and location of injury (relative to subaxial injury, upper cervical injury [OR 1.57]).

CONCLUSION

CTA utilization for cervical fracture evaluation in the ED increased from 6.09% in 2010 to 24.31% in 2022. This study identified multiple independent clinical, non-clinical, and anatomic predictors of CTA use.

CLINICAL RELEVANCE/APPLICATION

The findings reported here suggest increasing use and variability in CTA use in cervical spine fracture patients and support the development of more targeted imaging protocols in the acute management of such patients.

T3-SSER01-5 INCIDENCE OF MISSED SPLENIC VASCULAR INJURY ON CT IN HIGH ACUITY TRAUMA

Jeffrey Qiu, MD, BS (*Presenter*)
Min Tae Kim, MD,BSC (*Abstract Co-Author*)
John Choi, MD (*Abstract Co-Author*)
Susie Park, MD (*Abstract Co-Author*)
Bhavraj S. Khalsa, MD (*Abstract Co-Author*)
Alisa S. Han, MD (*Abstract Co-Author*)
Anton A. Mlikotic, MD (*Abstract Co-Author*)
Alexander Schwed (*Abstract Co-Author*)

Stuart T. Schroff, MD (*Abstract Co-Author*)
John J. Park, MD, PhD (*Abstract Co-Author*)

PURPOSE

CT is commonly used to evaluate splenic injury. Compared to digital subtraction angiography (DSA), reported sensitivity of CT for splenic vascular injury ranges from 52-60% [1]. We examine the rates of CT vs. DSA discordance to find the incidence of splenic missed vascular injury (MVI) in a high acuity trauma population.

METHODS AND MATERIALS

A retrospective study was performed including 278 patients, who underwent splenic artery DSA from 9/1/2015 to 9/1/2024 at 2 Level 1 trauma centers. MVI is defined as contained vascular injury (CVI) or active splenic hemorrhage (ASH) missed on initial CT, then diagnosed on DSA. Hypothesis testing performed using ANOVA and Chi-Squared tests.

RESULTS

The study population presented with severe trauma (mean Injury Severity Score = 30.6), and high proportions of high-grade splenic injury (83% AAST Grade IV-V), polytrauma (65%), hypotension (25%), coagulopathy (26%). Incidence of MVI was 20%. ASH comprised 13%, CVI comprised 87% of total MVI on CT. These patients were associated with delayed angiography (55%, $p<0.01$), which suggests clinical deterioration after CT triage, prompting further work-up. There were no significant clinical factors which may predict MVI. Overall rates of CT vs. DSA discordance were 46%, with 44% MVI and 56% interval resolution of ASH/CVI. No clinical factors differentiated patients with persistent vs. resolved ASH/CVI.

CONCLUSION

Advantages of DSA over CT in detecting vascular injury has been widely reported in head and neck trauma [2], which is mechanistically attributed to increased intravascular pressure from contrast bolus [3]. This study suggests significant incidence of MVI with CT alone. The lack of associated clinical factors with MVI makes this phenomenon unpredictable, suggesting a low threshold to consult Interventional Radiology for DSA with possible embolization.

CLINICAL RELEVANCE/APPLICATION

Incidence of splenic MVI is significant at 20% in the setting of trauma. This phenomenon is not predictable by clinical factors. A high level of clinical caution is advised even with no CT evidence of ASH or CVI. References:1. Lee JT, et al. American Society of Emergency Radiology Multicenter Blunt Splenic Trauma Study: CT and Clinical Findings. Radiology. 2021 2. Bodanapally UK, et al. Vascular Injuries to the Neck After Penetrating Trauma: Diagnostic Performance of 40- and 64-MDCT Angiography. AJR Am J Roentgenol. 2015 3. Roy-Choudhury SH, et al. Relative threshold of detection of active arterial bleeding: in vitro comparison of MDCT and digital subtraction angiography. AJR Am J Roentgenol. 2007

T3-SSER01-6 RADIOLOGICAL INSIGHTS INTO THE INTERSECTION OF INTIMATE PARTNER VIOLENCE AND OPIOID USE DISORDER

Jade Iwasaka-Neder, MD, MPH (*Presenter*)
Alexander Kwon (*Abstract Co-Author*)
Krishna Patel (*Abstract Co-Author*)
Isabela Lima, MD (*Abstract Co-Author*)
Scott Weiner (*Abstract Co-Author*)
Carrie Esopenko (*Abstract Co-Author*)
Bernard Rosner, PhD (*Abstract Co-Author*)
Bharti Khurana, MD, MBA (*Abstract Co-Author*)

PURPOSE

Intimate partner violence (IPV) and opioid use disorder (OUD) are intersecting public health challenges. Radiologists play a key role in detecting trauma and substance-related complications, particularly in undisclosed cases. This study examined injury patterns, severity, and imaging utilization among patients reporting IPV, with and without coexisting OUD.

METHODS AND MATERIALS

This retrospective study analyzed lifetime radiology reports from female patients who reported IPV between 2013 and 2018 (n = 1,183; 14,036 imaging reports) and age- and race-matched controls who did not report IPV (n = 4,094; 21,461 imaging reports). ICD-10 codes were used to identify OUD status, resulting in four groups: patients reporting both IPV and OUD (IPV+OUD+), only IPV (IPV+OUD-), only OUD (IPV-OUD+), and none (IPV-OUD-; reference group). Poisson regression with person-years offset was used to calculate adjusted incidence rate ratios (aIRRs) for imaging use, injury location, and severity. Main effects models assessed independent contributions of IPV and OUD. Logistic regression predicted OUD in IPV patients based on injury patterns.

RESULTS

Patients in IPV+OUD+ underwent more imaging (CT: aIRR 10.5, 95% CI: 8.8-12.7; ultrasound: aIRR 8.6, 95% CI: 3.0-24.9; X-ray: aIRR 4.1, 95% CI: 3.7-4.7), sustained more radiologically evident injuries (aIRR: 4.7, 95% CI: 3.3-6.8), and had higher rates of severe injuries (aIRR: 4.7, 95% CI: 3.3-6.8) compared to the reference group. Main effects models showed that both IPV and OUD independently increased imaging utilization, with synergistic elevation when co-occurring. IPV was independently associated with increased injury rates, most notably for the face (Relative risk [RR]: 7.5, 95% CI: 5.4-10.3), neck (RR: 6.2, 95% CI: 2.0-18.6), and head (RR: 3.3, 95% CI: 2.5-4.4). OUD was independently associated with elevated injury rates, particularly in the lumbar spine (RR: 5.8, 95% CI: 3.4-9.9), chest (RR: 3.5, 95% CI: 2.4-5.0), and thoracic spine (RR: 3.1, 95% CI: 1.8-5.6). Among IPV patients, lumbar spine (Odds ratio [OR] 10.1, 95% CI: 4.2-24.2), chest (OR 5.4, 95% CI: 3.0-9.7), and abdominal injuries (OR 4.9, 95% CI: 2.4-10.0) were the strongest predictors of co-occurring OUD.

CONCLUSION

Patients with both IPV and OUD had the highest imaging utilization, injury rates and severity among groups. IPV and OUD were independently associated with distinct injury patterns. Injuries to the lumbar spine, chest, and abdomen were strong indicators of co-occurring OUD.

CLINICAL RELEVANCE/APPLICATION

Recognition of higher imaging utilization and injury patterns among IPV survivors with OUD may aid in detection and earlier interventions. This study is among the first to quantify their synergistic impact through imaging data.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

T3-SSGU04

Genitourinary Imaging (Miscellaneous Issues in Genitourinary Imaging)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: E352

Zhen J. Wang, MD (*Moderator*)
Lyndon Luk, MD (*Moderator*)

Sub-Events

T3-SSGU04-1 COMPARISON OF 3D AND 2D T2WI FOR THE EVALUATION OF BLADDER CANCER: IMAGE QUALITY AND T-STAGE USING VI-RADS

Wei Wang (*Presenter*)
Jian-Xing Qiu, MD (*Abstract Co-Author*)
Jingyun Wu (*Abstract Co-Author*)

PURPOSE

To compare the image quality and diagnostic performance of three-dimensional (3D) and two-dimensional (2D) T2-weighted imaging (T2WI) for diagnosing muscle-invasive bladder cancer (BCa).

METHODS AND MATERIALS

This retrospective study included 35 patients with pathologically confirmed BCa who underwent 3 T MRI with both 3D and 2D T2WI. Two radiologists independently evaluated image quality, tumor characteristics (diameter and number), T stage, and the Vesical Imaging Reporting and Data System (VI-RADS) score on 3D and 2D T2WI at 4-week intervals. The image quality evaluation included overall image quality, artifacts, sharpness, contrast, delineation of the bladder wall, ureterovesical orifices, and bladder tumors using a 4-point scale. The VI-RADS score was assessed based on T2WI and DWI. Additionally, radiologists conducted a subjective comparison between 3D and 2D T2WI side-by-side, categorizing their preference as: 3D/2D T2WI or both for BCa evaluation.

RESULTS

Pathology revealed 11 non-muscle-invasive and 24 muscle-invasive BCa. 3D T2WI demonstrated significantly shorter acquisition time (5 min 32 sec) than multi-planar 2D T2WI (~8 min). Tumor diameters were larger on 3D T2WI (3.19±2.26 cm vs 2.85±2.14 cm, $p < 0.001$), while tumor detection rates were comparable between sequences ($p > 0.05$). 3D T2WI demonstrated equivalent overall image quality, artifacts, sharpness, and contrast to 2D (all $p > 0.05$). 3D T2WI outperformed 2D in delineating the bladder wall (3.80±0.41 vs. 3.54±0.71), ureterovesical orifices (3.94±0.34 vs. 3.23±0.77), and bladder tumors (3.94±0.24 vs. 3.51±0.82; all $p < 0.05$). No significant differences in AUC between 2D and 3D T2WI of direct T staging (0.873 vs. 0.881) or VI-RADS (0.898 vs. 0.907; $p > 0.05$) for muscle invasion diagnosis. Radiologists defined equal preference for 3D and 2D for 16/17 patients, and preferred 3D to 2D for 19/18 patients (Reader 1/2).

CONCLUSION

3D T2WI offered superior anatomical and tumor delineation compared to conventional 2D T2WI, while maintaining equivalent diagnostic performance for muscle invasion assessment, with reduced acquisition time.

CLINICAL RELEVANCE/APPLICATION

With isotropic voxels enabling multi-planar reconstruction, 3D T2WI could replace traditional three-plane 2D imaging and improve scan efficiency without sacrificing image quality. The superior spatial resolution of 3D T2WI allows for precise measurements, potentially enhancing the detection of smaller tumors, improving anatomical and tumor delineation, and optimizing surgical or radiotherapy planning. The results suggest 3D T2WI as a clinically promising alternative to 2D T2WI in bladder MRI protocols, streamlining workflow without compromising diagnostic performance for muscle invasion evaluation.

T3-SSGU04-3 CONTRAST AGENT SUBSTITUTION AS A STRATEGY TO DECREASE RISK OF BREAKTHROUGH ALLERGIC-LIKE REACTIONS: RESULTS FROM TWO ACADEMIC MEDICAL CENTERS

Madeleine Sertic, MBBCh (*Presenter*)
Elyse Lynch (*Abstract Co-Author*)
Debra A. Gervais, MD (*Abstract Co-Author*)
Joseph Fay, MS, RT (*Abstract Co-Author*)
Rose L. Wach, MBA, RT (*Abstract Co-Author*)
Daniel I. Glazer, MD (*Abstract Co-Author*)

PURPOSE

To determine the efficacy of contrast agent substitution to prevent breakthrough allergic-like reactions to iodinated contrast media in patients with a history of prior mild allergic-like reaction.

METHODS AND MATERIALS

This retrospective cohort study was performed at an academic health system and was approved by the local institutional review board. The need for informed consent was waived. All patients undergoing contrast enhanced CT scans in the emergency department (ED) setting from 6/1/24-4/1/25 were included. Patients that were imaged in other locations were not included. During the study period, patients that had a history of prior mild allergic like reaction to a specific contrast agent were considered candidates to be imaged with an alternative contrast agent rather than undergo steroid premedication. Patient demographic data, clinical notes, and CT examination information were extracted from the electronic health record (EHR). Mean time from order entry to exam completion was compared between groups with a t-test.

RESULTS

A total of 25,395 contrast enhanced CT scans were performed in the ED during the study period. Of this cohort that had a contrast enhanced CT, 242 patients (159 female, median age 61) undergoing 247 scans had a mild allergy to iodinated contrast media documented in the EHR. Only 58/242 patients (24.0%) had the inciting contrast agent specified. From this group of eligible patients, 35 (60.3%) received an alternative contrast (iopamidol) agent rather than steroid premedication and the

inciting agent (iohexol). The mean time from order placement to exam completion was 2.7 hours for the contrast substitution group and 4.7 hours for the steroid premedication group (p=0.002). There was a single breakthrough reaction (1/35, 2.9%) which was the same severity as the index reaction (mild). No patient in the contrast agent substitution group had a moderate or severe reaction.

CONCLUSION

Breakthrough allergic like reactions to iodinated contrast media are uncommon when an alternative contrast agent is utilized in the absence of steroid premedication. Utilizing an alternative contrast agent decreased time from order placement to imaging by 2 hours.

CLINICAL RELEVANCE/APPLICATION

Changing iodinated contrast media agents may be preferable to steroid premedication in the setting of prior mild allergic like reaction. EMR documentation of the exact agent rather than a generic contrast allergy would render more patients eligible for this steroid sparing pathway.

T3-SSGU04-4 AGE-RELATED DYNAMIC CHANGES OF PELVIC FLOOR ANATOMY DURING VOIDING: EVALUATION WITH UPRIGHT 4D-CT IN HEALTHY MALES

Yoichi Yokoyama, MD (*Presenter*)
Yoshitake Yamada, MD, PhD (*Abstract Co-Author*)
Minoru Yamada, RT (*Abstract Co-Author*)
Orito Ikeda (*Abstract Co-Author*)
Mohammed Alshahri (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate three-dimensional (3D) anatomical and four-dimensional (4D) dynamic changes of pelvic floor structures during voiding in healthy adult males using upright 4D-CT, elucidating their relationship with aging. Conventional methods for evaluating voiding dysfunction, such as urodynamics and voiding cystourethrography, have limitations in three-dimensional assessment and are typically invasive.

METHODS AND MATERIALS

Twenty-four asymptomatic male volunteers (mean age, 48.8 years; range, 31-66 years) underwent upright 4D-CT imaging during voiding. Scans were initially acquired at intervals of 1-2 seconds and subsequently at 2-5 second intervals throughout voiding phases: pre-void, initiation, maximum flow, end of voiding, and post-void. Uroflowmetry simultaneously recorded urine flow and voided volume, guiding 4D-CT phase determination. Parameters measured included bladder neck position, PC line, bladder neck angle, and angle os pubis ventral prostate. Changes among voiding phases and correlations with age were analyzed using paired t-tests and Pearson correlation. False discovery rate (FDR) was applied for multiple comparisons.

RESULTS

Significant anatomical changes occurred across voiding phases for all parameters (FDR $p<0.05$), notably in bladder neck position, PC line, bladder neck angle, and angle os pubis ventral prostate. Bladder neck and PC line positions substantially adjusted from initiation to maximum flow and from end to post-void phases. Significant age-dependent correlations were found: PC line (start-pre; $r=0.472$, $p=0.035$), bladder neck position (max-pre; $r=-0.450$, $p=0.035$), bladder neck position (post-pre; $r=-0.451$, $p=0.035$), PC line (post-pre; $r=0.449$, $p=0.035$), and bladder neck angle (max-pre; $r=0.430$, $p=0.036$). These results suggest that age-related physiological changes in lower urinary tract structures, including the bladder and prostate, influence voiding function.

CONCLUSION

Pelvic floor dynamics during voiding exhibit significant age-related changes, particularly affecting bladder neck position, PC line, and bladder neck angle. Upright 4D-CT provides essential baseline data for understanding normal physiological variations with aging. Future studies should explore these findings in clinical populations and assess interventions targeting age-related pelvic floor changes.

CLINICAL RELEVANCE/APPLICATION

Non-invasive, high-resolution upright 4D-CT provides essential baseline data for evaluating voiding dysfunctions such as benign prostatic hyperplasia, overactive bladder, and neurogenic bladder. This approach improves diagnostic accuracy and supports individualized treatment strategies, highlighting its utility for future clinical research.

T3-SSGU04-5 ADDITIONAL VALUE OF SYSTEMATIC CORES IN MRI GUIDED PROSTATE BIOPSY IN YOUNGER MEN (45-54 YEARS)

Matthias Boschheidgen (*Presenter*)
Rudolf Kaaks (*Abstract Co-Author*)
Peter Albers, MD, PhD (*Abstract Co-Author*)
Gerald Antoch, MD (*Abstract Co-Author*)
Lars Schimmoeller, MD (*Abstract Co-Author*)

PURPOSE

The prospective randomized PROBASE trial was designed to evaluate if risk-adapted screening for prostate cancer (PC) should start at 45 or 50 years. Indication to perform a prostate biopsy within PROBASE is based on a suspicious prostate-specific antigen (PSA) value only. This analysis assesses the performance of magnetic resonance imaging (MRI) targeted biopsy (TB) and systematic biopsy (SB) in a PC screening setting of young men.

METHODS AND MATERIALS

Young men with confirmed PSA levels of 3 ng/ml or higher were offered an MRI and recommended to undergo a prostate biopsy. According to the study design and diagnostic pathway of PROBASE, SB and TB were performed with software-based fusion techniques in all patients. The primary objective of this analysis was PC detection of MRI-TB and SB.

RESULTS

A total of 525 men (median age 50 years (range 44-54 years), median PSA level 3·98 ng/ml, median prostate volume 36 mL) were analyzed who underwent an MRI followed by TB and SB in one of the four study centers between December 2014 and September 2023. Of 209 diagnosed PC, 148 (71%) were clinically significant (csPC; ISUP = 2). 139 (94%) and 109 (74%) of 148 of csPC were detected by SB and TB, respectively ($p=0·05$). SB detected significantly more low-grade cancer compared to TB (51/61 vs. 26/61; $p <0·001$).

CONCLUSION

In this study most of the csPC were detected by SB. Therefore, in the setting of PC screening in young men, SB should be further recommended in combination with MRI-targeted biopsy.

CLINICAL RELEVANCE/APPLICATION

Our study provides the first large-scale population-based analysis of combined SB and TB in men aged 45-54 years as part of the prospective PROBASE trial. The findings demonstrate that SB alone detected 94% of csPC, outperforming TB, which detected 74% of csPC. Importantly, a quarter of csPC would have been missed if only TB had been performed, underscoring the necessity of combining both approaches in young men. These results challenge the current assumption that TB alone is sufficient in a screening setting, particularly in younger populations where MRI interpretation can be more challenging due to the lower prevalence of cancer and smaller tumours.

T3-SSGU04-6 THE CLINICAL VALUE OF PRE- AND POSTOPERATIVE ULTRASONOGRAPHIC EVALUATION IN ASSESSING SURGICAL OUTCOMES OF VARICOCELE REPAIR: A PROSPECTIVE OBSERVATIONAL STUDY

Xiaoyi Wang, MD (*Presenter*)

PURPOSE

To investigate the clinical utility of color Doppler ultrasound (CDUS) in evaluating the efficacy of microsurgical varicocelectomy through objective pre- and postoperative ultrasonographic measurements, and to explore the correlation between ultrasound parameters and symptom resolution.

METHODS AND MATERIALS

This prospective study enrolled 160 patients diagnosed with unilateral or bilateral clinical varicocele who underwent microsurgical subinguinal varicocelectomy between January 2023 and August 2024. Ultrasonographic evaluations were conducted preoperatively, and at 3 and 6 months postoperatively, including measurement of the maximum venous diameter and reflux duration during the Valsalva maneuver. Clinical symptoms were quantified using the Visual Analogue Scale (VAS), and semen analysis was performed according to WHO guidelines. Statistical analyses were performed to assess the relationship between ultrasonographic changes and clinical outcomes.

RESULTS

The maximum venous diameter decreased significantly from 3.9±0.8 mm before surgery to 2.4±0.6 mm at 3 months and 2.1±0.5 mm at 6 months postoperatively ($P<0.001$). Reflux duration showed a comparable reduction, decreasing from 4.6±1.2 seconds preoperatively to 2.0±0.8 seconds at 3 months and 1.5±0.7 seconds at 6 months ($P<0.001$). Improvements in ultrasonographic parameters were strongly correlated with reductions in symptom severity ($r=0.68$, $P<0.001$). Semen parameters also showed a significant positive trend in patients with marked reflux reduction.

CONCLUSION

Color Doppler ultrasound is an effective and noninvasive tool for monitoring the hemodynamic restoration following varicocelectomy. Reflux duration, in particular, serves as a sensitive and dynamic indicator for assessing surgical success and is recommended as a standard component of postoperative follow-up.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that color Doppler ultrasound (CDUS), especially the measurement of reflux duration during the Valsalva maneuver, is a sensitive and objective indicator for evaluating the effectiveness of microsurgical varicocelectomy. Regular pre- and postoperative ultrasonographic assessment provides clinicians with real-time insights into venous hemodynamics and correlates closely with symptom resolution and improvement in semen quality. Incorporating standardized CDUS follow-up protocols may enhance postoperative monitoring, guide clinical decision-making, and optimize management of male patients with varicocele.

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Nov. 30 – Dec. 4
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T3-SSHN02

Science Session with Keynote: Head and Neck Imaging (Advanced Head and Neck Imaging Techniques)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S403B

Burce Ozgen Mocan, MD (*Moderator*)
Naoko Saito, MD, PhD (*Moderator*)

Sub-Events

T3-SSHN02-1 FIRST-EVER VISUALIZATION OF 50 VAGUS NERVE BRANCHES IN CADAVERIC MRI USING HIGH-RESOLUTION 3D ISOTROPIC CISS IMAGING: A SPARC REVA STUDY

Shruti Kumari, MBBS (*Presenter*)
Mridhula Muthukumar (*Abstract Co-Author*)
Chris A. Flask, PhD (*Abstract Co-Author*)
Daniel Herzka (*Abstract Co-Author*)
Ari M. Blitz, MD (*Abstract Co-Author*)

PURPOSE

Vagus nerve (CN X) has evolved from a structure at potential risk in head and neck surgery to a target of nerve simulation. Apart from epilepsy and chronic heart failure, vagal nerve stimulation (VNS) is now applied to treat psychiatric conditions, headache, and bronchial asthma. Branching of CN X in the carotid sheath may be related to the side effects or the missing therapeutic efficiency of VNS. Also, CN X is frequently injured during neck and thoracic surgeries. We hypothesize that preoperative high resolution CISS MRI may potentially help identify the branches of CN X. We present the preliminary data showing the visualization of several branches of CN X in the neck and thorax that have never been seen before on MRI.

METHODS AND MATERIALS

55 embalmed cadavers were scanned with a 3T MRI scanner using isotropic 0.5-0.6 mm 3D-CISS; a total of 110 CN X were examined. Identification of prospective branches on MRI was evaluated by three readers and confirmed using anatomic dissection. The branch take-off point was noted on the MRI sequence and its distance from a predefined landmark was calculated, followed by anatomic dissection where each branch was traced up to the target organ to identify the branch. The main trunk of CN X was painted at locations corresponding to anatomical landmarks. The entire nerve with its branches was dissected and placed on a grid where distance of branch takeoff was calculated from the landmark and compared with MRI findings.

RESULTS

We were able to identify and confirm 50 branches on MRI which have never been seen before.. These include the cervical cardiac branch, the thoracic cardiac branch, cardiopulmonary branches, esophageal branches, branch to carotid bifurcation, etc.

CONCLUSION

SPARC-REVA is the most comprehensive mapping of CN X and its branches to date, from the perspectives of sample size, range of imaging modalities, lengths of nerve, and imaging resolutions. This is the first report of visualization these branches of CN X on CISS MRI. The high signal-to-noise ratio, along with high spatial resolution with isotropic 3D CISS images that can be reconstructed in multiple planes, makes this sequence superior to conventional 2D MRI sequences. Translation of this work to living subjects can have implications in therapeutic targeting and diagnostic imaging.

CLINICAL RELEVANCE/APPLICATION

Routine clinical imaging of CN X and its branches using CISS MRI offers significant potential for enhancing nerve preservation during surgery, optimizing therapeutic targeting, and mitigating side effects associated with VNS. The translation of this approach to living subjects could lead to a wide range of clinical applications, improving patient outcomes in both surgical and therapeutic settings.

T3-SSHN02-2 EXPLORING THE NEURAL BASIS OF OLFACTORY DYSFUNCTION IN CRS: STRUCTURAL AND FUNCTIONAL INSIGHTS FROM MULTIMODAL MRI

Chao Zhang, MD (*Presenter*)
Hu HU Sr, MD (*Abstract Co-Author*)
Kai Xu, MD, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the structural and functional neural alterations associated with olfactory dysfunction in patients with chronic rhinosinusitis (CRS-OD) using multimodal MRI, aiming to understand central nervous system involvement beyond peripheral olfactory changes.

METHODS AND MATERIALS

We prospectively enrolled 23 CRS-OD patients and 23 age- and sex-matched healthy controls (HCs). All participants underwent clinical olfactory assessments (TDI, QOD, OECS) and MRI scanning, including high-resolution T1-weighted imaging, resting-state fMRI, and olfactory bulb (OB) imaging using a DRIVen Equilibrium TSE sequence. Voxel-based morphometry (VBM) was used to assess gray matter volume, while functional connectivity (FC) analysis was conducted using seed regions with observed atrophy.

RESULTS

Compared to HCs, CRS-OD patients exhibited significantly reduced bilateral OB volumes ($p < 0.05$) and gray matter atrophy in the inferior frontal gyrus, hippocampus, parahippocampal gyrus, thalamus, and putamen (FDR corrected, $p < 0.05$). FC analysis revealed reduced connectivity between the putamen and regions such as the insula, posterior cingulate, and inferior frontal gyrus, alongside increased connectivity with the superior occipital gyrus. Notably, OCES scores negatively correlated with the volume of the right putamen ($p = 0.044$, $r = -0.467$), and QOD scores showed a negative correlation with the volume of the right hippocampus ($p = 0.007$, $r = -0.600$).

CONCLUSION

CRS-OD was characterized by OB atrophy, widespread gray matter volume reductions, and altered functional connectivity in sensory and cognitive networks. These findings underscore the central nervous system's involvement in CRS-related olfactory impairment.

CLINICAL RELEVANCE/APPLICATION

This study provides critical insights into the neural underpinnings of CRS-OD, highlighting the importance of integrating central brain assessments in clinical evaluations and therapeutic planning for patients with olfactory dysfunction.

T3-SSHN02-3 ECHOTEXTURE OF RECURRENT LARYNGEAL NERVES: THE DEPICTION OF RECURRENT LARYNGEAL NERVES AT HIGH-FREQUENCY ULTRASOUND DURING RADICAL THYROIDECTOMY

Ziyue Hu (*Presenter*)
Man Lu, PhD (*Abstract Co-Author*)

PURPOSE

The structure of peripheral nerves typically appears as multiple parallel, yet disjointed, hypoechoic linear areas separated by hyperechoic bands in longitudinal views, and as multiple rounded hypoechoic areas within a homogeneous hyperechoic background in transverse views. However, research on the structural morphology of the RLN is relatively limited. The ultrasound images of the RLN presented in a few studies have shown inconsistent findings. Some studies have described the RLN as a thin, hypoechoic structure, while others have depicted it as hyperechoic tissue. This discrepancy creates confusion for sonographers, making it difficult to accurately identify the RLN. Moreover, there is a lack of studies providing a clear ultrasound visualization of the RLN in a living individual. In this study, we aimed to investigate the ultrasonographic structure of the RLN during radical thyroid cancer surgery, aiming to enhance the understanding of its ultrasonographic characteristics. Notably, this study provides the first clear observation of the RLN structure via ultrasound.

METHODS AND MATERIALS

From October 2021 to December 2022, a prospective study was conducted involving 24 patients scheduled for bilateral thyroid surgery. Near the conclusion of the surgery, intraoperative ultrasonography of the RLN within the tracheoesophageal groove was performed using a 15-7 MHz transducer. The thickness and width of the RLN were measured during the procedure.

RESULTS

The internal architecture of the RLN was observed to consist of multiple hypoechoic, parallel, but discontinuous linear hyperechoic areas separated by bands. In the normal RLN group, the diameter of the RLN was relatively consistent, with thickness ranging from 2.20 to 2.71 mm (mean: 2.48±0.14 mm) and width from 1.25 to 1.70 mm (mean: 1.45±0.11 mm). Both weight and the body mass index (BMI) showed a statistically significant correlation with RLN thickness (Weight: r=0.544, P=0.001; BMI: r=0.605, P=0.001). The BMI also showed a statistically significant correlation with the RLN width (r=0.377, P=0.033). In the RLN invasion group, the width of invaded RLNs ranged from 1.9 to 2.3 mm (mean: 2.10±0.11 mm), while the width of non-invaded RLNs ranged from 2.6 to 3.2 mm (mean: 2.93±0.20 mm).

CONCLUSION

Ultrasound effectively reveals the structural features of the RLN and enhances sonographers' understanding of RLN characteristics.

CLINICAL RELEVANCE/APPLICATION

This study represents the first application of intraoperative ultrasound to investigate the RLN. Ultrasound provides a distinct visualization of the structural characteristics of the RLN, enhances the understanding of this nerve among ultrasound practitioners, and facilitates the preoperative ultrasound assessment of the RLN.

T3-SSHN02-4 MUSCLE AND FAT MATTER: CT-BASED BODY COMPOSITION PREDICTS SURVIVAL IN HEAD AND NECK CANCER PATIENTS TREATED WITH IMMUNOTHERAPY

Johannes M. Ludwig, MD, ARRT (*Presenter*)
Matthias F. Froelich, MD (*Abstract Co-Author*)
Johannes Haubold, MD (*Abstract Co-Author*)
Dominik Noerenberg (*Abstract Co-Author*)
Stefan O. Schoenberg, MD, PhD (*Abstract Co-Author*)
Sven Koitka, MSc (*Abstract Co-Author*)
Farroch Vahidi Noghani (*Abstract Co-Author*)

PURPOSE

To evaluate the prognostic value of CT-based body composition markers for survival in patients with Head and neck cancer (HNSCC) treated with immunotherapy

METHODS AND MATERIALS

This study included 55 patients (75.6% men; median age 66 years). Patients who underwent immunotherapy (Pembrolizumab or Nivolumab) between 08/18 and 05/23 were included in this study. A deep learning algorithm was used for automated body composition analysis (BCA) of thoracic CT scans to perform 3D volumetry of body tissues including visceral adipose tissue (VAT), skeletal muscle (SM), and bone (B). The area under the curve (AUC) for 3 months survival for BC parameters was calculated for all patients and for each sex because of significant differences between sexes ($p<0.05$). The Cox proportional hazard model for univariate (UVA) and multivariate (MVA) analyses (hazard ratio; 95%CI, p-value) and Kaplan-Meier analyses (survival in months; 95%CI) were performed.

RESULTS

The median survival time of the study cohort was 8.3 (4.8-21.9) months with 1-, 3 months, 6-months, 1 year, 2-years and 3-years survival rates of 93.3%, 68.9%, 55.6%, 42.2%, 26.7%, and 17.8%, respectively. The AUC for (SM/VAT)/B for all patients/men/women were 0.76 (0.61 - 0.82); p=0.003/ 0.79 (0.6 - 0.91); p<0.001/0.7 (0.37 - 0.93); p=0.24 with cutoff values for longer survival of >2/>2/>1.74, respectively. In UVA a sig. lower HR was identified for men (0.38 (0.17 - 0.86); p=0.028), lower ECOG (0/1/2/1-4) with 1/8.1 (4.2 - 20.2)/ 3.4 (0.23 - 21.9)/ 3.4 (0.23 - 21.9)/ 1.5 (1.1 - .); p=0.028 respectively, BMI = 18.5 kg/m 2 (0.34 (0.15 - 0.81); p=0.02), Albumin > 3.4g/dl (0.32 (0.15 - 0.69); p=0.0024) and (SM+VST)/B > 2.0 (m) / 1.74 (f) (0.34 (0.16 - 0.72);p=0.0035). In MVA, Albumin > 3.4 g/dl (0.25 (0.08 - 0.65); p=0.0045 and (SM+VST)/B > 2.0 (m) / 1.74 (f) 0.23 (0.09 - 0.63);p=0.0039 were independently significant.Patients with non-lowered albumin levels and a higher (SM + VAT)/B ratio, survived the longest with median not reached (4.9 -. months). Patients with either a lower serum albumin level or a lower (SM + VAT)/B ratio survived for a median of 20.2 months (6.5 - 28.6) whereas patients with a lower serum albumin level and a lower (SM + VAT)/B ratio survived only for a median of 2.3 months (1.1 - 4.8) (log-rank: p<0.0001).

CONCLUSION

The fully automated, CT-based body composition analysis with the independent prognostic parameter (SM + VAT)/B as well as non-lowered albumin levels were independent significant factors for overall survival in HNSCC patients treated with immunotherapy.

CLINICAL RELEVANCE/APPLICATION

The use of fully automated CT-based BCA may be an easily accessible tool to better understand which HNSCC patients may benefit from immunotherapy, which may help set expectations for patients and their relatives.

T3-SSHN02-5 BODY COMPOSITION ANALYSIS FROM ROUTINE CT IMAGES USING DEEP LEARNING: ASSOCIATION WITH SURVIVAL OUTCOMES IN HEAD AND NECK CANCER PATIENTS

Wichtlhuber, BSc (*Presenter*)
Andreas Bucher, MD (*Abstract Co-Author*)
Eric Frodl, MSc (*Abstract Co-Author*)
Teodora Biciusca (*Abstract Co-Author*)
Thomas J. Vogl, MD, PhD (*Abstract Co-Author*)
Lisa Joy Juergens (*Abstract Co-Author*)
Maurice Harth (*Abstract Co-Author*)
Philipp Thoenissen (*Abstract Co-Author*)

PURPOSE

To determine if deep learning-derived body composition metrics from routine CT scans independently predict survival in head and neck cancer patients. This approach uses existing diagnostic CTs, saving resources. We investigate muscle-to-bone volume ratio, intermuscular adipose tissue (IMAT) to total adipose tissue (TAT) ratio, and subcutaneous adipose tissue characteristics as potential prognostic biomarkers in this population.

METHODS AND MATERIALS

Retrospective analysis of 149 patients with head and neck cancer (144 oral cavity carcinoma, 5 oropharyngeal carcinoma; 76 male [51%], 73 female [49%]; mean age: 63.3±14.2 years; 62 deaths during follow-up). Routine contrast-enhanced CT scans with predominantly 5mm slice thickness (94% of patients) and soft-tissue kernel were analyzed. Body composition parameters were quantified using a validated 3D-UNet-based deep learning algorithm that first segmented tissue types, then applied thresholding to distinguish fat compartments. Cox proportional hazards models with significance threshold of $p<0.05$ assessed associations between metrics and overall survival, adjusting for gender, age, T-stage, N-stage, and UICC stage.

RESULTS

Three body composition metrics independently predicted survival after adjusting for clinical factors: decreased abdominal muscle/bone volume ratio (HR=0.70, 95% CI: 0.51-0.97, p=0.03), increased IMAT/TAT mean density ratio (HR=1.49, 95% CI: 1.15-1.92, p<0.005), and increased IMAT/TAT volume ratio (HR=1.50, 95% CI: 1.17-1.91, p<0.005). Multivariate models incorporating these metrics achieved c-indices of 0.75-0.76. Kaplan-Meier showed significant differences in median survival between patients with high vs. low IMAT/TAT density ratio (901.0 vs. 1717.0 days, p=0.0042) and IMAT/TAT volume ratio (1277.5 vs. 1525.5 days, p=0.0177).

CONCLUSION

Body composition metrics from routine diagnostic CT scans provide independent prognostic value in head and neck cancer patients, with substantial survival differences between risk groups. Unlike previous studies requiring specialized imaging or focusing only on single vertebral levels, our approach demonstrates that valuable prognostic information can be extracted from standard diagnostic scans.

CLINICAL RELEVANCE/APPLICATION

CT-based body composition analysis offers additional prognostic stratification in head and neck cancer (HR=0.70-1.50, p<0.005) without additional imaging, potentially identifying patients for nutritional intervention who may gain >2 years in median survival.

T3-SSHN02-6 **Keynote Speaker**

Burce Ozgen Mocan, MD (*Science Invited Presenter*)

Abstract Archives of the RSNA, 2025

T3-SSMK04

Musculoskeletal Imaging (Elbow, Forearm, Wrist and Hand, Trauma and Fractures)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S401

Eric A. Brandser, MD (*Moderator*)
Russell W. Chapin, MD (*Moderator*)

Sub-Events

T3-SSMK04-1 BEHIND THE PAIN: UNMASKING SMILE LESIONS IN RECALCITRANT TENNIS ELBOW - A RETROSPECTIVE EVALUATION

Sriram Rajan, MD, MBBS (*Presenter*)
Shankhneel Singh, MD,MBBS (*Abstract Co-Author*)
Harsh Mahajan, MD, MBBS (*Abstract Co-Author*)

PURPOSE

To evaluate the radiological findings in a retrospective cohort, focusing on defining MRI findings SMILE lesions (Symptomatic Micro-Instability of Lateral Elbow), previously described on arthroscopy

METHODS AND MATERIALS

A total of 313 consecutive elbow MRIs referred for recalcitrant tennis elbow of which 7 arthroscopically proven cases of SMILE lesions were identified as test cases, and key imaging findings were documented as a checklist. The remaining 306 cases were randomized and anonymized and analyzed by two experienced radiologists (11 and 22 years of experience).

RESULTS

Of the 306 evaluated cases, 122 (25.8%) showed partial LUCL tears, 12 (3.9%) had complete LUCL tears, 268 cases (87.5%). had deep surface partial tears of ECRB. Statistical analysis revealed a significant association between the presence of LUCL tears (partial and complete) and abnormal radiocapitellar alignment ($p < 0.01$). Abnormal ulnotrochlear alignment was significantly associated with the presence of ECRB tears ($p < 0.05$). Intra-articular abnormalities included posterior radial synovial plica in 22 cases (7.18%), synovitis in 3 cases (0.98%), and chondral lesions in the radial head in 39.78% of cases, with minimal occurrence of lateral capitellar lesions (0.65%).

CONCLUSION

The study underscores a significant association between MRI findings such as LUCL tears, ECRB injuries, and joint misalignments.

CLINICAL RELEVANCE/APPLICATION

Findings of symptomatic micro-instability need to be highlighted in patients with lateral epicondylitis and could potentially be responsible for failure of conservative management. Such findings may only be seen if they are looked for.

T3-SSMK04-2 PROGNOSTIC FACTORS AND POSTOPERATIVE OUTCOMES OF ARTHROSCOPIC SUTURE ANCHOR REPAIR FOR CHRONIC LATERAL EPICONDYLITIS: A LONGITUDINAL CLINICAL AND MRI FOLLOW-UP STUDY

Jianing Cui, MD (*Presenter*)
Bai Rongjie (*Abstract Co-Author*)
Ping Wang (*Abstract Co-Author*)
Qian Zhanhua (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate the healing process of ECRB after arthroscopic surgery for lateral epicondylitis by magnetic resonance imaging (MRI) and to assess clinical and imaging features that may be associated with prognosis.

METHODS AND MATERIALS

We included a total of 71 patients who underwent arthroscopic bunion tendon release for chronic epicondylitis. Clinical and magnetic resonance imaging (MRI) examinations were performed preoperatively and at 3 and 6 months postoperatively. Based on the postoperative DASH score, patients were categorized into a recovered group (N=54) and an unrecovered group (N=17). Serial changes in MRI scores and clinical scores were assessed. In addition, the predictors of recovery were analyzed by the logistic regression method.

RESULTS

Postoperative follow-up showed that the MRI signal intensity of the repaired ERCB gradually decreased, pain relief, and the clinical functional scores gradually improved ($P < 0.05$). Then, by comparing the recovered and unrecovered groups, the results showed that at 6 months postoperatively, the recovery of MRI features was similar in the two groups, but the recovery of clinical characteristics was different, with the recovered group improving more quickly. Then, by comparison between the recovered and unrecovered groups showed that at 6 months postoperatively, both clinical and MRI scores continued to improve in the recovered group (all $P < 0.05$), however, there was no significant improvement in the unrecovered group (all $P > 0.05$). Of note, the sex [odds ratio: 6.636 (1.174-37.51), $P = 0.032$] and ERCB tear size [odds ratio: 0.790 (0.643-0.971), $P = 0.025$] were independent predictors of recovery.

CONCLUSION

Continuous tendon and functional recovery assessed by MRI was found during 6 months after arthroscopy. Preoperative tendon status and gender were associated with poor postoperative recovery outcomes.

CLINICAL RELEVANCE/APPLICATION

This study provides the first comprehensive longitudinal analysis of ECRB healing patterns using serial MRI and clinical assessments following arthroscopic surgery for chronic lateral epicondylitis. We demonstrate that postoperative ECRB signal intensity progressively decreases alongside clinical improvement, with recovery speed differing significantly between recovered and unrecovered groups. Crucially, we identify preoperative tear size and patient sex as independent prognostic factors. Our work advances beyond previous single-timepoint MRI studies by documenting dynamic tendon healing processes through standardized follow-ups, while correlating structural changes with symptom resolution.

T3-SSMK04-3 REASSESSING THE ROLE OF INJECTATE IN MEDIAN NERVE HYDRODISSECTION FOR TREATMENT OF CARPAL TUNNEL SYNDROME: IS MECHANICAL DECOMPRESSION THE REAL HEALER?

Akanksha Saini, MBBS, MD (*Presenter*)
Anupama Tandon, MD, MBBS (*Abstract Co-Author*)

PURPOSE

USG guided hydrodissection has emerged as a promising technique for treatment of Carpal Tunnel Syndrome (CTS). It uses USG guided fluid injection to separate the median nerve from surrounding adhesions, thus relieving entrapment and restoring nerve function. Various injectates like steroids, 5% dextrose, PRP, hyaluronidase have been used for hydrodissection procedure, with recent research favoring 5% dextrose for its potential yet unproven pharmacological effects. With focus on various injectates, the contribution of pure mechanical nerve release remains unexplored. We hypothesize that the primary therapeutic benefit stems from the mechanical separation of the nerve rather than the pharmacological effects of injectate. This prospective, randomized controlled trial evaluates the effectiveness of true hydrodissection (HD) using normal saline for the treatment of CTS.

METHODS AND MATERIALS

After institutional ethical approval, CTRI registration and informed consent, 40 wrists with CTS; unresponsive to conservative treatment were enrolled. The pre-procedure parameters assessed were- BCTQ (symptom and functional scores), VAS and cross-sectional area (CSA) of median nerve. After randomization into 2 groups with single blinding, one group underwent USG-guided HD with 5% dextrose (Dx) and the other group with normal saline (NS). Titration of injectate volume was done in real time till full nerve separation was observed, no fixed volume was used. Follow-up done at 1, 3, and 6 months post-procedure.

RESULTS

The injectate required for complete dissection was higher in NS group (12-15ml) compared to Dx group (5-7 cc). Both groups showed significant clinical improvement in mean BCTQ score at 1 month (60% in dx vs 75% in NS, p=0.405) and up to 6 months (55% in dx vs 60% in NS, P=0.721) and mean reduction in VAS at 6 months (3.1 in dx vs 2.6 in NS; p=0.446). Intergroup difference was not significant at any time points. A significant reduction in CSA seen in both groups (14.5% in dx vs 16.7% in NS) at 6 months with no significant intergroup difference (p=0.626). No major complications were reported.

CONCLUSION

This study shows that HD with normal saline, an inert agent, is as effective as HD with 5% dextrose for treatment of CTS, highlighting, thus that mechanical decompression is the key therapeutic mechanism in this procedure.

CLINICAL RELEVANCE/APPLICATION

Ultrasound-guided HD is a safe, effective and minimally invasive procedure for treatment of CTS that alleviates the need for surgery. Given its similar efficacy, inert nature and lower cost, normal saline can serve as an effective and economical alternative to dextrose and other expensive neuromodulatory agents like PRP, hyaluronidase, thus paving the way for use of this procedure in resource limited settings.

T3-SSMK04-4 THE EXPOSED ULNAR SEAT: A MARKER OF SUBTLE TFCC INSTABILITY AND DORSAL SOFT TISSUE INJURY

Sriram Rajan, MD, MBBS (*Presenter*)
Shankhneel Singh, MD,MBBS (*Abstract Co-Author*)
Harsh Mahajan, MD, MBBS (*Abstract Co-Author*)

PURPOSE

To evaluate the correlation between ulnar seat uncovering and subtle instability of the triangular fibrocartilage complex (TFCC), in patients with dorsal distal radioulnar ligament (DRUL) and dorsal capsular tears

METHODS AND MATERIALS

A retrospective study of 67 MRI wrists performed for ulnar sided wrist pain, performed in prone Superman position. Images from the PACS were extracted and anonymized and randomized and read by two observers with 23 years (SR), and 11 years(SS) of experience by consensus. Images were scored for TFCC displacement and ulnar seat uncovering in mm, asymmetrical ulnar seat uncovering . (scored as 0-symmetrical displacement, 1-asymmetrical ulnar seat uncovering)Images were also scored for distal radioulnar joint instability, using the Epicentre method and the Congruence method (0-normal, 1-abnormal), the Mino method (% of dorsal displacement)Finally images were scored for Dorsal capsular tear, Dorsal distal radioulnar ligament tear and ulnar fovea of TFCC tear as 0-normal, 1-tear. (this included partial and complete tears)

RESULTS

Ulnar seat uncovering was significantly greater in patients with DRUL tears (mean = 6.46 mm) versus those without (mean = 2.54 mm) ($p < 0.01$).Ulnar seat uncovering was significantly higher in dorsal capsule tear cases (mean = 5.84 mm) compared to no-tear cases (mean = 1.93 mm), ($p < 0.01$).TFCC displacement was greater in DRUL tear cases (mean = 3.94 mm vs. 2.47 mm), with $p = 0.0010$ and weak correlation $r = 0.16$.TFCC displacement was significantly higher in dorsal capsule tear cases (mean = 3.39 mm vs. 2.50 mm), $p = 0.0034$, with weak correlation $r = 0.11$ Patients with uncovering > 4 mm are 20 times more likely to have a DRUL tearPatients with uncovering > 4 mm are 50 times more likely to have a dorsal capsule tear

CONCLUSION

There is significant correlation between ulnar seat uncovering and dorsal capsular tears and dorsal distal radio-ulnar ligament tearsTFCC displacement was greater in Dorsal capsular tears compared to DRUL tear cases. Ulnar seat uncovering >4mm was significantly associated with DRUL and Dorsal capsular tear.

CLINICAL RELEVANCE/APPLICATION

Identification of this sign, of ulnar seat uncovering is a useful sign to evaluate instability of the articular disc, and of the distal radioulnar joint. Ulnar seat uncovering is significantly associated with dorsal capsular tears and dorsal distal radioulnar ligament tears. Further arthroscopic studies along with MR studies will need to be done to prove this.

T3-SSMK04-5 COMPARISON OF CROSS-SECTIONAL IMAGING MODALITIES IN DIAGNOSING DISTAL BICEPS TENDON TEARS

Alexa Arvidson, MD (*Presenter*)
Jacqueline Kobayashi (*Abstract Co-Author*)
Mary Creedon, MD (*Abstract Co-Author*)
William Aibinder (*Abstract Co-Author*)
Kara D. Gaetke-Udager, MD (*Abstract Co-Author*)

PURPOSE

While some distal biceps tendon (DBT) tears can be diagnosed clinically with a high degree of confidence, imaging with ultrasound (US) or magnetic resonance imaging (MRI) can provide useful diagnostic information to guide surgical decision-making. Prior studies have shown conflicting results when evaluating the accuracy of US compared to MRI in diagnosis of DBT tears. The purpose of this study was to compare US and MRI in diagnosis of DBT tears at our institution.

METHODS AND MATERIALS

A retrospective analysis was performed on patients who underwent surgical repair of DBT tear from January 2007 - December 2023 and had preoperative US and/or MRI. The positive predictive value (PPV) of US and MRI diagnostic results were calculated by comparison with the surgical findings. Routine statistical analysis was performed, including Fisher exact test. Analysis was performed on a smaller cohort who underwent both US and MRI preoperatively to determine the percentage of patients that had concordant imaging and surgical findings, a discordant imaging test, discordant surgical findings, or complete discordance between the imaging tests and surgical findings.

RESULTS

A total of 181 patients were included in the study. MRI and US had similar PPV in diagnosing DBT tears in patients who underwent surgery. The overall (complete and partial tears) PPV was 89% for both US and MRI ($p = 0.48$). The PPV in diagnosing complete tears was 90% for US and 89% for MRI ($p = 0.39$), and the PPV for diagnosing partial tears was 82% for US and 89% for MRI ($p = 0.30$). Of the cohort who underwent both US and MRI preoperatively, both imaging studies and surgery were concordant 65.4% of the time. There was discordance between the imaging studies 26.9% of the time. There was a single instance (3.8%) of discordant surgical findings, and a single instance (3.8%) of complete discordance between the imaging tests and surgical findings. Most of these instances of discordance had prolonged intervals between imaging and/or surgery, or limited imaging usually due to soft tissue swelling.

CONCLUSION

US and MRI have similar positive predictive value in diagnosing DBT tendon tears in patients who underwent surgery. In the group that had both imaging modalities preoperatively, there was some sort of discordance between US, MRI, and surgical findings about 35% of the time. Many of these discordant instances may have related to prolonged intervals or limited imaging studies, and therefore the discordance may not be clinically relevant.

CLINICAL RELEVANCE/APPLICATION

Our findings show no significant difference between US and MRI in diagnosis of DBT tears, and given US's improved accessibility and cost effectiveness, US should be considered as the first-line imaging modality for diagnosis of DBT tears.

T3-SSMK04-6 COMPREHENSIVE ULTRASOUND EVALUATION IN DE QUERVAIN'S TENOSYNOVITIS

Saumya Pandey, MD, FRCR (*Presenter*)
Ankur Goyal, MD,MBBS (*Abstract Co-Author*)
MD Tahir Ansari (*Abstract Co-Author*)

PURPOSE

To present the high-resolution ultrasound (HUS) findings in patients with De Quervain's tenosynovitis (DQT) including anatomical variations in the first extensor compartment of the wrist. To compare the HUS parameters of DQT with healthy individuals, to identify objective criteria to aid in diagnosis and management.

METHODS AND MATERIALS

A retrospective case-control study was conducted involving 72 cases of clinically diagnosed with De Quervain tenosynovitis and 24 age- and sex-matched asymptomatic volunteers. High-resolution ultrasound using a 6-20 MHz range hockey stick transducer was used to assess the first dorsal extensor compartment for the following parameters-• cross-sectional diameters of the first extensor compartment• the thickness of the tenosynovial sheath• presence and number of accessory slips of Abductor Pollicis Longus(APL) and Extensor Pollicis Brevis (EPB) tendons• presence of intracompartmental septum and its degree of completeness• Colour vascularity Quantitative data was analysed using Mann-Whitney U test for synovial thickness, Transverse Pulley Diameter(D1) and Antero-Posterior(A-P) Pulley Diameter (D2). The qualitative variables were compared using Chi-Square tests with significance kept at $p=0.05$.

RESULTS

The two groups showed significant differences in the Synovial Thickness and A-P Pulley Diameter (D2) . Patients with DQT had greater synovial thickness (Group A mean= 1.65 mm +/- 1.96, range-0.2 to 12.9 mm; Group B mean= 0.31 mm +/-0.10, range-0.2 to 1.6 mm, p value- 0.0001) and A-P Pulley Diameter (Group A mean= 4.04 mm +/- 1.18, range- 3.25 mm to 12.9 mm; Group B mean= 2.71 mm +/- 0.60, range- 1.6 mm to 8.7 mm, p value- 0.0001) compared to controls. Accessory Tendon Slips of APL (87.50% incidence versus 45.83% in Group 2, p value- 0.003) and presence of Septation (80.56% incidence in Group A versus only 45.83% in Group 2; p value- 0.002) were more frequent in DQT group.

CONCLUSION

Ultrasound is an effective non-invasive modality for detecting characteristic features of De Quervain tenosynovitis. These findings can aid in early diagnosis, guide management decisions, and potentially serve as objective markers for disease severity and response to therapy.

CLINICAL RELEVANCE/APPLICATION

Our study demonstrates one of the largest ultrasound database of DQT in a single center. This study establishes the role of HUS in not only the diagnosis but also in identifying underlying anatomic variations that can predispose to this condition and also affect its management.

Nov. 30 – Dec. 4
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T3-SSMK05

Musculoskeletal Imaging (Image Guided Interventions and Infection)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: E351

Marcos L. Sampaio, MD (*Moderator*)
Karen C. Chen, MD (*Moderator*)

Sub-Events

T3-SSMK05-1 CT GUIDED FNA AND CNB OF BONE LESIONS: A COMPARISON OF THE YIELD AND DIAGNOSTIC VALUE

Bahareh Moazen, MD, MPH (*Presenter*)
Abdullah N. Felemban, MBBS (*Abstract Co-Author*)
Kawanpreet S. Rakhra, MD, FRCPC (*Abstract Co-Author*)
Ryan C. Foster, MD (*Abstract Co-Author*)

PURPOSE

To compare the yield and diagnostic value of CT guided fine needle aspirate(FNA) and core needle biopsy(CNB) of bone lesions, and determine the additive value of CNB.

METHODS AND MATERIALS

IRB approved, retrospective review of cases with concurrent CT guided FNA and CNB of bone lesions from August 2012-December 2021 was performed. Data extracted from EMR and CT biopsy reports included patient demographics, FNA cytology and CNB pathology diagnoses. FNA and CNB were evaluated for (1) yield with positivity defined as sample deemed adequate for laboratory analysis, and (2) diagnostic value with positivity defined as laboratory analysis able to provide definitive diagnosis. The redundancy or added value of CNB over FNA alone was evaluated. Differences between FNA and CNB for yield and diagnostic value were determined using chi-square test (significance $p<0.05$).

RESULTS

The study included 328 patients (172M,156F) with mean age (SD,range) 63 years (14,16-90). A definitive, pathologic diagnosis was obtained in 67%(221/328) of cases, with 96%(213/221) neoplastic. Of the neoplastic diagnoses, 92% were malignant and of these 42% were primary and 58% metastatic. In 5%(16/328) a definitive, benign diagnosis was made. In 16%(53/328) both FNA and CNB were non-diagnostic. The yield and diagnostic value of CNB(80%,79%) were both significantly higher than FNA(69%,54%), [$p=0.001$, $p<0.001$]. CNB was redundant in 39%(127/328) where FNA alone was diagnostic, and of no value in 6%(19/328) where it was non-diagnostic while FNA was diagnostic.

CONCLUSION

CNB has higher yield and diagnostic value than FNA for CT guided bone biopsies. However, 45% of CNB may not provide any added clinical value.

CLINICAL RELEVANCE/APPLICATION

For bone lesions, there is a sizable portion of instances where CT guided CNB is not of additive diagnostic value over FNA. Further analysis will determine in which clinical scenarios could FNA alone obviate the need for CNB, leading to shorter procedure times and cost savings.

T3-SSMK05-2 EQUIVALENT DIAGNOSTIC RATE OF CT-GUIDED BONE MARROW ASPIRATE AND BIOPSY (BMAB) WHEN PERFORMED BY MSK RADIOLOGISTS VS ADVANCED PRACTICE PROVIDERS (APPS)

Robert R. Lopez, MD (*Presenter*)

PURPOSE

Bone marrow aspirate and biopsy (BMAB) is commonly performed without image guidance and with local analgesia. However, radiology departments have seen increased requests for image-guidance for BMAB, usually performed by MSK radiologists, often with conscious sedation. The overall increase in imaging volumes, as well as the increase in certain image guided procedures like BMAB, has led to increase in work stress and burnout for some radiologists. Advanced practice providers (APPs) have been employed by some radiology practices to help offload some of this procedural work. At our practice, APPs, with radiologist supervision, are increasingly performing several MSK procedures including CT guided BMAB. Given the shift in our practice of BMAB now being primarily performed by APPs, we wanted to assess the diagnostic efficacy between radiologists and APPs in the performance of BMAB.

METHODS AND MATERIALS

Retrospective EMR search for CT guided BMAB procedures Bone Marrow Biopsy exams was performed between January 2015 to February 2024. Clinical notes and final pathology diagnosis were reviewed for presence of diagnostic or non-diagnostic sample for aspirates and core biopsies, as well as any major procedural complications. Cases performed by radiologists versus APPs were matched and compared.

RESULTS

Total of 774 exams were reviewed: 387 performed by radiologists and 387 performed by APPs. Diagnostic rate of core biopsy and aspirate samples was 97% and 88% for radiologists and 97% and 89% for APPs. Complication rate was 0.0% for radiologists and 0.3% for APPs (the latter was due to one patient with a bleeding complication at the biopsy site).

CONCLUSION

There was no loss in the diagnostic rate of bone marrow biopsy exams performed by APPs compared to exams performed by radiologists.

CLINICAL RELEVANCE/APPLICATION

APPs primarily performing image-guided BMAB procedures has allowed MSK radiologists in our practice more capacity to perform other more complex procedures and address high volume diagnostic imaging exams.

T3-SSMK05-3 DIAGNOSTIC VALUE OF MRI IN PEDIATRIC ACUTE OSTEOMYELITIS—SYSTEMATIC REVIEW & BAYESIAN HSROC META-ANALYSIS: IS INTRAVENOUS CONTRAST NECESSARY?

Mona Dabiri, MD (*Presenter*)
Shivani Ahlawat, MD (*Abstract Co-Author*)
Laura M. Fayad, MD (*Abstract Co-Author*)

PURPOSE

Intravenous gadolinium is routinely used during MRI for suspected pediatric acute hematogenous osteomyelitis (AHO), but its incremental diagnostic value compared with contemporary fluid-sensitive non-contrast protocols is uncertain. We performed a systematic review and Bayesian hierarchical summary ROC (HSROC) meta-analysis to quantify the benefit of contrast and identify clinical scenarios in which it remains useful.

METHODS AND MATERIALS

MEDLINE and Cochrane DTA Register were searched through 15 Apr 2025. Original studies (<18 y) reporting MRI accuracy for extremity AHO were screened. TP/FP/FN/TN counts, magnet strength, sequences, and reader expertise were extracted. One-arm sensitivity series were retained. Accuracy was pooled with DerSimonian-Laird (separate axes) and a Bayesian bivariate HSROC model (PyMC 5.11; 4 chains, 32 000 post-warm-up draws).

RESULTS

There were 37 original science investigations and no systematic reviews. Of the 20 studies that provided patient-level diagnostic metrics, the sensitivity of intravenous contrast-enhanced MRI for paediatric acute extremity osteomyelitis ranged from 75 % to 100 %, while specificity ranged from 67 % to 100 %. Ten studies reported an overall sensitivity of = 90 %, and five studies reported an overall specificity of = 90 %. The 17 analyzable arms comprised 682 children with culture/operative-proven AHO and 514 controls. Non-contrast MRI—pooled sensitivity was0.91 (95 % CrI 0.78-0.97), specificity 0.85 (0.66-0.96) and Contrast-enhanced MRI—sensitivity 0.93 (0.86-0.98), specificity 0.87 (0.74-0.96) and Contrast increased sensitivity by +0.03 pts (CrI -0.07 to +0.16) and specificity by +0.02 pts (CrI -0.15 to +0.24); both intervals crossed zero. Sub-analyses limited to paired cohorts, 1.5 T scanners or two-arm studies only produced similar estimates. Qualitative evidence suggested greatest contrast benefit in children < 3 y for detecting epiphyseal or growth-plate infection.

CONCLUSION

Non-contrast MRI already achieves high diagnostic accuracy for pediatric extremity AHO. Intravenous contrast yields a 3% sensitivity gain, a statistically uncertain improvement. Data suggest that contrast should be reserved for children <3-years-old, equivocal scans, or suspected epiphyseal disease. Routine use is probably not warranted.

CLINICAL RELEVANCE/APPLICATION

The addition of intravenous contrast to pediatric MRI requires additional time, sedation and is more invasive than non-contrast MRI. The ability to omit contrast for the evaluation of AHO routinely will impact the need for sedation and reduce MRI scan time.

T3-SSMK05-5 DIAGNOSTIC YIELD AND RADIOLOGIC-PATHOLOGIC CONCORDANCE IN CT VERSUS US-GUIDED BIOPSIES: A RETROSPECTIVE ANALYSIS

Pavan Brahmbhatt, MBBS, MD (*Presenter*)
Daniel E. Wessell, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate diagnostic yield and radiologic-pathologic concordance rates in CT versus ultrasound (US)-guided musculoskeletal biopsies and identify factors influencing these outcomes.

METHODS AND MATERIALS

A retrospective analysis of 134 consecutive image-guided musculoskeletal biopsies (83 CT-guided, 51 US-guided) was conducted. Lesions were classified as bone (74 cases, 55.2%) or soft tissue (60 cases, 44.8%). Primary outcomes included diagnostic yield and rad-path concordance. All procedures were performed with intraprocedural cytologic analysis to facilitate yield. Fisher's exact test was used for statistical analysis due to small sample sizes in subgroup analyses and the binary nature of outcome variables. Analyses were stratified by modality, tissue type, pathology results, and performing physician.

RESULTS

Overall diagnostic yield was 97.0% (CT: 96.4%, US: 98.0%, p=0.65). Rad-path concordance was 94.8%, with 7 discordant cases (5.2%). Obvious modality preferences were observed, with CT used for 95.9% of bone biopsies and US for 80.0% of soft tissue biopsies. Malignant lesions comprised 58.2% of cases, with metastases (32.1%) being most common. Benign lesions represented 30.6% of cases, with non-neoplastic lesions predominating. Physician-specific variation was observed in rad-path concordance (range: 66.7-100%, p=0.004), but not in diagnostic yield (range: 88.9-100%, p=0.19). Discordant results occurred more frequently in bone biopsies (5/74, 6.8%) than soft tissue biopsies (2/60, 3.3%), though this difference was not statistically significant (p=0.45).

CONCLUSION

Both CT and US demonstrated excellent diagnostic yield and high radiologic-pathologic concordance for musculoskeletal biopsies. Modality selection is frequently tailored based on lesion characteristics such as superficiality, tissue type, and ease of visualization. Therefore, clinical evaluation and pre-procedural planning plays a key role in optimizing diagnostic outcome. The significant variability in radiologic-pathologic concordance among physicians was likely due to small sample size, though a component of experience may be considered. We continue to maintain a prospective database to increase sample size and further analyze specific variables which may affect yield and concordance.

CLINICAL RELEVANCE/APPLICATION

Image-guided percutaneous biopsies are essential for definitive diagnosis in musculoskeletal lesions, yet optimal modality selection and factors affecting diagnostic accuracy may remain incompletely characterized.

T3-SSMK05-6 CAN REVIEWING PHOTOGRAPHS OF SKIN ULCERATION IMPROVE DIAGNOSIS OF OSTEOMYELITIS ON RADIOGRAPH?

Asad Khawaja (*Presenter*)
Oganes Ashikyan, MD (*Abstract Co-Author*)
Alireza Eajazi, MD (*Abstract Co-Author*)
Tomas Amerio, MD (*Abstract Co-Author*)
Caroline Pennington (*Abstract Co-Author*)
Parham Pezeshk, MD (*Abstract Co-Author*)

PURPOSE

Radiographs are often recommended as the first-line imaging study for assessment of osteomyelitis (OM), with findings on radiograph suggestive of osteomyelitis including loss of bone cortex, abnormal soft tissue density, and a periosteal reaction. However, they have limited sensitivity in detecting early osteomyelitis, and this limitation becomes more pronounced without knowledge of the location and depth of skin ulceration. This study aimed to determine whether reviewing a photograph of the ulceration in the electronic medical record improves radiologists' diagnostic accuracy for osteomyelitis on radiographs.

METHODS AND MATERIALS

In this retrospective study, 69 patients with extremity radiographs and a clinical suspicion of osteomyelitis were enrolled. Three radiologists with varying levels of musculoskeletal (MSK) radiology experience (15 years, 5 years, and 1 year) reviewed and scored the radiographs by consensus. They assessed the probability of osteomyelitis using a five-point scale (1: definitely no OM, 2: probably no OM, 3: indeterminate, 4: probably OM, 5: definitely OM). After one week, the radiographs were re-evaluated alongside photographs of skin ulceration, using the same grading system. Follow-up MRI or bone biopsy and culture were used as the gold standard for the presence or absence of osteomyelitis. The two sets of scores were compared using multi-reader, multi- case analysis.

RESULTS

Based on the combined readings of the three radiologists, the area under the curve (AUC) significantly improved from 0.69 (without photographs) to 0.74 (with photographs) ($P < 0.05$). However, the improvement was not statistically significant after excluding the least experienced radiologist.

CONCLUSION

These findings suggest that reviewing clinical photographs of skin ulcerations can enhance early osteomyelitis diagnosis for less experienced radiologists, while the impact on experienced radiologists is less pronounced.

CLINICAL RELEVANCE/APPLICATION

Integrating clinical photographs into radiographic workflows may improve diagnostic accuracy of osteomyelitis in the foot, particularly among trainees. This can help bridge gaps in experience and potentially reduce delays in diagnosis and treatment.

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Nov. 30 – Dec. 4
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T3-SSNR07

Neuroradiology (Stroke: Diagnosis and Treatment)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S406B

Mesha L. Martinez, MD (*Moderator*)
Dhairya Lakhani, MD (*Moderator*)

Sub-Events

T3-SSNR07-1 PROLONGED VENOUS TRANSIT IS ASSOCIATED WITH HIGHER ODDS OF UNFAVORABLE FUNCTIONAL OUTCOMES IN LARGE CORE STROKE PATIENTS

Hamza A. Salim, MD (*Presenter*)
Dhairya Lakhani, MD (*Abstract Co-Author*)
Gegory Albers (*Abstract Co-Author*)
Argye Hillis, MD (*Abstract Co-Author*)
Kambiz Nael, MD (*Abstract Co-Author*)
Max Wintermark, MD (*Abstract Co-Author*)
Jeremy J. Heit, MD, PhD (*Abstract Co-Author*)
Tobias Faizy, MD (*Abstract Co-Author*)
Vivek Yedavalli, MD, MS (*Abstract Co-Author*)

PURPOSE

Large core acute ischemic stroke (AIS) is associated with high rates of disability despite mechanical thrombectomy (MT) treatment. Recent studies suggest that prolonged venous transit (PVT) may indicate impaired venous drainage, influencing functional outcomes. However, its prognostic value in large core stroke patients remains unclear.

METHODS AND MATERIALS

We conducted a retrospective cohort study using data from consecutive patients with AIS-LVO and large ischemic core volumes (ASPECTS <6 or relative cerebral blood flow < 30% volume =50 mL; per SELECT-2 trial definition) between September 1, 2016 and September 2, 2024. PVT was assessed based on time-to-maximum (Tmax) =10 seconds in the superior sagittal sinus or torcula. The primary outcome was unfavorable functional recovery at 90 days, defined as a modified Rankin Scale (mRS) score of 4-6.

RESULTS

100 patients met inclusion criteria, and 41 (41%) had PVT. Unfavorable functional outcomes were more frequent in the PVT+ group (59% vs. 37%, p=0.036). Multivariable analysis confirmed that PVT was independently associated with unfavorable outcomes (adjusted OR 4.07, 95% CI 1.15-14.4, p=0.03), even after accounting for penumbra size (Tmax >6s) and large core volumes (rCBF <30%). Other predictors included older age (adjusted OR 1.07, 95% CI 1.02 to 1.11, P=0.003), higher admission NIHSS (adjusted OR 1.16, 95% CI 1.05 to 1.29, P=0.005), and larger rCBF <30% volume (adjusted OR 1.02, 95% CI 1.00 to 1.04, P=0.032).

CONCLUSION

PVT is independently associated with unfavorable outcomes in patients with large core infarcts.

CLINICAL RELEVANCE/APPLICATION

These findings suggest PVT may serve as a prognostic marker, warranting further investigation in larger prospective studies to guide treatment decisions in this high-risk population.

T3-SSNR07-2 BATTLEBOTS: A HEAD-TO-HEAD AI MATCHUP IN STROKE CTA OCCLUSION DETECTION

Sara Silberstein, MD, MS (*Presenter*)
Ryan K. Lee, MD, MBA (*Abstract Co-Author*)
Avishkar Sharma, MD (*Abstract Co-Author*)
Matthew Callaghan, MD (*Abstract Co-Author*)

PURPOSE

Acute ischemic stroke is a leading contributor to morbidity, mortality, and healthcare costs. To address this, artificial intelligence (AI) has increasingly been used to enhance detection of cerebral occlusions and expedite acute stroke management. Previous studies have evaluated the diagnostic performance of individual AI tools for LVO detection. However, no prior study has directly compared the diagnostic accuracy of two AI solutions using the same patient population. This study compares the diagnostic accuracy of two FDA-approved AI-based large vessel occlusion (LVO) detection software programs using identical clinical data.

METHODS AND MATERIALS

A retrospective analysis was conducted on all brain CT Angiography studies performed for code strokes triggered by emergency or neurology departments between January and September 2024. CTAs were performed at two thrombectomy- capable stroke centers: one suburban community hospital and one urban tertiary care center. The study compared two FDA-approved AI-based software programs (Program A and Program B) in detecting occlusions in the internal carotid artery (ICA), middle cerebral artery (M1, M2), anterior cerebral artery (ACA), posterior cerebral artery (PCA), vertebral artery, and basilar artery. Board-certified radiologist interpretation served as the reference standard. For both tools, we calculated sensitivity, specificity, accuracy, positive predictive value (PPV), negative predictive value (NPV), true positives (TP), false positives (FP), true negatives (TN), and false negatives (FN). A McNemar Test ($p < 0.05$) was used to assess statistical significance. A subset analysis focused on occlusions considered potential targets for endovascular therapy (ICA, M1, M2, and basilar artery).

RESULTS

Among 659 patients, Program A demonstrated a sensitivity of 0.65 while Program B demonstrated sensitivity of 0.35. Overall accuracy was 0.88 for Program A and 0.86 for Program B, with no statistically significant difference (McNemar Test p = 0.74). However, in the subset analysis of 48 thrombectomy relevant occlusions, Program A showed statistically significant improved detection of occlusions relevant to thrombectomy (McNemar Test p = 0.039).

CONCLUSION

While the overall diagnostic accuracy of the two FDA approved AI tools was similar, Program A demonstrated significantly higher sensitivity for detecting large vessel occlusions amenable to endovascular treatment.

CLINICAL RELEVANCE/APPLICATION

Accurate and timely detection of thrombectomy amenable LVOs is critical in acute stroke care. This study highlights difference in performance between FDA approved AI tools, suggesting tool selection may influence clinical decision making.

T3-SSNR07-3 ADDITION OF OXYGEN EXTRACTION FRACTION TO REFINE ISCHEMIC CORE AND PREDICT DIFFUSION REVERSAL IN ACUTE ISCHEMIC STROKE

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Luis Savastano (*Abstract Co-Author*)
Daniel L. Cooke, MD (*Abstract Co-Author*)
Steven W. Hetts, MD (*Abstract Co-Author*)
S.Andrew Josephson (*Abstract Co-Author*)
Christopher P. Hess, MD, PhD (*Abstract Co-Author*)
David S. Liebeskind (*Abstract Co-Author*)
Kambiz Nael, MD (*Abstract Co-Author*)

PURPOSE

In patients with acute ischemic stroke (AIS), overestimation of ischemic core on MRI-DWI due to ischemic lesion diffusion reversibility has been described following successful reperfusion. In this study we aim to assess the potential role of oxygen extraction fraction (OEF) derived from dynamic susceptibility contrast (DSC) MRI in prediction of diffusion lesion reversal in patients with AIS after successful reperfusion.?

METHODS AND MATERIALS

In this retrospective study, we included patients with anterior circulation large vessel occlusion stroke who underwent pretreatment MRI including DWI and DSC perfusion MRI, achieved successful reperfusion (TICI = 2c), and had follow-up MRI within 48 hours. Ischemic core masks were generated from baseline MRI using ADC = 620 × 10?6 mm²/s and final infarction masks were generated from final MRI-DW images. DSC perfusion was analyzed by Cercare Medical Neurosuite 15 (Cercare Medical, Denmark) to generate OEF maps and normalized to contralateral side to generate relative OEF values (OEF r). Image coregistration and subtraction was performed to determine final voxel fate as persistent infract vs. those that reversed (not infracted on final MRI). Logistic regression and receiver operating (ROC) analyses assessed the predictive value of imaging biomarkers.?

RESULTS

Despite using ADC = 620 × 10?6 mm²/s to define ischemic core, approximately 30% of voxels reversed (survived) on final MRI. Reversed voxels exhibited significantly higher OEF r (median 2.18 vs. 1.60) compared to persistent infarct voxels ($p < 0.0001$). ROC analysis showed AUC/sensitivity/specificity of 0.65/60/63 for ADC, 0.77/53/89 for OEF r and 0.86/76/78 for combined model (ADC + OEF r). Addition of OEF r to ADC significantly improved the diagnostic performance of ischemic core definition (Delong test, $p<0.001$).

CONCLUSION

Voxel-wise OEF r measurements from DSC MRI can predict ischemic lesion diffusion reversal in patients who underwent successful reperfusion. Addition of OEF r to ADC can improve core definition by predicting diffusion reversal and reducing overestimation of core volume.

CLINICAL RELEVANCE/APPLICATION

OEF can now be calculated from routinely acquired DSC and its addition to ADC has the potential to improve ischemic core delineation in reperfused AIS patients.

T3-SSNR07-4 THREE-DIMENSIONAL VOXEL-BASED SIGNAL INTENSITY QUANTIFICATION OF SYMPTOMATIC INTRACRANIAL PLAQUES

Martin Cabarique, MD (*Presenter*)
Carlos Dier, MD (*Abstract Co-Author*)
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Navami Shenoy (*Abstract Co-Author*)
Elena Sagues (*Abstract Co-Author*)
Sebastian Sanchez (*Abstract Co-Author*)
Pablo S. Martinez (*Abstract Co-Author*)
Domenica Cifuentes (*Abstract Co-Author*)
Ruben Calle (*Abstract Co-Author*)
Minako Hayakawa, MD (*Abstract Co-Author*)
Bruno A. Policeni, MD, MBA (*Abstract Co-Author*)
Edgar Samaniego (*Abstract Co-Author*)

PURPOSE

Intracranial plaque enhancement (IPE) serves as a biomarker for symptomatic plaques. Voxel-based IPE quantification offers a more reliable method to subjective assessment, minimizing human error and overcoming the limitations of 2D multiplanar sampling of enhancing regions.

METHODS AND MATERIALS

Patients with stroke due to intracranial atherosclerotic were prospectively imaged with 7T high-resolution MRI. Plaques were segmented using 3D Slicer, and IPE was analyzed using an in-house MATLAB code. Signal intensity (SI) distribution was normalized to the corpus callosum (CC) and voxel-based IPE colormaps were generated. These colormaps correlates with pre- and post-contrast SI curves. Three IPE metrics were obtained: mean enhancement ratio (MER: mean SI post / mean SI CC), gadolinium uptake ([mean SI post - mean SI pre] / standard deviation SI pre), and contrast-enhancement ratio (CER: [mean SI post - mean SI pre] / mean SI post). Plaques were classified as symptomatic if they were in the ipsilateral stroke vascular territory. The Mann-Whitney test was used to compare IPE metrics between

symptomatic and asymptomatic plaques, and univariate regression analysis was conducted to identify factors associated with symptomatic status. An ROC curve analysis was conducted to evaluate the accuracy of IPE metrics in detecting symptomatic plaques.

RESULTS

A total of 41 patients with 75 plaques were analyzed, of which 40 plaques (53%) were classified as symptomatic. Symptomatic plaques demonstrated different IPE patterns compared to asymptomatic plaques, including MER (1.16 ± 0.48 vs. 0.97 ± 0.33, p 0.03), gadolinium uptake ratio (5.6 ± 4.13 vs 3.43 ± 2.48, p < 0.001), and CER (1.09 ± 0.69 vs. 0.77 ± 0.67, p 0.01). Symptomatic plaques were more likely to show increased gadolinium uptake ratio (OR 1.25, 95 CI 1.05 - 1.49, p 0.01). Similarly, there was a trend toward higher MER (OR 3.07, 95 CI 0.92 - 10.26, p 0.06) and CER (OR 2.03, 95 CI 0.95 - 4.33, p 0.06) in symptomatic plaques. A gadolinium uptake ratio above 3.7 demonstrated an area under the curve of 0.70 for detecting symptomatic plaques.

CONCLUSION

Voxel-based IPE quantification improves the assessment of intracranial symptomatic plaques by characterizing IPE patterns.

CLINICAL RELEVANCE/APPLICATION

Objective quantification of IPE can help characterize enhancement patterns in symptomatic plaques

T3-SSNR07-5 THE COLLATERAL EFFECT: HOW BASELINE COLLATERAL CIRCULATION INFLUENCES ACUTE ISCHEMIC STROKE OUTCOMES - A SYSTEMATIC REVIEW AND META-ANALYSIS

Suryansh Bajaj, MD (*Presenter*)

PURPOSE

Collateral circulation plays an essential role in mitigating the severity of ischemic stroke by maintaining distal blood flow to the brain. The presence of collateral vessels at baseline may influence functional recovery, mortality, and recanalization success in patients with acute ischemic stroke (AIS). However, its impact remains under investigation. The purpose of this study is to study the effect of baseline collateral status assessed on perfusion scan on clinical outcomes, including functional recovery, mortality, recanalization success, and complications in patients with AIS.

METHODS AND MATERIALS

A systematic review and meta-analysis were performed, including studies that evaluated baseline collateral status in AIS patients on perfusion scans.The outcomes assessed included functional status (modified Rankin Scale), patient mortality, successful recanalization, and the incidence of symptomaticintracranial hemorrhage (sICH). A random effects model was used to account for heterogeneity across studies, and pooled risk ratios (RR) were calculated foreach outcome.

RESULTS

The meta-analysis included 26 studies with a total of 3,866 patients. Good baseline collateral status was significantly associated with a more thantwofold higher likelihood of achieving good functional outcomes at 90 days (RR: 2.18), a 50% reduced risk of mortality (RR: 0.49), and a 10% higher likelihood of successful recanalization (RR: 1.10), however, no significant association was found between collateral status and the occurrence of symptomatic intracranial hemorrhage (sICH) ($p>0.05$). Substantial heterogeneity was observed for functional outcomes and recanalization ($I^2>50\%$), which may be attributed to differences in study designs, collateral grading methods, and sample sizes.

CONCLUSION

Good baseline collateral status is associated with improved functional outcomes, reduced mortality, and higher likelihood of successfulrecanalization in AIS patients. This finding underscores the importance of collateral circulation assessment on perfusion scans in the management of AIS.

CLINICAL RELEVANCE/APPLICATION

Baseline collateral status provides valuable prognostic information, guiding clinical decisions and improving patient outcomes in acute ischemic strokemanagement. Good baseline collateral status assessed on perfusion scans is associated with a more than twofold higher likelihood of good functional outcomes at 90 days (RR: 2.18), a 50% lower risk of mortality (RR: 0.49), and a 10% higher chance of successful recanalization (RR: 1.10) in acute ischemic stroke patients. Further prospective studies with standardized collateral grading are needed to refine clinical decision-making.

T3-SSNR07-6 LOW PREVALENCE OF ACTIONABLE IMAGING FINDINGS IN EMERGENCY DEPARTMENT PATIENTS PRESENTING WITH VERTIGO: 10 YEAR RETROSPECTIVE ANALYSIS IN A LARGE HEALTH SYSTEM

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Jason Gandhi (*Abstract Co-Author*)
Charles Q. Li, MD (*Abstract Co-Author*)
Laura B. Eisenmenger, MD (*Abstract Co-Author*)
Michael F. Goldberg, MD (*Abstract Co-Author*)
Warren Chang, MD, MBA (*Abstract Co-Author*)

PURPOSE

Vertigo is a common presenting complaint in the emergency department (ED). However, benign etiologies without actionable imaging findings are common in patients with vertigo. Although most cases are due to benign causes, patients are frequently imaged with CT, MRI, CTA, and MRA due to concern for stroke or hemorrhage—often without positive findings. Prior studies suggest the risk of stroke in this population is under 5%. We examined the incidence and clinical impact of actionable imaging findings in ED patients presenting with vertigo or dizziness across a large health system over a 10-year period.

METHODS AND MATERIALS

5615 patients presented to network EDs with the provided history of vertigo between 2016 and 2025. 3493 patients were female and 2122 were male. Studies included 2665 head CTs, 536 brain MRIs, 2166 CT angiograms, 151 MR angiograms, and 97 other exams. A total of 337 (6%) examinations were flagged for review due to potentially relevant findings. Each exam was independently reviewed by a board certified neuroradiologist and neurologist. Imaging was classified as actionable if it led to admission or a change in management following consultation.

RESULTS

Of the 337 reviewed cases, 122 patients (2.2%, 73 female, 49 male) were determined to have actionable imaging findings. This included 46 patients (0.7%) with acute/subacute infarcts, primarily cerebellar, 59 (1%) were found to have vertebrobasilar high grade stenosis or occlusion, and 17 patients had other findings (e.g., tumor, hemorrhage or demyelination). From the remaining non-actionable cases, most were found to have chronic or stable findings unlikely to contribute to their presenting symptoms and did not require admission or a change in management. 51 were discharged from the ED without consultation. Of the remaining 164 who were evaluated, 53 (30%) were diagnosed with BPPV.

CONCLUSION

Imaging in ED patients with vertigo yielded actionable findings in only 2% of cases, with <1% having acute/subacute infarcts. While most infarcts involved the posterior fossa, a subset of actionable findings involved anterior circulation pathology not clearly linked to vertigo but still warranting treatment. Given the high prevalence of peripheral vertigo including BPPV, thorough bedside evaluation—including positional maneuvers—could reduce unnecessary imaging. Higher priority for imaging may be justified in patients with focal cerebellar signs.

CLINICAL RELEVANCE/APPLICATION

The vast majority of patients imaged for vertigo in the ED did not have actionable findings. Routine imaging may be avoided in patients with low-risk clinical features, potentially reducing costs and preventing overdiagnosis, while still ensuring detection of critical but sometimes incidental cerebrovascular disease.

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Nov. 30 – Dec. 4
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T3-SSNR08

Neuroradiology (Brain: Interventional and Non-Stroke Vascular)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S501

Ari M. Blitz, MD (*Moderator*)
Mohammad Chaudhry (*Moderator*)

Sub-Events

T3-SSNR08-1 THROMBOLYSIS IN BASILAR INFARCTION (TIBI): A NOVEL ANGIOGRAPHIC SCALE FOR EVALUATING MECHANICAL THROMBECTOMY IN BASILAR ARTERY OCCLUSION

Miguel Emilio Chevasco Hanze, MD (*Presenter*)
Antonio Lopez Rueda, MD (*Abstract Co-Author*)
Oscar Chirife Chaparro (*Abstract Co-Author*)
Enric Ripoll, MD (*Abstract Co-Author*)
Sonia Aixut (*Abstract Co-Author*)
Lucia Aja, MD (*Abstract Co-Author*)
M. Angels de Miquel, MD (*Abstract Co-Author*)
Monica Cos (*Abstract Co-Author*)

PURPOSE

Acute Basilar Artery Occlusion (BAO) has the highest morbidity and mortality in posterior circulation strokes. Current reperfusion scores for mechanical thrombectomy (MT) are based on anterior circulation strokes (mTICI score). This study proposes a basilar artery-specific reperfusion score, based on digital subtraction angiography (DSA), to assess MT efficacy in acute BAO.

METHODS AND MATERIALS

A retrospective analysis was conducted on a prospective database of acute BAO patients treated with MT within 24 hours of symptom onset at a stroke center from January 2014 to December 2023. Informed consent was obtained, and institutional review board approval was granted. Clinical, procedural, and radiological data were collected. The Thrombolysis in Basilar Infarction (TIBI) score was developed by grading posterior circulation territories in DSA post-MT, using PC-ASPECTS as reference (deducting 1 point for each occipital lobe/cerebellar lobe/thalamus or 2 points for pons/mesencephalon). Successful recanalization was defined as TIBI=8 and assessed by modified Rankin Scale at 90 days.

RESULTS

Ninety-eight patients were included (median age 70, 56 men). Successful recanalization (mTICI2b/3) was achieved in 84.7% and TIBI=8 in 71.4%. Good functional status (mRS=3) was seen in 50% of patients, with better outcomes in mTICI 2b/3 and TIBI=8 groups ($p < 0.001$ and $p=0.002$). After adjusting for age, NIHSS socre and Glasgow Coma Sacle, TIBI=8 was associated with good outcomes at 90 days (OR = 6.18; $p = 0.001$), and TIBI=7 was also linked to good outcomes (OR = 9.45; $p < 0.001$).

CONCLUSION

The TIBI scale is a novel tool for evaluating MT efficacy in acute BAO. A TIBI=8 should be the target for successful MT.

CLINICAL RELEVANCE/APPLICATION

Could discriminate patient who will have a good prognosis following mechanical thrombectomy

T3-SSNR08-2 COMPARATIVE EFFICACY OF FLOW DIVERTER DEVICES IN THE TREATMENT OF UNRUPTURED DISTAL ANTERIOR CEREBRAL ARTERY ANEURYSMS: A RETROSPECTIVE, MULTICENTER, MULTINATIONAL STUDY

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Frederic Clarencon, MD (*Abstract Co-Author*)
Andrea M. Alexandre, MD (*Abstract Co-Author*)
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Adam A. Dmytriw, MD,FRCPC (*Abstract Co-Author*)
Max Wintermark, MD (*Abstract Co-Author*)

PURPOSE

Flow diverters (FDs) have expanded endovascular treatment options for cerebral aneurysms, but comparative data regarding their efficacy and safety in distal anterior cerebral artery (DACA) aneurysms are limited. We aimed to compare clinical and radiographic outcomes among different FD devices in the treatment of unruptured DACA aneurysms.

METHODS AND MATERIALS

We conducted a retrospective, multicenter cohort study involving 166 patients from 39 centers across 14 countries who underwent FD treatment for unruptured DACA aneurysms between January 2018 and December 2022. Patients were treated with the Pipeline Embolization Device (PED), Silk Vista Baby (SVB), FRED Jr., or other FDs. The primary outcome was complete aneurysm occlusion at last imaging follow-up, assessed using the O'Kelly-Marotta (OKM) classification. Secondary outcomes included procedural complications, retreatment rates, and modified Rankin Scale (mRS) scores at last follow-up.

RESULTS

The median age was 61 years (interquartile range, 52-67), and 74% were women. Aneurysms were predominantly saccular and located on the pericallosal artery. Immediate complete obliteration occurred in 20% of cases, and adequate occlusion (OKM C-D) was achieved in the majority, with no significant differences among devices. Procedural ischemic complications occurred in 11% of patients, hemorrhagic complications in 5%, and symptomatic permanent ischemia in 0.6%, without

significant differences by device type. In-stent stenosis occurred in 17% of cases. The retreatment rate was 1.3%. At last follow-up, the median mRS score was 1 (interquartile range, 1-1).

CONCLUSION

Among patients with unruptured DACA aneurysms, treatment with PED, SVB, FRED Jr., and other flow diverters was associated with high rates of aneurysm occlusion, low rates of complications, and favorable functional outcomes. No significant differences in efficacy or safety were observed among devices.

CLINICAL RELEVANCE/APPLICATION

Flow diversion represents a safe and effective strategy for treating unruptured DACA aneurysms. Further prospective studies are warranted to confirm these findings.

T3-SSNR08-3 VISUALIZING THE INVISIBLE: MULTIMODAL IMAGING ASSESSMENT OF ENDOVASCULAR SHUNT (ESHUNT) FUNCTION IN ADULT HYDROCEPHALUS

Pablo A. Diluca, MD (*Presenter*)
Ivan R. Lylyk, MD (*Abstract Co-Author*)
Pedro Lylyk, MD (*Abstract Co-Author*)

PURPOSE

To evaluate cerebrospinal fluid (CSF) flow through an endovascular device (eShunt) in adult patients with hydrocephalus—either idiopathic normal pressure hydrocephalus (iNPH) or communicating hydrocephalus secondary to subarachnoid hemorrhage (SAH)—using MRI, CT, and Doppler ultrasound, and to compare different imaging strategies, including techniques with and without intrathecal contrast.

METHODS AND MATERIALS

A prospective cohort of 42 patients treated with the eShunt device was evaluated. Indications included iNPH and post-SAH communicating hydrocephalus. Post-implantation imaging included: (1) intrathecal gadolinium-enhanced volumetric T1-weighted MRI sequences, (2) balanced steady-state free precession (bSSFP) T2-weighted MRI sequences, and (3) CT myelography, exploiting CSF hyperintensity and hyperdensity. Doppler ultrasound was also performed in a subset of patients. Two neuroradiologists independently assessed CSF flow visualization, image quality, and patient tolerance.

RESULTS

CSF flow within the eShunt was detected using both MRI and CT myelography. Intrathecal contrast-enhanced T1-weighted MRI, balanced T2-weighted MRI, and CT myelography all contributed to flow visualization. Techniques involving intrathecal contrast (MRI and CT) demonstrated higher sensitivity but were associated with mild adverse effects (e.g., headache, nausea) in a few cases. Balanced T2 imaging provided good diagnostic confidence without requiring contrast. Doppler ultrasound was ineffective in detecting intrashunt flow. The overall low detection rate may reflect intermittent shunt activity at the time of imaging. Despite these limitations, patients demonstrated consistent clinical improvement following eShunt placement.

CONCLUSION

MRI is the most effective non-invasive modality for evaluating eShunt patency, though real-time flow detection may be limited by physiological variability. Balanced T2-weighted sequences offer a safe and accessible alternative, while intrathecal contrast enhances sensitivity and specificity at the cost of invasiveness. Despite limitations in flow visualization, the observed clinical benefits support the utility of these devices in selected patients.

CLINICAL RELEVANCE/APPLICATION

A minimally invasive endovascular CSF shunt has been developed to mimic the physiological function of arachnoid granulations, passively diverting CSF from the subarachnoid space into the intracranial venous sinuses. MRI—especially with balanced T2-weighted sequences—enables non-invasive evaluation of eShunt function in both iNPH and post-SAH communicating hydrocephalus, supporting its use for follow-up and correlation with clinical outcomes.

T3-SSNR08-4 LONG-TERM ANGIOGRAPHIC OUTCOMES AND COMPLICATIONS OF WEB AND INTRASACCULAR DEVICES IN INTRACRANIAL ANEURYSM TREATMENT

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Ammar Alam (*Abstract Co-Author*)
Mahad Siddiqi (*Abstract Co-Author*)
Theodore Liu (*Abstract Co-Author*)
Robert Fahed, MD, MSc (*Abstract Co-Author*)
Brian Drake, MD (*Abstract Co-Author*)
Howard Lesiuk (*Abstract Co-Author*)
Marlise P. dos Santos, MD,MPH (*Abstract Co-Author*)

PURPOSE

Intrasaccular devices such as the Woven EndoBridge (WEB) have emerged as promising alternatives to traditional coiling and flow diversion, particularly for wide-neck bifurcation aneurysms. These devices offer potential advantages in occlusion durability and procedural safety. However, long-term angiographic outcomes and delayed complications remain insufficiently characterized. This study aims to evaluate the incidence of aneurysm recurrence and delayed complications following treatment with WEB and similar intrasaccular devices, and to identify predictors of suboptimal outcomes.

METHODS AND MATERIALS

A retrospective cohort study was conducted at our institution, including all patients treated with WEB devices between March 30 th , 2021, and October 10 th , 2024. Data was extracted from the EPIC EMR and included patient demographics, aneurysm characteristics, device and procedural details, follow-up imaging, and clinical outcomes. Descriptive statistics and multivariate analyses were performed to assess associations between patient/aneurysm features and outcomes.

RESULTS

Thirty-six patients (mean age 59 ± 13 years) were treated with WEB from 2021 to 2024. Aneurysms were incidental in 72% (n=26), recurrent in 6% (n=2), and associated with subarachnoid hemorrhage in 22% (n=8). Immediate procedural complications occurred in 8% (n=3), and delayed complications in 17% (n=6). One patient (3%) required retreatment for aneurysm recurrence. Initial complete occlusion was achieved in 75% (n=27), with stable occlusion in all but three patients (8%, n=1). Modified Rankin Scale (mRS) scores remained stable in 50% (n=18), improved in 36% (n=13), and worsened in 14% (n=5).

CONCLUSION

Our initial experience with WEB for treatment of cerebral aneurysms showed high initial occlusion rates, low retreatment rate, and favorable safety. Most patients experienced stable or improved clinical outcomes. Some delayed complications underscored a need for long-term follow-up and individualized patient selection.

CLINICAL RELEVANCE/APPLICATION

By identifying predictors of recurrence and complications with new technology/devices, we can guide risk stratification and optimize patient outcomes in neurointerventional practice.

T3-SSNR08-5 DIFFERENTIATING DURAL ARTERIOVENOUS FISTULA FROM JUGULAR VENOUS REFLUX USING ARTERIAL SPIN LABELING AND SUSCEPTIBILITY-WEIGHTED IMAGING ON ROUTINE NON-CONTRAST BRAIN MRI

Luke M. Wojdyla, DO (*Presenter*)
Abraham Noorbakhsh, MD,MPH (*Abstract Co-Author*)
Adam A. Robinson, MD (*Abstract Co-Author*)
Usha Trivedi, MD, BS (*Abstract Co-Author*)
Divya S. Bolar, MD,PhD (*Abstract Co-Author*)

PURPOSE

To identify novel arterial spin labeling (ASL) and susceptibility-weighted imaging (SWI) biomarkers that differentiate jugular venous reflux (JVR) from dural arteriovenous fistulas (dAVFs) on routine non-contrast MRI, including in cases with overlapping features.

METHODS AND MATERIALS

This retrospective study included 13 patients with JVR and 19 with dAVF, all of whom underwent non-contrast brain MRI with 3D pseudocontinuous ASL using parameters adapted from the literature and SWI sequences. All dAVF cases were confirmed by digital subtraction catheter angiography. JVR was defined by one or more of the following criteria: reflux visualized on CTA or MRA, spontaneous resolution on follow-up imaging, or negative findings on digital subtraction angiography. Studies were assessed for hyperintense signal within the internal jugular vein (IJV) on SWI, hyperintense ASL signal in the lowest axial slice of the IJV, and continuity of ASL signal from the IJV to a dural venous sinus without interruption. Laterality and signal symmetry were also recorded. Statistical analysis was performed using Fisher's exact test.

RESULTS

In the JVR group (n=13), all cases demonstrated ASL hyperintensity in the left IJV and continuous ASL signal extending cranially to a dural sinus without interruption. Additionally, 12 of 13 cases showed hyperintense SWI signal in the ipsilateral jugular bulb. Among the dAVF group (n=19), 8 cases exhibited ASL signal localized to a jugular bulb. Within this subset, only 3/8 cases demonstrated hyperintense SWI signal, and just 2/8 showed continuous ASL signal from the jugular bulb to a dural sinus without interruption. Across all cases, absence of SWI hyperintensity in the IJV demonstrated 62% sensitivity and 92% specificity for detecting dAVF ($p = 0.0139$), while ASL discontinuity demonstrated 75% sensitivity and 100% specificity for dAVF ($p = 0.0005$). Taken together, these routine non-contrast features demonstrated complementary value in differentiating dAVF from JVR.

CONCLUSION

Hyperintense SWI signal in the IJV and continuous ASL signal from the jugular bulb to a dural sinus are highly consistent in JVR but less common and more variable in dAVF, even among cases with overlapping ASL signal at the jugular bulb. When applied together, these features enhance diagnostic differentiation between the two entities.

CLINICAL RELEVANCE/APPLICATION

ASL and SWI, standard components of many routine brain MRI protocols, may provide valuable, noninvasive clues to differentiate JVR from dAVF, improving diagnostic accuracy and potentially reducing the need for invasive angiography in ambiguous cases.

T3-SSNR08-6 THE APPLICATION OF TIME-RESOLVED NON-CONTRAST ANGIOGRAPHY (4D-TRANCE) IN THE ASSESSMENT OF COLLATERAL CIRCULATION IN MOYAMOYA DISEASE

Dinglan Yang (*Presenter*)
Chao Xia (*Abstract Co-Author*)
Jiaxin Zeng (*Abstract Co-Author*)
Kai Ai (*Abstract Co-Author*)
Su Lv, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate the efficacy of time-resolved non-contrast angiography (4D-TRANCE) in grading collateral circulation in MMD patients, comparing its consistency with digital subtraction angiography (DSA) and time-of-flight magnetic resonance angiography (TOF-MRA).

METHODS AND MATERIALS

This prospective study included 20 preoperative patients diagnosed with MMD. All patients underwent DSA, Time-of-Flight Magnetic Resonance Angiography (TOF-MRA), and 4D-TRANCE. The cohort comprised 9 males and 11 females, with a mean age of 47.2 years (range, 9 to 81 years). According to a New Grading System for Collateral Circulation in Moyamoya Disease, the grading scores were determined based on the collateral circulation status, ranging from 1 to 12. The collateral circulation grades were defined as follows: scores of 1 to 4 indicated poor collateral status (grade I), scores of 5 to 8 indicated fair collateral status (grade II), and scores of 9 to 12 indicated good collateral status (grade III). Linear correlation analyses were conducted on the grading scores from the three imaging modalities, while Kappa coefficient analysis was performed on the status grades.

RESULTS

In this study, we evaluated 36 hemispheres from 20 patients using a scoring system based on the aforementioned criteria, resulting in the creation of a scatter plot and conducting linear correlation analysis. The results consistently demonstrated a statistically significant positive correlation. Based on the scoring, the gradings were as follows: for DSA, there were 11 hemispheres in grade I and 25 in grade II; for TOF-MRA, there were 19 hemispheres in grade I and 17 in grade II; and for 4D-TRANCE, there were 15 hemispheres in grade I and 17 in grade II. Kappa coefficient analysis indicated a strong consistency between 4D-TRANCE and DSA, with a Kappa value of 0.785 ($P < 0.001$), while TOF-MRA exhibited moderate consistency with DSA and 4D-TRANCE, showing Kappa values of 0.565 and 0.560, respectively ($P < 0.001$).

CONCLUSION

While DSA has advantages in assessing collateral circulation, both TOF-MRA and 4D-TRANCE have demonstrated effectiveness in this regard, with 4D-TRANCE showing particular promise. As an emerging imaging modality, 4D-TRANCE has the potential to serve as a valuable complement to DSA and TOF-MRA, especially in clinical scenarios that require dynamic assessments of blood flow and vascular remodeling. Future research should focus on expanding sample sizes and further exploring the feasibility of 4D-TRANCE in clinical applications related to the management and prognosis of MMD.

CLINICAL RELEVANCE/APPLICATION

4D-TRANCE offers a promising alternative for evaluating collateral circulation in MMD patients without associated risks.

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Abstract Archives of the RSNA, 2025

T3-SSOB02

OB/Gynecology (Benign Gynecology)

Tuesday, Dec. 2 9:30AM - 10:30AM Room: S403A

Pamela I. Causa Andrieu, MD (*Moderator*)
Luis R. Ferreira de Souza, MD, PhD (*Moderator*)

Sub-Events

T3-SSOB02-1 IMPROVING DETECTION OF RECTOSIGMOID ENDOMETRIOSIS: INTEGRATING THE TEAR-DROP SIGN FOR ENHANCED MRI DIAGNOSTIC SENSITIVITY AND ACCURACY

Priyanka Jha, MBBS (*Presenter*)
Heng Zhang, MD,PhD (*Abstract Co-Author*)
Melika Rezaee, MD (*Abstract Co-Author*)
Luyao Shen, MD (*Abstract Co-Author*)
Pejman Ghanouni, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the MRI features of the uterus-rectosigmoid interface in patients with endometriosis, and correlate these findings with surgical diagnosis, aiming to identify potential MRI markers for early detection of rectosigmoid endometriosis (RE).

METHODS AND MATERIALS

Patients with laparoscopically confirmed endometriosis and preoperative MRI were included. Three radiologists, blinded to surgical outcomes, assessed the uterus-rectosigmoid interface on MRI in consensus. The interface was classified as either the posterior uterus contacting the bowel or not. Contacting cases were further divided into "tear-drop sign," broad-based contact without deeply invasive endometriosis (DIE), broad-based contact with DIE, and "mushroom cap sign." Surgical findings and pathology served as the reference standard.

RESULTS

Among 173 endometriosis cases, 140 (80.9%) showed the rectosigmoid colon contacting posterior uterus on MRI, with 85 cases (49.1%) of the “tear-drop sign” , 40 cases (23.1%) of broad-based contact with DIE, 30 cases (17.3%) of broad-based contact without DIE and 10 cases of “mushroom cap sign” (5.8%). Compared to the 80 patients without surgically confirmed RE, the 93 patients with RE more frequently showed bowel contacting the posterior uterus (95.7% vs. 63.7%), the “tear-drop sign” (59.1% vs. 37.5%), broad-based contact with DIE (26.6% vs. 7.5%), and the “mushroom cap sign” (10.8% vs. 0%) (all $p < 0.05$). The presence of the posterior uterus contacting the bowel, the “teardrop sign”, broad-based contact with DIE, broad-based contact without DIE and the “mushroom cap sign” showed sensitivities of 95.7%, 59.1%, 36.6%, 12.9%, and 10.8%, with specificities of 36.3%, 62.5%, 92.5%, 77.5%, and 100.0%, and diagnostic accuracies of 68.2%, 60.7%, 62.4%, 42.8%, and 52.0%, respectively. Combining the “tear-drop sign” and broad-based contact with DIE resulted in a sensitivity of 79.6%, specificity of 56.3%, and diagnostic accuracy of 68.8%, with an AUC of 0.679. Including the “mushroom cap sign” in this combination increased sensitivity to 87.1%, yielding the highest diagnostic accuracy of 72.8% and an AUC of 0.717.

CONCLUSION

Bowel contacting the posterior uterus is common in RE. In addition to the specific sign of DIE at the uterus-rectosigmoid interface, identifying the tear-drop sign can increase diagnostic sensitivity and accuracy in diagnosing RE.

CLINICAL RELEVANCE/APPLICATION

Evaluation of the rectosigmoid interface on MRI is often overlooked in endometriosis assessment. The “tear-drop sign” is a frequent marker of rectosigmoid involvement. Recognizing this sign can improve detection of deep endometriosis and aid in surgical planning.

T3-SSOB02-2 MRI ULTRAFAST PROTOCOL WITH IDENTICAL DIAGNOSTIC PERFORMANCE IN DEEP PELVIC ENDOMETRIOSIS DIAGNOSIS

Achraf Kanan, MD (*Presenter*)
Betty Sabatier (*Abstract Co-Author*)
Benoit Magnin, MD,MSc (*Abstract Co-Author*)
Benoit Chauveau, MMed (*Abstract Co-Author*)

PURPOSE

In recent years, the incidence of endometriosis has risen sharply. Imaging has an unequivocal place in the diagnostic process. To date, the reference MRI protocol has the advantage of being exhaustive, but its main inconvenient is the acquisition time.

METHODS AND MATERIALS

This monocentric retrospective study included all patients who underwent a pelvic MRI for a suspicion of endometriosis between April 2023 and November 2023 with a reference T2 Propeller protocol and an ultrafast T2 SSFSE protocol. Four radiologists independently assessed each protocol for the presence of endometriosis, its topography and evaluated the Deep Pelvic Endometriosis Index. Intra individual comparison was performed. The four readers also independently assessed acquisition quality comparing artifacts, diagnostic confidence, overall image quality.

RESULTS

A total of 200 patients were included. Of the 800 pelvic MRI scan assessment all operators combined, deep pelvic endometriosis was detected by at least one of the two protocols in 302 assessments. Correlation between the two protocols on the criterion of presence of deep pelvic endometriosis was excellent, with a kappa Cohen’s coefficient (?) 0.91 [0.88-0.94]. Ultrafast protocol was accurate in lesion mapping, with a Lin's concordance correlation coefficient (CCC) 0.83 [0.79-0.86]. The medio-central compartment was the most represented at over 90%, ? 0.90 [0.80-1.00], sensitivity of 1. Ultrafast protocol reduced acquisition time by 88% ($p < 0.0001$). No subjective parameters relating to acquisition quality altered diagnostic concordance.

CONCLUSION

This study demonstrated the excellent quality of ultrafast sequences in detecting deep pelvic endometriosis lesions while reducing acquisition time by 88%.

CLINICAL RELEVANCE/APPLICATION

This study suggests that the ultrafast MRI protocol can be used in routine screening protocols and offers the advantage of a short examination time without loss of diagnostic quality.

T3-SSOB02-3 COMMONLY MISSED ENDOMETRIOSIS LOCATIONS IN NEGATIVE PREOPERATIVE MRI

Priyanka Jha, MBBS (*Presenter*)
Heng Zhang, MD,PhD (*Abstract Co-Author*)
Melika Rezaee, MD (*Abstract Co-Author*)
Luyao Shen, MD (*Abstract Co-Author*)
Pejman Ghanouni, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study aims to analyze preoperative MRI findings in patients with laparoscopically confirmed endometriosis but negative imaging reports, with a focus on identifying commonly missed lesion locations. Given that negative MRI findings may delay timely treatment, we also explore potential causes of missed diagnoses to improve imaging accuracy and clinical management.

METHODS AND MATERIALS

Patients with surgically confirmed endometriosis and negative preoperative MRI were retrospectively included. Two experienced radiologists, blinded to surgical outcomes, independently re-evaluated the MRI scans by consensus. Endometriosis was assessed in three compartments: anterior (vesicouterine/vesicovaginal space, bladder, ureters, and round ligaments), middle (ovaries, fallopian tubes, and parametrium), and posterior (retro-uterine space, retrocervical area, rectovaginal septum, uterosacral ligaments, and rectosigmoid). MRI findings from initial reports and expert review were compared with surgical results.

RESULTS

Seventeen patients were included. In the initial reports, endometriosis was missed in 8 cases in the anterior compartment (7 vesicouterine, 1 bladder, and 3 ureter), 14 in the middle compartment (3 right ovary, 6 left ovary, and 14 parametrium), and 15 in the posterior compartment (4 retro-uterine, 8 retrocervical, 7 rectovaginal septum, 13 uterosacral ligament, and 3 rectosigmoid). The most frequently overlooked sites were the uterosacral ligaments and the parametrium. Expert review identified at least one positive lesion in all cases. However, lesions in the anterior compartment were missed in 2 patients, and lesions in the middle compartment were missed in 3 patients.

CONCLUSION

Endometriosis can be missed across all compartments, particularly in the parametrium in the middle compartment, and uterosacral ligament in the posterior compartment. Experienced radiologists can significantly improve detection, especially in the posterior compartment.

CLINICAL RELEVANCE/APPLICATION

Preoperative MRI plays a critical role in surgical planning for endometriosis. However, false-negative reports may delay diagnosis and treatment. This study highlights the most frequently missed lesion locations, emphasizing the need for increased radiologist awareness and structured compartment-based review. Incorporating these insights into routine MRI interpretation may enhance diagnostic accuracy, optimize surgical outcomes, and reduce patient morbidity.

T3-SSOB02-4 IMPROVED DIAGNOSTIC CONFIDENCE AND EFFICIENCY IN GYNECOLOGIC MRI USING T2 SHINE-THROUGH SUPPRESSION: COMPARISON WITH CONVENTIONAL DWI

Yoshie Omiya, MD (*Presenter*)
Reo Higuchi (*Abstract Co-Author*)
JIAJING HU (*Abstract Co-Author*)
Katsuhiro Sano, MD, PhD (*Abstract Co-Author*)
Koji Kamagata, MD, PhD (*Abstract Co-Author*)
Tsuyoshi Tajima, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic performance—including accuracy, reader confidence, and efficiency—of Water Diffusion Subtraction (WDS), a post-processing technique for diffusion-weighted imaging (DWI) that suppresses the T2 shine-through effect, in gynecologic MRI. We compared WDS with conventional DWI, including both diffusion-weighted images and apparent diffusion coefficient (ADC) maps, in distinguishing benign from malignant endometrial lesions.

METHODS AND MATERIALS

This study aimed to compare the diagnostic performance of WDS with conventional DWI in differentiating malignant from benign endometrial lesions. We analyzed 57 patients with suspected endometrial lesions, including 28 cases of surgically confirmed FIGO stage IA endometrial cancer and 29 benign cases confirmed by biopsy and two-year clinical follow-up. The mean age was 56.7 ± 8.7 years in the malignant group and 46.9 ± 9.7 years in the benign group. DWI was acquired using two b-values (0 and either 800 or 1000 μmm 2 /s). WDS images were generated from the acquired diffusion-weighted images by highlighting differences in signal decay to minimize T2 influence.Two readers independently assessed the datasets in two sessions: first with T2WI, DWI, and ADC maps; then with T2WI and WDS. Binary diagnostic accuracy and 5-point confidence scores were recorded. ROC analysis and AUC comparison were performed using the DeLong method. Reader-averaged confidence scores were compared using paired t-tests and Wilcoxon signed-rank tests. Reading time and inter-reader agreement were also evaluated.

RESULTS

WDS improved sensitivity and accuracy in both readers, with only slight or non-significant AUC differences. Given that WDS and ADC maps are derived from the same diffusion datasets, a significant difference in diagnostic performance was not anticipated. However, mean confidence scores significantly improved with WDS ($p = 0.0489$, paired t-test; $p = 0.0448$, Wilcoxon signed-rank test), and inter-reader agreement demonstrated stronger statistical consistency ($?^2$ $p = 0.0039$ vs. 0.0119 for ADC). Reading times were reduced by 40-50%. Cohen's ? remained low for both modalities.

CONCLUSION

Although both WDS and ADC maps are derived from the same diffusion-weighted images, WDS significantly improved diagnostic confidence, inter-reader consistency, and interpretation efficiency. It may be particularly helpful in distinguishing between benign and malignant endometrial lesions where strong T2 shine-through effects limit conventional DWI evaluation.

CLINICAL RELEVANCE/APPLICATION

WDS may serve as a valuable adjunct in gynecologic MRI by improving lesion visibility and diagnostic efficiency, especially when conventional DWI is limited by T2 shine-through effects.

T3-SSOB02-6 ASSESSING THE ROLE OF SOCIETY OF RADIOLOGISTS IN ULTRASOUND (SRU) CONSENSUS CRITERIA IN ULTRASOUND EVALUATION OF ENDOMETRIOSIS

Anne Y. Hu, MD (*Presenter*)
Liina Poder, MD (*Abstract Co-Author*)
Sneha Mittal (*Abstract Co-Author*)
Martina Z. Francisco, MD (*Abstract Co-Author*)
Priyanka Jha, MBBS (*Abstract Co-Author*)

PURPOSE

Endometriosis is commonly associated with chronic pelvic pain and infertility, yet is often underdiagnosed, leading to delays in care. Pelvic ultrasound is the initial imaging modality for evaluating patients with pelvic symptoms and infertility. Given the need for improved detection of endometriosis, the SRU released guidelines and imaging observations to support identification of endometriosis on augmented pelvic ultrasound (APU), along with a classification system for interpretation of these findings. To corroborate these guidelines, we performed a multi-center retrospective analysis of patients who underwent pelvic ultrasound to assess their indications for APU, imaging observations, and clinical outcomes.

METHODS AND MATERIALS

Our retrospective cohort consisted of female patients ages 16 to 55 years old who underwent transvaginal pelvic ultrasound in 2019 at two academic hospitals. Obstetric studies, ultrasounds performed or interpreted by non-radiology departments, and technically inadequate studies were excluded. Experienced readers then assessed clinical indications, presence of endometriosis imaging observations, and APU diagnostic classification. The electronic medical record was reviewed to obtain clinical history and whether endometriosis was diagnosed in the subsequent 5 years of follow-up.

RESULTS

Of the 888 patients in the cohort, 292 patients (32.9%) had symptoms or clinical history that met criteria for APU to evaluate for endometriosis. 58 patients (19.9%) had positive findings for endometriosis and 28 patients (9.6%) had equivocal findings. During the 5 year study period, 48 patients (5.4%) in the entire cohort received a new endometriosis diagnosis, with 14 patients (29.2%) diagnosed on ultrasound and the remainder diagnosed on subsequent MRI or surgery. More notably, 64% of patients classified as APU-3 had a confirmed endometriosis diagnosis on follow-up. Excluding patients with ultrasound findings confirmatory for endometriosis, the mean time from the initial pelvic ultrasound to endometriosis diagnosis was 2.2 years.

CONCLUSION

SRU consensus criteria for endometriosis evaluation provides a straightforward framework for identifying patients who may benefit from an APU and interpreting their imaging findings. Moreover, the classification system is a useful tool for stratifying patients who may have endometriosis or may benefit from further evaluation with MRI or surgery.

CLINICAL RELEVANCE/APPLICATION

Endometriosis can be challenging to detect on pelvic ultrasound and is often underdiagnosed, however applying SRU guidelines for APU and endometriosis imaging observations can streamline imaging interpretation with the goal of reducing diagnostic delays and patient morbidity.

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Nov. 30 – Dec. 4
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T3-STCE1

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Tuesday, Dec. 2 10:00AM - 10:30AM Room: LEARNING CENTER THEATER 1

Sub-Events

T3-STCE1-1 AUTOMATED OPPORTUNISTIC BREAST DENSITY ASSESSMENT FROM CHEST AND ABDOMINAL CT: A FEASIBILITY STUDY IN A DIVERSE CLINICAL COHORT

Kai Jones, MD (*Presenter*)
Edward Mardakhaev, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility of an open-source algorithm for automated, opportunistic breast density assessment from CT scans. This study aimed to benchmark CT-derived density against mammographic data, investigate the impact of technical factors like field-of-view (FOV) limitations, and establish an optimal, clinically relevant cut-off for identifying high breast density.

METHODS AND MATERIALS

In this IRB-approved retrospective study, we analyzed 647 chest CTs and 167 abdominal CTs from a diverse cohort of 383 women who also had a mammogram. An open-source algorithm segmented breast tissue to calculate CT-derived percentage and volume density. These values were benchmarked against mammogram-reported density, which was dichotomized into high (heterogeneously/extremely dense) and low density. We used Receiver Operating Characteristic (ROC) analysis to assess predictive performance and determine an optimal cut-off value.

RESULTS

Automated segmentation was successful in 97.5% of cases on manual review. CT-derived percentage density showed high accuracy for predicting high mammographic density, achieving an Area Under the Curve (AUC) of 0.899 across all scans, including those with technical limitations like incomplete FOV. An optimal cut-off of 2.99% density was identified. While parenchymal volume was also predictive, percentage density proved to be a more robust metric. The method was not feasible for most abdominal CTs, with only 31% providing the minimal coverage needed.

CONCLUSION

Automated, opportunistic breast density assessment from chest CT is highly feasible and accurate. CT-derived percentage density is a robust metric that can reliably identify women with dense breasts using a 2.99% cut-off, even in the presence of common technical limitations. These findings support exploring the integration of this automated method into clinical workflows to provide valuable breast cancer risk information from existing scans and guide screening recommendations.

CLINICAL RELEVANCE/APPLICATION

This automated open-source tool opportunistically analyzes existing chest and abdomen CT scans to accurately identify women with high breast density. This provides cancer risk stratification information at no additional radiation exposure or cost, helping to guide supplemental screening decisions.

T3-STCE1-2 OPPORTUNISTIC SCREENING FOR CORONARY ARTERY CALCIFICATION AND EMPHYSEMA ON LOW-DOSE CT LUNG CANCER SCREENING: IMPLICATIONS FOR SUBCLINICAL DISEASE DETECTION AND DOWNSTREAM CARE

Valentina Marulanda Corzo, MD (*Presenter*)
Daniel B. Green, MD (*Abstract Co-Author*)
Charlene Thomas (*Abstract Co-Author*)
Lauren R. Groner, DO, MS (*Abstract Co-Author*)

PURPOSE

Tobacco smoking, the leading cause of lung cancer, is also a major risk factor for cardiovascular disease (CVD) and chronic obstructive pulmonary disease (COPD). Lung cancer screening (LCS) with low-dose CT (LDCT) offers an opportunity to detect CT biomarkers of CVD (coronary artery calcium [CAC]) and COPD (emphysema). We examined the prevalence of these biomarkers in an asymptomatic LCS cohort and their impact on downstream care.

METHODS AND MATERIALS

We retrospectively reviewed baseline LDCT reports (2015-2022) of asymptomatic LCS program enrollees to identify reported emphysema and CAC; those without a smoking history were excluded. Cardiopulmonary care within 12 months before and after LDCT were compared using McNemar's chi-squared test with continuity correction. Associations with demographic and community-level characteristics were assessed via univariate logistic regression analyses.

RESULTS

Qualitative CAC and emphysema scores were reported for 2218 and 2335 participants, respectively (median age 64; 52.0% male), with CAC identified in 65.0% and emphysema in 84.0%. Emphysema was associated with older age (odds ratio [OR], 1.04/year [95% CI, 1.03-1.06]), non-White race (1.63 [1.26-2.12]), and living in a zip code with lower household income (1.89 [1.21-3.11]), lower educational attainment (1.64 [1.25-2.15]), and greater food insecurity (2.01 [1.53-2.65]); p<0.001. Pulmonary care increased from 24.0 to 45.1% post-LDCT (p<0.001): medication change (22.7 to 25.1%, p<0.008) and vaccination (0.6 to 13.8%), pulmonary function testing (0.1 to 13.6%), pulmonology referral (0.7 to 7.6%), and pulmonary rehabilitation (0.1 to 1.3%); p<0.001. CAC was associated with older age (1.11/year [1.10-1.13]) and male sex (1.95 [1.63-2.33]), p<0.001, whereas non-White race was associated with lower odds of CAC (0.73 [0.60-0.88], p=0.001). Cardiovascular care increased from 42.6 to 63.3% post-LDCT (p<0.001): revascularization (0.0 to 0.8%, p=0.003) and medication change (42.3 to 43.3%), cardiac imaging (0.0 to 18.4%), stress testing (0.0 to 12.6%), and cardiology referral (1.1 to 10.2%); p<0.001.

CONCLUSION

To our knowledge, this is the largest retrospective LCS cohort study examining opportunistic screening for CAC and emphysema on LDCT and the impact on cardiopulmonary care. CAC and emphysema are prevalent in an asymptomatic, high-risk LCS population. Identification of these biomarkers led to a significant change in care.

CLINICAL RELEVANCE/APPLICATION

CVD and COPD are common in LCS-eligible persons and contribute substantially to their morbidity and mortality. LDCT can be used to identify CVD and COPD biomarkers that inform care. Implementing structured reporting and downstream care pathways for these findings may enhance the clinical utility of LCS.

T3-STCE1-3 OPPORTUNISTIC SCREENING FOR PREOPERATIVE FRAILTY USING DEEP LEARNING CT BODY COMPOSITION BIOMARKERS

Ding Yi Zhang, MD (*Presenter*)
Fayeza Ahmad (*Abstract Co-Author*)
Jonathan Afilalo, MD, MSc (*Abstract Co-Author*)

PURPOSE

Frailty is a major risk factor for mortality and major morbidity in older adults undergoing surgery. Clinical methods to assess frailty are underutilized because they are either subjective or time-consuming. Radiographic detection of conditions such as sarcopenia and sarcopenic obesity provides mechanistic clues about the presence of frailty, and can be opportunistically extracted from routine preoperative CT scans.

METHODS AND MATERIALS

Preoperative CT scans for patients undergoing abdominopelvic cancer surgery between 2017-2023 were extracted and linked with the American College of Surgeons National Surgical Quality Improvement Program database at a tertiary care center. A deep learning software (coreslicer.com) featuring a 3-D neural architecture (nnU-Net) was used to segment the skeletal muscle, subcutaneous fat, visceral fat, and vertebrae. The volume and density of these segmentations were computed and standardized between the L1 and L5 vertebral levels. Frailty was measured using the Hospital Frailty Rating Score (HFRS) encompassing a weighted sum of 109 ICD codes.

RESULTS

The cohort consisted of 1,516 patients 66±12 years of age with 49% females. Based on the HFRS, 144 (10%) of patients were frail, and they suffered a 10.4-fold increase in odds of 30-day postoperative mortality (95% CI 4.7 to 22.9) adjusting for age, sex, disease severity, and type of surgery. CT body composition biomarkers found to be predictive of frailty in linear regression of log HFRS were: lower skeletal muscle volume index ($P=0.002$), lower skeletal muscle density indicative of intramuscular adiposity ($P<0.001$), and higher subcutaneous fat density indicative of adipose-tissue fibrosis or edema ($P<0.001$). Sarcopenia, defined as low skeletal muscle volume and density, was associated with a 2.8-fold increase in odds of frailty (95% CI 1.9 to 4.2).

CONCLUSION

Opportunistic analysis of body composition from preoperative CT scans is a promising radiographic method to objectively assess frailty. Biomarkers of muscle mass and quality as well as adipose tissue infiltration are highly predictive of frailty.

CLINICAL RELEVANCE/APPLICATION

This radiographic method can be implemented in preoperative workflows to systematically screen patients for frailty, enhancing risk stratification and identifying vulnerable patients who could benefit from geriatric assessment and prehabilitation.

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T3-STCE2

Science Session (Imaging-Guided Oncologic Therapies: From Histotripsy to Theranostics and Beyond)

Tuesday, Dec. 2 10:00AM - 10:30AM Room: LEARNING CENTER THEATER 2

Sub-Events

T3-STCE2-1 COMBINATIONAL ABLATION AND IMMUNE CHECKPOINT INHIBITOR THERAPY FOR BCLC STAGES B AND C HEPATOCELLULAR CARCINOMA: A SYSTEMATIC REVIEW

Arsalan Nadeem, MBBS (*Presenter*)
Talha Iqbal, MBBS (*Abstract Co-Author*)

PURPOSE

To systematically review studies evaluating combinational ablation and immune checkpoint inhibitor (ICI) therapy for Barcelona Clinic Liver Cancer (BCLC) stages B and C hepatocellular carcinoma (HCC), assessing the overall survival (OS) and progression-free survival (PFS).

METHODS AND MATERIALS

A systematic review for assessing the OS and PFS for patients with BCLC stages B and C HCC receiving combination therapy with ablation and ICI was conducted. Ablation included radiofrequency ablation, cryoablation and microwave ablation. PubMed, Google Scholar, Cochrane Library, clinicaltrials.gov and Science Direct along with reference lists were searched for relevant articles from inception to June 30, 2025. Keywords used were “ablation”, “immune checkpoint inhibitor” and “hepatocellular carcinoma”. Titles and abstracts were screened and assessed for inclusion, data for OS and PFS was extracted, and bias was assessed using RoB 2 and ROBINS-I tools. Certainty of evidence was rated using the GRADE tool. Due to heterogeneity in the intervention protocols and study designs, no meta-analysis was conducted.

RESULTS

Five studies were included in our review. One (n=64) was a randomized clinical trial (RCT) and four studies (n=119) had non-randomized designs. The median OS and PFS in Zhou et al (the RCT) were 20.8 months (95% CI: 16.2-25.3) and 8.3 months (95% CI: 4.6-12.0) respectively. The median OS (mOS) and median PFS (mPFS) in the other studies were as follows. In Duffy et al (n=12), mOS was 10.1 months (95% CI: 4.6-15.7) and mPFS was 7.8 months (95% CI: 6.0-12.0). In Lyu et al (n=33), mOS was 16.9 months (95% CI: 7.7-26.1) and mPFS was 5.0 months (95% CI: 2.9-7.1). In Wang et al (n=60), mOS was 24.1 months (95% CI: 22.2-28.1) and mPFS was 12.3 months (95% CI: 9.3-12.7). In Li et al (n=14), the mOS was 19.3 months (95% CI: 2.4-36.2) and mPFS was 10.8 months (95% CI: 0-23.5). ICIs used in these studies were tremelimumab, toripalimab, nivolumab, pembrolizumab, sintilimab and camrelizumab. According to the GRADE tool, the RCT-based evidence for OS and PFS was graded moderate certainty and low to very low certainty for the non-random studies.

CONCLUSION

These review findings suggest a potential survival advantage from combining ablation with ICI therapy as compared to ICI therapy alone in advanced HCC, particularly in terms of overall survival. However, due to the limited number of studies with high quality of evidence and the risk of bias in non-randomized designs, larger randomized trials are needed to confirm these findings and establish clinical efficacy.

CLINICAL RELEVANCE/APPLICATION

Combining ablation with ICI therapy may enhance survival outcomes in patients with BCLC stages B and C HCC. This approach could become a viable treatment option in selected patients.

T3-STCE2-2 ^{68}GA-DOTATATE PET/MRI IN MENINGIOMA: FROM TARGETED IMAGING TO EMERGING CLINICAL APPLICATIONS

Steven Jin, PharmD, BS (*Presenter*)
Michael X. Jin, MD, MBA (*Abstract Co-Author*)
Abhinav Mishra (*Abstract Co-Author*)
Louna Abouainain (*Abstract Co-Author*)
Austin Young (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic accuracy, clinical utility, and prognostic implications of 68 Ga-DOTATATE PET/MRI compared to conventional imaging modalities in the management of meningiomas.

METHODS AND MATERIALS

A comprehensive systematic review was performed following PRISMA 2020 guidelines, analyzing 21 high-quality studies from 2015 to 2025, sourced from PubMed and EMBASE. Inclusion criteria emphasized prospective trials, pathologically confirmed cohorts, and studies with institutional review board approval. Primary outcomes evaluated included diagnostic accuracy metrics, impact on treatment planning, and therapeutic response rates. Study quality was assessed using the Oxford Centre for Evidence-Based Medicine criteria.

RESULTS

68 Ga-DOTATATE PET/MRI demonstrated significantly superior sensitivity for detecting osseous involvement compared to contrast-enhanced MRI (98.5% vs. 53.7%, $P<0.001$), while specificity was comparable (86.7% vs. 93.3%). Overall sensitivity for tumor detection was higher for PET/MRI (90%) compared to conventional MRI (79%). PET/MRI findings led to modifications in radiation therapy planning in 73% of cases, allowing for more precise delineation of target volumes and improved sparing of critical structures. Optimal quantitative imaging thresholds were established (SUVmax 4.7; SUV ratio to superior sagittal sinus 3.2), achieving excellent reproducibility (AUC 0.910). Postoperative PET imaging findings correlated strongly with clinical outcomes; patients without residual uptake had no recurrence during follow-up. Theragnostic use of 177Lu-DOTATATE resulted in a median progression-free survival of 11.5 months in refractory cases.

CONCLUSION

68 Ga-DOTATATE PET/MRI offers superior diagnostic accuracy for detecting osseous involvement in meningiomas and significantly impacts clinical decision-making through improved treatment planning. The robust correlation between postoperative imaging results and patient outcomes supports its routine use in surveillance protocols. The expansion of theragnostic applications provides promising therapeutic avenues for refractory meningiomas.

CLINICAL RELEVANCE/APPLICATION

Incorporating 68 Ga-DOTATATE PET/MRI into routine meningioma management can significantly enhance surgical precision, optimize radiation therapy planning, and enable personalized patient surveillance through molecular imaging biomarkers.

T3-STCE2-3 RIGID VS. DEFORMABLE IMAGE REGISTRATION IN 3D ASSESSMENT OF MICROWAVE ABLATIONS: A RETROSPECTIVE ANALYSIS

Theresa Simmich (*Presenter*)
Amilcar Alzaga (*Abstract Co-Author*)
Matthias Wetzl, MD (*Abstract Co-Author*)
Michael Uder, MD (*Abstract Co-Author*)
Matthias S. May, MD (*Abstract Co-Author*)

PURPOSE

When comparing Microwave Ablation (MWA) to surgical approaches for treating liver tumors, MWA poses fewer risks but shows higher recurrence rates. With an adequate safety margin, recurrence rates drop significantly. Accurate 3D visualisation is key to ensuring full margin ablation. An novel dedicated commercial 3D ablation guidance on-site software (MyAblationGuide, Siemens Healthineers AG, Forchheim, Germany) provides two methods for fusing the pre- and post-ablation images: rigid and deformable registration. This study evaluates the difference between the registration types, analyzing impact on margin visualization, coverage and possible recurrence prediction.

METHODS AND MATERIALS

The study includes retrospective data of 116 Patients with a total of 203 lesions treated with MWA for colorectal liver metastases from 01/2020 - 03/2025. Pre- and post-ablation CT images are imported, tumors and ablation zones are segmented semi-automatically, and a 5mm safety margin is added. Each lesion is assessed using rigid and deformable registration focusing on ablation status (A0 = complete ablation; A1 = incomplete margin; A2 = incomplete tumor) and ablation zone size. Rigid registration preserves clear boundaries while deformable registration accounts for parenchyma shrinkage and respiration.

RESULTS

A one sided Wilcoxon signed-rank test (rigid r >deformable d) in a preliminary evaluation (n=9) showed a significant difference in axial plane defect size ($p=0.028$, effect size 0.54), indicating smaller ablation zones with deformable registration. No significant differences were found in the sagittal and coronal planes ($p=0.206$; $p=0.326$) with effect sizes (Cohen's d) 0.32 (sagittal) and 0.25 (coronal). The highest required sample size to achieve 80% power ($a = 0.05$) was 104 cases, which is covered by the available dataset of 203 lesions. In a clinical context, those differences translate to discrepancies in ablation status. In 4/9 evaluated cases (44%), the different registrations led to different A0-A2 classifications (3 cases: r A1 / d A2; one case: r A0 / d A1).

CONCLUSION

Initial results suggest that registration type can influence outcome classification. Further evaluation will focus on if volumetric differences translate into clinical consequences such as recurrences. These findings will provide valuable insights for clinical decision-making and workflow implementation to optimize patient care.

CLINICAL RELEVANCE/APPLICATION

Different image registrations techniques can significantly impact the perceived coverage of safety margins required for a successful (A0) microwave ablation. Understanding these effects is the key to avoiding over- or undertreatment, keeping risks and recurrences low and enabling an optimal approach to treating liver tumors.

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T5-STCE1

Science Session (Imaging-Guided Oncologic Therapies: From Histotripsy to Theranostics and Beyond)

Tuesday, Dec. 2 1:15PM - 1:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

T5-STCE1-1 PREDICTION OF POSTOPERATIVE RECURRENCE IN HEPATOCELLULAR CARCINOMA: A MULTICENTER STUDY OF CT-BASED CLINICALLY SIGNIFICANT PORTAL HYPERTENSION AND INTRATUMOR HETEROGENEITY SCORE

Yuan Xu (*Presenter*)

PURPOSE

The high incidence of early recurrence (ER) after curative resection of hepatocellular carcinoma (HCC) significantly compromises long-term survival. This study aimed to develop and validate a predictive model based on preoperative CT-derived clinically significant portal hypertension (CSPH) and intratumoral heterogeneity (ITH) score to predict ER after HCC resection.

METHODS AND MATERIALS

A total of 437 HCC patients who underwent curative hepatectomy across three centers were retrospectively enrolled. Of these, 319 patients from our institution were randomly assigned to a training cohort (n = 192) and an internal validation cohort (n = 127), while 118 patients from the other two institutions formed the external validation cohort. Preoperative CECT-derived CSPH-related indicators—including spleen diameter, gastroesophageal varices, and spontaneous portosystemic shunts—were extracted. Tumor regions on CECT were subjected to unsupervised clustering and integrated with global pixel distribution patterns to calculate the ITH score. A predictive model was constructed based on independent risk factors for ER. The model's discrimination and predictive accuracy were assessed using the area under the receiver operating characteristic curve (AUC), calibration curves, and decision curve analysis. AUCs were compared using the DeLong test.

RESULTS

CSPH, ITH score, tumor burden score (TBS), and systemic immune-inflammation index (SII) were identified as independent risk factors for ER ($P < 0.05$). Compared to the baseline model (TBS + SII; AUC = 0.715) and the CSPH model (TBS + SII + CSPH; AUC = 0.779), the integrated model incorporating ITH score (TBS + SII + CSPH + ITH score) demonstrated the best performance (AUC = 0.833, $P < 0.05$). The calibration and decision curves showed good agreement across the training, internal, and external validation cohorts.

CONCLUSION

The novel integrated model combining CT-assessed CSPH, ITH score, TBS, and SII outperformed conventional models and provides an effective tool for early prediction of ER in HCC patients following surgery.

CLINICAL RELEVANCE/APPLICATION

A CT-based model integrating CSPH and ITH enables accurate preoperative risk stratification for early recurrence after HCC resection, supporting personalized surgical planning and postoperative surveillance.

T5-STCE1-2 ULTRASOUND-GUIDED MICROBUBBLE THERAPY RESHAPES THE PANCREATIC TUMOR MICROENVIRONMENT

Chung-Hsin Wang, PhD (*Presenter*)
Shih-Tsung Kang (*Abstract Co-Author*)

PURPOSE

Pancreatic ductal adenocarcinoma (PDAC) remains one of the deadliest malignancies due to its hypoxic tumor microenvironment (TME), poor vascularity, and resistance to chemotherapy and immunotherapy. This study aimed to evaluate the therapeutic potential of ultrasound-guided microbubble sonoporation using a clinically available Power Doppler imaging system to modulate the TME, enhance drug delivery, and improve the efficacy of chemo-immunotherapy.

METHODS AND MATERIALS

Metastatic orthotopic PDAC tumors were established in mice using UN-KC-6141 cells. Tumor perfusion and hypoxia were assessed via contrast-enhanced ultrasound (CEUS) and immunofluorescence. Imaging-guided sonoporation was performed using a clinical ultrasound system (MI= 0.4), targeting tumors with Power Doppler. Microbubbles and chemotherapy agents (doxorubicin or gemcitabine) were co-infused. Tumor perfusion, hypoxia, and CD8?/CD4? T-cell infiltration were evaluated post-treatment. Anti-PD-L1 therapy was added to assess immunotherapy enhancement.

RESULTS

Sonoporation improved tumor perfusion (1.9× increase) and reduced hypoxia (77% and 67% at days 1 and 3). Combination therapy extended median survival (27?33.5 days with doxorubicin; 33?39 days with gemcitabine) and reduced tumor burden. CD8? T-cell infiltration increased four-fold by day 6. Triple therapy with anti-PD-L1 further prolonged survival (46 days vs. 28 days) and enhanced secondary tumor suppression.

CONCLUSION

Ultrasound-guided microbubble sonoporation effectively remodels the PDAC tumor microenvironment by enhancing perfusion, alleviating hypoxia, and promoting immune cell infiltration. This approach significantly improves the therapeutic efficacy of both chemotherapy and immune checkpoint blockade, offering a non-invasive and clinically translatable strategy for treating pancreatic tumors. By adopting a more compact and portable imaging ultrasound device, the technology becomes more readily integrated into outpatient procedures and conventional chemotherapy treatments.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the feasibility of integrating Power Doppler ultrasound with microbubble sonoporation to enhance oncologic therapies in PDAC. The use of commercially available ultrasound systems and clinically tested microbubbles supports rapid clinical translation. By modulating the tumor microenvironment, this technique may unlock new therapeutic windows for combination treatments, including chemo-immunotherapy, in patients with hypoxic and treatment-resistant pancreatic cancers.

T5-STCE1-3 THE VALUE OF CONTRAST-ENHANCED ULTRASOUND IN PREDICTING THE ENERGY AND TIME REQUIRED PER UNIT VOLUME FOR PERCUTANEOUS MICROWAVE ABLATION OF UTERINE FIBROIDS: A CROSS-SECTIONAL, MULTICENTER STUDY

Lei Liang, PhD (*Presenter*)
Yuqing Huang (*Abstract Co-Author*)

PURPOSE

To explore the feasibility of predicting the energy and time required per unit volume (EPV, TPV) for percutaneous microwave ablation (PMWA) treatment of uterine fibroids (UFs) using quantitative perfusion parameters from Contrast-enhanced ultrasound (CEUS).

METHODS AND MATERIALS

This retrospective study included 263 patients from five centers with UFs who underwent PMWA treatment between December 2023 to October 2024. All patients underwent routine ultrasound and CEUS before PMWA. Time-intensity curves (TICs) for CEUS were recorded, and the perfusion parameters were obtained. Ablation power and duration were recorded during the procedure. Post-treatment CEUS was used to determine nonperfused volumes. The relationship between CEUS-derived quantitative perfusion parameters and EPV and TPV was evaluated.

RESULTS

A total of 263 patients (272 UFs) were included, with 176 UFs achieving complete ablation, and 96 achieving majority ablation. The average age of the patients was 44.5±5.6years. Logistic regression analysis revealed that the ablation rate was correlated with the maximum intensity enhancement (IMAX), TPV and EPV(all $P < 0.001$). Restricted cubic splines analysis identified a U-shaped association between IMAX and EPV and TPV(P nonlinear < 0.001), with the turning point at approximately 203.56%. Multiple linear regression analysis showed that when IMAX<203.56%, a 1-unit increase in IMAX was associated with a decrease in EPV by 1.59J/cm³ and TPV by 0.03s. When IMAX=203.56%, with a 1-unit increase in IMAX leading to an increase in EPV by 1.02J/cm³ and TPV by 0.02s.

CONCLUSION

IMAX from CEUS demonstrates a nonlinear U-shaped correlation with the energy and time requirements of PMWA for UFs. CEUS can serve as a reliable tool for predicting energy and time needs, improving the efficiency of PMWA procedures.

CLINICAL RELEVANCE/APPLICATION

IMAX from CEUS have a nonlinear U-shaped correlation with the energy and time requirements of PMWA for UFs. Preoperative CEUS evaluation can effectively predict the energy and duration needed for successful fibroid ablation, providing a theoretical basis for optimizing treatment strategies and surgical management of UFs.

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T5-STCE2

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Tuesday, Dec. 2 1:15PM - 1:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

T5-STCE2-2 EXPLAINABLE AI FOR RADIOLOGY REPORT GENERATION: INTEGRATING VISUAL GROUNDING AND TEMPORAL COMPARISON FOR CLINICAL ACCEPTANCE

Zuby Syed, MD (*Presenter*)
Eun Kyoung Hong, MD, PhD (*Abstract Co-Author*)
SEUNGHO LEE (*Abstract Co-Author*)
Ok Kyu Song, MD (*Abstract Co-Author*)
Bardia Nadim, MD (*Abstract Co-Author*)
Chong Hyun Suh, MD, PhD (*Abstract Co-Author*)
Mark M. Hammer, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the clinical relevance of a multimodal AI system for radiologic report generation, assessing how visual grounding elements, such as bounding box accuracy and temporal comparisons, impact report quality, interpretability, and alignment with expert judgment.

METHODS AND MATERIALS

We used MAIRA-2 by Microsoft, an open-source model for chest radiograph report generation, to generate reports with visual grounding via bounding boxes and temporal comparisons leveraging prior images when available. Evaluation involved: (1) radiologist-scored report agreement and quality using RADPEER and Likert scales, (2) expert-centric assessments of bounding box and comparative statement accuracy, and (3) automated analyses of diagnostic accuracy and readability using reference standards and readability indices. NIH ChestX-ray14 dataset (122,120 images) was used for automated evaluations and a subset of 500 cases were used for expert review. We performed correlation analyses between report agreement and quality scores and key model performance metrics, including diagnostic accuracy, readability (word count and ORGL), bounding box accuracy, and comparative report accuracy. Statistical comparisons were performed using one-way ANOVA or Kruskal-Wallis tests, depending on data distribution.

RESULTS

AI-generated reports were rated as "Agreed" by 78-80% of two radiologists but only 22% by a third, indicating substantial inter-reader variability ($k = 0.05$). However, hallucination rates remained low (3-7%) with mild inter-reader agreement ($k = 0.22$). Reports with higher agreement had better bounding box alignment, with 64.0% of "Agreed" reports showing acceptable alignment vs. only 41.2% for non-agreed reports ($p < 0.001$). Reports with correct comparative findings and directional changes in relation to prior imaging had significantly higher "Agreed" rates (66.7%) compared to incorrect ones (34.9%) ($p < 0.001$). Reports rated "Excellent" had higher diagnostic accuracy (89.3%), lower word count (22.7 ± 13.5), and better readability (ORGL 13.1 ± 4.7), whereas lower rated reports had lower accuracy (84.8% and 84.1%), longer lengths (up to 38.6 ± 24.5 words), and lower readability scores (as low as 8.7 ± 2.1).

CONCLUSION

Accurate visual grounding, comparative statements, and reliable diagnostic performance were associated with higher report agreement and perceived quality.

CLINICAL RELEVANCE/APPLICATION

Improving visual grounding, temporal reasoning, and diagnostic accuracy may be key features for ensuring the quality of AI-generated radiology reports, supporting safer and more effective integration of generative AI into clinical workflows.

T5-STCE2-3 GENERALIST, SPECIALIST, OR AGENT? A COMPARATIVE EVALUATION OF GENERATIVE AI MODELS FOR CHEST RADIOGRAPH INTERPRETATION

Eun Kyoung Hong, MD, PhD (*Presenter*)
Ok Kyu Song, MD (*Abstract Co-Author*)
SEUNGHO LEE (*Abstract Co-Author*)
Seowoo Lee, MD (*Abstract Co-Author*)
Soon Ho Yoon, MD (*Abstract Co-Author*)

PURPOSE

To systematically compare state-of-the-art generative AI models for chest radiograph (CXR) interpretation, including general-purpose, domain-specific, and agent-based systems.

METHODS AND MATERIALS

A total of 112 chest radiographs from hospitals in US were interpreted using four AI models: Gemini 2.5 (a general-purpose large multimodal model), MAIRA-2 (a domain-specific report generation model), Harrison.ai (an agentic vision-language model for radiologic interpretation using commercially available classification tools), and MedRAX (an AI agent integrating diverse CXR analysis tools with multimodal reasoning capabilities). Two board-certified radiologists evaluated the reports in consensus using three criteria: (1) report acceptance without modification, (2) presence of hallucinations, defined as fabricated information not grounded in the image, and (3) per-case ranking of the best report among the four models. Additionally, we calculated the diagnostic accuracy of four AI-generated radiology report models by comparing model outputs to expert-defined reference standards.

RESULTS

Among the four models, Harrison.ai performed best overall with the highest acceptance (47.3%), lowest hallucination rate (5.4%), and was top-ranked in 56.3% of cases. MedRAX had the highest hallucination rate (54.5%) but was still top-ranked in 18.6%. Gemini 2.5 had low acceptance (13.4%) with a modest hallucination rate (10.7%), while MAIRA-2 showed moderate performance (24.1% acceptance, 20.5% hallucinations, 4.7% top-ranked). There were statistically significant differences in rates of acceptance ($p = 0.002$) and hallucination ($p < 0.001$) between the 4 models. Significant differences in diagnostic accuracy were observed across models for

consolidation, atelectasis, pulmonary edema, pleural lesion, and effusion ($p < 0.05$). For example, in pulmonary edema, Harrison.ai achieved an accuracy of 91.3% vs. 76.7% for Gemini, while in consolidation, MAIRA-2 reached 88.1% accuracy vs. 69.3% for MedRAX.

CONCLUSION

Substantial variability exists in the diagnostic reliability and clinical acceptability of generative AI models for chest radiograph interpretation. These results highlight the importance of rigorous evaluation to ensure the safe and effective clinical deployment of generative AI in radiology.

CLINICAL RELEVANCE/APPLICATION

Our findings highlight the need for a benchmarking platform designed to facilitate standardized and transparent evaluation of generative AI models in radiology. A curated dataset and dynamic evaluation pipeline incorporating both subjective and objective metrics will be released, enabling continuous improvement and fostering clinically relevant innovation.

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T6-SSCH06

Chest Imaging (Emphysema and Airways)

Tuesday, Dec. 2 1:30PM - 2:30PM Room: E451A

Jonathan G. Goldin, MD, PhD (*Moderator*)
Baskaran Sundaram, MD (*Moderator*)

Sub-Events

T6-SSCH06-2 CT-DERIVED QUANTITATIVE EMPHYSEMATOUS CHANGES AND DEEP LEARNING DERIVED VOLUMETRIC VERTEBRAL BONE LOSS IN NON-COPD INDIVIDUALS: A MULTILEVEL LONGITUDINAL ANALYSIS FROM MESA

Elena Ghotbi, MD (*Presenter*)
Quincy A. Hathaway, MD, PhD (*Abstract Co-Author*)
Payam Jannatdoust (*Abstract Co-Author*)
Roham Hadidchi, BS (*Abstract Co-Author*)
Michael Bancks (*Abstract Co-Author*)
David A. Bluemke, MD, PhD (*Abstract Co-Author*)
Matthew J. Budoff, MD (*Abstract Co-Author*)
Wendy Post (*Abstract Co-Author*)
Joao A. Lima, MD (*Abstract Co-Author*)
R. Graham Barr (*Abstract Co-Author*)
Shadpour Demehri, MD (*Abstract Co-Author*)

PURPOSE

Percent emphysema on chest CT is linked to adverse outcomes even in the absence of COPD. Although bone mineral density (BMD) loss is well established in COPD, it remains unclear whether subclinical emphysematous changes affect BMD in non-COPD individuals. This study evaluated associations between CT-derived percent emphysema and thoracic vertebral BMD, measured from the chest CT scans, in non-COPD participants.

METHODS AND MATERIALS

Using data from the Multi-Ethnic Study of Atherosclerosis (MESA), percent emphysema was quantified at Exam 5 as the percent of lung voxels with attenuation below -950 Hounsfield units (HU) on full-lung noncontrast chest CT. HU thresholds were adjusted for outside-air attenuation to standardize across scanners. Thoracic vertebral BMD was assessed at Exams 5 and 6 using a 3D deep learning-based segmentation of vertebral bodies T1-T10 using TotalSegmentator v2, with cortical bone excluded. BMD was calculated using reference phantom calibrations (0, 50, 100, 200 mg/cm³). COPD was excluded based on GOLD spirometry or self-report. Linear mixed-effects models with nested random effects for multilevel vertebra measures (T1-T10) and participant were used to assess associations, adjusting for demographics, BMI, smoking pack-years, alcohol, physical activity, corticosteroid use, and scanner type. Interactions by gender were tested. The Johnson-Neyman method identified threshold effects. Sensitivity analyses tested robustness.

RESULTS

The 6-week scan-rescan intraclass correlation coefficient (ICC) was 0.99 for percent emphysema. DL-based BMD segmentations showed strong agreement with manual labels (Dice: axial = 0.93; sagittal = 0.91). A total of 2,312 non-COPD individuals were included cross-sectionally and 1,142 longitudinally (mean age, 68.2 ± 8.9 years; 55% female; mean follow-up, 6.14 years). Cross-sectionally, percent emphysema was associated with lower BMD (ß = -0.94; 95% CI: -1.5, -0.32). Longitudinally, no overall association was observed (ß = -0.03; 95% CI: -0.10, 0.03), but significant gender interactions ($p < 0.001$) were identified. In stratified models, emphysema was associated with BMD loss in men (ß = -0.35; 95% CI: -0.45, -0.25). The Johnson-Neyman method identified 2.7% emphysema as a threshold for BMD decline in men. Results remained robust in sensitivity analyses.

CONCLUSION

Subclinical emphysema on chest CT is independently associated with lower vertebral BMD cross-sectionally and with greater longitudinal DL-derived volumetric vertebral BMD loss among non-COPD males.

CLINICAL RELEVANCE/APPLICATION

Quantification of emphysema may offer early insights into bone health in at risk patients without clinical COPD undergoing conventional chest CT for various cardiopulmonary indications.

T6-SSCH06-3 MULTI-VOLUME CT-DERIVED AIRWAY RESPIRATORY MECHANICS IN PRESERVED RATIO IMPAIRED SPIROMETRY (PRISM) AND DIFFERENT COPD SEVERITY GROUPS

Alejandro Comellas, MD (*Presenter*)
Syed Ahmed Nadeem, PhD (*Abstract Co-Author*)
Xinyu ZHANG (*Abstract Co-Author*)
Yan Liu (*Abstract Co-Author*)
Kung-Sik Chan (*Abstract Co-Author*)
Elizabeth A. Regan, MD,PhD (*Abstract Co-Author*)
Graham Barr, MD (*Abstract Co-Author*)
Eric A. Hoffman, PhD (*Abstract Co-Author*)
Sean B. Fain, PhD (*Abstract Co-Author*)
Punam K. Saha, PhD (*Abstract Co-Author*)

PURPOSE

Multi-volume CT-derived morphologic changes in airways between breath-hold lung inflation states at ends of inspiration and expiration offer an opportunity to quantify breathing-related mechanical properties of airways. We retrospectively study impairments of these respiratory airway mechanical properties in preserved ratio impaired spirometry (PRISm) and different COPD severity groups

METHODS AND MATERIALS

Our automated algorithms were applied to inspiratory and expiratory CT images to compute breathing-related radial expansion (? air-R) and along-the-length stretching (? air-S) of airways (Figure 1(a)). ? air-R is computed as the percentage change in cross-sectional area (CSA) at a matching airway between inspiratory and expiratory lung volumes. ? air-S is computed as the percent change in airway geodesic path-length from the carina to a specific matching airway between two lung volumes. ?-metric-specific mean value over segmental airways was computed for each participant of the Genetic Epidemiology of COPD (COPDGene) study Iowa cohort at baseline visits; exclusion criteria: never-smokers, BMI < 20 kg/m 2 or > 35 kg/m 2 , and missing data. A linear regression model was built for each ?-metric with age, sex, and BMI as predictor variables and the preserved lung function (PLF) group as the reference population. A participant- and ?-metric-specific standard residual (SR) score was computed as difference between observed and predicted values of a given ?-metric divided by the standard deviation (SD) of model residuals for the reference group. Summary statistics (mean and SD) as well as two-sample tests were used to assess the relationship of SRs of airway ?-metrics with COPD severity

RESULTS

Figure 1(b,c) presents box-and-whisker plots SRs or adjusted impairments in airway ?-metrics (n = 853; age (mean±SD): 64.2±8.3 years; 384 females; BMI: 27.9±3.6 kg/m 2). Statistics of ? air-R SRs for PLF, PRISm, and mild, moderate, and severe COPD groups were 0.00±1.00, -0.48±1.13, -0.55±1.15, -0.77±1.29, and -1.22±1.27, respectively, and that of ? air-S SRs were 0.00±1.00, -0.49±1.02, -0.34±1.08, -0.79±0.97, and -1.88±0.88, respectively. Adjusted impairments in ? air-R over different lung impairment groups were relatively more gradual as compared to ? air-S ; greater declines were observed at moderate and, particularly, at severe COPD. Although not statistically significant, for both airway ?-metrics, the median of PRISm group was lower than mild COPD

CONCLUSION

Age, sex, and BMI-adjusted impairments of respiratory airway mechanics significantly increased with COPD severity and impairments in PRISm were comparable to mild COPD

CLINICAL RELEVANCE/APPLICATION

Understanding of mechanistic pathways of airflow impairments at different stages of COPD

T6-SSCH06-4 PHENOTYPING COPD BY CT-DERIVED AIRWAY AND VASCULAR DYSANAPSIS

Stephanie Marie Aguilera, BSc (*Presenter*)
Arie Nakhmani (*Abstract Co-Author*)
Venkata Sthanam (*Abstract Co-Author*)
Pratim Saha (*Abstract Co-Author*)
Muhammad Faizyab Ali Chaudhary (*Abstract Co-Author*)
Surya P. Bhatt (*Abstract Co-Author*)
Sandeep Bodduluri, MS, PhD (*Abstract Co-Author*)

PURPOSE

Airway dysanapsis (mismatch between airway and lung size) is associated with incident COPD. However, it overlooks the potential role of pulmonary vessel size in COPD. Structural variations in pulmonary vascular anatomy relative to lung size may contribute to distinct COPD phenotypes that are not fully captured by current airway-based estimations and could influence disease severity, symptoms, and prognosis. We hypothesize that integrating the vascular-to-lung volume ratio (VLR) with the conventional airway-to-lung volume ratio (ALR) would uncover novel COPD subtypes with distinct clinical profiles.

METHODS AND MATERIALS

Inspiratory CT scans from subjects in the COPDGene study were included. ALR and VLR were estimated from lungs, airways, and pulmonary vasculature segmented from CT scans. Subjects were categorized into four groups based on ALR and VLR above/below 10th percentile of nonsmokers: (1) High ALR & High VLR (reference), (2) High ALR & Low VLR (vascular subtype), (3) Low ALR & High VLR (airway subtype), and (4) Low ALR & Low VLR (combined). Outcomes included lung function (FEV 1 , FEV1/FVC), six-minute walk distance (6MWD), annualized change in FEV1 , annualized change in adjusted lung density (ALD), and mortality. Statistical analyses included generalized linear regression and Cox proportional hazards regression after adjusting for age, sex, race, BMI, smoking status, pack-years, scanner type, and CT emphysema%, compared to the reference subtype.

RESULTS

Among 8,102 participants, compared to the reference subtype(n=3,952, 48.8%), the vascular subtype (n=1619, 20.1%) was associated with FEV1 reduction (ß=-0.04, p=0.03), FEV1/FVC decrease (ß=-0.02, p<0.001), 6MWD (ß=-8.7m, p<0.001), reduced ? FEV1 (ß= -5.2 mL/yr, p=0.02) and reduced ? ALD (ß= -0.52 g/L/yr, p=0.02). The airway subtype (n=1488, 18.2%) demonstrated even higher FEV1 reduction (ß=-0.51, p<0.001) and FEV1/FVC decrease(ß=-0.12, p<0.001), reduced ? FEV1 (-4.9 mL/yr, p=0.03),and reduced ? ALD (ß= -0.35 g/L/yr, p=0.001). The combined phenotype (n=1,043, 12.9%) showed the most significant worsened overall outcomes including FEV1 (ß=-0.48, p<0.001), FEV1/FVC (ß=-0.10, p<0.001), 6MWD (ß=-7.3m, p<0.001), reduced ? FEV1 (-9.4 mL/yr, p<0.001),and reduced ?ALD (ß= -0.90 g/L/yr, p<0.001). Mortality risk significantly increased in airway and combined subtypes with hazard ratios 1.4, and 1.5, respectively.

CONCLUSION

These findings provide insights into how the additional interplay of vascular remodeling may influence functional capacity and prognosis in COPD.

CLINICAL RELEVANCE/APPLICATION

Vascular dysanapsis is a novel phenotype that is distinct from airway dysanapsis and is associated with poor respiratory outcomes and higher mortality in COPD.

T6-SSCH06-5 QUANTITATIVE ANALYSIS OF PULMONARY EMPHYSEMA USING ELECTRON DENSITY IMAGES FROM PHOTON-COUNTING DETECTOR CT: CORRELATION WITH PULMONARY FUNCTION TESTS

Tomoaki Sasaki, MD (*Presenter*)
Hirofumi Kuno, MD, PhD (*Abstract Co-Author*)
Yoshihisa Muramatsu, PhD, RT (*Abstract Co-Author*)
Keiichi Nomura, PhD (*Abstract Co-Author*)
Keiju Aokage, MD, PhD (*Abstract Co-Author*)
Mikio Sakurai (*Abstract Co-Author*)
Masashi Wakabayashi (*Abstract Co-Author*)
Hideki Furuya (*Abstract Co-Author*)
Megumi Nishigaki (*Abstract Co-Author*)
Tatsushi Kobayashi, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the utility of electron density (ED) and effective atomic number (EZ) images generated with cadmium-zinc-telluride (CZT)-based photon-counting detector CT (PCD-CT) for quantitative assessment of pulmonary emphysema compared to virtual monochromatic images at 70 keV (VMI70), using pulmonary function tests as reference.

METHODS AND MATERIALS

Seventy-two adult patients (44 men, 28 women; 50 smokers, 22 never-smokers; median age 73 years, interquartile range 64-76 years) with written informed consent prospectively participated in a study evaluating lung tumors using a CZT-based PCD-CT. All patients underwent pulmonary function tests within two weeks of CT examination. CT images were acquired in a single-breath-hold helical mode (64 × 0.6 mm collimation, 120 kVp equivalence, 0.35-0.5 s/rotation) and reconstructed at

0.6-mm thickness for VMI70, ED, and EZ images.Lung segmentation was performed using the thresholds between -700 HU and -1024 HU) on VMI70. Normal lung was defined as voxels with CT values higher than -950 HU. For ED and EZ images, normal lung thresholds were determined by analyzing normal lung regions in a never-smoking reference patient, defined as mean minus two standard deviations (ED = 0.1664× 10^{23} electrons/cm^3, EZ = 4.4543). Emphysema ratio was calculated as 1-(normal lung voxel count/total lung voxel count) for VMI70, ED, and EZ images. Correlations between emphysema ratios and forced expiratory volume in one second percentage (FEV1.0%) were analyzed using Pearson correlation coefficients.

RESULTS

The emphysema ratio derived from ED images showed the strongest correlation with FEV1.0% (r=-0.652, p<0.001), followed by VMI70 (r=-0.577, p<0.001), while EZ showed the weakest correlation (r=-0.362, p=0.002). Scatter plots revealed that patients with low emphysema ratios on VMI70 images showed better differentiation on ED images, resulting in improved correlation with pulmonary function tests across the spectrum of disease severity.

CONCLUSION

Quantitative analysis of pulmonary emphysema using electron density images from photon-counting detector CT provides stronger correlation with pulmonary function tests compared to conventional CT density-based assessment, potentially improving the accuracy of emphysema quantification.

CLINICAL RELEVANCE/APPLICATION

Electron density images from photon-counting detector CT offer improved quantitative assessment of pulmonary emphysema that correlates better with clinical pulmonary function, potentially enhancing the role of CT in monitoring disease progression and treatment response in patients with chronic obstructive pulmonary disease.

T6-SSCH06-6 PREVALENCE OF EMPHYSEMA AMONG OLDER PEOPLE LIVING WITH HIV COMPARED TO HIV-NEGATIVE INDIVIDUALS IN THE COMBINED ANTIRETROVIRAL THERAPY ERA: A CT-BASED ANALYSIS

Yanisa Jarusyingdumrong, MD (*Presenter*)
Monravee Tumkosit, MD (*Abstract Co-Author*)
Teerapat Singwicha (*Abstract Co-Author*)
Anchalee Avihingsanon (*Abstract Co-Author*)
Napon Hiranburana (*Abstract Co-Author*)
Siwat Thammapiwan (*Abstract Co-Author*)

PURPOSE

To compare the prevalence of emphysema in older people living with HIV (PLWH) and HIV-negative individuals during the era of combined antiretroviral therapy (cART) and to identify factors associated with emphysema in PLWH.

METHODS AND MATERIALS

This cross-sectional study utilized data from participants aged 50 years and older, enrolled in a previous study who underwent non-contrast computed tomography (CT) scans to assess coronary artery calcium scores between March 2016 and June 2017. Chest CT images were evaluated for emphysema both visually and quantitatively. Visual assessment was performed independently by two radiologists using the Fleischner Society classification (agreement: 87.7%; ? = 0.48, 95% CI: 0.42-0.54, p < 0.001), and quantitative assessment was based on the low attenuation area below -950 Hounsfield units (LAA-950). Poisson regression was used to calculate risk ratios, adjusting for age, sex, body mass index (BMI), and smoking status. Logistic regression was used to calculate odds ratios.

RESULTS

479 participants (335 PLWH, 144 HIV-negative) were analyzed. Among PLWH, the median duration on cART was 18 (IQR 13-19) years. Of these, 98.51% had a current CD4 of =200 cells/mm^3 and 97.90% were virally suppressed. The adjusted prevalence (95%CI) of visual emphysema in PLWH and HIV-negative group were 12.1% (9.1-15.1) and 10.1% (5.2-15.1), respectively (risk ratio = 1.19, 95%CI 0.68-2.10, p = 0.535). Visual scores correlated weakly with LAA-950 (Spearman's ? = 0.22, p < 0.001). Only 3.28% of PLWH and 1.39% of HIV-negative group had LAA-950 =6%. Factors associated with emphysema in PLWH were age (OR 1.14, p < 0.001), BMI (OR 0.82, p = 0.006), current smoking (OR 21.24, p < 0.001), years on cART (OR 0.91, p = 0.035), and pulmonary tuberculosis (TB) history (OR 3.86, p = 0.043).

CONCLUSION

In the cART era, emphysema prevalence did not differ significantly between PLWH and HIV-negative individuals. Among PLWH, current smoking, pulmonary TB history, lower BMI, and older age were linked to higher odds of emphysema, while longer cART duration was linked to lower odds. Visual assessment showed only moderate interobserver agreement and weak correlation with quantitative measures, highlighting the need to refine classification - e.g., through more reference images, reassessing clinical relevance of categories, and adjusting quantitative thresholds.

CLINICAL RELEVANCE/APPLICATION

With advances in ART, the pulmonary profile of PLWH may be shifting. This study challenges older reports of increased emphysema in PLWH and underscores the value of sustained and effective treatment. Given current limitations in CT-based classification, combining visual and quantitative assessments with clinical context remains essential.

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T6-SSIR02

Science Session with Keynote: Interventional Radiology (Expanding the Scope of Interventional Oncology)

Tuesday, Dec. 2 1:30PM - 2:30PM Room: E352

Alda L. Tam, MD (*Moderator*)
Frank K. Wacker, MD (*Moderator*)

Sub-Events

T6-SSIR02-1 ABLATION WITHOUT COAGULATION? MANAGING PORTAL VEIN THROMBOSIS AFTER HISTOTRIPSY

Aadithya Nalla, BS (*Presenter*)
Nathan E. Loudon, MD (*Abstract Co-Author*)
Valerie Khaykin (*Abstract Co-Author*)
Andrew Navarro, MD (*Abstract Co-Author*)
Elaine M. Caoili, MD, MS (*Abstract Co-Author*)
Neehar Parikh, MD (*Abstract Co-Author*)
Mishal Mendiratta-Lala, MD (*Abstract Co-Author*)

PURPOSE

Histotripsy is a novel non-invasive, non-thermal liver tumor ablation technique, with a unique property of tissue selectivity, sparing critical structures such as bile ducts and vessels from injury. Unlike other forms of treatment, histotripsy can be used to treat centrally located hepatic tumors. Despite tissue selectivity that spares central structures, we observed a pattern of acute bland portal vein thrombosis (PVT) following histotripsy of central lesions. This study investigates the mechanism and incidence of histotripsy-induced PVT and evaluates a procedural anticoagulation strategy to mitigate thrombus formation.

METHODS AND MATERIALS

An IRB approved HIPAA compliant retrospective analysis was conducted of 40 patients treated with histotripsy from February 2024 to February 2025. Fourteen patients with tumors abutting major portal or hepatic veins met inclusion criteria. Immediate and 30-day post-treatment contrast-enhanced CT or MRI were reviewed to identify PVT formation and resolution. An iterative anticoagulation protocol was introduced in four escalating phases: no anticoagulation, pre-procedure bolus, bolus at cavitation initiation, and finally, a weight-based therapeutic bolus followed by a continuous heparin infusion during cavitation. Statistical analyses examined correlations between PVT formation and treatment parameters (pre-treatment tumor size, ablation zone size, tumor type, cavitation voltage).

RESULTS

13 patients (11 male, 2 female; mean age 60 years (range 45-85)) had 14 centrally located tumors treated with histotripsy. 6 (43%) treated tumors resulted in bland, non-occlusive PVT post-treatment although anti-coagulation dose-escalation resulted in decreased PVT volume. Patients who received the maximum dose of therapeutic weight-based bolus plus continuous infusion (n=6) during histotripsy cavitation showed no evidence of PVT on post-treatment imaging. No significant correlations were found between PVT and tumor type, pre-treatment size, post-treatment ablation zone size, or treatment voltage. All patients with PVT showed full or partial resolution by 30 days with no long-term hepatic sequelae.

CONCLUSION

Our findings suggest that histotripsy-induced cavitation near major portal vessels may cause endothelial stress and initiate thrombus formation. Continuous intraprocedural anticoagulation effectively prevents this complication. Continued research is warranted to optimize histotripsy protocols and ensure patient safety.

CLINICAL RELEVANCE/APPLICATION

Histotripsy offers a safe and effective alternative to thermal ablation for centrally located liver tumors. Protocolized anticoagulation during treatment can mitigate the risk of bland PVT and enhance patient safety.

T6-SSIR02-2 BIODEGRADABLE STENTS FOR BILIARY STRICTURES AFTER PEDIATRIC LIVER TRANSPLANTATION: A MULTICENTER EXPERIENCE

Paolo Marra, MD (*Presenter*)
Daniel Barnes, MD (*Abstract Co-Author*)
Lucia Fernandez Rodriguez, BMBS (*Abstract Co-Author*)
Simon P. McGuirk, MBBS (*Abstract Co-Author*)
Giulio Barbiero (*Abstract Co-Author*)
Riccardo Muglia, MD (*Abstract Co-Author*)
Sandro Sironi, MD (*Abstract Co-Author*)

PURPOSE

Biodegradable biliary stents are commonly used to treat benign biliary strictures in adults. However, there is limited data regarding their use in pediatric patients. This study aims to assess the efficacy and safety of biodegradable biliary stents following pediatric liver transplantation (pLT).

METHODS AND MATERIALS

Consecutive pLT patients with benign biliary strictures were retrospectively evaluated in five tertiary centers between October-2014 and May-2024. All patients underwent percutaneous bilioplasty followed by the placement of selfexpandable polydioxanone-based stents. Stricture features and treatment timing were assessed, as well as freedom from stricture recurrence and complications.

RESULTS

A total of 102 patients (52 males, 50 females; median age at treatment 5 years, IQR=9 years) were included. At baseline, 58/102 (57%) had a stricture length =10 mm and 53/102 (52%) had intrahepatic ducts involvement. Stenting was done after a median of 55 days (IQR=113 days) from biliary drainage. Technically successful stent placement was achieved in 101/102 (99%) cases and low-grade complications occurred in 19/102 (19%). During a median follow-up of 793 days (IQR = 1188.5 days),

24/102 (24%) patients had stricture recurrence with an estimated median time to recurrence of 2915 days. At logistic regression no factors were independent predictors of stricture recurrence, while Cox regression showed that recoil/residual stenosis was independently associated with earlier recurrence (p=0.005; HR=5.334; 95 CI=1.674-17).

CONCLUSION

Biodegradable stents appear safe and effective for treating biliary strictures after pLT. Certain factors may contribute to failure and should inform patient selection and the optimal timing for stenting.

CLINICAL RELEVANCE/APPLICATION

Biodegradable biliary stents may improve the management of biliary strictures after pediatric liver transplantation with a positive impact on outcomes and less invasiveness; some factors may help to predict the outcome and define the best timing for stenting.

T6-SSIR02-3 TRANSARTERIAL PERIARTICULAR EMBOLIZATION WITH IMIPENEM/CILASTATIN IN 100 PATIENTS WITH CHRONIC JOINT PAIN: A MONOCENTRIC PROSPECTIVE SAFETY PROFILE ANALYSIS

Verena Schaefer, MD (*Presenter*)
Isabella Kuhn (*Abstract Co-Author*)
Fabian Christoph Traub (*Abstract Co-Author*)
Georg Siebenburger (*Abstract Co-Author*)
Fabian Gilbert (*Abstract Co-Author*)
Max Seidensticker (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Paul Reidler, MD (*Abstract Co-Author*)
Daniel Puhr-Westerheide, MD (*Abstract Co-Author*)

PURPOSE

To assess the safety profile of transarterial periarticular embolization (TAPE) using imipenem/cilastatin (I/C) in patients with chronic joint pain caused by adhesive capsulitis, osteoarthritis, chronic pain following partial or total knee arthroplasty (P-/TKA), and epicondylitis.

METHODS AND MATERIALS

In this prospective single-center study, 100 patients (45% male) with chronic joint pain underwent TAPE using I/C. Indications included chronic knee osteoarthritis (n=57), chronic shoulder pain (n=25), chronic pain post-P-/TKA (n=12), epicondylitis (n=3), rhizarthritis (n=1), and chronic ankle pain (n=2). Among 15 patients with adhesive capsulitis, 14 received shoulder joint capsule biopsies (2 MR-guided, 12 ultrasound-guided) to assess inflammatory changes. TAPE was performed via transfemoral access in n=79 or transradial access in n=21. Adverse events were classified according to the Society of Interventional Radiology (SIR) classification (A-D).

RESULTS

The overall complication rate of embolizations was low (23%), with 96% categorized as minor (SIR A, B). Minor events included intraprocedural pain requiring pain medication (SIR B, n=10), puncture site pain (SIR A, n=3), transient high systolic blood pressure requiring therapy (SIR B, n=1), vasovagal reaction managed with atropine (SIR B, n=3), iodine contrast allergy (SIR B, n=1), groin hematoma (SIR A, n=1), and superficial skin infection at the puncture site (SIR B, n=1). Only one major complication (SIR C) occurred: thrombus formation in the common femoral artery during a vasovagal reaction with hypoperfusion, successfully treated with local thrombolysis using t-PA. The patient was observed for < 48 h and received a digital subtraction angiography control 24 hours after the initial event. All patients experienced transient, self-limiting skin discoloration near the embolized joint, resolving completely within 4 hours.

CONCLUSION

TAPE with imipenem/cilastatin shows an excellent safety profile for treating chronic joint pain of various etiologies, with mostly minor, well-controlled adverse events except for n=1 major complication (SIR C) without sequelae.

CLINICAL RELEVANCE/APPLICATION

TAPE is a safe, minimally invasive therapeutic option that may significantly enhance quality of life in patients with chronic joint pain refractory to conservative treatment.

T6-SSIR02-4 AUTOCATALYTIC PICKERING EMULSION MODULATES TUMOR METABOLISM AND ENHANCES TACE EFFICACY IN HCC THERAPY

Feier Ding, PhD (*Presenter*)
Lin-Zhu Zhang (*Abstract Co-Author*)
Hai-Dong Zhu, MD,PhD (*Abstract Co-Author*)

PURPOSE

Hepatocellular carcinoma (HCC) exhibits an immunosuppressive tumor microenvironment (TME), limiting treatment efficacy. Pyroptosis, an immunogenic cell death mechanism, can remodel the TME but remains challenging to induce effectively. Here, we developed glucose oxidase (GOx)-loaded CoF2 nanoparticles (GOCoF2) to simultaneously disrupt glycolysis and trigger pyroptosis. Combined with lipiodol in a Pickering emulsion, this strategy enhances transarterial chemoembolization (TACE) for HCC therapy.

METHODS AND MATERIALS

GOCoF2 was synthesized by thermal decomposition and self-assembly of CoF2 NPs with GOx, followed by DSPE-PEG2000-NH2 modification. Material characterization was performed using XRD, while ROS, cell death, and immune responses were analyzed via flow cytometry. Pyroptotic cell morphology was observed by confocal microscopy, and transcriptomic profiling (RNA-seq) revealed therapeutic mechanisms. Glucose levels were quantified using a commercial assay. In vivo efficacy was evaluated in SD rats and BALB/c mice through MRI and optical imaging.

RESULTS

GOCoF 2 NPs, synthesized via high-temperature thermal decomposition, effectively induced pyroptosis in H22 cells by depleting glucose and generating ROS. This mechanism was validated through XRD, flow cytometry, and Western blot analysis (Fig. A-G) . In vivo studies using H22 tumor-bearing mice demonstrated that GOCoF 2 treatment significantly inhibited tumor growth, outperforming the effects of GOx or CoF 2 alone (Fig. H&I) . Furthermore, GOCoF2 promoted dendritic cell (DC) maturation and enhanced CD8 + T cell infiltration within the tumor microenvironment, thereby bolstering antitumor immunity (Fig. J&K) . RNA transcriptome analysis revealed significant enrichment of inflammatory and metabolic pathways, indicating the induction of tumor pyroptosis and metabolic reprogramming following treatment (Fig. L) . Additionally, GOCoF2 augmented the therapeutic efficacy of TACE in a rat orthotopic liver cancer model, underscoring its potential for interventional therapy (Fig. M) . These findings underscore the dual role of GOCoF 2 in modulating tumor metabolism and immune responses, offering a promising strategy for enhancing cancer treatment.

CONCLUSION

This study presents an inorganic nanozyme that disrupts tumor glucose metabolism to induce pyroptosis and remodel the immunosuppressive microenvironment. By combining metabolic modulation with immunotherapy, GOCoF2 offers a new bioactive material design for enhanced TACE therapy in liver cancer, surpassing conventional approaches.

CLINICAL RELEVANCE/APPLICATION

Developing a novel GOCoF2-Pickering emulsion for TACE therapy in orthotopic liver cancer models with strong clinical translation potential.

T6-SSIR02-5 MR-GUIDED TRANSURETHRAL ULTRASOUND ABLATION (TULSA): SINGLE CENTER OUTCOMES IN 160 PATIENTS WITH ORGAN-CONFINED PROSTATE CANCER

Joseph J. Busch, MD (*Presenter*)
Busch Kathy (*Abstract Co-Author*)
Roland Rose (*Abstract Co-Author*)
Jessica Pendergraft (*Abstract Co-Author*)
Amanda Sdrigotti (*Abstract Co-Author*)

PURPOSE

MRI-guided transurethral ultrasound ablation (TULSA) uses an ultrasound blade and live MRI monitoring for subtotal to whole-gland treatment of prostate cancer (PCa) with precise sparing of structures associated with sexual and urinary function. We report outcomes from the largest U.S. single-center series of TULSA in 160 patients with primary or recurrent PCa.

METHODS AND MATERIALS

A retrospective analysis included patients with organ-confined PCa and at least 3 months post-TULSA follow-up. Treatment plans were defined using a patient-centered approach based on clinical stage, areas of biopsy-proven disease, lower urinary tract symptoms, and lesion targetability on intraoperative DWI, ADC, and T2-w MRI. High-grade PCa with negative PSMA-PET were included after counseling. Patients were followed daily for 2 weeks, PSA q3mo, with MRI, IPSS, IIEF at 6-9 months. Radiologic recurrence was defined as PI-RR=4 on mpMRI, or positive PSMA-PET after PI-RR=3. Biochemical recurrence (BCR) was defined as nadir + 2 ng/ml.

RESULTS

160 patients (138 treatment-naïve, 17 post-ablation and 5 post-radiation) had a median follow-up of 12 (9-18) months. Grade Group 1-5 PCa distributions were: 12%, 47%, 25%, 10%, 6%. Median prostate volume: 48cc (IQR 35-68, range 12-160). Whole-gland ablation was done in 59% of men, with uni- and bilateral NVB sparing in 18% and 31%; only 20% were less than hemi-gland. The extreme apex was targeted in 26%. PSA nadirs after whole-gland vs. subtotal ablation were 0.6 (0.6-1.1) and 1.5 (0.8-2.7) ng/mL. Negative MRI (PI-RR 1-3) was observed in 92% of patients; 89% (142/160) are free of radiologic and biochemical recurrence; three men underwent repeat TULSA. One BCR case lacked imaging follow-up. 8/13 radiologic recurrences are BCR-free and remain on surveillance. 4/13 failures were out-of-field, 4/13 had residual disease near ejaculatory duct sparing (now discontinued). Remaining failures occurred where either MRI thermometry or ultrasound propagation was compromised by calcifications or motion. LUTS, mild hematuria, or bladder spasms in 11 men resolved within 4 weeks with oral meds. Three required endoscopic intervention for retention/obstruction/stricture. Urinary symptoms (IPSS) were stable. Two had early post-op urine leakage, 100% are pad-free >4 months. 88% maintained erection sufficient for penetration (IIEF Q2=2).

CONCLUSION

TULSA with patient-centered ablation plans shows promising real-world efficacy and safety. Ongoing optimization of patient selection and technique may further improve treatment across all ablation plans.

CLINICAL RELEVANCE/APPLICATION

This large U.S. single-center series shows that MRI-guided TULSA is a safe, effective, and customizable treatment for primary or recurrent prostate cancer.

T6-SSIR02-6 Keynote Speaker

Frank K. Wacker, MD (*Science Invited Presenter*)

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

T6-SSMS02

Multisystem (Artificial Intelligence Applications and Quantitative CT)

Tuesday, Dec. 2 1:30PM - 2:30PM Room: E353B

Yueh Z. Lee, MD, PhD (*Moderator*)
M. Milagros Otero-Garcia, MD, PhD (*Moderator*)

Sub-Events

T6-SSMS02-1 ABDOMENATLAS X: A LARGE-SCALE, SEMI-SYNTHETIC DATASET FOR ABDOMINAL TUMOR SEGMENTATION IN SOLID AND TUBULAR ORGANS

Alan Yuille, PhD (*Presenter*)
Qi Chen (*Abstract Co-Author*)
Zongwei Zhou, PhD (*Abstract Co-Author*)

PURPOSE

To establish a large-scale, high-quality annotated abdominal tumor dataset by significantly augmenting existing tumor data and providing extensive annotations for numerous additional tumor types previously unavailable.

METHODS AND MATERIALS

We developed AbdomenAtlas X, a comprehensive annotated multi-tumor dataset comprising 10,136 three-dimensional CT volumes collected from 89 hospitals, resulting in 91,224 high-quality per-voxel tumor masks covering solid and tubular organs. Significantly, AbdomenAtlas X introduces the first publicly available annotated examples of esophageal cancer and endometriomas, thereby facilitating AI model development for these rare tumor types. The annotation process involved 10 radiologists from institutions across China, including 4 senior radiologists with 10-16 years of experience and 6 junior radiologists with 5-8 years of experience. To further expand tumor data beyond conventional manual annotation limits, we implemented an advanced generative diffusion model, trained on both public and proprietary datasets, capable of synthesizing highly realistic tumors within CT volumes. A dedicated tumor discriminator was concurrently developed to rigorously ensure the realism and clinical validity of the synthetic tumors. Additionally, four expert radiologists independently conducted comprehensive visual inspections to validate the synthetic data quality.

RESULTS

AbdomenAtlas X is the largest fully annotated public abdominal tumor dataset to date, comprising 10,136 CT volumes with detailed annotations of six tumor types. Generative AI was responsible for synthesizing 90% of tumor examples, complemented by 10% real tumors annotated by medical professionals. Our model trained on AbdomenAtlas X achieved excellent performance and ranked first in the MSD challenge, leading to substantial improvements over previous state-of-the-art methods. Specifically, our model improved liver tumor DSC by 3.2% and NSD by 3.5%; pancreatic tumor DSC improved by 4.9% and NSD by 3.1%.

CONCLUSION

AbdomenAtlas X significantly advances tumor detection and segmentation, particularly at early stages. Our results highlight the efficacy of Generative AI techniques in creating realistic, large-scale annotated medical datasets, considerably reducing the workload on expert radiologists, and establishing a practical, scalable model for future dataset expansion.

CLINICAL RELEVANCE/APPLICATION

AbdomenAtlas X will be publicly accessible, enabling significant advancements in multi-tumor detection and segmentation research. It holds promise for improving early detection and understanding of imaging phenotypes related to various critical diseases, including cancer, diabetes, and cardiovascular conditions.

T6-SSMS02-2 TURNING CT SLICES INTO A STORY: HOW VIDEO-INSPIRED AI IS HELPING US TRAIN SMARTER CANCER DETECTORS

Zongwei Zhou, PhD (*Presenter*)
Qi Chen (*Abstract Co-Author*)
Wenxuan Li, BS (*Abstract Co-Author*)
Xinze Zhou (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

To explore whether synthetic CT scans can improve tumor detection by mimicking how radiologists and AI interpret anatomy across slices—much like understanding motion in a video sequence.

METHODS AND MATERIALS

We introduce Tumor Genesis, a generic tumor synthesis approach inspired by video sequence analysis. Built upon the Latent Diffusion Model (LDM) architecture, our method synthesizes tumors and organ structures conditioned on anatomical masks. A pre-trained VAE is used to encode CT volumes into a latent space, followed by a denoising U-Net trained to recover tumor-augmented volumes via a forward diffusion process. The model is optimized with a mask-conditioned MSE loss and trained with a missing-class strategy that allows flexible tumor generation during inference. To ensure realistic generation, we enforce 3D anatomical consistency through (i) shape consistency constraints that align tumor and organ masks across slices, and (ii) texture consistency using axial attention layers and sequential residual learning to maintain inter-slice coherence. To overcome GPU memory limitations during inference, we implement a sliding-window inpainting strategy across the z-axis, allowing full-volume synthesis with spatial overlap handling.

RESULTS

Tumor Genesis produces synthetic tumors with highly realistic appearance and structural coherence, each automatically paired with per-voxel annotations. A visual Turing test was conducted involving four radiologists with 5 (R1), 7 (R2), 12 (R3), and 20 (R4) years of clinical experience. The average specificity across all six tumor types was 19.6%, indicating the difficulty in distinguishing synthetic tumors from real ones. Notably, even senior radiologists R3 and R4 achieved only 16.4% and 40.5% specificity, respectively. Training AI models with our synthetic tumors led to significant performance gains in both detection and segmentation tasks. For tumor detection, AI models trained with synthetic data achieved sensitivities of 83.7% (liver), 96.0% (pancreas), 100% (kidney), 96.2% (colon), 96.2% (esophagus), and 95.8%

(uterus). For tumor segmentation, the corresponding Dice Similarity Coefficients (DSC) were 77.5%, 65.8%, 87.9%, 50.7%, 61.2%, and 80.1%, showing improvements over models trained on real data by 4.9%, 8.8%, 3.1%, 3.6%, 7.3%, and 1.4%, respectively.

CONCLUSION

Synthetic tumor generation based on CT slice consistency offers a scalable and practical way to improve AI performance in tumor detection and generalization.

CLINICAL RELEVANCE/APPLICATION

This method enables the creation of diverse, annotated CT datasets without the need for manual annotations, making it especially valuable for training AI in rare cancers, early detection, and across different imaging centers.

T6-SSMS02-3 UNIVERSAL DEEP LEARNING SEGMENTATION OF THIRD SPACE FLUIDS ON BODY CT

Sayantan Bhadra, PhD (*Presenter*)
Jianfei Liu (*Abstract Co-Author*)
Tejas Sudharshan Mathai, PhD, MS (*Abstract Co-Author*)
Praveen Thoppey Srinivasan Balamuralikrishna, MBBS (*Abstract Co-Author*)
Vivek Batheja (*Abstract Co-Author*)
Nicholas Lee, MD (*Abstract Co-Author*)
Pritam Mukherjee, PhD (*Abstract Co-Author*)
Anthony F. Suffredini, MD (*Abstract Co-Author*)
Ronald M. Summers, MD, PhD (*Abstract Co-Author*)

PURPOSE

Excessive accumulation of “third space” fluids is associated with multiple organ dysfunctions. 3D image segmentation on CT scans can be a direct and non-invasive way to quantify the accumulated third space fluid and improve the fluid management of critically ill patients in the ICU. Different types of third space fluid often co-exist in patients; yet, to our knowledge, no automated method exists that can quantify all major third space fluids (subcutaneous edema, ascites, pleural effusion, pericardial effusion). We propose a deep learning model that segments all primary third space fluids using weakly supervised learning.

METHODS AND MATERIALS

In this retrospective study, we used a dataset of anasarca patients (2014-2018), consisting of 769 CT scans from 455 patients aged 5-81 years. We randomly selected n = 200 CT scans (166 patients) as the training dataset. The internal test dataset consisted of n = 77 scans of 77 in-patients with multiple recorded visits but including only the first recorded scan. We also included an external CT test dataset of liver cirrhosis patients with visible subcutaneous edema (n = 44) to evaluate generalization of edema segmentation performance. We used nnU-Net with weakly supervised learning and iterative annotation for an initial set of n = 50 training CT scans, using subcutaneous edema labels from a state-of-the-art method [EdemaCT] and pseudo-labels of ascites (Hou et al. , 2024) [Ascites nnU-Net], pleural and pericardial effusion [TotalSegmentator (TS)]. Anatomical priors were included to minimize false positives. After training, we applied entropy-based pseudo-labeling (Wang et al. , 2022) to generate labels for the remaining n = 150 training CT scans and trained the final nnU-Net using n = 200 CT-label pairs.

RESULTS

The proposed method significantly reduced false positive edema labels compared to EdemaCT, with improved Dice scores measured against expert annotations on a single slice per CT scan: internal test [Proposed (61.0 +/- 17.0)% vs EdemaCT (57.4 +/- 15.6)%; p = 0.015] and external test [Proposed (58.0 +/- 18.7)% vs EdemaCT (40.2 +/- 18.6)%; p < 0.001]. The predicted volumes of ascites, pleural and pericardial effusion on the internal test dataset had high correlation with Ascites nnU-Net and TS (r 2 = 0.98, 0.95 and 0.86 respectively). Bland-Altman plots demonstrated a bias in the segmentation of ascites and pericardial effusion for higher volumes, indicating reduced false positives or under-segmentation by the proposed method.

CONCLUSION

We created the first universal model that detects all major sites of third spacing on CT scans.

CLINICAL RELEVANCE/APPLICATION

This model may be clinically useful for fluid management and monitoring the disease progression of critically ill patients with major organ failure.

T6-SSMS02-4 OPPORTUNISTIC OSTEOPOROSIS ASSESSMENT FROM ROUTINE CT - EFFECT OF INTRAVENOUS CONTRAST AGENTS ON ABSOLUTE VALUES, T-SCORES, AND DERIVED CLASSIFICATIONS IN SINGLE- AND DUAL-ENERGY CT

Leon D. Gruenewald, MD (*Presenter*)
Vitali Koch, MD (*Abstract Co-Author*)
Scherwin Mahmoudi, MD (*Abstract Co-Author*)
Simon S. Martin, MD (*Abstract Co-Author*)
Jan-Erik Scholtz, MD (*Abstract Co-Author*)
Jennifer Gotta, MD (*Abstract Co-Author*)
Philipp Reschke, MD (*Abstract Co-Author*)
Thomas J. Vogl, MD, PhD (*Abstract Co-Author*)

PURPOSE

To assess the impact of intravenous contrast agents on opportunistic osteoporosis assessment via routine CTs in arterial and venous phases and identify mitigation strategies using dual-energy CT (DECT).

METHODS AND MATERIALS

288 patients (154 men, 134 women; median age 62 years; interquartile range 42-81) who underwent abdominal dual-energy CT (DECT) scans in non-contrast, late-arterial, and portal venous phases between January 2018 and December 2023 were retrospectively analyzed. Trabecular HU values were measured in all phases, including 90kV and 150kV DECT series, using automatic segmentation. T-scores were calculated to classify patients as osteoporotic, osteopenic, or normal. Changes in HU values, T-scores, and classifications due to contrast were compared to non-contrast images, and effects were quantified using Cohen’s d.

RESULTS

The median trabecular HU value at L1 was 147 (IQR 116 - 185). Contrast application in late arterial and portal venous phases increased HU values by +14.4 (+11.2%) and +25.7 (+20.7%), respectively. Using 150kV DECT series reduced these changes to -20.5 (-12.2%) for arterial phases and -23.15 (-12.6%) for venous phases. Cohen’s d was lowest for normal arterial phase acquisition (+0.55) and highest for 90 kV arterial phase acquisition (+1.9). Based on calculated T-Scores, 120 patients were classified as healthy, 108 patients as osteopenic, and 60 patients as osteoporotic. The lowest number of total reclassifications was observed for arterial phase acquisitions (n = 92) and venous phase acquisitions (n = 104). For arterial phase acquisitions, 44 patients were classified from osteoporosis to osteopenic, and for venous phase acquisitions, 52 patients were classified from osteoporosis to osteopenia. The number of reclassifications from osteoporosis to osteopenia significantly reduced for high-kV acquisition methods (n = 24 for arterial and n = 32 for venous phase, respectively), but increased reclassifications from healthy to osteopenia.

CONCLUSION

Intravenous contrast significantly alters HU-based osteoporosis assessment. Late arterial and portal venous phase imaging can lead to significant reclassification from osteopenia to healthy. Employing 150 kV DECT series can partially mitigate these reclassifications but will incorrectly shift healthy classifications toward osteopenia.

CLINICAL RELEVANCE/APPLICATION

Despite suggestions that intravenous contrast agents do not affect opportunistic osteoporosis assessments, we demonstrate significant patient reclassifications from osteoporosis to less severe categories upon contrast application. This underscores the necessity of using dedicated normative values for osteoporosis diagnosis based on contrast-enhanced examinations.

T6-SSMS02-5 REAL-WORLD RADIATION DOSE AUDIT OF PHOTON-COUNTING DETECTOR AND ENERGY-INTEGRATING DETECTOR CT SCANNERS: RESULTS FROM UNBIASED, CONSECUTIVE, AND NON-EXCLUSIONARY DATA

Seyedehelaheh Hosseini, MD (*Presenter*)
Anushree M. Burade, MBBS (*Abstract Co-Author*)
Javier Contreras Yametti, MD (*Abstract Co-Author*)
Parisa Kaviani, MD (*Abstract Co-Author*)
Lina Karout, MD (*Abstract Co-Author*)
Shivangi Jha (*Abstract Co-Author*)
Aaminah Kobeisy, MBBS (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)

PURPOSE

To audit and compare CT output doses from photon-counting detector (PCCT) and energy-integrating detector CT (EICT) scanners using a real-world, unbiased, consecutive, and non-exclusionary data in 15493 examinations from 14237 patients.

METHODS AND MATERIALS

Our study included all consecutive 15439 CT examinations of chest (n= 6272) and abdomen-pelvis (n= 9221) from 14237 adult patients (age range: 0.2-124 years; female: male 7851:6428) on third-generation, dual-source PCCT (Siemens NAEOTOM Alpha: n = 1619 examinations), third-generation, dual-source EID CT (Siemens SOMATOM Force: n = 7779) and/or 512-row, single-source EID (GE Revolution: n = 6095). The acquisition protocols included routine chest CT, CT pulmonary angiogram, lung cancer screening , incidental lung nodule follow-up, routine abdomen CT, non-contrast kidney stone CT, and biphasic liver protocol CT. We recorded the following metrics for analysis: age, gender, CT acquisition protocol name, water equivalent diameter [WED], dose-length product [DLP], and size-specific dose estimates [SSDE]. After testing data normalcy, we performed Kruskal-Wallis and Mann-Whitney tests to assess acquisition protocol, WED, and body region-specific comparison of DLP, and SSDE between the PCCT and EICT scanners.

RESULTS

The dose distribution for the three scanner types for chest and abdomen CT was: Chest CT - PCCT (DLP 182 mGy.cm; SSDE 6 mGy), EICT-Force (DLP 389 mGy.cm; SSDE 12 mGy), EICT-Revolution (DLP 351 mGy.cm; SSDE 12 mGy), abdomen CT - PCCT (DLP 604 mGy.cm; SSDE 14 mGy), EICT-Force (DLP 610 mGy.cm; SSDE 15 mGy), EICT-Revolution (DLP 793 mGy.cm; SSDE 19 mGy). Although there was a strong statistical difference between doses associated with PCCT and EICT for both chest and abdomen-pelvis CT ($p<0.001$), we found no significant difference between the size (WED, $p>0.32$) of patients scanned on the three scanner types.

CONCLUSION

Regardless of patient age, gender, body size, body part imaged, and protocol type, our consecutive, non-exclusionary data demonstrates up to 51% lower radiation dose for chest CT and 14% lower dose for abdomen-pelvis CT with PCCT relative to EICT.

CLINICAL RELEVANCE/APPLICATION

We provide key information on radiation dose reduction with PCCT over multi-vendor EICT scanners regardless of patient and protocol characteristics.

T6-SSMS02-6 AI ALGORITHMS CAN ASSIST RADIOLOGISTS IN DETECTION AND SEGMENTATION OF TUMORS IN UTERUS AND ESOPHAGUS THROUGH NON-CONTRAST ENHANCED CT IMAGES

Zongwei Zhou, PhD (*Presenter*)
Qi Chen (*Abstract Co-Author*)
Zekun Jiang, PhD (*Abstract Co-Author*)
Wenxuan Li, BS (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the effectiveness of AI algorithms for detecting and localizing pathologically confirmed esophageal and uterine tumors on CT scans by publicly releasing a carefully annotated, pathologically validated dataset for open-source AI model development.

METHODS AND MATERIALS

We retrospectively collected and annotated 233 non-contrast-enhanced CT scans from a Chinese hospital, comprising 154 esophageal tumor cases and 79 uterine tumor cases. Annotation involved 10 radiologists, including 4 senior radiologists with 10-16 years of clinical experience and 6 junior radiologists with 5-8 years of experience. Tumor boundaries were manually delineated using ITK-SNAP software by junior radiologists, subsequently reviewed, adjusted, and validated by senior radiologists. Any annotation discrepancies were resolved through consensus discussions among senior radiologists, finalizing pathologically confirmed tumor masks. Tumor sizes ranged from 10-52 mm for uterine tumors and 4-33 mm for esophageal tumors. Segmentation and detection performance was assessed using U-Net and SegResNet algorithms, evaluating metrics including tumor-wise sensitivity, voxel-wise Dice Similarity Coefficient (DSC), and Normalized Surface Dice (NSD).

RESULTS

AI models trained on this dataset achieved promising performance on internal test data. The best-performing model reached a tumor-wise sensitivity of 100% for uterine tumors and 96.6% for esophageal tumors. It also demonstrated strong localization accuracy, with DSC scores of 75.4% for uterine tumors and 56.4% for esophageal tumors, and NSD scores of 65.1% and 54.7%, respectively. Further detailed performance analysis and examples are provided in the accompanying figures.

CONCLUSION

AI models, particularly those utilizing advanced backbone architectures, achieved tumor detection sensitivities comparable to expert radiologists. Additionally, these models effectively localized uterine and esophageal tumors, facilitating targeted visual inspection by radiologists.

CLINICAL RELEVANCE/APPLICATION

Our publicly released annotated dataset significantly contributes to the development and refinement of AI algorithms aimed at detecting and accurately localizing uterine and esophageal tumors. This resource enables researchers to enhance AI-assisted diagnostic tools, thereby improving clinical workflows and patient outcomes.

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T6-SSPH08

Physics (Ultrasound and Nuclear Medicine)

Tuesday, Dec. 2 1:30PM - 2:30PM Room: S401

Osama R. Mawlawi, PhD (*Moderator*)
Zheng Feng Lu, PhD (*Moderator*)

Sub-Events

T6-SSPH08-1 CLINICAL EVALUATION OF A SIMULTANEOUS IMAGE SYNTHESIS AND UNCERTAINTY ESTIMATION FRAMEWORK FOR AI-BASED PET RECONSTRUCTIONS

Stephen Liu, PhD (*Presenter*)

PURPOSE

Deep learning (DL) has gained increasing interest in PET reconstruction for its potential to enhance image quality and computational speed. However, its clinical adoption remains limited, largely due to the lack of efficient methods for quantifying uncertainties - critical for assessing the reliability of DL-generated images. We investigate a novel inference scheme that estimates aleatoric (reflecting data noise) and epistemic uncertainty (reflecting DL model confidence) jointly with each PET reconstruction synthesis.

METHODS AND MATERIALS

The proposed framework was implemented in conjunction with the recently introduced FastPET, a network model that synthesizes MLEM-like reconstructions from multi-angle PET histo-images at high speed. An "uncertainty-aware" training was first performed using a likelihood-based loss and dropout layers. During inference, voxel-wise mean and variance maps - initialized as the standard histo-images and zeros - were analytically propagated through each dropout-enabled FastPET layer. This enabled the generation of reconstructed images, aleatoric uncertainty (both from propagated mean) and epistemic uncertainty (from propagated variance) in a single inference pass. Clinical evaluation of the framework was performed on 5 static whole-body PET/CT scans of patients (with 18F-FDG tracers) acquired on Biograph Vision Quadra (Siemens Healthineers). The estimated reconstructions and uncertainty maps using proposed method were compared to the results from the baseline approach involving FastPET with multi- inference Monte Carlo (MC) dropout sampling, in terms of quantitative accuracy and runtime performance

RESULTS

The proposed single-pass approach generated reconstructions and uncertainty maps closely aligned with the baseline FastPET with 50-pass MC sampling. The mean errors across 5 studies were <0.02% (SUVmax) for the reconstruction, <5.3% (SUVmax 2) for the aleatoric uncertainty, and <4.2% (SUVmax 2) for the epistemic uncertainty in high-uptake regions. Average processing time per scan of proposed method was ~146s, compared to ~68s for FastPET without uncertainty estimation ability and ~3405s for the MC-based method.

CONCLUSION

This framework enables accurate, efficient estimation of uncertainties along with PET reconstruction synthesis. It adds a critical reliability metric without compromising DL inference speed, potentially supporting safer and clinically viable DL-based image formation.

CLINICAL RELEVANCE/APPLICATION

To provide near real-time estimation of uncertainties in AI-based PET image formation, enabling assessment of AI confidence and supporting more reliable, informed clinical decision-making.

T6-SSPH08-2 MODULATION OF CELL VIABILITY, APOPTOSIS, AND AUTOPHAGY IN PANCREATIC CANCER CELLS USING THERAPEUTIC ULTRASOUND WITH MICROBUBBLES AND GEMCITABINE

Seunghyeon Roh, MD (*Presenter*)
Eun-Joo Park, PhD (*Abstract Co-Author*)
Jae Young Lee, PhD, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to investigate the effects of therapeutic ultrasound (TUS) with microbubbles and gemcitabine on cell viability, apoptosis, and autophagy in pancreatic cancer cells. The goal was to elucidate the cell death mechanisms by which TUS enhances drug delivery and therapeutic efficacy.

METHODS AND MATERIALS

Human pancreatic ductal adenocarcinoma CFPAC-1 cells were treated using varying TUS intensities (0.29 MPa/continuous wave, 0.42 MPa/50% duty cycle, and 0.86 MPa/10% duty cycle), microbubble volumes (0, 10, 50 μL), and gemcitabine concentrations (0 μg/mL, 2 μg/mL). Cell viability was assessed via MTT assay, apoptosis by Annexin V/Propidium Iodide staining and flow cytometry, and autophagy by an autophagy detection kit. Statistical analyses included three-way analysis of variance and post-hoc Tukey's honestly significant difference tests to evaluate the effects and interactions of treatment variables.

RESULTS

TUS combined with microbubbles and gemcitabine significantly reduced cell viability, induced apoptosis, and modulated autophagy in pancreatic cancer cells. Higher ultrasound intensities (lower duty cycles) and microbubble volumes enhanced these effects. Autophagy activation varied across conditions. Under certain condition, autophagy showed dose-dependent suppression under higher intensity TUS, thus promoting apoptosis-mediated cell death.

CONCLUSION

TUS combined with microbubbles and gemcitabine synergistically enhances drug delivery and induces cell death in pancreatic cancer cells through apoptosis and autophagy modulation. These findings highlight a promising strategy for improving pancreatic cancer treatment outcomes, warranting further in vivo and clinical studies to optimize parameters and evaluate translational potential.

CLINICAL RELEVANCE/APPLICATION

Therapeutic ultrasound with microbubbles and gemcitabine enhances drug delivery and induces cell death in pancreatic cancer cells. The combination therapy amplifies cytotoxic effects via apoptosis and autophagy modulation. This strategy offers innovative prospects for pancreatic cancer treatment, warranting further optimization and translational studies.

T6-SSPH08-3 A PRELIMINARY ANALYSIS OF SUBHARMONIC-AIDED PRESSURE ESTIMATION'S (SHAPE'S) UTILITY FOR SCREENING FOR ESOPHAGEAL VARICES IN PATIENTS WITH COMPENSATED CHRONIC LIVER DISEASE

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Jonathan M. Fenkel (*Abstract Co-Author*)
Antonina Antonenko (*Abstract Co-Author*)
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PURPOSE

Esophageal varices (EVs) are a common consequence of chronic liver disease (CLD) as they often result from clinically significant portal hypertension and can give rise to major bleeding. In patients with compensated advanced CLD, approximately 60% of patients that undergo endoscopic screening have no varices, which underlines the need of non-invasive tests able to identify these cases, so sparing unnecessary invasive evaluations and reducing costs. Subharmonic-aided pressure estimation (SHAPE) is a noninvasive ultrasound-based measurement of pressure that has been shown to be an accurate predictor of portal hypertension. SHAPE relies on the subharmonic responses of ultrasound contrast agents (UCAs) to changes in ambient pressure. The study aims to determine SHAPE's ability to differentiate between patients who require endoscopic screening for varices, and those where it is unnecessary.

METHODS AND MATERIALS

17 subjects undergoing endoscopic evaluation for varices were enrolled in this ongoing, multi-center, IRB-approved study and had their data analyzed. Sonazoid (GE HealthCare) was administered as an infusion of 0.18 mL/kg/hour in accordance with the recommended dose of this agent in SHAPE applications. SHAPE was performed using a LOGIQ E10 (GE HealthCare) with a C1-6 curvilinear probe in the commercially available subharmonic imaging mode (tx: 2.5 MHz, rx: 1.25 MHz). An acoustic pressure calibration algorithm was used to optimize the acoustic pressure on an individual basis. Once the optimal acoustic pressure was identified, 3-5 five second cine clips were obtained with the portal vein (PV) and hepatic vein (HV) at similar depths. Offline, an ROI was placed in both veins to acquire the subharmonic amplitude of each. The SHAPE gradient was calculated as the signal in the HV minus the signal in the PV. Endoscopic outcomes were compared to the SHAPE gradient using receiver operating characteristics (ROC) analysis.

RESULTS

Eight patients had EVs while nine did not. ROC analysis resulted in an area under the curve of 0.94 (95% CI: 0.84 to 1.000; p = 0.002) for SHAPE. Using a cut off value of -0.87 dB for the SHAPE gradient, there was 100% specificity and 75% sensitivity for correctly identifying patients who have varices.

CONCLUSION

These preliminary results indicate that SHAPE may be suitable as a noninvasive modality for selecting those patients with chronic liver disease that do not require endoscopic screening for varices.

CLINICAL RELEVANCE/APPLICATION

This work indicates SHAPE may be used as a noninvasive imaging tool to help limit unnecessary endoscopic screening for varices in patients with chronic liver disease.

T6-SSPH08-4 UNDERESTIMATION OF CT ATTENUATION DUE TO MISREGISTRATION ON [^{18}F]PSMA-1007 PET/CT: A PITFALL IN BONE UPTAKE METASTATIC PROBABILITY (BUMP) SCORE-BASED INTERPRETATION OF RIB LESIONS

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Amalia Stavropoulos, MBBS (*Abstract Co-Author*)
Amit Bahl (*Abstract Co-Author*)
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Russell Frood, MBChB, FRCR (*Abstract Co-Author*)
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Amarnath Challapalli, MD,MBBS (*Abstract Co-Author*)
Julien M. Willaime, PhD (*Abstract Co-Author*)
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PURPOSE

Indeterminate bone lesions (IBLs) are commonly observed on 18 F Prostate Specific Membrane Antigen (PSMA)-1007 PET/CT in patients with prostate cancer. Bone uptake metastatic probability (BUMP) score was developed to aid characterisation using lesion SUVmax and mean Hounsfield Unit (HU) measurements alongside androgen deprivation therapy (ADT) status. Rib lesions are a frequent site of IBLs and are particularly prone to PET/CT misregistration artefact due to breathing motion, which may distort HU values and lead to inaccurate BUMP score classification. This study aimed to assess the extent of HU misclassification in rib lesions and evaluate the impact on composite BUMP score for predicting skeletal metastases.

METHODS AND MATERIALS

Patients with histologically confirmed prostate cancer who underwent [18 F]PSMA-1007 PET/CT over a 4-year period at two tertiary centres, with PSMA-avid rib lesions were retrospectively identified. For each lesion, SUVmax and androgen deprivation therapy (ADT) status at time of imaging were recorded. Mean HU values were calculated from volumes of interest (VOI) defined by both PET and CT components and compared using paired analysis. Lesion ground truth was established through follow-up imaging, prostate specific antigen (PSA) kinetics, and multidisciplinary clinical consensus. The impact of manual HU correction on clinical risk stratification was evaluated by comparing predicted metastatic likelihood before and after correction, using institution-specific BUMP score thresholds.

RESULTS

A total of 54 patients with 132 PSMA-avid rib lesions were analysed. In 31% of lesions (n=42), there was a discordance in mean HU value between PET and CT derived VOI ($p<0.001$). In cases of PET/CT misregistration the median difference was 290 HU (interquartile range (IQR) 283). The largest absolute difference between PET and CT VOI-defined HU was 1351. In 5% of lesions (n=6), this HU difference led to a change in BUMP score-based classification from benign to malignant. Lesions with a borderline BUMP score were most affected.

CONCLUSION

PET/CT misregistration can lead to significant underestimation of mean HU in rib lesions, resulting in falsely low BUMP scores. This misclassification has tangible consequences, altering predicted malignancy status in a subset of cases and potentially impacting clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

Misregistration can lead to significant HU underestimation and misclassification if PET-based volumes are used for rib lesion HU quantification. HU measurements should be extracted from CT ROIs to ensure accuracy for BUMP scoring.

T6-SSPH08-5 ULTRASOUND IMAGE QUALITY ACROSS VENDORS: COMPARING SONOGRAPHERS' PERCEPTION, RADIOLOGIST EVALUATION, AND PHANTOM MEASUREMENTS

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PURPOSE

Our institution has used ultrasound systems from vendors A and B and recently adopted vendor C's system. Sonographers reported diverging image quality perceptions among the three vendors. This study aimed to evaluate these perceptions and compare them with phantom-based objective measurements and radiologist assessments.

METHODS AND MATERIALS

The study consisted of four phases. First, a brief survey gathered sonographers' perceptions of image quality (penetration, spatial resolution, grayscale) for vendors A, B, and C using a 1-10 scale. Second, phantom experiments using a multi-purpose ultrasound phantom (Model 040GSE, CIRS) tested objective quality metrics (penetration, spatial resolution, and contrast) for each vendor using convex transducers and standard protocols. Third, clinical images were acquired from a healthy adult volunteer using all vendor systems (34 images in total). Six sonographers independently rated the anonymized images (liver, kidney, gallbladder, aorta, and IVC) on a 1-5 scale for overall diagnostic image quality, penetration, spatial resolution, and contrast. Finally, two radiologists independently evaluated the same images using identical criteria.

RESULTS

The initial survey ranked vendors A > B > C, with vendor B noted for excessive contrast. Phantom results showed vendors A and B performed better than C in penetration and lateral resolution (A ˜ B > C). Vendor B excelled in axial resolution (B > A ˜ C) and showed the highest contrast, partially aligning with initial feedback. However, human image evaluation revealed a shift: both sonographers and radiologists rated vendor B lowest overall, with vendors A and C performing similarly (A ˜ C > B). Radiologist I reported more distinct differences, while Radiologist II saw minimal variation between vendors.

CONCLUSION

Initial sonographer concerns were partly supported by phantom data, confirming vendor specific image traits. However, clinical image assessments contradicted earlier findings, revealing lower performance from vendor B and improved scores for vendor C. Possible explanations include: (1) clinical images were adult-based in a pediatric-focused facility, (2) subjective variability among reviewers, (3) limited phantom settings, and (4) single-operator image acquisition. Future work should include more subjects, operators, and reviewers, along with vendor input for standardized phantom settings. Understanding these discrepancies is essential for informed equipment choices, protocol optimization, and quality assurance.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the value of aligning sonographer perceptions with objective and radiologist-based assessments to support image quality optimization and guide vendor evaluation.

T6-SSPH08-6 WHICH METHOD IS USEFUL FOR NODULE DETECTION AMONG MRI WITH ULTRA-SHORT TE (UTE-MRI) AND STIR IMAGING ON PET/MRI AND FDG-PET/CT WITH AND WITHOUT BREATH-HOLD CTS?

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PURPOSE

To compare the capability of nodule detection among PET/MRI with thin-section MRI with ultra-short TE (UTE-MRI) and short TI inversion-recovery (STIR) imaging and PET/CT with and without breath-hold CT in oncologic patients.

METHODS AND MATERIALS

110 consecutive oncologic patients underwent standard-dose thin-section CTs, FDG-PET/CTs, FDG-PET/MRI with UTE-MRI and STIR fast advanced spin-echo (FASE) imaging, pathological examinations obtained by transbronchial or CT-guided biopsy or surgical resection, micro bacterial examinations and more than 2 years follow-up examinations. In each patient, breath-hold low-dose CT (BHCT) was obtained as a part of PET/CT examination, which included non-breath hold CT (non-BHCT) as CT-based attenuation corrections on PET/CT. Then, two board-certified chest radiologists confirmed 548 nodules in 110 patients according to standard-dose thin-section CT findings. In each patient, probability of presence at each pulmonary nodule was assessed on non-BHCT, BHCT, UTE-MRI and STIR imaging by means of 5-point visual scoring system by two board certified general radiologists and two board certified PET physicians. To determine the interobserver agreement on each method, kappa statistics with ? 2 test was performed. To compare nodule detection capability, Jackknife alternative free-response receiver operating characteristic (JAFROC) analysis were performed among all methods. Then, sensitivity was also compared among four methods by McNemar's test. Moreover, false-positive per case (FP/case) rate was compared among all methods by Wilcoxon's signed rank test.

RESULTS

Interobserver agreement of each method was determined as substantial or almost perfect ($0.64<?<0.97$, $p<0.0001$). Figure-of-merits (FOMs) of UTE-MRI (FOM=0.98) and STIR imaging (FOM=0.98) were significantly higher than that of non-BHCT (FOM=0.89, $p<0.05$). FP/case rates of UTE-MRI (0.10/case) and STIR imaging (0.09/case) were significantly lower than that of non-BHCT (0.36/case, $p<0.05$) and BHCT (0.35/case, $p<0.05$).

CONCLUSION

PET/MRI has superior potential for nodule detection in oncologic patients as compared with PET/CT with and without breath-hold CT.

CLINICAL RELEVANCE/APPLICATION

PET/MRI has superior potential for nodule detection in oncologic patients as compared with PET/CT with and without breath-hold CT.

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T6-SSPH09

Physics (Applications of Artificial Intelligence in CT)

Tuesday, Dec. 2 1:30PM - 2:30PM Room: S404

Guang-Hong Chen, PhD (*Moderator*)
Hao Gong, PHD (*Moderator*)

Sub-Events

T6-SSPH09-1 PROSPECTIVE PATIENT SIZE AND REGION-SPECIFIC DOSE ESTIMATION THROUGH AN AI-BASED CONTOUR SEGMENTATION OF CT LOCALIZERS

Aiping Ding, PhD,DSc (*Presenter*)
Yakun Zhang, MS (*Abstract Co-Author*)
Jered R. Wells, PhD (*Abstract Co-Author*)
Francesco Ria, PhD (*Abstract Co-Author*)
Donald P. Frush, MD (*Abstract Co-Author*)
Ehsan Samei, PHD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate an AI-based framework for automatic head and body contour segmentation from CT localizer images, enabling accurate pre-scan patient size and scan region-specific dose estimation in CT dosimetry.

METHODS AND MATERIALS

A total of 2,400 CT localizer images (959 AP, 1,441 LAT) were retrospectively collected from 1,817 patients scanned across 28 CT stations using over 400 protocols. Manual annotations of head and body contours were used to train a U-Net-based segmentation model. Pixel-level performance was assessed using Dice Similarity Coefficient (DSC), Intersection over Union (IoU), pixel accuracy, precision, sensitivity (recall), specificity, AUC-ROC, and Cohen's Kappa. Agreement with manual annotations was further evaluated using Bland-Altman analysis. Effective diameter (D eff) and water-equivalent diameter (D w) were derived from the segmented contour and used to calculate size-specific dose estimates (SSDE). Scan region-specific CTDI vol and other metadata were extracted from the Radiation Dose Structured Report (RDSR) to align SSDE calculation with actual scan coverage.

RESULTS

The trained AI model achieved a mean DSC of 0.984 and IoU of 0.969, with high pixel accuracy (0.982), precision (0.984), sensitivity (0.987) ,and specificity (0.999). Bland-Altman analysis demonstrated strong agreement with manual segmentations (mean difference of 0.013; limits of agreement (LoA) of -0.022 to 0.049). Compared to traditional threshold-based methods, the AI-generated contours produced smoother and more anatomically consistent D eff and D w profiles across the scan length, particularly in complex regions such as the neck and shoulders. Threshold-based segmentations often underestimated body boundaries or exhibited irregularities. Scan region-specific SSDE estimates based on AI segmentation showed improved alignment with scanned anatomy, enhancing accuracy over threshold-based methods.

CONCLUSION

AI-based contour segmentation from CT localizers enables precise patient size characterization and scan region-specific SSDE estimation. This approach supports pre-scan dose estimation and personalized protocol optimization, reducing dependence on post-scan metrics and manual contouring.

CLINICAL RELEVANCE/APPLICATION

AI-driven contour segmentation from CT localizers enables automated, patient-specific size and dose estimation. This enables accurate dose estimates and the opportunity for timely scan adjustments—a level of persionalization of scan particularly valuable in managing protocol variability across indications and populations (e.g., pediatric vs. adult) for identical scan regions. Additionally, it serves as a valuable tool for approaching CT image quality targets.

T6-SSPH09-2 PHOTON COUNTING CT IMAGING OF JOINT SOFT TISSUE USING PHYSICS-INFORMED MATERIAL-PRIOR- AND SELF-ATTENTION-ASSISTED BAYESIAN NETWORK

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PURPOSE

Photon counting detector (PCD) CT allows full time spectral imaging, providing material differentiation / quantification for diagnosis of joint diseases. Conventional material decomposition is limited in soft tissue contrast resolution due to the amplified noise and artifacts. We aim to improve soft tissue image quality using a p hysics-informed material-p r ior- and self-attent i on-assisted Baye s ian neural network for multi- m aterial decomposition (PRISM)

METHODS AND MATERIALS

PRISM included a de-blooming process (DP), a material prior generation process (MPG), and a Bayesian dual-task neural network (BDN). In DP, local point spread function was derived via Gaussian fitting in Fourier domain and used to reduce blooming artifacts in iterative deconvolution. In MPG, we created one-hot-encoded material prior via tissue-wise segmentation. BDN used synergistic material classification and quantification in spectral CT images. Material prior served as an extra input to provide global image context and guide self-attention to regularize local classification and quantification. BDN used probabilistic modeling of model likelihood and posterior distribution to rebalance uncertainty and bias in training and characterize output distribution. BDN training used PCD 50 and 100 keV images of tissue-

mimicking inserts and simulated inserts (basis materials: hydroxyapatite (HA), fat, collagen, water). The predicted means of material-specific mass density were used in evaluation due to improved robustness and detail preservation. Quantification accuracy was assessed using mean absolute percent error (MAPE) of physical test inserts. CT scans of cadaveric wrists were used to assess overall image quality, noise, artifacts, and structural fidelity in material maps. An inception-net and a prior-assisted iterative method (PIMD; HA, collagen, water) served as baselines. MRI provided the reference for soft tissue

RESULTS

In phantom validation, comparable noise levels were observed (collagen / water): PRISM 1.1 / 5.1 HU, Inception 1.6 / 5.2 HU, PIMD 0.9 / 3.3 HU), but PRISM improved accuracy on testing soft tissue inserts (MAPE range: PRISM [0.6%, 3.4%], Inception [9%, 11%], PIMD [0.8%, 5%]). In cadaver scans, PRISM improved soft tissue contrast resolution, and visualized finer pathological features in connective tissues

CONCLUSION

The proposed PRISM provides high-quality PCD CT post-processing, showing improved quality of material decomposition in phantom and cadaver scans

CLINICAL RELEVANCE/APPLICATION

PRISM is potential to accurately differentiate and quantify target materials for patients with musculoskeletal conditions affecting connective tissues, which could be undiagnostic with standard CT imaging techniques

T6-SSPH09-3 STABILIZING CT RADIOMIC FEATURES ACROSS VARYING TUBE POTENTIALS (KVS) USING LEARNED VIRTUAL MONOENERGETIC IMAGING

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Shravani Kharat, MS (*Abstract Co-Author*)
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Hao Gong, PHD (*Abstract Co-Author*)
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Shuai Leng, PhD (*Abstract Co-Author*)

PURPOSE

Radiomic features of CT images are influenced by different tube potentials (kVs) during data acquisition. The purpose of this study is to use a D eep-learn I ng b A sed virtual MON oenergetic imaging at D ifferent energies (DIAMOND) framework to harmonize images and radiomic features at different kVs and improve reproducibility.

METHODS AND MATERIALS

DIAMOND was developed to harmonize CT images acquired at one tube voltage to match those acquired at another. The network was trained using virtual monoenergetic images (VMIs) representing the effective energies of the respective tube potentials, determined through phantom calibrations. Gammex MECT phantoms were scanned at two target tube voltages on a conventional CT and on a photon-counting detector CT (PCD-CT) system operated in high-resolution multi-energy (HRME) mode, which provides VMIs from 40 to 190 keV. Equivalent VMI energy levels were identified by matching CT numbers between conventional CT at different tube potentials and PCD-CT VMIs. Dual-source, dual-energy CT with 100/Sn150 kV was used as a representative case. The DIAMOND network was trained to translate input 100 kV images into target Sn150 kV images using the same scan. To evaluate radiomic feature stability, fifty regions of interest (ROIs) were placed at consistent locations within the kidney across 100 kV, Sn150 kV, and DIAMOND-processed images. Radiomic analysis included 93 non-shape features across six categories: first-order, gray-level co-occurrence matrix (GLCM), gray-level dependence matrix (GLDM), gray-level run-length matrix (GLRLM), gray-level size zone matrix (GLSZM), and neighboring gray-tone difference matrix (NGTDM). Feature reproducibility was assessed by calculating the concordance correlation coefficient (CCC) between 100 kV and Sn150 kV images, and between DIAMOND and Sn150 kV images.

RESULTS

The CT number within a kidney ROI decreased from 320 HU in the original 100 kV scan to 160 HU after DIAMOND processing, closely matching the Sn150 kV reference value of 155 HU. Radiomic features showed moderate variability (mean CCC = 0.30) between 100 kV and Sn150 kV images. After applying DIAMOND, the mean CCC improved markedly to 0.97, indicating near-perfect agreement. Improvements were consistent across all feature categories, demonstrating DIAMOND's effectiveness in stabilizing radiomic features across varying tube voltages.

CONCLUSION

DIAMOND enables learned virtual monoenergetic imaging and harmonizes CT data across tube voltages, improving radiomic feature reproducibility.

CLINICAL RELEVANCE/APPLICATION

This vendor-agnostic VMI harmonization supports reproducible radiomics and AI model generalization across multi-center, multi-protocol CT imaging.

T6-SSPH09-4 IMAGE SYNTHESIS OF CT VOLUMES FROM TWO-VIEW SCOUTS WITH CONDITIONAL DIFFUSION MODELS

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Grant M. Stevens, PhD (*Abstract Co-Author*)
Justin Tse, MD (*Abstract Co-Author*)
Adam S. Wang, PhD (*Abstract Co-Author*)

PURPOSE

Scout images are regularly obtained before the acquisition of the main CT examination to determine scan range and optimize radiation dose. By translating two-view 2D scout images to synthetic 3D images, the organ size and position can be estimated, which would optimize organ-level radiation dose. The purpose of our study was to develop a novel Conditional Denoising Diffusion Model (CondDDPM) that predicts volumetric CT images based on two-view scout images and, for the first time, evaluate its ability to segment abdominal organs.

METHODS AND MATERIALS

We developed a novel CondDDPM conditioned on the Filtered Back Projection (FBP) image of two-view scouts for the 2D-to-3D synthesis. In one training iteration, an image is corrupted by the noise whose variance is time-dependent, and the U-Net learns to predict the noise with the timestamp, the corrupted image, and the FBP image. In testing, the noise image is denoised by subtracting the estimated noise predicted from the U-Net in each reversed timestamp until a clean sample is reached. We compare the CondDDPM with the NAFNet and its variant with adversarial training (NAFNet-ADV). The frontal and lateral scout projections are simulated using the LEAP library to model a CT scanner, and FBP reconstruction was performed using the same library. We adopted Normalized Root Mean Squared Error (NRMSE) as the metric for synthesis. We further evaluated their utility for abdominal organ segmentation using TotalSegmentator and compared their performances with ground truth CTs using Dice scores. 314 adult CT examinations were included in this study, with an 80:20 ratio split into training and testing datasets. The CondDDPM was trained for 150 epochs with a learning rate of 0.0001. We used the cosine learning scheduler and the DDIM sampler.

RESULTS

The realistic synthetic 3D images from CondDDPM can be used to segment organs for dose optimization. The mean/standard deviation of NRMSE of NAFNet, NAFNet-ADV, and CondDDPM were 0.1178/0.0392, 0.1280/0.0382, and 0.1175/0.0353, respectively. The mean/standard deviation Dice scores of lung, liver, kidney, and spleen segmentation from CondDDPM were 0.9245/0.1207, 0.8322/0.0704, 0.5082/0.2406, and 0.3795/0.2658, respectively.

CONCLUSION

We developed a diffusion model to generate synthetic CTs based on two-view scouts. We achieved accurate segmentation of larger organs (lung and liver) with off-the-shelf TotalSegmentator software, though it was less accurate for smaller organs (e.g., kidney and spleen). Ongoing work includes its application for organ dose calculation.

CLINICAL RELEVANCE/APPLICATION

The proposed generative AI model can improve abdominal organ localization before performing the actual CT examination, which refines dose optimization.

T6-SSPH09-5 ARTIFACT REDUCTION IN DUAL-ENERGY CT MATERIAL BASIS IMAGES USING A PHYSICS-CONSTRAINED TRANSFORMER-BASED DEEP LEARNING MODEL

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Zhihua Qi, PhD (*Abstract Co-Author*)
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PURPOSE

Dual-energy CT (DECT) combines images acquired at low and high tube potentials to generate material basis images, such as iodine maps, enhancing diagnostic accuracy. However, in large patients, low-kV data are prone to photon starvation and beam hardening, leading to severe artifacts that propagate into the material basis images and impair diagnostic utility. This study aimed to develop a physics-constrained, transformer-based deep learning model to generate artifact-reduced material basis images using only high-kV CT data, which are less affected by these artifacts.

METHODS AND MATERIALS

A variational autoencoder (VAE) with a transformer backbone was developed. The encoder was trained to synthesize high-kV CT images from DECT-derived material basis images, and the decoder was trained to disentangle the synthesized high-kV image into corresponding material basis images. The model was trained on 16,000 pairs of high-kV and material basis images from DECT scans, with cases exhibiting photon starvation or beam hardening artifacts excluded from the training set. After training, only the decoder was used to generate material basis images directly from high-kV scans. The model was evaluated on two cohorts: (1) a cohort without artifacts to assess accuracy, using structural similarity index (SSIM) and root-mean-square error (RMSE) compared to scanner-generated DECT outputs; and (2) a cohort with severe artifacts to assess the degree of artifact reduction, quantified by RMSE and difference images of the iodine maps.

RESULTS

In the artifact-free cohort, the model accurately predicted material basis images from high-kV data alone, achieving median SSIM values of 97.9% ([97.5%, 98.4%]) for water and 92.7% ([86.4%, 95.3%]) for iodine, with an RMSE of 0.8 mg/ml ([0.7, 1.0]) for iodine quantification. In the artifact-prone cohort, the model substantially reduced artifacts in iodine maps, with lower RMSE values and visibly cleaner basis images compared to conventional DECT results.

CONCLUSION

A physics-constrained, transformer-based deep learning model was developed to generate material basis images from high-kV CT scans alone. The model demonstrated high accuracy in artifact-free cases and effectively reduced severe artifacts in challenging clinical cases.

CLINICAL RELEVANCE/APPLICATION

This deep learning approach offers a practical solution for generating artifact-reduced material basis images from high-kV CT alone, improving diagnostic quality in DECT, particularly for large patients where conventional methods are compromised by photon starvation and beam hardening.

T6-SSPH09-6 A PHYSICS-INFORMED NEURAL NETWORK FOR ACCURATE 5-MATERIAL DECOMPOSITION FROM SINGLE-ENERGY CT

Dale Black, BS (*Presenter*)
Christine Nguyen (*Abstract Co-Author*)
Sabee Y. Molloi, PhD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a Physics-Informed Multi-Material Decomposition (PiMMD) neural network for accurate five-material decomposition from single-energy computed tomography using both digital phantom and clinical images.

METHODS AND MATERIALS

A physics-informed neural network was designed using a UNet to generate an implicit virtual monoenergetic image (VMI), followed by convolutional layers to predict volume fractions for 5 basis materials (air, lipid, water, collagen, hydroxyapatite). High-fidelity training labels were created by decomposing known atomic compositions of digital phantoms into basis fractions via constrained optimization. CT images of the digital phantoms were simulated using CatSim. A physics-based loss function compared the implicit VMI against a VMI reconstructed from predicted fractions and known linear attenuation coefficients, enforcing physical consistency without requiring explicit energy input during inference. This training enables PiMMD to directly estimate all five basis materials within each voxel by effectively imposing additional physical constraints via training data unavailable to conventional algorithms, unlike the direct inversion method (SE-MMD), which is fundamentally limited by single-energy physics for estimating only a pair of materials per voxel. Quantitative accuracy was evaluated against known ground truth using unseen phantoms with Mean Squared Error (MSE) in volumetric fraction reported as percentages. Clinical feasibility was assessed using 60 CT scans from the Multi-Ethnic Study of Atherosclerosis (MESA) dataset.

RESULTS

Quantitative analysis showed PiMMD significantly outperformed SE-MMD. For digital humanoid phantoms, PiMMD's MSE was below 2% for all materials, while SE-MMD errors ranged from 14-40%. For instance, PiMMD achieved MSE of 1.5%±0.3% for Lipid compared to 15.1%±16.1% for SE-MMD. In more complex digital XCAT phantoms, PiMMD maintained lower errors than SE-MMD (e.g., Water MSE: PiMMD 20.8%±0.3% vs SE-MMD 29.4%±8.2%). Qualitative analysis on the 60 MESA CT scans confirmed these quantitative trends, showing PiMMD decomposition maps with markedly reduced noise, clearer tissue boundaries, and superior anatomical consistency compared to the highly variable SE-MMD results.

CONCLUSION

The physics-informed neural network enables accurate 5-material decomposition per voxel from single-energy CT, demonstrating superior performance compared to direct inversion methods, validated on phantoms and confirmed in clinical CT scans.

CLINICAL RELEVANCE/APPLICATION

By enabling quantitative tissue characterization from routine CT scans, this method offers potential to enhance diagnostic capabilities without specialized hardware or energy calibration.
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T6-STCE1

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Tuesday, Dec. 2 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

T6-STCE1-1 AUTOMATING CAD-RADS REPORTING AND CAD PREDICTION WITH ZERO-SHOT LARGE LANGUAGE MODELS: A STEP TOWARD CLINICAL INTEGRATION

Wenchi Hsu, MD (*Presenter*)
Yuli Wang (*Abstract Co-Author*)
Harrison X. Bai, MD (*Abstract Co-Author*)
Gigin Lin, MD (*Abstract Co-Author*)
Ihab R. Kamel, MD, PhD (*Abstract Co-Author*)
Cheng Ting Lin, MD (*Abstract Co-Author*)

PURPOSE

The Coronary Artery Disease Reporting and Data System (CAD-RADS) standardizes coronary CTA (CCTA) reporting and guides management. However, CCTA is prone to overestimate stenosis degree and risk over-referral for invasive testing. This study aimed to (1) assess the ability of large language models (LLMs) to assign CAD-RADS scores from textual reports and (2) evaluate their performance in predicting confirmed significant coronary artery disease (CAD).

METHODS AND MATERIALS

This retrospective study included 555 CCTA reports between April 2013 and January 2024 from patients with suspected CAD. Basic demographics were collected. CAD-RADS scores, determined by consensus between two radiologists, served as the ground truth. Four LLMs (Llama 3.2, Gemma 3, Qwen 2.5, and DeepSeek R1) were evaluated with a zero-shot prompt. Each model was prompted to assign CAD-RADS categories from de-identified report texts and to estimate the probability of confirmed significant CAD, which was defined as either more than 50 % stenosis in the left main artery or more than 70% stenosis in the left anterior descending, left circumflex, or right coronary artery on invasive coronary angiography, or undergoing coronary revascularization within one year.

RESULTS

Of 555 CCTA reports, CAD-RADS categories were 0 in 187 (33.7%), 1 in 146 (26.3%), 2 in 104 (18.7%), 3 in 66 (11.9%), 4 in 50 (9%), and 5 in 2 (0.3%). The LLMs achieved correct classification in 459 (82.7%), 489 (88.1%), 455 (82.0%), and 370 (66.7%) cases for Llama 3.2, Gemma 3, Qwen 2.5, and DeepSeek R1, respectively. Agreement with radiologists was assessed using quadratic weighted Kappa, yielding values of 0.94, 0.96, 0.95, and 0.78, respectively. Category upgrades (from CAD-RADS 0-3 to 4-5) and downgrades (from CAD-RADS 4-5 to 0-3) were noted in 2 (0.4%) and 11 (2.0%) cases for Llama 3.2, 1 (0.2%) and 4 (0.7%) for Gemma 3, 2 (0.4%) and 1 (0.2%) for Qwen 2.5, and 35 (5.1%) and 7 (2.3%) for DeepSeek R1. Regarding the prediction of confirmed significant CAD, the four LLMs achieved AUCs of 0.92, 0.93, 0.91, and 0.66 for Llama 3.2, Gemma 3, Qwen 2.5, and DeepSeek R1, respectively. Performance declined in the more challenging CAD-RADS 3 and 4 subgroups, with AUCs dropping to 0.73, 0.75, 0.71, and 0.52, respectively.

CONCLUSION

Using a zero-shot prompt, LLMs demonstrated high agreement with radiologist consensus when assigning CAD-RADS scores, with varying tendencies in upgrading or downgrading. Furthermore, most LLMs achieved moderate-to-good performance in predicting confirmed significant CAD.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the potential of LLMs as clinically integrable tools to support structured reporting and inform downstream decision-making in CCTA interpretation.

T6-STCE1-2 LEVERAGING LLM-ENHANCED STRUCTURED REPORTING TO IMPROVE VISION-LANGUAGE MODEL FOR PULMONARY EMBOLISM CT ANGIOGRAPHY

Cheng-Yi Li, MSc (*Presenter*)
Yuli Wang (*Abstract Co-Author*)
Yuwei Dai, MD (*Abstract Co-Author*)
Haoyue Guan (*Abstract Co-Author*)
Haiman Guo (*Abstract Co-Author*)
Chenhao Lyu (*Abstract Co-Author*)
Qiuhao (alex) Zhu (*Abstract Co-Author*)
Ihab R. Kamel, MD, PhD (*Abstract Co-Author*)
Harrison X. Bai, MD (*Abstract Co-Author*)
Cheng Ting Lin, MD (*Abstract Co-Author*)

PURPOSE

Vision-language models (VLMs) hold promise for automating radiology reporting and aiding clinical decisions, but are limited by unstructured free-text inputs. This study proposes a scalable approach using large language models (LLMs) to reformat free-text reports into a structured template and assesses its impact on VLM performance for pulmonary embolism (PE) prognostication on CT pulmonary angiography (CTPA) across a large health system.

METHODS AND MATERIALS

This IRB-approved study included 18,427 CTPA scans from adult patients at a tertiary care center from 2014 to 2024. We collected clinical data including demographic and physiological variables (age, gender, heart rate, respiratory rate, and systolic BP), and clinical outcomes (ICU admission, 90-day mortality, and 30-day readmission). A VLM based on the Otter framework was trained to integrate CTPE volumes with corresponding radiology reports—either original free-text or LLM-reformatted versions. We compared the two approaches across several benchmarks: automated text-based metrics (BLEU, ROUGE, and METEOR) and LLM-based evaluation of 6 PE-specific abnormality questions. Additionally, we assessed how both output types, combined with clinical variables, predicted ICU admission, mortality, and readmission.

RESULTS

VLM trained with LLM-reformatted reports consistently outperformed those trained on original free text. Report generation metrics improved substantially, with BLEU-1 increasing from 0.23 to 0.42, ROUGE-L from 0.34 to 0.37, and METEOR from 0.28 to 0.33. LLM-reformatted reports yielded more accurate responses to the 6-question PE abnormality test—covering acute PE presence, PE location, and right heart strain—raising classification accuracy from 0.71 to 0.82 (as shown in Figure 2(a)). Clinical outcome prediction also benefited: AUCs rose for ICU admission (0.71 vs. 0.62), 90-day mortality (0.79 vs. 0.64), and 30-day readmission (0.72 vs. 0.58).

CONCLUSION

LLM-driven report reformatting is a scalable and effective method to enhance VLM performance in CTPE. By improving both the quality of report generation and downstream clinical prediction, this strategy enables large health systems to deploy VLMs without the need for manual data labeling.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that LLM-based reformatting of free-text CTPE reports can significantly improve the training of VLMs. By producing high-quality structured data at scale, health systems can develop VLMs that generate more accurate and complete reports. This enhancement has the potential to streamline radiology workflows, improve reporting efficiency, and support radiologists' routine clinical operations.

T6-STCE1-3 GENERATIVE AI IN CLINICAL PRACTICE: GROUNDING A VISION LARGE LANGUAGE MODEL POWERED CHEST X-RAY SYSTEM USING A CLINICALLY VALIDATED COMPUTER VISION CLASSIFIER MODEL

Sajith Karunasena, MBBS, FRANZCR (*Presenter*)
Nalan Ektas (*Abstract Co-Author*)
Georgina Bottrell (*Abstract Co-Author*)
Jarrel C. Seah, MBBS (*Abstract Co-Author*)
Michael Milne (*Abstract Co-Author*)

PURPOSE

Recent advances in generative AI and large language models (LLMs), have rapidly transformed the landscape of tools available for healthcare, offering promising solutions to the radiology industry, particularly with respect to the generation of draft radiology reports. However, risks associated with hallucinated content present a significant challenge with clinical safety, acceptability and adoption. This work describes the development of a novel AI system that utilises a comprehensive, clinically validated computer vision classification model for chest x-ray (CXR) finding detection to ground the outputs of a radiology focussed vision LLM (vLLM) for CXR report generation. The methods used present an opportunity for transformative innovation of radiology reporting workflow optimization whilst maintaining clinical accuracy and safety.

METHODS AND MATERIALS

A collaborative team of radiologists, industry AI engineers, medical device and research professionals developed an integrated system, whereby outputs from a commercially available, machine learning-based medical device for classification of radiological findings on CXR, were transformed into natural language radiology report text using a vLLM trained with radiology data. To mitigate risk of error in clinical use, the scope of the vLLM outputs were controlled to ensure the core radiologic findings represented in the generated report text were concordant with the classification model outputs. Any additional detail provided by the LLM would not be expected to impact patient management. Clinical validation was performed by an expert independent evaluator (FRANZCR qualified radiologist) via concordance analysis and assessed against a pre-specified level of agreement.

RESULTS

The vLLM reliably transformed AI-predicted findings into radiology report narrative text, demonstrating very high concordance with the classification model for core radiology findings (concordance rate 0.987, 95% CI [0.958, 1.000], p = 0.019).

CONCLUSION

This study demonstrates a novel method of grounding the outputs of a radiology trained vLLM using a clinically validated computer vision classification model to produce accurate text outputs for draft radiology reports. It also shows how collaboration between clinical experts, AI engineers and medical device professionals can ensure technical innovation that addresses real clinical needs within the appropriate standards. Feedback from early clinical deployment will confirm positive impacts on radiologist workflow from draft report generation.

CLINICAL RELEVANCE/APPLICATION

This work paves a pathway to implementing generative AI in a clinical setting, and opens the roadmap for future innovation in radiology workflow optimization.

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T6-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Tuesday, Dec. 2 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

T6-STCE2-1 MESOSCALE CISS IMAGING FOR THE DETECTION OF DURAL DEFECTS IN SPINAL CSF LEAKS

Michelle Wegscheid, MD, PhD (*Presenter*)
Arindam R. Chatterjee, MD (*Abstract Co-Author*)
Cyrus A. Raji, MD, PhD (*Abstract Co-Author*)
Martin N. Reis, MD (*Abstract Co-Author*)
Sherwin N. Azad, MD,MS (*Abstract Co-Author*)
Ananth K. Vellimana, MBBS (*Abstract Co-Author*)
Manu S. Goyal, MD, MSc (*Abstract Co-Author*)
Arash Nazeri, MD (*Abstract Co-Author*)

PURPOSE

Spontaneous intracranial hypotension (SIH) is most often attributable to cerebrospinal fluid (CSF) leaks from the spinal canal, yet precise localization of dural defects remains challenging. While fat-saturated heavily T2-weighted MR myelography (HT2-MRM) is sensitive to spinal longitudinal extradural CSF collections (SLECs), it does not reliably localize the leak site. This study evaluates a two-stage spine MRI protocol incorporating high resolution, mesoscale 3D constructive interference in steady state (meso-CISS) for targeted CSF leak localization.

METHODS AND MATERIALS

Twenty consecutive patients with suspected SIH underwent a standardized total spine MRI protocol, including 3D HT2-MRM for SLEC screening. In cases with positive SLEC or indeterminate findings, meso-CISS was performed for targeted high-resolution leak localization.

RESULTS

Eight patients (40%) demonstrated SLECs on HT2-MRM, prompting further evaluation with meso-CISS. Dural defects were successfully identified in five patients (1.5-8 mm in size). In one case, meso-CISS delineated intrathecal protrusion of ligamentum flavum calcification, suggesting an underlying defect. Compared with HT2-MRM, meso-CISS provided superior visualization of dural defects, arachnoid scarring, and neo-membrane formation. Two cases were limited by motion or metal artifacts.

CONCLUSION

A two-stage spine MRI protocol incorporating HT2-MRM and meso-CISS improves the localization of dural defects in SIH. Meso-CISS enhances visualization of small dural tears and associated pathology, facilitating targeted interventions and potentially reducing reliance on invasive myelography.

CLINICAL RELEVANCE/APPLICATION

The results of this study support the use of meso-CISS as a targeted, high-resolution imaging tool to refine CSF leak localization. In our cohort, meso-CISS enabled prospective identification of suspected dural defects that were only retrospectively appreciated on HT2-MRM. By improving pre-procedural localization, this approach has the potential to increase the diagnostic yield and spatial accuracy of invasive studies, such as digital subtraction myelography, reduce unnecessary radiation exposure, and facilitate more precise and targeted therapeutic interventions.

T6-STCE2-2 ULTRAFAST BREAST MRI WITHOUT CONTRAST USING ARTERIAL SPIN LABELING-BASED CONTRAST-INHERENT INFLOW-ENHANCED MULTIPHASE ANGIOGRAPHY

Kazunori Oohashi, BSc (*Presenter*)
Kazunori Kubota, MD, PhD (*Abstract Co-Author*)
Tomoyuki Fujioka, MD, PhD (*Abstract Co-Author*)

PURPOSE

Recent advances in MRI systems and pulse sequences have enabled non-contrast-enhanced MR angiography (MRA) to visualize vascular structures and hemodynamics in various anatomical regions.Contrast-Inherent Inflow-Enhanced Multiphase Angiography (CINEMA) is a non-contrast 4D MRA technique combining Look-Locker-based multiphase acquisition with pulsed ASL (PASL), allowing high temporal resolution visualization of blood flow dynamics. However, no established non-contrast alternative exists in breast MRI. In this study, we aimed to optimize ASL parameters—including labeling position and post-labeling delay—based on the hemodynamics and vascular anatomy of the breast, in order to visualize background parenchymal enhancement (BPE) without contrast at a temporal resolution comparable to ultrafast DCE-MRI.

METHODS AND MATERIALS

Non-contrast CINEMA imaging was performed using a 3.0T MRI system (Ingenia CX, Philips). A phantom was constructed using extension tubing, and normal saline was injected at a rate of 0.1 mL/sec using an injector (Sonic Shot 7, Nemoto Kyorindo). Signal changes were measured at the marked position. Labeling delay (LD) was varied from 100 to 220 ms, and the label gap was set from 0 to 50 mm to evaluate optimal conditions. Signal intensities were compared across conditions. Five dynamic phases were acquired with a total imaging time of 1200 ms and a phase interval of 200 ms.

RESULTS

As the labeling delay (LD) increased, the signal peak shifted to earlier phases, with the peak observed at the first phase at LD 220 ms. Similarly, as the label gap widened, spins arrived earlier, resulting in earlier peak phases (first phase at the maximum gap of 50 mm). These findings reflect the relationship between inflow time and signal changes.

CONCLUSION

visualization of arterial inflow, enabling dynamic assessment comparable to contrast-enhanced ultrafast MRI [Figure]. Optimization of the labeling slab location proved essential for consistent depiction of breast vasculature. Application of ASL and optimized temporal sampling strategies suggests that ultrafast dynamic breast MRI is

feasible without the use of contrast agents. This innovative approach may serve as a promising alternative in breast MRI, especially for patients with contraindications to contrast media or requiring repeated imaging.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the feasibility of non-contrast-enhanced ultrafast breast MRI using ASL-based CINEMA, offering a promising alternative for patients who cannot receive contrast agents due to allergies or renal dysfunction. It may enable dynamic perfusion assessment and background parenchymal enhancement evaluation without contrast administration.

T6-STCE2-3 STABLE SPARSE CT WITH MAXIMUM ENTROPY: A FRAMEWORK FOR REAL-TIME IMAGING

Wolfram R. Jarisch, PhD (*Presenter*)

PURPOSE

Sparse-view CT presents a trade-off between dose and image quality. Conventional iterative methods often lack stability and require heavy computation, while machine learning approaches demand training and offer no guarantees of convergence. We propose use of a novel implementation that solves the computational impasse by combining the mathematical uniqueness of Maximum Entropy (MENT) reconstruction with Kalman filtering to achieve fast, stable CT reconstruction even under sparse, noisy conditions.

METHODS AND MATERIALS

The MENT component enforces a global entropy-maximizing solution under projection constraints, ensuring uniqueness and drift-free convergence, especially in underdetermined systems. Adapted non-linear Kalman filter operations, with (approximate) Kalman gains replacing FBP in the inversion process, account for noisy projection data, acting as an efficient signal processing engine while accelerating convergence. Simulated head phantom data with =10% coverage were reconstructed and compared to FBP, SART, and OS-SART. Metrics: SSQ, visual fidelity, iteration count. No training or tuning needed.

RESULTS

The proposed framework achieved near-FBP reconstruction speeds, converging in ~4 effective full-resolution iterations, with residual SSQ of 0.36×10 - 3— utperforming OS-SART, which required 30 iterations and yielded a higher SSQ of 0.53×10 - 3. Visual review showed superior contrast and artifact suppression. A representative head phantom comparison is included as supporting evidence.

CONCLUSION

This work demonstrates that CT reconstruction from sparse data can be both fast and stable when grounded in entropy-based uniqueness. The MENT formulation guarantees a unique solution by construction, as described in Cover & Thomas (2006), Ch. 12, minimizing the risk of instability and bias even under non-linear constraints. The non-linear Kalman filter structure accounts for the exponential form of the MENT equation supporting fast convergence through a pyramidal resolution buildup, beginning from a single-voxel estimate and refining toward full resolution. Its gain matrix, derived from filtered back-projection (FBP), ensures a recursive, near-orthogonal updating scheme that is both computationally efficient and noise-suppressing. In sparse or limited-angle cases, Kalman convergence may otherwise drift unless guided by suitable criteria—an issue mitigated here through the stabilizing nature of the MENT solution.

CLINICAL RELEVANCE/APPLICATION

This method enables reliable low-dose, high-speed CT imaging without contrast agents or training data—well suited for interventional radiology, mobile scanners, and resource-constrained environments.

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T7-SSBR06

Breast Imaging (Contrast Enhanced Mammography)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: S406A

Wendie A. Berg, MD, PhD (*Moderator*)
Simone Schiaffino, MD (*Moderator*)

Sub-Events

T7-SSBR06-2 DEEP LEARNING MODELS ON CONTRAST ENHANCED MAMMOGRAPHY TO REDUCE FALSE RECALLS

Zhiwei Gong, MSc (*Presenter*)
Chang Liu, BS (*Abstract Co-Author*)
Wendie A. Berg, MD, PhD (*Abstract Co-Author*)
Dooman Arefan, PhD, MSc (*Abstract Co-Author*)
Shandong Wu, PhD (*Abstract Co-Author*)

PURPOSE

Contrast-enhanced mammography (CEM) is a lower-cost, better tolerated imaging modality than breast MRI. For CEM to be widely accepted, harms of additional testing and/or unnecessary procedures for women who do not have cancer should be minimized. The purpose of this study is to develop and validate deep learning-based models to reduce false recalls using screening CEM datasets from two different cohorts.

METHODS AND MATERIALS

In retrospective, IRB-approved HIPAA-compliant protocols, we utilized two screening CEM cohorts collected from a single large academic center. Cohort A comprises biopsy-proven 56 breast cancers and 114 benign biopsies, 281 false recalls for additional imaging, and 527 normal, from screening CEM in women with a personal history of breast cancer, with at least one-year follow-up. Cohort B comprises biopsy-proven 14 breast cancers and 82 benign biopsies, 216 false recalls, and 971 normal, from screening CEM exams of women meeting state law criteria for insurance coverage of screening MRI (extremely dense; or heterogeneously dense breasts with family history or LCIS), with at least 1-year follow-up. Data-efficient Image Transformer models were built for the classification task of false recall vs. normal, using full-size images. Data in Cohort A were used to train a classification model, using Cohort B as an independent testing set for validation reporting testing AUCs. We also performed five-fold cross-validation on Cohort A to examine technical robustness reporting average AUCs with standard deviations. Low-energy (LE) and dual-energy subtraction (DES) images were used in combination and individually for comparisons. CC and MLO views were combined in the model.

RESULTS

The independent test AUCs on Cohort B are 0.72 (LE+DES), 0.60 (LE), 0.71 (DES), respectively. For five-fold cross validation on Cohort A, the mean AUCs are 0.84±0.05 (LE+DES), 0.75±0.05 (LE), 0.77±0.09 (DES). P values are all <0.05 when comparing AUCs of LE+DES vs. DES and DES vs. LE.

CONCLUSION

CEM-based deep learning models can distinguish potential false recalls from normal exams in CEM screening. DES images play dominant roles in the models.

CLINICAL RELEVANCE/APPLICATION

Deep learning models can improve CEM performance to reduce unnecessary false recalls in screening, reducing unnecessary workload, cost, biopsies, and patient stress.

T7-SSBR06-3 ADDING TOMOSYNTHESIS TO CONTRAST-ENHANCED MAMMOGRAPHY REDUCES FALSE POSITIVES

Wendie A. Berg, MD, PhD (*Presenter*)
Bronwyn Nair, MD (*Abstract Co-Author*)
Amy E. Kelly, MD (*Abstract Co-Author*)
Adrienne Vargo, MD (*Abstract Co-Author*)
Luisa P. Wallace, MD (*Abstract Co-Author*)
Alisa Sumkin, DO (*Abstract Co-Author*)
John Drescher, BS (*Abstract Co-Author*)
Andriy I. Bandos, PhD (*Abstract Co-Author*)

PURPOSE

To assess the impact on reader performance [sensitivity, false positive recall rates (FPRR), and AUC] of adding digital breast tomosynthesis (DBT) to contrast-enhanced mammography (CEM).

METHODS AND MATERIALS

In an IRB-approved protocol, five breast imaging radiologist observers with 0.2 to 5 years' experience interpreting CEM retrospectively reviewed 403 screening CEM examinations enriched in malignancies (68, 17%). Benign cases had at least one year follow-up and atypical lesions were excised. Observers first reviewed low-energy (LE) images, recorded any recalled findings electronically, and locked in forced BI-RADS assessments (1 or 2, 3, 4A, 4B, 4C, or 5). Next, contrast-enhanced recombined (RC) images were reviewed, asking if and how RC images altered BI-RADS assessments of each LE finding, then recording any newly seen recalled findings and assessments. Finally, observers were shown DBT images and asked if DBT altered assessment of any LE or RC findings, then recording any newly seen findings and assessments. Primary outcome was case-level performance using maximum BI-RADS assessment (with BI-RADS 3 or higher positive). Statistical analysis of rates was performed using the generalized linear mixed model (proc glimmix, SAS, v.9.4) accounting for heterogeneity across cases and readers. Multi-reader multi-case analysis was used for comparing the AUCs.

RESULTS

Across all five observers, among 340 interpretations of malignant cases, 148 (44%) were recalled on LE images; adding RC images significantly improved sensitivity to 269 (79%, OR=4.9, 95% CI:3.3-7.3). There was no significant change in cancer detection with addition of DBT to LE+RC (OR=0.98, CI: 0.77-1.26): for one observer, DBT added detection of one cancer; for two, one less cancer was identified; and for two readers, there was no change, for net 268/340 (79%) possible detections made.

FPRR from LE alone across five observers was 410/1675 (24.5%); adding RC to LE increased FPRR to 664/1675 (39.6%,OR=2.1, CI:1.8-2.5, P<.001), but increase in FPRR was outweighed by the increase in sensitivity, producing an increase in AUC from 0.61 to 0.77 (P<.001). Adding DBT to LE+RC decreased FPRR overall to 582/1675 (34.7%, OR=0.80, CI: 0.72-0.89, P<.001), but not enough to significantly change the AUC (0.78 vs. 0.77, P=0.64).

CONCLUSION

In this retrospective reader study, addition of DBT to CEM produced a 5% (82/1675) decrease in false-positive recall rates while maintaining high sensitivity.

CLINICAL RELEVANCE/APPLICATION

A combined examination with LE, RC CEM images, and DBT improves screening performance by reducing need for unnecessary CEM-prompted additional testing. The additional radiation exposure from adding DBT to CEM needs to be considered but remains within accepted limits.

T7-SSBR06-4 CLINICAL CORRELATIONS OF BACKGROUND PARENCHYMAL ENHANCEMENT IN CEM: AN AI AND RADIOLOGIST ASSESSMENT

Tamerlan Mustafaev, MD (*Presenter*)
Margarita L. Zuley, MD (*Abstract Co-Author*)
Robert M. Nishikawa, PhD (*Abstract Co-Author*)

PURPOSE

The purpose of our study is to correlate clinical findings with quantitative and qualitative Background Parenchymal Enhancement (BPE) characteristics derived using an in-house AI algorithm and radiologist-reported data from Contrast-Enhanced Mammography (CEM) studies.

METHODS AND MATERIALS

Low energy (LE) and recombined images (RI) from 1111 consecutively accrued CEM exams from an ongoing prospective diagnostic CEM trial included 982 exams with pathologically verified benign lesions and 129 studies with verified breast cancer. Patient age, radiologist-reported breast density, and BPE were collected from the research database. We applied our in-house, radiologist-trained AI to segment breast density on LE images and transferred those segmentations to RI images to extract BPE within fibroglandular tissue (AI-fBPE) and fatty tissue. The AI model was a transformer-based U-net trained using publicly available datasets. We then calculated the difference between fibroglandular and fatty enhancements (AI-dBPE), thereby quantifying true tissue contrast. Two pairs of correlation analyses were performed: (1a) AI-dBPE vs. age for two combined breast density groups (i) non-dense (BI-RADS density category A&B), and (ii) dense (BI-RADS C&D); (1b) Radiologist-reported BPE vs. age, also evaluated separately within these two (i and ii) combined density groups; (2a) AI-dBPE vs. radiologist-reported density, and (2b) radiologist-reported BPE vs. radiologist-reported density. We calculated Pearson correlation and 95% confidence intervals.

RESULTS

(1a) AI-dBPE correlated inversely with age, -0.23 [-0.31, -0.14] for non-dense breasts, and this association was stronger in dense breasts, -0.42 [-0.48, -0.36]. Similarly, (1b) radiologist-reported BPE showed inverse correlations with age: -0.28 [-0.36, -0.19] for non-dense and -0.35 [-0.42, -0.20] for dense breasts. Additionally, (2a) AI-dBPE correlated with radiologist-reported density 0.59 [0.55, 0.63] and (2b) radiologist-reported BPE with radiologist-reported density 0.47 [0.43, 0.52]. AI-dBPE had a higher correlation than radiologist-reported BPE, 0.59 vs 0.47 ($p<0.05$).

CONCLUSION

Both AI-dBPE and radiologist-reported BPE decrease with increasing patient age, and this relationship was stronger for women with dense breast. AI-dBPE and radiologist-reported BPE both showed moderate correlations with radiologist-assessed breast density category, with AI-dBPE having a statistically significantly stronger correlation.

CLINICAL RELEVANCE/APPLICATION

The novel marker AI-dBPE may improve the reproducibility of CEM-based background parenchymal enhancement classification.

T7-SSBR06-5 LONGITUDINAL FLUCTUATIONS IN BACKGROUND PARENCHYMAL ENHANCEMENT ON CONTRAST ENHANCED MAMMOGRAPHY

Noam Nissan, MD, PhD (*Presenter*)
Jeffrey S. Reiner, MD (*Abstract Co-Author*)
Yuki Arita, MD, PhD (*Abstract Co-Author*)
Tali Amir, MD (*Abstract Co-Author*)
Victoria L. Mango, MD (*Abstract Co-Author*)
Hila Fruchtman (*Abstract Co-Author*)
Rosa E. Ochoa Albiztegui, MD, MS (*Abstract Co-Author*)
Jill Gluskin, MD (*Abstract Co-Author*)
Kimberly N. Feigin, MD (*Abstract Co-Author*)
Maxine S. Jochelson, MD (*Abstract Co-Author*)
Janice S. Sung, MD (*Abstract Co-Author*)

PURPOSE

Background parenchymal enhancement (BPE) and mammographic density (MD) are imaging biomarkers derived from contrast-enhanced mammography (CEM). However, unlike MD, the consistency of BPE across consecutive examinations in pre- and postmenopausal women has remained unexplored.

METHODS AND MATERIALS

A computational search was conducted for all screening CEM exams performed at our facility between December-2012 and January-2024 to identify patients with at least five consecutive negative annual screenings. BPE grades and MD categories were extracted from the official radiology reports, and their variability parameters were statistically compared both between these factors and across age groups.

RESULTS

Forty-five eligible patients at premenopausal age-group were identified (mean age at first scan 38.2±3.4 years, range: 27-42) and a matched postmenopausal age-group was assembled (mean age at first scan 63.7±3.8 years, range: 60-74), resulting in 450 CEMs analyzed. BPE demonstrated greater variability than MD, including fluctuations of at least one point (71.1-91.1%), two-point changes (17.8-22.2%), and transitions between low and high binary distributions (17.8-27.7%) ($P<0.01$ for all). No differences were observed in the standard deviation between the two age groups ($P=0.34$).

CONCLUSION

BPE in CEM exhibits greater longitudinal variability than MD in both premenopausal and postmenopausal women, with persistent fluctuations across age groups, highlighting the dynamic nature of BPE and emphasizing the need to carefully consider its role in clinical decision-making and research.

CLINICAL RELEVANCE/APPLICATION

Further studies are needed to refine BPE's potential as a biomarker and improve its clinical utility, by using automated assessment tools and standardizing image acquisition and analysis protocols.

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T7-SSBR07

Breast Imaging (MRI AI Applications)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: N228

Habib Rahbar, MD (*Moderator*)
Sarah Eskreis-Winkler, MD, PhD (*Moderator*)

Sub-Events

T7-SSBR07-1 NONINVASIVE PREDICTION OF TUMOR-INFILTRATING LYMPHOCYTES IN BREAST CANCER USING MULTIPARAMETRIC DCE-MRI RADIOMICS AND SEMANTIC FEATURES

Wenjun Yang (*Presenter*)
Xin-Gui Peng, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop and validate a machine learning model integrating multiphasic DCE-MRI radiomics and clinical semantic features for predicting tumor-infiltrating lymphocyte (TIL) levels in breast cancer.

METHODS AND MATERIALS

A total of 298 pathologically confirmed BC patients were retrospectively enrolled and stratified into two groups based on postoperative TIL levels: low TILs (<10%, n =102) and high TILs (=10%, n =196). Using 3D-Slicer software, tumor volumes of interest (VOIs) were manually delineated slice-by-slice across all six DCE-MRI phases, with 3mm peritumoral VOIs generated through margin expansion. Radiomics features were extracted separately from tumor and peritumoral regions in each phase using the FAE software. Ten machine learning algorithms were tested with five-fold cross-validation in the training set to determine the optimal model. Traditional imaging features were screened using univariate logistic regression, and features with P <0.05 were included in multivariate logistic regression to construct a combined model. Model performance was assessed by the area under the receiver operating characteristic curve (AUC), and statistical comparisons between models were conducted using DeLong's test.

RESULTS

A total of 1,688 radiomics features were extracted from tumor and peritumoral VOIs. Among intratumoral radiomics models, DCE_Phase 5 (DCE_P5) demonstrated optimal performance (training AUC=0.835; validation AUC=0.714). For peritumoral models, DCE_P3 showed the best results (training AUC=0.793; validation AUC=0.703). The combined model incorporating DCE_P5 tumor features and DCE_P3 peritumoral features achieved an AUC of 0.878 and 0.772 respectively. In semantic feature analysis, axillary lymph node status (P = 0.017) and fibroglandular tissue content (P = 0.019) were identified as significant predictors . The combined model using DCE_P5 tumor features and semantic features reached an AUC of 0.853 (training) and 0.706 (validation), while the model using DCE_P3 peritumoral features and semantic features reached an AUC of 0.792 and 0.705, respectively. A final model integrating all features achieved the highest performance (AUC_train = 0.881; AUC_valid = 0.773).

CONCLUSION

This study presents a clinically applicable radiomics model that combines multiphasic DCE-MRI features with routine semantic features to noninvasively predict TIL levels in breast cancer, potentially aiding in immunotherapy decision-making.

CLINICAL RELEVANCE/APPLICATION

The developed model provides a noninvasive method to assess tumor immune microenvironment, which may help identify patients likely to benefit from immunotherapy while maintaining compatibility with standard breast MRI protocols.

T7-SSBR07-2 ADAPTIVE AI-BASED MRI BREAST CANCER SCREENING

Ritse M. Mann, MD, PhD (*Presenter*)
Luuk Balkenende (*Abstract Co-Author*)
Jonatan Ferm (*Abstract Co-Author*)
Joren Brunekreef (*Abstract Co-Author*)
Katja Pinker-Domenig, MD, PhD (*Abstract Co-Author*)
Jonas Teuwen, MSc, PhD (*Abstract Co-Author*)

PURPOSE

Multi-parametric breast MRI offers high sensitivity for breast cancer detection, but its widespread use in screening is limited by high cost and long scan duration. Abbreviated MRI protocols reduce imaging duration but may compromise specificity and reduce available prognostic information. This study introduces an AI-based adaptive screening protocol that aims to combine the efficiency of abbreviated MRI with the diagnostic depth of full protocols by determining, at the scanner, when full imaging is necessary.

METHODS AND MATERIALS

An AI detection algorithm was developed using breast MRI scans from patients at a tertiary cancer center collected between 2004 and 2020 (n=3272). To evaluate the proposed adaptive screening protocol, the trained algorithm was retrospectively applied to an independent dataset consisting exclusively of screening cases (n=1277). In this setting, the model analyzed abbreviated MRI scans to identify suspicious regions and determine whether additional full-protocol imaging was required. The impact of the adaptive protocol was assessed by measuring average scan duration and recall rate under the assumption that any patient with an abnormality (benign or malignant) that would not directly be offered the full protocol would be recalled for performance of a full protocol scan in second instance.

RESULTS

The AI-based adaptive protocol substantially reduced average scan duration, enabling more efficient screening. A trade-off between scan duration and recall rate was observed: average shorter protocol durations (i.e., less direct scanning of a full protocol) led to higher recall rates. At a 4.8% patient recall rate for full protocol scanning, the adaptive protocol achieved 75% of the maximum potential time savings, reducing the average protocol duration to 63% of the full protocol.

CONCLUSION

AI-based adaptive screening can streamline breast MRI scanning while still acquiring full protocol information in women with abnormalities. By adjusting sensitivity and specificity thresholds, the balance between efficiency and diagnostic performance can be optimized.

CLINICAL RELEVANCE/APPLICATION

By tailoring MR scanning to individual findings, an AI-based adaptive protocol can increase accessibility and cost-effectiveness of breast cancer screening with MRI, making this MRI screening available to more women in clinical practice.

T7-SSBR07-5 ULTRAFAST BREAST MRI WITH DEEP LEARNING RECONSTRUCTION: ENHANCING IMAGE QUALITY AND REDUCING ACQUISITION TIME

Xin Weng, MBBS (*Presenter*)
Pingping Wang (*Abstract Co-Author*)
Baoying Chen (*Abstract Co-Author*)

PURPOSE

Compared to abbreviated dynamic contrast-enhanced MRI (DCE-MRI) MRI, breast ultrafast DCE-MRI enables the acquisition of multiple sequential enhanced images with high temporal resolution within one minute following contrast injection. This imaging modality not only captures early kinetic information about breast lesions but also significantly reduces scan time, making it a potentially effective screening tool. However, due to limitations in temporal resolution, the spatial resolution of ultrafast MRI is lower than that of conventional DCE-MRI, which may lead to the omission of some small breast lesions. This study aimed to investigate the feasibility of reconstructing high-resolution ultrafast DCE-MRI images using a deep learning approach.

METHODS AND MATERIALS

We retrospectively collected breast MRI data from 202 patients (165 for training and 37 for testing, selected randomly) who underwent both ultrafast and conventional DCE-MRI between August 2023 and October 2024 at our hospital. A deep learning model was developed, trained, and evaluated to reconstruct high-resolution ultrafast images from unenhanced T1-weighted images (T1WI) and actual ultrafast images. The quality of the reconstructed images was quantitatively assessed using metrics such as Peak Signal-to-Noise Ratio (PSNR), Structural Similarity Index (SSIM), Mean Absolute Error (MAE), and Mean Squared Error (MSE). Additionally, we analyzed the consistency of spatial resolution differences between the actual ultrafast and conventional DCE-MRI images, as well as between the actual ultrafast and reconstructed ultrafast images.

RESULTS

In the test dataset, the reconstructed ultrafast images exhibited a spatial resolution comparable to that of conventional DCE-MRI images (PSNR: 29.383 ± 2.058, SSIM: 0.849 ± 0.070, MAE: 0.017 ± 0.010, MSE: 0.001 ± 0.003). The similarity in spatial resolution between real ultrafast images and reconstructed ultrafast images (PSNR: 19.032 ± 1.488, SSIM: 0.595 ± 0.0646), as well as between real ultrafast images and conventional DCE-MRI images (PSNR: 18.990 ± 1.463; SSIM: 0.600 ± 0.050), demonstrates a high level of consistency (PSNR-ICC: 0.978 [0.977, 0.979], P<0.01; SIM-ICC: 0.849 [0.841, 0.856], P < 0.01).

CONCLUSION

Deep learning-based reconstruction is expected to generate high-resolution, ultrafast images without increasing the scanning time for breast ultrafast MRI.

CLINICAL RELEVANCE/APPLICATION

The application of deep learning to reconstruct high-resolution ultrafast DCE-MRI images shows significant promise in advancing breast MRI screening. This method can improve the efficiency of MRI procedures, reduce scan times, and enable the acquisition of high-spatial-resolution DCE-MRI images without the need for actual scanning.

T7-SSBR07-6 DIAGNOSTIC PERFORMANCE OF AI-ENHANCED LOW-DOSE GADOLINIUM BREAST MRI COMPARED TO STANDARD-DOSE PROTOCOLS

Hanna Terhaar (*Presenter*)
Kathryn W. Zamora, MD, MPH (*Abstract Co-Author*)
Ceren Yalniz, MD (*Abstract Co-Author*)
Stefanie B. Zalasin, MD (*Abstract Co-Author*)
Stefanie A. Woodard, DO (*Abstract Co-Author*)

PURPOSE

To determine whether AI combined with low-dose gadolinium breast MRI maintains diagnostic accuracy compared to standard-dose protocols.

METHODS AND MATERIALS

This prospective, IRB-approved, single-center clinical trial included 20 female participants that were chosen based on the presence of known, enhancing breast lesions. At time of exam, 10 cases had biopsy-proven breast cancer and 10 cases had no known breast cancer. Participants underwent a standard dose (0.1 mmol/kg) gadolinium-enhanced MRI followed by a low-dose (0.025 mmol/kg). Exams were conducted within 48 hours to 14 days apart. An AI algorithm was applied to enhance image quality and lesion conspicuity on both datasets. Three fellowship-trained breast radiologists independently evaluated images from 3 groups: low-dose with AI (Group 1), standard-dose without AI (Group 2), and standard-dose with AI (Group 3). Overall diagnostic performance, including sensitivity, specificity, and predictive values, were calculated. Lesion characteristics between groups were compared using Pearson's Chi-Square test for categorical variables and ANOVA for continuous variables. Fleiss' Kappa and Intraclass Correlation Coefficient (ICC) were used to determine inter-reader agreement. Pearson's Chi-Square test was used for diagnostic accuracy. Significance was set at $p < 0.05$.

RESULTS

Diagnostic sensitivity was identical across groups (83.3%), while specificity was highest in Group 1 (71.4%) compared to Group 2 (65.9%) and Group 3 (60.8%). Group 1 also had the highest positive predictive value (50.0%) and all groups shared consistently high negative predictive values. Chi-Square analysis showed no significant difference in diagnostic accuracy among groups ($X^2 = 0.981$, $p = 0.612$). Inter-reader agreement for lesion type (Kappa = 0.647, $p < 0.001$) and malignancy likelihood (Kappa = 0.527, $p <0.001$), was strong across all groups but lesion conspicuity assessments showed greater variability, particularly in AI-enhanced groups. Size measurements had fair inter-reader agreement throughout (ICC = 0.382, $p < 0.001$).

CONCLUSION

AI-assisted low-dose gadolinium breast MRI demonstrates comparable diagnostic accuracy to the standard-dose protocols. Although variability in conspicuity assessment was observed, lesion classification and malignancy evaluation remained consistent across groups.

CLINICAL RELEVANCE/APPLICATION

The results of this study highlight the potential for AI-enhanced low-dose breast MRI to serve as a safe and clinically viable alternative to standard gadolinium protocols, reducing the risks associated with gadolinium exposure while maintaining diagnostic accuracy. Implementing standardized AI interpretation training could improve consistency among radiologists.

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T7-SSCA06

Science Session with Keynote: Cardiac Imaging (Photon Counting CT)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: E353C

Ricardo P. Budde, MD, PhD (*Moderator*)
Christos V. Gkizas, MD, PhD (*Moderator*)

Sub-Events

T7-SSCA06-2 DEEP LEARNING-BASED AUTOMATED CORONARY PLAQUE QUANTIFICATION: FIRST DEMONSTRATION WITH ULTRA-HIGH RESOLUTION PHOTON- COUNTING DETECTOR CT AT DIFFERENT TEMPORAL RESOLUTIONS

Tristan Thorben Demmert (*Presenter*)
Konstantin Klambauer, MD (*Abstract Co-Author*)
Victor Mergen, MD (*Abstract Co-Author*)
Lukas Jakob Moser (*Abstract Co-Author*)
Chris Schwemmer (*Abstract Co-Author*)
Michael Wels (*Abstract Co-Author*)
Matthias Eberhard, MD (*Abstract Co-Author*)
Hatem Alkadhi, MD (*Abstract Co-Author*)
Bernhard Schmidt, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the impact of temporal resolution on deep learning (DL)-based automated coronary plaque quantification in patients undergoing ultra-high resolution photon-counting detector coronary CT angiography (UHR-CCTA).

METHODS AND MATERIALS

In this retrospective single-center study, 45 patients undergoing UHR-CCTA were included. For each patient, two image reconstructions were generated: one using dual-source mode (66 ms temporal resolution) and one simulating single-source mode (125 ms). A validated DL algorithm automatically quantified coronary plaque volumes and stenosis severity in both reconstructions. Quantitative analysis was performed for the entire left anterior descending artery (LAD), left circumflex artery (CX), and right coronary artery (RCA) - from the coronary ostium to the point where the vessel diameter decreased to 1.5 mm - as well as for the largest lesion within each of these vessels. Vessels without detectable plaque were excluded from analysis. Paired Wilcoxon signed-rank tests with Benjamini-Hochberg correction were used for statistical comparisons.

RESULTS

119/135 (88.1%) of evaluable coronary arteries showed the presence of atherosclerotic plaque and were included in the analysis. This comprised 45/45 (100%) LAD, 35/45 (77.8%) CX, and 39/45 (86.7%) RCA. At the vessel level, total plaque volume was lower in 28 of 45 patients (62.2%) in the 66 ms reconstructions compared to 125 ms, with calcified and non-calcified plaque volumes lower in 32 (71.1%) and 28 (62.2%) patients, respectively. Total plaque volume was significantly higher at 125 ms in the LAD (271.8 mm^3 vs. 250.4 mm^3, $P < 0.001$) and across all vessels (681.3 mm^3 vs. 647.8 mm^3, $P = 0.023$). At the lesion level, differences were more pronounced: total plaque volume was lower in 44 of 45 patients (97.8%) at 66 ms, with both calcified and non-calcified volumes lower in 42 of 45 patients (93.3%). Combined lesion plaque volume was significantly higher in 125 ms reconstructions (447.3 mm^3 vs. 414.9 mm^3, $P < 0.001$). Lumen volumes were lower and diameter stenosis grades higher in the 125 ms reconstructions (combined average stenosis: 35.4% vs. 28.1%, $P = 0.003$).

CONCLUSION

Lower temporal resolution reconstructions systematically overestimated coronary plaque burden and stenosis severity compared to higher temporal resolution in DL-based automated coronary plaque quantification in patients undergoing UHR-CCTA.

CLINICAL RELEVANCE/APPLICATION

Differences in temporal resolution significantly affect DL-based quantification of coronary plaque and stenosis on UHR-CCTA. Clinicians should be aware that lower temporal resolution may systematically overestimate plaque burden and stenosis severity, potentially impacting risk assessment and treatment decisions.

T7-SSCA06-3 AUTOMATED CORONARY ANALYSIS IN ULTRAHIGH-SPATIAL RESOLUTION PHOTON-COUNTING DETECTOR CT ANGIOGRAPHY: CLINICAL VALIDATION AND INTRA-INDIVIDUAL COMPARISON WITH ENERGY-INTEGRATING DETECTOR CT

Dmitrij Kravchenko, MD (*Presenter*)
Giuseppe Tremamunno, MD (*Abstract Co-Author*)
Milan Vecsey-Nagy, MD, PhD (*Abstract Co-Author*)
Muhammad Taha Hagar, MD (*Abstract Co-Author*)
Tilman S. Emrich, MD (*Abstract Co-Author*)
Akos Varga-Szemes, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of a deep learning (DL) -based automated coronary assessment (ACA) algorithm for the detection and classification of coronary artery disease (CAD) on ultrahigh-resolution (UHR) photon-counting detector (PCD) coronary computed tomography (CT) angiography.

METHODS AND MATERIALS

Prospectively enrolled patients underwent a PCD-CT research scan within 30 days of energy-integrating detector (EID)-CT. The ACA and two expert readers assessed all EID-CT and UHR PCD-CT reconstructions according to the coronary artery disease-reporting and data system (CAD-RADS) classification and compared them to the reference standard of invasive coronary angiography (ICA). Statistical analysis was performed based on patient stratification according to the presence of non-obstructive (CAD-RADS 0-2) or obstructive (CAD-RADS =3) lesions. After a washout period of 3 months, Reader 2 repeated all assessments using the ACA as assistance (aACA). The time taken for each reading by all experts and the ACA was recorded.

RESULTS

In total, 401 segments with 185 lesions were identified and available for intra-individual comparison in 32 patients (81.3% males, age 68.6±6.8 years). Inter-reader agreement was substantial for EID-CT (? = 0.75) and near perfect for the UHR PCD-CT datasets (? = 0.86). When compared to expert readers, the ACA achieved good to moderate sensitivity, excellent specificity, and excellent accuracy for EID-CT (Reader 1: 85.3%, 91.2%, 90.3%, respectively; Reader 2: 83.1%, 93.0%, 91.3%) and PCD-CT (Reader 1: 84.6%, 96.1%, 95.0%; Reader 2: 73.9%, 96.3%, 93.7%) on a per-segment level. When compared to the reference standard, manual coronary assessment and ACA demonstrated a similar sensitivity, specificity, and accuracy (66.7% vs 66.7%; 85.3% vs 79.4%; 83.8% vs 78.4%; respectively) on PCD-CT. The combined aACA showcased a similar sensitivity (66.7%), but with increased specificity (97.1%), and accuracy (94.6%) and were significantly faster than manual assessments with an average decrease in time of 54% (mean time: 7:17±1:50 minutes vs 3:09±0:46 minutes; p<0.001).

CONCLUSION

DL-based ACA demonstrated robust performance with substantial agreement with experts and better agreement with the ICA reference standard on UHR PCD-CT imaging compared to EID-CT. The combined use of ACA with expert assessment led to a higher specificity and significantly shorter analysis times.

CLINICAL RELEVANCE/APPLICATION

DL-assisted coronary assessments are a promising support tool for radiologists, enhancing diagnostic accuracy and workflow efficiency, and helping clinicians manage increasing workloads in routine practice.

T7-SSCA06-4 PHOTON-COUNTING CT-DERIVED ECV IN HYPERTROPHIC CARDIOMYOPATHY: A VIABLE ALTERNATIVE TO MRI

Christos V. Gkizas, MD, PhD (*Presenter*)
Benjamin Longere, MD, PhD (*Abstract Co-Author*)
Francois Pontana, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility of myocardial late iodine enhancement (LE) and extracellular volume (ECV) quantification using dual-source photon-counting detector computed tomography (PCCT) in hypertrophic cardiomyopathy (HCM) compared with cardiac MRI.

METHODS AND MATERIALS

Patients with HCM were referred for cardiac CT angiography (CCTA) on a first-generation dual-source PCCT (NAEOTOM Alpha, Siemens Healthineers) to exclude coronary artery disease and for a comprehensive cardiac MRI. The CCTA protocol was systematically associated with a LE acquisition in spectral mode, 5 minutes after contrast media injection. ECV was calculated from the iodine map of the myocardium on a dedicated platform (SyngoVia Frontier). The cardiac MRI biomarkers included T1 mapping, ECV and late gadolinium enhancement (LGE) percentage.

RESULTS

30 patients with confirmed genetic testing were retrospectively included (mean age = 59±13.8 years; 8 females). The mean dose length product of the LE scan was 105±45 mGy.cm. No significant difference was found between global ECV-CT and ECV-MRI (30.0% ± 4.8 vs 30.62 ± 4.2, P=0.59). Linear regression revealed a strong segmental correlation between ECV-PCT and ECV-MRI (basal: r = 0.89, mid-ventricular: r = 0.85, apical: r = 0.85, P <0.001). ECV-CT showed good diagnostic performance for predicting LGE =15% (Se = 80%, Sp = 76%, AUC = 0.77, 95% CI: 0.53-0.97) at a 33.4% threshold, comparable to ECV-MRI (Se = 80%, Sp = 76%, AUC = 0.80, threshold = 33.9%, P = 0.176). Both modalities showed strong negative correlation with peak VO2 (r = -0.76) and moderate to strong correlation with NT-proBNP levels (r = 0.59).

CONCLUSION

PCD-CT presents a promising non-invasive alternative to MRI in the assessment of HCM, with the potential to monitor myocardial fibrosis and enhance multimodality disease management.

CLINICAL RELEVANCE/APPLICATION

ECV quantification using PCD-CT is feasible and accurate compared to MRI,and can be achieved with a low radiation dose. ECV quantification using dual-source PCD-CT offers a promising non-invasive imaging alternative to MRI providing an incremental value to LGE for risk stratification in HCM.

T7-SSCA06-6 Keynote Speaker: Clinical impact of Photon Counting CT in Cardiac Imaging

Ricardo P. Budde, MD, PhD (*Science Invited Presenter*)

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T7-SSGI08

Gastrointestinal Imaging (Pancreas - Adenocarcinoma (II))

Tuesday, Dec. 2 3:00PM - 4:00PM Room: E353A

Ersan Altun, MD (*Moderator*)
Abraham Fourie Bezuidenhout, MD (*Moderator*)

Sub-Events

T7-SSGI08-1 SUBTLE SIGNS, DISCORDANT EYES: NEAR-NORMAL PANCREAS MORPHOLOGY AND INTEROBSERVER VARIABILITY ARE BARRIERS FOR DETECTION OF PANCREATIC DUCTAL ADENOCARCINOMA (PDA) AT THE PRE-DIAGNOSTIC STAGE

Khurram K. Bhinder, MBBS (*Presenter*)
Sovanlal Mukherjee, PhD (*Abstract Co-Author*)
Ajith Antony, MBBS, MD (*Abstract Co-Author*)
Armin Zarrintan, MD (*Abstract Co-Author*)
Suresh T. Chari (*Abstract Co-Author*)
Ajit H. Goenka, MD (*Abstract Co-Author*)

PURPOSE

To characterize imaging phenotype of the pancreas and quantify interobserver variability during the prediagnostic stage (3-36 months prior to diagnosis) of PDA, thereby identifying barriers in early cancer detection.

METHODS AND MATERIALS

From 4,150 PDA cases (2006-2025), 326 pre-diagnostic CTs were identified [median lead time: 399 days (93-1,092); age: 70 (33-92); 45.7% female] and independently reviewed by 3 radiologists for predefined features and a 5-point global score. Ten randomly selected scans were used for reader calibration and excluded from analysis. Feature agreement was evaluated using Gwet's AC1; global scores were trichotomized into Normal (1-2), Equivocal (3), and Abnormal (4-5) and analyzed using quadratic-weighted kappa (?). Agreement was stratified by time to diagnosis [3-12 (133 CTs), 12-24 (105 CTs), 24-36 months (78 CTs)] and compared using 1,000 bootstrap iterations and Kruskal-Wallis test. Ground truth was assigned by majority vote (=2 readers); scans with three distinct ratings were labeled Discordant.

RESULTS

Ductal findings were infrequent yet interpreted with high agreement: MPD dilatation (32.6%, AC1=0.78), CBD dilatation (19.9%, AC1=0.80), MPD abrupt cutoff (25.3%, AC1=0.80), CBD abrupt cutoff (8.9%, AC1=0.88) and tapered narrowing of either duct (<10%, AC1=0.76-0.78). Parenchymal focal attenuation difference (FAD) was most common (45.6%) but least reproducible (AC1=0.36). Contour deformity (18.1%, AC1 = 0.59) and focal atrophy (12.4%, AC1 = 0.71) were less common but showed higher agreement. Ductal findings rose near diagnosis (e.g., MPD dilatation: 14.1%?29.5%?45.8%), but FAD remained more common (25.6%?39%? 62.4%). All findings increased in frequency near diagnosis, but agreement declined (e.g., contour deformity: 8.9%?11.4%? 28.6%, AC1=0.79? 0.66? 0.37; MPD abrupt cutoff: 7.7%?20.9%?39.0%, AC1=0.89?0.84?0.59). Global score agreement was moderate (?=0.59, 95% CI:0.53-0.65) and did not improve (? = 0.59, 0.49, 0.51 for 3-12, 12-24, and 24-36 months; p> 0.05). Unanimous scores occurred in only 45% CTs and remained stable (44.3%, 40.0%, 53.0%). Majority-vote ground truth classified most CTs as Normal (43.4%). Although Abnormal CTs increased (7.7%?21.9%?45.1%), most still showed near-normal pancreas (Equivocal 18%, Discordant 9%, Normal 27.8%) even at 3-12 months.

CONCLUSION

Early PDA often presents with near-normal pancreas morphology; rising feature prevalence is offset by declining agreement, limiting reliable prediagnostic detection on CT alone.

CLINICAL RELEVANCE/APPLICATION

Persistent interpretive variability and near-normal pancreas morphology—even within a year of diagnosis—underscore the urgent need for AI-driven tools to augment early PDA detection.

T7-SSGI08-2 MULTICENTER STUDY OF SMALL PANCREATIC ADENOCARCINOMA: COMPARISON OF CT AND MRI IMAGING FEATURES

Yuki Sato (*Presenter*)
Yoshihiko Fukukura, MD, PhD (*Abstract Co-Author*)
Takeshi Fukunaga (*Abstract Co-Author*)
Keitaro Sofue, MD (*Abstract Co-Author*)
Masakatsu Tsurusaki, MD, PhD (*Abstract Co-Author*)
Dai Inoue (*Abstract Co-Author*)
Yasunari Fujinaga, MD (*Abstract Co-Author*)
Nobuhiro Fujita, MD,PhD (*Abstract Co-Author*)
Katsuhiro Sano, MD, PhD (*Abstract Co-Author*)
Yoshifumi Noda, MD, PhD (*Abstract Co-Author*)
Yoshiki Asayama, MD, PhD (*Abstract Co-Author*)
Masamitsu Hatakenaka, MD, PhD (*Abstract Co-Author*)
Satoshi Goshima, MD, PhD (*Abstract Co-Author*)

PURPOSE

Pancreatic cancer has a dismal prognosis, with a 5-year survival rate below 10%. However, early-stage pancreatic cancers show markedly better outcomes, with 5-year survival rates exceeding 80% for tumors smaller than 10 mm and approximately 50% for those measuring 10-20 mm. These figures underscore the critical importance of early detection. Imaging modalities capable of high tumor detectability or predictive feature identification are essential for improving patient outcomes. The purpose of this study was to compare the imaging features of small pancreatic adenocarcinomas between CT and MRI.

METHODS AND MATERIALS

This multicenter study was approved by the institutional review boards of the twelve participating centers. We enrolled 247 patients (122 men and 125 women; mean age, 70.8 years; range, 37-89 years) with histologically confirmed small (=20 mm) pancreatic adenocarcinoma, including high-grade pancreatic intraepithelial neoplasia (PanIN) (n=45), = 10mm PDACs (n=46), and 10-20 mm PDACs (n=156) who had undergone surgical resection. All patients underwent contrast-enhanced CT and MRI examinations, including T1-weighted, T2-weighted, and diffusion-weighted imaging sequences. Two radiologists independently assessed: (a) tumor delineation, (b) tumor attenuation or signal intensity, and (c) secondary signs (parenchymal atrophy, focal parenchymal atrophy, main pancreatic duct [MPD] stricture, and small cyst near MPD stricture). Frequencies of findings between CT and MRI were compared using the McNemar test.

RESULTS

None of the high-grade PanINs were demarcated on either CT or MRI (Fig. 1). Tumor delineation was significantly better on CT than on MRI for =10 mm PDACs (P=0.039) and 10-20 mm PDACs (P <0.001). However, abnormal tumor attenuation or signal intensity was more frequently observed on MRI for high-grade PanINs (P=0.023) as well as for =10 mm and 10-20 mm PDACs (both, P <0.001). The frequency of parenchymal and focal parenchymal atrophy was comparable between CT and MRI for high-grade PanINs (both, P >0.999), =10 mm PDACs (P=0.375 and =500), and 10-20 mm PDACs (P=0.250 and >0.999). MPD strictures were more readily identified on MRI for both high-grade PanINs and =10 mm PDACs (both, P=0.031). The frequency of small cysts adjacent to MPD strictures was significantly higher on MRI for high-grade PanINs, =10 mm PDACs, and 10-20 mm PDACs (all, P <0.001).

CONCLUSION

While CT demonstrates superior tumor delineation, MRI is equally or even more useful than CT for predicting tumor presence when the tumor is not clearly demarcated.

CLINICAL RELEVANCE/APPLICATION

Integration of MRI into clinical diagnostic pathways may facilitate the early detection of pancreatic adenocarcinoma, contributing to improved prognostic outcomes.

T7-SSGI08-4 UNFOLDING PANCREATIC CANCER WITH ULTRA-HIGH-RESOLUTION PHOTON-COUNTING CT - IMPROVED DIAGNOSTIC ACCURACY AND VESSEL EVALUATION

Erik Brandt, MD (*Presenter*)
Felix C. Muller, MD (*Abstract Co-Author*)
Yousef W. Nielsen, PhD (*Abstract Co-Author*)
Anne Ewald (*Abstract Co-Author*)
Bulat Ibragimov, PhD (*Abstract Co-Author*)
Henrik S. Thomsen, MD (*Abstract Co-Author*)
Michael B. Andersen, MD, PhD (*Abstract Co-Author*)

PURPOSE

Pancreatic cancer (PDAC) has a dismal prognosis and is difficult to detect with imaging in its early stages. Photon-counting CT (PCCT) is a recent considerable improvement in CT detector technology with potential to improve the detection of early PDAC. Our aim was to investigate the diagnostic accuracy of PDAC detection with the use of dose optimized ultra-high resolution PCCT and multiplanar curved reformations (MPCR) compared to standard reformations (MPR). Our secondary aims were to investigate whether evaluation of tumor size or vessel invasion were affected by MPCR.

METHODS AND MATERIALS

This retrospective interpretation of prospectively included patients under suspicion of PDAC from October 10, 2022, until June 30, 2024. Presence of PDAC was confirmed with pathology and absence of PDAC was confirmed with a minimum follow-up of 12 months. Twelve readers of three different experience levels reviewed the two types of reformations (MPR and MPCR) in two separate sessions in a blinded, balanced, and crossed setup. Presence of PDAC and signs of vessel invasion were registered. We used a parametric multi-reader multi-case (MRMC) analysis of variance to compare diagnostic performance across reformations.

RESULTS

Sixty-one participants were included in this study (30 with PDAC [8 resected] and thirty-one normal (median age, 72 years [IQR, 62-80 years]) (30M). Mean tumor size was 46.3mm (SD 13.8mm). MRMC analysis revealed an improved sensitivity of tumor detection with the use of MPCR compared to MPR (0.98 vs 0.94, p = .048) with an unaltered specificity (0.98 vs 0.98, p = .75) for all readers as a group. A total of fifty-three vessels has tumor-to vessel contact in this study. We found a significant improvement for MPCR compared to MPR in the detection of contour abnormality of the PV/SMV (sensitivity 0.73 vs 0.67, p = .020; specificity 0.98 vs 0.99, p = .23), in the degree of tumor-to-vessel contact for both the superior mesenteric artery (reference standard 197°; MPCR 117 ° vs MPR 102 °, p = .002) and the PV/SMV (reference standard 199°; MPCR 172 ° vs MPR 147 °, p < .001), and in the measurement of tumor size (39.7mm for MPCR vs 38.0mm for MPR, p = .023). We saw an insignificant improvement in detection of tumor-to-vessel contact (sensitivity 0.91 vs 0.87, p = .10; specificity 0.95 vs 0.96, p = .21).

CONCLUSION

MPCR and ultra-high resolution PCCT improved diagnostic accuracy of PDAC detection and improved evaluation of vessel invasion compared to standard MPR reformations.

CLINICAL RELEVANCE/APPLICATION

The results suggest a possibility to minimize the considerable number of missed cases of pancreatic cancer with initial imaging. Additionally, the improvement in evaluation of vessel invasion has important implications in the evaluation of resectability of pancreatic cancers.

T7-SSGI08-5 PROSPECTIVE PANCREATIC CANCER RISK PREDICTION BASED ON IMAGING FEATURES IN NON-CONTRAST CT: A RETROSPECTIVE COHORT STUDY

Wenyi Deng (*Presenter*)
Feiyang Xie, MD (*Abstract Co-Author*)
Fuze Cong, PhD (*Abstract Co-Author*)
Zhengyu Jin, MD (*Abstract Co-Author*)
Huadan Xue, MD (*Abstract Co-Author*)

PURPOSE

Pancreatic cancer is often diagnosed late, highlighting the need for accessible, non-invasive screening methods. This study evaluates if non-contrast CT imaging features from routine abdominal or chest scans can predict pancreatic cancer occurrence within 3 years.

METHODS AND MATERIALS

We retrospectively analyzed patients undergoing non-contrast abdominal or chest CT scans (2014-2022) visualizing the pancreas. Participants were divided into two groups: a case group (n=79), diagnosed with pancreatic cancer within 3 years post-baseline CT without initial tumor suspicion, and an age- and gender-matched control group (n=98), remaining cancer-free for at least 3 years post-baseline CT. Two radiologists, blinded to patient outcomes, independently assessed baseline CT features: cystic lesions, pancreatic duct dilation (main duct =3 mm in the head or =2 mm in the body/tail), peripancreatic fat stranding, and pancreatic parenchymal atrophy (anteroposterior diameter =2 cm in the head/body or =1 cm in the tail). Combination features, including the protective absence of fat stranding and atrophy, were evaluated. The risk stratification model was constructed as follows: very high risk: high-risk features (cystic lesions or duct dilation) without protective combination; high risk: no high-risk features but atrophy present; intermediate risk: high-risk features with protective combination or isolated fat stranding; low risk: no high-risk features with protective combination.

RESULTS

Cystic lesions (OR=26.6, p<0.001) and duct dilation (OR=26.6, p<0.001) strongly predicted cancer. Pancreatic atrophy showed moderate risk (OR=7.94, p<0.001). Fat stranding alone was non-significant. Protective combination strongly reduced risk (OR=0.17, p<0.001). The developed four-tier risk stratification model significantly differentiated between case and control groups. The "very high risk" category exclusively contained cases (specificity=100%, PPV=100%). The proportion of cases increased progressively across risk categories (low: 14.5%, intermediate: 35.3%, high: 62.3%, very high: 100%). The combined "high and very high" risk categories yielded a sensitivity of 73.4% and specificity of 76.5%.

CONCLUSION

Non-contrast CT features predict pancreatic cancer occurrence. The developed risk stratification model significantly discriminates risk levels. The routine availability and non-invasive nature of non-contrast CT highlight its potential as a pragmatic, frontline screening tool for pancreatic cancer.

CLINICAL RELEVANCE/APPLICATION

Routine non-contrast CT can stratify pancreatic cancer risk, guiding targeted surveillance and reducing unnecessary procedures, especially valuable in resource-limited settings.

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Nov. 30 – Dec. 4
RSNA® 2025
Imaging the Individual

Abstract Archives of the RSNA, 2025

T7-SSGI09

Gastrointestinal Imaging (Gastric Cancer (II))

Tuesday, Dec. 2 3:00PM - 4:00PM Room: E451B

Lauren M. Burke, MD (*Moderator*)
Nancy Kim, MD (*Moderator*)

Sub-Events

T7-SSGI09-3 PREDICTION OF THE NEED FOR NEOADJUVANT THERAPY IN GASTRIC CANCER PATIENTS USING A MULTIPARAMETRIC IMAGING MODEL BASED ON DUAL-ENERGY CT

Lili Guo, MD (*Presenter*)
ZHOU HAIFEI (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a multiparametric model for preoperative prediction of the need for neoadjuvant therapy in patients with gastric cancer, based on dual-energy CT-derived parameters, morphological imaging features, and tumor marker data.

METHODS AND MATERIALS

This prospective study included 113 patients who underwent abdominal dual-energy multiphase contrast-enhanced CT prior to surgery. Dual-energy CT parameters were extracted from the arterial, venous, and delayed phases. Calculated metrics included extracellular volume fraction (ECV) and iodine enhancement fraction (IEF). Two radiologists independently assessed the morphological features of the tumors on contrast-enhanced images and provided morphological staging assessments. Tumor marker results were also collected. With postoperative pathological staging as the reference standard, patients were classified into those not requiring neoadjuvant therapy (stage I-II) and those requiring neoadjuvant therapy (stage III). Feature selection was performed using univariate analysis and LASSO regression, followed by construction of a logistic regression model. The diagnostic performance of the model was evaluated using five-fold cross-validation and compared to that of conventional morphological assessment.

RESULTS

LASSO regression identified delayed-phase iodine concentration, venous-phase water content, effective atomic number, normalized iodine concentration, normalized effective atomic number, ECV, and traditional morphological diagnosis as significant predictors. The mean area under the curve (AUC) was 0.927 in the training cohort and 0.912 in the validation cohort, with no significant difference between them. Both AUCs were markedly higher than that of traditional morphological diagnosis alone (0.723). Calibration curves indicated good agreement between predicted and actual staging results. Decision curve analysis demonstrated favorable clinical applicability of the proposed model.

CONCLUSION

A multiparametric model incorporating dual-energy CT features and morphological assessment can effectively predict the need for neoadjuvant therapy in gastric cancer patients prior to surgery.

CLINICAL RELEVANCE/APPLICATION

Accurate preoperative identification of patients who may benefit from neoadjuvant therapy can guide treatment planning and help avoid both overtreatment and undertreatment.

T7-SSGI09-4 APPLICATION OF DEEP LEARNING RECONSTRUCTION BASED ON DUAL ENERGY CT IN GASTRIC CANCER

Ya Wang, DMRD (*Presenter*)

PURPOSE

o study the effect of deep learning reconstruction algorithm on abdominal image quality in patients with gastric lesions based on new double transient energy spectrum mode.

METHODS AND MATERIALS

47 cases of abdominal enhanced CT scan for energy spectrum imaging (GSI) mode scanning, four groups of date files images with different weights of ASiR-V40%, DLIR-L, DLIR-M and DLIR-H were reconstructed, The abdominal venous phase images were selected and the region of interest (ROI) was sketched at the same level by energy spectrum analysis software GSI Viewer, The CT values and noise (SD) of 40keV, 55keV and 70keV images in each ROI were obtained by further post-processing, and the signal-to-noise ratio (SNR) was calculated. Single factor variance analysis was used to compare the differences of SD and SNR reconstructed with different weights of ASiR-V, DLIR-L, DLIR-M and DLIR-H ($P < 0.05$).

RESULTS

there was no significant difference in CT value between different reconstruction algorithms and different DLIR grades. The CT values of spleen of 40keV, 55keV and 70keV single energy images were (348.87 ±45.50). 201.39 ±26.10 129.72 ±16.91) Hu In the same single energy image, the SD value of single energy image decreased gradually, the SNR increased gradually, and the image quality improved obviously in different reconstruction algorithms and different DLIR grades. The spleen SD values of 40keV, 55keV, 70keV single energy image ASiR-V40%, DLIR-L, DLIR-M, DLIR-H were (4.350 ±5.42), respectively. 42.12 ±6.31 32. 61 ±3.85 24. 26 ±4. 08 Hu, (27. 35 ±3. 07) 26.01 ±3.80 20.12 ±2.01 15.00 ±2.21) Hu, (19.56 ±2.08) 18.29 ±2.62 14.08 ±1.27 10.56 ±1.37) Hu There were significant differences in SD and SNR between the two groups ($P < 0.05$). There were significant differences in subjective scores of reconstructed images between different algorithms ($P < 0.001$).

CONCLUSION

the deep learning reconstruction technique based on new double transient energy spectrum mode can optimize the image quality of abdominal energy spectrum.

CLINICAL RELEVANCE/APPLICATION

the depth reconstruction technology based on new double transient energy spectrum scanning mode can optimize the abdominal energy spectrum image quality, and the depth reconstruction technology based on new double transient energy spectrum scanning mode can further improve the abdominal energy spectrum image quality without increasing the radiation dose.

T7-SSGI09-5 CAN SPECTRAL COMPUTED TOMOGRAPHY (CT) REPLACE PERFUSION CT TO EVALUATE THE LYMPHOVASCULAR AND PERINEURAL INVASION OF GASTRIC CANCER?

Tiezhu Ren, MD, MMEd (*Presenter*)

PURPOSE

The presence of lymphovascular invasion (LVI) and perineural invasion (PNI) in patients with gastric cancer (GC) is an independent risk factor for recurrence and metastases. However, the LVI/PNI status can only be retrieved from postoperative pathological specimens. The purpose of this study was to investigate the correlation between spectral computed tomography (CT) and CT perfusion parameters.

METHODS AND MATERIALS

We prospectively analyzed 87 patients with gastric adenocarcinoma. All cases were confirmed by pathology and underwent "one-stop" spectral and perfusion CT imaging examination. Patients were divided into positive (n=65) and negative (n=22) groups depending on LVI/PNI occurrence. The effective atomic number (Zeff), iodine concentration (IC), and water concentration were measured in the arterial (AP) and venous (VP) phases. The blood flow (BF), blood volume (BV), mean transit time (MTT), capillary permeability surface area product (PS), and time to max (Tmax) were measured in the perfusion imaging. Spearman correlation analysis was used to detect the correlation between spectral parameters and perfusion parameters. Parameter differences between the two groups were compared. Receiver operating characteristic (ROC) curves were plotted.

RESULTS

The LVI/PNI-positive group's Zeff, IC, BV, and MTT were substantially greater than those of the negative group. There was no significant correlation between the spectral parameters (Zeff, IC) in AP and the perfusion parameters (all $P>0.05$). There was a strong correlation between the spectral parameters in VP and the perfusion parameters BV, and VP-Zeff, VP-IC and BV were strongly correlated, with correlation coefficients of 0.746 and 0.751, respectively (all $P<0.001$). The evaluated efficiency of the combination of spectral-CT and CT-perfusion parameters was superior to that of individual parameters. The BV and MTT combined with Zeff and IC in AP and VP exhibited good evaluation efficacy (AUC=0.827; F1=0.892).

CONCLUSION

The "one-stop" spectral-perfusion CT imaging has good value in the preoperative evaluation of LVI/PNI in GC. There is a correlation between the spectral parameters and the perfusion parameters, and the venous spectral parameter IC can be used as a reference index for the perfusion parameter BV. The evaluated efficiency of the combination of spectral-CT and CT-perfusion parameters was superior to that of individual parameters. Spectral computed tomography (CT) can replace perfusion CT to evaluate the lymphovascular and perineural invasion of gastric cancer.

CLINICAL RELEVANCE/APPLICATION

Spectral computed tomography (CT) can replace perfusion CT to evaluate the lymphovascular and perineural invasion of gastric cancer.

T7-SSGI09-6 OPTIMIZING PRE-OPERATIVE CT DIAGNOSIS OF SEROSAL INVASION IN ADVANCED GASTRIC CANCER BY USING ARTIFICIAL INTELLIGENCE ITERATIVE RECONSTRUCTION

Xiaolong Gu (*Presenter*)
Lingwei Kong (*Abstract Co-Author*)
Jintao Han (*Abstract Co-Author*)
Yang You (*Abstract Co-Author*)
Wanhui Zhou (*Abstract Co-Author*)
Li Yang (*Abstract Co-Author*)

PURPOSE

Serosal invasion in advanced gastric cancer suggests a higher probability of peritoneal metastasis, warranting neoadjuvant chemotherapy to achieve tumor downstaging and higher R0 resection rates. Thus, accurate diagnosis of serosal invasion is critical for guiding treatment selection. This study aims to investigate the clinical value of artificial intelligence iterative reconstruction (AIIR) in optimizing pre-operative CT diagnosis of serosal invasion in advanced gastric cancer.

METHODS AND MATERIALS

This retrospective study included 45 patients with pathology confirmed advanced gastric cancer (61.2±11.2 years, male: 36). CT data were reconstructed using both hybrid iterative reconstruction (HIR) and AIIR. Two radiologists independently diagnosed the serosal invasion of gastric tumor using a 5-point confidence scale (1, definitely absent; 2, probably absent; 3, indeterminate; 4, probably present; 5, definitely present). In case of discrepancy, the radiologists achieved consensus through negotiation. Receiver operating characteristic (ROC) analysis was performed to assess the diagnostic performance, using the surgical pathology results as the reference. The diagnostic image quality, regarding the tumor margin conspicuity, gastric wall layer differentiation, and serosa visualization, was scored by the two radiologists using a 5-point scale (1: unrecognizable, 5: excellent). The contrast-to-noise ratio (CNR) was also calculated for the tumor with the normal gastric wall as background.

RESULTS

Serosal invasion of tumor was confirmed in 24 of the 45 patients (53.3%) by surgical pathology. The area under the ROC curve of the AIIR and HIR images for diagnosing serosal invasion was 0.843 and 0.621, respectively, showing significant improvement using AIIR ($p < 0.001$). Compared with HIR images, AIIR images showed higher sensitivity (70.8% vs 50.0%), specificity (85.7% vs 66.7%), accuracy (77.8% vs 57.8%), positive predictive value (85.0% vs 63.2%), and negative predictive value (72.0% vs 53.8%). The diagnostic image quality across all three metrics were scored better and the tumor CNR was 34.0% higher on AIIR images (all $p < 0.001$).

CONCLUSION

Compared to HIR, AIIR improved the diagnostic performance on serosal invasion of tumor in pre-operative CT imaging of advanced gastric cancer.

CLINICAL RELEVANCE/APPLICATION

The artificial intelligence iterative reconstruction demonstrates the potential to improve the accuracy of pre-operative CT staging in advanced gastric cancer and could be implemented to optimize treatment strategy planning.

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

T7-SSIN03

Imaging Informatics (Radiology Data Science: Automation, Harmonization, and Clinical Applications)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: S404

Morgan P. McBee, MD (*Moderator*)
Amara Tariq, PhD, MS (*Moderator*)

Sub-Events

T7-SSIN03-1 AN INTEGRATED DATABASE AND QUERY SYSTEM WITH LARGE LANGUAGE MODEL INTEGRATION FOR MANAGING LARGE-SCALE ANNOTATED CT IMAGING DATASETS

Felipe Lopez-Ramirez, MD (*Presenter*)
Alejandra Blanco (*Abstract Co-Author*)
Emir Syailendra, MD (*Abstract Co-Author*)
Florent Tixier, PhD (*Abstract Co-Author*)
Satomi Kawamoto, MD (*Abstract Co-Author*)
Linda C. Chu, MD (*Abstract Co-Author*)
Elliot K. Fishman, MD (*Abstract Co-Author*)

PURPOSE

To develop and implement a scalable approach for managing large-scale radiological databases that integrate clinical data, multiple semantic segmentation annotations, and longitudinal imaging timepoints. The system aims to enable structured data retrieval, allowing for natural language querying, and streamlined export to different machine learning workflows.

METHODS AND MATERIALS

We designed a custom database architecture based on Python/Tkinter and a JSON hierarchical structure to store metadata including scan dates, image reconstruction parameters, multiple segmentation versions, and clinical labels for each CT study while adhering to HIPAA regulations. The system was built to accommodate complex real-world data scenarios including repeated imaging, evolving annotations, and multiple imaging and segmentation sources. To support interactive querying, a "talk-to-your-data" module was implemented by transforming the JSON structure into an SQL format that supports integration into common RAG (retrieval-augmented generation) frameworks powered by locally served large language models. Users can issue natural language queries to retrieve patient metadata, segmentation availability, and imaging characteristics. Additionally, an export module was developed to generate machine learning-ready datasets based on inclusion criteria, complete with automated data splits and preprocessing configurations.

RESULTS

The database currently manages 7,255 CT volumes with associated clinical information and corresponding semantic segmentation data for arterial and venous phases. The system supports real-time queries on segmentation completeness, scan chronology, and case inclusion criteria. Natural language queries (e.g., "export all patients with venous scans and pancreatic tumors under 2 cm") return results in under 30 seconds. Exported datasets have successfully supported the training and evaluation of machine learning models under varied inclusion scenarios.

CONCLUSION

This database framework enables robust management of large-scale, annotated CT imaging datasets with multiple timepoints and segmentation files. By combining structured metadata with natural language querying and customizable export tools, it effortlessly brings powerful querying capabilities into the clinical setting of image repositories and aids AI model development.

CLINICAL RELEVANCE/APPLICATION

Our system empowers radiology research teams to manage, query, and prepare large-scale annotated CT datasets efficiently, accelerating the development and validation of AI algorithms for diagnostic and prognostic applications. This could facilitate the integration of AI-derived insights into the routine clinical workflow of radiologists.

T7-SSIN03-2 IMPROVING CLINICAL AI INTEGRATION WITH GSPS: ENHANCING STORAGE AND TRANSFER EFFICIENCY IN RADIOLOGY WORKFLOWS

Abhishek Gupta (*Presenter*)
Easwar Lakshmi Narayanan, MD (*Abstract Co-Author*)
Sarang Ingole, MBBS (*Abstract Co-Author*)
Vidur Mahajan, MBA, MBBS (*Abstract Co-Author*)

PURPOSE

To evaluate and compare the efficiency of Grayscale Softcopy Presentation State (GSPS) versus Secondary Capture (SC) for storing and visualizing AI outputs in DICOM format, focusing on storage efficiency, clinical usability, and scalability across imaging modalities.

METHODS AND MATERIALS

In clinical AI workflows, outputs such as regions of interest (ROIs), annotations, and classification labels are typically stored using either SC or GSPS. SC generates a new image series by embedding visual overlays into duplicated images, which increases storage load and consumes full display viewports in PACS viewers. In contrast, GSPS references the original DICOM images and stores visual overlays as lightweight, toggleable vector layers, preserving the original images and minimizing additional storage demands. This study assessed the storage and transfer efficiency of both formats across four modalities: X-ray, CT, MRI, and mammography. We simulated AI-generated outputs for 1,000 studies per modality, calculating storage requirements and estimating transfer times using a 0.5 Gbps network under a sequential upload scenario, assuming one AI output file per study.

RESULTS

GSPS demonstrated substantial advantages over SC across all modalities. Storage requirements decreased by up to 49.5% for X-ray, 44.4% for CT and MRI, and 16.7% for mammography. Network transfer times were dramatically reduced, with GSPS shortening transfer times by up to 99.9%, effectively enabling near-instantaneous transmission even for large CT and MRI studies where SC required several seconds per study. In addition to technical gains, GSPS overlays could be toggled on or off within the PACS, improving clinical usability by preserving the primary diagnostic image and avoiding additional viewport use.

CONCLUSION

GSPS is a highly efficient and scalable solution for storing and transmitting AI-generated overlays in radiology workflows. Compared to SC, GSPS substantially reduces PACS storage burden, accelerates network transfers, and enhances clinical usability by maintaining original image fidelity while allowing dynamic display of AI overlays. These advantages make GSPS the preferred approach for integrating AI outputs into routine and high-volume radiology practices, supporting scalable, efficient, and clinician-friendly deployment of AI in medical imaging.

CLINICAL RELEVANCE/APPLICATION

Integrating AI outputs using GSPS improves radiology workflows by reducing storage demands, accelerating image transfers, and enabling seamless overlay visualization without compromising diagnostic images — making it ideal for routine and high-volume clinical settings.

T7-SSIN03-3 AN NLP AND PIXEL-BASED DATA HARMONIZATION APPROACH ACHIEVES 98.1% ACCURACY IN SERIES NAMING STANDARDIZATION ON A LARGE BRAIN VALIDATION DATASET

Thomas C. Arnold, PhD (*Presenter*)
Dayang Wang (*Abstract Co-Author*)
Brennan McFarland (*Abstract Co-Author*)
Soumya Mohanty (*Abstract Co-Author*)
Lanhong Yao (*Abstract Co-Author*)
Praveen Gulaka, PhD (*Abstract Co-Author*)
Ajit Shankaranarayanan (*Abstract Co-Author*)
Greg Zaharchuk, MD, PhD (*Abstract Co-Author*)

PURPOSE

Magnetic Resonance Imaging (MRI) is widely used in both clinical and research settings. However, sequence naming conventions are not standardized and vary based on differences in imaging protocols, scanner vendors, and institutional practices. As a result, MRI series descriptions often appear inconsistent, and DICOM metadata can be unreliable or conflicting. As radiology continues to scale, with larger practices and researchers aggregating massive datasets, it becomes increasingly difficult to verify sequence information. The goal of this study is to create an efficient, automated method for standardizing MRI sequence naming.

METHODS AND MATERIALS

The naming standardization pipeline relies on three methods to predict MRI sequence types: an NLP-based algorithm, a pixel-based algorithm, and rule-based logic. The NLP model (a transformer pretrained on ~500,000 sequences) parses metadata tags to generate an initial prediction. For sequence types where metadata is often inaccurate (e.g. T1 vs T1c), a pixel-based method (ResNet50 trained on ~5,600 cases) is activated for more accurate distinctions. Finally, a rule-based logic layer checks specific metadata fields linked to specialized sequence types with reliable tags (e.g. MRA, DWI) and performs final verification. The pipeline minimizes reliance on the Original Series Description tag, which can be altered by technologists, causing inconsistencies. The algorithm currently supports predictions for sequence type, anatomy, orientation, acquisition, and sequence variant, which are used to generate standardized series descriptions (e.g., "Brain Ax T1_SE"). We tested the algorithm on a heterogeneous brain MRI dataset with 623 sequences from 15 different sites with ground truth labels.

RESULTS

The dataset includes 13 sequence types (T1, T1c, T2, T2-FLAIR, DWI, MRA, T2*, SWI, SSFP, ASL, ADC, CAL, and LOC), covering nearly all common neuroimaging sequence types. The algorithm achieved an accuracy of 98.1% on sequence classification and after standardization the total number of unique series descriptions was reduced by 66%. The algorithm also reached 99%+ accuracy on anatomy classification, though this offers limited insight as the dataset included only brain data.

CONCLUSION

The proposed method enables MRI metadata standardization and shows high accuracy in brain MRI sequence classification. It enhances the reliability and efficiency of MRI data organization, retrieval, and downstream analysis, aiding both research and standardization across large clinical organizations.

CLINICAL RELEVANCE/APPLICATION

The proposed data harmonization method can standardize MRI naming convention across large organizations and datasets, significantly improving radiologist workflows.

T7-SSIN03-4 AUTOCLAIM: A WEB APPLICATION FOR AUTOMATED CLAIM CHECKLIST COMPLETION

Anna Zapaishchykova, MSc (*Presenter*)
Keno K. Bressem, MD (*Abstract Co-Author*)
Charles E. Kahn JR, MD, MS (*Abstract Co-Author*)
Bardia Khosravi, MD, MPH (*Abstract Co-Author*)

PURPOSE

The CLAIM (Checklist for Artificial Intelligence in Medical Imaging) framework promotes transparency and reproducibility in AI imaging research but requires significant time and effort when completed manually. We developed AutoCLAIM, a web application that automates CLAIM checklist generation from research manuscripts using large language models (LLMs).

METHODS AND MATERIALS

Among 440 evaluated checklist items, the LLM achieved 80.5% accuracy in evaluating CLAIM criteria and extracting relevant supporting text. In 7.3% of cases, items were missing but sufficient information was found elsewhere; 6.4% had sufficient items but were marked as missing; 5.2% contained no relevant text; and 0.7% included incorrect evidence. Individual article performance ranged from 43.2% to 95.5% accuracy, with Article A showing the lowest and Article B showing the highest accuracy. Performance was lower for complex study designs and benchmarking articles where relevant details were less explicitly stated. Processing costs for all 10 articles were $12.97.

RESULTS

Among 440 evaluated checklist items, the LLM achieved 80.5% accuracy in evaluating CLAIM criteria and extracting relevant supporting text. In 7.3% of cases, the LLM indicated items were missing but sufficient information was found elsewhere; 6.4% had sufficient items but were incorrectly marked as missing; 5.2% contained no relevant text; and 0.7% included incorrect evidence. Individual article performance ranged from 43.2% to 95.5% accuracy. Performance was lower for complex study designs and benchmarking articles where relevant details were less explicitly stated. Processing costs for all 10 articles were $12.97.

CONCLUSION

AutoCLAIM streamlines CLAIM checklist completion through AI assisted review, manual editing capabilities, and export options in JSON or HTML formats. Further refinement is needed for nuanced content recognition, particularly in complex study designs.

CLINICAL RELEVANCE/APPLICATION

AutoCLAIM enhances efficiency and consistency in AI research reporting, supporting more reliable clinical translation of AI models in medical imaging.

T7-SSIN03-5 TRANSPARENT AI FOR LIVER CANCER DIAGNOSIS IN MRI WITH EXPLANATIONS IN LI-RADS LANGUAGE

Kenji Suzuki, PhD (*Presenter*)
Dichao Liu (*Abstract Co-Author*)
Masatoshi Hori, MD, PhD (*Abstract Co-Author*)
Keitaro Sofue, MD (*Abstract Co-Author*)
Takamichi Murakami, MD, PhD (*Abstract Co-Author*)

PURPOSE

To enhance the clinical applicability of AI-based liver tumor diagnosis, we developed a novel interpretable AI system that mimics radiologists' decision-making based on LI-RADS. The system integrates concept-guided reasoning and graph-based modeling to generate structured LI-RADS-style reports from liver MRI, promoting transparency and trust in clinical practice.

METHODS AND MATERIALS

We used 277 contrast-enhanced liver MRI studies (114 patients; 107 malignant and 170 benign tumors) annotated with LI-RADS features. To support transparent and interpretable AI in liver tumor diagnosis, we developed a system that mimics radiologists' reasoning by first predicting clinically meaningful features and then integrating them into structured LI-RADS reports. After preprocessing to extract tumor-centered regions, a MobileNetV2-based concept bottleneck model identifies key imaging features—such as APHE and restricted diffusion—and models their interrelationships using a graph-based structure. This allows the system to capture patterns that radiologists associate with malignancy, such as the presence of restricted diffusion without peripheral globular enhancement. The system outputs both a malignancy likelihood and an interpretable report aligned with LI-RADS standards, helping clinicians make informed decisions with greater confidence and consistency.

RESULTS

We performed 5-fold cross-validation , with all reported results averaged across folds . Twelve LI-RADS features were considered important across all folds, namely: APHE, nonperipheral "washout," corona enhancement, restricted diffusion, mild-to-moderate T2 hyperintensity, transitional phase hypointensity, nodule-in-nodule architecture, blood products in mass, marked T2 hyperintensity, hepatobiliary phase isointensity, ring enhancement, and hepatobiliary phase hypointensity. Our approach first trained a LI-RADS prediction model to predict the presence (1) or absence (0) of these features, achieving an overall mean presence/absence classification accuracy of 0.84. Then, the predicted LI-RADS features were input into a tumor classification model, achieving an AUC of 0.88. This model outperformed several state-of-the-art (SOTA) deep learning models, including MedMamba (0.76), CoAtNet (0.83), and EfficientNetV2 (0.77).

CONCLUSION

We present a clinically aligned, interpretable AI system capable of predicting liver tumor malignancy with structured LI-RADS-style explanations and achieving the highest diagnostic performance of SOTA models.

CLINICAL RELEVANCE/APPLICATION

By modeling concept relationships and generating structured LI-RADS reports, our system enhances clinical transparency and supports radiologist decision-making.

T7-SSIN03-6 CT-DERIVED BIOMARKERS SHOW STRONGER ASSOCIATIONS WITH SOCIOECONOMIC DEPRIVATION COMPARED TO BMI

Alexandra Wong, BS (*Presenter*)
Benjamin Rush (*Abstract Co-Author*)
Yunju Ha (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)
Matthew H. Lee, MD (*Abstract Co-Author*)
John W. Garrett, PhD (*Abstract Co-Author*)

PURPOSE

Body Mass Index (BMI) is widely used in population health studies and disparities research, yet it cannot differentiate bone, fat, or muscle composition. In contrast, automated analysis of abdominal CT scans includes muscle, fat, and bone biomarkers that can be assessed on a population health scale. Our work evaluates whether CT-derived biomarkers, including muscle density, visceral adipose tissue (VAT) area, and first lumbar bone mineral density (BMD), are more associated with census tract-level socioeconomic disparities compared to BMI.

METHODS AND MATERIALS

We utilized statewide retrospective abdominal CT scans collected at our institution between 2000 and 2021. BMI values came from electronic health records and AI body composition tools quantified L3 average muscle density (HU), L3 total VAT area (cm^2), and L1 BMD (HU). Non-physiological values, out-of-state patients, and ZIP codes with <= 30 patients were excluded. Biomarker values were age-normalized using per-patient differences from 10-year age-group medians. We converted aggregated ZIP code-level biomarker values to census tract values by using the proportion of ZIP code overlap in a census block as a weighted sum of biomarker values. Only census tracts above a 0.9 proportional area with the ZIP code were included. The Area Deprivation Index (ADI), a census-tract level national percentile measure factoring income, education, employment, and housing quality, was used to represent socioeconomic disadvantage. Higher ADI rankings indicate greater disadvantage. Spearman correlations between ADI, BMI, and each CT-derived biomarker were performed.

RESULTS

Our data included 805 state-wide census tracts (median number of patients per census tract: 69) aggregated from 108,908 adult patients (56,638 F). Spearman correlations showed that muscle density, BMD, and VAT area had greater associations with ADI than BMI: muscle density (?=-0.41, $p<0.001$), BMD (?=-0.2, $p<0.001$), VAT area (?=-0.24, $p<0.001$), BMI (? = 0.15, $p < 0.001$).

CONCLUSION

CT-derived biomarkers (muscle density, BMD, and VAT area) are more strongly associated with socioeconomic deprivation (ADI) compared with BMI.

CLINICAL RELEVANCE/APPLICATION

CT-derived biomarkers may serve as stronger indicators of population health level disparities than BMI.

Nov. 30 – Dec. 4
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T7-SSIN04

Science Session with Keynote: Imaging Informatics (Reporting)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: E450B

Namita S. Gandhi, MD, MSc (*Moderator*)
Paulo E. Kuriki, MD (*Moderator*)

Sub-Events

T7-SSIN04-1 GAZE2REPORT: USING RADIOLOGISTS' GAZE TO IMPROVE AUTOMATIC REPORT GENERATION

Prateek Prasanna, PhD (*Presenter*)
Gagandeep Singh, MD, MBA (*Abstract Co-Author*)

PURPOSE

Existing methods for automated radiology report generation focus on improving natural language generation (NLG) quality but often lack clinically grounded alignment with disease manifestations due to the absence of human-centered priors. Eye gaze data offers a valuable window into radiologist decision-making but is seldom integrated into automated reporting systems. We propose Gaze2Report , a framework that incorporates radiologist visual attention through gaze-informed graph neural networks (GNNs) to guide large language models (LLMs) for clinically accurate radiology report generation, even in the absence of eye gaze during inference.

METHODS AND MATERIALS

Gaze2Report comprises two primary components: a visual-gaze token generation module and a multimodal prompt-tuned LLM decoder. Eye gaze vectors are derived from a scanpath prediction model (MedGaze), and combined with image patch embeddings using a GNN to produce joint visual-gaze features. These are projected into the LLM feature space and concatenated with instruction and report tokens to create a unified prompt. We fine-tune low-rank adapter layers of the LLaMA2-7B model for autoregressive report generation. Experiments were conducted on three benchmark chest X-ray datasets (REFLACX, IU-XRAY, MIMIC-CXR), evaluating both NLG quality (BLEU, METEOR, ROUGE-L) and clinical efficacy (CheXbert-derived F1, precision, recall, and BERTScore).

RESULTS

Gaze2Report outperformed baselines (R2GenGPT, EGGCA-Net) across all NLG and CE metrics. On MIMIC-CXR, Gaze2Report achieved BLEU-4 of 0.137, METEOR of 0.167, and F1 score of 0.444. Even without gaze at inference, the scanpath prediction module maintained performance over a purely image-only baseline. On REFLACX, Gaze2Report outperformed baselines both with and without gaze availability. Qualitative comparisons showed that Gaze2Report-generated reports contained more clinically precise terminology compared to baselines.

CONCLUSION

By incorporating gaze-informed embeddings and aligning them with a radiologist’s visual search behavior, Gaze2Report enhances the contextual understanding and factual accuracy of generated reports. This visual grounding enables more interpretable and trustworthy outputs, bridging the gap between AI-generated content and clinical reasoning. The inclusion of an on-the-fly scanpath predictor enables its deployment even without eye-tracking hardware, making it robust for real-world clinical scenarios.

CLINICAL RELEVANCE/APPLICATION

Gaze2Report offers a scalable and interpretable AI solution for radiology report generation that emulates expert visual reasoning. This approach holds promise for improving reporting efficiency in high-volume clinical settings.

T7-SSIN04-2 MONITORING COMMERCIAL RADIOLOGY AI TOOLS WITH AN IN-HOUSE FOUNDATION MODEL

Camila Gonzalez, DPhil (*Presenter*)
Zhongnan Fang, PhD (*Abstract Co-Author*)
Hye Sun Na (*Abstract Co-Author*)
David B. Larson, MD, MBA (*Abstract Co-Author*)
Akshay Chaudhari, PhD (*Abstract Co-Author*)

PURPOSE

To enable real-time monitoring of radiology AI tools by training a vision-language model with in-house CT scans and radiology reports. Our approach improves sensitivity by identifying missed findings without requiring structured labels during training or accompanying reports during inference.

METHODS AND MATERIALS

We retrieved 4,648 in-house non-contrast head CT studies (median age 69.4 years, 43.7% female). The vendor system under evaluation was an FDA-cleared model for intracranial hemorrhage (ICH) detection. ICH findings were extracted from radiology reports using the LLaMA 3.1 large language model (LLM) and evaluated on a subset of 1,068 manually curated labels. A vision-language model initially trained on 15,331 abdominal CT scans was fine-tuned on the head CTs and corresponding reports via contrastive language-image training for 12 hours on an NVIDIA L40 GPU. For each scan, we extracted model embeddings and computed the mean cosine distance to true negative (i.e., ICH neither present nor detected by the vendor model) cases in the training set. Test studies (N=706) with high distance scores—indicating deviation from typical ICH-negative patterns—were flagged as likely to contain ICH based on a threshold selected with validation (N=735) data.

RESULTS

The LLM report-derived ICH labels correspond with a 0.97 accuracy to the manually annotated subset. The vendor model obtained a sensitivity of 0.64 and specificity of 0.83 on the in-house test set, misidentifying 206 from 567 ICH-positive studies. The distance distributions between false negatives (FN) and true negatives (TN) were significantly different across all splits ($p < 0.001$; Mann-Whitney U), indicating that FNs can be identified from image embeddings. By selecting decision thresholds using validation data, we increased the model’s sensitivity on the test set from 0.64 to 0.75 (+67) and further to 0.81 (+99), with moderate (+58, +77) rises in false positives.

CONCLUSION

Foundation models trained with routinely collected images and radiology reports can monitor commercial AI tools post-deployment. Circumventing the need for manual annotations and finding-specific models, they offer a scalable solution to flag potential failures across multiple AI products addressing different clinical needs.

CLINICAL RELEVANCE/APPLICATION

AI tools are increasingly integrated into radiologic workflows, yet manufacturers rarely provide oversight strategies for in-house data despite differences in acquisition protocols causing discrepancies between the reported and real-world performances. Our framework allows institutions to calibrate black-box, commercially available tools to clinically acceptable sensitivity thresholds by flagging potentially missed findings.

T7-SSIN04-4 ARE WE REPORTING AI WELL? A CONSORT-AI AUDIT OF RADIOLOGY TRIALS

Joyce Ang, BSc (*Presenter*)
Emmanuel Salinas SR, MD (*Abstract Co-Author*)
Xin Dong (*Abstract Co-Author*)
Xiaoxuan Liu (*Abstract Co-Author*)
Matthew D. McInnes, MD, PhD (*Abstract Co-Author*)

PURPOSE

We evaluated the completeness of reporting the Consolidated Standards of Reporting Trials in Artificial Intelligence (CONSORT-AI) in Randomized Control Trials (RCT) evaluating artificial intelligence in radiology practice.

METHODS AND MATERIALS

A literature search was conducted in MEDLINE, Embase, the Cochrane Central Register of Controlled Trials (CENTRAL), the Database of Abstracts of Reviews of Effects (DARE), and the Cochrane Database of Systematic Reviews (CDSR) for medical imaging RCTs published between January 2000 and June 2024 with AI interventions integrated to the clinical practice impacting diagnosis, follow-up or treatment of the patient. Reporting was assessed per item using the CONSORT-AI checklist. Items were classified as infrequently (<33%), moderately (33-66%), or frequently (>66%) reported. We compared the completeness of reporting between CONSORT-AI endorsers versus non-endorsers RCTs using a risk ratio (RR) with a 99% confidence interval for each outcome and random-effects model for all analyses. A RR greater than 1 indicated relatively increased reporting of any CONSORT item.

RESULTS

Thirty-one RCTs were included, with a median (Q1, Q3) of 72% (60, 80%) of CONSORT-AI items reported. Reporting completeness was significantly higher in studies published in higher-impact journals (18 vs. 12; P = 0.004) and those with larger sample sizes (median [Q1, Q3]: 628 [275, 4198.5] vs. 109 [100, 406.5]; P = 0.015). Most checklist items were frequently reported (17/25), though subitems related to `Interventions`, `Outcomes`, and `Harms` were less commonly addressed. Pooled relative risks (RRs) across assessed CONSORT-AI items indicated higher adherence among RCTs endorsing CONSORT-AI compared to those without endorsement, with a pooled RR of 1.12 (99% CI, 1.06 to 1.28).

CONCLUSION

Reporting of AI-based RCTs in radiology remains suboptimal. Nonetheless, endorsement of the CONSORT-AI Statement appears to positively influence reporting completeness in medical journals.

CLINICAL RELEVANCE/APPLICATION

Reporting of AI-based RCTs in radiology remains suboptimal, which may hinder safe clinical adoption. Greater adherence to CONSORT-AI can improve transparency and support more reliable patient care.

T7-SSIN04-5 AUTOMATED, EFFICIENT EXTRACTION OF STRUCTURED METADATA FOR RADIOLOGY AI MODELS AND DATASETS

Abhinav Suri, BA, MPH (*Presenter*)
Rohit Reddy, MD (*Abstract Co-Author*)
Ricardo A. Gonzales Vera, DPhil (*Abstract Co-Author*)
Marcelo S. Takahashi, MD, PhD (*Abstract Co-Author*)
Charles E. Kahn JR, MD, MS (*Abstract Co-Author*)
Shahriar Faghani, MD (*Abstract Co-Author*)

PURPOSE

Artificial Intelligence (AI) research has increased rapidly over the past two decades. Thus discoverability of AI models and datasets used to train/evaluate AI is of utmost importance. “Model card” summary documents have been popularized to communicate findings; however, these model cards are unstandardized and do not capture critical information that clinicians and healthcare regulators need to know. Accordingly, the Radiology Ontology for AI Datasets, Models, and Projects (ROADMAP) has been established to describe models and datasets in radiology. The schema underlying this ontology can be used to create model and dataset cards if individuals extract structured information; however, doing so can be cumbersome, ultimately hampering widespread adoption. To address this shortcoming, we create and evaluate an automatic pipeline to extract structured information from documents describing radiological AI models and datasets.

METHODS AND MATERIALS

We utilized a corpus of published papers from the Radiology: Artificial Intelligence journal and GPT-4o (v08/2024 with structured outputs) to extract 40 fields in ROADMAP’s underlying schema. After trialing multiple approaches on a set of 5 articles and 2 RSNA grand challenge description documents, we created a two-step pipeline. First, GPT is prompted to summarize the article given descriptors of ROADMAP schema sub-fields. Next, the summary is passed into a structured output prompt using the schema to establish the format. We ran this pipeline on 54 articles and had researchers rate each subfield output as either being correct (2 pts), partially correct but incomplete (1), or incorrect (0). We report the time and cost required to run this pipeline along with an analysis of ratings for the extracted model and dataset ROADMAP schema data.

RESULTS

Articles took 1 minute and 13 seconds to run (±15 seconds; ±1SD). The average cost per article was $0.046±0.003 (USD). 81.5% of extracted subfields were correct as is, 15.5% were correct but incomplete, and 3.0% were incorrect. The average number of points for the model and dataset fields were similar (1.76 vs 1.78, p=0.35, t-test) and there was no correlation between model/dataset scores and length of papers (in tokens, Pearson’s R=-0.036, p=0.13, not different from R=0).

CONCLUSION

We show that our automated pipeline can extract information from radiological AI models and datasets in a manner that is reasonably cheap, efficient, and accurate. Future work includes validating this model on a larger corpus of data such as regulatory/healthcare product documents.

CLINICAL RELEVANCE/APPLICATION

This pipeline can be used for enabling discoverability of AI models and datasets. Doing so can fuel research and product development in applications that can benefit patients.

T7-SSIN04-6 Keynote Speaker

Nov. 30 – Dec. 4
RSNA® 2025
Imaging the Individual

Abstract Archives of the RSNA, 2025

T7-SSMK06

Musculoskeletal Imaging (Knee)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: E350

Gunnar K. Astrom, MD, PhD (*Moderator*)
Natalia Gorelik, MD, MPH (*Moderator*)

Sub-Events

T7-SSMK06-2 REVEALING THE INVISIBLE: DEEP LEARNING ENABLES AUTOMATIC CARTILAGE SEGMENTATION ON NON-CONTRAST CT

Paul Margain (*Presenter*)
Julien Favre (*Abstract Co-Author*)
Patrick Omoumi, MD, PhD (*Abstract Co-Author*)

PURPOSE

Computed tomography (CT) is the reference standard for the evaluation of mineralized tissues like bone, yet it fails to visualize soft tissues such as cartilage without the use of invasive intra-articular contrast injection, thereby limiting its utility for comprehensive joint assessment. Deep learning's power in discerning subtle image patterns offers an opportunity to overcome this fundamental limitation. This study aims to develop and validate a novel framework for fully automatic knee cartilage segmentation directly from standard non-contrast CT scans, using high-resolution MRI as the reference standard.

METHODS AND MATERIALS

This study utilized same-day non-contrast CT and DESS MRI scans from 430 participants in the Lausanne Knee Study. Manual MRI cartilage segmentations, serving as ground truth, were carefully registered to the CT space using a previously validated method. A 3D U-Net was trained (n=328) and tested (n=102) to predict cartilage masks from non-contrast CT (Figure 1). Accuracy was assessed using Dice Similarity Coefficient (DSC), and morphological agreement via regional cartilage thickness correlations. Clinical relevance was evaluated by comparing an automatic severity score of osteoarthritis based on the analysis of cartilage patterns (CTh-Score) between osteoarthritic (OA; Kellgren-Lawrence =2) and non-OA knees.

RESULTS

The deep learning model achieved excellent cartilage segmentation performance on CT in the test set (n=102), with mean DSC > 0.90 for femur and tibia. CT-derived cartilage thickness measurements exhibited strong correlations with MRI manual segmentations (Pearson’s r ranging from 0.87 to 0.92 across regions). The CT-derived CTh-Score effectively differentiated OA from non-OA knees as did the MRI-based assessments.

CONCLUSION

This study showed the feasibility and validated a deep learning framework that accurately segments knee cartilage on non-contrast CT. This breakthrough demonstrates strong morphological correlations with MRI and immediate clinical utility for OA assessment, potentially enhancing the CT diagnostic capabilities in the context of osteoarthritis. Further validation in other cohorts is needed; however, a key strength of CT is its typical acquisition standardization compared to MRI, which could facilitate broader applicability and generalizability.

CLINICAL RELEVANCE/APPLICATION

This deep learning framework enables morphological evaluation of cartilage directly from non-contrast CT scans, where cartilage is typically poorly distinguishable by the human eye. This is particularly valuable in situations where MRI is inaccessible, contraindicated for the patient, or when CT scans are already acquired for other purposes.

T7-SSMK06-3 ARTIFICIAL INTELLIGENCE-ASSISTED 3D WEIGHT-BEARING IMAGING TO ASSESS LOWER LIMB ALIGNMENT AND ITS CORRELATION WITH CHARACTERISTICS OF KNEE OSTEOARTHRITIS

Zejun Liang (*Presenter*)
Zhenlin Li (*Abstract Co-Author*)
Jing Tang (*Abstract Co-Author*)

PURPOSE

Assessing lower limb alignment is essential for tracking progression of knee osteoarthritis and for guiding treatment, but this cannot be done reliably with traditional 2D imaging. This study aimed to evaluate artificial intelligence-assisted 3D weight-bearing imaging for measuring the spatial hip-knee-ankle (HKA) angle in patients with knee osteoarthritis, and to explore associations of the angle with disease characteristics.

METHODS AND MATERIALS

This study prospectively analyzed 151 patients with knee osteoarthritis in Kellgren-Lawrence grades 1-4 from two medical centers. A 3D U-Net segmentation model was used to determine HKA angles from 3D weight-bearing images, and the performance of the model was evaluated in terms of the Dice similarity coefficient, recall, and volume similarity. Reproducibility was assessed in terms of the intraclass correlation coefficient between HKA angles determined twice two weeks apart in 20 patients. Potential associations of HKA angles were explored with osteoarthritis severity, joint space narrowing, and scores on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).

RESULTS

The segmentation model showed high mean Dice similarity coefficient, recall and volume similarity in the internal test set (0.968, 0.977, and 0.989) and external test set (0.944, 0.960, and 0.974), and the intraclass correlation coefficient was 0.98. Reconstruction of 3D deformities based on HKA angle showed that varus-flexion deformities became increasingly prevalent with advancing Kellgren-Lawrence grade, such that they occurred in most patients in grade 3 (67.2%) and grade 4 (89.1%). The spatial HKA angle increased with Kellgren-Lawrence grade and correlated more strongly with joint space narrowing (r = 0.52-0.61) and WOMAC scores (r = 0.45-0.56) than traditional 2D HKA angles did.

CONCLUSION

Artificial intelligence-assisted 3D weight-bearing imaging can reliably determine spatial hip-knee-ankle angles in patients with knee osteoarthritis, and the angles correlate with various disease characteristics. Varus-flexion deformity becomes increasingly prevalent as disease progresses and is dominant in advanced disease.

CLINICAL RELEVANCE/APPLICATION

Three-dimensional weight-bearing imaging combined with artificial intelligence can determine lower limb alignment with excellent reproducibility. Varus-flexion deformity becomes more prevalent as knee osteoarthritis progresses and is the most dominant deformity in advanced stages of the disease. Spatial hip-knee-ankle angle correlated moderately with the extent of joint space narrowing and patient-reported pain, stiffness, and functional limitation.

T7-SSMK06-4 COMPARISON OF ANTERIOR TIBIAL TRANSLATION AND FEMOROTIBIAL ROTATIONMEASUREMENTS IN MRI AND WEIGHT BEARING CT IN PATIENTS WITH CHRONIC ANTERIOR CRUCIATE LIGAMENT TEARS

Renata V. Leao, MD (*Presenter*)
Sandro Ricardo Benites Zelada (*Abstract Co-Author*)
Paulo Victor P. Helito, MD (*Abstract Co-Author*)
Carlos F. Teixeira Lobo, MD (*Abstract Co-Author*)
Catherina Zadeh, MD, FRCR (*Abstract Co-Author*)
Riccardo G. Gobbi (*Abstract Co-Author*)
Andre Giardino Moreira Da Silva (*Abstract Co-Author*)
Camilo P. Helito (*Abstract Co-Author*)

PURPOSE

To compare anterior tibial translation (ATT) and femorotibial rotation (FTR) measurements obtained from conventional MRI and weight-bearing CT (WBCT) in patients with chronic anterior cruciate ligament (ACL) tears.

METHODS AND MATERIALS

This retrospective study included 23 patients chronic ACL tears who underwent both conventional knee MRI and knee WBCT in flexion and extension. ATT and FTR were measured Statistical analysis was performed using repeated measures ANOVA and Sidak post-hoc tests, with a significant level of 5%.

RESULTS

A total of 23 patients were enrolled WBCT in flexion demonstrated significantly higher values for key kinematic parameters compared to MRI and WBCT in extension. Lateral ATT was significantly greater on WBCT in flexion (8.6 ± 3.4 mm) than on MRI (4 ± 3.6 mm; $p < 0.001$), with no significant difference between MRI and WBCT in extension ($p = 0.705$). Femorotibial rotation (FTR) was also significantly increased on WBCT in flexion (12 ± 5.6°) compared to MRI (7.3 ± 5.5°; $p < 0.001$), while lower values were observed on WBCT in extension (3.6 ± 4.7°; $p = 0.002$). Medial ATT did not differ significantly between WBCT in flexion and MRI ($p = 0.988$) but was significantly higher on WBCT in extension (6 ± 3 mm vs. 3.1 ± 2.4 mm; $p = 0.003$).

CONCLUSION

WBCT, particularly in flexion, demonstrates greater ATT and FTR than MRI, suggesting higher sensitivity to functional instability.

CLINICAL RELEVANCE/APPLICATION

Weight-bearing CT in flexion reveals greater anterior tibial translation and femorotibial rotation than MRI, enhancing detection of functional instability in chronic ACL tears and potentially guiding more precise treatment planning for improved patient outcomes.

T7-SSMK06-6 Lateral Meniscal Oblique Radial Tears (LMORT Lesions): MRI Appearance

Erin F. Alaia, MD (*Science Invited Presenter*)
Mohammad M. Samim, MD, MRCS (*Abstract Co-Author*)
Michael Moore (*Abstract Co-Author*)
William R. Walter, MD (*Abstract Co-Author*)
Christopher J. Burke, MBChB, FRCR (*Abstract Co-Author*)
Alexander Egol (*Abstract Co-Author*)
Alexander Golant (*Abstract Co-Author*)
Zachary L. Laporte, BA (*Abstract Co-Author*)
Michael Alaia, MD (*Abstract Co-Author*)

Nov. 30 – Dec. 4
RSNA® 2025
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T7-SSMK07

Musculoskeletal Imaging (Metabolic, Quantitative and Functional)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: E351

Idoia Corcuera-Solano, MD (*Moderator*)
Jan Vosshenrich, MD (*Moderator*)

Sub-Events

T7-SSMK07-1 ASSESSMENT OF TRABECULAR BONE MICROARCHITECTURE USING PHOTON-COUNTING DETECTOR CT AT VARIOUS RADIATION DOSES AS COMPARED TO HIGH-RESOLUTION PERIPHERAL QUANTITATIVE CT

Edwin H. Oei, MD, PhD (*Presenter*)
Melissa Bevers (*Abstract Co-Author*)
Joeri Kok (*Abstract Co-Author*)
Caroline Wyers (*Abstract Co-Author*)
J Van Den Bergh (*Abstract Co-Author*)
B Vanrietbergen (*Abstract Co-Author*)
Ronald Booij, PhD, MSc (*Abstract Co-Author*)

PURPOSE

To compare trabecular microarchitecture measurements in distal radius and tibia specimens from photon-counting detector CT (PCD-CT) at various radiation doses with the in-vivo gold standard high-resolution peripheral quantitative CT (HR-pQCT).

METHODS AND MATERIALS

PCD-CT and HR-pQCT scans were taken of two wrist and two ankle specimens from an 88-year old Caucasian man. The specimens had been kept intact to mimic in-vivo conditions. PCD-CT scans were taken of a 80-mm region and reconstructed at a slice thickness of 0.2 mm, a slice increment of 0.1 mm, and a pixel size of 0.111-0.127 mm using a Qr89-kernel. Radiation dose was varied at 2.5, 5, 10, and 20 mGy (effective dose: ~4-35 µSv). HR-pQCT scans were taken of a 102-mm (wrists) and 51-mm region (tibiae), which included the clinically standard HR-pQCT region. The scans were reconstructed at a voxel size of 61 µm. Effective radiation dose was 50 µSv (wrists) and 25 µSv (tibiae). The PCD-CT and HR-pQCT scans were pre-processed, after which the trabecular bone on the images was segmented and split into cubes (6-mm edge length). For each cube, bone volume fraction (BV/TV), trabecular thickness (Tb.Th), trabecular number (Tb.N), and trabecular heterogeneity (Tb.1/N.SD) were quantified and compared using linear regression between corresponding PCD-CT and HR-pQCT cubes, with cube correspondence based on three-dimensional image registration of the PCD-CT and HR-pQCT scans.

RESULTS

PCD-CT captured the trabecular microarchitecture of the specimens visually well compared to HR-pQCT. Coefficients of determination (R 2) were 0.72-0.97 at 2.5 mGy and remained stable with increasing radiation dose for all parameters except Tb.1/N.SD. For Tb.1/N.SD, R 2 increased from 0.72 at 2.5 mGy to 0.85 at 5 mGy and stabilized at higher doses. At every radiation dose, BV/TV and Tb.Th and to a smaller extent Tb.N were higher on PCD-CT than on HR-pQCT, while Tb.1/N.SD was lower.

CONCLUSION

Trabecular microarchitecture measurements in radius and tibia specimens strongly correlated between PCD-CT and HR-pQCT at already low radiation dose for PCD-CT and without large improvement at higher doses. The higher values of especially BV/TV and Tb.Th on PCD-CT than on HR-pQCT may be due to a larger partial volume effect and likely lower resolving power of thin trabeculae on PCD-CT due to its lower spatial resolution, although optimization of image processing and analysis protocols may help to reduce this difference.

CLINICAL RELEVANCE/APPLICATION

PCD-CT has potential for bone microarchitecture assessment in clinical practice and possibly also as one-shop-stop examination in (pre-operative) evaluations of fractures. It has a lower spatial resolution than HR-pQCT but several advantages and possibilities regarding scan acquisition.

T7-SSMK07-2 RETHINKING OSTEOPOROSIS SCREENING: OUTCOMES FROM A 15-YEAR RETROSPECTIVE ANALYSIS OF DEXA SCANS

Helen Kwon, BA (*Presenter*)
Michaela Kop (*Abstract Co-Author*)
Kyle Ishikawa (*Abstract Co-Author*)
Lana H. Gimber, MD (*Abstract Co-Author*)
Hyo-chun Yoon, MD, PhD (*Abstract Co-Author*)

PURPOSE

According to USPSTF guidelines, DEXA screening for osteoporosis is recommended for all women aged 65 and older and at-risk younger women. Despite recommendations, screening rates remain low nationwide, increasing the risk for osteoporosis-related complications. This study examined the rate of conversion to osteoporosis in women whose initial DEXA scan was performed before age 65 compared to those 65 and older within an integrated healthcare system.

METHODS AND MATERIALS

We conducted a retrospective analysis of women who underwent more than one DEXA scan from 1/1/2010 to 3/31/25. For each scan, we recorded the lowest T-score, bone mineral density, location, date, and patient age. Statistical analyses were conducted using Kaplan-Meier curves to nonparametrically estimate survival probability, and p-values were determined by a log-rank test. The median and 80% time to event were calculated using the corresponding quantiles while considering right-censoring.

RESULTS

There were 2,205 women under age 65 and 2,375 women aged 65 and older at the time of their initial DEXA scan. Among women 65+ years, 27.4% were osteoporotic (T-score =-2.5), compared to 19.1% of women <65 years. Among those who became osteoporotic on subsequent scans, the median time to osteoporosis was 13.3

years for the younger group and 12.2 years for the older group (p<.001). The number of years for 80% of the population to remain non-osteoporotic was 8.7 years for women <65 and 7.7 years for women 65+ (p<.001). When comparing women who initially had normal-to-mild osteopenia (T-score =-1.9) to those with moderate-to-severe osteopenia (T-score -2.0 to -2.4), the number of years for 80% of the population to remain non-osteoporotic was 12.2 and 4.8 years, respectively (p<.001). The median time to osteoporosis for the moderate-to-severe osteopenia group was 9.4 years (p<.001). There was no median time to event for normal-to-mild osteopenia, as most were right-censored before 50% could convert to osteoporosis.

CONCLUSION

Women who underwent initial screening <65 years old took longer to convert to osteoporosis and had a longer 80% survival time, which may suggest that early screening may not improve detection. Women who initially had a T-score =-1.9 took significantly longer to convert to osteoporosis compared to those with a T-score of -2 to -2.4, suggesting that frequent repeat screening at intervals <5 years should be reserved for moderate-to-severe osteopenic individuals.

CLINICAL RELEVANCE/APPLICATION

Osteoporosis trends within this integrated healthcare system suggest that there should be greater emphasis on appropriate initial screening as well as less frequent interval imaging, especially in women not osteoporotic or only mildly osteopenic at initial screening.

T7-SSMK07-3 DIAGNOSTIC ACCURACY OF DUAL-ENERGY CT-BASED ONE-STOP PREDICTIVE MODEL FOR BONE MINERAL DENSITY ASSESSMENT COMPARED WITH QUANTITATIVE COMPUTED TOMOGRAPHY

Mingyue Zhao, MMedSc (*Presenter*)
Hong Ren (*Abstract Co-Author*)

PURPOSE

The purpose of this study was to establish diagnostic criteria for bone status assessment using dual-energy computed tomography (DECT) material decomposition technique through comparison with quantitative computed tomography (QCT).

METHODS AND MATERIALS

Totally 255 patients who underwent both unenhanced and contrast-enhanced (arterial-, venous- and delayed-) phase abdominal DECT were divided into four groups A, B, C, D according to their ages (<30years, 30-49years, 50-69years, =70years). QCT standard scanning and reconstruction parameters were used in the unenhanced phase, and spectral imaging mode was used in the enhanced phases. The bone densities of hydroxyapatite (iodine) (D HAP (iodine)) in the trabecular bone of vertebral bodies (L1-L3) were measured, along with bone mineral density (BMD) via QCT. Spearman's correlation test was performed to analyze the relationship between the DECT- and QCT-derived BMD. According to the diagnostic criteria of QCT, D HAP (iodine) of osteoporosis, osteopenia and normal vertebral bodies were compared by One-Way ANOVA. ROC curves were generated to determine the optimal diagnostic thresholds of HAP (Iodine) for diagnosing osteopenia and osteoporosis and normal bone mass. The correlated fitting curve between D HAP (iodine) of L3 and age in each group was established and analyzed.

RESULTS

D HAP (iodine) was positively related to QCT BMD (r =0.960, P <0.05). The differences in D HAP (iodine) among different age groups were statistically significant (P <0.05). D HAP (iodine) showed no correlation to age in group A (P> 0.05). D HAP (iodine) were negatively correlated with age in groups B, C and D (r =-0.467, -0.506, -0.426, P <0.05), and overall high negative correlation with age for patients =30years (r =-0.733,P <0.05): D HAP (iodine) = -1.059 * age + 751.642 2mg/cm 3 . There were significant differences in D HAP (iodine) among osteoporosis, osteopenia and normal group (P <0.05). The area under the ROC curve, sensitivity, and specificity for identifying osteopenia were 0.987, 92.77%, and 95.97% with D HAP (iodine) =695.92 (2mg/cm 3), respectively. The corresponding values for identifying osteoporosis were 0.963, 92.63%, 89.51% and with D HAP (iodine) =677.34 (2mg/cm 3), respectively.

CONCLUSION

The one-stop DECT-based predictive model for quantification of vertebral BMD demonstrates technical feasibility and high diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

1. Development of a simplified BMD predictive model leveraging population-based demographic data. 2. Implementation of a one-stop examination protocol enabling real-time acquisition of clinically actionable BMD metrics related to diagnosis.

T7-SSMK07-4 DEEP LEARNING ANALYSIS OF CHEST RADIOGRAPHS OUTPERFORMS FRAX IN PREDICTING MAJOR OSTEOPOROTIC FRACTURES

Yisak Kim, PhD (*Presenter*)
Chang Min Park, MD, PhD (*Abstract Co-Author*)
Sung Hye Kong (*Abstract Co-Author*)

PURPOSE

FRAX is widely used for predicting fracture risk but is limited by its dependence on dual-energy X-ray absorptiometry (DXA) and low responsiveness to short-term fracture events. This study aimed to develop and validate a deep learning (DL) model based on chest radiography (CXR) to predict major osteoporotic fractures (MOFs), and to evaluate its predictive performance compared to FRAX.

METHODS AND MATERIALS

This multicenter retrospective study included 42,014 patients (mean age, 59.3 years; 79.8% women) from Institution A (2008-2019) for model development and 31,821 patients (mean age, 64,6 years; 72.4% women) from Institution B (2003-2022) for external validation. CXR images were preprocessed using localized energy-based normalization, and convolutional neural network (CNN) models were trained separately for original and normalized images. A logistic hazard loss function was used to directly model time-to-event data. Predictive performance was evaluated using Concordance index (C-index) and time-dependent area under the receiver operating characteristic curve (AUROC) at 2, 3, 5 and 10 years.

RESULTS

In the internal test set (n=5,000), the DL model achieved a C-index of 0.867, significantly outperforming FRAX (C-index, 0.800; P<.001). The 2-, 3-, 5- and 10-year AUROCs for the DL model were 0.878, 0.887, 0.886, and 0.899 respectively, also significantly higher than FRAX (AUROCs, 0.805, 0.804, 0.805, and 0.832; all P<.001). In the external test set (n=31,821), the DL model yielded C-indices of 0.780, outperforming FRAX (C-index, 0.767; P<.001). The 2-, 3-, 5- and 10-year AUROCs for the DL model were 0.804, 0.816, 0.831, and 0.865 respectively, also significantly higher than FRAX (AUROCs, 0.774, 0.780, 0.784, and 0.810; all P<.001). The DL model also demonstrated strong performance across fracture subtypes: C-indices of 0.828 (vertebral), 0.710 (non-vertebral), and 0.833 (hip); with 2-, 3-, 5- and 10-year AUROCs ranging from 0.715 to 0.879 depending on fracture type.

CONCLUSION

The DL model using chest radiographs significantly outperformed FRAX in predicting major osteoporotic fractures. This image-based approach may provide a more accessible and accurate tool for fracture risk assessment in clinical practice.

CLINICAL RELEVANCE/APPLICATION

This DL-based approach enables fracture risk prediction from widely available chest radiographs, offering a practical and accessible alternative to DXA-based assessments, with potential to improve early detection and preventive care in clinical practice.

T7-SSMK07-5 INCLUSION OF THE 33% RADIUS INCREASES THE SENSITIVITY OF DXA IN PRIMARY HYPERPARATHYROIDISM

Alain E.
Sherman, MD, MBA (*Presenter*)
Rakan Alqaqaa (*Abstract Co-Author*)
Kai Jones, MD (*Abstract Co-Author*)
Jenny T. Bencardino, MD (*Abstract Co-Author*)
Kwang J. Chun, MD (*Abstract Co-Author*)

PURPOSE

Patients with primary hyperparathyroidism routinely undergo screening for osteoporosis using dual-energy X-ray absorptiometry (DXA) due to accelerated bone resorption and resulting impaired bone mineral density (BMD). Parathyroid hormone preferentially exerts catabolic effects on cortical bone found in the distal forearm over trabecular bone in the lumbar spine or hip. Nonetheless, the 33% radius is not routinely included in most DXA imaging protocols. We sought to investigate the added diagnostic value of the 33% radius in DXA screening of patients with primary hyperparathyroidism.

METHODS AND MATERIALS

Three hundred twenty-five patients with primary hyperparathyroidism underwent DXA screening for osteoporosis as part of standard of care. BMD measurements were taken at the 33% radius of the non-dominant forearm, L1 through L4 vertebral bodies, and femoral neck. Age-matched T-scores were standardized using NHANES III population datasets. Patients were classified as having normal BMD, osteopenia, or osteoporosis according to WHO reference standards. Regression analysis and repeated measures analysis of variance (ANOVA) were used to compare T-scores at the 33% radius, lumbar spine, and femoral neck. McNemar-Bowker test was used to compare the proportions of patients diagnosed with normal BMD, osteopenia, and osteoporosis at each anatomic site.

RESULTS

T-scores at the 33% radius were moderately correlated with those at the lumbar spine, $r = 0.58$, $p < 0.001$, and femoral neck, $r = 0.54$, $p < 0.001$. T-scores at the 33% radius ($M = -1.12$, $SD = 1.51$) were significantly lower than at the lumbar spine ($M = -0.48$, $p < 0.001$) and femoral neck ($M = -0.96$, $SD = 1.29$, $p = 0.04$), $F(2, 314) = 25.68$, $p < 0.001$?. There were statistically significant differences in the distribution of patients diagnosed with normal BMD, osteopenia, and osteoporosis according to the 33% radius, lumbar spine, and femoral neck, $p < 0.001$. The incidence of osteoporosis was highest at the 33% radius (20.3%), significantly greater than the lumbar spine (13.5%, $p < 0.001$) and femoral neck (9.8%, $p < 0.001$).

CONCLUSION

Imaging of the 33% radius increases the sensitivity of DXA in patients with primary hyperparathyroidism. For 65 patients (20.0%), inclusion of the 33% radius upstaged the diagnostic classification from normal BMD to osteopenia or osteopenia to osteoporosis.

CLINICAL RELEVANCE/APPLICATION

Inclusion of the 33% radius in DXA screening identifies a significant proportion of patients with primary hyperparathyroidism at risk of osteoporotic fractures not captured by the lumbar spine or femoral neck alone.

T7-SSMK07-6 INTRAVENOUS CONTRAST MEDIA-RELATED VARIATIONS IN CT-DERIVED BODY COMPOSITION METRICS: ASSOCIATIONS WITH SEX AND ADIPOSE TISSUE

Tae Ran Ahn, MD, MD (*Presenter*)

PURPOSE

To investigate changes in CT-derived body composition metrics following intravenous contrast administration and identify factors associated with muscle enhancement.

METHODS AND MATERIALS

This retrospective study included 88 healthy adults (61 men; mean age, 60.97±7.12 years) who underwent three-phase abdominal CT. Deep learning-based software segmented skeletal muscle, visceral fat, subcutaneous fat, and intermuscular adipose tissue (IMAT) at the L3 level. Repeated-measures ANOVA assessed phase-dependent changes in tissue areas (cm 2) and attenuation (HU). McNemar's test compared sarcopenia and myosteatosis prevalence between precontrast and portal phases. Regression analyses identified factors associated with muscle enhancement, defined as absolute attenuation difference and percentage change from precontrast to portal phase.

RESULTS

Body composition metrics showed significant phase-dependent variations. From precontrast to arterial and portal phases, skeletal muscle index (cm 2 /m 2) increased ($p < 0.001$), while visceral fat index decreased ($p < 0.001$), and subcutaneous fat index remained unchanged ($p = 1.000$). All tissue attenuation metrics rose significantly across phases ($p < 0.001$). These shifts lowered the prevalence of sarcopenia (26.2% to 16.9%, $p = 0.031$) and myosteatosis (64.6% to 29.2%, $p < 0.001$) from precontrast to portal phase. Women consistently demonstrated greater muscle enhancement than men across each phase comparison. In overall multivariable analysis, greater muscle enhancement was associated with female sex (absolute difference: $b = 1.39$, $p = 0.011$; percent change: $b = 1.75$, $p < 0.001$), lower precontrast subcutaneous fat attenuation (SFA) (absolute difference: $b = 0.98$, $p = 0.020$; percent change: $b = 0.97$, $p = 0.009$), and older age (percent change: $b = 1.02$, $p = 0.004$). Sex-specific multivariable analyses revealed that lower precontrast SFA in women (absolute difference: $b = 0.94$, $p = 0.024$; percent change: $b = 0.95$, $p = 0.014$) and higher IMAT proportion in men (percent change: $b = 1.32$, $p = 0.022$) correlated with greater muscle enhancement.

CONCLUSION

CT-derived body composition metrics vary considerably across contrast phases, leading to potential reclassification of sarcopenia and myosteatosis. Muscle enhancement exhibits sex-specific patterns related to regional adipose tissue distribution, with lower precontrast SFA in women and higher IMAT in men associated with greater enhancement.

CLINICAL RELEVANCE/APPLICATION

Understanding the influence of contrast phase, sex-specific enhancement patterns, and regional adipose tissue distribution on CT-derived muscle metrics is critical for accurate sarcopenia and myosteatosis assessment in routine clinical imaging.

Nov. 30 – Dec. 4
RSNA® 2025
Imaging the Individual

Abstract Archives of the RSNA, 2025

T7-SSNPM02

Science Session with Keynote: Noninterpretive Skills (Beyond Imaging) (Workforce and Economics)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: S402

Jay R. Parikh, MD, FRCPC (*Moderator*)
Madelene C. Lewis, MD (*Moderator*)

Sub-Events

T7-SSNPM02-2 THE TYRANNY AND CHAOS OF SMALL NUMBERS: A PROBABILISTIC OPEN-ACCESS STAFFING CALCULATOR TO MITIGATE PATIENT RISK, REDUCE BURNOUT, AND PROMOTE RETENTION IN EMERGENCY RADIOLOGY STAFFING

Daniel T. Kawakyu-O'Connor, MD (*Presenter*)
Katherine A. Kaproth-Joslin, MD, PhD (*Abstract Co-Author*)
James Bai, MD (*Abstract Co-Author*)
Jeffrey Kallas, MD (*Abstract Co-Author*)

PURPOSE

Radiologist staffing decisions in emergency settings are often based on mean hourly exam volumes or relative value units (RVU), despite wide variability in real-world demand. This approach oversimplifies complexity and contributes to chronic understaffing, turnaround time (TAT) delays, and increased burnout risk. We developed a probabilistic modeling framework to support institutional leaders in aligning staffing levels with service targets, safety thresholds, and workforce sustainability goals.

METHODS AND MATERIALS

Hourly CT volumes were modeled using Poisson distributions, enabling estimation of the probability that a given staffing configuration could meet operational goals—such as interpreting all exams within a 60-minute TAT. Radiologist capacity was modeled as fixed hourly throughput. The tool was applied to 12 months of overnight CT data at a Level 1 trauma center to compare mean-based planning with variability-aware projections. An open-access calculator was developed to allow other institutions to perform similar analyses. Sites with empirical variance data can further refine the model by relaxing the assumption that mean equals variance.

RESULTS

At our institution, overnight staffing of 3 radiologists met 90% of the average hourly demand. However, Poisson modeling revealed that five radiologists would be required to meet demand 85% of the time. Mean-based planning significantly underestimated the risk of TAT breaches during surge conditions. Detailed application examples and calculator demonstrations will be presented.

CONCLUSION

This model corrects a fundamental mismatch between the traditional staffing logic in diagnostic imaging based on metrics of exam volume —where volume is high and variability is low—and emergency radiology, where small team sizes amplify the effects of stochastic demand. It offers a scalable, transparent framework to inform staffing decisions and balance safety, efficiency, and cost.

CLINICAL RELEVANCE/APPLICATION

Variability-aware staffing models are essential in high-acuity, resource-constrained environments. This on-line tool supports radiology leaders and administrators in advocating for safer, more staffing levels—helping to prevent burnout, improve patient flow, and sustain the emergency radiology workforce in the face of rising clinical demand and limited personnel. It also highlights the risk of emphasizing inappropriate metrics of productivity such as exam volume or RVU when developing staffing strategies.

T7-SSNPM02-3 TURNING ABSENCE INTO OPPORTUNITY: A 6-YEAR ANALYSIS OF NO-SHOW MANAGEMENT IN RADIOLOGY SERVICES

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Carlos Capunay, MD (*Abstract Co-Author*)
Juan Cruz Gallo, MD, MD (*Abstract Co-Author*)

PURPOSE

Patient no-shows remain a significant challenge in radiology departments worldwide, with rates reported as high as 25% in some institutions. These absences lead to underutilization of imaging equipment, disrupt workflow, and cause substantial financial losses. Proactive, automated patient confirmation processes are essential to maintain scheduling efficiency and ensure high productivity. This study aims to demonstrate how a large imaging center successfully achieved and sustained a significant reduction in no-show rates through a structured, multichannel patient confirmation system. It also quantifies the long-term impact on productivity and revenue.

METHODS AND MATERIALS

We evaluated no-show rates from 2018 to 2025 across all imaging departments modalities. In 2018 (baseline), no confirmation system was in place. In 2019, a WhatsApp-based confirmation protocol was introduced with automated reminders sent at 72, 48, and 24 hours prior to the scheduled exam. Patients were able to confirm or cancel their appointment, and if cancelled, the time slot was automatically released for rebooking. Follow-up tracking was performed annually to assess the sustainability of no-show reduction. Economic analysis was based on an estimated average loss of USD 30,000 per 1% of no-show.

RESULTS

The no-show rate in 2018 was 15%. After the implementation of the confirmation system, the annual rates were: 2019: 9.51%; 2020: 12.41% (increase due to the COVID-19 pandemic); 2021: 10.01%; 2022: 8.15%; 2023: 7.36%; 2024: 6.79%: 2025 (YTD): 6.62% Between 2018 and 2025, the no-show rate decreased by 55%, corresponding to an 8.38 percentage point improvement. In 2024, our institution performed 968,769 patient studies with a no-show rate of 6.79%. If the 2018 no-show rate (15%) had persisted, the number of completed studies would have been significantly lower. The improvement achieved between 2018 and 2024 resulted in approximately 79,535 additional patients being scanned in 2024 alone. Given that each percentage point of no-show reduction represents an estimated value of USD 30,000, this improvement translates to a financial gain of approximately USD 251,400 in productivity and billing.

CONCLUSION

Reducing no-show rates is essential for optimizing resource use and financial performance in radiology departments. A structured and automated patient confirmation process—leveraging widely used platforms such as WhatsApp—proved highly effective and sustainable over a six-year period. Maintaining low no-show rates offers significant operational and economic benefits and should be a priority in imaging service management.

CLINICAL RELEVANCE/APPLICATION

Low no-show rates offers significant operational and economic benefits.

T7-SSNPM02-4 REPEAT IMAGING RATES FOR OFFICE-BASED IMAGING STUDIES INTERPRETED BY NON-PHYSICIAN PRACTITIONERS COMPARED WITH RADIOLOGISTS

Eric Christensen, PhD (*Presenter*)
Alexandra Drake (*Abstract Co-Author*)
Stella Kang, MD, MSc (*Abstract Co-Author*)
Elizabeth Y. Rula, PhD (*Abstract Co-Author*)
Andrew B. Rosenkrantz, MD (*Abstract Co-Author*)

PURPOSE

Non-physician practitioners (NPPs) have been associated with higher rates of imaging ordering compared with physicians and, over time, have performed an increasing share of imaging interpretation. Repeat imaging, a potential source of waste that can occur if initial image interpretation is inadequate, has not been evaluated in association with NPP interpretation. Accordingly, the purpose of this study is to examine differences in repeat imaging rates between imaging studies interpreted by an NPP versus a radiologist.

METHODS AND MATERIALS

This multiyear (January 2013 to December 2022) retrospective study evaluated imaging performed on Medicare fee-for-service beneficiaries using a 5% nationally representative, research identifiable sample from CMS. Imaging families (i.e., combination of body region and modality) with =30 repeat studies within 90 days for both NPP-interpreted and radiologist-interpreted index studies were included. Logistic regression was used to assess the likelihood of repeat imaging within 90 days for NPP-interpreted versus radiologist-interpreted index studies, adjusted for patient sex, age, race/ethnicity, comorbidities, urbanicity, and community income.

RESULTS

There were 1,397,002 imaging studies that met the selection criteria. Of these, repeat imaging occurred for 12.5%. Unadjusted repeat imaging rates were higher for NPP-interpreted versus radiologist-interpreted imaging for radiography (20.4% vs 15.1%), ultrasound (11.6% vs 4.6%), and MR (8.8% vs 3.9%). Adjusted for covariates, the odds ratio (OR) for repeat imaging was higher for NPP-interpreted versus radiologist-interpreted imaging: 1.35 (95%CI: 1.33, 1.37) for XR, 2.41 (95%CI: 2.21, 2.63) for ultrasound, and 2.56 (95%CI: 1.81, 3.64) for MR. By imaging family, these ORs ranged from 1.39 (95%CI: 1.34, 1.44) for shoulder XR to 3.40 (95%CI: 2.80, 4.14) for abdominal US, except for knee XR for which it was not significantly different (OR: 1.01, 95%CI: 0.99, 1.04).

CONCLUSION

Among Medicare beneficiaries, imaging studies are more likely to be repeated when interpreted by a NPP than when interpreted by a radiologist.

CLINICAL RELEVANCE/APPLICATION

The insights into potential drivers of repeat imaging are important given the implications of excess reimaging for system-level unnecessary care, associated patient harm, and higher healthcare costs.

T7-SSNPM02-5 NATIONAL TRENDS AND PREDICTORS OF MALPRACTICE PAYMENTS IN U.S. RADIOLOGY: A 33-YEAR ANALYSIS OF THE NATIONAL PROVIDER DATA BANK

Ashima Kundu, BS (*Presenter*)
Sachin Govind (*Abstract Co-Author*)
Divya Kumari, MD (*Abstract Co-Author*)

PURPOSE

Radiologists experience substantial risk for malpractice litigation, with diagnostic errors driving many malpractice claims. Prior studies have relied on surveys or legal repositories, which may not reflect national trends. National-scale analyses leveraging objective data sources remain limited. This study assesses malpractice claims involving radiologists in the United States, compares them to non-radiology claims, evaluates predictors of higher payment, and analyzes temporal and regional trends in radiology litigation.

METHODS AND MATERIALS

We retrospectively analyzed all physician malpractice payment records in the National Practitioner Data Bank from 1991-2024. Radiology-related claims were identified based on coded allegations involving imaging errors. Comparative analyses were performed across patient, case, physician, and state-level factors. Payment trends over time and regional variation were assessed relative to radiologist employment and compensation. High- versus low-payment radiology claims were compared to identify factors associated with larger indemnity amounts using standard statistical methods.

RESULTS

We analyzed 399,568 total physician malpractice cases from 1991-2024. Diagnostic errors accounted for >70% of radiology claims. Compared to non-radiology cases, radiology suits more often involved outpatient care (50.5% vs. 20.6%, $p < .001$), severe outcomes (64.2% vs. 32.3%, $p < .001$), and higher mean payments ($374,248±$11,210 vs. $290,437±$825, $p < .001$). Higher-payment radiology claims were associated with severe outcomes (84.8% vs. 43.6%, $p < .001$), out-of-state filings (33.1% vs. 24.9%, $p < .001$), lower settlement rates (96.7% vs. 99.2%, $p < .001$), and higher likelihood of originating in more litigious states (42.4% vs. 31.9%, $p < .001$). Regional analyses showed that most states experienced an increase in radiological malpractice incidence over time ($p = .006$). More recent cases had higher payments ($412,050±14478 vs. $285,958±15377, $p < .001$) and were more likely to be filed across state lines compared to older cases ($p < .001$).

CONCLUSION

Radiology malpractice claims, driven largely by diagnostic errors, were more likely to involve severe outcomes, occur in outpatient settings, cross state lines, and result in higher payments than non-radiology claims. Higher payment stems from more severe outcomes, and these patterns have intensified over time.

CLINICAL RELEVANCE/APPLICATION

Radiologists face unique medicolegal risks, particularly related to diagnostic errors in outpatient settings. Understanding the predictors of high-payment claims and evolving trends can inform risk management strategies, guide practice improvements, and support policy efforts to reduce litigation exposure.

T7-SSNPM02-6 AFFIRMATIVE ACTION IN U.S. ACADEMIC RADIOLOGY: LONGITUDINAL AND CROSS-SECTIONAL ANALYSIS OF GENDER, RACE, AND ETHNICITY

Mujtaba Ibrahim, MD, BSc (*Presenter*)
Mansimran Virk (*Abstract Co-Author*)
Stacy E. Smith, MD (*Abstract Co-Author*)

Amina Saghir, MD (*Abstract Co-Author*)
Jeffrey Ding (*Abstract Co-Author*)
Osher Lee (*Abstract Co-Author*)
Faisal Khosa, FRCPC, MBA (*Abstract Co-Author*)

PURPOSE

To assess changes in gender, racial, and ethnic diversity in academic radiology during the affirmative action era and identify persistent disparities across academic ranks and training.

METHODS AND MATERIALS

This was a retrospective analysis of radiology faculty (1966-2023), department chairs (1977-2023), and trainees (2017-2023) was performed using datasets from the AAMC, ACGME, and ERAS. Linear regression and chi-square ($?^2$) analyses were conducted to examine trends in gender, racial, and ethnic representation. A P value of < .01 was considered statistically significant.

RESULTS

Radiology faculty grew from N=759 (1966) to N=10,334 (2023), and chairs from N=127 (1977) to N=229 (2023). Women's representation increased annually among faculty (+0.44%) and chairs (+0.49%) (P < .001). African American representation also improved among faculty (+0.02%) and chairs (+0.08%) (P < .001). Trends for Asian, Hispanic, Multiracial, and White groups mirrored national census patterns. Intersectional analyses revealed yearly gains among women of underrepresented racial or ethnic identity (+0.04% faculty; +0.08% chairs; P < .001), with more variable trends for men (-0.01% faculty; +0.02% chairs; P < .001). However, women's representation declined with academic rank (-4.4%; P = .002) and was significantly lower in residency recruitment ($?^2$ = 1534; P < .001). African American and Hispanic individuals faced barriers in both residency acceptance ($?^2$ = 722; P < .001) and academic hiring ($?^2$ = 54.2; P < .001).

CONCLUSION

While affirmative action improved representation for women and African Americans in academic radiology, its overall impact was limited. Structural inequities continue to restrict advancement and recruitment for underrepresented groups.

CLINICAL RELEVANCE/APPLICATION

Understanding the historical and ongoing effects of affirmative action provides insight into structural barriers in academic radiology. Addressing these disparities requires targeted, evidence-based strategies to promote equitable recruitment, advancement, and retention of a diverse workforce.

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Nov. 30 – Dec. 4
RSNA® 2025
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T7-SSNR09

Neuroradiology (Cognition and Memory)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: S406B

Hossein Nejadnik, MD, PhD (*Moderator*)
Chad W. Farris, MD, PhD (*Moderator*)

Sub-Events

T7-SSNR09-1 IMPAIRED COUPLING BETWEEN CEREBRAL ARTERIAL BLOOD AND PERIVASCULAR CSF DYNAMICS IN ALZHEIMER'S DISEASE

Adam Wright, BS (*Presenter*)
Xiaopeng Zhou (*Abstract Co-Author*)
Yu-Chien Wu, PhD, MD (*Abstract Co-Author*)
Shannon Risacher (*Abstract Co-Author*)
Andrew J. Saykin, PsyD, MS (*Abstract Co-Author*)
Yunjie Tong (*Abstract Co-Author*)
Qiuting Wen (*Abstract Co-Author*)

PURPOSE

Cerebral waste accumulation is a hallmark of Alzheimer's disease (AD), reflecting dysfunction in brain waste clearance. However, assessing the brain waste clearance system, particularly the perivascular cerebrospinal fluid (pCSF) flow, remains challenging in humans. Using a novel multimodal MRI approach, our group recently demonstrated that pCSF flow is strongly coupled with arterial blood pulsations in healthy brains. We applied this technique to examine vascular-perivascular coupling across the AD spectrum, hypothesizing that this coupling is disrupted in AD.

METHODS AND MATERIALS

Participants from an Alzheimer’s Disease Research Center (N=115) underwent MRI and comprehensive cognitive evaluation: cognitively unimpaired (CU, N=87), mild cognitive impairment (MCI, N=18), or AD dementia (AD, N=10). Pulsatile blood flow in cerebral arteries was assessed using cardiac-aligned resting-state functional MRI (fMRI), while adjacent pCSF dynamics were assessed using cardiac-aligned dynamic diffusion-weighted imaging (dynDWI). Vascular-perivascular coupling was quantified by a correlation-based approach that measures how closely the pCSF dynamics are synchronized with arterial cardiac pulsations. Systolic peaks in the fMRI and dynDWI signals were aligned, and the resulting correlation, termed the “Correlation at Aligned Peaks,” was calculated. Higher values correspond to stronger coupling. Group differences in Correlation at Aligned Peaks and peak time delays were tested via ANOVA with Tukey’s pairwise correction. Pearson’s r assessed correlations with cognitive and volume metrics.

RESULTS

Correlations at Aligned Peaks differed across groups ($F=4.4$, $p<0.05$). Compared with CU, coupling was significantly lower in AD ($p<0.05$, Cohen’s $d=0.92$) and nonsignificantly lower in MCI ($p=0.19$, Cohen’s $d=0.45$). Correlations at Aligned Peaks were positively correlated with MoCA ($r=0.29$, $p<0.01$) and normalized brain volume ($r=0.23$, $p<0.05$), and negatively correlated with normalized ventricle volume ($r=-0.29$, $p<0.01$) and white matter hyperintensity volume ($r=-0.33$, $p<0.001$). The time delay between peaks did not differ ($F=0.163$, $p=0.85$) and was not correlated with cognition or volume metrics.

CONCLUSION

Vascular-perivascular fluid coupling was reduced in AD, suggesting less effective arterial driving of pCSF flow. This study provides human evidence that impaired perivascular pumping may contribute to AD pathology.

CLINICAL RELEVANCE/APPLICATION

The MRI protocol comprises two short scans with clinically feasible scan times (10 minutes total). It can be used to monitor disease progression and evaluate the effects of future interventions targeting brain waste clearance in AD and CSF-related brain disorders.

T7-SSNR09-2 MOTOR-COGNITIVE AGING: THE ROLE OF CORTICOSTRIATAL PATHWAY

Jiaqi Wen, MD, MS (*Presenter*)
Zifei Liang (*Abstract Co-Author*)
Chenyang Li (*Abstract Co-Author*)
Huize Pang (*Abstract Co-Author*)
Jiayi Li (*Abstract Co-Author*)
Xiaojun Guan (*Abstract Co-Author*)
Xiaojun Xu (*Abstract Co-Author*)
Yulin Ge, MD (*Abstract Co-Author*)

PURPOSE

Cognitive decline and motor dysfunction are hallmark features of aging. The primary motor cortex (M1) plays a critical role in voluntary movement and exhibits a somatotopic organization enabling precise control of different body parts. In the M1, pyramidal neurons project to the corticospinal tract (CST) and send collaterals to the ipsilateral striatum, forming the corticostriatal tract (CStrT). In this study, we aimed to investigate age-related degeneration of the M1 and its connected CST and CStrT using multimodal MRI and examine their associations with cognitive function.

METHODS AND MATERIALS

We analyzed 339 right-handed adults from the Human Connectome Project-Aging cohort using T1-, T2-weighted, pseudo-continuous arterial spin labeling, and diffusion MRI to assess age-related changes in M1 structure, perfusion, and white matter integrity. Participants were divided into two age groups using 65 years as the cutoff. An automated method (mrGrad) was used to generate ATT, CBF, and T1/T2 ratio functions along the face-to-feet axis of M1. Along-tract FA and MD of the CST and CStrT were compared between groups. Mediation analyses assessed relationships among M1 metrics, tract integrity, and cognitive performance.

RESULTS

Aging was associated with reduced M1 volume, increased cortex curvature and T1/T2 ratio, prolonged ATT, and decreased CBF. Significant differences in ATT and CBF were observed across all M1 segments bilaterally, indicating widespread hemodynamic impairments in older adults. T1/T2 ratios were significantly elevated in segments 1-3 of the left M1 and 1-4 of the right M1, suggesting iron accumulation in regions controlling the face and upper limbs. Older adults also exhibited decreased FA in the left CST near M1, increased MD in bilateral CST, and widespread reductions in CStrT integrity. Tract integrity was associated with M1 structure and perfusion. Notably, atrophy of the right M1 was associated with cognitive impairment, fully mediated by degeneration of the right CStrT, underscoring its role as a key pathway linking motor cortical atrophy to cognitive decline.

CONCLUSION

Aging leads to structural and hemodynamic degeneration in the M1 and its associated tracts. The corticostriatal pathway serves as a key link between M1 atrophy and cognitive decline, highlighting its potential as an early biomarker for age-related neurodegeneration.

CLINICAL RELEVANCE/APPLICATION

This study identifies the corticostriatal tract as a critical mediator between motor cortex degeneration and cognitive decline in aging. Multimodal MRI markers from this pathway may aid in early detection of individuals at risk for cognitive impairment, guiding targeted interventions to slow neurodegenerative progression.

T7-SSNR09-3 ADDED VALUE OF AMYLOID PET QUANTIFICATION WITH CENTILOID SCALE IN CLINICAL PRACTICE

Akarsh Vijayashankar, MD, BA (*Presenter*)
Graham C. Keir, MD (*Abstract Co-Author*)
Matthew Sagnelli, MD (*Abstract Co-Author*)
David R. Petrover, MD (*Abstract Co-Author*)
Mehdi Djekidel, MD (*Abstract Co-Author*)
Joseph E. Glaser, MD (*Abstract Co-Author*)
Christopher Caravella, BS, ARRT (*Abstract Co-Author*)
Sean Clouston (*Abstract Co-Author*)
Josephine N. Rini, MD (*Abstract Co-Author*)
Ana M. Franceschi, MD, PhD (*Abstract Co-Author*)

PURPOSE

For amyloid brain PET/CT and PET/MRI fusion images, (1) determine agreement between visual interpretations of amyloid PET, and (2) compare results of visual interpretation to quantitative analysis as measured by the Centiloid scale.

METHODS AND MATERIALS

167 clinical amyloid brain PET/CT scans were reviewed by 3 readers blinded to the original reports. Readers interpreted the amyloid PETs as negative (0), positive (1), or indeterminate (2) for amyloid deposition. For quantitative analysis, two additional readers analyzed amyloid PET images using MIMNeuro to generate Centiloid (CL) score and regional SUVRs. Reader agreement was determined for visual assessment and quantitative assessment. Using positive scan cut-offs of CL=40, visual assessment versus quantitative assessment was determined for scans consistently interpreted as positive by all 3 readers and for each reader.

RESULTS

53 scans (31.74%) were rated amyloid-positive by all readers, while 62 scans (37.13%) were rated as amyloid-negative by all readers. The remaining 52 scans had inconsistent ratings with an agreement rate of 69.46%. Most (99/167, [59.28%]) scans had CL scores above the Centiloid-positive cutoff (CL=40) and 47/167 (28.14%) had Centiloid-negative scans (CL<10). The lowest CL score to achieve visual positivity among all three readers was 57, while the lowest CL score to receive at least one indeterminate score was 11. The readers had a high degree of inter-reader reliability when rating individuals as either positive (? = 0.62) or negative (? = 0.66) but were inconsistent when rating scans as indeterminate (? = 0.17). Optimal cut-points were CL<3.6 for consistent negative and CL=28.8 for consistent visual positivity.

CONCLUSION

Given the emergence of anti-amyloid monoclonal therapies for early-stage Alzheimer’s disease, reliable detection of amyloidosis is critical for patient care. This study suggests that visual reads of amyloid PET may be insensitive when amyloidosis is milder but spread across multiple regions (CL ranging from 40-59).

CLINICAL RELEVANCE/APPLICATION

Quantification of amyloid PET using the Centiloid scale may help guide treatment of patients with mild amyloidosis who are under consideration for anti-amyloid disease modifying therapeutics.

T7-SSNR09-4 IMPACT OF MR-GUIDED PET RECONSTRUCTION ENHANCES AMYLOID DETECTION

Yu Cai, MD, PhD (*Presenter*)
Chen Lin, PhD (*Abstract Co-Author*)
Jun Zhang, PhD (*Abstract Co-Author*)
Manoj K. Jain, MD (*Abstract Co-Author*)
Robert A. Pooley, PhD (*Abstract Co-Author*)
Vivek Gupta, MD (*Abstract Co-Author*)
Matthew Spangler-Bickell (*Abstract Co-Author*)
Alex K. Smith, PhD,MS (*Abstract Co-Author*)
Daniel Litwiller, PhD,MBA (*Abstract Co-Author*)
Erik H. Middlebrooks, MD (*Abstract Co-Author*)
Neetu Soni, MD, FRCR (*Abstract Co-Author*)

PURPOSE

To assess the impact of MR-guided PET reconstruction (MRgPET recon) on reader consistency, diagnostic confidence, and visual imaging quality in interpreting amyloid PET/MR scans.

METHODS AND MATERIALS

This study was approved by the Mayo Clinic Institutional Review Board. Three independent readers evaluated amyloid PET-MR (18F-florbetapir, Amyvid) images reconstructed with conventional method (Ordered-subsets expectation-maximization, OSEM) and novel MR-guided (MRg) PET algorithm in 30 patients. Each case was rated as amyloid-positive or amyloid-negative and assigned a 1-3 diagnostic confidence score (1, not at all confident; 3, very confident), and a 1-5 subjective visual image quality score (1, worst quality, unusable image; 5, excellent quality, minimal noise). Inconsistent cases were defined as one out of three readers disagreed. Centiloid (CL) values were based on OSEM and calculated on MIMneuro software. Statistical comparisons included Fleiss' Kappa, Mann-Whitney U and Chi-square tests.

RESULTS

OSEM had five inconsistent cases (5/30, 16.7%), while MRgPET recon had only two (2/30, 6.67%). Inter-rater agreement was higher in MRgPET recon (? = 0.889, 95% CI: 0.683-1.0) than OSEM (? = 0.758, 95% CI: 0.551-0.964). Figure 1 shows two cases initially classified as inconsistent using OSEM but reclassified as consistent positive using MRgPET recon. The mean diagnostic confidence in MRg PET recon is significantly higher than OSEM (2.92 ± 0.27 vs. 2.71 ± 0.62, p =0.013). The proportion of low-confidence cases (score =2) was significantly lower in MRg PET recon than OSEM (7.8% vs. 20%, p = 0.018). Visual image quality scores were significantly higher in MRgPET recon than OSEM (4.72 ± 0.54 vs. 3.87 ± 0.59, p < 0.01). Low image quality cases were less frequent in MRg than OSEM (4.4%

vs.24.4% p < 0.001). Figure 1. Two representative cases initially classified as inconsistent using OSEM reconstruction but reclassified as consistent amyloid-positive by all readers using MRg PET recon (MRg).

CONCLUSION

MRg PET reconstruction has a higher inter-reader agreement, improves diagnostic confidence, and visual image quality compared to OSEM. These findings suggest that MRg PET reconstruction can offer a more reliable and confident interpretation framework for amyloid PET/MR imaging. We will present large data-based results in our final presentation.

CLINICAL RELEVANCE/APPLICATION

This novel MR-guided PET reconstruction improves the diagnostic performance of amyloid PET/MR imaging by enhancing image quality and boosting radiologists' confidence. This technique may lead to more consistent and reliable diagnoses in clinical practice, potentially improving decision-making in the assessment of Alzheimer's disease pathology.

T7-SSNR09-5 CHOROID PLEXUS EXTRACELLULAR EXTRAVASCULAR VOLUME FRACTION FROM DCE-MRI ASSOCIATES WITH AMYLOID BURDEN

Mohammad Khalafi, MD (*Presenter*)
Liangdong Zhou, PhD (*Abstract Co-Author*)
Seyed Hani Hojjati (*Abstract Co-Author*)
Tracy Butler (*Abstract Co-Author*)
Xiuyuan H. Wang, PhD (*Abstract Co-Author*)
Silky Pahlajani (*Abstract Co-Author*)
Yi Li, PhD, MD (*Abstract Co-Author*)
Gloria C. Chiang, MD (*Abstract Co-Author*)

PURPOSE

To investigate the relationship between dynamic contrast-enhanced MRI (DCE-MR) permeability metrics and amyloid burden, quantified by Centiloids, in individuals.

METHODS AND MATERIALS

Twenty-nine participants (19 amyloid-positive, 10 amyloid-negative) underwent 3T MRI with DCE-MR and amyloid PET imaging. The choroid plexus was manually segmented. DCE-MRI-derived parameters were quantified using the extended Tofts model in the Olea software platform, including tissue microstructure-related metrics like the extravascular extracellular volume fraction (V_e) and plasma volume fraction (V_p), as well as permeability markers such as the volume transfer constant (K^{trans}) and rate constant (K_{ep}). Linear regression models were used to evaluate the associations between V_e and Centiloid values, adjusting for choroid plexus volume, in amyloid-positive and negative subgroups.

RESULTS

In amyloid-positive individuals, V_e demonstrated a statistically significant inverse association with amyloid burden, quantified by Centiloids (ß = -0.0060, p = 0.0067). This relationship remained robust after adjusting for choroid plexus volume, indicating that the observed effect was not confounded by volumetric differences in the choroid plexus. V_e explained approximately 40% of the variance of amyloid burden (R^2 = 0.38; Adjusted R^2 = 0.30). The other permeability metrics (V_p, K^{trans}, and K_{ep}) were not associated with amyloid burden (p>0.05).

CONCLUSION

Choroid plexus V_e, as measured by DCE-MR, is significantly associated with amyloid burden in amyloid-positive individuals. Given that V_e reflects the volume of the extracellular extravascular space, it offers insights into vascular permeability and interstitial/glymphatic fluid exchange at the choroid plexus blood-CSF barrier, which may be influenced by amyloid pathology. Ongoing studies at the Brain Health Imaging Institute (BHII) aim to expand this work in a larger cohort to validate V_e as a valuable marker of amyloid-related changes in interstitial fluid volumes.

CLINICAL RELEVANCE/APPLICATION

DCE-MR-derived V_e may serve as a promising, non-invasive imaging biomarker for assessing choroid plexus dysfunction in the context of Alzheimer's disease. These preliminary results highlight the value of permeability imaging in neurodegenerative research.

T7-SSNR09-6 FLOWDM: DIFFUSION-BASED DEEP LEARNING FOR ENHANCING THE UTILITY OF MRI IN DETECTING MILD COGNITIVE IMPAIRMENT

Chetan Vadali (*Presenter*)
Alfredo Lucas, PhD, MS (*Abstract Co-Author*)
Xavier Beltran Urbano (*Abstract Co-Author*)
Kathryn Davis, MD (*Abstract Co-Author*)
Joel M. Stein, MD, PhD (*Abstract Co-Author*)
John A. Detre (*Abstract Co-Author*)

PURPOSE

Positron Emission Tomography (PET) with fluorodeoxyglucose (FDG-PET) is commonly used to quantify regional metabolism for the diagnosis and monitoring of Alzheimer's Disease (AD) and differentiation of AD and mild cognitive impairment (MCI), which can be a prodromal phase of AD, from other types of dementia. However, FDG-PET is costly and not widely available. Arterial spin labeling (ASL) provides MR-based cerebral blood flow (CBF) quantification that could aid in this classification, though its accuracy is limited. We propose a diffusion-based deep-learning framework, FlowDM, to synthesize PET-like images from routinely acquired MRI, enhancing the utility of MRI in MCI and dementia.

METHODS AND MATERIALS

We included 47 MCI and 31 cognitively unimpaired subjects (78 total). We developed FlowDM, a Conditional Wavelet Diffusion Model (cWDM), to generate synthetic PET from ASL and T1-weighted inputs. FlowDM was trained using 63 subjects and tested in 15 subjects (9 MCI/6 unimpaired). We compared synthetic PET and true PET both in appearance and for their classification performance in distinguishing MCI from unimpaired via a random forest (RF) model within regions of interest (ROIs).

RESULTS

FlowDM-generated PET volumes demonstrated significant structural similarity to true PET volumes (SSIM = 0.90). Furthermore, the performance of the best RF models for classification of MCI versus unimpaired were comparable between the original PET and FlowDM PET, both when considering all ROIs (PET ROC-AUC = 0.85, 95% CI: [0.69, 1.00]; FlowDM ROC-AUC = 0.89, 95% CI: [0.77, 1.00]) and only a hypothesis-driven subset canonically implicated in MCI/AD (PET ROC-AUC = 0.92, 95% CI: [0.82, 1.00]; FlowDM ROC-AUC = 0.92, 95% CI: [0.82, 1.00]).

CONCLUSION

FlowDM enhances the diagnostic performance of ASL and T1-weighted imaging, improving alignment with FDG-PET and generating synthetic FDG-PET volumes that perform comparably to true FDG-PET in both appearance and classification.

CLINICAL RELEVANCE/APPLICATION

Through PET-like metabolic imaging synthesis from multimodal MRI that can be acquired as part of a routine protocol for patients presenting with cognitive complaints, FlowDM may provide improved diagnostic sensitivity of MRI in patients with cognitive impairment. Our preliminary results in temporal lobe epilepsy are comparable, demonstrating the potential of FlowDM for broader neurological applications.

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Abstract Archives of the RSNA, 2025

T7-SSRO03

Science Session with Keynote: Radiation Oncology (Gastrointestinal Malignancies)

Tuesday, Dec. 2 3:00PM - 4:00PM Room: S401

Anna Shapiro, MD (*Moderator*)
Ann Raldow, MD, MPH (*Moderator*)

Sub-Events

T7-SSRO03-2 PANCREAS, FAT AND MUSCLE ATROPHY IN PATIENTS UNDERGOING RADIATION FOR NEUROBLASTOMA

Pradipta Debnath, MD (*Presenter*)
Marissa Ray (*Abstract Co-Author*)
Alexandra Glenn, MD (*Abstract Co-Author*)
Stephen Hartman (*Abstract Co-Author*)
Elanchezhian Somasundaram, PhD, MS (*Abstract Co-Author*)
Todd Jenkins (*Abstract Co-Author*)
Luke E. Pater, MD (*Abstract Co-Author*)
Katherine Somers (*Abstract Co-Author*)
Juan Gurria (*Abstract Co-Author*)
Meera Kotagal (*Abstract Co-Author*)
Andrew T. Trout, MD (*Abstract Co-Author*)

PURPOSE

Radiation therapy (RT) is a component of standard-of-care therapy in high-risk neuroblastoma (HR-NBL) but can have damaging effects on nearby tissue. The objectives of this study are 1) to characterize changes in pancreas volume after RT and 2) to characterize changes in body composition metrics, including body weight percentile, subcutaneous fat area, and total psoas muscle area (tPMA) after treatment in children with abdominal HR-NBL.

METHODS AND MATERIALS

This retrospective study included patients aged 0-17 years old with HR-NBL who underwent imaging and RT at a quaternary pediatric hospital (January 2012-December 2022). A linear regression model was used to determine association between various tissue changes and radiation dose adjusting for age, sex, and days elapsed between RT administration and follow-up scan.

RESULTS

Fifty patients (median age 3 [IQR 2], 56% male) met inclusion criteria. Median days between pre- and post-radiation imaging was 141 (IQR 77). Pancreatic volume decreased significantly from pre- to post-radiation (16,731 mm 3 vs 14,288 mm 3 , p<0.001), with pancreatic exposure of >2000cGy associated with greater volume loss compared to <2000cGy (p=0.045). Patient body weight percentile declined significantly (48.4 vs 44.9, p=0.016), independent of radiation dose. There were non-significant decreases in subcutaneous fat area standardized to height (38.6 vs 36.9 cm 2 /m 2 , p=0.41) and tPMA z-scores (-1.56 vs -2.09, p=0.26).

CONCLUSION

Patients undergoing abdominal RT for HR-NBL experienced significant pancreatic volume loss which may place them at risk for pancreatic insufficiency. Patients also had significant decreases in weight percentile with corresponding non-significant decreases in subcutaneous fat and psoas muscle area.

CLINICAL RELEVANCE/APPLICATION

Pancreas volume and body composition changes are apparent by imaging in children with HR-NBL. In these patients with known nutritional complexities, clinicians should consider evaluating pancreatic insufficiency.

T7-SSRO03-3 HISTOPATHOLOGICAL OUTCOMES OF CT-GUIDED HIGH-DOSE-RATE INTERSTITIAL BRACHYTHERAPY AND PREDICTIVE ACCURACY OF THE LI-RADS RADIATION TREATMENT RESPONSE ALGORITHM V2024 IN HCC PATIENTS PRIOR TO LIVER TRANSPLANTATION

Matthias P. Fabritius, MD (*Presenter*)
Daniel Puhr-Westerheide, MD (*Abstract Co-Author*)
Max Seidensticker (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Freba Grawe, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the histopathological results of CT-guided high-dose-rate interstitial brachytherapy (HDR-BT) and the accuracy of the LI-RADS Radiation Treatment Response Algorithm (TRA) in predicting pathological necrosis in hepatocellular carcinoma (HCC) patients treated with HDR-BT as bridging therapy to liver transplantation.

METHODS AND MATERIALS

This retrospective single-center study included all HCC patients who underwent HDR-BT before liver transplantation between July 2017 and June 2023. Tumor necrosis was assessed on explant histopathology. Associations between procedural characteristics and complete necrosis were analyzed. Pre-transplant MRI scans were reviewed by two readers using LI-RADS TRA v2024 categories.

RESULTS

19 patients with 29 treated lesions were included. MRI was available for 12 patients (18 lesions). Complete pathological necrosis was observed in 19 lesions (65.5%). The remaining 10 lesions showed >50% necrosis with apoptotic activity in viable tumor areas, confirmed by TUNEL staining. A longer interval between HDR-BT and transplantation (>136 days) was significantly associated with complete necrosis (86.6% vs. 42.8%, p=0.026), suggesting ongoing radiation-induced tumor cell death.

On MRI, no lesion was categorized as LR-TR viable. All 11 lesions classified as LR-TR nonviable showed complete necrosis on histology. Seven lesions were LR-TR nonprogressing.

CONCLUSION

HDR-BT is associated with high rates of complete pathological necrosis and may induce continued tumor cell death beyond treatment. The LI-RADS Radiation TRA shows excellent predictive accuracy for assessing treatment response.

CLINICAL RELEVANCE/APPLICATION

This study highlights CT-guided HDR-BT as an effective bridging therapy for patients with HCC awaiting liver transplantation, achieving high rates of complete pathological necrosis. The results suggest that HDR-BT not only offers effective local tumor control but may also promote ongoing tumor cell death even after treatment, making it a valuable option in transplant programs. Furthermore, the excellent predictive accuracy of the LI-RADS Radiation TRA enables reliable, non-invasive assessment of therapeutic success, supporting informed clinical decisions.

T7-SSRO03-4 PREDICTING NEOADJUVANT CHEMORADIOTHERAPY OUTCOME IN LARC: A SYNERGISTIC APPROACH OF RADIOMICS AND TRANSPARENT MACHINE LEARNING

Jianfeng Li (*Presenter*)

PURPOSE

This study investigates the feasibility of using radiomics features derived from radiotherapy target regions combined with interpretable machine learning models to predict the efficacy of neoadjuvant chemoradiotherapy (nCRT) in patients with locally advanced rectal cancer (LARC).

METHODS AND MATERIALS

Clinical data from 358 LARC patients were included. Patients were categorized into effective and ineffective groups based on tumor regression grade (TRG). Radiomics features were extracted and integrated with clinicopathological information, then used to develop predictive models, and their performance was evaluated using the area under the receiver operating characteristic curve (AUC).

RESULTS

A total of 272 patients were included in the final analysis, the training set consisted of 156 patients (34 effective), the internal validation set included 67 patients (14 effective), and the external validation set included 49 patients (20 effective). Among models incorporating clinical T stage, CEA levels, and radiomics features, the nomogram-based model demonstrated the best performance, achieving an AUC of 0.858 in the training set,0.844 in the internal validation set and 0.800 in external set. The decision curve analysis shows that the partial dependence plot model achieves higher clinical net benefit than other models across most threshold ranges.

CONCLUSION

A nomogram model integrating radiomics and clinicopathological variables accurately predicts the efficacy of nCRT in LARC patients and enhances the model's clinical utility.

CLINICAL RELEVANCE/APPLICATION

The clinical relevance of this study lies in its ability to accurately predict the efficacy of neoadjuvant chemoradiotherapy (nCRT) in locally advanced rectal cancer patients, enabling personalized treatment decisions by allowing doctors to adjust strategies according to predicted responses, facilitating prognosis assessment and communication with patients, promoting rational medical resource allocation, and advancing precision medicine in oncology by integrating multiple variables for treatment response prediction.

T7-SSRO03-6 EVALUATION OF PREDICT CRITERIA ON MRI FOR PREDICTING POSTOPERATIVE LOCAL RECURRENCE IN RECTAL CANCER

Andre De Freitas Secaf, MD (*Presenter*)
Matheus Palma, MD (*Abstract Co-Author*)
Gabriel Ramos, MD (*Abstract Co-Author*)
Thalyne Lima (*Abstract Co-Author*)
Alexandre S. Morgado (*Abstract Co-Author*)
Cecilia V. Torres, MD (*Abstract Co-Author*)
David F. Vieira, MD (*Abstract Co-Author*)
Gabriel L. Gouvea, MD (*Abstract Co-Author*)
Danilo T. Wada, MD (*Abstract Co-Author*)
Valdair F. Muglia, MD, PhD (*Abstract Co-Author*)
Jorge Elias JR, MD, PhD (*Abstract Co-Author*)

PURPOSE

Evaluate the ability of MRI to predict locoregional recurrence of rectal cancer after mesorectal resection, using histopathological criteria of the PREDICT score, and to assess the degree of agreement between histopathological PREDICT score and the score applied to MRI.

METHODS AND MATERIALS

A retrospective survey was conducted using the institutional database to catalog information from patients with clinical suspicion of rectal cancer (RC) over five years (2017-2021). Clinical data, such as sex, age, tumor T and N stages, tumor distance from the anal verge, among others, were obtained from electronic medical records, while imaging information was collected from the image storage and distribution server. Based on these data and image analyses, pathological and MRI PREDICT scores were calculated for each patient, offering a comprehensive assessment of the probability of locoregional recurrence of RC.

RESULTS

The final sample included 141 patients, with a mean age of 60 years and a male majority (54.6%). Tumor stage T3 was most prevalent (49.6%), and most tumors were located within 5 cm from the anal verge (46.8%), with 39% showing mesorectal fascia invasion. Neoadjuvant therapy was administered in 63.1% of cases, resulting in a significant reduction in tumor length, while the distance to the mesorectal fascia did not vary significantly. There was good correlation between MRI and pathological PREDICT scores. Locoregional recurrence occurred in 13.4% of patients, all of whom deceased, mainly due to cancer-related causes (78.3%).

CONCLUSION

The results of this study emphasize the crucial role of neoadjuvant therapy in patient prognosis. The importance of continuous prognostic assessments and risk stratification is emphasized to guide more precise therapeutic and surgical decisions, thus contributing to a more effective and personalized approach to RC.

CLINICAL RELEVANCE/APPLICATION

This study highlights the potential of MRI-based PREDICT scoring to accurately assess the risk of locoregional recurrence in rectal cancer patients following mesorectal excision. The strong correlation with histopathological findings supports its use as a non-invasive prognostic tool. Early identification of high-risk patients enables more tailored treatment strategies, reinforces the value of neoadjuvant therapy, and may ultimately improve survival outcomes through personalized care.

T7-SSRO03-7 Keynote Speaker: Nonoperative Management of Pancreatic Cancer - Is Ablative Radiotherapy Becoming a Viable Alternative to the Whipple?

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T7-STCE1

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Tuesday, Dec. 2 3:15PM - 3:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

T7-STCE1-1 MYELIN AND PERFUSION IMAGING IN NORMAL APPEARING WHITE MATTER IN PATIENTS WITH MULTIPLE SCLEROSIS

Devinder Pal Singh Dhanota, MBBS,MD (*Presenter*)
Kavita Saggar SR, MD (*Abstract Co-Author*)

PURPOSE

Multiple sclerosis (MS) is a chronic autoimmune inflammatory disorder of the central nervous system, characterized by demyelination, gliosis, and axonal injury. While conventional MRI detects white matter plaques, it underrepresents early microstructural changes in normal-appearing white matter (NAWM). This study aimed to assess myelin content and perfusion parameters in NAWM using SyMRI and DSC-perfusion imaging to identify early imaging biomarkers of MS.

METHODS AND MATERIALS

A prospective study was conducted on 20 MS patients (mean age: 32 years) and 18 healthy controls (mean age: 40 years). All subjects underwent MRI on a 3T Siemens Skyra scanner. Myelin content was quantified using QRAPMASTER-based synthetic MRI (SyMRI) and perfusion parameters (CBV, CBF) via dynamic susceptibility contrast (DSC) imaging. ROIs were placed in frontal, parietal, temporo-occipital lobes, and corpus callosum. Normalized perfusion metrics were derived by comparison with grey matter values. Statistical analysis used Student's t-test and Pearson correlation ($p < 0.05$ as significant).

RESULTS

Myelin-correlated component (MyC) in NAWM was significantly reduced in MS patients (31.95±1.67%) compared to controls (36.66±1.47%, $p < 0.01$). MyC negatively correlated with lesion number ($r = -0.68$) and positively with disease duration ($r = 0.48$). Normalized CBV and CBF were significantly reduced in MS patients (mean CBV: 0.40±0.07; mean CBF: 0.40±0.06) compared to controls (CBV: 0.59±0.07; CBF: 0.55±0.07, $p < 0.05$). No significant correlation was found between perfusion values and EDSS or disease duration.

CONCLUSION

MS patients show early demyelination and microvascular hypoperfusion in NAWM, even in the absence of conventional imaging findings. Quantitative myelin mapping and perfusion analysis may serve as early imaging biomarkers to track disease progression and guide personalized therapy.

CLINICAL RELEVANCE/APPLICATION

This study highlights that microstructural and perfusion abnormalities in NAWM precede plaque formation and are measurable with SyMRI and DSC-perfusion imaging. These imaging biomarkers can improve MS diagnosis, monitor treatment response, and potentially predict long-term outcomes.

T7-STCE1-2 NEXT-GENERATION VIRTUAL FLUOROSCOPY IMAGE FROM NON-CONTRAST CT-OPTIMIZING CARDIAC CATHETERIZATION IN ACUTE MYOCARDIAL INFARCTION

Rina Sugihara, BA (*Presenter*)
Masahiro Ida, MD (*Abstract Co-Author*)
Yoshihiro Tanaka, RT (*Abstract Co-Author*)

PURPOSE

To determine whether virtual fluoroscopic images (VFI) reconstructed from routine non-contrast CT can serve as an immediate anatomic roadmap for emergency coronary catheterisation in acute myocardial infarction (AMI), thereby improving procedural safety and efficiency without additional radiation or cost.

METHODS AND MATERIALS

Single-centre, retrospective study (April 2022 - February 2025). Fifty consecutive patients (mean age 64 ± 11 y) underwent non-contrast chest CT to exclude aortic dissection before primary percutaneous coronary intervention (PCI). CT volume data were exported to a 3-D workstation (Synapse VINCENT; FUJIFILM Healthcare) to generate VFI—ray-summation projections emulating fluoroscopy. Two blinded interventional cardiologists prospectively reviewed the VFI to localise right/left coronary ostia, pre-select a safe arterial puncture trajectory, and anticipate heavy aortic-root calcification. Procedural metrics (first-pass cannulation rate, fluoroscopy time, contrast volume, access-site complications) were compared with historical PCI data in which CT was not shared.

RESULTS

VFI successfully depicted both coronary ostia and aortic course in 94 % (47/50) of cases; heavy calcifications that could hinder catheter torque were visualised in 88 % (44/50). Pre-procedural VFI review changed planned sheath entry in 38 % of patients and eliminated all second-attempt punctures, lowering the access-site re-try rate from a historical 15 % to 0 %. Median fluoroscopy time fell from 11.2 min to 8.1 min (-28 %, $p < 0.01$) and contrast use from 78 mL to 63 mL (-19 %, $p = 0.03$). No catheter-related vascular complications occurred. Cardiologists rated VFI utility 4.7 ± 0.3 (5-point Likert). Inter-reader agreement for ostial visualisation was excellent (? = 0.86).

CONCLUSION

Virtual fluoroscopy derived from existing non-contrast CT provides an immediate, radiation-free roadmap that streamlines emergency PCI—improving first-pass success and reducing fluoroscopy time, contrast dose, and access complications.

CLINICAL RELEVANCE/APPLICATION

Embedding VFI into the AMI “door-to-balloon” workflow closes the information gap between CT and the cath lab, aligns with ALARA principles, and may translate to faster reperfusion and better patient outcomes—offering a cost-neutral upgrade that can be implemented on any workstation-equipped center.

T7-STCE1-3 NON-CONTRAST MRI MEASURES LINKED TO SYSTEMIC INFLAMMATION: ASL-DERIVED CEREBRAL PERFUSION AND DIXON FAT-TO-MUSCLE RATIO IN MIDLIFE OBESITY

Mahshid Naghashzadeh, MSc, PhD (*Presenter*)
Paul K. Commean, BA (*Abstract Co-Author*)
Mahsa Dolatshahi, MD, MPH (*Abstract Co-Author*)
Soheil Mohammadi, MD, MPH (*Abstract Co-Author*)
Lakisha Lloyd (*Abstract Co-Author*)
Caitlyn Nguyen (*Abstract Co-Author*)
Weiying Dai, PhD (*Abstract Co-Author*)
Tammie S. Benzinger, MD, PhD (*Abstract Co-Author*)
Hongyu An, DSc (*Abstract Co-Author*)
Cyrus A. Raji, MD, PhD (*Abstract Co-Author*)

PURPOSE

Midlife obesity is a known risk factor for Alzheimer's disease (AD), yet BMI lacks sensitivity to underlying body composition. This study investigates whether non-contrast MRI-derived fat-to-muscle ratio (FMR) and arterial spin labeling (ASL) cerebral perfusion provide more physiologically relevant indicators of systemic and neurovascular alterations associated with midlife adiposity.

METHODS AND MATERIALS

We studied 104 cognitively normal midlife adults (mean age: 49.8 ± 6.0 years; 65% female; 55% obese; BMI: 32.0 ± 7.3). Cognitive status was assessed via MMSE. All imaging was performed on Siemens 3T scanners. Cerebral perfusion was quantified using non-contrast pCASL with 3D TGSE readout to generate absolute cerebral brain perfusion (CBF) maps. Thigh composition was assessed using T1-weighted VIBE Dixon MRI; nine mid-thigh slices were processed with N4ITK correction and segmented via a custom MATLAB pipeline to compute FMR. Cortical thickness was derived from brain T1-weighted images using FreeSurfer. Associations between FMR, CBF, and cortical thickness across 22 AD-relevant regions were analyzed using rank-based correlation, adjusting for age, sex, and multiple comparisons.

RESULTS

Individuals with obesity exhibited higher FMR and HOMA-IR, along with reduced muscle volume and HDL cholesterol, reflecting greater metabolic dysfunction and systemic inflammation. Non-contrast Dixon and ASL MRI revealed absolute adiposity measures (e.g., BMI, fat volume) were inversely associated with global and regional CBF, particularly in limbic and default mode network regions implicated in early AD. In contrast, FMR showed weaker associations with cerebral perfusion, suggesting resting-state ASL may offer greater sensitivity to overall fat burden. Notably, FMR was negatively associated with cortical thickness in 11 AD-relevant regions—predominantly in left hemisphere—indicating a possible link to obesity-related neurodegeneration. FMR correlated positively with BMI and HOMA-IR, reinforcing its role as an index of adiposity and insulin resistance.

CONCLUSION

Non-contrast MRI techniques demonstrated differential sensitivity to systemic and neurovascular alterations associated with midlife obesity. While ASL-derived CBF was more closely linked to absolute adiposity, Dixon-derived FMR showed stronger associations with cortical thinning and metabolic dysfunction. These findings suggest combining non-contrast perfusion and body composition imaging may enhance early detection of obesity-related neurodegenerative risk.

CLINICAL RELEVANCE/APPLICATION

Non-contrast MRI measures of FMR and cerebral perfusion may serve as complementary, noninvasive indicators of systemic and neurovascular changes linked to AD risk in midlife obesity.

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Nov. 30 – Dec. 4
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T7-STCE2

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Tuesday, Dec. 2 3:15PM - 3:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

T7-STCE2-1 UNLOCKING THE FULL VALUE OF THE MAMMOGRAM: USING AI-BASED RISK SCORES TO DETECT CANCER, IDENTIFY MISSED CANCERS, AND PREDICT FUTURE RISK

Constance D. Lehman, MD, PhD (*Presenter*)
David Miller (*Abstract Co-Author*)
Emily Hipp (*Abstract Co-Author*)
Elizabeth A. Morris, MD (*Abstract Co-Author*)
Christiane K. Kuhl, MD, PhD (*Abstract Co-Author*)
Toni W. Vomweg (*Abstract Co-Author*)
Christopher P. Ho, MD (*Abstract Co-Author*)
Hari Trivedi, MD (*Abstract Co-Author*)
Louie Enriquez, MD, JD (*Abstract Co-Author*)
Wendy B. Demartini, MD (*Abstract Co-Author*)
Wei T. Yang, MD, FRCR (*Abstract Co-Author*)
Ray C. Mayo III, MD (*Abstract Co-Author*)
Lora D. Barke, DO (*Abstract Co-Author*)

PURPOSE

Screening mammography's role to reduce breast cancer mortality through early detection is well established. AI risk models offer a novel opportunity to expand the value of a screening mammogram beyond detection alone. We evaluated such a model for three distinct applications: triaging patients at higher likelihood of harboring cancer at the time of screening (current cancer detection), identifying patients at risk for false-negative exams (missed cancers), and stratifying future cancer risk well beyond the screening interval.

METHODS AND MATERIALS

We analyzed 122,993 bilateral digital screening mammograms from 67,776 patients imaged between 2011-2017 at 10 geographically diverse U.S. facilities. Exams were Hologic-2D acquired exams and none were included in model development. Cancer outcomes were derived from registries and health records. Performance was estimated using areas under the receiver operating characteristic curve (AUCs) with 95% CIs for: (1) all cancers diagnosed within 0-5 years, (2) cancers within 1 year (inclusive of true positives and interval cancers), (3) interval cancers diagnosed within 1 year after a negative BI-RADS assessment, and (4) future cancers diagnosed >1-5, >2-5, and >3-5 years after screening. For year-1 cancers, controls required =365 days of follow-up. For future cancer analyses, index exams with cancers prior to the defined window were excluded; controls required =5 years of follow-up.

RESULTS

A total of 2,584 breast cancers were diagnosed across the 5-year follow-up: 774 within 1 year (including 72 interval cancers), 1,810 years 1-5, 1,333 years 2-5, and 845 years 3-5. The AUC for all cancers within 0-5 years was 0.717 (95% CI: 0.706-0.728). For cancers within 1 year, AUC was 0.822 (95% CI: 0.806-0.838). For interval cancers, AUC was 0.694 (95% CI: 0.634-0.751). Future cancer prediction performance remained >0.65 across all windows: 0.669 (95% CI: 0.657-0.680) for >1-5 years, 0.662 (95% CI: 0.647-0.676) for >2-5 years, and 0.653 (95% CI: 0.635-0.671) for >3-5 years.

CONCLUSION

An AI-based image-only risk model applied to a single screening mammogram delivers value across multiple clinical timeframes. It can triage patients likely to have current cancer, flag those at risk for missed diagnoses, and assess long-term cancer risk. These results highlight how image-based models can amplify the diagnostic and preventive reach of screening mammography.

CLINICAL RELEVANCE/APPLICATION

This study exemplifies opportunistic screening by extending the value of mammography beyond detection alone. AI-based risk scores applied to routine screening exams inform diagnostic triage, identify high-risk patients for supplemental testing, and support preventive strategies—leveraging existing imaging to optimize population health.

T7-STCE2-2 OPPORTUNISTIC BONE HEALTH SCREENING: DEEP LEARNING ANALYSIS OF CHEST RADIOGRAPHS FOR OSTEOPOROSIS AND OSTEOPENIA DETECTION

Minje Kim, MSc (*Presenter*)
Minjee Kim (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

Osteoporosis and osteopenia affect 19.7% and 40.4% of the global population respectively, significantly increasing fracture risk and associated with increased mortality in severe cases. Despite high prevalence, dual-energy X-ray absorptiometry (DXA) screening remains limited by accessibility and cost constraints. We developed a deep learning model utilizing chest radiographs (CXR) to complement the limited accessibility of DXA through cost-effective opportunistic screening.

METHODS AND MATERIALS

77,677 CXRs from 47,773 patients who underwent CXR and DXA within 6 months at a tertiary care institution were partitioned 7:1:2 by patient for training/validation/test. Five categories were defined by T-scores: normal (=-1.0), mild osteopenia (-1.0 to -1.49), moderate osteopenia (-1.5 to -1.99), advanced osteopenia (-2.0 to -2.49), and osteoporosis (=-2.5), with 46,150, 9,821, 10,300, 6,799, and 4,607 CXRs respectively. To evaluate the model's generalizability, an external validation set of 3,338 CXRs, each from a distinct patient, was collected from an independent institution. A deep learning model was developed within a multi-task learning framework to simultaneously classify the bone health categories and regress DXA T-scores from CXRs.

RESULTS

Internal testing achieved AUCs of 0.944 (95% CI: 0.941-0.948), 0.792 (0.782-0.801), 0.852 (0.844-0.859), 0.903 (0.897-0.909), and 0.969 (0.964-0.973) for normal, mild, moderate, advanced osteopenia, and osteoporosis, respectively. External validation showed AUCs of 0.916, 0.735, 0.802, 0.868, and 0.924 (95% CIs: 0.907-0.926, 0.714-0.756, 0.784-0.819, 0.851-0.884, 0.906-0.940).

CONCLUSION

This study demonstrates that deep learning analysis of chest radiographs can effectively stratify bone health status with high diagnostic accuracy, offering a practical opportunistic screening tool for osteoporosis and osteopenia detection in routine clinical practice. Notably, the model introduces a novel five-tier classification that uniquely subdivides osteopenia into mild, moderate, and advanced stages, a level of granularity not previously explored in CXR-based screening studies.

CLINICAL RELEVANCE/APPLICATION

This novel granularity enables risk-stratified clinical management—non-pharmacological interventions for mild-to-moderate osteopenia versus immediate DXA referral and pharmacotherapy consideration for advanced osteopenia and osteoporosis—optimizing resource allocation and fracture prevention. By leveraging routine chest radiographs, the model provides a scalable, cost-effective screening alternative that not only identifies at-risk patients requiring urgent intervention but also potentially defers unnecessary DXA examinations in normal cases.

T7-STCE2-3 AI-DRIVEN QUANTIFICATION OF ABDOMINAL AORTIC CALCIFICATION ON CONTRAST ENHANCED CT IS PREDICTIVE OF CARDIOVASCULAR EVENTS AND MORTALITY

Louis A. Hinshaw, BS (*Presenter*)
Matthew H. Lee, MD (*Abstract Co-Author*)
John W. Garrett, PhD (*Abstract Co-Author*)
Ryan Zea, MS (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the utility of AI-driven quantification abdominal aortic calcification (AAC) from contrast enhanced CT (CECT) scans for predicting cardiovascular events (CVE) and all-cause mortality.

METHODS AND MATERIALS

In this retrospective cohort study, a fully automated AI tool was used to quantify AAC from the hiatus to iliac bifurcation from CT scans in a large, heterogenous adult population undergoing CT between January 2001-February 2021. The tool was applied to non-contrast CT (NCCT) and CECT scans. Simple linear corrections were applied to CECT-derived measures to determine non-contrast equivalent (NCE) values. CVEs and death following CT were determined from the electronic health record. ROC curve and time-to-event analyses were performed to determine 5-year AUCs, HRs comparing highest versus lowest risk quartiles, and Kaplan-Meier curves.

RESULTS

123,500 adults (mean age, 51; M:F, 58,442: 65,058) underwent abdominal CT (43,455 NCCT; 79,885 CECT. 16,599 patients had a CVE and 21,937 patients died. 5-year AUCs for CVE prediction were 0.74 (NCCT), 0.72 (CECT), and 0.73 (NCE), and for mortality prediction were 0.72 (NCCT), 0.71 (CECT), 0.71 (NCE). Higher AAC was associated with greater CVE risk: HR 1.73 (CI 1.61,1.86) for NCCT, HR 1.45 (CI 1.35,1.55) for CECT, and 1.78 (CI 1.69,1.87) NCE scans (all $p<0.001$). Higher AAC was also associated with higher mortality risk: HR 2.08 (CI 1.94, 2.24) for NCCT, HR 1.8 (CI 1.71, 1.91) for CECT, and 2.47 (CI 2.36,2.59) NCE scans (all $p<0.001$).

CONCLUSION

Fully automated quantification of AAC extracted from CECT scans predicts CVE and mortality risk, with comparable performance after adjusting for IV contrast.

CLINICAL RELEVANCE/APPLICATION

AI-driven measures of AAC from CECT is feasible and approach the performance of NCCT for CVE and mortality risk assessment, expanding the scope and impact of population level "opportunistic screening."

Nov. 30 – Dec. 4
RSNA® 2025
Imaging the Individual

Abstract Archives of the RSNA, 2025

T8-SSNMMI04

Nuclear Medicine and Molecular Imaging (Brain)

Tuesday, Dec. 2 4:30PM - 5:30PM Room: S405

Phillip H. Kuo, MD, PhD (*Moderator*)
Cristina S. Matushita, MD, MSc (*Moderator*)

Sub-Events

T8-SSNMMI04-1 EVALUATING THE DIAGNOSTIC VALUE OF DEEP LEARNING-SYNTHESIZED DYNAMIC PET IMAGES FOR BRAIN AMYLOIDOPATHIES

Yu-Nong Lin, MS (*Presenter*)
Kevin Chen (*Abstract Co-Author*)

PURPOSE

Dynamic positron emission tomography (dPET) with tracer kinetic modeling enables parametric images with greater physiological specificity (e.g., R1 for brain perfusion) than conventional static PET using standardized uptake values (SUV). However, its time-intensive acquisition limits dPET to research settings. To address this, a physiologically informed deep learning framework (i.e., PINN-PET) was developed to synthesize a full 23-frame dPET from a single-frame PET. In this study, we evaluate the diagnostic performance of imaging biomarkers from synthetic dPET generated by PINN-PET, compared to those from static PET and real dPET, in a cohort with diverse amyloid deposition patterns.

METHODS AND MATERIALS

The amyloid dPET/magnetic resonance (MR) dataset used in this study comprised 28 Alzheimer's disease participants and 35 cerebral amyloid angiopathy (CAA) participants. An excluded test set of 9 AD and 11 CAA participants was used for evaluation. Each subject underwent a 70-minute 11 C-PiB dPET scan with 23 frames. Synthetic dPET was generated from early-frame PET and its paired MR using PINN-PET, a DL framework regularized by compartmental model-derived PiB tracer kinetics to enforce physiological consistency in the synthetic outputs. Four sets of imaging biomarkers (regional measurements from selected critical brain ROIs), including (1) SUVs from an early frame (2-3 min. post-injection); (2) SUVs from late frames (40-70 min. p.i.); (3) R1 parametric images calculated from real dPET; and (4) R1 parametric images from synthetic dPET generated from early-frame PET, were used as inputs to a logistic regression classifier for AD/CAA classification. ROIs were derived from FreeSurfer segmentations and R1 maps were computed via the SRTM module in QModeling.

RESULTS

Despite significant differences in R1 between real and synthetic dPET, their classification performance remained consistent (accuracy, precision, and specificity: 0.70, 0.80, 0.67) and was higher compared to early-frame (0.60, 0.60, 0.60) and late-frame PET (0.55, 0.50, 0.56).

CONCLUSION

PINN-PET, a DL-based image augmentation framework guided by kinetic modeling, showed superior diagnostic performance to standard-of-care static PET, demonstrating its potential as a computational alternative that reduces acquisition time without compromising diagnostic value.

CLINICAL RELEVANCE/APPLICATION

CAA is increasingly recognized as a major risk factor for adverse events in current AD immunotherapies, making their differentiation of clinical significance. PINN-PET also generalizes to any tracer compatible with kinetic modeling, extending its utility as an image augmentation tool beyond amyloid PET to other PET modalities.

T8-SSNMMI04-2 EVALUATION OF MR-GUIDED PET RECONSTRUCTION FOR QUALITATIVE AND QUANTITATIVE AMYLOID AND TAU BRAIN PET/MRI

Yun-Chi Lin (*Presenter*)
Yu-Hua Fang, PhD (*Abstract Co-Author*)
Matthew Spangler-Bickell (*Abstract Co-Author*)
Mohammadhossein Nadian (*Abstract Co-Author*)
Alex K. Smith, PhD,MS (*Abstract Co-Author*)
Daniel Litwiller (*Abstract Co-Author*)
Erik D. Roberson, MD, PhD (*Abstract Co-Author*)
Jonathan E. McConathy, MD, PhD (*Abstract Co-Author*)

PURPOSE

Amyloid and tau PET acquired with simultaneous PET/MRI is increasingly used to evaluate for Alzheimer's disease. This study compared a novel MR-guided PET (MRgPET) reconstruction technique with standard reconstruction for assessing brain amyloid and tau deposition using[C-11]PiB and [F-18]flortuacipir.

METHODS AND MATERIALS

21 subjects imaged through the UAB Alzheimer's Disease Research Center (ADRC) were included. PiB and flortaucipir were produced by the UAB Cyclotron Facility. A SIGNA PET/MRI system (GE HealthCare, Waukesha, WI) was used to acquire 50-70 min and 80-100 min data for PiB and flortaucipir, respectively. PET reconstructions were performed using standard manufacturer parameters (TOF-OSEM) and with a novel MRgPET algorithm (modified Bowsher's algorithm which uses MR images to regularize the PET updates). Images were evaluated qualitatively by an experienced reader. MR-based brain segmentation with FreeSurfer defined brain regions for quantification of the standard and MRgPET data. Brain region standardized uptake values (SUVs) were divided by the whole cerebellum SUV to provide regional SUV ratios (SUVRs) and analyzed as mean percent differences (standard minus MRgPET) in key brain regions.

RESULTS

Of the 21 subjects, 9 were qualitatively amyloid and tau positive, 8 were amyloid and tau negative, 3 were amyloid positive and tau negative, and 1 was amyloid negative and tau positive. Qualitative evaluation differed in 1 amyloid study and 1 tau study, both of which were considered equivocal. MRgPET reconstruction made apparent activity in the cortex vs. white matter easier to distinguish visually. In the Braak regions, mean % differences in SUVRs ranged from -2.0 to 2.7% for amyloid

and -4.6% to 1.9% for tau. In the frontal, insular, parietal, occipital and temporal cortex, mean % differences ranged from 0.3 to 1.5% for amyloid and -2.3 to 1.3% for tau. In the posterior cingulate and precuneus cortex, mean % differences ranged from 2.1 to 4.5% for amyloid and 0.8 to 2,2% for tau.

CONCLUSION

MRgPET reconstruction provided similar qualitative and quantitative results in key brain regions for amyloid and tau measures as standard PET reconstruction methods, supporting further study in larger cohorts. Improved delineation of the cortex has the potential to facilitate qualitative image interpretation and reduce variability in quantitative measures.

CLINICAL RELEVANCE/APPLICATION

MRgPET reconstruction is feasible for amyloid and tau PET and has the potential to simplify visual assessment of cortical activity compared to standard reconstruction techniques. If MRgPET can reduce variability in quantitative measures such as SUVRs and centiloids, this technique would be valuable for monitoring clearance of amyloid during therapies.

T8-SSNMMI04-3 IDENTIFYING TEMPORAL LOBE ENCEPHALOCELES ON FDG-PET/CT IN FOCAL EPILEPSY

Ajay Kumar, MD, PhD (*Presenter*)
Douglas Roberts-Wolfe, MD, PhD (*Abstract Co-Author*)
Kathryn Davis, MD (*Abstract Co-Author*)
Jacob G. Dubroff, MD, PhD (*Abstract Co-Author*)
Joel M. Stein, MD, PhD (*Abstract Co-Author*)

PURPOSE

Temporal lobe encephaloceles are an increasingly recognized and potentially treatable cause of adult-onset focal epilepsy, particularly in association with idiopathic intracranial hypertension. Standard imaging workup includes brain MRI and FDG-PET/CT; however, small encephaloceles may be subtle or overlooked on MRI alone. We hypothesized that FDG-PET/CT may serve a complementary role by characterizing encephaloceles through metabolic activity and associated osseous remodeling, with FDG PET revealing herniated brain tissue and CT detecting skull base abnormalities.

METHODS AND MATERIALS

In this retrospective study, we identified 27 adult focal epilepsy patients with encephaloceles suggested on MRI who also underwent FDG-PET/CT between August 2020 and August 2024. Two independent neuroradiologists reviewed the PET/CT scans, rating the presence of encephaloceles (absent, questionable, probable, definite, definite with distortion/encephalomalacia), and recording number and location. Discrepancies were resolved by consensus. Temporal pole and skull base foramina locations were specifically assessed.

RESULTS

The neuroradiologists agreed on the presence of probable or definite encephaloceles based on FDG-PET/CT in 63% of cases (17 of 27) and classified 15% (4 of 27) as questionable or absent, occasionally questioning the MRI findings in these cases. Inter-rater disagreement occurred in 22% (6 of 27) of patients. Among agreed-upon cases, encephaloceles were located along the temporal pole in 88% (15 of 17) and at skull base foramina in 35% (6 of 17), with multiple locations noted in some patients and bilateral lesions in 53% (9 of 17).

CONCLUSION

This study suggests that FDG-PET/CT provides a useful and complementary tool for confirming temporal lobe encephaloceles in patients with focal epilepsy. Metabolic activity and CT-based detection of skull base remodeling enhance diagnostic confidence, particularly when MRI findings are subtle or equivocal.

CLINICAL RELEVANCE/APPLICATION

Small temporal encephaloceles may be missed or underestimated even with high-resolution MRI or temporal bone CT. Careful evaluation of FDG-PET/CT can reveal FDG-avid herniated brain tissue associated with osseous changes, supporting the identification of these surgically remediable lesions and refining presurgical planning.

T8-SSNMMI04-4 ASSOCIATION OF REDUCED BRAIN METABOLISM WITH MOTOR FUNCTION AND SURVIVAL IN AMYOTROPHIC LATERAL SCLEROSIS PATIENTS WITH NEUROFILAMENT HEAVY (NEFH) GENE MUTATION

Linmei Zhao, MD, PhD (*Presenter*)
Xiaoping Yi, MD,PhD (*Abstract Co-Author*)
Bihong T. Chen, MD, PhD (*Abstract Co-Author*)

PURPOSE

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease with common clinical symptoms of weakness, atrophy, cognitive changes, and emotional changes. Mutations in neurofilament heavy (NEFH) gene have been linked to neuromuscular disorders and are associated with higher risk for ALS. This study aimed to assess the potential pathological mechanism in ALS patients with NEFH gene mutations (NEFH-ALS) by evaluating brain metabolic alteration and its correlation with clinical features.

METHODS AND MATERIALS

We recruited 127 ALS patients and 128 age- and gender-matched health controls. There were 26 patients with NEFH mutations among the 127 ALS patients. Study assessments included demographic data collection, and questionnaires for motor function, cognition and depression. All participants underwent a brain F-18 FDG PET/CT (fluorodeoxyglucose positron emission tomography (PET)/computed tomography (CT) scan.

RESULTS

NEFH-ALS patients had hypometabolism in the cortex-striatum/limbic system-brainstem circuit when compared with health controls ($p < 0.01$). Decreased brain metabolism was correlated with impairments of motor function($r=0.418$, $p=0.042$), cognitive scores($r=0.473$, $p=0.020$), and depression($r=-0.536$, $p=0.007$). Motor functions were found to be mediated by cognitive function and depression in the patients with NEFH-ALS.

CONCLUSION

Reduced metabolic activity was noted in the cortex-striatum/limbic system-brainstem circuit of patients with NEFH-ALS, which could potentially be an independent prognostic factor for ALS patients with NEFH gene mutation

CLINICAL RELEVANCE/APPLICATION

This study showed that the patients with ALS and NEFH mutations had hypometabolisms of the cortex-striatum/limbic system-brainstem circuit, which was correlated with motor function, cognition, and depression. The reduced brain metabolic activity could potentially be an independent prognostic factor for survival for patients with ALS and NEFH gene mutation.

T8-SSNMMI04-5 IMAGING FOLLOW-UP OF THE THERAPEUTIC EFFECT OF PRUSSIAN BLUE IN TRAUMATIC BRAIN INJURY

Lishuai Feng, PhD (*Presenter*)
Chaoran Dou (*Abstract Co-Author*)
Yuehua Li (*Abstract Co-Author*)

PURPOSE

Traumatic brain injury (TBI), as an acquired injury to the brain caused by external mechanical force, has the highest incidence among all kinds of neurological dysfunctions. No effective pharmacological intervention is available to improve the prognosis of TBI and promising pre-clinical data has not been successfully translated into effective therapeutic to date. Prussian blue nanozyme (PBzyme) with highly stable properties have been applied in multiple neurological diseases. This study aims to investigate the therapeutic effect of PBzyme on TBI with the application of imaging follow-up by multiple in vivo imaging methods.

METHODS AND MATERIALS

Controlled cortical impact, a well-recognized model of TBI, was applied in mice to simulate TBI in this study. After CCI procedure, mice from Saline group and PBzyme group were subjected to intravenous administration of saline and PBzyme, respectively. MRI examination was performed on days 1, 7, 14 and 28 after TBI with a horizontal bore 9.4T/30 cm uMR (uMR 9.4T, United Imaging Life Science Instrument, Wuhan, China). T 2 -weighted imaging (T2WI), diffusion-weighted imaging (DWI), diffusion tensor imaging (DTI), arterial spin labeling magnetic resonance perfusion imaging (ASL-MRI), time-of-flight MR angiography (TOF-MRA), dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) and susceptibility-weighted imaging (SWI) were employed on different time-points after TBI.

RESULTS

PBzyme achieved a reduction in cerebral edema during the hyperacute phase, with further infarct mitigation in the acute, subacute, and chronic phases respectively. Additionally, PBzyme treatment improved cerebral hemodynamics, preserved BBB integrity, mitigated hemorrhage, and promoted axonal fiber remodeling.

CONCLUSION

This study proposes a promising therapeutic method by applying intravenous injected PBzyme to alleviating TBI induced secondary injuries thus improving long-term outcomes of TBI.

CLINICAL RELEVANCE/APPLICATION

This study establishes a promising solution to the limitations of current therapeutic strategies in TBI.

T8-SSNMMI04-6 LONGITUDINAL TRAJECTORIES OF AMYLOID BURDEN AND PLASMA BIOMARKERS IN ALZHEIMER'S DISEASE: A LONGITUDINAL ADNI STUDY

Soheil Mohammadi, MD, MPH (*Presenter*)
Farzaneh Rahmani, MD, MPH (*Abstract Co-Author*)
Mahsa Dolatshahi, MD, MPH (*Abstract Co-Author*)
Suzanne E. Schindler, MD,PhD (*Abstract Co-Author*)
Cyrus A. Raji, MD, PhD (*Abstract Co-Author*)

PURPOSE

Obesity is a risk factor for Alzheimer's disease (AD), but its impact on the trajectories of amyloid burden and blood biomarkers (BBMs) of AD is still scarce. This study investigates how baseline obesity relates to the trajectory of amyloid burdenalongside corresponding changes in BBM.

METHODS AND MATERIALS

Plasma samples from the Alzheimer's Disease Neuroimaging Initiative (ADNI) were assayed using six leading commercial tests. Amyloid positron emission tomography (PET) scans were used to assess amyloid burden. Spearman's partial correlation was used to assess the baseline cross-sectional association between body mass index (BMI) and BBM levels. Linear mixed-effects regression models were used to study three-way interaction between baseline BBM, time, and obesity.

RESULTS

At the baseline cross-sectional level, BMI was not significantly associated with whole brain amyloid burden. However, longitudinal analysis revealed that participants with baseline obesity exhibited a significantly greater rate of amyloid accumulation over time compared to non-obese individuals. At the baseline cross-sectional level, BMI showed no significant correlation with ptau217 levels measured by C2N or Janssen but had significant negative associations with measurements by Fuji, AlzPath, and the C2N ptau217 ratio. BMI was negatively correlated with Roche and QX plasma NfL and GFAP levels. At the longitudinal level, baseline obesity was not directly associated with longitudinal levels of plasma ptau217 and ptau217 ratio. However, all participants showed increases over time, with those who were obese experiencing significantly faster rates of increase compared to non-obese individuals. In the case of plasma NfL, baseline obesity was not consistently associated with longitudinal changes across different measurement methods. Lastly, baseline obesity status had no significant effect on the longitudinal trajectories of plasma GFAP levels.

CONCLUSION

individuals with obesity show faster amyloid accumulation over time despite similar baseline levels. Plasma p-tau217 and its ratio were especially sensitive to these changes. This study provides valuable insights for interpreting amyloid burden BBM levels in response to obesity in AD.

CLINICAL RELEVANCE/APPLICATION

The impact of obesity on trajectories of changes in amyloid burden and BBM of Alzheimer's disease is an important aspect to consider implementing these into clinical practice.

Nov. 30 – Dec. 4
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W1-SSMS03

Multisystem (Biomarkers and Biomolecular Radiology)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: E350

Susana Calle, MD (*Moderator*)
David P. Munger, DO, MPH (*Moderator*)

Sub-Events

W1-SSMS03-3 MIDLIFE MR-DERIVED VISCERAL ADIPOSITY IS LINKED TO CORTICAL THINNING INDEPENDENT FROM BODY MASS INDEX

Mahsa Dolatshahi, MD, MPH (*Presenter*)
Paul K. Commean, BA (*Abstract Co-Author*)
Soheil Mohammadi, MD, MPH (*Abstract Co-Author*)
Farzaneh Rahmani, MD, MPH (*Abstract Co-Author*)
Mahshid Naghashzadeh, MSc, PhD (*Abstract Co-Author*)
Yifei Xu (*Abstract Co-Author*)
Esther Lu (*Abstract Co-Author*)
Joseph E. Ippolito, MD, PhD (*Abstract Co-Author*)
Tammie S. Benzinger, MD, PhD (*Abstract Co-Author*)
John C. Morris, MD (*Abstract Co-Author*)
Cyrus A. Raji, MD, PhD (*Abstract Co-Author*)

PURPOSE

Obesity in midlife is recognized to contribute to Alzheimer disease in late life. We aimed to assess the link between MRI-derived abdominal visceral and subcutaneous adipose tissue (VAT and SAT), insulin resistance, and lipid profile with MRI-derived brain cortical thickness in cognitively normal midlife individuals.

METHODS AND MATERIALS

A total of 98 cognitively normal midlife individuals (Age: 49.34 years, 66.3% female, BMI: 32.46kg/m2, 57.1% obese) underwent brain and body MRI, and metabolic assessment. FreeSurfer 7.1.1 was used for the automatic segmentation of cortical and subcortical brain regions using a probabilistic atlas, followed by visual inspection and if needed, manual editing. VAT and SAT were semi-automatically segmented using an in-house MATLAB-based software, followed by manuals editing. Using Spearman correlation rank test, the association of cortical thickness in late-onset Alzheimer disease (LOAD) regions with BMI, HOMAIR, VAT, SAT, and lipid profile was assessed, with age and sex as covariates and correction for multiple comparisons. Additionally, BMI was added as a covariate in the models for assessing these associations independent from BMI.

RESULTS

Individuals with obesity had significantly higher VAT, SAT, HOMAIR, and lower high-density lipoprotein (HDL) ($p<0.001$ for all). Among the LOAD regions, cortical thinning in right precuneus, superior parietal, lateral occipital and left transverse temporal and temporal pole were linked to higher BMI, after correction for multiple comparisons. Higher VAT was associated with lower cortical thickness in right posterior cingulate, parahippocampal, and fusiform and left entorhinal, middle temporal, superior temporal and temporal pole, independent from BMI. While cortical thickness was associated with SAT, HOMAIR and lower HDL in a couple of the LOAD regions, after controlling for BMI, these associations disappeared.

CONCLUSION

Higher visceral fat is linked to reduced cortical thickness, as a precursor to neurodegeneration later in life, independent from BMI.

CLINICAL RELEVANCE/APPLICATION

Our results highlight the importance of characterizing body fat for the risk of neurodegeneration and its prevention. Modifying visceral fat is of particular importance for brain health.

W1-SSMS03-5 GADOLINIUM-BASED CONTRAST AGENTS AND RISK OF NEPHROGENIC SYSTEMIC FIBROSIS: A "WORST CASE SCENARIO" ANALYSIS OF CONTEMPORARY PRACTICE

Adarsh Mallepally (*Abstract Co-Author*)
NITIN CHETLA (*Abstract Co-Author*)

PURPOSE

We sought to assess the risk of nephrogenic systemic fibrosis (NSF) with contemporary gadolinium-based contrast agents (GBCAs) in patients with advanced renal dysfunction (ARD).

METHODS AND MATERIALS

We performed a retrospective cohort study in the TriNetX US Network, searching for adults with a diagnosis of ARD (chronic kidney disease stage 4-5 or endstage renal disease) who received GBCAs from 2010-2025, further analyzing American College of Radiology (ACR) Group 2 and macrocyclic GBCA subgroups. Propensity score matching (PSM) of demographics and comorbidities was performed to reduce confounding. The primary endpoint was a diagnosis code of possible NSF (ICD-10 L90.8), with a secondary endpoint of codes for possible NSF confounders (e.g. scleroderma, eosinophilic fasciitis) within 1 year. Risk ratios (RR) with 95% confidence intervals were used to assess possible NSF incidence and mortality. Kaplan-Meier curves with log-rank test were used to compare cumulative incidences.

RESULTS

We identified 73,022 adults with ARD who received GBCAs, of which 72,245 (98.9%) were Group 2 and 54,731 (74.9%) were macrocyclic GBCAs. Compared to patients without ARD (n=3,866,899), these patients were more likely to be older, male sex, Black race, and had higher rates of comorbidities. After PSM (n=73,006 per group), there were 31 (0.04%) and 474 (0.68%) patients with ARD with possible NSF and NSF confounder codes, respectively, not significantly different than controls (RR: 0.91 [0.56-1.49], p=0.713 and RR: 0.99, [0.88-1.13], p=0.989, respectively). Cumulative incidence of the two outcomes was similar (?2=0.028, p=0.867; ?2=0.492,

p=0.483; respectively). Among those with ARD receiving ACR Group 2 GBCAs, incidence was similar: 0.04% and 0.69% for possible NSF and confounders, respectively, not different from matched controls. Patients with ARD who received macrocyclic GBCAs had 0.03% and 0.68% rates of endpoints, respectively, also not significantly different than matched controls. Adjusted mortality was higher for patients with ARD within 1 year (RR: 1.97 [1.91-2.02], RR: 1.98 [1.92-2.04], RR: 2.01 [1.94-2.07] for total, ACR group 2, and macrocyclic GBCAs, respectively, p<0.001 for all), similar to risk in patients with ARD who did not receive any GBCAs (RR: 6.06 [5.82-6.31], p<0.001).

CONCLUSION

In this large real-world cohort, the risk of possible NSF following contemporary GBCA use in patients with ARD was exceedingly low and not significantly higher than patients without ARD.

CLINICAL RELEVANCE/APPLICATION

Our findings suggest that the use of modern GBCAs, particularly Group 2 and macrocyclic agents, carry minimal apparent risk of NSF in patients with ARD, supporting their use when otherwise clinically indicated.

W1-SSMS03-6 QUANTITATIVE DIXON MRI-BASED EVALUATION OF PANCREATIC FAT IN OBESE INDIVIDUALS: CORRELATION WITH TYPE 2 DIABETES MELLITUS IN A PILOT COHORT STUDY

Rui Zhang (*Presenter*)
Yi Zhu (*Abstract Co-Author*)

PURPOSE

To investigate the correlation between pancreatic fat fraction measured by Dixon MRI and the presence of type 2 diabetes mellitus (T2DM) in an obese Chinese population, and to evaluate its diagnostic potential as a noninvasive biomarker.

METHODS AND MATERIALS

This retrospective, single-center study enrolled 33 obese adults (BMI =28 kg/m²) who underwent abdominal MRI using a six-echo Dixon sequence between January 2025 and March 2025. Subjects were stratified into three groups: T2DM (n=10), prediabetes (n=11), and normal glucose tolerance (n=12), based on fasting glucose and HbA1c levels. Pancreatic fat fraction (PFF) was quantified by drawing regions of interest (ROIs) on the head, body, and tail of the pancreas. Mean PFF values were compared across groups using one-way ANOVA. ROC analysis was performed to evaluate the diagnostic accuracy of PFF for detecting T2DM. Inter-observer agreement was assessed using ICC. Institutional Review Board approval was obtained, and informed consent was waived.

RESULTS

Mean PFF was significantly higher in the T2DM group (21.5 ± 3.7%) than in the prediabetes (15.6 ± 4.1%) and normal glucose groups (12.2 ± 3.0%) (P < 0.01). ROC analysis yielded an AUC of 0.864 (95% CI: 0.644-0.972) for distinguishing T2DM from non-diabetic individuals using a PFF cutoff of 18.5%. The ICC for inter-observer agreement was 0.91.

CONCLUSION

Pancreatic fat fraction measured by Dixon MRI is significantly elevated in obese individuals with T2DM and may serve as a noninvasive imaging biomarker for metabolic risk stratification. Larger, prospective studies are warranted to validate these findings.

CLINICAL RELEVANCE/APPLICATION

This study suggests that pancreatic fat quantification by Dixon MRI may provide a noninvasive and reproducible imaging tool for early identification of metabolic dysfunction in obese individuals at risk of diabetes.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

W1-SSNMMI05

Nuclear Medicine and Molecular Imaging (Neuroendocrine Tumors)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: S405

Helen R. Nadel, MD, FRCPC (*Moderator*)
Amir Iravani, MD (*Moderator*)

Sub-Events

W1-SSNMMI05-1 ASSOCIATION OF INTEGRATED BIOMARKERS AND PREDICTION OF PFS IN PATIENTS WITH GEP-NET UNDER [177LU]LU-DOTA-TATE THERAPY

Moritz L. Schnitzer, MD (*Presenter*)
Felix Herr, MD (*Abstract Co-Author*)
Maurice Heimer, MD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Matthias Brendel (*Abstract Co-Author*)
Rudolf A. Werner (*Abstract Co-Author*)
Clemens C. Cyran, MD (*Abstract Co-Author*)

PURPOSE

Integrated biomarkers that predict survival in patients with gastroenteropancreatic neuroendocrine tumors (GEP-NET) receiving peptide receptor radionuclide therapy (PRRT) are still limited. This study aims to identify predictors of progression-free survival (PFS) in patients with GEP-NET undergoing two cycles of PRRT.

METHODS AND MATERIALS

This single-center retrospective study included 178 patients with GEP-NET (G1 and G2) who received at least two consecutive cycles of PRRT with [177Lu]Lu-DOTA-TATE and underwent somatostatin receptor (SSTR)-PET/CT before and after therapy. At baseline, Krenning score (KS) > 2, clinical, pathological, and laboratory parameters were collected and correlated to PFS. Survival predictors were analyzed using univariate and multivariate models. For goodness-of-fit analysis, the Akaike information criterion and Harrell concordance index were determined. To assess the impact on the regression model, the Wald-Test was performed.

RESULTS

In univariate analysis, KS 3 (vs. KS 4; HR, 2.02; 95% CI, 1.27-3.22; p = 0.003), Ki-67 > 5% (HR, 2.00; 95% CI, 1.31-3.04; p = 0.001), CgA > 200 ng/mL (HR, 1.77; 95% CI, 1.14-2.76; p = 0.011), and NSE > 35 ng/mL (HR, 2.37; 95% CI, 1.44-3.89; p < 0.001) were significantly associated with shorter PFS, with CgA providing the highest C-index (0.6). In multivariate analysis, KS 3 (vs. KS 4; HR, 1.94; 95% CI, 1.17-3.21; p = 0.01), CgA > 200 ng/mL (HR, 1.76; CI, 1.08-2.87; p = 0.024), NSE > 35 ng/mL (HR, 1.98; 95% CI, 1.17-3.36; p = 0.011), and Ki-67 > 5% (HR, 1.89; 95% CI, 1.18-3.02; p = 0.008) were significantly associated with reduced PFS. Including KS into multivariate analysis significantly improved the Cox regression model performance, as shown by a reduction in Akaike Information Criterion (592/596) and an increase in concordance index (0.66/0.65). The Wald test for individual variables supported the significance of both Ki-67 (7.1) and KS (6.7) as independent predictors of PFS.

CONCLUSION

Integrated baseline diagnostics including in-vivo PET-based (Krenning) and ex-vivo histopathological (Ki-67) and laboratory (CgA and NSE) metrics in GEP-NET patients scheduled for two cycles of PRRT have been demonstrated to enhance the accuracy of PFS prediction.

CLINICAL RELEVANCE/APPLICATION

This study underscores the clinical importance of integrating biomarkers such as KS, Ki-67, NSE and CgA to predict PFS in GEP-NET undergoing PRRT. These routinely assessed parameters could be valuable in identifying high-risk individuals prone to disease progression early in treatment, potentially informing therapeutic decisions and enabling more personalized treatment strategies.

W1-SSNMMI05-2 INTEGRATED BIOMARKERS PREDICT SURVIVAL IN GEP-NET PATIENTS TREATED WITH LU-DOTA-TATE THERAPY

Christian Alexander Dascalescu, MD (*Presenter*)
Felix Herr, MD (*Abstract Co-Author*)
Ricarda Ebner, MD (*Abstract Co-Author*)
Moritz L. Schnitzer, MD (*Abstract Co-Author*)
Matthias P. Fabritius, MD (*Abstract Co-Author*)
Christine Schmid-Tannwald, MD (*Abstract Co-Author*)
Vera Wenter, MD (*Abstract Co-Author*)
Matthias Brendel (*Abstract Co-Author*)
Maurice Heimer, MD (*Abstract Co-Author*)
Christoph Auernhammer, MD, PhD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Rudolf A. Werner (*Abstract Co-Author*)
Clemens C. Cyran, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the prognostic value of clinical, histopathological, laboratory, and imaging-derived parameters for overall survival (OS) prediction in gastroenteropancreatic neuroendocrine tumors (GEP-NET) under peptide receptor radionuclide therapy (PRRT) at baseline.

METHODS AND MATERIALS

We retrospectively analyzed 178 patients with GEP-NETs who underwent at least four cycles of PRRT. At baseline, the Krenning score (KS > 3), clinical, histopathological, and laboratory parameters were collected and correlated with OS. OS predictors were identified using univariate Cox regression analysis and incorporated into multivariate models. Model performance was assessed using the concordance index (C-index) and 95% confidence intervals (CI) for improved precision.

RESULTS

With a median follow-up of 47 months, the median OS was 42 months. In univariate analysis, the following parameters were significantly associated with shorter OS: KS 3 vs. KS 4 ($p = 0.019$), CgA > 200 ng/mL ($p = 0.0015$), NSE > 35 ng/mL ($p = 0.021$), BMI < 18.5 kg/m² ($p < 0.001$), CRP > 0.5 mg/dL ($p = 0.045$), albumin < 4.1 g/dL ($p = 0.006$), and Hb < 12 g/dL ($p = 0.005$). Among these, CgA demonstrated the highest C-index (0.61). The multivariate Cox regression model incorporating BMI, Hb, and CgA exhibited the highest predictive performance (C-index = 0.63, CI: 0.49 - 0.64), followed closely by a model combining KS, Hb, and NSE (C-index = 0.62, CI: 0.50 - 0.64).

CONCLUSION

Our findings support the use of integrated biomarkers at baseline to predict OS in GEP-NET patients receiving four cycles of PRRT.

CLINICAL RELEVANCE/APPLICATION

A multivariate model including the KS demonstrated high predictive performance, underscoring the importance of incorporating molecular imaging parameters for OS prediction.

W1-SSNMMI05-3 PET-BASED QUANTITATIVE PREDICTIONS OF INDIVIDUAL LESION RESPONSE TO PEPTIDE RECEPTOR RADIONUCLIDE THERAPY IN METASTATIC NEUROENDOCRINE TUMORS THROUGH MACHINE LEARNING

Sebastian Salgado-Maldonado, MSc, BSc (*Presenter*)
Victor Santoro-Fernandes (*Abstract Co-Author*)
Brayden Schott (*Abstract Co-Author*)
Alison Deatsch (*Abstract Co-Author*)
Scott B. Perlman, MD, MS (*Abstract Co-Author*)
Robert Jeraj, PhD (*Abstract Co-Author*)

PURPOSE

Metastatic neuroendocrine tumor (mNET) patients typically exhibit heterogeneous lesion-level responses to peptide receptor radionuclide therapy (PRRT). Locoregional approaches (e.g., trans-arterial embolization, stereotactic body radiation therapy) are effective in the management of non-responding NETs, but lesion selection in the metastatic setting is challenging. This study evaluated the feasibility of lesion selection for locoregional therapy of NETs by predicting lesion persistence with machine learning and PET-based longitudinal lesion-level assessment.

METHODS AND MATERIALS

This retrospective study included patients with mNETs treated with [177Lu]Lu-DOTA-TATE PRRT who were scanned using [68Ga]Ga-DOTA-TATE SSTR PET at three timepoints— baseline (BL), post-treatment (PT), and long-term (LT). The median scan times were 1 week before the first PRRT cycle (BL), 16 weeks post-treatment (PT), and 65 weeks post-treatment (LT). Lesions were segmented under clinician supervision and tracked across all timepoints. For each lesion, nine quantitative PET features—SUV mean, median, maximum, minimum, variance, skewness, kurtosis, volume, and total uptake—were extracted. Using BL and PT features, a fully connected neural network (FCNN) was trained to predict lesion persistence on LT. Training features were paired longitudinally and ranked by point biserial correlation. Model sensitivity to feature quantity, and the inclusion of longitudinal information was then assessed through 5-fold cross validation. The best performing model was deployed on a separate test set. The FCNN performance was compared to random forest and logistic regression classifiers.

RESULTS

Training and validation were performed with 462 lesions from 8 patients, and testing with 116 lesions from 5 patients. The AUC varied between 0.77 (with n=1 feature) to a maximum of 0.79 (with n=3 features). The maximum AUC of 0.79 was obtained, when both BL and PL data were used in the predictive model. The AUC decreased to 0.73 using a model trained on BL data only, and 0.67 using PT data only. Finally, on the test data, the FCNN AUC was 0.80, while the AUC slightly lower for logistic regression at 0.79, and the random forest at 0.82.

CONCLUSION

mNET lesions that do not respond favorably to PRRT in the long term can be predicted using a fully connected neural network classifier trained with quantitative and longitudinal SSTR PET features with relatively high accuracy. Longitudinal information from both baseline and early post-treatment imaging are critical for optimal performance.

CLINICAL RELEVANCE/APPLICATION

This methodology enables lesion-specific management of metastatic neuroendocrine tumors for partial responders and is readily extendable to other types of solid tumors.

W1-SSNMMI05-4 "THE LIVER OF BLINDING LIGHTS": CAN THE TOTAL METABOLIC TUMORAL BURDEN PREDICT THE LIVER TOXICITY IN PATIENTS TREATED WITH 177LU-DOTATE?

Javier M. Martinez Martinez, MD (*Presenter*)
Eliana Vazquez (*Abstract Co-Author*)
Mariano Portillo (*Abstract Co-Author*)
MARTINA MUSUMECI (*Abstract Co-Author*)
Mariano Lopez (*Abstract Co-Author*)
Silvina Racioppi (*Abstract Co-Author*)

PURPOSE

The aim of this study was to evaluate the association between baseline tumor burden, measured by metabolic tumor volume (MTV) and total lesion activity (TLA), and the development of hepatotoxicity in patients treated with 177Lu-DOTA-TATE.

METHODS AND MATERIALS

Baseline 68Ga-DOTA-TATE PET/CT images of patients treated with 177Lu-DOTA-TATE were retrospectively reviewed. Baseline wholebody tumor burden was quantified in terms of MTV and TLA and compared with the presence or absence of hepatotoxicity.

RESULTS

A total of 31 patients were included in the study, with a median age of 49 years (IQR 41-59). Of these, 15 (48%) were female and 16 (52%) were male. 75% of the cohort had grade 2 tumors, and 60% of the patients received four doses of 177Lu-DOTA-TATE. Disease progression was observed in 30% of the cohort, and 18% died. Hepatic toxicity of any grade occurred in 23% of patients at some point during treatment. The median metabolic tumor volume (MTV) was 170 cm^3 (IQR 49-571 cm^3), while the median total lesion activity (TLA) was 2702 $SUV \cdot cm^3$ (IQR 874-9202 $SUV \cdot cm^3$). Among patients who developed hepatic toxicity, the median MTV was 305 cm^3 (IQR 25-978 cm^3), compared to 151 cm^3 (IQR 50-544 cm^3) in those without toxicity, with no statistically significant difference ($p = 0.7$). Similarly, the median TLA in patients with hepatic toxicity was 6169 $SUV \cdot cm^3$ (IQR 459-23691 $SUV \cdot cm^3$), versus 2477 $SUV \cdot cm^3$ (IQR 955-8213 $SUV \cdot cm^3$) in those without toxicity, also without statistical significance ($p = 0.7$).

CONCLUSION

In conclusion, while a group of patients experienced hepatic toxicity during 177Lu-DOTA-TATE treatment, no statistically significant association was found between toxicity and baseline MTV or TLA values. These findings suggest that further research is needed to identify reliable predictors of hepatic toxicity in this patient

population. Furthermore, this line of research needs to continue to expand the number of patients involved in order to increase the statistical power of the groups involved.

CLINICAL RELEVANCE/APPLICATION

Understanding the relationship between baseline tumor burden and hepatotoxicity is clinically relevant, as it may help identify patients at higher risk for liver-related adverse events during 177Lu-DOTA-TATE therapy and guide treatment planning.

W1-SSNMMI05-5 OPTIMAL SCAN TIME FOR (18F)SITATE PET/CT IMAGING OF PATIENTS WITH NEUROENDOCRINE TUMORS

Lukas Salvermoser, MD (*Presenter*)
Ricarda Ebner, MD (*Abstract Co-Author*)
Felix Herr, MD (*Abstract Co-Author*)
Christian Alexander Dascalescu, MD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Clemens C. Cyran, MD (*Abstract Co-Author*)
Rudolf A. Werner (*Abstract Co-Author*)

PURPOSE

The fluorine-18-labelled, somatostatin receptor (SSR)-targeting tracer [¹8F]SiTATE is gaining momentum in clinical use as a promising alternative to commonly used gallium-68-labelled SSR-targeting compounds, demonstrating excellent image quality and clinical utility. Currently, imaging with SITATE-PET/CT is performed 90 minutes after tracer injection, complicating its integration into a multi-tracer PET environment, in which most tracers are imaged 60 minutes after tracer injection. We therefore investigated whether comparable image quality and quantification can be achieved at other time points, that better integrate into clinical routine.

METHODS AND MATERIALS

Eight NET patients with histologically confirmed metastasized GEP-NET received a [18 F]SiTATE-PET/CT (250 ± 66 MBq) with repeated emission scans 60, 90, and 120 minutes post-injection. SUVmax, SUVpeak and SUVmean were measured in visceral organs and in a total of 49 SSR-positive lesions (lymph nodes, liver and bone), and tumor-to-background ratios were calculated. Statistical comparison was performed across the three time points. Additionally, scans were visually evaluated for clinically noticeable differences by four readers with varying levels of experience.

RESULTS

No significant differences in tumor-to-background ratios were observed across time points for liver (p=0.6613), lymph nodes (p=0.5413), bone (p=0.8478), or overall lesion assessment (p=0.7248). Post hoc multiple comparisons using Tukey's test revealed no significant pairwise differences (p=0.5103-0.999). Individual readers did not report any relevant qualitative visual difference between the time points; all lesions could be clearly identified against the surrounding background.

CONCLUSION

The results demonstrate a consistent tracer uptake pattern over time, with minimal variation in tumor-to-background contrast across different metastatic sites. Imaging at 60 minutes post-injection yields equivalent lesion detectability and quantitative contrast compared to later time points at 90 and 120 minutes. These findings underscore the clinical utility of early imaging with [¹8F]SiTATE for NET patients, offering the potential to facilitate workflow and enhance patient comfort without sacrificing diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

Early [¹8F]SiTATE PET/CT at 60 minutes post-injection provides equivalent diagnostic performance to later imaging, enabling faster workflows and improved patient management without compromising accuracy.

W1-SSNMMI05-6 STANDARDIZED IMAGING EVALUATION OF GASTROENTEROPANCREATIC NEUROENDOCRINE TUMORS USING SSTR-RADS 1.0 CRITERIA

Marta Vaillant, MD (*Presenter*)
Eliseo Vano Galvan, PHD (*Abstract Co-Author*)
Cristina Rodriguez Rey (*Abstract Co-Author*)
Pedro Nespral Torres, MD (*Abstract Co-Author*)
Gonzalo Cuesta Domingo, MD (*Abstract Co-Author*)
Maria Zapardiel, MD (*Abstract Co-Author*)
Patricia Romero Fernandez, MBBS (*Abstract Co-Author*)
Luisa F. Leon, MD (*Abstract Co-Author*)
Cristina G. Wakfie Corieh, MD (*Abstract Co-Author*)
Paloma Dauden (*Abstract Co-Author*)

PURPOSE

To determine the correlation between SSTR-RADS 1.0 criteria for 68Ga-DOTATOC PET-CT and definitive diagnosis in gastroenteropancreatic neuroendocrine tumors (GEP-NET).

METHODS AND MATERIALS

Retrospective analysis of patients who underwent 68Ga-DOTATOC PET-CT with i.v. iodinated contrast agent by GEP-NET between August/2019 and December/2023. Two nuclear medicine physicians with >15 years of experience determined SSTR-RADS (1-5) and uptake score (1-3) (Werner et al, J Nucl Med 2018;59:1085-91). Categories 4/5 were considered positive for NET, 1/2 negative for NET. Category 3 was the most controversial of the different subcategories and required further individualised analysis. Histopathological examination (HE) or clinical follow-up (CFU) was considered the gold standard. SP, E, PPV and NPV were calculated. A ?² test and logistic regression were performed.

RESULTS

77 patients (45 males), mean age 63.5 (25-87 years), with suspected or diagnosed GEP-NET. The gold standard was HE (n=28) or CFU (n=49; mean 19.16 months). In 11 cases of suspected neoplasia, GEP-NET was not confirmed by imaging or CF. Of the 66 patients with NET, 38 had stage III-IV disease. Most of the NETs were located in the pancreas (n=33) and small intestine (n=31), 4 were MEN-1. Of the 66 GEP-NET: G1 (n=47), G2 (n=17) and G3 (n=2). The most common metastatic sites were regional lymph nodes (28.6%) and liver (29.9%). SP=100%, E=76%, PPV=90%, NPV=100%. An association was found between SSTR-RADS 1.0 classification and NET diagnosis (?²=58.625, p-value<0.001). Logistic regression showed a capacity for correct SSTR-RADS classification of 85.7%. In categories 4 and 5, 100% (n=47) showed tumor. In category 3 (n=13) only 38.5% (2/2 labelled as 3A and 3/9 of 3D) showed NET. In 3C, none (n=2) corresponded to NET. In category 1 (n=17) 17.6% had NET.

CONCLUSION

The SSTR-RADS 1.0 criteria allow the correct diagnosis of NET in a high percentage of patients. Category 3, especially 3D, requires further confirmation.

CLINICAL RELEVANCE/APPLICATION

Is important in the context of nuclear imaging because it promotes standardized interpretation and reporting of somatostatin receptor (SSTR)-targeted PET/CT studies in patients with gastroenteropancreatic neuroendocrine tumors (GEP-NETs). By applying the SSTR-RADS 1.0 criteria, the study contributes to reducing interobserver variability, enhancing diagnostic accuracy, and improving communication among multidisciplinary teams. These improvements are critical for appropriate patient management, therapy selection—particularly regarding peptide receptor radionuclide therapy (PRRT)—and consistent follow-up in clinical practice and research.
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Nov. 30 – Dec. 4
RSNA® 2025
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W1-SSNPM03

Science Session with Keynote: Noninterpretive Skills (Beyond Imaging) (Artificial Intelligence)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: S402

Safwan Halabi, MD (*Moderator*)
Sophie Chheang, MD (*Moderator*)

Sub-Events

W1-SSNPM03-1 Keynote Speaker

Woojin Kim, MD (*Science Invited Presenter*)

W1-SSNPM03-2 PATIENT PERCEPTIONS OF THE USE OF ARTIFICIAL INTELLIGENCE (AI) IN A TERTIARY REFERRAL RADIOLOGY DEPARTMENT

Hayley Briody, MBBCh (*Presenter*)
Sneha Singh (*Abstract Co-Author*)
Richard Bruen, MRCPI (*Abstract Co-Author*)
Ruth M. Dunne, MBBCh (*Abstract Co-Author*)
Martina M. Morrin, MD (*Abstract Co-Author*)
Nuala A. Healy, MD, MEd (*Abstract Co-Author*)

PURPOSE

To determine patient attitudes towards the use of artificial intelligence (AI) in a tertiary referral radiology department.

METHODS AND MATERIALS

This study was conducted using a voluntary, 16-item questionnaire distributed to patients attending the radiology department. The questionnaire includes questions on basic demographics, general attitudes towards AI in healthcare, attitudes to radiology-specific applications of AI and willingness to consent for anonymised personal data to be used for training AI models in a research setting. Responses were collated in a prospectively maintained excel datasheet. Data analysis was performed using R Studio and Microsoft Excel. Institutional review board approval was obtained prior to study commencement.

RESULTS

1,041 responses were collected during the study period, 90 of which were incomplete. The majority of respondents were aged 50-69 (42.3%) and of white Irish ethnicity (85.4%). 55.1% respondents agreed or strongly agreed that the use of AI in healthcare is a good idea. Participants aged > 70 years were more likely to respond "I don't know" when asked about their interest in AI ($p<0.05$). Higher level of education (Masters degree or higher) was associated with an increased likelihood of strong interest in AI ($p<0.05$). When asked if they would allow a radiologist and AI to interpret their imaging, over two thirds (67.3%) respondents agreed or strongly agreed. However, when asked if they would allow AI to act as the sole reader of their imaging only 20.4% respondents agreed or strongly agreed. Most patients (67.2%) would still prefer a radiologist to interpret their imaging even if AI was a more accurate reader. 40% respondents disagree or strongly disagree with the statement "I think replacement of radiologists by AI could happen in the future". Only 4% of patients indicated the use of AI for reporting of radiology images did not need to be disclosed with the majority (54%) wishing to be asked for written consent. Overall, patients were agreeable to having their images shared for the purposes of research into AI tool development (70.9% agreed or strongly agreed).

CONCLUSION

Overall, patients have a positive attitude toward the use of AI in healthcare. However, the majority of respondents in this study would not agree to AI as the sole reader of their imaging even if quicker, more efficient and more accurate. Over half of respondents wish to be asked for written consent if AI is to be used in the interpretation of their radiological imaging.

CLINICAL RELEVANCE/APPLICATION

This study suggests that patients are not ready for standalone AI and would prefer written consent prior to the use of AI for interpretation of their radiological images and this should be considered in clinical practice going forward.

W1-SSNPM03-3 ACCELERATING ICD-10 CODING OF PET/CT REPORTS WITH CHATGPT: A COMPARATIVE STUDY

Tristan Ruhwedel, MD (*Presenter*)
Julian Rogasch (*Abstract Co-Author*)
Paul Martin Dahlke (*Abstract Co-Author*)
Seyd Shnayien, MD (*Abstract Co-Author*)
Christian Furth (*Abstract Co-Author*)
Christoph Wetz (*Abstract Co-Author*)
Imke Schatka (*Abstract Co-Author*)
Holger Amthauer, MD (*Abstract Co-Author*)
Nick Lasse Beetz, MD (*Abstract Co-Author*)

PURPOSE

Radiologists often work up to five extra hours weekly on administrative tasks, potentially reducing time for patient care and increasing the risk for burnout. Large language models (LLMs) such as ChatGPT o1 can potentially reduce administrative workloads. Radiology reports in the U.S. must be assigned to an ICD-10 code for insurance reimbursement. Therefore, we aimed to investigate whether ChatGPT o1 can be consulted to assist in assigning ICD-10 codes to PET/CT examination reports.

METHODS AND MATERIALS

100 different fictious PET/CT reports were created based on standardized institutional text modules for PET/CT including contrast-enhanced diagnostic CT. Each report was assigned a single, most relevant ICD-10 code by two experienced nuclear medicine physicians. Coding of multiple reports at the same time was allowed. One

physician used ChatGPT o1, while the other was limited to traditional search engines. Time was recorded in seconds, from the beginning of report review to entry of the ICD-10 code into a data table. Discrepancies were resolved via a blinded consensus process. Differences in error distribution across ICD-10 hierarchy levels were analyzed using four-field tables and the McNemar test. Time differences were assessed using the Wilcoxon signed-rank test.

RESULTS

At the first character of the ICD-10 code, the ChatGPT-assisted coder made 2 errors compared to 3 errors by the manual coder ($p = 1.0$). For the second and third characters, ChatGPT-based coding resulted in 3 errors versus 5 ($p = 0.727$). At the fourth and fifth characters, ChatGPT o1 significantly outperformed manual coding, with 6 errors versus 17 ($p = 0.035$). Overall, the ChatGPT-assisted coding resulted in 6 incorrect codes, whereas manual coding led to 18 ($p = 0.023$). Median coding time was 135 seconds (range 41 - 433 s) without ChatGPT and just 8 seconds (range 6 - 9 s) with it. The median time difference between both coders was 127 seconds (range 33 - 424 s; $p < 0.001$).

CONCLUSION

ChatGPT o1 demonstrates faster coding times and higher accuracy when assigning ICD-10 codes to PET/CT examination reports. Given the complexity of PET/CT reports, similar approaches might be feasible for other imaging modalities like diagnostic CT or MRI. Providers of LLMs should develop software solutions that fulfill the stringent data protection requirements in healthcare settings.

CLINICAL RELEVANCE/APPLICATION

Higher accuracy of ICD-10 codes might reduce billing errors and insurance rejections, while saved time could be reallocated to patient care. As total-body PET/CT becomes more widely adopted and scan durations decrease, these efficiencies might prevent up to an hour of overtime daily in a center performing 30 PET/CT scans, potentially helping alleviate administrative burdens and reduce burnout risk.

W1-SSNPM03-4 ENHANCING THE CLINICAL USABILITY OF CANCER PATHOLOGY REPORTS THROUGH LLM-BASED SUMMARIZATION

Jacob John, BEng, MS (*Presenter*)
Yirong Liu, MD, PhD (*Abstract Co-Author*)
Sagnik Sarkar, MS (*Abstract Co-Author*)
Paul Kinkopf (*Abstract Co-Author*)
Abdul Zakkar (*Abstract Co-Author*)
Peng (Troy) Teo, PhD (*Abstract Co-Author*)
Mohamed Abazeed (*Abstract Co-Author*)

PURPOSE

Reviewing multiple pathology reports during oncology consultations is time-intensive and prone to error due to information fragmentation, variability in testing modalities, and the cognitive fatigue associated with synthesizing complex clinical findings. This study evaluates the effectiveness of large language models (LLMs) in generating clinically accurate and complete summaries of pathology reports to reduce physician documentation burden while preserving medical fidelity.

METHODS AND MATERIALS

This retrospective study included patients who underwent initial consultations in a thoracic oncology clinic between January 2019 and July 2023. Original pathology reports and corresponding physician-generated pathology summaries were extracted and anonymized from the electronic health record. Six open-source LLMs—LLaMA 3.0, LLaMA 3.1, LLaMA 3.2, DeepSeek R1, Mistral 7.2B, and Gemma 9B—were used to generate summaries from the original pathology reports. The evaluations were conducted using a hybrid framework combining objective metrics (ROUGE, METEOR, BLEU, and BERT Score via llama-based embeddings for long-form medical summaries) and subjective assessments (based on completeness, correctness, conciseness, and potential harm) by clinical experts.

RESULTS

Ninety-four cases met the inclusion criteria. Across all objective metrics, LLM-generated summaries scored significantly higher than physician-generated summaries ($p < 0.0001$). Subjectively, DeepSeek, Mistral, LLaMA 3.1, and LLaMA 3.2 outperformed physicians in completeness ($p = 0.017$, $p < 0.0001$, $p < 0.0001$, and $p < 0.0001$, respectively) while maintaining equivalent levels of correctness ($p = 1.000$). Consistency in findings was confirmed through multi-evaluator subjective analysis of LLaMA 3.1 summaries.

CONCLUSION

LLM-generated pathology summaries demonstrated superior performance compared to physician summaries in both objective and subjective evaluations. These findings highlight the potential of LLMs to improve the completeness of clinical documentation while preserving accuracy and, hereby, offering a scalable solution to reduce the cognitive and time burden of pathology review.

CLINICAL RELEVANCE/APPLICATION

Integrating LLMs into clinical workflows may enhance documentation efficiency and reduce physician fatigue, particularly in complex fields such as oncology. By producing concise and complete pathology summaries, LLMs can support more informed and timely clinical decision-making, potentially improving patient care outcomes with minimal risk of error.

W1-SSNPM03-5 AI-POWERED MRI: TIME, ENERGY, AND EMISSION SAVINGS FOR A GREENER FUTURE

Tiziano Polidori, MD (*Presenter*)
Marta Zerunian, MD (*Abstract Co-Author*)
Michela Polici, MD (*Abstract Co-Author*)
Domenico De Santis, MD (*Abstract Co-Author*)
Damiano Caruso, MD, PhD (*Abstract Co-Author*)
Marco Francone, MD, PhD (*Abstract Co-Author*)
Andrea Laghi, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of artificial intelligence (AI)-assisted MRI on scan time, energy consumption, and greenhouse gas (GHG) emissions in routine clinical practice, and to quantify the potential sustainability benefits of AI integration across different anatomical districts.

METHODS AND MATERIALS

This retrospective study included 148 patients: 45 undergoing upper abdomen MRI, 53 cardiac MRI, and 50 lumbar spine MRI. Each patient underwent conventional and AI-assisted MRI acquisitions. Air Recon DL (GE Healthcare) was applied to T2 and DWI sequences for upper abdomen MRI and to T1, T2, and STIR sequences for lumbar spine MRI. Sonic DL was applied to SSFP sequences for cardiac MRI. Time saved per patient, energy reduction (kW/h), and CO_2-equivalent emissions were recorded and statistically analyzed. All scans were performed on 1.5T and 3T scanners, and AI-enhanced protocols were developed in collaboration with the vendor to ensure diagnostic equivalence. Energy consumption was calculated based on scanner-specific power profiles and scan durations. Emission data were derived using standard CO_2-equivalent conversion metrics based on national electricity production sources. Statistical significance was established using paired t-tests with $a=0.05$.

RESULTS

AI application resulted in significant time savings per patient: 5’11’’ (58%) for upper abdomen MRI, 1’30’’ (52%) for cardiac MRI, and 6’ (50%) for lumbar spine MRI (all $p<0.01$). These reductions translated into energy savings of 1.39, 0.40, and 1.68 kW/h, and CO_2 emission reductions of 0.57 kg, 0.16 kg, and 0.69 kg, respectively (all $p<0.05$).

CONCLUSION

AI integration in MRI protocols enables significant reductions in acquisition time, energy use, and GHG emissions, supporting its role in sustainable imaging practices. By optimizing acquisition efficiency while maintaining diagnostic accuracy, AI-enhanced MRI protocols represent a pivotal innovation for the future of eco-responsible radiology.

CLINICAL RELEVANCE/APPLICATION

AI-powered MRI can substantially reduce the environmental impact of diagnostic imaging, offering a green pathway for routine clinical workflows.

W1-SSNPM03-6 ENHANCING MRI EFFICIENCY AND DIAGNOSTIC ACCURACY WITH ARTIFICIAL INTELLIGENCE: A COMPARATIVE ANALYSIS OF IMAGE QUALITY, DIAGNOSTIC CONFIDENCE, AND PATIENT EXPERIENCE

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Carlos Capunay, MD (*Abstract Co-Author*)
Natalia Soria (*Abstract Co-Author*)
Victor Miguez (*Abstract Co-Author*)
Gabriel Bolzan (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the impact of deep learning-based artificial intelligence (AI) in magnetic resonance imaging (MRI) by assessing its effectiveness in image quality enhancement, diagnostic confidence, and patient experience, compared to conventional MRI acquisitions.

METHODS AND MATERIALS

This study was approved by the institutional ethics committee, and a retrospective analysis was conducted on patients who underwent MRI examinations of the spine and musculoskeletal regions (knee, hip, and shoulder) at our institution. Each MRI was performed using AI-based image reconstruction technology (AIR™ Recon DL, GE Healthcare), followed by an additional sequence without AI assistance for comparison. Image quality was evaluated using a 3-point scale (1 = regular, 2 = good, 3 = excellent), and diagnostic accuracy was assessed based on the detection of pathological findings. To assess patient experience, a post-exam survey was conducted regarding their perception of scan duration. Two groups were analyzed: Group 1 (AI-assisted MRI, 3T scanner): Reduced scan times by approximately 50%. Group 2 (conventional MRI, same scanner model): Standard scan duration without AI acceleration. Patients rated their perceived scan duration using a 3-point scale: 1 = very short/short, 2 = usual/indistinct, 3 = long/very long.

RESULTS

A total of 331 patients were included in the image quality and diagnostic confidence analysis. The AI-assisted MRI group achieved a mean image quality rating of 2.6, compared to 2.2 in the conventional group. Regarding diagnostic accuracy, AI-assisted MRI demonstrated a sensitivity of 99%, specificity of 86%, positive predictive value (PPV) of 95%, and negative predictive value (NPV) of 94%. For patient experience, we analyzed 600 responses (300 per group). In Group 1 (AI-assisted MRI), 85% of patients rated the scan as very short or short, whereas in Group 2 (conventional MRI), 40% found the duration normal, and 45% considered it long or very long.

CONCLUSION

The integration of AI-powered image reconstruction in MRI significantly enhanced image quality and diagnostic confidence, demonstrating high sensitivity and specificity. Additionally, AI-driven acceleration led to a substantial reduction in scan duration, improving patient comfort and overall experience. These findings highlight the clinical value of AI in MRI, optimizing workflow efficiency while maintaining high diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

The clinical value of AI in MRI in optimizing workflow efficiency while maintaining high diagnostic performance.

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Nov. 30 – Dec. 4
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W1-SSVA03

Vascular Imaging (Spectral/"Black-Blood" CT for Vessel-Wall Characterization)

Wednesday, Dec. 3 8:00AM - 9:00AM Room: S503

Nicholas S. Burris, MD (*Moderator*)
Anushri Parakh, MBBS, MD (*Moderator*)

Sub-Events

W1-SSVA03-2 DUAL-ENERGY BLACK-BLOOD CT FOR FOOT ARTERIAL WALL THICKNESS MEASUREMENT IN PREDICTING DIABETES MELLITUS

Jianjun Shen, PhD (*Presenter*)
Cheng Yan (*Abstract Co-Author*)
Sihua Zhong, MD (*Abstract Co-Author*)

PURPOSE

To develop a dual-energy black-blood CT (DE-BBCT) technique, validate its improved measurement of foot arterial wall thickness and potential for predicting diabetes mellitus, by comparing it with the optimal angiography virtual mono-energetic image (VMI) and conventional CT angiography (CTA).

METHODS AND MATERIALS

A total of 50 patients (25 diabetic and 25 non-diabetic) were retrospectively enrolled, and all underwent DECT (80 kVp/Sn140 kVp) immediately following lower extremity CTA (120 kVp). Optimal 60 keV VMI and virtual non-contrast (VNC) images were obtained from the DECT data. DE-BBCT was developed by subtracting VNC images from VMI to create iodine maps, and further subtracting the iodine maps from VNC images to differentiate the arterial wall from the lumen. On VMI, CTA, and DE-BBCT images, two readers independently measured the signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR) and the bilateral popliteal artery wall thickness (PAWT), with mean values calculated for analysis. Inter-observer agreement for PAWT measurements was quantitatively evaluated using the intraclass correlation coefficient (ICC). Receiver operating characteristic (ROC) analysis was performed to assess the predictive value of PAWT for diabetes, using clinical diagnosis as the reference standard.

RESULTS

DE-BBCT demonstrated significantly higher SNR and CNR than VMI and conventional CTA (all $p < 0.05$), indicating superior arterial wall visualization. It also achieved the highest inter-observer agreement for PAWT measurements (ICC = 0.897), outperforming VMI (ICC = 0.826) and CTA (ICC = 0.788). All three imaging modalities consistently showed popliteal artery wall thickening in diabetic patients, with significantly higher PAWT values compared to non-diabetic patients (VMI: 1.08 ± 0.22 vs 0.83 ± 0.16 mm; CTA: 1.05 ± 0.21 vs 0.82 ± 0.16 mm; DE-BBCT: 1.11 ± 0.22 vs 0.83 ± 0.18 mm; all $p < 0.05$). Notably, PAWT derived from DE-BBCT showed good predictive value for diabetes, with an area under the curve (AUC) of 0.835. The AUCs for CTA and VMI were 0.803 and 0.817, respectively.

CONCLUSION

Dual-energy black-blood CT offers superior visualization of the foot arterial wall, enabling more reliable thickness measurements, and shows strong potential as a predictive marker for diabetes.

CLINICAL RELEVANCE/APPLICATION

Dual-energy black-blood CT provides a reliable method for detecting foot arterial wall thickening in diabetic patients, facilitating early identification of vascular changes and enhancing clinical decision-making.

W1-SSVA03-5 CLINICAL APPLICATION OF DARK-BLOOD IMAGING IN INTRAMURAL HEMATOMA: EFFECT ON IMAGE QUALITY AND LESION VISIBILITY

Ke Wei, MD (*Presenter*)

PURPOSE

To evaluate a novel subtraction-based dark-blood imaging (DBI) technique for improving aortic intramural hematoma (IMH) visualization, comparing its performance against true non-contrast (TNC) and arterial phase (AP) CT.

METHODS AND MATERIALS

Twenty-four IMH patients undergoing whole-aorta spectral CTA were retrospectively enrolled (mean age 65.8±10.2 years; 75% male). Quantitative metrics—contrast-to-noise ratio (CNR), image signal-to-noise ratio (SNR image), lesion SNR (SNR leison), wall-to-lumen ratio (WLR), wall-to-fat ratio (WFR) were compared across TNC, subtraction-based DBI and AP. Two radiologists independently scored lesion visualization (4-point Likert scale) and wall clarity (5-point scale). Wall thickness (WT) measurements and interobserver agreement (intraclass correlation coefficients, ICCs) were analyzed using propagated ROIs and Friedman tests.

RESULTS

Subtraction-based DBI and AP demonstrated superior SNR image (IQR: 18.15 [11.79, 22.00] and 33.98 [21.19, 39.91] vs. 8.38 [5.43, 10.57], respectively), CNR i mage (IQR: 12.01 [8.88,15.75] and 24.41 [16.01, 31.29] vs. 0.39 [0.11, 1.16], respectively), and WLR (IQR: 18.72 [13.47-25.33] and 29.36 [20.21-36.57] vs. 1.79 [0.56-2.64], respectively) compared to TNC. While TNC achieved higher SNR leison than subtraction-based DBI and AP (IQR: 5.73(2.53-8.09) vs. 2.64(1.89-4.34) and 3.83(2.65-39.91)). Qualitatively, Subtraction-based DBI outperformed TNC/AP in lesion visualization (DBI: 4.00 [4.00, 4.00], AP: 3.00 [2.25, 3.00], TNC: 2.00 [1.00, 2.00]) and inner wall clarity (DBI: 5.00 [4.25, 5.00], AP: 3.00 [3.00, 4.00], TNC: 1.50 [1.00, 2.00]) ($P<0.05$), while both subtraction-based DBI and AP surpassed TNC in outer wall clarity ($P<0.05$). Subtraction-based DBI yielded significantly larger WT measurements (IQR 9.62 [7.79, 10.78] mm vs. TNC: 8.06 [6.58, 9.58] mm and AP: 7.85 [6.86, 9.71] mm; $P<0.05$). Interobserver agreement was moderate to substantial (?=0.506-0.778). No intermodal differences were observed in WFR.

CONCLUSION

Subtraction-based DBI enhances IMH assessment through superior quantitative metrics and qualitative visualization, enabling accurate wall thickness measurements unattainable with conventional CT.

CLINICAL RELEVANCE/APPLICATION

DBI mitigates beam-hardening artifacts from AP imaging, improving IMH lesion delineation and measurement precision, with direct implications for vascular pathology management.

W1-SSVA03-6 BLACK-BLOOD CT COMBINED WITH CE-BOOST SIGNIFICANTLY ACCELERATES PORTAL VEIN SEGMENTATION AND ENHANCES IMAGE QUALITY

Huasong Cai (*Presenter*)
Zhiman Lai (*Abstract Co-Author*)
Dingxiang Xie (*Abstract Co-Author*)
Rulin Xu (*Abstract Co-Author*)

PURPOSE

To determine whether integration of black-blood CT (BBCT) with contrast-enhancement boost (CE-boost) post-processing can reduce manual portal vein segmentation time and improve both subjective and objective image quality of the portal venous system compared with conventional and CE-boost-only workflows.

METHODS AND MATERIALS

In this IRB-approved retrospective study, 50 consecutive patients (34 men, 16 women; mean age 49.7 ± 14.2 years) who underwent abdominal CTA between April and May 2024 were evaluated. Three post-processing pipelines were applied to the portal venous phase datasets: conventional multiplanar MIP/volume rendering (Group A), CE-boost (Group B), and CE-boost plus BBCT arterial subtraction (Group C). A single experienced operator recorded segmentation times for each method. Two blinded senior radiologists rated image quality on a 5-point scale (branch visibility, wall delineation, artifacts, noise), with scores =3 considered diagnostic. Objective metrics—signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR)—were measured in standardized ROIs within the main portal vein and its branches. Data are reported as median (Q1-Q3) or mean ± SD; comparisons used Kruskal-Wallis and ANOVA with $P < 0.05$ deemed significant.

RESULTS

Median segmentation times were 5.1 min (3.6-7.9) in Group A, 4.2 min (2.8-6.7) in Group B, and 2.2 min (1.9-3.5) in Group C ($P < 0.001$). The wider IQRs in Groups A and B reflected variability due to residual arterial signals, whereas Group C showed a tighter distribution. Interobserver agreement for subjective scores was excellent (ICC > 0.92). Group C achieved the highest median image quality score of 5.0 (4.9-5.0), compared with 4.4 (4.3-4.4) in Group B and 3.7 (3.7-3.7) in Group A ($P < 0.001$). Objective analysis demonstrated significantly higher SNR and CNR in Group C across the main portal vein and branches (all $P < 0.001$).

CONCLUSION

BBCT integration with CE-boost CTA nearly halves manual portal vein segmentation time while narrowing variability and delivers superior subjective and objective image quality by effectively suppressing residual arterial signals.

CLINICAL RELEVANCE/APPLICATION

Automated arterial subtraction via BBCT streamlines 3D portal vein visualization and segmentation, offering radiologists a rapid, reliable workflow for preoperative planning and diagnostic evaluation of portal venous pathology.

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W2-STCE1

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER THEATER 1

Sub-Events

W2-STCE1-1 PREDICTING PULMONARY FUNCTION IN LUNG CANCER SCREENING: OPPORTUNISTIC USE OF DEEP LEARNING AND CHEST CT FOR LUNG DISEASE ASSESSMENT

Joao Fonseca, MD (*Presenter*)
Alan Medeiros Guimaraes (*Abstract Co-Author*)
Alysson Roncally S. Carvalho, MD,PhD (*Abstract Co-Author*)
Kyle See (*Abstract Co-Author*)
MD MAHFUZ AL HASAN (*Abstract Co-Author*)
Rosana S. Rodrigues, MD, PhD (*Abstract Co-Author*)
Bruno Hochhegger, MD, PhD (*Abstract Co-Author*)

PURPOSE

Chronic obstructive pulmonary disease (COPD) is a leading cause of mortality globally, yet it remains underdiagnosed due to the limited use of spirometry, especially in resource-constrained settings. Chest CT is commonly employed in lung cancer screening and COPD assessment, but its potential for predicting pulmonary function using AI models has been underexplored. This study aims to evaluate a hybrid AI model that combines CT projections with lobar attenuation features to predict spirometric parameters, offering an opportunistic and low-computational-demand method to identify patients at risk for abnormal pulmonary function.

METHODS AND MATERIALS

This retrospective study analyzed low-dose chest CT scans and spirometry data from the National Lung Screening Trial (N = 7,933) and an external cohort from Brazil (N = 266). A convolutional neural network was trained using three coronal CT projections, combined with quantitative CT features. The model's ability to predict FEV1, FVC, and the FEV1/FVC ratio was evaluated, alongside its accuracy in identifying abnormal pulmonary function. For continuous PFT prediction, accuracy was assessed using root mean square error (RMSE), mean absolute error (MAE), and concordance metrics. For binary classification (normal vs. abnormal pulmonary function), performance metrics such as accuracy, sensitivity, specificity, and the summary receiver operating characteristic (SROC) curve were evaluated.

RESULTS

The model demonstrated an accuracy of 88.3%, sensitivity of 88.9%, specificity of 88.0%, and an SROC AUC of 0.93 for detecting abnormal pulmonary function in the external test cohort. Continuous predictions from the model showed strong correlations with reference spirometry (all $r > 0.7$). For the FEV1/FVC ratio, the model achieved a concordance correlation coefficient (CCC) of 0.70, an RMSE of 0.11, and a MAE of 0.09. For FEV1, the CCC was 0.67, with an RMSE of 0.52 and an MAE of 0.41. For FVC, the CCC was 0.60, with an RMSE of 0.74 and an MAE of 0.60.

CONCLUSION

This study introduces a novel hybrid model that accurately predicts pulmonary function using low-dose chest CT, achieving high predictive performance. The model surpasses more complex approaches, providing a streamlined and efficient tool for identifying individuals at risk for abnormal pulmonary function.

CLINICAL RELEVANCE/APPLICATION

This study highlights the potential of AI-based imaging biomarkers, requiring low computational power, for opportunistic pulmonary function testing in lung cancer screening. It presents an opportunity to optimize spirometry referrals and enhance COPD diagnosis in high-risk patients.

W2-STCE1-2 LYMPH NODE ADIPOSITY AND BREAST ARTERIAL CALCIFICATION: OPPORTUNISTIC IMAGING BIOMARKERS OF CARDIOVASCULAR DISEASE RISK ON SCREENING MAMMOGRAPHY

Roberta M. diFlorio-Alexander, MD, MS (*Presenter*)
Judith M. Austin-Strohbehn, MD (*Abstract Co-Author*)
Clifford J. Eskey, MD, PhD (*Abstract Co-Author*)
Thara Ali (*Abstract Co-Author*)

PURPOSE

Cardiovascular disease (CVD) remains the leading cause of death among women in the United States (U.S.). Screening mammograms contain imaging features such as breast arterial calcification (BAC) that may be opportunistically used to identify women at high risk for CVD. Emerging evidence suggests that axillary lymph node adiposity (LNA) — defined as cancer-free lymph nodes enlarged by excess hilar fat (Figure 1) — may serve as an additional imaging biomarker of CVD risk on mammography. This study aims to compare the associations of LNA and BAC, independently and combined, with (a) high CVD risk calculated by the pooled cohort equation (PCE) defined as >7.5% 10-year risk of a major adverse cardiovascular event (MACE) and (b) incidence of MACE

METHODS AND MATERIALS

In this retrospective cohort study, we evaluated 1206 consecutive women aged 40-75 who underwent routine screening mammography at our institution from 2011 to 2012 and who had a PCE risk assessment within one year of imaging. MACE incidence was evaluated over 10 years. Index mammograms were reviewed for the presence of BAC and LNA. BAC was anayzed as a binary variable, and LNA was determined via measurement of the largest lymph node dimension on the mediolateral oblique (MLO) view (Figure 1). Associations between BAC, LNA, high CVD risk, and MACE were analyzed using a multivariable logistic regression model, adjusting for baseline risk factors.

RESULTS

LNA showed a statistically significant association with CVD risk estimation, which persisted after adjusting for age (OR continuous = 1.37, $p < 0.001$). However, adding LNA to the PCE did not enhance MACE prediction. BAC was not significantly associated with the PCE estimation of CVD risk after adjusting for age. However, adding BAC to the PCE improved MACE prediction among women aged 40-65 (OR= 2.7, $p = 0.002$).

CONCLUSION

LNA may represent a novel body composition imaging biomarker of high CVD risk that is available on a widely utilized screening exam in women over 40. Additionally, BAC may enhance MACE prediction beyond PCE risk assessment in women aged 40-65.

CLINICAL RELEVANCE/APPLICATION

The American Heart Association has called for improved CVD risk assessment in women. Body composition studies have demonstrated a link between cardiometabolic disease and adiposity in muscle, liver, and the visceral cavity, yet the role of immune system adiposity has been largely overlooked. Furthermore, most body composition evaluation requires advanced imaging studies that are not routinely performed in healthy populations. In contrast, LNA and BAC can be assessed on screening mammography, a study that is utilized by 78% of eligible women in the U.S., thereby allowing for potential large-scale CVD opportunistic risk assessment.

W2-STCE1-3 OPPORTUNISTIC CARDIOVASCULAR RISK ASSESSMENT FROM EMERGENCY DEPARTMENT HEAD CT IMAGING

Xiaoman Zhang, PhD (*Presenter*)
Julian Acosta, MD (*Abstract Co-Author*)
Siddhant Dogra, MD (*Abstract Co-Author*)
Erica Silva (*Abstract Co-Author*)
Sanjay Basu (*Abstract Co-Author*)
Rohan Khera (*Abstract Co-Author*)
Pranav Rajpurkar, PhD (*Abstract Co-Author*)
David Kim (*Abstract Co-Author*)

PURPOSE

To develop and validate deep learning (DL) models that leverage routine head CT scans to opportunistically predict incident cardiovascular disease (CVD) events and coronary artery calcium (CAC) scores, comparing performance against established clinical risk factors.

METHODS AND MATERIALS

This retrospective cohort study analyzed de-identified data from a large academic health system. The CVD prediction cohort included 27,990 adults without prior CVD who had head CT scans. The CAC prediction cohort included 2,313 adults with head CT and coronary CT angiography. DL models were pre-trained on 98,175 head CT studies using vision transformers. 3 models were developed: (1) PREVENT variables (clinical factors), (2) HeadCT (imaging features alone), and (3) HeadCT+PREVENT (combined). Primary outcomes were incident CVD events (myocardial infarction, stroke, heart failure) assessed using Cox Proportional Hazards models, and CAC scores (0, 1-10, 11-100, 101-400, >400 Agatston units) assessed using multiclass classification. Performance was evaluated using the concordance index (C-index) and area under the receiver operating characteristic curve (AUROC).

RESULTS

For CVD prediction (median age 63.0 years, 51.7% female, median follow-up 533 days), the HeadCT model achieved superior performance with C-index 0.82 (95% CI: 0.78-0.85) versus PREVENT variables (0.75, 95% CI: 0.70-0.79), showing significant improvement of 0.07 (95% CI: 0.04-0.10). During follow-up, 4.0% (n=1,110) experienced cardiovascular events. For CAC prediction (median age 65.0 years, 53.5% female), the HeadCT+PREVENT model achieved the highest performance (C-index 0.76, 95% CI: 0.72-0.80) and AUROC 0.80 (95% CI: 0.73-0.85) for predicting substantial coronary calcification (CAC >100). Among reclassified patients, 74.5% were correctly reclassified. Patients reclassified to higher CVD risk were younger with more favorable traditional risk profiles but had a higher prevalence of vascular calcifications (30.2% vs 24.8%, p=0.001) and brain infarcts (20.1% vs 5.8%, p<0.001) on imaging.

CONCLUSION

Routine head CT scans can significantly improve cardiovascular risk stratification beyond traditional clinical factors. DL models identified subclinical cardiovascular disease in younger patients with favorable traditional risk profiles.

CLINICAL RELEVANCE/APPLICATION

Head CT-derived cardiovascular risk assessment could enable real-time identification of high-risk patients, facilitating immediate preventive interventions (statins, smoking cessation, cardiology referral), potentially improving early detection and prevention of cardiovascular disease for millions of patients annually without additional cost, radiation exposure, or workflow disruption.

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W2-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER THEATER 2

Sub-Events

W2-STCE2-3 DIFFUSION BRIDGE-BASED GENERATION OF XENON-ENHANCED VENTILATION IMAGES FROM PAIRED DUAL-ENERGY VIRTUAL NON-CONTRAST CT

Chang Yong Choi, MS (*Presenter*)
Sangyoon Lee, PhD (*Abstract Co-Author*)
Jongjun Won, BS (*Abstract Co-Author*)
Hye Jeon Hwang, MD, PhD (*Abstract Co-Author*)
Sang Min Lee, MD, PhD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate whether Xenon-enhanced Ventilation Images (XeVIs) can be generated from paired virtual non-contrast (VNC) CT using a diffusion bridge model (DBM), offering a contrast-free alternative for functional imaging in obstructive airway disease.

METHODS AND MATERIALS

We retrospectively collected XeVIs from 268 patients with chronic obstructive pulmonary disease (COPD) or asthma-COPD overlap syndrome from a tertiary hospital. For each case, paired inspiratory and expiratory (insp/exp) VNC CT images were also acquired using dual-energy CT (Somatom Definition, Siemens Healthineers) through material decomposition. The dataset was split into training, internal, and temporally separated test sets (n = 180, 44, 44, respectively). A conditional DBM was trained to generate XeVIs from insp/exp VNC CT pairs, guided by physiologic CT ventilation images computed from Hounsfield unit (HU) differences. Defect lung areas (DLA) were evaluated by computing the Dice similarity coefficient (DSC) between generated and reference XeVIs. Physiologic agreement was assessed by computing Pearson correlation coefficients between defect lung percentage (DLP) and pulmonary function test (PFT) parameters (FVC, FEV1/FVC, DLCO) for both generated and reference XeVIs. Statistical comparison of the correlation coefficients was performed using Fisher's r-to-z transformation. Image quality of the generated XeVIs was independently evaluated by two board-certified thoracic radiologists with 16 and 14 years of experience, using a 5-point scale.

RESULTS

The DSC of DLA between generated and reference XeVIs was 57.98 ± 8.87 in the internal test and 53.55 ± 11.74 in the temporally separated test. Correlations between DLP and PFT parameters were observed in both generated and reference XeVIs. FEV1/FVC and DLCO showed significantly negative correlations across test sets, while FVC correlations were weaker (reference: r = -0.549 and -0.177, generated: r = -0.289 and 0.035 for internal and temporally separated test sets, respectively). No significant differences were found between correlation coefficients (all p > 0.05). The mean image quality scores assigned by reader 1 and reader 2 were 4.05 ± 0.90 and 3.53 ± 1.01, respectively.

CONCLUSION

The proposed model effectively captures regional ventilation defects and preserves clinically relevant correlations with pulmonary function metrics, suggesting its feasibility as a functional imaging surrogate.

CLINICAL RELEVANCE/APPLICATION

This diffusion-based approach enables generation of physiologically meaningful ventilation images without the need for contrast agents or specialized acquisition protocols, potentially expanding access to functional lung assessment in patients with obstructive airway diseases.

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W3-SSBR08

Breast Imaging (Interventional Procedures and Pathology)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: S406A

Steven P. Poplack, MD (*Moderator*)
Sarah J. Vinnicombe, FRCR, MRCP (*Moderator*)

Sub-Events

W3-SSBR08-1 NON-SURGICAL TREATMENT OF BREAST CANCER: A COMPARISON OF OUTCOMES BETWEEN CRYOABLATION WITH HORMONAL THERAPY VERSUS CRYOABLATION ALONE AND HORMONAL THERAPY ALONE IN PATIENTS NOT ELIGIBLE FOR SURGERY

Federica Di Naro, MD (*Presenter*)
Sofia Elisabetta Baldi Giorgi (*Abstract Co-Author*)
Francesca Pugliese, MD (*Abstract Co-Author*)
Sofia Vidali (*Abstract Co-Author*)
Tommaso Amadori, MD (*Abstract Co-Author*)
Diego De Benedetto (*Abstract Co-Author*)
Jacopo Nori Cucchiari (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the most effective non-surgical treatment for breast cancer in surgery-ineligible patients, comparing ultrasound-guided Cryoablation combined with hormonal therapy (HT) versus Cryoablation alone and hormonal therapy alone.

METHODS AND MATERIALS

A cohort of 111 patients (mean age 81.2 years, ±11.3) not-suitable for surgery due to comorbidities and/or advanced age was enrolled, with a total of 125 biopsy-confirmed malignant breast lesions. All the lesions were invasive ductal carcinomas (mean size 17.7 mm), hormone-positive and HER2-negative, with no ultrasound-visible lymph node involvement. Patients were divided into three groups: 41 lesions were treated with Cryoablation and HT, 36 with Cryoablation only and 36 with HT only. A locoregional staging was performed at baseline with contrast-enhanced-mammography (CEM) and ultrasound, followed by CEM and ultrasound follow-up at 12 months post-treatment. Only patients completing the follow-up were included. Lesion size was compared at baseline and 12 months after-treatment. Fisher's exact test was used for group comparison.

RESULTS

Of the 125 lesions, 98 of them completed the 12-months follow-up; 39 in the Cryoablation-with-HT group, 23 in the Cryoablation-only group, and 36 in the HT-only group. Tumor size reduction was significantly different between the groups (P=0.0005), with greatest reduction in the Cryoablation-with-HT group (83.3%, mean reduction of 13.6 mm), followed by Cryoablation-only (61.7%, mean reduction of 8.2 mm), and HT-only (42.1%, mean reduction of 7.4 mm). Tumors with no CEM-enhancement, suggesting no residual-disease, were most frequent in the Cryoablation-with-HT group (69.2%), followed by Cryoablation-only (60.9%),and HT-only (36.1%). Tumors with complete remission (CR, RECIST 1.1) were similar between the Cryoablation-with-HT and Cryoablation-only groups (74.4% and 78.3%, respectively), followed by the HT-only (36.1%). Pairwise comparisons revealed a significant difference between the Cryoablation-with-HT and the HT-only groups for CEM-enhancement, size reduction (%), and CR, expressing the added value of Cryoablation (P=0.0041, P<0.0001 and P<0.0001, respectively).

CONCLUSION

Cryoablation with hormonal-therapy significantly reduces tumor size and residual disease more effectively than therapy alone, making it a promising option for patients not-eligible for surgery.

CLINICAL RELEVANCE/APPLICATION

Integrating cryoablation with hormonal therapy leverages complementary mechanisms for tumor control, providing a targeted and minimally invasive strategy tailored to frail breast cancer patients.

W3-SSBR08-2 CAN WE OMIT SENTINEL LYMPH NODE BIOPSY? RETROSPECTIVE ANALYSIS BASED ON THE SOUND TRIAL

Laura Abelairas Lopez, MD (*Presenter*)
Laura Lopez, MD (*Abstract Co-Author*)
Lucia Grana Lopez, MD (*Abstract Co-Author*)
Ignacio Fernandez Sobrado (*Abstract Co-Author*)

PURPOSE

The aim of this study is to retrospectively evaluate if the omission of surgical axillary staging in patients diagnosed with early breast cancer (cT1cN0) would have had impact on the adjuvant treatment (hormone or chemotherapy).

METHODS AND MATERIALS

All patients with cT1N0 breast cancer, diagnosed in our Breast Unit, who underwent sentinel lymph node biopsy (SLNB), according to the SOUND trial criteria, between January 2021 and December 2024, were identified from a prospectively maintained database. Clinicopathological characteristics and information on surgical and adjuvant treatment were examined. A descriptive statistical analysis of the data was performed.

RESULTS

A total of 283 patients met eligibility criteria. Median age was 62 (IQR 54-69) years, and 211 (74,5%) were post-menopausal women. Regarding tumor type, most were infiltrating ductal carcinomas (n=231; 81,62%), histological grade 1 (n=135; 47,7%) or grade 2 (n=132; 46,64%) and had positive hormone receptors: 138 (48,76%) Luminal A, 109 (38,51%) Luminal B Her2 negative, 21 (7,42%) Luminal B Her2 positive. SLNB was positive in 61 patients (pN+), so the false-negative rate of axillary ultrasound was 21,5%. Of these, 96.7% presented three or fewer positive nodes after axillary surgery (27 pN1mi and 32 pN1a). Following the SOUND study

recommendations, if we analyze the group of postmenopausal patients, the false-negative rate of ultrasound drops to 15% (32/211). Adjuvant chemotherapy recommendations changed, due to the pathological nodal status, in only 5/(211) post-menopausal women.

CONCLUSION

In postmenopausal women with cT1 breast cancer, axillary ultrasound is accurate to predict significant nodal disease burden, supporting the implementation of the SOUND trial results without compromising the adjuvant chemotherapy recommendations.

CLINICAL RELEVANCE/APPLICATION

In patients with small breast cancer and negative axillary ultrasonography, axillary surgery could be safely avoided without an impact on adjuvant chemotherapy recommendations.

W3-SSBR08-3 DE-ESCALATION THERAPY IN WOMEN ≥ 70 WITH LOW-RISK EARLY-STAGE BREAST CANCER: MULTI-INSTITUTIONAL EXPERIENCE AND OUTCOME WITH ULTRASOUND-GUIDED CRYOABLATION

Janice Thai, MD (*Presenter*)

PURPOSE

To determine the locoregional tumor recurrence rate in small, low-risk, early-stage breast cancer treated with ultrasound-guided cryoablation. Cryoablation therapy for breast cancer is a non-surgical alternative to lumpectomy in elderly women with small, early-stage breast cancer, offering the benefits of a minimally invasive procedure, greater quality of life, superior cosmetic outcome and substantial cost savings.

METHODS AND MATERIALS

Women with newly-diagnosed breast cancer = 70 years old meeting selection criteria were recruited and treated at five institutions. Patients were selected for cryoablation treatment based on the following selection criteria: 1) histology of invasive ductal carcinoma, 2) small size (= 1.5 cm), 3) low histologic grade (Nottingham 1-2), 4) < 25% intraductal component or ductal carcinoma in situ, 5) unifocal disease, 6) hormone receptor positivity for estrogen/progesterone (ER/PR+) and receptor negativity for human epidermal growth factor 2 (HER2-), 7) ultrasound-visible mass or biopsy clip, and 8) clinically/imaging axillary node negative. Ultrasound-guided cryoablation was performed with a standard freeze-thaw-freeze treatment cycle to achieve a 1 cm ablation margin. Postablation imaging follow-up was performed with mammography, contrast-enhanced mammography, ultrasound or contrast-enhanced MRI.

RESULTS

Between October 2017 and December 2024, eighty two women with a mean age of 78 (range 70-94) who were diagnosed with breast cancer and treated with cryoablation were included in the analysis. Eighty two procedures were performed with standard procedural protocol using either argon gas- or liquid nitrogen-based cryoablation systems with only local anesthesia. With a mean imaging follow-up duration of 36 months (range 6 months to 8 years), there were three locoregional recurrences at the site of cryoablation (3.7 %). The recurrences were detected on imaging at 12, 12 and 24 months, respectively, and confirmed by biopsy and subsequent surgical resection. Only three patients were treated with whole breast radiation. Thirty eight patients had adjuvant endocrine therapy with a mean duration of 48 months. There was no device-related complication.

CONCLUSION

Cryoablation therapy is a safe and effective non-surgical alternative treatment for small, low-risk breast cancer in elderly women, with a locoregional recurrence rate that is similar to lumpectomy. Patients benefited from multiple advantages of cryoablation therapy, including the use of only local anesthesia and fast recovery.

CLINICAL RELEVANCE/APPLICATION

Results from this large multi-institutional study demonstrates a positive outcome for ultrasound-guided cryotherapy for small, low-risk breast cancer in elderly women.

W3-SSBR08-4 CRYOABLATION EFFECTIVENESS IN TREATING STAGE I/II HER2-NEGATIVE INVASIVE BREAST CANCER WITH AXILLARY SURGERY OMISSION BASED ON TUMOR IMMUNOPHENOTYPE

Jorge Rey, MD (*Presenter*)
Jose Maria Oliver-Goldaracena (*Abstract Co-Author*)
Laura Tello Arnas (*Abstract Co-Author*)
Jorge Guisandez (*Abstract Co-Author*)
Ignacio De Garcillan, MD (*Abstract Co-Author*)
Maria Aguilar Picapiedra (*Abstract Co-Author*)
Pablo Lama (*Abstract Co-Author*)

PURPOSE

To evaluate the effectiveness of cryoablation in the treatment of early-stage (clinical stage I/II) invasive breast cancer in patients who underwent axillary surgery omission, according to tumor immunophenotype.

METHODS AND MATERIALS

We retrospectively reviewed local recurrence and local control rates in patients with early-stage invasive breast cancer treated with cryoablation and omission of axillary surgery, with a minimum follow-up of 18 months. Patients were categorized based on estrogen receptor status (ER+ or ER-). Cryoablation treatment was determined by a multidisciplinary breast cancer board. ER+ patients also received adjuvant hormonal therapy. Follow-up included semiannual ultrasound and annual mammography. In cases of suspected local or distant recurrence, a core needle biopsy was performed. Confirmed recurrences were managed with repeat cryoablation.

RESULTS

In the ER+ group, 69 tumors (3-60 mm, mean 18 mm) in 64 patients (ages 58-96, mean 83) were followed for a mean of 31 months (range 18-60). Two local recurrences (2.9%) occurred between 17 and 24 months (mean 21). Both were successfully treated with repeat cryoablation, achieving a 100% local control rate. In the ER- group, 13 tumors (15-45 mm, mean 32 mm) in 13 patients (ages 83-94, mean 88) were followed for a mean of 20 months (range 18-30). Six local recurrences (46%) were observed between 3 and 24 months (mean 10). Five of these were retreated with cryoablation, achieving a second-attempt local control in four cases. Overall local control rate was 84.6% (11/13).

CONCLUSION

Cryoablation is highly effective in treating ER+ early-stage invasive breast cancers, providing excellent local control. Its effectiveness in ER- tumors is lower but still offers a substantial local control rate near 85%.

CLINICAL RELEVANCE/APPLICATION

Cryoablation may serve as a viable, minimally invasive alternative for elderly patients with early-stage breast cancer, particularly in ER+ subtypes, enabling omission of axillary surgery without compromising local control.

W3-SSBR08-5 ACHIEVING IMPROVING ACCURACY AND REDUCING UNNECESSARY BIOSPY IN ULTRASOUND DIAGNOSIS OF BREAST LEISIONS USING LARGE LANGUAGE MODELS IN REAL-WORLD

Yi Feng Zhang, MD, PhD (*Presenter*)

PURPOSE

Large language models (LLMs) demonstrate considerable potential in the interpretation of medical imaging. The emergence of GPT-4o has opened new avenues for automated image-text processing. Unlike other AI models, large language models are more convenient to use and output results more quickly and directly, making them very suitable for real-world clinical diagnostic scenarios. The purpose of this study is to evaluate the diagnostic accuracy of GPT-4o in breast lesions and its value in reducing unnecessary biopsy in real clinical scenarios.

METHODS AND MATERIALS

In this retrospective study, ultrasound images of breast nodules and corresponding free-text reports were collected. We evaluated ChatGPT-4o's diagnostic performance in breast nodule classification via two modalities: analyzing textual descriptions or ultrasound images of breast lesions by ChatGPT-4o. Compare the BI-RADS classification results output by the above two diagnostic modes with the results of radiologists in reality. The sensitivity, specificity, PPV, NPV, accuracy, the area under the receiver operating characteristic curve (AUC), and corresponding unnecessary biopsy rates (UBR) were compared. All cases had pathological findings as the reference standard. The intra-agreements of ChatGPT-4o have also been evaluated.

RESULTS

A total 1271 images and 424 text reports from 424 breast lesions (294 benign lesions and 130 malignant lesions) were included. The sensitivity, specificity, PPV, NPV, accuracy, AUC and UBRs of three diagnostic modes were as follows: ChatGPT-4o-Image: 77.5%,64.4%, 48.8%,86.8%,68.4%,0.710 and 51.2%; radiologists: 95.3%,79.0%,46.2%,96.2%, 64.9%,0.734 and 53.8%; ChatGPT-4o-Text: 82.1%,79.0%,63.1%,91.0%, 80.0%,0.806 and 36.9%. The intra-agreements of ChatGPT-4o-Image and ChatGPT-4o-Text were 0.68 and 0.82, respectively. The accuracy and AUC of ChatGPT-4o-Text were significantly higher than those of the other two modes ($P < 0.001$). The UBR of ChatGPT-4o-Text was significantly lower than that of ChatGPT-4o-Image and radiologists ($P < 0.001$).

CONCLUSION

A LLMs based on textual description of lesions achieved superior diagnostic accuracy and markedly reduced UBRs compared with radiologists in real-world settings, simultaneously possessing excellent repeatability. This advantage arises from their objective analysis of ultrasound-derived tumor features, free from the subjective variability of human interpretation.

CLINICAL RELEVANCE/APPLICATION

Coupled with intuitive interfaces and clear result presentation, LLMs thus represent a promising preoperative diagnostic aid for breast tumor evaluation.

W3-SSBR08-6 CONTRAST-ENHANCED MAMMOGRAM (CEM)-GUIDED BIOPSY OUTCOMES: A SINGLE-INSTITUTION COMPARISON OF SUCCESSFUL AND CANCELED BIOPSY CHARACTERISTICS

Michelle Lee, MD (*Presenter*)
Alison McIlvride, MD (*Abstract Co-Author*)
Paola C. Tabaro Pico, MD (*Abstract Co-Author*)
Varadan Sevilimedu (*Abstract Co-Author*)
Molly P. Hogan, MD (*Abstract Co-Author*)
Donna D. D'Alessio, MD (*Abstract Co-Author*)
Janice S. Sung, MD (*Abstract Co-Author*)
Maxine S. Jochelson, MD (*Abstract Co-Author*)
Victoria L. Mango, MD (*Abstract Co-Author*)

PURPOSE

Contrast-enhanced mammography (CEM)-guided biopsy is an emerging technique with little data available. Our purpose is to determine the frequency, imaging features and initial follow up results of successful CEM-guided biopsies, as well as to compare characteristics between successful and canceled biopsies.

METHODS AND MATERIALS

IRB-approved, HIPAA-compliant search of our institutional database identified CEM-guided biopsies performed from January 1, 2023 to October 4, 2024. The electronic medical record, images, procedure and pathology reports were reviewed for patient demographics, biopsy target characteristics, imaging follow up and available pathology. Descriptive statistics were performed.

RESULTS

74 CEM-guided biopsies were attempted during the study period. Fifty-three of 74 (71.6%) were successful and 21 of 74 (28.4%) were cancelled. The median age was 50 years and not significantly different between successful and cancelled cases ($p = 0.7$). The median biopsy target size was significantly larger in successful biopsies (1.2 cm) than in cancelled biopsies (0.7 cm) ($p = 0.027$). Biopsy targets included non-mass enhancement (50/74, 68%), mass (20/74, 27%), asymmetry (3/74, 4%), and architectural distortion (1/74, 1%), with no statistically significant difference in target type between successful and cancelled biopsies ($p = 0.9$). Fifteen of 53 (28%) successfully biopsied targets ultimately yielded cancer, 4 of 53 (8%) yielded high-risk pathology, and 34 of 53 (64%) yielded benign pathology. In patients with a history of cancer within the last two years, 13 of 53 (25%) successful biopsy targets yielded cancer.

CONCLUSION

In our single-institution study, 72% of CEM-guided biopsies were successfully completed and 28% were canceled. Successful biopsies were associated with larger targets (at least approximately one centimeter) and canceled biopsies were associated with smaller targets (less than approximately one centimeter). Malignancy was found in 28% of successful biopsy cases; however, long-term follow-up of canceled biopsy cases is needed.

CLINICAL RELEVANCE/APPLICATION

CEM-guided biopsy is an effective technique to evaluate enhancing lesions detected on contrast-enhanced mammography for breast cancer. Assessing its success rate, imaging characteristics, and malignancy yield is crucial for optimizing both diagnostic accuracy and procedural efficiency as CEM and CEM-guided biopsy continues to expand in clinical practice.

Nov. 30 – Dec. 4
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W3-SSCA07

Cardiac Imaging (Clinically Applied AI)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E353C

Rozemarijn Vliegenthart, MD, PhD (*Moderator*)
Scott J. Adams, MD, PhD (*Moderator*)

Sub-Events

W3-SSCA07-2 BREAST ARTERIAL CALCIFICATION PROGRESSION ON MAMMOGRAMS PREDICTS RISK OF MAJOR ADVERSE CARDIOVASCULAR EVENTS

Alyssa T. Watanabe, MD (*Presenter*)
Richard Mantey (*Abstract Co-Author*)
Junhao Wang (*Abstract Co-Author*)
Homa Karimabadi, PhD (*Abstract Co-Author*)

PURPOSE

Evaluate if extent and progression rate of breast arterial calcification (BAC) on mammograms is predictive of major adverse cardiovascular events and mortality (MACE).

METHODS AND MATERIALS

We retrospectively evaluated 27,780 full-field digital mammograms in 10,348 women (index age 26-94, mean 56 years) performed 2006-2016 at a single Southwestern U.S. academic center. Imaging follow-up ranged 6 months-10 years (mean 4.1 years) and clinical follow-up 6 months-15 years (mean 5.6 years). An artificial intelligence model (AI) generated a BAC score for each exam. BAC positive scores were age-adjusted to derive percentiles, then binned by quartile (Q): 1st-25th (Q1),26-50th (Q2), 51-75th (Q3) and 76-100th (Q4). Adjusted Hazard ratios (HRs) for MACE were obtained using stable BAC-negative women as reference (covariates = ethnicity, chronic kidney disease, cardiovascular disease, smoking, hypertension, hyperlipidemia, elevated A1C, and use of antihypertensive or cholesterol-lowering medications). HRs calculated for all women and women < 65 years.

RESULTS

Higher but stable BAC quartiles were associated with high HRs: compared to the reference, HRs were 1.41 (95% CI 1.10-1.68) for Q2, 1.28 (1.06-1.54) for Q3, and 2.11 (1.76-2.52) for Q4. In those showing BAC progression, the hazard ratios rose to 2.19 for Q1?Q3, 8.66 for Q1?Q4, and 1.90 for Q3?Q4. These effects were even more pronounced in women under 65, with HRs of 2.80 (Q1?Q3), 10.86 (Q1?Q4), and 2.01 (Q3?Q4).

CONCLUSION

BAC severity and progression rate are both significant independent predictors of MACE risk. Women under age 65 with rapid progression of BAC into upper quartiles over 10 years face more than a 10-fold increased risk compared to women who remain BAC negative.

CLINICAL RELEVANCE/APPLICATION

Reporting of breast arterial calcification severity and progression on sequential mammograms may aid in identifying subgroups of women who are at greatest cardiovascular risk.

W3-SSCA07-3 AI-BASED AUTOMATED BREAST ARTERIAL CALCIFICATION ON SCREENING MAMMOGRAMS PREDICTS CARDIOVASCULAR RISK

Samantha Platt, MD (*Presenter*)
Pranav Singh (*Abstract Co-Author*)
Laura Heacock, MD, MS (*Abstract Co-Author*)
Yiqiu Shen, PhD, BSc (*Abstract Co-Author*)
Krzysztof J. Geras (*Abstract Co-Author*)
Miriam A. Bredella, MD, MBA (*Abstract Co-Author*)

PURPOSE

Cardiovascular disease (CVD) is the leading cause of death in women, and coronary artery calcium (CAC) scanning using ECG-triggered CT can predict coronary artery disease and major adverse cardiovascular events (MACE). Women undergoing screening mammography are susceptible to both breast cancer and CVD. Breast arterial calcification (BAC) can be quantified automatically using artificial intelligence (AI) on screening mammograms potentially offering a way to predict MACE. The purpose of our study was to determine the clinical utility of BAC assessment on screening mammograms to predict CAC and MACE.

METHODS AND MATERIALS

A fully automated AI algorithm to detect BAC was retrospectively applied to a cohort of women that had undergone both screening mammography and ECG-triggered CAC CT within 12 months. Subsequent MACE (myocardial infarction (MI)/coronary revascularization) were identified via electronic health record review. Logistic regression analysis was performed to determine associations between BAC and CAC. Sensitivity, specificity, positive and negative predictive value, and accuracy of BAC identifying CAC and MACE was calculated.

RESULTS

Our cohort included 5100 women (mean age: 66 ± 10 years, 65% White). BAC were present in 1421 women (28%) and there were 876 MACE. The presence of BAC was positively correlated with and CAC ($r=0.18$, $p<0.001$). Sensitivity, specificity, positive and negative predictive value, and accuracy of BAC to identify CAC was 36%. 80%, 64%, 55%, and 58%, respectively. BAC had a high negative predictive value for identifying MI (98%) and coronary revascularization (97%). Sensitivity, specificity, and accuracy were 38%, 72%, and 72% for MI, and 45%, 73%, and 72% for coronary revascularization, respectively.

CONCLUSION

BAC, quantified on screening mammograms using a fully automated AI algorithm, correlated with CAC and had a high negative predictive value for MACE. These data support the use of opportunistic BAC screening on mammography.

CLINICAL RELEVANCE/APPLICATION

A fully automated AI algorithm can be used to screen for breast arterial calcification on screening mammograms, thereby allowing not only for the early detection of breast cancer but also cardiovascular disease.

W3-SSCA07-4 A FULLY AUTOMATED DEEP LEARNING MODEL FOR QUANTIFYING CORONARY PLAQUE AND PREDICTING CARDIOVASCULAR EVENTS ON CORONARY CT ANGIOGRAPHY: A CHINESE MULTI-COHORT STUDY

Qian Chen, MD, PhD (*Presenter*)
Zhang Longjiang (*Abstract Co-Author*)

PURPOSE

Deep learning (DL) models for quantifying plaques on coronary CT angiography (CCTA) in routine clinical care are scarce. Our study aimed to develop and validate a fully automated DL model based on CCTA for coronary plaque detection and quantification.

METHODS AND MATERIALS

This retrospective, multicenter study included patients with coronary artery disease who underwent CCTA at 17 Chinese hospitals between June 15, 2009, and May 14, 2024. We trained and validated a fully automated DL model to segment coronary plaques in 2013 patients (6202lesions). The DL model was external tested in 100 patients with paired CCTA and intravascular US within 3 months, 100 patients in subgroup of China CT-FFR Study 3, 59 patients undergoing pre- and postprocedural CT of left atrial appendage closure (LAAC) within 3 months, and 100 patients undergoing the latest photon-counting detector CT. Further, the prognostic value of the DL model was validated in 10644 patients from China CT-FFR Study 2, 1122 patients from China CT-FFR Study 1.1, and 270 patients undergoing serial CCTA examinations. The study is registered at ClinicalTrials.gov (NCT03871140).

RESULTS

The DL model demonstrated excellent agreement for quantifying total plaque volumes against intravascular US and expert readers in subgroup of China CT-FFR Study 3 (all intraclass correlation coefficients [ICCs] > 0.90). For patients undergoing pre- and postprocedural of LAAC, the DL model showed high reproductivity for quantifying total plaque volumes (ICC=0·984, 95% CI 0·974-0·990). Excellent diagnostic agreement was found between DL model and expert readers for quantifying total plaque volume in photon-counting detector CT. The DL-based total plaque volume was associated with higher major adverse cardiac outcomes (MACEs) (hazard ratio [HR]: 2.17 per IQR, 95% CI 1.64-2.87, p<0.001) in China CT-FFR Study 2 (2.3-year follow-up), after correction for clinical risk factors. The DL-based total plaque volume predicted MACEs independently of clinical risk factors (HR: 2.95 per IQR, 95% CI 1.88-4.62, p<0.001) in China CT-FFR Study 1.1 (5-year follow-up). Plaque progression also was an independent predictor (HR: 2.55 per IQR, 95% CI 1.14-5.68, p=0.022) of MACEs (4-year follow-up).

CONCLUSION

In conclusion, we developed and externally validated a fully automated DL model for quantifying plaque volume. The DL model closely aligns with expert readers and intravascular US, and it carries prognostic value for future adverse cardiac events.

CLINICAL RELEVANCE/APPLICATION

The proposed DL system has the potential to be integrated into routine CCTA workflow as a clinical decision support tool.

W3-SSCA07-5 PREDICTING ADVERSE CARDIAC EVENTS USING CLINICAL AND IMAGING FEATURES WITH AN INTERPRETABLE MACHINE LEARNING MODEL

Xinyue Yan, BS (*Presenter*)
Gabrielle Gershon, BS (*Abstract Co-Author*)
Ali Adibi (*Abstract Co-Author*)
Nattakorn Kittisut (*Abstract Co-Author*)
Roy Gabriel (*Abstract Co-Author*)
Saikiran Rapaka, PhD (*Abstract Co-Author*)
Carlo N. De Cecco, MD, PhD (*Abstract Co-Author*)
Marly Van Assen, MSc, PhD (*Abstract Co-Author*)

PURPOSE

This project aims to evaluate the importance of various clinical and imaging variables in developing a machine learning model (ML) for risk prediction of major adverse cardiac events (MACE).

METHODS AND MATERIALS

This retrospective study included coronary artery calcium (CAC) CT imaging from 7,828 individuals without known cardiac disease between 2010-2023. A total of 52 variables, including 16 clinical, 7 medications-related, 15 EKG-derived, and 14 CT-derived variables were used. From CT, Agatston score, mean and peak calcium density, calcium volume, and cardiac chamber volumes were quantified. An XGBoost model was generated with 10-fold stratified cross-validation for outcome prediction. Grid search was used to optimize hyperparameters. Total gain metrics were used to evaluate feature importance, identifying key predictors. Model performance was assessed using the area under the receiver operating characteristic curve (AUROC) and compared against clinical risk scores (PCE and PREVENT).

RESULTS

The mean age was 57.9 years old, 11.5% were Black, and 44.6% were women. Hypercholesteremia was the most prevalent clinical risk factor, present in 6,195 (79%) of individuals. Non-zero CAC was present in 56.6% of individuals with a median non-zero CAC of 44.2. MACE rate was 4.5% for the total population. The ML model achieved an AUC of 0.861 for predicting MACE. ML outperformed individual clinical risk score models including PCE and PREVENT (AUC=0.627 and 0.630). ML also outperformed total CAC score alone (AUC=0.628). PREVENT and PCE risk scores and CAC scores in the left anterior descending artery were the features that obtained the highest gain for predicting MACE. Imaging features such as total CAC volume, myocardial volume and right atrial volume, and multiple CAC subregion scores also ranked among the top predictors.

CONCLUSION

ML based interpretable AI shows good accuracy in predicting MACE using a combination of CT and clinical variables, outperforming clinical risk scores and CAC scoring alone.

CLINICAL RELEVANCE/APPLICATION

ML algorithms can improve outcome prediction by combining multimodality features. Interpretability measures can increase the insight and clinical utility of these algorithms.

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W3-SSER02

Science Session with Keynote: Emergency Radiology (The Expanding Role of AI in Emergency Radiology and Workflow)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: N228

David Dreizin, MD (*Moderator*)
Melissa A. Davis, MD, MBA (*Moderator*)

Sub-Events

W3-SSER02-2 COMPARISON OF THE ACCURACY OF ARTIFICIAL INTELLIGENCE SOFTWARE FOR THE DETECTION OF PNEUMOTHORAX ON CHEST RADIOGRAPHS

Katrina Nash, MBChB (*Presenter*)
James Vaz, MD (*Abstract Co-Author*)
Nabeeha Salik (*Abstract Co-Author*)
Cosmin Mihaiu (*Abstract Co-Author*)
Sarim Ather, PhD, MBChB (*Abstract Co-Author*)
Alex Novak, MBChB (*Abstract Co-Author*)

PURPOSE

To compare the accuracy of commercial artificial intelligence (AI) algorithms in the detection of pneumothorax (PTX) on chest X-rays (CXR).

METHODS AND MATERIALS

We conducted a retrospective evaluation of nine CE-marked AI tools capable of PTX detection using a curated dataset of 394 CXRs obtained from Oxford University Hospitals (OUH). Ground truth for PTX presence/absence on each CXR was established by two radiologists, with disagreement arbitrated by a third. Sensitivity, specificity, and accuracy were calculated for each vendor. Receiver Operating Characteristic (ROC) curve was calculated where vendors were able to provide variable threshold scores. Statistical significance of variability was evaluated using Cochrans Q and McNemars test.

RESULTS

394 CXRs were included in the final dataset, 186 of which were positive for PTX. Accuracy values ranged from 79.5% (95% confidence interval 84.7 - 91.3) to 93.9% (91.1-96.1). All specificity values were greater than 79.5%, with the highest specificity at 97.1% (93.8-98.9). Overall, sensitivity was lower across the group and had a higher spread of results ranging from 54.3% (46.9-61.6) to 92.5% (87.7-95.8). AUC ranged from 0.859 (0.821-0.898) to 0.979 (0.966 - 0.992). Cochran Q test demonstrated a statistically significant difference in performance across the group ($p < 0.001$); McNemars also demonstrated statistically significant differences between vendors.

CONCLUSION

Multiple AI algorithms demonstrated a high accuracy in identifying PTX on CXR. However, there was significant variation in accuracy across the group. In general, AI tools demonstrated a higher specificity and a lower sensitivity, meaning that AI is more likely to result in false negatives than false positives in clinical practice.

CLINICAL RELEVANCE/APPLICATION

There is significant variation in performance across AI tools; these differences have important implications for both clinicians and patients. Algorithms demonstrating higher accuracy may produce fewer diagnostic errors in identifying PTX on CXR in real-world settings. For instance, AI tools with lower sensitivity are more likely to result in false negatives, increasing the risk of missed PTX on CXR. However, it is worth noting that there are multiple important pathologies to identify on CXR and that binary outputs were based on default settings for each algorithm. Further refinement and calibration of tools for specific clinical uses may improve performance. Nevertheless, the significant variability across algorithms highlights the critical need for comparative evaluations of AI algorithms across all relevant pathologies using large datasets representative of the intended population. These evaluations are essential to ensure clinical safety prior to deployment.

W3-SSER02-3 ARTIFICIAL INTELLIGENCE FOR INTRACRANIAL HEMORRHAGE DETECTION: A 15-MONTH MULTICENTER COMPARISON OF THREE AI SERVICES AND RADIOLOGISTS

Alexey Petryaikin, MD, PhD (*Presenter*)
Anna Khoruzhaya (*Abstract Co-Author*)
Polina Sakharova (*Abstract Co-Author*)
Kirill Arzamasov (*Abstract Co-Author*)
Rustam Erizhokov (*Abstract Co-Author*)
Iurii Vasilev (*Abstract Co-Author*)

PURPOSE

Compare diagnostic performance of three AI services and radiologists in detecting intracranial hemorrhage (ICH) on head CT scans, evaluating sensitivity, specificity, accuracy, and clinical implications.

METHODS AND MATERIALS

A longitudinal multicenter study (April 2022-December 2024) assessed three diagnostic AI tools and radiologists across 67 hospitals. Ground-truth expert verification included 3,409 CT scans (from 439,542 total). Metrics: sensitivity (Se), specificity (Sp), accuracy (Ac). Statistical analysis: Mann-Whitney U test (AI comparison), McNemar's test (AI vs. radiologists).

RESULTS

AI services showed high sensitivity but varied in specificity. AI-1 achieved the highest sensitivity (97.4 [95.8-98.5] %, but $p>0.005$ vs. AI-2/3), while AI-3 demonstrated superior specificity and accuracy (92.3 [90.4-94.3] % and 92.6 [90.1-94.1] %, $p<0.005$ vs. AI-1). AI-1's Sp (75.4 [71.8-78.7] %) and Ac (86.0 [83.9-87.9] %) was significantly lower than AI-2/AI-3 Sp ($p<0.0001$) and Ac ($p<0.002$). Radiologists outperformed all AI systems: sensitivity (98.92% vs. pooled AI 95.33%, $?^2=19.11$, $p<0.001$), specificity (99.85% vs. 86.30%, $?^2=356.17$, $p<0.001$), and accuracy (99.6% vs. 90.23%, $?^2=287.43$, $p<0.001$). False negatives were rare among

radiologists (12/1,106 ICH cases, 1.08%) but more frequent with AI (45/1,106, 4.07%). AI generated 368 false positives (13.7% of non-ICH cases) versus 4 (0.15%) for radiologists.

CONCLUSION

Radiologists remain the gold standard for ICH diagnosis, excelling in specificity and accuracy. AI, while highly sensitive, produces 92-fold more false positives, necessitating radiologist oversight. AI-2 and AI-3, with more balanced metrics show clinical potential if optimized for specificity. A theoretical combined AI-radiologist approach could achieve 99.5% sensitivity, though overlapping errors limit practical implementation.

CLINICAL RELEVANCE/APPLICATION

AI can reduce missed ICH in emergencies but requires rigorous validation. Integration should prioritize AI as a screening tool, with mandatory radiologist review of AI-positive cases. Improving AI specificity and training radiologists to interpret AI outputs are critical. Synergy between AI and human expertise may enhance diagnostic safety if protocols address false positives.

W3-SSER02-4 MULTICENTRIC PROSPECTIVE STUDY COMPARING ULTRA-LOW-DOSE CT, STANDARD RADIOGRAPHY AND STANDARD-DOSE CT FOR DETECTING LESIONS IN PATIENTS FOLLOWING THORACO-LUMBAR SPINE, PELVIC, OR EXTREMITY TRAUMA

Oumaya Ben Said (*Presenter*)
Joel Greffier, PhD (*Abstract Co-Author*)
Djamel Dabli (*Abstract Co-Author*)
Jean-Paul Beregi, MD, PhD (*Abstract Co-Author*)
Maxime PASTOR, MD (*Abstract Co-Author*)

PURPOSE

To compare the diagnostic performance of ultra-low dose (ULD) CT scanning and a standard radiography examination (STD-RX) for detecting fractures of the thoraco-lumbar spine, pelvis, proximal femur, or extremities in adult trauma emergencies, with final diagnosis of fracture established using a standard-dose CT scan (STD-CT; gold standard).

METHODS AND MATERIALS

Adults presenting to the emergency department with suspected bone fractures following trauma were prospectively included at five centers from October 2019 to September 2023. Each patient was evaluated with STD-CT, ULD-CT, and STD-RX in the area where fractures were suspected. For each patient, two radiologists recorded the location and number of fractures for the three types of examination, blinded to the results of the other exams. Based on these results, the diagnostic performance of ULD-CT and STD-RX was evaluated and compared with that of STD-CT. Image quality was subjectively assessed and the overall image quality, diagnostic image quality, and confidence levels of ULD-CT and STD-RX were rated. Finally, the interpretation time was measured for each patient and each examination. Interobserver agreement on fracture detection and subjective image analysis are currently being analyzed.

RESULTS

Based on a total population of 536 patients (285 women; 52.4±21.7 years old; 25.6±4.6 kg/m²), 284 patients (53%) had at least one fracture. A total of 293 fractures were detected by STD-CT (86 hand/wrist, 7 dorsal spine, 21 lumbar spine, 79 pelvis, 100 foot/ankle). Using STD-CT as the standard of reference, the sensitivity and specificity of ULD-CT were 95.2% and 97.2% with 14 false negatives (3 hand/wrist, 2 lumbar spine, 2 pelvis, 7 foot/ankle) and 7 false positives. For STD-RX, sensitivity and specificity were 71.7% and 96.4% with 83 false negatives (15 hand/wrist, 5 dorsal spine, 6 lumbar spine, 16 pelvis, 41 foot/ankle) and 9 false positives. ULD-CT was completely interpretable with no technical problems or only a slight problem in 97% of cases and in 83% of cases for STD-RX. Overall image quality was excellent to acceptable for 97% of patients for ULD-CT and 89% for STD-RX. The confidence level was high to excellent in 92% of cases for ULD-CT and 55% for STD-RX.

CONCLUSION

ULD-CT demonstrated significantly higher diagnostic performance than STD-RX for detecting fractures in trauma patients. Radiologists were more confident with ULD-CT than with STD-RX, with sensitivity and image quality approaching that of STD-CT.

CLINICAL RELEVANCE/APPLICATION

ULD-CT offers excellent diagnostic confidence, closed to that of STD-CT, with a reasonable interpretation time, making it a compelling alternative to standard radiography for detecting fractures in trauma patients.

W3-SSER02-5 AI TRIAGE AND ALERTING IN EMERGENCY RADIOLOGY: ENHANCING DETECTION OR ADDING NOISE ?

Guillaume Herpe, MD (*Presenter*)
Leo Mabit (*Abstract Co-Author*)
Gaspard d'Assignies, MD, PhD (*Abstract Co-Author*)
Mathieu Lederlin, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the implementation of mutiples AI-driven alerting tools in an emergency radiology department, assessing their role as safety nets or noise generators.

METHODS AND MATERIALS

A retrospective, multi-center study was conducted over a two-month period across one tertiary and two secondary emergency radiology centers (35 radiologists). AI-based detection algorithms were deployed for brain trauma (ICH detection), pneumothorax on chest X ray, and IPE across 2336 CT scans and 119 chest X-rays. The reference standard for both negative and positive algorithm results was established following a two-step process. First, a general radiologist compared the reports and AI results to identify discrepancies between AI findings and radiologist interpretations. Any discrepancies were then resolved by an experienced emergency radiologist through a re-evaluation of images. Performance metrics included sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV). Statistical analysis was performed using R (version 3.6.2, The R Foundation).

RESULTS

Brain Trauma (ICH detection): Among 682 head CT scans, AI flagged 133 positives (19.5%, 133/682), including 46 false positives (6.7%, 46/682) and 11 false negatives (1.6%, 11/682). AI detected 2 additional true positives (1.5%, 2/133) missed by radiologists. Chest X-ray - Pneumothorax Detection: Out of 119 chest X-rays, AI identified 3 positive cases (2.5%, 3/119), including 1 missed by the radiologist (0.8%, 1/119), with no false positives (0%, 0/119). Incidental Pulmonary Embolism (IPE) Detection: In 1654 contrast-enhanced CT scans, AI flagged 70 positives (4.2%, 70/1654), with 22 true positives (31.4%, 22/70) and 9 missed by radiologists (41%, 9/22). AI increased the detected prevalence from 0.8% (14/1654) to 1.3% (22/1654), but the false-positive rate was 68.6% (48/70), requiring radiologist validation. Alerting : At the cost of 1.5 false positive alerts every day, AI algorithms identified 1 life threatening conditions missed by the radiologist every 5 days.

CONCLUSION

AI-driven triage tools in emergency radiology serve as effective safety nets, improving the detection of missed critical findings such as intracranial hemorrhage and incidental pulmonary embolism. Given the acceptable number of alerts, their integration remains valuable, provided that false positives are managed to maintain workflow efficiency and prevent alert fatigue.

CLINICAL RELEVANCE/APPLICATION

AI-driven triage tools enhance clinical safety in emergency radiology by detecting life-threatening conditions missed by radiologists, with a manageable false-positive rate that supports their integration into routine workflow.

W3-SSER02-6 PREDICTING UNREMARKABLE BRAIN CT SCANS WITH AN ENSEMBLED GENERATIVE UNSUPERVISED ANOMALY-DETECTION MODEL: IMPLICATIONS FOR RADIOLOGIST WORKLOAD REDUCTION

Namkug Kim, PhD (*Presenter*)
Jongjun Won, BS (*Abstract Co-Author*)
Jihwan Kim, BSc, MSc (*Abstract Co-Author*)
Joonseo Oh (*Abstract Co-Author*)
Yereen Yoo (*Abstract Co-Author*)
Joon Park, MD (*Abstract Co-Author*)
Hyungbin Park (*Abstract Co-Author*)
Jihyun Kim (*Abstract Co-Author*)
Jimin Sung (*Abstract Co-Author*)
Hyunki Lee (*Abstract Co-Author*)
JIEUN YUM (*Abstract Co-Author*)
Joonsang Lee (*Abstract Co-Author*)
Gil-Sun Hong, MD, PhD (*Abstract Co-Author*)

PURPOSE

Neurologic emergencies require swift detection of critical findings on non-contrast brain CT, yet most emergency department (ED) scans are unremarkable. We built a generative unsupervised anomaly-detection (GUAD) system to flag unremarkable studies and measured its ability to cut workload while preserving a high negative predictive value (NPV).

METHODS AND MATERIALS

We retrospectively collected 28,510 non-contrast brain CT scans from healthy individuals at a tertiary academic hospital to form the training set. Using a 3D hierarchical diffusion autoencoder, we trained two generative unsupervised anomaly-detection models: a coarse-morphological model that identifies gross structural abnormalities and a fine-grained model that detects subtle intensity deviations. A study was labeled "unremarkable" only when both models produced anomaly scores below a predefined decision threshold. We evaluated our model on four test datasets: the internal consecutive ED cohort (n = 544), the external consecutive ED cohort (n = 1,795), a public intracranial-hemorrhage dataset (n = 244), and a multi-institutional hemorrhage dataset spanning five hospitals (n = 1,295). The consecutive ED cohorts contained diverse critical findings, including hemorrhage, infarction, mass-like lesions, hydrocephalus, and rarer lesions. Performance was assessed with two primary metrics: negative predictive value (NPV) and workload reduction (WLR), the latter defined as the proportion of correctly excluded unremarkable scans among all test scans.

RESULTS

At the strictest threshold set by validation (target NPV > 99 %), the GUAD ensemble achieved an NPV of 98.1 % with a WLR of 9.7 % on the internal test set, NPV/WLR of 96.7 %/19.9 % on the external set, 98.5 %/26.2 % on the public hemorrhage set, and 96.0 %/27.8 % on the multi-institutional set. Relative to either single model, these results represent an NPV improvement of up to 3.7 percentage points. When the threshold was relaxed to target an NPV of 99 %, NPVs dropped slightly to 95.9-97.1 %, while WLRs rose to 13.1-33.1 %. A further reduction of the cut-off to target an NPV of 98 % increased WLRs to 17.8-36.8 % but lowered NPVs to 94.2-96.5 %.

CONCLUSION

With appropriately chosen thresholds, the GUAD ensemble maintains an NPV close to 98 % while reducing radiologists' workload by 10-35 %. It consistently outperforms each single-model counterpart.

CLINICAL RELEVANCE/APPLICATION

By automatically filtering a meaningful subset of unremarkable emergency brain CTs, the GUAD ensemble can streamline radiology workflows. Because a residual risk of missed abnormalities remains, further research and the development of complementary safety pipelines are required to minimize this risk.

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W3-SSGI10

Gastrointestinal Imaging (Miscellaneous Topics including Segmentation and Circulating DNA)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E353A

Courtney C. Moreno, MD (*Moderator*)
Satheesh Krishna, MD (*Moderator*)

Sub-Events

W3-SSGI10-1 FOUNDATIONAL TUMOR SEGMENTATION MODELS

Halil Ertugrul Aktas (*Presenter*)
Sirui Li (*Abstract Co-Author*)
Linkai Peng, BEng (*Abstract Co-Author*)
Zheyuan Zhang, PhD (*Abstract Co-Author*)
Gorkem Durak, MD (*Abstract Co-Author*)
Ulas Bagci, MSc, PhD (*Abstract Co-Author*)

PURPOSE

Accurate volumetric tumor segmentation remains a critical challenge in oncologic imaging despite its fundamental importance for diagnosis, treatment planning, and response assessment. We propose a novel approach, named TAGS, to overcome the limitations of existing methods by adapting a 2D vision-language foundation model (Segment Anything Model, SAM) for robust 3D tumor delineation across multiple organ sites using a multi-prompt guidance framework.

METHODS AND MATERIALS

We developed Tumor-Adaptive Guidance for SAM (TAGS), a parameter-efficient approach that synergistically combines three complementary prompt types: (1) organ-specific prompts automatically generated by TotalSegmentator to provide structural context; (2) dual-category text prompts derived from concise medical descriptors to incorporate semantic information; and (3) sparse interactive 3D point prompts requiring minimal user guidance. Lightweight alignment adapters integrate these prompts while preserving most pre-trained parameters. We evaluated TAGS on three public datasets—KiTS21 (kidney), LiTS (liver), and MSD-Pancreas—using Dice and Normalized Surface Dice (NSD) metrics.

RESULTS

TAGS significantly outperformed established clinical and AI-based segmentation methods across all metrics. With three interactive point prompts, it achieved Dice scores of 80.8%, 66.2%, and 61.0% for kidney, liver, and pancreatic tumors, respectively, showing substantial improvements over the clinical standard nnUNet (50.2%, 58.9%, 36.5%). Boundary delineation accuracy, measured by NSD, demonstrated even greater improvements: 88.3%, 79.3%, and 83.1% for kidney, liver, and pancreatic tumors, versus nnUNet's performance (47.6%, 57.6%, 43.2%). TAGS maintained high consistency regardless of prompt placement location (ICC > 90%).

CONCLUSION

By leveraging organ-specific anatomical guidance, clinically meaningful text prompts, and limited user interaction, TAGS effectively bridges the inherent 2D-to-3D gap in foundation models. It delivers robust, accurate tumor segmentation in volumetric imaging without requiring the comprehensive retraining of large models.

CLINICAL RELEVANCE/APPLICATION

TAGS provides a streamlined, flexible solution for volumetric tumor segmentation that requires minimal user interaction while delivering superior accuracy. This approach enhances clinical workflows by improving consistency in tumor delineation, which may lead to more precise treatment planning, reliable longitudinal monitoring, and standardized quantitative reporting. Its efficiency makes it particularly valuable in busy clinical environments and for cases involving complex tumor morphology where traditional segmentation methods often fail.

W3-SSGI10-2 HOW MANY ANNOTATIONS ARE ENOUGH? REAL-AND-SYNTHETIC DATA PLATEAUS FOR <2 CM PDAC DETECTION ON CT

Qi Chen (*Presenter*)
Wenxuan Li, BS (*Abstract Co-Author*)
Xinze Zhou (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)
Zongwei Zhou, PhD (*Abstract Co-Author*)

PURPOSE

To quantify (i) the minimum number of voxel-wise annotated scans required for detecting <2 cm pancreatic ductal adenocarcinoma (PDAC) and (ii) the extent to which synthetic data can cut that requirement and improve robustness on external test.

METHODS AND MATERIALS

This study was designed in two experimental settings to evaluate the annotation requirements for accurate small PDAC detection and the impact of synthetic tumor augmentation on data efficiency and external robustness. First, real-data scaling: 3,144 CTs (n = 156 small PDAC, 5%) were randomly split into five training subsets at 10%, 25%, 50%, 75% and 100%. An nnU-Net was trained on each subset and tested (i) internally on 684 held-out CTs from the same data distribution (i.e., population, vendors, and protocols) and (ii) externally on 50,000 multicenter scans from a total of 140 global hospitals with different data distribution. Second, synthetic augmentation: small, synthetic PDACs were created on the normal CTs from both internal and external cohorts. An nnU-Net was trained on the same five training subsets augmented by these synthetic PDACs, and tested on the same internal (n = 684) and external (n = 8,250) datasets. We evaluated the performance using area under the receiver operating characteristic curve (AUC), sensitivity on small PDAC patients, and specificity on normal patients.

RESULTS

Real-data scaling (internal test) - AUC increased from 0.94 ± 0.03 with 10 % of the data to 0.97 ± 0.02 with 25 % and plateaued at 0.98 ± 0.02 from the 50 % fraction onward; sensitivity at 87.8% specificity stabilized at 97.7% after ~340 annotated scans, indicating a clear data plateau. Real-data scaling (external test) - AUC rose

monotonically from 0.85 (10 %) to 0.90 (100 %) with no sign of saturation; sensitivity improved from 86.4% to 92.9%. Synthetic augmentation - 500 real + synthetic achieved the internal plateau and reached external AUC 0.89, equaling the 3,000-real benchmark while using one-sixth of the real annotations.

CONCLUSION

For internal test, 1,500 annotated real scans are enough; augmented by synthetic data can further lower the requirement to 500 without accuracy loss. For multicenter external test, every additional real scan helps, yet synthetic augmentation accelerates gains and closes the domain gap, achieving superior performance with half the real annotation.

CLINICAL RELEVANCE/APPLICATION

The study provides concrete annotation requirement—500 scans augmented by synthetic data or 1,500 scans alone—for small PDAC detection, reducing annotating effort by up to 83%. This efficiency accelerates deployment of reliable, cross-institution AI algorithms for earlier detection of <2 cm PDAC, when curative treatment is still feasible.

W3-SSGI10-3 EFFECTIVE REGISTRATION-FREE DUAL-PHASE SEGMENTATION FOR PANCREATIC LESION

Wenyi Deng (*Presenter*)
Fuze Cong, PhD (*Abstract Co-Author*)
Feiyang Xie, MD (*Abstract Co-Author*)
Hebing Chen (*Abstract Co-Author*)
Xiuli Li (*Abstract Co-Author*)
Zhengyu Jin, MD (*Abstract Co-Author*)
Huadan Xue, MD (*Abstract Co-Author*)

PURPOSE

Arterial and portal dual-phase contrast-enhanced CT images are critical for pancreatic masses precise diagnosis. However, existing methods often rely on registration techniques that may undermine both accuracy and efficiency. In light of this, the purpose of this study was to develop a deep learning model capable of accurately segmenting various pancreatic masses by analyzing CT images obtained during both arterial and portal phases without registration.

METHODS AND MATERIALS

This study leveraged four private datasets consisting of more than eight types of pancreatic lesions to build the dual-phase registration-free segmentation model. The internal dataset consisted of 313 patients with confirmed surgical pathology. The internal dataset was divided for training/validation (223) and testing (90) based on the time of CT acquisition. Additionally, three external testing datasets from three hospitals which consisted of 53, 50, 60 cases were utilized to evaluate the performance on images from different scanners, low-dose and different thicknesses. The dual-phase CT images were simultaneously fed into the proposed registration-free segmentation model where a cross-attention mechanism was employed to integrate the dual-phase features with misalignment. The output of the model is the contour of pancreatic lesions in the input portal-phase images.

RESULTS

The proposed pancreatic lesion segmentation model exhibited excellent performance in one internal and three external testing datasets achieving DSC of 84.02%, 78.40%, 79.53% and 83.62%, respectively. Meanwhile, the proposed method achieves an overall 95.63% detection rate of eight types of pancreatic lesions, exceeding the existing methods. Also, the proposed method achieves an inference time of 10.55s per scan, more than 10 times faster than other dual-phase methods and comparable to the single-phase methods.

CONCLUSION

The proposed registration-free dual-phase pancreatic lesion segmentation approach significantly surpassed traditional registration-dependent methods in both accuracy and inference speed. These findings suggest that the proposed model has the potential in handling pancreatic lesions, particularly those exhibiting variable enhancement across different phases, such as in PNET/PNEC cases.

CLINICAL RELEVANCE/APPLICATION

The efficient and accurate pancreatic lesion segmentation provided by the dual-phase model offers reliable input regions of interest for subsequent studies such as radiomics.

W3-SSGI10-4 CONCORDANCE OF CIRCULATING TUMOR DNA TESTING AND IMAGING SURVEILLANCE OF SURGICALLY RESECTED PANCREATIC ADENOCARCINOMA

Sherif B. Elsherif, MD (*Presenter*)
Luyao Shen, MD (*Abstract Co-Author*)
Luke S. Yoon, MD (*Abstract Co-Author*)
Aya Kamaya, MD (*Abstract Co-Author*)
Justin Tse, MD (*Abstract Co-Author*)

PURPOSE

To assess the concordance of circulating tumor DNA (ctDNA) and imaging surveillance after surgical resection of pancreatic ductal adenocarcinoma (PDAC).

METHODS AND MATERIALS

This retrospective, single-center study included 50 patients (17 women, 33 men; mean age, 69 years [range, 45-89 years]) with PDAC who underwent surgical resection followed by ctDNA and imaging surveillance from 2015 to 2025. When multiple positive ctDNA results were available, the first positive test was selected. Imaging surveillance was performed within 3 months of ctDNA testing. Two radiologists blinded to ctDNA results and surgical pathology reviewed all imaging studies, with consensus adjudication for discrepancies.

RESULTS

ctDNA and imaging results were concordant in 39 patients: 22 had recurrence and 17 had no recurrence. Discordant findings were observed in 11 patients: 10 had recurrence by imaging only and 1 had recurrence by positive ctDNA only. The percentage agreement between ctDNA and imaging was 78%, with a kappa statistic of 0.57. Among concordant patients with recurrence, the most common site was local recurrence (surgical bed), with a median disease size of 2.1 cm. In the 10 discordant cases where imaging was positive but ctDNA was negative, imaging preceded ctDNA testing by a median of 38 days (range 7-122 days preceding ctDNA); these sites were exclusively lung metastases and local recurrence, with median disease sizes of 0.5 cm and 2.4 cm, respectively. Among these discordant patients, 8 had tissue-proven recurrence and the remaining 2 showed continued growth of disease on follow-up imaging. Overall, 1/6 (17%) of lung metastases and 10/15 (67%) of local recurrences showed a positive ctDNA test, whereas all other sites of metastases at imaging (liver, peritoneum, lymph node, and bones) had a 100% positive rate of ctDNA detection. The single patient with positive ctDNA only showed no evidence of recurrent disease during 497 days of imaging follow-up. Using imaging as the reference standard, the sensitivity and specificity of ctDNA for detecting recurrence were 68.8% and 94.4%, respectively. The positive predictive and negative predictive values were 95.7% and 63%, respectively.

CONCLUSION

ctDNA did not detect about a quarter of recurrences after surgical resection of PDAC, particularly when the disease sites are local recurrence and lung metastases.

CLINICAL RELEVANCE/APPLICATION

ctDNA testing is increasingly performed in conjunction with imaging but most lung metastases and 1/3 of local recurrences could only be identified by imaging. Radiologists should continue to scrutinize those two sites in particular during surveillance of patients after PDAC resection.

W3-SSGI10-6 MULTI-MODAL INTEGRATION OF ABDOMINAL CT AND CLINICAL DATA FOR NONINVASIVE HVPG CLASSIFICATION

Jingyo Jeong (*Presenter*)
Jhii Hyun Ahn, MD (*Abstract Co-Author*)

PURPOSE

This study proposes a novel deep learning-based multimodal model that combines abdominal CT imaging with clinical data to non-invasively grade the hepatic venous pressure gradient (HVPG).

METHODS AND MATERIALS

The dataset used in this study consists of blood test results and abdominal CT images collected from 603 subjects. The cohort included 305 healthy controls and 298 patients with compensated cirrhosis who underwent HVPG measurement. All CT images were resampled to a voxel spacing of [1.0, 1.0, 1.0] and standardized to a size of [256x256x96]. For each patient, 15 clinical variables were used to generate text prompts: sex, age, albumin, total bilirubin, AST, ALT, WBC, PMN, hemoglobin, platelet count, sodium, creatinine, liver-to-spleen volume ratio, liver volume, and spleen volume. The dataset was split into training, validation, and test sets in a 6:2:2 ratio.The proposed multimodal framework integrates a pre-trained Swin Transformer as an image encoder for extracting high-dimensional features from CT images, and the BLIP (Bootstrapping Language-Image Pre-training) model for handling text prompts derived from clinical data. The image features were transformed to have the same output dimensions as BLIP, which allowed for concatenation of image and text features. The combined features were then fed into a classifier to predict clinically significant portal hypertension (HVPG = 10 mmHg). Model performance was evaluated using 5-fold cross-validation.

RESULTS

The model was trained and validated using 5-fold cross-validation on the dataset, achieving an average accuracy of 0.82, recall of 0.83, precision of 0.85, F1 score of 0.82, and an AUC of 0.87 across the validation folds. These results indicate that the integration of abdominal CT and clinical data through a deep learning-based multimodal approach is effective for non-invasive grading of HVPG and shows promise for clinical application.

CONCLUSION

This study demonstrates the effectiveness of a deep learning-based multimodal framework that integrates abdominal CT imaging and clinical data for non-invasive grading of HVPG. The model achieved high predictive performance, offering a potential alternative to invasive HVPG measurement. This approach may facilitate safer, faster, and more accessible assessment of portal hypertension in clinical practice.

CLINICAL RELEVANCE/APPLICATION

The proposed multimodal model provides a non-invasive method to accurately classify clinically significant portal hypertension, potentially replacing invasive HVPG measurement. This approach can enhance clinical decision-making by enabling early risk stratification and timely intervention in patients with clinically significant portal hypertension.

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

W3-SSGI11

Gastrointestinal Imaging (Liver - HCC)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E351

Alessandro Furlan, MD, MMM (*Moderator*)
Yuan-Cheng Wang, MD, PhD (*Moderator*)

Sub-Events

W3-SSGI11-1 DETECTION OF HCC ONE YEAR FOLLOWING NEGATIVE MRI VERSUS NEGATIVE ULTRASOUND

Chanel Varney, BA (*Presenter*)
Samantha Morrison (*Abstract Co-Author*)
Maragatha (maggie) Kuchibhatla (*Abstract Co-Author*)
David T. Harris, PhD (*Abstract Co-Author*)
Lukas Mueller, MD, PhD (*Abstract Co-Author*)
Rohit Loomba, MD, MSc (*Abstract Co-Author*)
Aman Khurana, MD (*Abstract Co-Author*)
David K. Nam, MD (*Abstract Co-Author*)
Mahnaz Hosseinibensenjan, MD (*Abstract Co-Author*)
Ji Hye Min, MD, PhD (*Abstract Co-Author*)
Manaf Alsudaney, MD (*Abstract Co-Author*)
Katherine Wang (*Abstract Co-Author*)
Ian Bolger (*Abstract Co-Author*)
Scott B. Reeder, MD, PhD (*Abstract Co-Author*)
Claude B. Sirlin, MD (*Abstract Co-Author*)
Bachir Taouli, MD (*Abstract Co-Author*)
Mustafa R. Bashir, MD (*Abstract Co-Author*)

PURPOSE

In the US, over 4.5 million people are eligible for routine surveillance for hepatocellular carcinoma (HCC). Biannual ultrasound (US) is the primary surveillance protocol in practice recommendations. MRI surveillance has been shown to be more sensitive than US and may allow for less frequent examination. This study aims to assess the rate of HCC diagnosis within one year of a negative MRI versus negative ultrasound.

METHODS AND MATERIALS

Patients at risk for HCC were included if they had negative MRI and/or negative US at index (time 0) and either an HCC diagnosis within 1 year or negative follow-up surveillance for at least 1 year. Patients who had both negative MRI and US at baseline were included in both the MRI subgroup and US subgroup; patients with one exam negative and the other exam positive were analyzed in the subgroup corresponding to their negative exam. We investigated the rates of both "prevalent" HCC, in which the index exam failed to detect existing cancer, and "incident" HCC, in which an HCC diagnosis was made following a truly negative index exam. To determine the rate of HCC diagnosis within 1 year, Kaplan Meier (KM) survival curves were fit and probability of HCC at 1 year from index and 95% confidence intervals (CI) were estimated.

RESULTS

Our overall cohort included 132 patients, with median age of 62.5, median BMI of 31.3, majority female (53.8%), majority white (90.2%), and all diagnosed with cirrhosis. 118 and 121 patients were included in the MRI and US subgroups, respectively. For the overall cohort, the rate of HCC at 1 year was 3.8% (0.5%, 7.0%). In the MRI subgroup, no patients became positive for HCC within 1 year. In the US subgroup, 5 patients, representing 4.2% (0.5%, 7.7%) of the subgroup, were ultimately diagnosed with HCC by 1 year. All 5 diagnoses were detected by the index MRI. Based on the available follow-up data, only 1 MRI subgroup patient became HCC-positive after the 1-year mark, with a time-to-diagnosis from index of 587 days.

CONCLUSION

This study assesses the combination of prevalent (pre-existent/missed) and incident (new) HCC diagnosed within 1 year of negative surveillance imaging. The rate of HCC diagnosis within 1 year was lower for MRI screening than for US screening (0 vs. 4.2%). Of the five HCCs diagnosed in the subgroup with negative initial US, all were present at baseline MRI (prevalent HCC), and thus none were detected as incident HCC. Overall, the data demonstrate the strong prognostic value of negative MRI and suggest that prolongation of the recommended 6-month screening interval may be plausible.

CLINICAL RELEVANCE/APPLICATION

This research investigates the prognostic value of negative MRI in patients at-risk for HCC.

W3-SSGI11-2 LI-RADS CT/MRI RADIATION TREATMENT RESPONSE ALGORITHM VERSION 2024: CATEGORY REDISTRIBUTION AND SHORT-TERM OUTCOMES

Sung-Hua Chiu, MD (*Presenter*)
Andrew Kesselman, MD (*Abstract Co-Author*)
Luke S. Yoon, MD (*Abstract Co-Author*)
Aya Kamaya, MD (*Abstract Co-Author*)
Justin Tse, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the redistribution of categories in LI-RADS CT/MRI Radiation TRA v2024 (v2024) versus LI-RADS CT/MRI TRA version 2018 (v2018) in patients with HCC treated by Y-90 radioembolization and to assess short-term outcomes of v2024 categories.

METHODS AND MATERIALS

This retrospective study included 242 patients (57 women, 185 men; median age, 65 years) with 319 HCCs treated by Y-90 radioembolization from February 2011 to March 2022 and evaluated by initial 3-month posttreatment CT or MRI. Two radiologists assigned v2018 and v2024 categories; a third radiologist resolved discrepancies. The radiologists also assessed available second posttreatment CT or MRI examinations using v2024. Overall survival (OS) was determined.

RESULTS

242 patients (57 women, 185 men; median age 65) with 319 HCCs and liver CT or MRI follow-up were included. After treatment, based on v2018, 280 (87.8%) were LR-TR Viable, 21 (6.6%) were LR-TR Equivocal, and 18 (5.6%) were LR-TR Nonviable. Based on v2024, 119 (37.3%) were LR-TR Viable, 182 (57.1%) were LR-TR Nonprogressing, and 18 (5.6%) remained LR-TR Nonviable. All LR-TR Equivocal were recategorized as LR-TR Nonprogressing. Among the 280 LR-TR Viable (v2018), 161 (57.5%) were recategorized as LR-TR Nonprogressing (v2024), and the rest remained LR-TR Viable (119; 42.5%). Of LR-TR Nonprogressing, 96 had a second post-treatment imaging: 14 (14.6%) became LR-TR Viable, 63 (65.6%) remained LR-TR Nonprogressing, and 19 (19.8%) became LR-TR Nonviable. Of LR-TR Viable, 29 had a second post-treatment imaging: 23 (79.3%) remained LR-TR Viable and 6 (20.7%) became LR-TR Nonprogressing. Patients with LR-TR Nonprogressing at first post-treatment imaging evaluation had greater OS than those with LR-TR Viable (v2024) (46 versus 12 months, $p<0.001$).

CONCLUSION

Most treated HCCs are categorized as LR-TR Nonprogressing rather than LR-TR Viable based on v2024. Among HCCs with second post-treatment follow-up, most LR-TR Nonprogressing remained as such. Patients with LR-TR Nonprogressing have greater OS than those with LR-TR Viable.

CLINICAL RELEVANCE/APPLICATION

v2024 provides greater granularity and potential prognostic value in the treatment response assessment of HCCs after Y-90 radioembolization.

W3-SSGI11-3 WATCH OR TREAT? PRE-THERAPEUTIC OUTCOMES OF LI-RADS 4 AND LI-RADS 5 HEPATOCELLULAR CARCINOMA LESS THAN 2 CM

Varun Rohatgi (*Presenter*)
Jeffrey Sung, MD (*Abstract Co-Author*)
Andrea S. Kierans, MD (*Abstract Co-Author*)
Resmi Charalel, MD,MPH (*Abstract Co-Author*)

PURPOSE

To study the pre-therapeutic outcomes and natural history of LI-RADS 4 (LR-4) and LI-RADS 5 (LR-5) lesions that are less than 2 cm. Given current transplant guidelines provide exception points only for single HCCs =2 cm, understanding the potential risks of delaying therapy is important for this unique patient cohort.

METHODS AND MATERIALS

This is a retrospective, single-center cohort study of treatment-naïve patients presenting with LR-4 or LR-5 lesions less than 2 cm on liver protocol CT or MR between January 2010-June 2024. Patient records were evaluated for subject-level and lesion-specific parameters. Subject level parameters included demographics, treatment history, and pathology correlate. Lesion imaging was reviewed to assess time to growth =2cm, threshold growth, LR-4 upgrade to LR-5, development of additional pre-therapeutic LR-4/LR-5 lesions, time to treatment, progression to T2 disease and resolution/non-progression. Competing risk analysis via Fine-Gray testing was performed for select outcomes.

RESULTS

Eighty-eight subjects with 110 lesions (40 LR-4 and 70 LR-5, diagnosed by clinical report) met inclusion criteria. There were no differences in baseline demographics or liver dysfunction (MELD, ascites, hepatic encephalopathy) between LR-4 and LR-5 patients. Of the 110 lesions, 42 achieved growth to = 2 cm in a mean time of 175.5 ± 129.8 days (152.6 days vs 186.4 days for LR-4/5 respectively, $p = 0.834$). 12 of 40 LR-4 lesions were upgraded to LR-5 at a mean of 185.33 ± 81.62 days. Compared to LR-5, LR-4 lesions showed increased propensity for resolution/non-progression without therapy (22.0% vs 8.6%, $p = 0.0485$), but similar rates of achieving threshold growth (9.8% vs 20.3%, $p = 0.1252$), growth to = 2 cm (26.8% vs 44.9%, $p = 0.0697$), time to treatment (183.4 vs 176.9 days, $p = 0.997$), and development of additional lesions (16.7% vs 25.9%, $p = 0.4253$). These data are further supported by Fine-Gray analysis (see Figure), with higher cumulative incidence of resolution/non-progression in LR-4 than LR-5 ($p = 0.00317$) but similar incidence for time to therapy ($p = 0.376$) and growth to = 2 cm ($p = 0.117$).

CONCLUSION

LR-4 lesions less than 2 cm are more likely to resolve or non-progress than their LR-5 counterparts. Otherwise, these lesions demonstrate similar growth and progression metrics across pre-therapeutic imaging surveillance.

CLINICAL RELEVANCE/APPLICATION

Understanding the progression of LR-4 and LR-5 lesions less than 2 cm is critical for shared decision-making with patients who are considering deferring treatment to potentially gain HCC transplant exception points. As OPTN tumor classification guidelines are now aligned with LI-RADS, these results are valuable to clinicians seeking to better position patients for timely transplantation.

W3-SSGI11-6 ASSESSMENT OF MICROVASCULAR INVASION IN HEPATOCELLULAR CARCINOMA USING FRACTAL FEATURES DERIVED FROM CT IMAGING

Feng Che, PhD (*Presenter*)
Bin Song (*Abstract Co-Author*)

PURPOSE

This study aimed to assess the potential role of 3-dimensional (3D) fractal dimension (FD) derived from contrast-enhanced CT images in predicting microvascular invasion (MVI) in hepatocellular carcinoma (HCC) patients.

METHODS AND MATERIALS

This retrospective study included 655 patients with surgically confirmed HCC from two medical centers (training set: 406 patients; internal test set: 170 patients; and external test set: 79 patients). Box-counting algorithms were employed to compute the 3D FD values from portal venous phase images. Univariable and multivariable logistic regression analyses were used to determine independent predictors. The model area under the curve (AUC) was calculated. Recurrence-free survival (RFS) and overall survival (OS) curves were generated using Kaplan-Meier method.

RESULTS

Patients with MVI-positive HCC demonstrated significantly higher FD values compared to MVI-negative HCC ($p < 0.01$). The FD achieved AUCs of 0.786 (95%CI: 0.713-0.849) in the internal test set and 0.776 (95%CI: 0.669-0.874) in the external test set. The combined model incorporating alpha-fetoprotein, tumor size, tumor number, and FD showed superior diagnostic performance for MVI prediction compared to the clinical model, with AUCs of 0.795 (95% CI:0.720-0.860) versus 0.752 (95% CI:0.670-0.825) in the internal test set, and 0.826 (95% CI:0.721-0.915) versus 0.739 (95% CI:0.613-0.849) in the external test set. Patients stratified as high-risk MVI exhibited worse RFS and OS outcomes compared to low-risk MVI patients ($p <0.05$).

CONCLUSION

The 3D FD value significantly differed between MVI-positive and MVI-negative HCC patients. Integration of FD into the clinical model enhances MVI prediction accuracy and may identify patients at high risk.

CLINICAL RELEVANCE/APPLICATION

Fractal analysis based on contrast-enhance CT is a feasible tool for MVI measurement with additional clinical benefits for prognostic prediction. It can serve as a reference for preoperative MVI estimation and aid clinicians in executing more tailored therapies.

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Nov. 30 – Dec. 4
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W3-SSGI12

Gastrointestinal Imaging (Liver - Diffuse Disease, CT, Ultrasound)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E451B

Jonathan R. Dillman, MD, MSc (*Moderator*)
Ijin Joo, MD, PhD (*Moderator*)

Sub-Events

W3-SSGI12-1 CT ATTENUATION-BASED HEPATIC STEATOSIS ASSESSMENT USING 3D ORGAN SEGMENTATION: IMPACT OF TUBE VOLTAGE AND NEED FOR CUT-OFF ADJUSTMENT

Jeongin Yoo, MD (*Presenter*)
Ijin Joo, MD, PhD (*Abstract Co-Author*)
Sun Kyung Jeon, MD,PhD (*Abstract Co-Author*)
Junghoan Park, MD (*Abstract Co-Author*)
Jeong Min Lee, MD, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the impact of tube voltage on CT attenuation-based parameters obtained using 3D organ segmentation for hepatic steatosis assessment, and to evaluate the feasibility of tube voltage-specific cut-off application.

METHODS AND MATERIALS

This single-center retrospective study included 795 adults who underwent abdominal CT and MRS-PDFF between January 2017 and June 2024. CT scans were performed using single-energy 120 kVp or dual-energy 80/Sn150 kVp. In the dual-energy group, both 80 kVp images and linearly blended images (60% 80 kVp and 40% 150 kVp), considered equivalent to 120 kVp, were analyzed. Using 3D organ segmentation, mean CT attenuation values for the liver and spleen were extracted from pre- and post-contrast (portal venous phase) images. The diagnostic performance of liver attenuation (L) and liver-spleen attenuation difference (L-S) was assessed using receiver operating characteristic (ROC) curve analysis for detecting MRS-PDFF =5% and =10%. Cut-off values were derived from 120 kVp data based on predefined targets (=80% sensitivity or specificity), and corresponding 80 kVp values were estimated via regression and applied to assess diagnostic performance.

RESULTS

L and L-S at 120 kVp showed good diagnostic performance, with AUCs of 0.761-0.785 and 0.689-0.792 for precontrast and post-contrast parameters, respectively, at MRS-PDFF =5%, and 0.895-0.912 and 0.829-0.862 at =10%. In the dual-energy CT group, intra-individual comparisons showed no significant differences in precontrast diagnostic performance between 80 kVp and 120 kVp-equivalent images for both MRS-PDFF =5% and =10% (all P >0.05). For post-contrast images, L_post and L-S_post showed significantly better performance on blended images at =10% (P <0.001 and P =0.019, respectively), and L-S_post also at =5% (P <0.001). Regression-adjusted cut-off values for 80 kVp reliably achieved the predefined diagnostic targets of =80% specificity and =80% sensitivity. For example, for detecting MRS-PDFF =5%, the estimated cut-off for L_pre to achieve =80% sensitivity was 62.9 HU, yielding sensitivity of 82.2%, while the cut-off for =80% specificity was 60.0 HU, achieving specificity of 86.8%.

CONCLUSION

CT attenuation-based parameters are affected by tube voltage, and applying tube voltage-specific adjusted cut-off values enables reliable evaluation across different kVp settings.

CLINICAL RELEVANCE/APPLICATION

Given the variability in CT tube voltage settings, applying tube voltage-specific cut-off adjustments ensures consistent hepatic steatosis assessment, enhancing the utility of CT attenuation-based opportunistic screening in multicenter studies, longitudinal assessments, and retrospective analysis of existing CT datasets.

W3-SSGI12-2 EXPANDING HABITAT ANALYSIS BEYOND TUMORS: A TWO-CENTER STUDY OF 28- AND 90-DAY SURVIVAL PREDICTION IN ACUTE-ON-CHRONIC LIVER FAILURE

Yujia Shen (*Presenter*)
Shiman Wu, MD (*Abstract Co-Author*)
Xueyun Zhang (*Abstract Co-Author*)
Kangyi Pan (*Abstract Co-Author*)
Qi Zhang (*Abstract Co-Author*)
Yuxian Huang (*Abstract Co-Author*)
Yuxin Huang (*Abstract Co-Author*)
Zhenwei Yao (*Abstract Co-Author*)

PURPOSE

Habitat analysis, commonly used in oncology, is potentially applicable to complex conditions like acute-on-chronic liver failure (ACLF), capturing the microenvironment shaped by fibrosis, necrosis, and inflammation. This study investigates its feasibility for predicting survival in ACLF patients by analyzing liver tissue heterogeneity on CT imaging.

METHODS AND MATERIALS

A two-center study involved 181 ACLF patients, with 102 for model development, 44 for internal validation, and 35 for external validation. CT scans were performed without contrast, using standardized preprocessing. K-means clustering segmented liver CT images into subregions reflecting intra-tumoral heterogeneity (ITH). Radiomic features were extracted and selected through univariate analysis, and a multi-task LASSO regression model combined clinical and radiomic data.

RESULTS

The integrated model combing radiomics and habitat analysis demonstrated superior predictive performance for ACLF survival. For 90-day survival, the model achieved AUCs of 0.943 (training), 0.937 (validation), and 0.867 (test), surpassing clinical (0.933, 0.937, 0.727), habitat (0.934, 0.877, 0.801) and radiomics models (0.838, 0.918, 0.703). Similarly, for 28-day survival, it achieved AUCs of 0.839 in the test set, outperforming clinical (0.736), habitat (0.782) and radiomics models (0.759). Calibration analysis demonstrated strong agreement between predicted and observed survival, and decision curve analysis confirmed the model's clinical utility in guiding early interventions. The integrated model achieves higher AUCs in internal (28-day: 0.928, 90-day: 0.937) and external validation (28-day: 0.839, 90-day: 0.867), demonstrating superior generalizability over CLIF-C ACLF (0.500, 0.500) and COSSH-ACLF (0.546, 0.566), which decline in external validation.

CONCLUSION

The integrated model combining radiomic features and clinical data provides a dynamic tool for survival prediction in ACLF patients. By incorporating ITH, it offers enhanced prognostic capabilities and real-time, non-invasive insights for early risk stratification and liver transplantation decisions.

CLINICAL RELEVANCE/APPLICATION

The integration of radiomics with habitat analysis enhances prognostic accuracy in ACLF, offering a non-invasive tool for timely risk stratification and optimized transplant timing decisions.

W3-SSGI12-3 ULTRASOUND-GUIDED FAT FRACTION FOR ASSESSING SEVERITY OF HEPATIC STEATOSIS IN PATIENTS WITH CHRONIC LIVER DISEASE: A VALIDATION STUDY

Hidekatsu Kuroda (*Presenter*)
Takuma Oguri (*Abstract Co-Author*)
Naohisa Kamiyama (*Abstract Co-Author*)
Yudai Fujiwara (*Abstract Co-Author*)
Tamami Abe (*Abstract Co-Author*)
Takayuki Matsumoto (*Abstract Co-Author*)

PURPOSE

Ultrasound-guided fat fraction (UGFF) is a novel prediction model that estimates hepatic steatosis by integrating three acoustic parameters including ultrasound-guided attenuation parameter (UGAP), signal-to-noise ratio, and backscatter coefficient. This study aimed to externally validate the diagnostic performance of UGFF for the assessment of steatosis using histopathological grading as the reference standard.

METHODS AND MATERIALS

This prospective observational study enrolled an external validation cohort comprising 276 patients with chronic liver disease (mean age; 54.8 years, 117 men), who underwent UGAP, UGFF, and liver biopsy on the same day. The underlying etiologies included metabolic dysfunction-associated steatotic liver disease (n=226), hepatitis C virus infection (n=23), alcohol-associated liver disease (n=14), and others (n=13). Hepatic steatosis was histologically graded by a certified pathologist as follows; grades 0 (<5%), 1 (5-33%), 2 (34-66%), and 3 (=66%).

RESULTS

UGFF demonstrated excellent diagnostic performance with the area under the receiver operating characteristic curve of0.90 (0.87-0.95), 0.90 (0.86-0.94), and 0.96 (0.94-0.97) for steatosis grades 1, 2, and 3, respectively. All the values showed a significantly higher accuracy than those obtained by UGAP alone ($p<0.01$). The optimal UGFF cut-off value for detecting grade 1 steatosis was 0.64, with sensitivity, specificity, positive predictive value, and negative predictive value of 80.1%, 87.3%, 96.2%, and 52.2%, respectively. UGFF showed a close correlation with the grade of histological steatosis ($r = 0.83$, 95% CI; 0.78-0.86), outperforming UGAP alone ($r = 0.68$, 95% CI; 0.61-0.75).

CONCLUSION

UGFF was found to be a reliable and non-invasive tool for quantifying hepatic steatosis in patients with chronic liver disease. While the model has been shown to provide a robust alternative to MRI-PDFF, we could show that its performance was validated against histopathological standards. These results offer a scalable approach for managing steatotic liver disease by UGFF, which seems to be alternative to UGAP.

CLINICAL RELEVANCE/APPLICATION

UGFF represents an advanced and noninvasive tool for the measurement of liver fat quantification. Integrating multiple "acoustic biomarkers" into a unified, ultrasound-based tool enables histologically verified assessment of steatosis, which can be applied to the intervention strategies for steatotic liver disease.

W3-SSGI12-6 SPECTRAL CT DERIVED LIVER AND SPLENIC EXTRACELLULAR VOLUME FRACTION AS A NONINVASIVE METHOD FOR PREDICTING LIVER CIRRHOSIS AND HEPATIC DECOMPENSATION IN PATIENTS WITH CHRONIC LIVER DISEASE

Yiming Yang (*Presenter*)
Yupin Liu (*Abstract Co-Author*)
Dongjing Zhou (*Abstract Co-Author*)

PURPOSE

To investigate whether hepatic and splenic CT parameters, such as extracellular volume fraction (ECV) and normalized iodine concentration (NIC) derived from spectral-CT, can be used as noninvasive methods for predicting liver cirrhosis and hepatic decompensation in patients with chronic liver disease (CLD), and to compare these with liver stiffness measurement (LSM).

METHODS AND MATERIALS

This study recruited a total of 66 patients with CLD, who underwent spectral-CT scanning in the equilibrium phase and LSM, including 41 patients with liver cirrhosis and 12 patients with hepatic decompensation. Spectral-CT derived ECV of liver (L-ECV) and spleen (S-ECV), as well as NIC of the liver (L-NIC) and spleen (S-NIC) were measured based on the iodine concentration (Fig 1a). LSM was performed using FibroScan(Fig 1b). The area under the curve (AUC) of receiver operating characteristic (ROC) curve were calculated to evaluate the diagnostic performance of CT parameters and LSM for predicting liver cirrhosis and hepatic decompensation.

RESULTS

The ROC curve shows that LSM has higher dagnostic performance for predicting liver cirrhosis, with AUC of 0.934 ($p<0.001$), followed by S-ECV, L-ECV, S-NIC and L-NIC, with AUCs of 0.865 ($p<0.001$), 0.830 ($p<0.001$), 0.722 ($p<0.001$) and 0.717 ($p<0.001$), respectively (Table 1, Fig 2). The ROC curve shows that S-ECV has higher dagnostic performance for predicting hepatic decompensation, with AUC of 0.890 ($p<0.001$), followed by L-ECV, LSM, L-NIC and S-NIC, with AUCs of 0.855 ($p<0.001$), 0.752 ($p=0.005$), 0.708($p=0.017$) and 0.701($p=0.038$), respectively (Table 2, Fig 3).

CONCLUSION

Both liver ECV, splenic ECV and LSM can be used as noninvasive methods for predicting liver cirrhosis and hepatic decompensation in patients with CLD.

CLINICAL RELEVANCE/APPLICATION

The prognosis of patients with ACLD critically depends on the occurrence of liver cirrhosis and hepatic decompensation. LSM demonstrates superior performance in predicting liver cirrhosis, while spectral-CT derived splenic ECV shows enhanced accuracy for predicting liver decompensation in patients CLD. Using a variety of imaging techniques can provide more comprehensive information for risk stratification in patients with CLD.
Printed on: 02/18/26

Nov. 30 – Dec. 4
RSNA® 2025
Imaging the Individual

Abstract Archives of the RSNA, 2025

W3-SSIN05

Imaging Informatics (Image Processing and Analytics)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: S503

Ayis T. Pyrros, MD (*Moderator*)
Eduardo J. Mortani Barbosa JR, MD, MBA (*Moderator*)

Sub-Events

W3-SSIN05-1 A TOUCHSTONE OF MEDICAL ARTIFICIAL INTELLIGENCE

Pedro Ricardo Ariel Salvador Bassi (*Presenter*)
Wenxuan Li, BS (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)
Zongwei Zhou, PhD (*Abstract Co-Author*)

PURPOSE

To create a fair, large-scale benchmark for evaluating AI segmentation models in medical imaging, emphasizing accuracy, efficiency, and generalizability across real-world clinical variability.

METHODS AND MATERIALS

We launched the Touchstone Benchmark to address limitations in existing medical AI evaluations—such as small test sets, overfitting, and narrow comparisons. Forty-four research teams from 12 countries participated, submitting AI algorithms they originally developed. All models were trained using a common, open dataset of 5,195 fully annotated abdominal CT scans from 76 hospitals across 8 countries. The benchmark includes 22,682 CT volumes in total and evaluates performance using a reserved and unseen external test set of 13,420 volumes from 12 hospitals. These scans were annotated per voxel for nine anatomical structures and represent real-world diversity across scanner types, patient demographics (age, sex, race), and disease conditions.AI models—including convolutional neural networks (CNNs), Transformers, diffusion-based models, and vision-language hybrids—were independently evaluated by our team. Inference speed and segmentation quality were assessed using the Dice Similarity Coefficient (DSC), Normalized Surface Distance (NSD), and runtime per case. The benchmark is featured in ISBI 2024, MICCAI 2024, and will continue to expand through 2029.

RESULTS

We have evaluated 19 models so far, with 35 more anticipated. Segmentation performance varied significantly across organs, models, and datasets. For instance, models achieved DSCs of 70-96% across organs and 82-92% in overall average performance. Inference speed ranged from 0.12 to 0.61 seconds per CT slice. Our largest test set (N=5,903) allowed us to uncover performance gaps that are statistically significant yet previously overlooked in small-scale benchmarks. Metadata analysis revealed meaningful performance differences based on age, race, and disease type—emphasizing the clinical importance of diverse test data .

CONCLUSION

Touchstone offers a robust, fair, and long-term platform for benchmarking medical AI. By evaluating algorithms on large, out-of-distribution datasets and conducting all assessments independently, it provides the most comprehensive evaluation framework to date.

CLINICAL RELEVANCE/APPLICATION

Touchstone supports the clinical translation of AI by identifying algorithms that perform well across diverse hospitals and patient populations. Beta-tested at Johns Hopkins and UCSF, benchmarked AI tools are already aiding in organ volume measurement and surgical planning.

W3-SSIN05-2 AI-BASED IMAGE ENHANCEMENT IMPROVES DIAGNOSTIC ACCEPTABILITY OF SUBOPTIMAL CHEST CT AND CTPA STUDIES

Tejash Sikka, BS, MS (*Presenter*)
Lina Karout, MD (*Abstract Co-Author*)
Javier Contreras Yametti, MD (*Abstract Co-Author*)
Tarick Ahmad (*Abstract Co-Author*)
Parisa Kaviani, MD (*Abstract Co-Author*)
Anushree M. Burade, MBBS (*Abstract Co-Author*)
Seyedehelaheh Hosseini, MD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)

PURPOSE

A substantial number of CT pulmonary angiography (CTPA) exams are rendered suboptimal due to inadequate contrast enhancement, often caused by large body habitus, cardiac output variability, or contrast timing issues. This study evaluated the effectiveness of a vendor-neutral AI model in enhancing image quality—specifically by improving contrast and reducing noise—in both optimal and suboptimal chest CTPAs and contrast-enhanced chest CTs (CECTs).

METHODS AND MATERIALS

This retrospective IRB-approved study analyzed 611 CTPA and CECT examinations from 611 adult patients (mean age 59 years; 310 males, 301 females) performed at a tertiary care center over one year. Based on qualitative assessment by two board-certified Thoracic Radiologists, 318 cases were identified as suboptimal due to insufficient vascular opacification or excessive image noise. All images were anonymized and subsequently processed using a convolutional neural network-based AI algorithm designed to enhance contrast media visibility, reduce photon-related image noise, and minimize common artifacts, including streak and beam-hardening artifacts. The institution providing data was not involved in AI model training, validation, or testing. Image quality was quantitatively assessed by measuring attenuation values (HU) in the main pulmonary artery (PA), ascending thoracic aorta (ATA), and segmental pulmonary arteries (SPA), as well as by calculating signal-to-noise ratios (SNR) and contrast-to-noise ratios (CNR). HU values were measured from CT images with a standardized 1-mm thickness. Statistical analysis utilized paired t-tests comparing pre- and post-AI enhancement metrics, with a p-value <0.05 deemed significant.

RESULTS

Post-AI processing significantly improved vascular attenuation: PA (192±106?293±174 HU), ATA (235±132?362±217 HU), SPA (187±103?282±165 HU); all p=0.001. Noise significantly decreased: PA (17.6±7.8?11.2±5.5 HU), ATA (17.2±8.4?10.8±6.8 HU), SPA (19.0±11.2?14.7±12.3 HU); all p=0.001. Correspondingly, marked improvements were observed in SNR (PA: 20.8?59.7, ATA: 25.2?72.7, SPA: 20.1?56.9) and CNR (PA: 188.8?288.8, ATA: 232.1?357.3, SPA: 184.5?277.9); all comparisons were statistically significant (p=0.001).

CONCLUSION

The AI algorithm significantly enhances diagnostic image quality of CTPAs and CECTs by improving vascular contrast, substantially reducing noise, and increasing both SNR and CNR in optimal and suboptimal exams.

CLINICAL RELEVANCE/APPLICATION

Applying AI-based image enhancement in routine clinical practice can effectively salvage suboptimal chest CT studies, reducing repeat imaging, avoiding additional radiation and contrast exposure, and enhancing diagnostic confidence and accuracy in patient care.

W3-SSIN05-4 AN END-TO-END PIPELINE FOR BLADDER CANCER RECURRENCE PREDICTION USING MULTIMODAL IMAGING AND CLINICAL MARKERS

Israa Sharaby, BSc, MSc (*Presenter*)
Ahmed Alksas, PhD (*Abstract Co-Author*)
Osama Ezzat (*Abstract Co-Author*)
Amr A. Elsawy (*Abstract Co-Author*)
Rasha T. Abouelkheir, MBBCh (*Abstract Co-Author*)
Ahmed Elmahdy (*Abstract Co-Author*)
Sherry M. Khater (*Abstract Co-Author*)
Ahmed Mosbah (*Abstract Co-Author*)
Mahmoud A. Bazeed (*Abstract Co-Author*)
Ayman S. El-Baz SR, PhD (*Abstract Co-Author*)

PURPOSE

Bladder cancer poses a clinical challenge due to the high recurrence rate after initial treatment, necessitating reliable and non-invasive methods for early prediction. This study proposes an end-to-end pipeline for predicting recurrence in bladder cancer patients using multimodal data, including radiomics features derived from MRI scans and clinical features to improve prediction outcomes.

METHODS AND MATERIALS

We included a cohort of 119 bladder cancer patients (25 recurrence, 94 non-recurrence) with MRI scans and clinical data. Tumor segmentation was performed using a shape-aware generative adversarial network (GAN) with three input channels (original MRI, appearance-guided enhancement map, and circular binary pattern probability map) to highlight tumor morphology. Following segmentation, first-order statistical, second-order radiomics features, and morphological descriptors were extracted. Clinical features were preprocessed using label-aware imputation, normalized with RobustScaler for outliers, followed by Min-Max scaling. Both feature sets underwent Recursive Feature Elimination with Cross-Validation (RFECV) using different classifiers to identify relevant predictors by iteratively removing the least contributive features. To reduce multicollinearity, Principal Component Analysis (PCA) was applied to selected features, retaining components explaining at least 95% of the variance resulting in 5 radiomics and 18 clinical components. These were used to train and evaluate ML classifiers using Leave-One-Out and 5-Fold Cross-Validation.

RESULTS

Models were tested using clinical features alone, radiomics alone, and both combined. Using clinical markers, SVM achieved 93% accuracy and 88% sensitivity under LOOCV. Radiomics performed slightly lower a 90% accuracy, 72% sensitivity with DT and KNN showing image-derived features are informative but less robust. Combining both improved performance across classifiers; LGBM achieved 94% accuracy and 84% sensitivity. Sensitivity variability was due to class imbalance (25 recurrence vs. 94 non-recurrence), but combined features improved generalization and recall for the minority class, crucial for recurrence prediction.

CONCLUSION

This study proposed an automated pipeline for predicting bladder cancer recurrence. RFECV followed by PCA reduced redundancy and improved model interpretability. Integrating clinical and radiomics features provided a more comprehensive and discriminative representation, improving classification performance.

CLINICAL RELEVANCE/APPLICATION

The proposed automated pipeline offers a non-invasive decision-support tool aiding bladder cancer treatment planning while maintaining high diagnostic accuracy.

W3-SSIN05-5 PREDICTING POST-SURGICAL COMPLICATIONS IN LOSS OF DOMAIN INCISIONAL HERNIAS: THE ROLE OF ABDOMINAL VOLUMETRY

Hector Alvarez-Manzo, MD, MSc (*Presenter*)
Axel A. Torres Monarrez, MD (*Abstract Co-Author*)
Monica Chapa-Ibarguengoitia, MD (*Abstract Co-Author*)

PURPOSE

To investigate the utility of abdominal volumetric analysis for forecasting postoperative complications in patients with loss of domain incisional hernias.

METHODS AND MATERIALS

This retrospective study included all patients diagnosed with incisional hernias with loss of domain referred to a tertiary care unit from 2007 to April 2023. Patients without postoperative outcome data or with inadequate CT scans were excluded. Demographic variables and postoperative complications such as wall-related, intra-abdominal, or systemic, were collected. All patients underwent standard preoperative evaluation and structured postoperative follow-up. Quantitative analysis was performed on 199 preoperative CT scans from 152 patients using IntelliSpacePortal 9.0 (IQon Spectral CT). Volumetric measurements included intra-hernia volume (VIH), abdominal cavity volume (VAC), and total peritoneal volume (VP = VAC + VIH), obtained via semi-automated segmentation. The hernia volume ratio (HVR = VIH/VP) was calculated for each case. Statistical analysis was conducted using the Mann-Whitney U test ($p < 0.05$) to evaluate associations between HVR and postoperative complications. The study was approved by the institutional ethics committee (RAD-4101-22-23-1).

RESULTS

We analyzed 199 CT scans from 152 patients with incisional hernias with loss of domain; 121 scans lacked a Valsalva maneuver. In non-Valsalva scans, the median hernia index was 7.87, with a hernia volume of 680 cm^3 and a total abdominal volume of 9262.6 cm^3. Valsalva scans showed a higher median hernia index of 12.38 and a hernia volume of 923 cm^3. Regarding postoperative complications, 31 patients developed wall-related issues, mainly dehiscence and infection; 15 had intra-abdominal complications, and 39 experienced systemic events, predominantly respiratory. A significant correlation was found between the hernia index and postoperative complications in non-Valsalva scans ($p = 0.0123$).

CONCLUSION

The hernia-to-abdominal cavity volume ratio is a valuable predictor of postoperative complications in patients with incisional hernias with loss of domain, providing critical information for preoperative planning.

CLINICAL RELEVANCE/APPLICATION

A volumetric approach may offer critical preoperative insight, enabling more informed surgical planning and potentially improving outcomes in the repair of complex incisional hernias.

W3-SSIN05-6 HYBRID DISTANCE-TRANSFORM GUIDED AFFINE AND DEEP-LEARNING REGISTRATION FOR ROBUST TRACKING OF LIVER LESIONS ON LONGITUDINAL CT SCANS

Nalan Karunanayake, PhD, BEng (*Presenter*)
Lin Lu (*Abstract Co-Author*)
Ping Yin (*Abstract Co-Author*)
Hao Yang (*Abstract Co-Author*)
Richard Kinh Gian Do, MD, PhD (*Abstract Co-Author*)
Lawrence H. Schwartz, MD (*Abstract Co-Author*)
Binsheng Zhao, DSc (*Abstract Co-Author*)

PURPOSE

To develop an automated framework that delivers high-precision liver registration and accurate longitudinal classification of colorectal liver metastases (CRLM) on contrast-enhanced CT (CECT), enabling reliable identification of matched, new, and disappeared lesions.

METHODS AND MATERIALS

This retrospective study analyzed CECT pairs, baseline and follow-up, from 100 patients with CRLM, treated with chemotherapy. One radiologist annotated 887 lesions (mean diameter 31.9 ± 25.6 mm) and 862 lesions (27.4 ± 19.4 mm) on baseline and follow-up scans respectively. Liver masks automatically generated by TotalSegmentator drove a three-stage registration pipeline: (1) coarse rigid pre-alignment to place follow-up livers in approximate correspondence; (2) distance-transform optimized affine registration confined to the masked liver volumes, and (3) a convolutional neural network that refined the result to a final six-degree-of-freedom rigid transform. Registration accuracy was assessed with whole liver Dice, 1-mm surface-Dice, and the 95th-percentile Hausdorff distance (HD95). Lesion tracking was performed using voxel and bounding-box overlaps, and precision and recall were reported for matched, new, and disappeared lesions.

RESULTS

Whole-liver registration progressively improved across the three stages. The initial rough alignment yielded Dice 0.734 ± 0.087, surface-Dice 0.146 ± 0.060, and HD95 26.5 ± 13.1 mm. Applying the distance-transform affine registration raised performance to Dice 0.919 ± 0.032, surface-Dice 0.470 ± 0.115, and HD95 9.7 ± 10.1 mm. Final deep learning (DL) refinement further boosted accuracy to Dice 0.957 ± 0.010, surface-Dice 0.715 ± 0.067, and HD95 3.5 ± 1.3 mm. Lesion tracking with voxel overlap showed stepwise gains: matched-lesion precision/recall rose from 0.87/0.47 (initial) to 0.99/0.89 (affine) and 1.00/0.91 (DL); new-lesion precision improved from 0.392 to 0.803 and 0.780 (recall remained 1.00); disappeared-lesion precision climbed from 0.443 to 0.748 and 0.805 (recall 1.00 throughout). Bounding-box analysis mirrored these trends, culminating in DL-registered precision/recall of 0.935/0.961 (matched), 0.871/1.000 (new), and 0.841/1.000 (disappeared).

CONCLUSION

The hybrid distance-transform affine plus DL refinement framework delivers sub-voxel liver alignment and near-perfect lesion correspondence, outperforming conventional rough or affine-only strategies.

CLINICAL RELEVANCE/APPLICATION

Automated, high-fidelity registration markedly streamlines longitudinal assessment of liver lesion burden, enabling reliable detection of subtle lesion evolution and reducing radiologist workload in treatment-response evaluation.

Nov. 30 – Dec. 4
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W3-SSIN06

Imaging Informatics (Informatics and Artificial Intelligence to Understand and Improve Practice)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E450B

Manisha Bahl, MD, MPH (*Moderator*)
Susan Sotardi, MD, MEng (*Moderator*)

Sub-Events

W3-SSIN06-1 PROTOCOL PREDICTION USING LARGE LANGUAGE MODELS

Barbaros S. Erdal, PhD (*Presenter*)
Conrad Testagrose (*Abstract Co-Author*)
Panagiotis Korfiatis, PhD (*Abstract Co-Author*)
Justin Benfield (*Abstract Co-Author*)
Peggy Merkel (*Abstract Co-Author*)
Daniel J. Blezek, PhD (*Abstract Co-Author*)
Timothy L. Kline, PhD (*Abstract Co-Author*)
Mutlu Demirer, PhD (*Abstract Co-Author*)
Richard D. White, MD, MS (*Abstract Co-Author*)
Candice W. Bolan, MD (*Abstract Co-Author*)

PURPOSE

Advances in NLP and deep learning have expanded AI's role in clinical radiology. We investigate whether a sparse-attention transformer (BigBird) can automatically predict imaging protocols from free-text patient reports to streamline workflows and reduce manual selection errors.

METHODS AND MATERIALS

We retrospectively collected a total of 498,228 total Mayo Clinic patient records, extracting the region, radiology division, clinician name, the patient's problem list (PL), and any relevant comments or descriptions were compiled and constructed into input prompts. After construction of the input prompts, medical terms within the report were normalized to UMLS CUIs to ensure consistency across the patient reports. The data were then stratified and split into training, validation, and test sets based on three Mayo Clinic locations (Rochester, Florida, and Arizona). This data was used to train a modified Big-Bird model (sparse-attention based transformer model that extends BERT to sequences of 8192 tokens) for each Mayo Clinic region or division. Models were saved based on validation F1 score. We compare the performance of models trained on the region-based data to that of a division-based model with and without including the PL.

RESULTS

Figure 1 shows the average F1 score of each model across the separate radiological divisions with a region. The division-based model without the PL provided F1 scores of 0.80, 0.80, and 0.83 for Rochester, Florida, and Arizona respectively. F1 scores of 0.86, 0.89, and 0.88 were achieved for the division-based model with the PL included. Lastly, the region-based model achieved F1 scores of 0.86, 0.86, and 0.85 for Rochester, Florida, and Arizona. Figure 2 gives a more granular visualization of F1 score by division per region.

CONCLUSION

The models developed in this study show acceptable F1 performance for most radiological protocols in our dataset. The region-based model saw a slight reduction in F1 score on Florida and Arizona however, in a deployment/operationalization setting, having one model per-region rather than per-division we have experienced to be easier to maintain. While including the PL when training the models allows for exceptional performance for commonly prescribed protocols, some less common protocols (such as site-specific protocols) may require additional data to increase the F1 score. Results show promise for the use of LLMs for auto protocoling of radiological workflows and identify areas of potential improvement for future research directions.

CLINICAL RELEVANCE/APPLICATION

Automated protocol prediction with LLMs can accelerate radiological workflows and reduce errors in the manual selection of protocols.

W3-SSIN06-2 TRANSFORMING RADIOLOGY PROTOCOLING EXPERIENCE AND EXPEDITING PATIENT CARE (TREE PROJECT)

Jin Yoon, MD (*Presenter*)
Dorothy A. Sippo, MD, MPH (*Abstract Co-Author*)
Michael J. Rasiej, MD (*Abstract Co-Author*)
Marc Brown, MD (*Abstract Co-Author*)
Matthew P. Moy, MD (*Abstract Co-Author*)
John R. Zech, MD, MA (*Abstract Co-Author*)

PURPOSE

Radiology cross-sectional studies require significant time and effort to protocol by radiologists and contribute to the ever increasing number of workflow interruptions. Our goal was to train tree-based machine learning models to recommend imaging protocols utilizing ordering information to expedite the protocoling process and improve patient care.

METHODS AND MATERIALS

We acquired 18743 CT and MRI protocols (452 unique protocols) from August 1, 2022 to July 30, 2024 from 15455 patients. Protocols were split into training (n = 13212), validation (n = 1815), and test (n = 3718) datasets. We trained and fine-tuned decision tree models and random forest models to predict the correct protocol with two different sets of input information. We trained our first set of models using only the ordered study title as the input (labeled as "order-only" model). We then trained a second set of models with more comprehensive input information including the ordered study title, age, sex, indications, comments from the ordering provider, and the referring provider (labeled as "complete" model). Accuracies of the models were calculated for their first choice and top 5 choices. A random sample of 100 protocols that the model guessed incorrectly were selected for manual review to reassess the model's final decision.

RESULTS

Our order-only decision tree and order-only random forest models showed accuracy rates of 68.3% and 68.3%, respectively. Our complete decision tree and complete random forest models showed accuracy rates of 80.7% and 84%, respectively. The complete random forest model contained the correct protocol in its top 5 choices in 95.1% of cases. Manual review of 100 randomly selected incorrect predictions revealed that 17% of predictions were preferred over the radiologist-selected protocol, 40% were diagnostically equivalent, 22% were suboptimal but diagnostic, and 21% were nondiagnostic and/or not possible to protocol with the provided information.

CONCLUSION

Our study showed that the complete random forest model predicted the protocols with 84% accuracy and included the correct guess in its top 5 predictions in 95.1% of cases. Manual review of the 100 randomly selected incorrect predictions revealed that 57% of these protocols were in fact diagnostically equivalent or preferable to the clinically chosen protocol, highlighting that there can be variations in acceptable protocols for cross sectional studies.

CLINICAL RELEVANCE/APPLICATION

With the growing complexity and volume of cross-sectional exams, it is crucial to protocol them correctly and promptly to maintain workflow efficiency and avoid delays in patient care. Our study demonstrates the potential of utilizing machine learning AI models to quickly and accurately select the correct protocol.

W3-SSIN06-3 ACHIEVING TRULY INFORMED CONSENT? A PROSPECTIVE TRIAL USING RETRIEVAL-AUGMENTED GENERATION BEFORE CT EXAMINATIONS

Felix Busch, MD (*Presenter*)
Lisa C. Adams, MD, PhD (*Abstract Co-Author*)
Keno K. Bressem, MD (*Abstract Co-Author*)

PURPOSE

This prospective comparative study aimed to investigate the feasibility, usability, and effectiveness of a Retrieval-Augmented Generation (RAG)-powered Patient Information Assistant (PIA) chatbot for pre-CT information counseling, compared to standard physician-led consultation and informed consent procedures.

METHODS AND MATERIALS

Eighty-six patients scheduled for CT imaging (November-December 2024) were randomly assigned to either the PIA group (n=43), receiving pre-CT information via a RAG-powered chatbot, or the control group (n=43), receiving standard doctor-led consultation. Patient satisfaction, information clarity, comprehension, and concerns were assessed using six ten-point Likert-scale questions. Consultation duration was recorded, and patients in the PIA group indicated their preferred mode of future counseling. Two radiologists independently evaluated each PIA session based on five criteria: overall quality, scientific and clinical evidence, clinical usefulness and relevance, consistency, and up-to-dateness.

RESULTS

Both groups reported similarly high ratings for information clarity (PIA: 8.64 ± 1.69; control: 8.86 ± 1.28; p=0.82) and overall comprehension (PIA: 8.81 ± 1.40; control: 8.93 ± 1.61; p=0.35). Physician-led consultations more effectively alleviated patient concerns (8.30 ± 2.63 vs. 6.46 ± 3.29; p=0.003). Patients in the PIA group required significantly shorter subsequent consultation times (median: 120 s [IQR: 100-140] vs. 195 s [IQR: 170-220]; p=0.04). Radiologists rated PIA chats favorably across all evaluated categories.

CONCLUSION

A RAG-powered PIA chatbot can effectively deliver pre-CT information while reducing physician consultation time. Although patient satisfaction and comprehension were comparable to standard consultations, physician-led interactions remained superior in addressing patient concerns.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the potential of AI-based chatbot solutions to streamline patient counseling for imaging procedures. At the same time, physician engagement remains crucial for addressing patient worries, suggesting a complementary role for both approaches in clinical practice.

W3-SSIN06-4 CLINICIAN-CENTRIC EXPLAINABLE AI: A MULTI-DIMENSIONAL FRAMEWORK FOR TRUSTWORTHY DIAGNOSTIC REASONING IN RADIOLOGY

Tician Schnitzler, MD, MSc (*Presenter*)
Okan Efe Ogretmen (*Abstract Co-Author*)
Mehmet Can Yavuz (*Abstract Co-Author*)

PURPOSE

Artificial intelligence (AI) in radiology continues to face adoption barriers due to opaque decision-making processes that limit clinical trust. Traditional explainable AI (XAI) tools—such as saliency maps or feature importance rankings—rarely align with radiologists' diagnostic reasoning. We propose a Clinician-Centric Explainable AI (CC-XAI) framework to embed clinically meaningful, anatomy- and workflow-rooted explanations directly into radiological decision support.

METHODS AND MATERIALS

A conceptual and applied analysis of CC-XAI was performed, contrasting its interpretability with general-purpose XAI. We developed a five-category taxonomy comprising: (1) Visual (anatomy-aware saliency maps), (2) Textual (clinical language generation), (3) Example-Based (retrieval of annotated similar cases), (4) Quantitative (comparative measurement over time), and (5) Rule-Based (integration of clinical decision logic). A modular CC-XAI system was illustrated using a representative lung nodule case, demonstrating integration of lesion localization, volumetric growth analysis, similar case retrieval, and risk-factor-based reasoning into one cohesive explanation output.

RESULTS

The proposed CC-XAI framework translates AI predictions into structured, interpretable outputs aligned with clinical workflows and cognitive heuristics. In our example, a spiculated nodule with growth from 8 mm to 15 mm over one year (estimated doubling time of 1119 days) was explained via anatomy-aware localization, growth kinetics, retrieval of two malignant-confirmed prior cases, and rule-based consideration of smoking, cancer history, and pulmonary fibrosis. Each module contributes to a cohesive final interpretation that improves explainability and trust calibration.

CONCLUSION

Clinician-centric XAI addresses a fundamental barrier to AI adoption in radiology by offering domain-specific, multi-dimensional explanations that mirror radiologists' decision-making processes. Embedding these modules into radiology workflows can facilitate clinically robust, interpretable, and trustworthy AI integration.

CLINICAL RELEVANCE/APPLICATION

CC-XAI empowers radiologists with transparent AI reasoning across visual, textual, and rule-based domains. Its modular design supports integration into clinical workflows for safer, more interpretable, and diagnostically aligned AI usage—especially in high-stakes areas such as lung cancer evaluation.

W3-SSIN06-5 PHYSICIAN- AND PRACTICE-LEVEL PREDICTORS OF E&M SERVICE INTENSITY IN INTERVENTIONAL RADIOLOGY: A NATIONAL MEDICARE CLAIMS ANALYSIS POST-E&M REFORM

Zain Hussain, MD (*Presenter*)
Hamza Masood (*Abstract Co-Author*)
Gulcin Altinok, MD (*Abstract Co-Author*)
Ali N. Harb, MD (*Abstract Co-Author*)

PURPOSE

To quantify Evaluation and Management (E&M) service patterns among U.S. interventional radiologists (IRs), stratify intensity by procedural workload tiers, and identify physician- and practice-level predictors of E&M service use in the 2023 Medicare fee-for-service environment.

METHODS AND MATERIALS

We conducted a cross-sectional analysis using the 2023 Medicare Physician & Other Practitioners Public Use File, merged with the Physician Compare database, to analyze E&M billing among radiologists. IR-related workload was defined as the percentage of total wRVUs from procedural and E&M services, stratified into 10-49%, 50-89%, and =90% tiers. Negative binomial regressions assessed predictors of E&M intensity, including gender, years since graduation, rurality, group size, and U.S. Census division. Primary outcomes included total E&M claims, high-complexity visits, and repeat encounter ratios.

RESULTS

Among 5,330 IRs, mean E&M volume rose with procedural intensity: 13.3 (10-49%), 74.5 (50-89%), and 101.2 (=90%). High-complexity visits increased from 2.6 to 21.7 per physician across tiers. In adjusted models, female gender predicted lower E&M output in the 10-49% (RRR 0.79, $p<0.001$) and 50-89% (RRR 0.63, $p<0.001$) tiers, but not in the =90% tier. Rural practice was associated with increased E&M billing in the 10-49% tier (RRR 4.17, $p<0.001$), yet with reduced high-complexity billing in the =90% tier (RRR 0.42, $p=0.021$). Repeat encounter ratios and RVU-per-visit rose with IR workload, suggesting that longitudinal care scales with procedural engagement. Geographic disparities persisted, with Pacific and East South Central divisions demonstrating the highest relative E&M intensity.

CONCLUSION

E&M service volume in IR scales directly with procedural intensity and is shaped by geography, gender, and rurality. These findings support IR's growing role as a longitudinal clinical specialty and call for equitable support structures to optimize non-procedural care delivery.

CLINICAL RELEVANCE/APPLICATION

This national analysis demonstrates that evaluation and management service intensity in interventional radiology increases directly with procedural workload, with highly active interventional radiologists delivering substantial cognitive and longitudinal care. Geographic, gender, and rural disparities suggest structural barriers to clinic access rather than differences in provider behavior, highlighting opportunities for more equitable resource distribution.

W3-SSIN06-6 IMPACT OF LARGE LANGUAGE MODEL (LLM) LABELLING ERRORS ON PERFORMANCE AND EVALUATION INTEGRITY OF IMAGING AI MODELS

Seyed Mohammadreza Chavoshi, MD (*Presenter*)
Aawez Mansuri, BS, MS (*Abstract Co-Author*)
Hari Trivedi, MD (*Abstract Co-Author*)
Theodorus Dapamede, MD, PhD (*Abstract Co-Author*)
Frank Li, PhD (*Abstract Co-Author*)
Rohan Satya Isaac (*Abstract Co-Author*)
Janice M. Newsome, MD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)

PURPOSE

Post-deployment monitoring of AI models is an active area of research requiring comparison of AI model predictions to ground truth extracted from radiology reports. Large language models (LLMs) have shown promising performance for label extraction; however, this performance can vary depending on label complexity. We investigate how errors in LLM-based label extraction impact subsequent evaluation of imaging AI models.

METHODS AND MATERIALS

We simulated 10,000 hypothetical radiology exams with 10% disease prevalence to assess how LLM labeling errors affect AI model estimated evaluation. We simulated LLM sensitivity (Sn) and specificity (Sp) across values from 80-100%, and AI model Sn/Sp were set at 90%, 95%, and 99%. For each combination, we calculated a best-case (LLM and model errors completely overlapped) and a worst-case (errors occurred on entirely different cases). The difference between these defined the uncertainty range in estimated performance.

RESULTS

LLM labeling errors significantly affected the estimated Sn of AI models. For a model with Sn/Sp of 90% and LLM Sn/Sp of 80%, the estimated model Sn ranged from 65.4% to 26.9%, resulting in an uncertainty of 38.5 percentage points. The corresponding estimated Sp ranged from 98.6% to 85.1% (13.5 percentage points uncertainity). Increasing only the LLM Sn to 100% (with Sp at 80%) narrowed the estimated Sn range to 64.2%-32.1% (32.1 point uncertainty) and Sp to 100%-87.5% (12.5 point uncertainty). While, increasing only the LLM Sp to 100% (with Sn at 80%) resulted in an estimated Sn range of 100%-87.5% (12.5-point uncertainty) and Sp range of 89.1%-88.0% (1.1-point uncertainty). For AI models with higher Sn/Sp values of 95% or 99%, the uncertainty induced by LLM errors was reduced but remained more pronounced in the estimated Sn than Sp. Across all scenarios, enhancing LLM specificity reduced uncertainty more effectively and yielded performance estimates closer to the true model values.

CONCLUSION

While model training may tolerate label noise, evaluation during external validation or real-world monitoring is highly sensitive to it. Because most diseases in radiology are low prevalence, LLM labeling errors can significantly distort estimated model performance metrics, especially the Sn. Across models with varying performance levels, improving LLM Sp consistently reduced evaluation uncertainty, underscoring its critical role in real world performance assessment.

CLINICAL RELEVANCE/APPLICATION

For post-deployment model evaluation in low-prevalence settings, LLM-based labelling should prioritize high specificity—ideally approaching 100%—to ensure reliable performance monitoring across models with different performance levels.

Nov. 30 – Dec. 4
RSNA® 2025
Imaging the Individual

Abstract Archives of the RSNA, 2025

W3-SSMK08

Musculoskeletal Imaging (Muscle, Tendon and Nerve)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: E450A

Jorge A. Vidal, MD (*Moderator*)
Laxshmi Veda Avula (*Moderator*)

Sub-Events

W3-SSMK08-1 SOUND AND SIGNAL: CORRELATING ULTRASOUND AND NERVE CONDUCTION IN DIABETIC NEUROPATHY

Asmita Dhandekar, MBBS (*Presenter*)
Priscilla Joshi, MBBS, MD (*Abstract Co-Author*)

PURPOSE

Diabetes is a major global health concern, responsible for considerable illness and morbidity due to its complications. Diabetic peripheral neuropathy (DPN) is one of the major debilitating complications in diabetic patients. The purpose of this study was to evaluate the association between peripheral nerve thickening, as assessed by high-resolution ultrasound (HRUS), and functional impairment detected through nerve conduction studies (NCS) in patients with Type II diabetes mellitus (T2DM). DPN is a common yet often underdiagnosed complication of diabetes, and early detection is crucial for effective management. This study aims to explore the potential of HRUS as a complementary, non-invasive diagnostic tool alongside traditional NCS in the assessment of DPN.

METHODS AND MATERIALS

66 type II diabetes patients were evaluated. Patients with polyneuropathies other than DPN, drugs causing neuropathy and gestational diabetes were excluded from the study. Data collected included demographics, diabetes duration, HbA1c levels, and NCS parameters. On HRUS the cross-sectional areas (CSA) of median, ulnar, common peroneal, posterior tibial and sural nerves were measured. These findings were correlated with NCS results.

RESULTS

Of the 66 patients evaluated, 23 patients had abnormal NCS with increased CSA, indicating DPN. 30 patients, despite normal NCS, showed increased CSA on HRUS, suggesting early changes of DPN. The remaining patients had normal NCS and USG findings. Peripheral nerve thickness increased with worsening glycemic control, which was consistently seen in the poor control group (HbA1c > 8.5%). Patients on insulin therapy had a significantly higher proportion of abnormal NCS results (~75%), whereas those on oral hypoglycemic agents (OHA) showed a higher percentage of normal NCS findings (~65%).

CONCLUSION

HRUS demonstrates significant promise as a non-invasive and accessible tool for the early detection of diabetic peripheral neuropathy. It can identify nerve thickening prior to the onset of clinical symptoms or abnormalities on NCS. With further validation, HRUS has the potential to play a crucial role in the early diagnosis and management of neuropathy in T2DM patients.

CLINICAL RELEVANCE/APPLICATION

As the global burden of diabetes continues to rise, particularly in low- and middle-income countries, there is a critical need for accessible screening tools. HRUS offers a feasible and affordable approach for the early identification of diabetic neuropathy, enabling timely therapeutic interventions and potentially improving long-term neurologic outcomes in T2DM patients.

W3-SSMK08-2 CAN MULTIPARAMETRIC MRI USING DTI AND T2 MAPPING IMPROVE THE DIAGNOSIS OF DIABETIC PERIPHERAL NEUROPATHY?

Eunsun Oh, MD, PhD (*Presenter*)
Won Nyoung Yun (*Abstract Co-Author*)

PURPOSE

To investigate whether multiparametric MRI combining diffusion tensor imaging (DTI) and T2 mapping improves diagnostic accuracy in distinguishing diabetic peripheral neuropathy from diabetes without neuropathy and healthy controls, using age- and diabetes duration-matched groups.

METHODS AND MATERIALS

This prospective, age- and diabetes duration-matched study included 17 diabetic patients with clinically confirmed peripheral neuropathy, 16 diabetic patients without neuropathy, and 12 healthy controls. All subjects underwent 3T knee MRI, including axial T2-weighted Dixon imaging, diffusion tensor imaging (DTI), and T2 mapping sequences. Quantitative parameters—fractional anisotropy (FA), axial diffusivity (AD), radial diffusivity (RD), mean diffusivity (MD), and T2 relaxation time—were measured in the tibial nerve at the proximal calf level. Group comparisons were performed using ANOVA, and diagnostic performance was assessed using ROC curve analysis for individual and combined parameters.

RESULTS

FA values of the tibial nerve were significantly lower in both diabetic groups (with and without DPN) compared to healthy controls ($p < 0.01$). T2 relaxation times were significantly longer in both diabetic groups than in controls ($p < 0.01$). Among the single-parameter models, FA showed the highest diagnostic performance for detecting DPN (AUC = 0.85). The multiparametric model combining FA and T2 relaxation time demonstrated improved diagnostic accuracy (AUC = 0.91), outperforming all single-parameter models. AD, RD, and MD showed lower AUC values and were less effective as standalone markers.

CONCLUSION

Multiparametric MRI incorporating FA and T2 relaxation time demonstrated improved accuracy for detecting diabetic peripheral neuropathy compared to single-parameter models. This approach may enhance noninvasive evaluation of peripheral nerve integrity in diabetic populations.

CLINICAL RELEVANCE/APPLICATION

Noninvasive multiparametric MRI evaluation of the tibial nerve using FA and T2 relaxation time offers a promising imaging biomarker for early detection and monitoring of diabetic peripheral neuropathy, potentially aiding clinical decision-making and personalized treatment strategies.

W3-SSMK08-3 EVALUATION OF MUSCLE QUALITY AFTER LIMB SALVAGE SURGERY IN OGS PATIENTS: A COMPARATIVE STUDY OF MOLLI AND MAGIC T1 MAPPINGBACKGROUND AND PURPOSE:

Chung-Jung Lin, MD (*Presenter*)
Hung Ta H. Wu, MD, MBA (*Abstract Co-Author*)
Han-Ying Lin, MD (*Abstract Co-Author*)
Ching-lan Wu, MD (*Abstract Co-Author*)
Hong-Jen Chiou, MD (*Abstract Co-Author*)

PURPOSE

Limb salvage surgery for osteosarcoma (OGS) often results in muscle remodeling, including fibrosis and fatty infiltration. Quantitative T1 mapping provides a noninvasive means of evaluating these changes. However, the relative performance of Modified Look-Locker Inversion Recovery (MOLLI) and Magnetic Resonance Image Compilation (MAGiC) T1 sequences—particularly in the presence of metallic implants—remains uncertain. This study aimed to compare the consistency and accuracy of MOLLI and MAGiC in assessing muscle quality in young OGS patients following surgery.

METHODS AND MATERIALS

We prospectively enrolled 25 OGS patients under age 30 who had undergone limb salvage surgery. Bilateral thigh MRIs were performed using MOLLI and MAGiC T1 mapping sequences, both with MAVRIC metal artifact reduction. Mean T1 values were extracted from quadriceps and hamstring muscles on both surgical and contralateral sides. Side-to-side differences and inter-sequence agreement were evaluated using paired t-tests, intraclass correlation coefficients (ICC), and Bland-Altman plots.

RESULTS

Both MOLLI and MAGiC detected significantly decreased T1 values in muscles near the surgical site ($p < 0.03$), reflecting fatty replacement and tissue remodeling. MAGiC (924 ± 60 ms) yielded higher absolute T1 values than MOLLI (848.3 ± 67 ms, $p < 0.001$) and showed stronger side-to-side discrimination with lower variability. The ICC between MOLLI and MAGiC was moderate (0.74), and Bland-Altman analysis demonstrated a systematic bias between sequences. In addition to T1 mapping, MAGiC provides broader anatomical coverage with simultaneous T2 and PD data, though it is more susceptible to fat-related biases.

CONCLUSION

Both MOLLI and MAGiC effectively detect post-surgical muscle changes in OGS patients. While MAGiC may show less deviation in T1 values near implants and enables multi-parametric imaging, MOLLI offers greater consistency in focal T1 quantification and may be preferable in high-metal environments.

CLINICAL RELEVANCE/APPLICATION

Quantitative T1 mapping using MAGiC can aid in noninvasively monitoring muscle quality after limb salvage surgery in young OGS patients, potentially guiding rehabilitation and long-term functional planning.

W3-SSMK08-4 MRI OF POSTOPERATIVE PROXIMAL HAMSTRING TENDON HEALING: NEW INSIGHTS FROM A DESCRIPTIVE CASE SERIES

Sandra Mecho Meca, PhD (*Presenter*)
PAMELA PEREZ (*Abstract Co-Author*)
Gil Rodas Font (*Abstract Co-Author*)
Ricard Pruna (*Abstract Co-Author*)
Jordi Puigdellivol (*Abstract Co-Author*)
Ignasi Moix (*Abstract Co-Author*)
Alvaro F. Siedi III, MD (*Abstract Co-Author*)
Xavier ALOMAR SERRALLACH, MD (*Abstract Co-Author*)
Jaime Isern-Kebschull, PhD, MD (*Abstract Co-Author*)

PURPOSE

To characterize the healing process of surgically repaired proximal hamstring tendons in elite football players using MRI, and to define normal imaging features during the first four months post-surgery.

METHODS AND MATERIALS

From 2017 to 2025, 21 surgically repaired proximal hamstring tendons in male professional football players (mean age: 18.5, range: 17-25) were prospectively followed with MRI. Surgery followed Lempainen's technique. A short MRI protocol was performed in all cases. It included axial/coronal fat-suppressed intermediate-weighted and axial T1-weighted sequences. Two blinded radiologists scored seven imaging features: fragmentation (longitudinal/transverse), scar maturation, oedema type (interstitial, intermuscular, reparative), subcutaneous hematoma, tendinous angulation, blunt outline, and denervation-like sign. A total of 51 MRI exams were assessed across monthly intervals.

RESULTS

Of 21 injuries, 14 (66.7%) were complete free tendon tears and, 7 (33.3%) proximal aponeurosis. Most occurred in the right limb (52%). Oedema shifted from interstitial/intermuscular to reparative over time. Secondary denervation-like sign was detected after two months in 12 cases, persisting at month four. Tendinous angulation and blunt outline were constant throughout follow-up.

CONCLUSION

MRI effectively monitors tendon healing following hamstring repair. Acute signs resolve progressively, while reparative changes dominate from month two. Persistent signs such as angulation, blunt outline and denervation-like sign suggest residual alterations beyond four months.

CLINICAL RELEVANCE/APPLICATION

Radiologists should recognize typical MRI findings during early tendon healing post-surgery to differentiate normal evolution from complications and to guide return-to-play decisions in elite athletes.

W3-SSMK08-5 DIAGNOSTIC ACCURACY OF MAGNETIC RESONANCE IMAGING (MRI) IN GRADING, AND CLASSIFICATION OF SPORTS-RELATED THIGH MUSCLE INJURIES IN PROFESSIONAL ATHLETES WITH SPECIAL EMPHASIS ON IMPROVING PREDICTION OF TIME TO RETURN TO PLAY (TTRTP) AND THE POTENTIAL ROLE OF ARTIFICIAL INTELLIGENCE (AI)

Sherif El Hanawy, PhD, MSc (*Presenter*)
Yasser Abd El Fattah Hassan, PhD, MSc (*Abstract Co-Author*)
Moataz Elsayed (*Abstract Co-Author*)
Yasmine Atteya El Feky (*Abstract Co-Author*)

PURPOSE

Evaluate diagnostic accuracy of MRI in classification of sports-related thigh muscle injuries in professional athletes using the British Athletics muscle injury classification (BAMIC) and MLG-R classification systems, focusing on predicting (TtRtP) and potential integration of both classifications and AI to increase diagnostic and prognostic accuracy

METHODS AND MATERIALS

Retrospective analysis conducted on 40 professional athletes who sustained recent thigh muscle injuries between 2018 and February 2025. All participants underwent 1.5Tesla MRI machine within 72 hours of injury. Injuries classified using both the BAMIC and MLG-R systems. The reference standard for TtRtP was considered as expert-determined clinical and radiological TtRtP based on previous studies defined as the time from injury to full team training clearance, verified by the team physician and rehabilitation staff). The actual TtRtP data were recorded and compared to the reference standard were calculated for each classification system independently and in combination. Inter-observer reliability was assessed with correlation between classification grades and actual TtRtP. A preliminary machine learning model was trained to classify muscle injuries and predict TtRtP categories based on MRI findings.

RESULTS

BAMIC demonstrated the strongest individual correlation with TtRtP (r = 0.977) and a high AUC of 0.984. MLG-R showed also strong correlation (r = 0.904) and AUC (0.959). The integrated BAMIC and MLG-R model yielded an overall correlation of 0.959 and AUC of 0.984. Sensitivity and specificity for predicting TtRtP were 95.5% and 94.4% for BAMIC, 91.2% and 88.9% for MLG-R, and 96.4% and 94.4% for the combined approach. When AI was applied to the combined model, predictive correlation improved further to r = 0.989, with an AUC of 0.993, and classification accuracy of 94.5%. Sensitivity and specificity for predicting TtRtP were 96.4% and 94.4% for the integrated model, and 98.2% and 96.7% with AI enhancement. Interobserver agreement for MRI classification was excellent (? = 0.86)

CONCLUSION

MRI-based classification using BAMIC shows superior predictive accuracy for TtRtP in thigh muscle injuries. While MLG-R provides valuable anatomical details, combining both systems improves overall diagnostic performance. Integration of classification frameworks, potentially enhanced by AI tools, may support individualized rehabilitation strategies and optimize return-to-play decisions

CLINICAL RELEVANCE/APPLICATION

MRI-based classification systems like BAMIC and MLG-R classifications, especially when augmented by AI, enables improved prediction of TtRtP in professional athletes, facilitating evidence-based rehabilitation planning and return-to-sport decisions

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Nov. 30 – Dec. 4
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W3-SSNR10

Neuroradiology (Movement Disorders)

Wednesday, Dec. 3 9:30AM - 10:30AM Room: S406B

Maria J. Borja, MD (*Moderator*)
Suyash Mohan, MD (*Moderator*)

Sub-Events

W3-SSNR10-1 FOLLOWING THE TAIL: CAN THE CORONAL SWALLOW TAIL CLEFT SIGN IMPROVE NIGROSOME-1 ASSESSMENT?

Sriram Rajan, MD, MBBS (*Presenter*)
Shankhneel Singh, MD,MBBS (*Abstract Co-Author*)
Harsh Mahajan, MD, MBBS (*Abstract Co-Author*)

PURPOSE

To assess whether coronal reconstruction of phase images from axial susceptibility-weighted imaging (SWI) enhances the visualization confidence of the dorsolateral nigral signal / nigrosome-1 layer of the substantia nigra.

METHODS AND MATERIALS

A retrospective review was conducted on 433 consecutive MR brain scans acquired between January 2024 and January 2025 using a routine protocol for various indications. The axial phase images of susceptibility weighted images were analyzed in Phase 1 by two radiologists with 11 (SS) and 23 (SR) years of experience. They evaluated the visibility of the nigrosome-1 layer below the level of the red nucleus using a 5-point Likert scale (1 = very difficult to 5 = easily seen). In Phase 2, coronal reconstructed images of the phase susceptibility weighted images were assessed perpendicular to the substantia nigra in posterior sections, posterior to the Sukeroku sign, for the presence of the coronal cleft sign, also scored with the 5-point Likert scale.

RESULTS

Likert scores of 1 and 2 were similar for Phase 1 and 2 (6% and 9%, respectively). There was a marginal decrease in score 3 (from 4.97% to 4.04%). Scores of 4 decreased significantly from 16.97% in Phase 1 to 7.96% in Phase 2, while the score of 5 increased substantially from 62.01% in Phase 1 to 72.97% in Phase 2. Statistical analysis with Wilcoxon signed-rank test demonstrated that the addition of the coronal Swallow Tail cleft sign significantly enhanced confidence in visualizing the nigrosome-1 layer ($p < 0.01$).

CONCLUSION

The coronal Swallow Tail cleft sign significantly improves the confidence of visualization of the nigrosome-1 layer in both normal subjects and those with Parkinsonism.

CLINICAL RELEVANCE/APPLICATION

The Coronal Swallow tail cleft sign in routine practice can be used in cases where the axial images are indeterminate. The three dimensional visualization of the cleft sign may help in improving diagnostic accuracy.

W3-SSNR10-3 A NEUROIMAGING-GUIDED APPROACH TO PATIENT SELECTION FOR DBS: FOCUS ON REGIONS AND NETWORKS

Tiffany Rodrigues, BSc, MEng (*Presenter*)
Yutong Bai (*Abstract Co-Author*)
Andrew Yang (*Abstract Co-Author*)
Rafael E. Buongermini, MD (*Abstract Co-Author*)
Mohammad Mehdi Hajiabadi (*Abstract Co-Author*)
Kristine Keon (*Abstract Co-Author*)
Nir Lipsman (*Abstract Co-Author*)
Suneil Kalia (*Abstract Co-Author*)
George Ibrahim (*Abstract Co-Author*)
Carolina Gorodetsky, MD (*Abstract Co-Author*)
Victor Tang (*Abstract Co-Author*)
Alfonso Fasano, MD,PhD (*Abstract Co-Author*)
Andres Lozano, MD,PhD (*Abstract Co-Author*)
Jurgen Germann (*Abstract Co-Author*)
Alexandre Boutet, MD, PhD (*Abstract Co-Author*)

PURPOSE

Current patient selection for deep brain stimulation (DBS) relies on clinical assessments, which lack sufficient accuracy to reliably identify poor responders. Pre-operative neuroimaging presents a practical and feasible avenue for developing biomarkers to enhance patient selection. In this study we (I) reviewed pre-operative brain regions associated with DBS outcomes reported in the literature and (II) assessed the associated underlying brain networks.

METHODS AND MATERIALS

We systematically reviewed DBS studies examining preoperative neuroimaging findings from any modality (volumetric, fMRI, PET, etc) associated with postoperative DBS outcomes. Fifty-three studies (1,758 patients), mostly on Parkinson's disease (PD) and major depressive disorder (MDD), were included. Brain regions were extracted, weighted based on the number of studies reporting them, mapped onto standardized atlases, and used to generate disease- and target-specific brain maps. Two normative functional connectivity analyses were performed: (I) identification of the most central regions using graph theory metrics (internal network) and (II) assessment of brain-wide circuit engagement patterns (external network).

RESULTS

Frequency maps showed that in preoperative neuroimaging studies, the primary motor cortex was most often associated with outcomes in PD, and the anterior cingulate cortex in MDD. Internal network analysis revealed that, in PD, the primary motor cortex, left thalamus, brainstem, and right subthalamic nucleus were key hubs. In MDD, the main hubs were the bilateral amygdala, medial frontal gyrus, and frontal operculum. External network analysis demonstrated strong engagement of the basal ganglia in PD and the limbic system in MDD. Both conditions also recruited broader brain control networks, including the salience, cerebellar, and default mode networks.

CONCLUSION

Our approach identified key preoperative brain regions associated with DBS outcomes, revealing distinct disease-specific patterns and highlighting both central hubs and higher-order control regions. These findings offer a foundation for imaging biomarker development and support a more personalized, network-based strategy for DBS patient selection.

CLINICAL RELEVANCE/APPLICATION

These findings offer a framework for imaging biomarker development, supporting more personalized and network-informed DBS patient selection.

W3-SSNR10-4 AUTOMATED SUBSTANTIA NIGRA SEGMENTATION AND MULTICLASS CLASSIFICATION OF PARKINSONISM USING NEUROMELANIN-SENSITIVE MRI

Septian Hartono, PhD (*Presenter*)
Qicong Sun (*Abstract Co-Author*)
Alger Remirata (*Abstract Co-Author*)
Thomas Welton, PhD (*Abstract Co-Author*)
Pik Hsien Chai (*Abstract Co-Author*)
Louis Tan (*Abstract Co-Author*)
Eng King Tan (*Abstract Co-Author*)
Ling Ling Chan, MBBS, FRCR (*Abstract Co-Author*)

PURPOSE

Neuromelanin-sensitive magnetic resonance imaging (NMS MRI) offers a promising non-invasive marker for Parkinson's disease (PD) by enabling visualization of dopaminergic loss in the substantia nigra pars compacta (SNc). This study develops an automated SNc segmentation model on NMS MRI and a classification model to distinguish patients with Parkinsonism based on SNc features.

METHODS AND MATERIALS

A total of 548 subjects were included in this study: 166 healthy controls (HC), 256 patients with idiopathic Parkinson's disease (iPD), 36 with atypical Parkinsonian disorders (aPD; e.g., multiple system atrophy, progressive supranuclear palsy, Lewy body dementia), and 90 with non-neurodegenerative or secondary Parkinsonism (sPD; e.g., essential tremor, dementia, vascular Parkinsonism, drug-induced Parkinsonism). All subjects underwent 3T MRI, including high-resolution midbrain NMS MRI with 0.5 × 0.5 mm in-plane resolution. We trained and validated four vision transformer-based segmentation models (MERIT, ParaTransCNN, HiFormer, and Swin-Unet) against manual SNc annotations from 76 subjects (46 HC, 30 iPD). Quantitative features were extracted from the resulting SNc masks, including contrast-, intensity-, volume-, and shape-based parameters. To further enhance sensitivity, we applied an adaptive thresholding algorithm that excluded voxels with low neuromelanin signal based on an automatically derived baseline intensity and optimized cutoff. An XGBoost gradient boosting classifier was trained, validated, and tested on the extracted features using a 30:20:50 data split.

RESULTS

MERIT achieved the highest segmentation performance with a mean Dice similarity coefficient of 0.76. The multiclass classifier based on contrast- and intensity-based features yielded an overall accuracy of 89.4%, with 98.8% sensitivity and 98.8% specificity for HC, 89.8% sensitivity and 94.2% specificity for iPD, 66.7% sensitivity and 94.7% specificity for aPD, and 80.0% sensitivity and 97.2% specificity for sPD.

CONCLUSION

Our results demonstrate the feasibility of an automated pipeline that segments the substantia nigra and classifies various Parkinsonian disorders using NMS MRI-derived features. The model achieves high diagnostic accuracy, particularly in distinguishing idiopathic Parkinson's disease from other types of Parkinsonism.

CLINICAL RELEVANCE/APPLICATION

This pipeline leverages NMS MRI to objectively detect PD-related changes in the SNc. It could support radiologists in differentiating various forms of Parkinsonism using a single neuromelanin-sensitive MRI sequence, offering a non-invasive and accessible tool to supplement clinical diagnosis, especially in early or ambiguous presentations.

W3-SSNR10-5 IN VIVO MAPPING OF IRON, PROTEIN AGGREGATION, AND MYELIN INTEGRITY IN SYNUCLEINOPATHIES VIA DECOMPOSE-QSM

Jiaqi Wen, MD, MS (*Presenter*)
Jingjia Chen (*Abstract Co-Author*)
Xiaojun Guan (*Abstract Co-Author*)
Chunlei Liu (*Abstract Co-Author*)
Xiaojun Xu (*Abstract Co-Author*)

PURPOSE

Parkinson's disease (PD) and multiple system atrophy (MSA) are synucleinopathies that share motor symptoms but differ in clinical course and pathology. Non-heme iron accumulation, a-synuclein aggregation, and myelin damage contribute to disease progression. Decompose-QSM enables separation of paramagnetic (iron) and diamagnetic (protein/myelin) sources, allowing more precise characterization of disease-specific neurodegeneration. This study applied Decompose-QSM to investigate differences in iron deposition, a-synuclein accumulation, and myelin integrity in PD and MSA.

METHODS AND MATERIALS

MRI data from 184 older normal controls (ONC), 260 PD, and 22 MSA patients were acquired using 3T ESWAN sequences. Multi-echo magnitude and QSM images were processed with Decompose-QSM to generate paramagnetic (PCS) and diamagnetic (DCS) maps. Deep learning models segmented the substantia nigra, putamen, and caudate for ROI analysis. DCS maps were nonlinearly registered to the ICBM-152 2009c template for voxel-wise white matter analysis. ROI statistics were performed in SPSS with FDR correction; voxel-wise comparisons used SPM with FWE correction.

RESULTS

In the nigrostriatal system, DCS in the caudate nucleus was significantly lower in PD and MSA compared to ONC (both $P < 0.001$), suggesting increased diamagnetic content (a-synuclein). PCS in the putamen was higher in MSA than PD ($P = 0.024$) and ONC ($P = 0.022$), indicating greater iron accumulation. PCS in the substantia nigra was elevated in both PD ($P < 0.001$) and MSA ($P = 0.022$) versus ONC. In PD, caudate DCS negatively correlated with UPDRS part II ($P = 0.009$) and III ($P = 0.048$). In MSA, lower caudate DCS correlated with SCOPA-AUT scores ($P = 0.001$), while putamen PCS correlated with HAMD, HAMA, and UMSARS I and IV scores. In PD, DCS was increased in major white matter tracts (e.g., corona radiata, internal capsule, corpus callosum), suggesting demyelination, while decreased DCS in adjacent regions may reflect compensatory myelination. Higher DCS correlated with UPDRS III, and lower DCS correlated with SCOPA-AUT and UPDRS II/III. In MSA, reduced DCS in the middle cerebellar peduncle may indicate early myelination changes, and was correlated with UMSARS I scores.

CONCLUSION

This study reveals distinct patterns of iron, pathological protein, and myelin alterations in PD and MSA. Decompose-QSM offers improved sensitivity to pathophysiological differences, supporting its potential as a diagnostic and monitoring tool.

CLINICAL RELEVANCE/APPLICATION

Decompose-QSM enables precise, non-invasive quantification of iron, pathological protein and myelin-related changes in neurodegenerative diseases, offering imaging biomarkers to differentiate PD from MSA and guide clinical decision-making.

W3-SSNR10-6 7T MRI QUANTITATIVE SUSCEPTIBILITY MAPPING FOR MRGFUS THALAMOTOMY: METHODOLOGY AND ANATOMO-CLINICAL CORRELATIONS IN A PILOT STUDY

Daniele Botta (*Presenter*)
Rares Salomir, PhD (*Abstract Co-Author*)
Karl-Olof Lovblad, MD (*Abstract Co-Author*)
Felix T. Kurz, MD (*Abstract Co-Author*)

PURPOSE

Ventral intermediate nucleus (VIM) thalamotomy performed with MR-guided focused ultrasound (MRgFUS) is an effective, non-invasive treatment for essential tremor (ET). However, conventional MRI at 1.5T or 3T offers limited anatomical detail for precise targeting of intra-thalamic sub-nuclei. This study aims to assess the feasibility and potential added value of integrating 7T Quantitative Susceptibility Mapping (QSM) into the clinical workflow of MRgFUS thalamotomy.

METHODS AND MATERIALS

We retrospectively analyzed radiological and clinical data from four patients who underwent MRgFUS thalamotomy for ET. Each patient underwent a pre-operative multi-echo gradient-echo (MEGRE) scan at 7T MRI with 0.6 mm isotropic resolution. QSM images were generated from these datasets and co-registered with a paired T1-weighted MPRAGE sequence acquired both pre- and 6 weeks post-operatively. MPRAGE provided anatomical landmarks critical for indirect targeting, such as commissures and ventricular walls.

RESULTS

7T QSM provided enhanced intra-thalamic contrast, allowing for more accurate depiction of sub-nuclei and better localization of the HIFU lesion. The fusion of QSM with MPRAGE enabled detailed assessment of lesion position relative to thalamic anatomy. This improved radiological precision supported a more meaningful correlation with clinical outcomes.

CONCLUSION

This preliminary experience demonstrates the technical feasibility of integrating 7T QSM into MRgFUS thalamotomy workflow and highlights its potential to improve lesion visualization and outcome assessment.

CLINICAL RELEVANCE/APPLICATION

7T QSM may represent a valuable imaging tool to refine pre-operative targeting and post-operative evaluation in patients undergoing MRgFUS thalamotomy for essential tremor, enhancing both anatomical precision and clinical interpretation.

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W3-STCE1

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Wednesday, Dec. 3 10:00AM - 10:30AM Room: LEARNING CENTER THEATER 1

Sub-Events

W3-STCE1-1 ULTRASOUND-DERIVED FAT FRACTION IS A RELIABLE METHOD TO GRADE HEPATIC STEATOSIS IN PATIENTS WITH CHRONIC LIVER DISEASES, A MULTICENTER STUDY IN A POPULATION WITH MIXED ETIOLOGIES

Jiahao Han (*Presenter*)
Jia Li (*Abstract Co-Author*)

PURPOSE

To investigate the performance of ultrasound derived fat fraction (UDFF) on grading hepatic steatosis in CLD patients applying liver biopsy as the gold standard. Also, the potential factors that affect the diagnostic performance of UDFF will also be analyzed.

METHODS AND MATERIALS

This prospective study enrolled patients suspicious for or confirmed CLD, and scheduled for liver biopsy from October 2024 to June 2025 at four tertiary care centers. UDFF was measured on the same day of liver biopsy and the region of interest (ROI) contained the biopsy site. The performance of UDFF on detecting hepatic steatosis =S1, =S2, and =S3 was analyzed by ROC curve.

RESULTS

A total of 255 patients with CLD were included in the final analysis, with a mean age of 52.00 (14.00) years old. The counts of patients with hepatic steatosis of S0, S1, S2, and S3 were 146(57.25%), 40(15.69%), 30(11.76%), and 39(15.30%). The AUCs of UDFF on detecting hepatic steatosis =S1, =S2, and of S3 were 0.914 (0.873 ~ 0.946), 0.950 (0.916 ~ 0.974), 0.916 (0.875 ~ 0.947). The optimal cutpoints of UDFF to grade hepatic steatosis =S1, =S2, and of S3 in this cohort were =7%, =11, and =18%. The AUC of UDFF on detecting hepatic steatosis =S1 in patients with inflammation of G2~3 is significantly higher than those with G0~1 [0.969 (0.929 ~ 0.990) vs. 0.888 (0.805~0.945), p =0.043].

CONCLUSION

UDFF is a reliable method to noninvasively grade hepatic steatosis in CLD patients regardless of the etiology, stage of inflammation as well as fibrosis.

CLINICAL RELEVANCE/APPLICATION

UDFF could be considered a reliable method to quantitatively evaluate hepatic steatosis in patients with CLD.

W3-STCE1-2 ADVANCING CARDIAC STRUCTURE SEGMENTATION FROM NON-CONTRAST CT BY DOMAIN ADAPTATION APPROACH

Piotr J. Slomka, PhD (*Presenter*)
Aditya Killekar, MS (*Abstract Co-Author*)
Anna Marcinkiewicz (*Abstract Co-Author*)
Hidenobu Hashimoto (*Abstract Co-Author*)
Dominika Grodecka (*Abstract Co-Author*)
Mark Lemley (*Abstract Co-Author*)
Jacek Kwiecinski (*Abstract Co-Author*)
Donghee Han (*Abstract Co-Author*)
Waseem Hijazi (*Abstract Co-Author*)
David E. Newby, PHD, MRCP (*Abstract Co-Author*)
Erick Alexanderson-Rosas, MD (*Abstract Co-Author*)
Isabel Carvajal (*Abstract Co-Author*)
Damini Dey, PhD (*Abstract Co-Author*)
Daniel S. Berman, MD (*Abstract Co-Author*)

PURPOSE

Detailed cardiac structure assessment is vital to the clinical evaluation of cardiovascular patients. While contrast-enhanced CT angiography (CTA) and MRI offer clear anatomical delineation, it is challenging to obtain accurate chamber volumes and great vessel dimensions from non-contrast chest CT (NCT) scans. We propose a cross-modal self-supervised learning (CMSSL) pre-training framework to learn robust, segmentation of cardiac structures from gated and ungated chest NCT, aided during training by co-registered CTA of the same patient.

METHODS AND MATERIALS

This study utilized a retrospective, multi-center dataset comprising 1169 chest CT scans: 434 Gated NCT - CTA and 301 Ungated NCT - CTA co-registered pairs from 3 sites. The overall patient age was 63.5 ± 8.7 years (range: [37 - 89]) with 74% patients males. Ground truth segmentations for 7 cardiac structures: Left Ventricular Myocardium (Myo), Left Ventricle (LV), Left Atrium (LA), Aorta, Right Ventricle (RV), Right Atrium (RA), and Pulmonary Artery (PA) were created as 3D multi-class masks. The paired contrast/non-contrast scans were registered with demons' nonlinear registration. Initial annotations were obtained on the registered CTA using Total Segmentator (TS) model. Subsequently, three expert physicians thoroughly adjusted all segmentations, as needed. Site 1 served as the training/internal validation set (N=159 gated NCT-CTA pairs, N=159 ungated NCT-CTA pairs), while sites 2 and 3 were used for external validation (N=275 gated NCT-CTA, and N=142 ungated NCT-pairs).

RESULTS

In external validation, CMSSL improved overall Dice similarity coefficient (DSC) vs TS for all structures (0.94 ± 0.03 vs. 0.92 ± 0.02; $p < 0.001$) for gated NCT and (0.89 ± 0.09 vs. 0.87 ± 0.1; $p < 0.001$) for ungated NCT. A detailed comparison for individual cardiac structures is presented in the figure.

CONCLUSION

Novel cross-modal self-supervised pre-training framework significantly enhances cardiac structure segmentation on NCT. This approach would improve the accurate assessment of cardiac structures on NCT thus paving the way for broader clinical application of NCT in cardiac imaging.

CLINICAL RELEVANCE/APPLICATION

Automated cardiac segmentation speeds up analysis, reduces variability, and improves efficiency compared to manual methods, ultimately leading to better patient outcomes.

W3-STCE1-3 LOW -DOSE CONTRAST MEDIA PROTOCOLS IN CT: CLINICAL PERFORMANCE, ECONOMIC VALUE AND A STEP FORWARD A MORE SUSTAINABLE RADIOLOGY.

Iacopo Capitoni, MD (*Presenter*)
Giulio Bagnacci, MD (*Abstract Co-Author*)
Armando Perrella, MD (*Abstract Co-Author*)
Cristian Sica, MD (*Abstract Co-Author*)
Chiara Piscitello, MD (*Abstract Co-Author*)
Maria Antonietta Mazzei, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the effects of implementing a low-dose iodinated contrast protocol based on Lean Body Weight (LBW) on image quality, patient safety, and cost reduction in oncologic CT imaging.

METHODS AND MATERIALS

Elective, multiphase whole body CT scans were retrospectively reviewed from January 2024 to July 2025, performed using a modern dual-energy CT (DECT) system. Selected cases received contrast tailored to LBW, targeting =400 iodine mg/kg. Data collected included Total Iodine Load (TIL) and Iodine-to-Weight Ratio (IWR). Image quality was assessed via Contrast-to-Noise Ratio (CNR), measured in hepatic and paravertebral muscle ROIs, comparing prior polyenergetic images with new monoenergetic reconstructions.

RESULTS

A cohort of 100 patients with comparable prior non-optimized exams was analyzed. Monoenergetic low-keV reconstructions demonstrated a 50.8% mean increase in CNR, despite a 30-50% average reduction in IWR.

CONCLUSION

Substantial iodine dose reduction did not compromise diagnostic quality; on the contrary, it enhanced iodine conspicuity in DECT imaging. These findings support a reevaluation of contrast dosing standards in oncologic protocols, particularly where precautionary excess is common.

CLINICAL RELEVANCE/APPLICATION

contrast media represent a significant cost driver in cancer imaging. Our estimates suggest that DECT-based optimization protocols could lower iodinated contrast costs by 25-50%. Broader implementation may also mitigate environmental and resource concerns linked to iodine availability.

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W3-STCE2

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Wednesday, Dec. 3 10:00AM - 10:30AM Room: LEARNING CENTER THEATER 2

Sub-Events

W3-STCE2-1 INTEGRATION OF GPT-4O IN RADIOLOGICAL WORKFLOW FOR REAL-TIME MULTILINGUAL TRANSLATION OF RADIOLOGY REPORTS ACROSS IMAGING MODALITIES

Robert Terzis, MD (*Presenter*)
Babak Salam, MD (*Abstract Co-Author*)
Sebastian Nowak, PhD (*Abstract Co-Author*)
Narine Mesropyan, MD (*Abstract Co-Author*)
Ana Fehrmann-Efferoth (*Abstract Co-Author*)
Dmitrij Kravchenko, MD (*Abstract Co-Author*)
Marilia B. Voigt (*Abstract Co-Author*)
Daniel Ginzburg (*Abstract Co-Author*)
Claus C. Pieper, MD (*Abstract Co-Author*)
Daniel Kuetting, MD (*Abstract Co-Author*)
Saif Afat, MD (*Abstract Co-Author*)
David C. Maintz, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)
Alexander Isaak, MD (*Abstract Co-Author*)

PURPOSE

The increasing cultural and linguistic diversity of hospital patient populations represents a growing challenge for health care systems. Large language models (LLMs) like GPT-4o offer multilingual and real-time translation capabilities. This study aims to assess the feasibility of integrating GPT-4o as a semi-automated module within a radiology information system (RIS) and to evaluate its performance in translating radiology reports across multiple languages.

METHODS AND MATERIALS

In this two-center study, GPT-4o was integrated into the radiological workflow via an application programming interface (API)-based connection to the in-house software infrastructure. A total of 100 real-world radiology reports from four imaging modalities (X-ray, ultrasound, CT, MRI) were randomly selected and fully anonymized. Reports were translated using GPT-4o with zero-shot prompting from German into four languages including English, French, Spanish, and Russian (n=400 translations). Eight bilingual radiologists (two per language) evaluated the translations for general readability, overall quality, and utility for translators using 5-point Likert scales (ranging from 5 [best score] to 1 [worst score]). Binary questions (yes/no) were conducted to evaluate potential harmful errors, completeness, and factual correctness.

RESULTS

GPT-4o required a mean processing time of no more than 25 seconds for the translation of radiological reports, with mean times ranging from 9 ± 3 seconds for English X-ray reports to 24 ± 9 seconds for Russian CT reports. The overall quality of translations achieved a median of 4.5 (IQR 4-5), with English (5 [4-5]), French and Spanish (each 4.5 [4-5]) significantly outperforming Russian (4 [3.5-4]; each $p<0.05$). Usefulness for translators was rated highest for English (5 [5-5], $p<0.05$ against other languages). Readability scores and translation completeness were significantly higher for translations into Spanish, English and French compared to Russian (each $p<0.05$). Factual correctness averaged 79%, with English (84%) and French (83%) outperforming Russian (69%) (each $p<0.05$). Potentially harmful errors were identified in 4% (16/400) of translations, primarily in Russian (9%, 9/100).

CONCLUSION

GPT-4o demonstrated rapid and robust performance in translating radiology reports across multiple languages, with limitations observed in Russian translations.

CLINICAL RELEVANCE/APPLICATION

The integration of GPT-4o via an API-based interface enables its seamless incorporation into radiological workflows. This approach positions the large language model as a promising tool for real-time workload reduction and mitigation of language barriers in the context of increasingly diverse and multilingual healthcare environments.

W3-STCE2-2 THE VALUE OF COMBINING PULSE OXIMETRY WITH ECG-LESS PERSONALIZED EXPOSURE WINDOW SETTING IN CORONARY CT ANGIOGRAPHY

He Chunyan, BArch (*Presenter*)

PURPOSE

To evaluate whether real-time pulse-oximetry-guided, heart-rate-adapted exposure windows can reduce radiation dose in ECG-less coronary CT angiography (CCTA) while maintaining biphasic (systolic and diastolic) image quality.

METHODS AND MATERIALS

One hundred consecutive patients with suspected coronary artery disease were prospectively enrolled and randomized into two groups. Group A (n = 50) underwent ECG-less CCTA with a fixed 200-800 ms exposure window. Group B (n = 50) had the exposure window individually set to 0 %-80 % of the R-R interval based on real-time pulse-oximetry heart-rate measurement. CT attenuation, standard deviation (SD), signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) of the RCA, LAD, and LCX were quantified for both cardiac phases. Effective dose (DLP × k) and examination time were recorded. Two radiologists with 5 years of cardiac imaging experience independently assessed biphasic diagnostic adequacy and overall image quality using a 3-point scale; inter-observer agreement was calculated (?).

RESULTS

Group B achieved a 27 % lower effective dose than Group A ($P < 0.05$), with more pronounced reductions in patients whose heart rate exceeded 80 bpm. Examination times were similar between groups (221 ± 28 s vs 210 ± 22 s, $P > 0.05$). No significant differences were observed in objective image parameters (CT attenuation, SD, SNR, CNR) or subjective scores (biphasic diagnostic adequacy 2.58 ± 0.24 vs 2.63 ± 0.21, $P > 0.05$). Inter-observer agreement was good (? = 0.67-0.92).

CONCLUSION

Pulse-oximetry-guided, heart-rate-adapted exposure windows significantly reduce radiation dose in ECG-less CCTA without compromising biphasic image quality, especially in patients with higher heart rates.

CLINICAL RELEVANCE/APPLICATION

Integrating a simple pulse-oximeter with ECG-less CT scanners allows each patient's exposure window to be tailored to his / her instantaneous heart rate. This "ECG-free, pulse-guided" approach cuts effective dose by ~27 % without lengthening the study or degrading coronary image quality, making low-dose, high-quality coronary CTA feasible even in high-HR or arrhythmic patients and in centres lacking reliable ECG gating.

W3-STCE2-3 BENCHMARKING FRONTIER MULTIMODAL REASONING AI MODELS VERSUS RADIOLOGISTS: NATIONWIDE PILOT STUDY ON REAL-WORLD DIAGNOSTIC STUDIES

Divya Buchireddygari, MD (*Presenter*)
Mrudula Bhalke (*Abstract Co-Author*)
Sonit Sai Vasipalli (*Abstract Co-Author*)
Kartik Vuthoo (*Abstract Co-Author*)
Bhavya Ratan Maroo, MBBS (*Abstract Co-Author*)
Hakikat Bir Singh Bhatti, MBBS (*Abstract Co-Author*)
Lakshmi Kaza (*Abstract Co-Author*)
Dheeksha Devasya Shama Prasad, MD,MBBS (*Abstract Co-Author*)
Sanjana Hebbar, MBBS (*Abstract Co-Author*)
Rahul Joseph, MD (*Abstract Co-Author*)
Gurkawal Kaur, MBBS (*Abstract Co-Author*)
Devyani Singh, MD (*Abstract Co-Author*)
Akhil V, MBBS (*Abstract Co-Author*)
Nishtha Mahajan, MBBS (*Abstract Co-Author*)
Ayinaparthi Arisha (*Abstract Co-Author*)
Rajesh Vanagundi, MBBS,MD (*Abstract Co-Author*)
Rajat Jain, MBBS, MD (*Abstract Co-Author*)
Rishabh Jain, MBBS (*Abstract Co-Author*)
Suvrankar Datta, MD, MBBS (*Abstract Co-Author*)

PURPOSE

General-purpose multimodal AI models, and more recently reasoning models, are rapidly entering radiology practice without rigorous clinical benchmarking on real - world cases. In this nation wide industry-academia collaboration, we compared the diagnostic performances of four frontier multimodal generalist models with radiologists of varying experience using diverse clinically challenging real world single - image spotters.

METHODS AND MATERIALS

Fifty fully anonymised, clinically challenging imaging cases (single spotters) were prospectively selected by supervising radiologists from large institutional studies across multiple states. Cases were independently interpreted by four trainee radiology residents, four board certified radiologists and four frontier multimodal generalist reasoning models (OpenAI o3, Gemini 2.5 Pro, and the first ever evaluation of Grok4 and Claude Opus 4.1). All the Models were prompted identically and the responses were graded ordinally: 1 (exact diagnosis), 0.5 (partially correct/general), or 0 (incorrect). Statistical analyses included Friedman's test with Holm-corrected Wilcoxon signed-rank comparisons and Spearman rank correlation, to benchmark model performance against human expertise. The dataset and scoring scheme will be publicly released upon publication.

RESULTS

Radiologists' accuracy significantly improved with experience (Spearman ?=0.77, p=0.02); with scores ranging from 4 [JR1trainees] to 45.5 [board certified radiologists]. We demonstrate that all frontier AI models underperformed and scored lower than radiologists including trainees with total scores (out of 50) as follows: Gemini 2.5 Pro - 14.5, OpenAI o3 - 13, Grok4 - 5, andClaude Opus 4.1 - 1. Friedman tests confirmed significant differences ($?^2$=296.8, $p<0.001$) and pairwise comparisons showed that even junior trainee radiologists with two years of experience significantly outperformed all AI models ($p<0.01$)

CONCLUSION

Frontier generalist AI models demonstrate marked deficits compared to radiologists (including junior trainees) when confronted with complex real-world radiology cases from a novel non contaminated dataset. These results highlight the critical need for robust clinical validation before considering integration into routine clinical workflows

CLINICAL RELEVANCE/APPLICATION

This radiologist-industry benchmarking collaboration clarifies the true capability of current generalist AI models, cautioning against premature clinical deployment (based on reported performances on open often contaminated radiology datasets) without rigorous, real-world validation.

Abstract Archives of the RSNA, 2025

W5-STCE1

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Wednesday, Dec. 3 1:15PM - 1:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

W5-STCE1-1 REVOLUTIONIZING CHEST CT WORKFLOW WITH AI-ASSISTED MULTIPLE ABNORMALITY SEGMENTATION AND AUTOMATED REPORTING

Suvrankar Datta, MD, MBBS (*Presenter*)
Mohammed Jabeer (*Abstract Co-Author*)
Shweta Tyagi (*Abstract Co-Author*)
Jitender Singh (*Abstract Co-Author*)
Anuj Chandalia (*Abstract Co-Author*)

PURPOSE

To address the clinical need for comprehensive, automated interpretation of chest CTs by developing a deep learning system for the detection, and reporting of multiple thoracic abnormalities, including fibrosis, pleural effusion, atelectasis, emphysema, ground-glass opacity, lesions, pneumocysts, and consolidation. These findings are associated with high morbidity and mortality and are commonly seen in conditions such as interstitial lung disease, and malignancy. Manual interpretation can be time-intensive and inconsistent, particularly in high-volume or resource-limited settings. This study aims to integrate these capabilities into a unified AI-driven workflow to support accurate, timely, and reproducible chest CT analysis.

METHODS AND MATERIALS

A curated dataset of 3000 chest CT scans with expert-annotated segmentations for eight thoracic abnormalities was used to train a multi-stage 3D segmentation model built on a modified nnUNet architecture. The pipeline first segmented lung lobes to enable anatomical localization, followed by abnormality-specific segmentation. To address class imbalance, the model was optimized using a combination of Dice and focal loss functions. In addition to segmentation, the system generated structured reports detailing the type and lobe-wise location of each abnormality. This work extends our prior study, which focused on lung nodule classification, lymph node segmentation with diameter estimation, and vascular calcification scoring.

RESULTS

The model achieved high segmentation performance across all abnormality classes, with mean Dice scores of 0.86 for consolidation, 0.82 for ground-glass opacities, 0.87 for pleural effusion, 0.77 for emphysema, and above 0.75 for the remaining findings. The automated reporting system successfully generated structured outputs with clinical descriptors, showing more than 90% consistency with radiologist-generated summaries in a blinded comparison.

CONCLUSION

This study presents a robust, unified AI system capable of segmenting and reporting multiple chest abnormalities with anatomical precision on chest CTs. The inclusion of lobe-wise localization and quantitative metrics supports comprehensive thoracic disease assessment within a single automated workflow.

CLINICAL RELEVANCE/APPLICATION

The proposed system enables consistent, rapid, and interpretable analysis of chest CT scans by automating the detection, quantification, and structured reporting of multiple abnormalities. Its integration into radiology workflows has the potential to improve diagnostic efficiency, support clinical decision-making, and enhance access to quality thoracic imaging interpretation, especially in high-volume or resource-constrained settings.

W5-STCE1-2 CLINICAL WORKFLOW INTEGRATION OF AI-BASED AUTOMATED DETECTION, LOCALIZATION, AND REPORTING OF AORTIC CALCIFICATIONS ON CHEST CT

Suvrankar Datta, MD, MBBS (*Presenter*)
Jitender Singh (*Abstract Co-Author*)
Mohammed Jabeer (*Abstract Co-Author*)
Shweta Tyagi (*Abstract Co-Author*)
Anuj Chandalia (*Abstract Co-Author*)

PURPOSE

Aortic calcification is a significant marker of systemic atherosclerosis and is associated with increased cardiovascular morbidity and mortality. Globally, the prevalence of calcific aortic valve disease has risen markedly, with cases increasing from approximately 1.7 million in 1990 to over 9.4 million in 2019. The age-standardized prevalence rate also escalated by 120%, reaching 116.34 per one lakh individuals in 2019. Accurate detection and quantification of aortic calcifications, including anatomical zone localization and aortic diameter measurement, are crucial for risk assessment and surgical planning. This study aims to develop and validate an AI-based method for automated detection of aortic calcifications on CT scans and aortic diameter estimation.

METHODS AND MATERIALS

We developed a multi-stage deep learning framework based on convolutional neural networks (CNNs) to segment the aorta, detect, and localize aortic calcifications, and estimate aortic diameters. The model was trained on a retrospectively collected dataset of 2,000 non-contrast chest CT scans, each annotated with calcification masks and labeled aortic zones. The framework first performs multi-label segmentation to delineate the aorta, followed by targeted segmentation and localization of calcified regions. This work extends our previous study on coronary artery calcification and scoring by incorporating additional features focused on the aorta. The system generates a DICOM segmentation overlay to visually highlight the calcifications in the aorta and coronary arteries, and an automated report using a Large Language Model (LLM), summarizing the findings.

RESULTS

The system was evaluated on a test set of 100 chest CT cases, achieving a Dice similarity coefficient of 0.97 for aortic segmentation and 0.93 for calcification segmentation. It demonstrated an overall accuracy of 95%, with all results verified by a radiologist. The average processing time per scan was approximately one minute.

CONCLUSION

This study introduces an effective AI-driven solution for the detection and quantification of aortic calcifications on routine chest CT scans. The system demonstrates high accuracy in anatomical zone localization and aortic diameter estimation, enabling automated identification and grading of calcifications. By streamlining reporting and providing actionable risk insights, the tool supports physicians in early assessment and informed clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

The proposed AI tool enables automated detection, localization, and quantification of aortic calcifications on routine chest CTs, delivering structured reports and early risk indicators that enhance cardiovascular assessment and support proactive clinical decision-making.

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Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

W5-STCE2

Science Session (Opportunistic Screening: Enhancing Diagnostic Impact from Routine Imaging)

Wednesday, Dec. 3 1:15PM - 1:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

W5-STCE2-1 DISH-COVERY: OPPORTUNISTIC DETECTION OF CARDIOMETABOLIC RISK ON ROUTINE CT

Lily Gao, BA (*Presenter*)
Kathryn E. Jordan, MD, BS (*Abstract Co-Author*)
Enobong Anako (*Abstract Co-Author*)
Andrew Hoyek (*Abstract Co-Author*)
Trey McGonigle (*Abstract Co-Author*)
Shi Huang (*Abstract Co-Author*)
Manish Kota (*Abstract Co-Author*)
Bennett A. Landman, PhD (*Abstract Co-Author*)
Katherine Van Schaik (*Abstract Co-Author*)

PURPOSE

To investigate Diffuse Idiopathic Skeletal Hyperostosis (DISH) as a potential opportunistic radiologic marker for untreated metabolic syndrome (MetS) by evaluating its association with (1) MetS and (2) individual MetS components.

METHODS AND MATERIALS

This single-center retrospective cross-sectional study used de-identified imaging and clinical data from ImageVU and Synthetic Derivative databases to identify adults aged 40-65 who had complete metabolic data (i.e., BMI, blood pressure, HbA1c, lipid panel) within 90 days of a thoracolumbar CT scan done for any indication. Patients with history of trauma or pharmacologic treatment for diabetes, hypertension, or hyperlipidemia prior to imaging were excluded. Two raters independently assessed scans for DISH, defined as =3 contiguous intervertebral levels with near-complete or complete bridging, using a structured scoring system combining previously published criteria (Kuperus et al. and Holton et al.). Interrater agreement was evaluated using Gwet's AC2, and discrepancies were resolved by a tiebreaker rater. MetS was defined as = 3 of 5 criteria: triglycerides >150 mg/dL, HDL-C < 40 mg/dL (men) or < 50 mg/dL (women), BMI > 30 kg/m², systolic BP > 130 mmHg, and HbA1c = 5.7%. Differences between DISH and non-DISH groups were evaluated using Chi-squared test for categorical variables and Wilcoxon rank sum test for continuous variables. Multivariable logistic regression estimated odds ratios (OR) for DISH predicted by (1) MetS as a composite variable (primary analysis) and (2) individual MetS components (secondary analysis), adjusting for age and sex.

RESULTS

Among 599 patients, 139 (23.2%) had DISH, defined as =3 contiguous levels with near-complete or complete bridging based on our composite scoring system. Interrater agreement was excellent (AC2 = 0.957; 95% CI: 0.936-0.977). MetS was more common in patients with DISH than without (56.1% vs. 30.0%, p<0.001). After adjusting for age and sex, MetS remained independently associated with DISH (OR 3.04; 95% CI: 2.03-4.56, p<0.001). In a separate model evaluating the individual components of MetS, BMI (OR 1.46 per 5 kg/m 2 increase; 95% CI: 1.26-1.69, p<0.001) and HbA1c (OR 1.20 per 0.8% increase; 95% CI: 1.08-1.32, p<0.001) were independently associated with DISH. Older age and male sex were significant predictors of DISH in both models (all p<0.01).

CONCLUSION

DISH is significantly associated with untreated metabolic syndrome, especially obesity and poor glycemic control, and may serve as a radiologic marker of elevated cardiometabolic risk.

CLINICAL RELEVANCE/APPLICATION

Reporting incidental DISH on routine imaging can support opportunistic screening for metabolic dysfunction, prompting timely clinical evaluation and intervention.

W5-STCE2-2 OPPORTUNISTIC PREDICTION OF AORTIC DISSECTION USING AN AI TOOL FOR AORTIC SEGMENTATION AND MEASUREMENT: CAN AORTIC GEOMETRY HELP?

Yash Saboo (*Presenter*)
Brian Ayers, MD,MBA (*Abstract Co-Author*)
Anushree M. Burade, MBBS (*Abstract Co-Author*)
Elizabeth Pan (*Abstract Co-Author*)
Sandeep S. Hedgire, MD (*Abstract Co-Author*)
Thoralf M. Sundt, MD (*Abstract Co-Author*)
Arminder Jassar, MBBS (*Abstract Co-Author*)
Ryan Krishna (*Abstract Co-Author*)

PURPOSE

Aortic dissection (AD) often presents as a life threatening, acute or catastrophic condition; few studies have focused on the ability to predict AD based on imaging studies. We performed a retrospective, consecutive patient study with up to 19-year data to assess if AI-based aortic segmentation and measurements (AI-AAM) on chest CT can help predict patients who will develop AD in the future.

METHODS AND MATERIALS

In two quaternary centers, we queried >18 million radiology reports, to identify adult patients between 2006 and 2024 who met the following inclusion criteria: thin-section (</= 1.5 mm) baseline, chest CT without AD, and AD-positive patients (on follow-up at >3-month interval) or AD-negative on 2-19 years follow-up. Of the 515 cases included, 42 cases developed AD (pre-AD group), and the remaining did not develop AD (no-AD group) on follow-up CT. DICOM CT data were deidentified and processed with an offline, AI-AAM (UII, China). We compared the short and long axis aortic diameters (from aortic root to celiac trunk at fixed landmarks and at the site of maximum aortic dimension - MAD) and aortic lengths (AL) and exact three-coordinate locations between different landmarks (such as proximal descending thoracic aorta to celiac trunk) to calculate aortic tortuosity (AT) in all patients. We used univariable and multivariable logistic regression with AUROC as output and odds ratios (OR) to determine the best features to estimate the probability of developing AD.

RESULTS

Cross-sectional aortic measurements were better for separating AD from no-AD groups (up to 0.724 AUROC, p<0.001 for mid descending aorta diameter for univariate tests; up to 0.77 AUROC for two diameters and AL/MAD) than AT and AL (up to 0.682 AUROC, p<0.05). Mid descending aorta diameter (DTA: OR 2.537; 95% CI 1.853-3.475; p < 0.001), sinus of Valsalva diameter (SVD) (OR 1.797; 95% CI 1.223-2.641; p = 0.00285) had the highest AD prediction power with OR. In non-dilated aorta, aortic arch diameter (AAD) (AUROC: 0.83; OR: 4.337; CI 2.288-8.22; p < 0.001) and SVD (OR: 2.207; 95% CI 1.092-4.461; p = 0.027) had the highest AD prediction power with OR and outperformed AT and AL (up to AUROC 0.749). Multivariate AUROC with AAD-SVD was 0.856.

CONCLUSION

Contrary to the reported literature, aortic diameters outperform tortuosity for predicting AD; AI-derived opportunistic screening for cross-sectional aortic diameters can allow prediction of AD on chest CT.

CLINICAL RELEVANCE/APPLICATION

AI-based automated aortic segmentation and measurement can enable opportunistic screening for patients at risk of AD on chest CT.

W5-STCE2-3 COMPARISON OF CT-BASED BODY COMPOSITION BIOMARKERS BETWEEN KENYAN AND MATCHED U.S. PATIENT COHORTS USING AUTOMATED OPPORTUNISTIC SCREENING

Tai Le (*Presenter*)
Meghan G. Lubner, MD (*Abstract Co-Author*)
John W. Garrett, PhD (*Abstract Co-Author*)
Michael P. Hartung, MD (*Abstract Co-Author*)
Marcio Aloisio Bezerra Cavalcanti Rockenbach, MD, MS (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)

PURPOSE

Abdominal CT scans, performed for various indications, contain valuable but underutilized body composition data. AI tools have automated the measurement of body composition biomarkers from abdominal CT scans, enabling large-scale opportunistic screening. However, clinical implementation requires better understanding of how these biomarkers vary with demographic features such as race and geographic location. To achieve this, we compared a Kenyan patient cohort with matched U.S.-based African American and white American cohorts.

METHODS AND MATERIALS

In this multicenter retrospective study, abdominal CT scans were obtained from the following cohorts: Tenwek hospital in Kenya (1657 adults), UWHealth (UW) in the U.S. (148593 adults), and Massachusetts General Hospital (MGB) in the U.S. (181566 adults). AI tools processed the scans to generate abdominal aortic Agatston score; volume and attenuation of the liver; volume of the spleen and kidneys; trabecular bone attenuation (BMD) of the L1 vertebral body; area and attenuation of skeletal muscle at L3; area of visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) at L3. The cohorts were matched based on age and sex at ratios of 1:1 for Kenyan to African American and 1:10 for Kenyan to white American. The matched cohorts were Tenwek (mean age 54.3, M/F: 886/768), UW white American (mean age 54.3, M/F: 8860/7680), UW African American (mean age 54.1, M/F: 836/816), MGB white American (mean age 54.1, M/F: 8790/7750), MGB African American (mean age 53.9, M/F: 897/757).

RESULTS

The Tenwek patient cohort showed lower VAT area (mean±SD in cm2: 44.9±91.3) compared with the US cohorts of UW African American (136.6±109.2), UW white American (175.4±134.4), MGB African American (126.6±102.9), and MGB white American (158.9±128.0) (p<0.001). Similar differences were observed for SAT area, muscle area, liver volume, and kidney volume. Tenwek (mean±SD in Hounsfield Unit: 172.7±64.1) and U.S. African American cohorts (UW: 184.2±52.0, MGB: 187.3±54.3) showed higher BMD than U.S. white American (UW: 163.4±48.0, MGB: 164.9±49.1). White American cohorts had the highest abdominal aortic Agatston score (UW: 1334.9±3415.9, MGB: 1155.7±3050.3) compared to African American (UW: 904.2±2574.5, MGB: 659.6±2330.5) and Tenwek (330.1±1458.6).

CONCLUSION

The findings showed differences in VAT, SAT, muscle area, liver volume, and kidney volume were driven by geographic location while BMD and splenic volume by race/ethnicity. Aortic Agatston score varied by both geographic location and race/ethnicity.

CLINICAL RELEVANCE/APPLICATION

Opportunistic screening population standards may need to account for geographical area, race and ethnicity.

Nov. 30 – Dec. 4
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W6-SSGU05

Science Session with Keynote: Genitourinary Imaging (Current Topics in Benign Renal Disease)

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E353B

Andrew L. Wentland, MD,PhD (*Moderator*)
Kristen Olinger, MD (*Moderator*)

Sub-Events

W6-SSGU05-1 DYNAMIC GRAPH-BASED MULTIMODAL APPROACH FOR NON-INVASIVE DIAGNOSIS OF ACUTE RENAL REJECTION

Israa Sharaby, BSc, MSc (*Presenter*)
Ibrahim Abdelhalim (*Abstract Co-Author*)
Abdelrahman Abdallah (*Abstract Co-Author*)
Amy Dwyer (*Abstract Co-Author*)
Mohamed Ghazal (*Abstract Co-Author*)
Ayman S. El-Baz SR, PhD (*Abstract Co-Author*)

PURPOSE

Acute renal rejection is a serious post-transplant complication requiring timely diagnosis to preserve graft function. However, variability in Diffusion Weighted Magnetic Resonance Imaging (DW-MRI) protocols across different magnetic field strengths (Tesla levels) hinders consistent interpretation. This work introduces a scanner-agnostic, multimodal framework for non-invasive detection of acute rejection.

METHODS AND MATERIALS

The proposed method integrates DW-MRI scans, clinical biomarkers, and clinical reports. First, ADC maps are co-registered across field strengths to ensure standardized cortex-to-medulla visualization. These maps are segmented into iso-surfaces, and Cumulative Distribution Functions (CDFs) are computed for each layer. A Bag of Visual Embeddings (BoVE) is constructed to capture these spatial features. Clinical biomarkers, specifically serum creatinine and creatinine clearance, are used to reweight BoVE representations via attention mechanisms. Separately, a generative model extracts salient phrases from associated clinical notes, which are embedded using a vision-language text encoder. Finally, a dynamic graph-based model fuses textual and visual information to classify each case as rejection or non-rejection.

RESULTS

The framework was evaluated on a dataset of 94 kidney transplant recipients (40 with biopsy-confirmed rejection and 54 controls). The model achieved a mean precision of 82.49%, recall of 95.24%, and F1 score of 87.05%, indicating high diagnostic performance across imaging conditions.

CONCLUSION

This framework demonstrates strong potential for accurate and generalizable acute rejection diagnosis. By combining co-registered DW-MRI features, clinical markers, and unstructured text, the method enables robust classification even under heterogeneous scanner settings.

CLINICAL RELEVANCE/APPLICATION

The proposed approach provides a non-invasive, data-efficient solution to support early identification of acute renal rejection. Its compatibility with diverse imaging setups and incorporation of routine clinical data make it suitable for deployment in real-world transplant care settings.

W6-SSGU05-2 EVALUATION OF RENAL HISTOLOGICAL CHANGES WITH THE PROGRESSION OF DIABETIC NEPHROPATHY USING FUNCTIONAL MRI PARAMETERS

Akira Yamamoto, MD, PhD (*Presenter*)
Tsutomu Tamada, MD, PhD (*Abstract Co-Author*)
Yu Ueda, PhD (*Abstract Co-Author*)
Hiroyasu Sanai, RT (*Abstract Co-Author*)
Akihiko Kanki, MD (*Abstract Co-Author*)
Atsushi Higaki, MD, PhD (*Abstract Co-Author*)
Yoshihiko Fukukura, MD, PhD (*Abstract Co-Author*)

PURPOSE

Diabetic nephropathy is a leading cause of renal failure, but early-stage evaluation is limited due to glomerular hyperfiltration and the low sensitivity of albuminuria. This study aimed to assess whether various functional MRI parameters can reflect renal histological changes and allow non-invasive risk stratification according to the KDIGO classification.

METHODS AND MATERIALS

This prospective study included 122 subjects who underwent 3.0T renal MRI between December 2018 and October 2021: 23 healthy volunteers (mean age 46.0 ± 15.5 years) and 99 patients with type 2 diabetes mellitus (mean age 62.2 ± 14.9 years). Diabetic patients were divided into five KDIGO risk groups (low to highest) based on eGFR and albuminuria. MRI parameters included T1 and T2, BOLD-derived T2* and R2*, IVIM-derived ADC, f, D*, D, ASL perfusion, and corticomedullary differentiation (CMD) assessed by SSFP with inversion recovery. Group comparisons and post hoc analyses were performed, and findings were interpreted in light of known diabetic nephropathy pathology.

RESULTS

Significant differences across KDIGO groups were found in cortical T1 ($p=0.007$), T2* ($p<0.001$), R2* ($p<0.001$), ASL ($p=0.002$), IVIM-ADC ($p=0.001$), IVIM-D ($p=0.001$), and CMD ($p<0.001$). All differences were limited to the cortex. CMD and cortical T2 were significantly elevated in the low-risk group compared to controls. Between low- and moderate-risk groups, IVIM-D and CMD were reduced. No significant changes were seen between moderate- and high-risk groups. However, T1 and ADC increased between high and very high risk, and CMD declined further from very high to highest risk.

CONCLUSION

Early diabetic nephropathy is characterized by hyperfiltration, with increased perfusion and oxygenation that complicates diagnosis by albuminuria alone. Functional MRI detected early changes in cortical T2 and CMD between healthy and low-risk individuals. In more advanced stages, histological progression such as fibrosis and ischemia corresponded with increased T1, decreased ADC and D, reduced ASL, and altered BOLD values. These findings suggest functional MRI parameters can capture stage-specific pathological changes.

CLINICAL RELEVANCE/APPLICATION

Functional MRI enables non-invasive assessment of diabetic nephropathy, identifying structural, perfusional, and oxygenation changes beyond traditional markers. It may improve risk classification and reduce the need for renal biopsy, aiding clinical decision-making across disease stages.

W6-SSGU05-3 EVALUATION OF RENAL INJURY IN TRANSPLANTED KIDNEYS BY AMIDE PROTON TRANSFER MAGNETIC RESONANCE IMAGING

Xintian Yu, MMEd (*Presenter*)
Jiule Ding (*Abstract Co-Author*)
Jinggang Zhang, MD (*Abstract Co-Author*)
Jie Chen (*Abstract Co-Author*)
Wei Xing, MD (*Abstract Co-Author*)
Liang Pan, MD (*Abstract Co-Author*)

PURPOSE

To quantitatively analyze the differences in amide proton transfer (APT) values between the cortex and medulla of renal allografts in kidney transplant recipients using amide proton transfer magnetic resonance imaging (APT-MRI), and to explore the value of APT-MRI in evaluating renal allograft injury.

METHODS AND MATERIALS

A total of 80 kidney transplant recipients were divided into two groups based on estimated glomerular filtration rate (eGFR): mild renal impairment and moderate-to-severe renal impairment. The differences in APT values between the cortex and medulla of renal allografts were compared using the Wilcoxon signed-rank test. The Mann-Whitney U test was used to compare APT values between the two groups. Spearman correlation analysis was performed to assess the correlation between cortical and medullary APT values and eGFR. The diagnostic efficacy of APT values was evaluated using receiver operating characteristic (ROC) curve analysis.

RESULTS

Based on eGFR, 39 kidney transplant recipients were classified into the mild renal impairment group, and 41 recipients were classified into the moderate-to-severe renal impairment group. In both groups, the cortical APT values of renal allografts were higher than the medullary APT values ($P < 0.05$). Compared with the mild renal impairment group, both cortical and medullary APT values were higher in the moderate-to-severe renal impairment group ($P < 0.0001$). The cortical and medullary APT values of renal allografts were negatively correlated with eGFR ($r = -0.6533$, $P < 0.0001$; $r = -0.5103$, $P < 0.0001$). ROC curve analysis showed that cortical and medullary APT values had high diagnostic efficacy in assessing different degrees of renal impairment. When the cortical cut-off APT value was 3.0%, the difference between the mild renal impairment and moderate-to-severe renal impairment groups showed a respective AUC, sensitivity, and specificity of 0.907, 100.0%, and 79.49%. Finally, when the medullary cut-off APT value was 2.0%, the difference between the mild renal impairment and moderate-to-severe renal impairment groups showed an AUC, sensitivity, and specificity of 0.819, 82.93%, and 82.05%, respectively.

CONCLUSION

APT-MRI can directly evaluate the injury status of renal allografts.

CLINICAL RELEVANCE/APPLICATION

This study, for the first time, explored the value of APT-MRI in assessing renal allograft injury. The results indicate that APT-MRI is a non-invasive, repeatable, and precise imaging diagnostic tool. It complements existing imaging biomarkers, has high diagnostic efficacy, and provides an important basis for the assessment of renal function in renal allografts.

W6-SSGU05-5 ASSESSING THE DIAGNOSTIC VALUE OF CONTRAST-ENHANCED ULTRASOUND IN DETECTING ACUTE RENAL TRANSPLANT REJECTION: A SYSTEMATIC REVIEW AND BIVARIATE META-ANALYSIS

Victor Arthur Ohannesian (*Presenter*)
Miguel J. Francisco Neto, MD, PhD (*Abstract Co-Author*)
Giovana Alvarez (*Abstract Co-Author*)
Gustavo Rossini (*Abstract Co-Author*)
Bruno Ishizuka (*Abstract Co-Author*)
Luciano Falcao (*Abstract Co-Author*)

PURPOSE

To systematically assess the diagnostic accuracy of contrast-enhanced ultrasound (CEUS) using quantitative parameters from time-intensity curves (TIC) in detecting acute or subclinical kidney allograft rejection, using biopsy as the gold standard.

METHODS AND MATERIALS

A PRISMA-DTA-compliant systematic review and bivariate meta-analysis was performed (PROSPERO: CRD420251036575). Searches were conducted in PubMed, Embase, Cochrane CENTRAL, MEDLINE, Web of Science, and Scopus. Eligible studies evaluated CEUS-TIC in adult or pediatric kidney transplant recipients undergoing protocol or indication biopsy. Outcomes included sensitivity, specificity, AUC, diagnostic odds ratio (DOR), positive (LR+) and negative (LR-) likelihood ratios. Heterogeneity, threshold effects, and publication bias (Deeks' test) were assessed. Meta-regression was conducted for the TIC-derived parameter PIc.

RESULTS

Seven studies (n = 545; 166 reference-positive, 379 reference-negative) were included. Pooled sensitivity was 81% (95% CI: 67-90%), specificity 71% (95% CI: 52-85%), LR+ 2.8 (95% CI: 1.7-4.6), LR- 0.27 (95% CI: 0.17-0.43), DOR 10 (95% CI: 6-19), and AUC 0.84 (95% CI: 0.74-0.90). Interstudy heterogeneity was high (I^2 = 96%; LRT_Q = 46.5, $p < 0.001$), largely attributable to threshold effects (? = -0.93; 87% explained variance). PIc use showed no significant effect on diagnostic performance (LRT?^{2} = 0.39; p = 0.82). Deeks' funnel plot showed no publication bias (p = 0.326). Across individual studies, LR+ ranged from 1.56 to 14.93, and LR- from 0.05 to 0.60, with substantial inconsistency (I^2 ˜ 66% for both).

CONCLUSION

CEUS-TIC presents acceptable sensitivity (81%) but modest specificity (71%) and low LR+ (2.8), limiting its stand-alone utility in detecting acute or subclinical rejection. Heterogeneity and threshold effects further weaken its interpretability.

CLINICAL RELEVANCE/APPLICATION

Although CEUS with TIC analysis demonstrates suboptimal diagnostic performance, our results suggest that it still represents a viable complementary tool in resource-limited settings, particularly where access to biopsy or advanced imaging is restricted. Its main advantages include being non-invasive, bedside-performable, rapidly executable, and utilizing a non-nephrotoxic contrast agent. While it does not replace renal biopsy as the gold standard, its logistical benefits may support its use as a screening strategy in selected clinical scenarios.

W6-SSGU05-6 GADOLINIUM RETENTION AND SPECIATION IN HUMAN KIDNEY SPECIMENS

Mariane Le Fur, PhD (*Presenter*)
Chloe Brasket (*Abstract Co-Author*)
Ivy Rosales (*Abstract Co-Author*)
Adam S. Feldman, MD (*Abstract Co-Author*)
Peter D. Caravan, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the long-term retention and speciation of gadolinium-based contrast agents (GBCAs) in human kidney specimens.

METHODS AND MATERIALS

The collection of human kidney samples was approved by our institutional review board. 14 healthy human kidney samples were obtained from patients undergoing nephrectomy. Patients received at least one dose of a GBCA 16 to 2795 days before sample collection. 10-µm frozen sections were analyzed by Laser Ablation (LA) inductively coupled mass spectrometry (ICP-MS) to obtain Gd distribution maps. The Gd speciation was measured by Liquid Chromatography (LC) ICP-MS following extraction of water-soluble species in water. Extracted kidney sections were analyzed by LA-ICP-MS to evaluate the distribution of insoluble Gd species.

RESULTS

Mean Gd concentrations of 318, 133, 178, 5, and 0 ppb were measured in the cortex of kidney samples from patients who received a single dose of the macrocyclic Gadoterate 43 (case 1), 65 (case 11), 77 (case 3), 466 (case 9), and 2367 (case 10) days before surgery, respectively. This suggests that gadoterate is retained in human kidneys for months after administration but is gradually excreted over time. Intact Gadoterate could be detected in the corresponding kidney extracts by LC-ICP-MS except for cases 9 and 10, for which Gd levels were below the instrument limit of detection. For case 11, LA-ICP-MS maps, before and after extraction, also showed near-total removal (>95%) of Gd, indicating that Gadoterate is mostly retained in its intact form. In samples obtained from patients who received a single dose of the macrocyclic Gadobutrol 49, 51, and 75 days before surgery, the intact GBCA could be detected in kidney extracts. Of the three samples from patients who received doses of at least two different GBCAs with a macrocyclic agent as the last injection, each LC-ICP-MS trace showed only one peak, all of which matched the retention time of the last injected macrocyclic GBCA. In contrast, two patients who received linear GBCAs had elevated Gd levels in both cortex and medulla even seven years after injection. Despite such high concentrations, no soluble Gd species could be detected by LC-ICP-MS, indicating that Gd is retained as insoluble Gd.

CONCLUSION

This study found that Gd is retained in human kidneys for months to years after GBCA injection. The macrocyclic GBCAs appear to be primarily retained intact and slowly excreted over time, whereas linear agents form insoluble Gd species that accumulate in kidneys.

CLINICAL RELEVANCE/APPLICATION

The presence of residual GBCAs in human kidneys for months after administration raises concerns about potential long-term effects.

W6-SSGU05-7 Keynote Speaker: The Quantitative Kidney: Integrating Imaging and Biology in Benign Renal Disease

Andrew L. Wentland, MD,PhD (*Science Invited Presenter*)

Abstract Archives of the RSNA, 2025

W6-SSNMMI06

Nuclear Medicine and Molecular Imaging (Innovations in Nuclear Medicine)

Wednesday, Dec. 3 1:30PM - 2:30PM Room: S405

Don C. Yoo, MD (*Moderator*)
Sophia R. O'Brien, MD, MEd (*Moderator*)

Sub-Events

W6-SSNMMI06-2 EXTERNAL EVALUATION OF A DEEP LEARNING MODEL FOR AUTOMATED LESION SEGMENTATION IN BASELINE PET/CT IMAGING OF MULTIPLE MYELOMA PATIENTS

Haoyue Zhang, PhD (*Presenter*)
Fahmida Haque, PhD (*Abstract Co-Author*)
Nathan S. Lay, PhD (*Abstract Co-Author*)
Esther Mena, MD (*Abstract Co-Author*)
Liza Lindenberg, MD (*Abstract Co-Author*)
Evrim B. Turkbey, MD (*Abstract Co-Author*)
Peter L. Choyke, MD (*Abstract Co-Author*)
Elizabeth Hill, MD (*Abstract Co-Author*)
Baris Turkbey, MD (*Abstract Co-Author*)
Stephanie A. Harmon, PhD (*Abstract Co-Author*)

PURPOSE

This study evaluates the performance of a 3D Artificial Intelligence (AI) model, originally trained to segment lesions on baseline FDG PET/CT scans of multiple cancer types, on baseline FDG PET/CT scans in newly diagnosed multiple myeloma patients, using PET and MRI expert reads as reference standards.

METHODS AND MATERIALS

Fifty-seven patients with newly diagnosed multiple myeloma (NDMM) who underwent baseline FDG PET/CT imaging and whole-body MRI were included. An established 3D deep learning model developed on PET/CT images from 1014 scans with various solid cancers from a publicly available cohort, AUTOPET, was applied to segment lesions on the NDMM whole-body PET scans. To improve specificity for myeloma, regions unlikely to harbor disease (soft tissues and visceral organs) were excluded using an automated whole-body organ segmentation tool, TotalSegmentator. AI-predicted lesions were categorized into five skeletal regions: skull, spine, ribs, upper extremities, and lower extremities. Segmentation results were compared to expert interpretations from whole-body PET and MRI to compute the final patient-level performance metrics, including sensitivity and specificity.

RESULTS

Among 13 PET-positive patients, the AI model detected lesions in 10 patients (sensitivity 76.9%), while maintaining a 63.6% specificity for the 44 PET-negative patients. Among 28 MRI-positive patients with 12 focal patterns, 11 diffuse patterns, and 5 combined patterns, the AI models identify 8, 4, and 1 patients with focal, diffuse, and combined patterns, respectively. The specificity against MRI is 68.97%. In the subset of 16 patients where PET failed to detect lesions but MRI was positive, the AI models identified lesions in 6/16 (37.5%) patients (3/7 focal, 2/6 diffuse, 1/3 combined), demonstrating its capability to detect lesions that may overlooked by radiologists or not apparent on PET scans to naked eyes.

CONCLUSION

A deep learning model trained to segment non-myeloma malignancies on PET/CT demonstrated promising performance for lesion segmentation in baseline multiple myeloma PET/CT. The AI model can identify 37.5% more MM cases than expert PET interpretation while maintaining a low false negative rate when integrating with TotalSegmentator. Refining the AI model on MM lesions may further improve generalizability for myeloma applications. Automated lesion quantification holds potential for supporting standardized imaging assessments in multiple myeloma.

CLINICAL RELEVANCE/APPLICATION

An AI model can significantly improve the efficiency of reading whole-body PET. Moreover, the AI model shows improved sensitivity on myeloma lesions referenced to MRI readouts, demonstrating the value of a well-trained segmentation model.

W6-SSNMMI06-3 CORRELATION BETWEEN MANUAL AND AUTOMATED WHOLE-BODY TUMOR VOLUME ASSESSMENT IN FDG-PET/CT: A COMPARATIVE ANALYSIS OF SEGMENTATION METHODS

Ricarda Ebner, MD (*Presenter*)
Maurice Heimer, MD (*Abstract Co-Author*)
Felix Herr, MD (*Abstract Co-Author*)
Christian Alexander Dascalescu, MD (*Abstract Co-Author*)
Michael Ingrisch (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Lalith Kumar Shiyam Sundar, PhD, MS (*Abstract Co-Author*)
Rudolf A. Werner (*Abstract Co-Author*)
Paul Blanc-Durand, MD,MSc (*Abstract Co-Author*)
Clemens C. Cyran, MD (*Abstract Co-Author*)

PURPOSE

Accurate quantification of whole-body tumor burden is essential for disease assessment and response evaluation in oncologic PET/CT. This study analyzes the correlation between manually segmented tumor volumes and AI-based, automated metabolic tumor volume (TMTV) and total lesion glycolysis (TLG) metrics. Validating automated volumetric analysis is clinically relevant, as it may simplify workflows, reduce interobserver variability, and support consistent assessment over time and across institutions.

METHODS AND MATERIALS

Patients with non-small cell lung cancer (NSCLC) who underwent [¹8F]FDG-PET/CT were retrospectively included. Each patient received one scan prior to therapy initiation (baseline) and at least one follow-up scan during treatment. Manual volumetric segmentation of all FDG-avid tumor lesions was performed using free-breathing, standard-kernel CT mapped to attenuation-corrected PET images. Automated segmentation was performed using Pionus v1.2.2 (PAIRE, Paris, France), a CE-marked, AI-driven software designed for fully automated detection and quantification of FDG-avid lesions on PET imaging. Automated metrics — TMTV41% and TLG41% (41% SUVmax threshold) and TMTVSUV4 (fixed threshold SUV > 4) — were computed separately for each time point. Pearson correlation coefficients (r) were used to assess the linear relationship between manually defined PET tumor volume (PET_VOL) and AI-derived metrics.

RESULTS

123 patients were included, each with a baseline and up to five follow-up scans. At baseline, PET_VOL showed very high correlations with automated metrics (TMTV41%: r = 0.892; TMTVSUV4: r = 0.983; TLG41%: r = 0.920; all $p < 0.001$). Across all time points, correlations remained robust but were moderately lower (TMTV41%: r = 0.723; TMTVSUV4: r = 0.867; TLG41%: r = 0.821; all $p < 0.001$). TMTVSUV4 consistently demonstrated the highest correlation with PET_VOL.

CONCLUSION

Automated, AI-based PET segmentation using SUV-based thresholds shows very high correlation with manual whole-body tumor volume assessments, particularly for TMTVSUV4. Slightly reduced correlations at follow-up may reflect therapy effects, tumor heterogeneity, or segmentation variability. Still, automated volumetry is a robust and scalable method for longitudinal tumor burden quantification. These findings support the integration of AI-based tumor burden quantification into clinical workflows, enabling standardized response assessment and improved decision-making in NSCLC management.

CLINICAL RELEVANCE/APPLICATION

Automated PET volumetry enables high-throughput, operator-independent tumor burden quantification, offering a scalable tool for standardized response assessment and improved clinical decision-making in NSCLC.

W6-SSNMMI06-4 TO EXPLORE THE REMODELING CHARACTERISTICS OF THE IMMUNE MICROENVIRONMENT OF IMMUNE CHECKPOINTS AND THEIR DOWNSTREAM MOLECULE SHP2 IN COLORECTAL CANCER UNDER HYPOXIC CONDITIONS BASED ON PET IMAGING

Mingyu Zhang, PhD (*Presenter*)
Xia Lu (*Abstract Co-Author*)
Jigang Yang (*Abstract Co-Author*)

PURPOSE

To investigate the correlation between FDG PET/CT parameters and PD-L1 with its downstream molecule SHP2 in colorectal cancer (CRC) under hypoxic conditions, and to identify suitable candidates for immunotherapy based on molecular imaging biomarkers.

METHODS AND MATERIALS

Western blot (WB) and immunofluorescence double-staining were employed to assess the expression levels of PD-L1, HIF-1a, and SHP2 in multiple CRC cell lines, enabling the selection of cell lines with high vs. low expression. Xenograft models were established using CRC cell lines with high/low metastatic potential, and immunohistochemistry (IHC) was performed to analyze differential HIF-1a/PD-L1/SHP-2 expression in transplanted tumor tissues. We retrospectively enrolled 38 CRC patients who underwent preoperative whole-body FDG PET/CT at our institution. Correlations between FDG uptake parameters and HIF-1a/PD-L1/SHP-2 protein expression in tumor tissues were evaluated, along with associations between TNM staging and these molecular markers. Logistic regression was applied to assess the predictive value of FDG multiparameters for immunotherapy benefit.

RESULTS

The hypoxic microenvironment significantly upregulated PD-L1 expression and recruited SHP2 in CRC cell lines in vitro . In xenograft models, tumors with high metastatic potential exhibited elevated HIF-1a, PD-L1, and SHP-2 expression compared to low-metastasis counterparts. Clinical data revealed that significant correlations between SUVmax and HIF-1a/PD-L1/SHP-2 expression ($p<0.05$).MTV correlated with HIF-1a and PD-L1 levels ($p<0.01$).SUVmax, TLG, and MTV were associated with advanced T/M staging ($p<0.05$).The combination of SUVmax and MTV served as a predictive biomarker for PD-L1 blockade therapeutic benefit.

CONCLUSION

Hypoxia drives immune evasion in CRC via PD-L1 upregulation and subsequent SHP2 activation. FDG PET parameters (MTV and SUVmax) correlate with PD-L1/SHP-2 expression and provide non-invasive imaging biomarkers to stratify patients for PD-L1-targeted immunotherapy.

CLINICAL RELEVANCE/APPLICATION

Provide imaging markers for the screening of groups benefiting from immunotherapy

W6-SSNMMI06-5 RADIOEMBOLIZATION FOR HCC PATIENTS WITH PERSONALIZED YTTRIUM-90 DOSIMETRY FOR CURATIVE INTENT (RAPY90D)

Srinivas C. Kappadath, PhD (*Presenter*)
Armeen Mahvash, MD (*Abstract Co-Author*)

PURPOSE

To report on completed single-arm single-institution prospective clinical trial (RAPY90D, NCT03896646) on 90 Y-glass radioembolization (TARE) for hepatocellular carcinoma (HCC) using patient-specific voxel-dosimetry treatment planning. The primary endpoint was localized-mRECIST objective response rate (ORR) at 6-month follow-up. The secondary objective was evaluation of planned- and delivered-dose concordance.

METHODS AND MATERIALS

All adult HCC patients with non-infiltrative tumors size =3 cm suitable for 90 Y-glass radioembolization were eligible. All patients underwent hepatic angiography with fan-beam CT (AngioCT), received 99m Tc-MAA injections at all planned treatment sites. AngioCT and 99m Tc-MAA SPECT/CT was used to plan tumor dose =200Gy and normal liver dose =100Gy (stratified by underlying disease and volume) with voxel dosimetry. All treatments used 90 Y-glass 2 nd -week-calibration vials. ORRs and toxicities (CTCAEv5.0) were determined 3- and 6-month follow-up. Post-treatment for delivered-dose verification was performed using both 90 Y-SPECT/CT and 90 Y-PET/CT. Cases with adjustments to perfused-normal-liver distribution via gelfoam/particle use or catheter-location changes >1cm were excluded from dose-concordance analysis.

RESULTS

40 patients (62/52 all/index tumors) received 90 Y-TARE; 37 patients (58/48 all/index tumors) completed 6-month follow-up. The median (range) treated index-tumor size was 5.4 (3.0-15.4) cm. The median (range) planned- and delivered-doses to tumors were 331 (206-562) Gy and 361 (208-981) Gy, and to perfused-normal-liver were 113 (32-343) Gy and 138 (37-487) Gy, respectively. The tumor ORR at 6-month follow-up was 97% (56/58) with 72% (42/58) complete responders. Concordance analysis included 81% (67/83) infusions and demonstrated strong dose correlations (R 2 >0.90).

CONCLUSION

RAPY90D has demonstrated feasibility and efficacy of prospective, patient-specific 99m Tc-MAA-based voxel dosimetry treatment planning for 90 Y-TARE.

CLINICAL RELEVANCE/APPLICATION

RAPY90D was the first US radioembolization trial to use voxel dosimetry for prospective treatment planning and dose verification. It used an innovative dosimetry schema to increase the therapeutic ratio. RAPY90D was a positive study with localized mRECIST ORR 96% and CRR 72%. 90 Y-TARE is a highly effective therapy - getting the right amount of dose to the right location is critical for success.
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W6-SSOB03

OB/Gynecology (Placental and Fetal Imaging)

Wednesday, Dec. 3 1:30PM - 2:30PM Room: E351

Manjiri K. Dighe, MD (*Moderator*)
Jesse L. Courtier, MD (*Moderator*)

Sub-Events

W6-SSOB03-1 AN INTERACTIVE LEARNING MODULE FOR MRI EVALUATION OF PLACENTA ACCRETA SPECTRUM

Carolyn Chen, BA, MA (*Presenter*)
Erin N. Gomez, MD (*Abstract Co-Author*)
Lydia Gregg, MA (*Abstract Co-Author*)

PURPOSE

Placenta accreta spectrum (PAS) is a potentially life-threatening condition in which the placenta is adherent to or invades the uterine myometrium. MRI may serve as a helpful tool in the diagnosis and characterization of PAS. Interpretation of placental MRI is challenging for many radiologists due to the numerous, sometimes subtle imaging features present and variation in imaging protocols and image quality. Educational resources regarding MRI evaluation of PAS are limited, and many radiologists are infrequently exposed to this type of examination. To address this gap, an interactive educational module detailing and illustrating the imaging features of PAS was developed and evaluated for knowledge gain and learner engagement.

METHODS AND MATERIALS

A needs assessment was conducted via interviews with radiology faculty to evaluate confidence interpreting placental MRI and preferences for educational media. The results were used to guide the development of the educational module, which included a broad overview of PAS, recommended MRI protocols, diagrammatic and case-based interpretive illustrations of MR images detailing key features of PAS, and annotated, scrollable case studies. An institutional review board-approved randomized controlled trial was conducted comparing the module to a review article from the literature. Twenty-four participants, which included radiology faculty, fellows, and residents, completed the survey. Knowledge gain was assessed using pre- and post-tests, while engagement was measured using Likert-scale items and qualitative free-response questions.

RESULTS

Participants who used the module demonstrated a significant increase in post-test scores ($p < 0.001$), while those who read the article did not ($p = 0.189$). The module received higher engagement scores, with all participants demonstrating a preference for the interactive format over the review article. Qualitative feedback highlighted the utility of the illustrations in clarifying complex imaging features, as well as the value of the scrollable case studies in promoting understanding of the appearance of PAS on MRI.

CONCLUSION

An interactive module significantly improved radiologists' knowledge of key MR imaging features of PAS, outperforming a review article in both knowledge transfer and user engagement. This highlights the value of targeted, interactive educational media in addressing content gaps for conditions with complex imaging features such as PAS.

CLINICAL RELEVANCE/APPLICATION

Understanding aspects of media that increase comprehension of complex clinical conditions can provide valuable insight in the development of educational materials for radiologists.

W6-SSOB03-2 DIFFUSION-WEIGHTED MRI AND SURGICAL OUTCOMES IN A PROSPECTIVE COHORT OF PREGNANT PATIENTS WITH INCREASED RISK OF PLACENTA ACCRETA SPECTRUM

Quyen N. Do, PhD (*Presenter*)
Yin Xi, PhD (*Abstract Co-Author*)
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PURPOSE

Diffusion-weighted MR imaging (DWI) evaluates water molecule motion within tissues, intravoxel incoherent motion (IVIM) analysis of multi-b-value DWI provides metrics on tissue diffusivity and microcirculation. This prospective study aimed to assess regional placental diffusion characteristics, specifically near vs. remote from the internal os, to predict placenta accreta spectrum (PAS) requiring hysterectomy in pregnancies with increased PAS risk.

METHODS AND MATERIALS

Pregnancies with first-trimester ultrasound findings indicating low uterine segment implantation and a history of cesarean delivery were eligible. Participants underwent 3T MRI between 24-27+6 gestation. Sagittal DWI of the gravid uterus (b-values: 0, 50, 100, 150, 400, 700, and 1000 sec/mm²) was acquired. Using Philips MR Advanced Diffusion Analysis software, diffusion parameters-apparent diffusion coefficient ADC , diffusion coefficient D , pseudo-diffusion coefficient D* , and perfusion fraction f - were computed. Regions of interest (ROIs) for the placenta and internal os were manually segmented on b=0 images and then applied to the diffusion coefficient maps for analysis under expert supervision (Figure 1). For each placental pixel, the distance to the center of mass of the internal os was calculated. Linear regressions models were generated for each diffusion parameter (ADC , D , D* , and f) as a function of distance. The slope of each regression line represented the change in the diffusion parameter per centimeter from the internal os. Two-sample t-tests were used to compare slope distributions between patients who did and did not require hysterectomy.

RESULTS

Among the 38 cases, 10 required cesarean hysterectomy and 28 had cesarean delivery alone. Groups were similar in age, race, and number of prior cesareans (Table 1). Hysterectomy cases had flatter or slightly positive slopes in D , f , and ADC , while non-hysterectomy cases showed steeper negative slopes. Figure 2 shows individual regression models for the diffusion coefficient D for each patient. No significant group differences were found in D* (Table 2).

CONCLUSION

IVIM-derived diffusion metrics, especially f and D , differ regionally in cases requiring hysterectomy due to PAS. Larger negative slopes in non-hysterectomy cases suggest preserved regional microcirculation, while flatter slopes in cases requiring hysterectomy due to PAS may reflect abnormal perfusion, especially in the lower uterine segment. This supports DWI as a physiologic biomarker for microvascular alteration in PAS.

CLINICAL RELEVANCE/APPLICATION

Diffusion slope analysis may help differentiate cases with PAS severe enough to require hysterectomy and inform surgical risk by identifying altered regional placental microcirculation.

W6-SSOB03-3 ASSESSING CHANGES IN MATERNAL OPHTHALMIC AND UTERINE ARTERY DOPPLER AS AN INDICATOR OF EFFECTIVENESS OF ASPIRIN IN PREVENTING PREECLAMPSIA - A PROSPECTIVE STUDY IN HIGH-RISK PREGNANT WOMEN

Meera Shah, MBBS (*Presenter*)
Chetankumar M. Mehta, MD (*Abstract Co-Author*)

PURPOSE

This prospective study aimed to evaluate changes in maternal ophthalmic and uterine artery doppler parameters across trimesters to determine low-dose (150 mg/day) aspirin's impact on maternal vascular adaptation , placental blood flow and effectiveness in preventing pre-eclampsia (PE) among high-risk pregnant women .

METHODS AND MATERIALS

High-risk pregnant women (gestational age (GA): 11-13+6 weeks) were identified via the Fetal Medicine Foundation pre-eclampsia screening algorithm . Participants (n=130) were randomly divided into 2 groups; one received low-dose aspirin (150mg/day) daily from 11-14 weeks to 36 weeks of gestation or delivery, whichever came first while the other group did not receive aspirin. Maternal ophthalmic and uterine artery doppler parameters were assessed in the 2nd and 3rd trimesters (19-23 & 32-36 weeks respectively).

RESULTS

Comparative analysis of ophthalmic artery doppler parameters between aspirin and non-aspirin groups revealed no statistically significant difference in PSV2/PSV1 ratio (PSV = peak systolic velocity, PSV1 = 1st peak, PSV2 = 2nd peak) during the 1st trimester (11 to 13+6 weeks; $p > 0.05$). However, significant differences were observed in the 2nd & 3rd trimesters with the non-aspirin group exhibiting a higher PSV2/PSV1 ratio value (p-value < 0.01) . Similarly, uterine artery doppler assessment showed a significant reduction in pulsatility index (UtA-PI) values in the aspirin group during the 2nd & 3rd trimesters (p-value < 0.01); while the difference in RI values during these periods remained statistically non-significant. Also, statistically significant (p-value < 0.05) differences were noted in the incidence rates of PE between the 2 groups with a higher incidence rate in the non-aspirin group .

CONCLUSION

Early doppler indices of both ophthalmic and uterine arteries do not differ significantly between the 2 groups, administration of aspirin is associated with lowering of peripheral resistance as depicted by lower PSV2/PSV1 ratios in ophthalmic arteries and UtA-PI in the later gestational period as well as a reduction in the incidence of PE suggesting potential hemodynamic influence of aspirin in modulating maternal vascular adaptation during pregnancy.

CLINICAL RELEVANCE/APPLICATION

Pre-eclampsia is a leading cause of maternal and perinatal morbidity. Identifying high-risk pregnancies early allows for timely interventions, such as low-dose aspirin therapy , which has been shown to reduce the incidence of PE , especially when initiated before 16 weeks of gestation. Monitoring Doppler indices provides a non-invasive method to assess placental perfusion and the effectiveness of preventive measures , thereby guiding clinical decision-making and improving maternal and fetal outcomes.

W6-SSOB03-4 INTER-READER AGREEMENT BETWEEN EXPERT AND NON-EXPERT READERS IN THE INTERPRETATION OF PLACENTAL MRI

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Andrew Cho (*Abstract Co-Author*)
Robert M. Weinstein (*Abstract Co-Author*)
James Facciola (*Abstract Co-Author*)
Claire Brookmeyer, MD (*Abstract Co-Author*)
Katarzyna J. Macura, MD, PhD (*Abstract Co-Author*)
Erin N. Gomez, MD (*Abstract Co-Author*)

PURPOSE

To evaluate accuracy and inter-reader agreement among subject matter expert (SME) and non-SME radiologists in the interpretation of MRI for evaluation of placenta accreta spectrum (PAS), characterize imaging features reported and identify areas for improvement in PAS-related education and training.

METHODS AND MATERIALS

A single institution retrospective study was conducted including patients who underwent placental MRI prior to caesarean hysterectomy with pathology diagnosis of PAS from 2008-2022. Cases were categorized as missed/under-diagnosed vs. concordant/over-diagnosed by comparing final MRI diagnoses to pathology and operative diagnoses. Demographics, obstetric history, intraoperative needs, postoperative outcomes, and original reports of PAS imaging features were compared using Student’s t-tests. Missed/under-diagnosed cases were re-interpreted by two SME and two non-SME radiologists. Accuracy and agreement on PAS diagnosis and specific imaging features were assessed with intraclass correlation coefficients and kappa statistics.

RESULTS

59 patients met inclusion criteria, with 19 missed/under-diagnosed cases and 40 concordant/over-diagnosed cases. There was no significant difference in demographics or prior cesarean deliveries. Missed/under-diagnosed cases had increased intraoperative needs with greater blood loss, units of blood transfused and intraoperative crystalloid use (4700 vs. 2966, P=0.03). Original readers reported fewer findings per missed/under-diagnosed case (1.6 vs. 3.5, P=<0.01), identifying fewer placental bands and myometrial thinning/bulging compared to concordant/over-diagnosed cases (11% vs. 53%, P=<0.01; 42% vs. 80%, P=<0.01). Secondary SME review of missed/under-diagnosed cases demonstrated higher detection of all key features of PAS with increased findings per case compared to original reads (4.4, P=<0.01). Non-SME readers had higher rates of missed diagnoses compared to SMEs. Overall agreement on PAS diagnosis was fair (ICC=0.30). Overall agreement was highest for placenta previa (K=0.82) and lowest for image quality concerns (K=0.18). Agreement increased for identification of placental bands, heterogenous placental signal and image quality concerns when compared between SMEs.

CONCLUSION

Subject matter expertise is valuable in the correct interpretation of MRI for PAS, but agreement on imaging features present, even among SMEs, varies.

CLINICAL RELEVANCE/APPLICATION

Missed/under-diagnosed cases of PAS result in increased intraoperative needs and worse postoperative outcomes in an already high-risk population. Continued efforts are needed to educate and train radiologists in the interpretation of placental MRI to improve accurate prenatal detection.

W6-SSOB03-5 CLINICAL OUTCOMES AMONG PATIENTS UNDERGOING MRI VERSUS ULTRASOUND ONLY FOR THE EVALUATION OF PLACENTA ACCRETA SPECTRUM: 20-YEAR EXPERIENCE FROM A LARGE TERTIARY CARE CENTER

Maria Carolina Rodriguez Steube, BS (*Presenter*)
Andrew Cho (*Abstract Co-Author*)
Judy Fustok, MD (*Abstract Co-Author*)
Abigail Coco (*Abstract Co-Author*)
Erin N. Gomez, MD (*Abstract Co-Author*)

PURPOSE

Placenta accreta spectrum (PAS) refers to the abnormal adherence of the placenta to the uterine myometrium during pregnancy and significantly increases the risk of peripartum hemorrhage. Antepartum diagnosis of PAS with referral to a tertiary care center has been shown to improve outcomes. Magnetic resonance imaging (MRI) has comparable sensitivity and specificity to ultrasound (US) for detection of PAS and is currently performed in high-risk patients or when US evaluation is suboptimal. The purpose of this study was to determine clinical and demographic factors associated with referral for MRI after initial US evaluation for PAS and differences in clinical outcomes between MRI and US groups.

METHODS AND MATERIALS

Obstetric patients evaluated for PAS with MRI at our institution between 2004-2024 were identified from the electronical medical record. Patients with suspected PAS on US who did not undergo MRI between 2015-2024 were identified as controls. Data collected included patient demographics and history, imaging, surgical and pathology findings. Outcome measures included surgical complications, postpartum course, estimated blood loss (EBL), and transfusion requirements. Quantitative statistical analysis was done in Jupyter (Python 3.7).

RESULTS

116 MRI patients and 59 US only controls were included. A significantly greater proportion of MRI patients had public insurance or were uninsured versus controls ($p = 0.0209$). More patients with prior CS and a history of tobacco use were referred to MRI than in the US group ($p = 0.00988$, and $p = 0.0147$, respectively). There was a higher proportion of patients with placenta percreta intraoperatively in the MRI group ($p = 0.0012$). There were no significant differences in EBL or units of blood transfused between the two groups. However, the MRI group received more liters of crystalloid during delivery ($p = 0.000353$) and had a longer post-partum length of stay ($p < 0.0001$). Gynecologic Oncology and Urology were more likely to assist in the delivery MRI patients ($p < 0.0001$ and $p = 0.0187$, respectively).

CONCLUSION

Patients with more clinically or socially complex cases of PAS were referred for MRI. Although patients undergoing MRI had more severe disease and thus more complex surgeries requiring longer postoperative monitoring, we observed similar degrees of peripartum hemorrhage in patients evaluated with US only. This is likely a testament to the role of MRI as an operative planning tool, which in conjunction with management at a tertiary care center may decrease the risk of maternal and fetal morbidity and mortality in patients with more severe forms of PAS.

CLINICAL RELEVANCE/APPLICATION

MRI is essential to the multidisciplinary care that improves clinical outcomes among patients with severe forms of PAS.

W6-SSOB03-6 PREDICTIVE VALUE OF MRI SIGNS COMBINED WITH IVIM PARAMETERS IN ASSESSING CLINICAL OUTCOMES IN PATIENTS WITH PLACENTA ACCRETA SPECTRUM DISORDERS

Yanbo Li (*Presenter*)
Xiaohan Zheng (*Abstract Co-Author*)
Weiwei Cui (*Abstract Co-Author*)
Can Feng (*Abstract Co-Author*)
Jun Liu, PhD (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the predictive value of preoperative MRI features combined with intravoxel incoherent motion (IVIM) parameters for adverse clinical outcomes in patients with placenta accreta spectrum disorders(PASDs).

METHODS AND MATERIALS

In this retrospective study, 118 singleton pregnant women with surgically and pathologically confirmed PASDs, between 32 and 39 weeks of gestation, underwent preoperative 1.5 T MRI scans. Adverse outcomes were defined as any of the following: intraoperative blood loss =1000 mL, preterm delivery (<36 weeks), bladder injury, or ICU admission. Two radiologists independently evaluated MRI features based on standardized PASD diagnostic criteria. IVIM parameters (f: perfusion fraction; D*: pseudo-diffusion coefficient; D: true diffusion coefficient) were measured by delineating the placental region of interest (ROI), excluding calcifications, fibrotic areas, and umbilical insertion sites. Binary variables for IVIM parameters were derived from ROC curve thresholds. Logistic regression analyses were conducted to identify predictors of adverse clinical outcomes. Pearson correlation assessed the association between IVIM metrics and intraoperative bleeding. ROC curves evaluated model performance.

RESULTS

A total of 118 pregnant women were included in this study. Patients with poor outcomes had a higher incidence of increased abnormal intraplacental vascularity, increased T2WI hypointense bands, loss of chemical shift line at uterovesical interface, and placental thickness >4 cm(all $P<0.05$), as compared to those with good outcomes. In addition, patients with a poor outcomes had higher f , D*, and D values (all $P<0.05$). Logistic regression analysis showed that increased abnormal placental vascularity, thinning of the myometrium, $f = 0.343$, $D = 1.82 \times 10^{-3}$ mm 2 /s, and $D^* = 24.26 \times 10^{-3}$ mm 2 /s were independent predictors of the presence of poor outcomes. f, D*, and D were positively and linearly correlated with intraoperative blood loss. When the MRI signs were combined with each parameter of IVIM separately to create a prediction model, ROC curve analysis showed that the combination of f with increased abnormal placental vascularity and thinning of the myometrium had the best diagnostic results (AUC=0.894, 95% CI: 0.83-0.95).

CONCLUSION

MRI features and IVIM parameters are independently associated with adverse outcomes in PASDs. The combination of placental perfusion fraction with key MRI signs offers strong predictive performance and may enhance clinical risk assessment.

CLINICAL RELEVANCE/APPLICATION

These findings support the use of multiparametric MRI, including IVIM analysis, as a non-invasive tool for preoperative risk stratification and surgical planning in PASDs management.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

W6-SSPH10

Physics (Machine Learning for Imaging)

Wednesday, Dec. 3 1:30PM - 2:30PM Room: S404

Emil Y. Sidky, BS, PhD (*Moderator*)
Despina Kontos, PhD (*Moderator*)

Sub-Events

W6-SSPH10-1 PERFORMANCE EVALUATION OF A FINE-TUNED SMALLER LARGE LANGUAGE MODEL (LLM) FOR EXTRACTING CLINICAL PREDICTORS OF 5-YEAR SURVIVAL IN BLADDER CANCER PATIENTS POST-CYSTECTOMY

Russell G. Day (*Presenter*)
Lubomir M. Hadjiiski, PhD (*Abstract Co-Author*)
Di Sun, MEng, BEng (*Abstract Co-Author*)
Heang-Ping Chan, PhD (*Abstract Co-Author*)
Elaine M. Caoili, MD, MS (*Abstract Co-Author*)
Richard H. Cohan, MD (*Abstract Co-Author*)
Ajjai S. Alva, MD (*Abstract Co-Author*)
Grace Bruno (*Abstract Co-Author*)
Chuan Zhou, PhD (*Abstract Co-Author*)
Vikas Gulani, MD, PhD (*Abstract Co-Author*)

PURPOSE

An offline LLM facilitates HIPAA compliance and kept frozen ensures reproducibility in clinical applications. Offline in-house LLMs may need to be smaller to conserve local computational resources. We investigated if a small LLM (Llama3.2-3B-instruct), fine-tuned for a specific clinical information retrieval, can match or exceed large LLMs such as GPT4 in supporting a survival prediction for bladder cancer patients post-radical cystectomy.

METHODS AND MATERIALS

With IRB approval, we identified 781 bladder cancer patients treated from 2001 to 2020. Inclusion criteria: (1) receipt of neoadjuvant chemotherapy (NAC); (2) CT urography obtained pre and post NAC; (3) treatment with radical cystectomy; and (4) 5-year survival status. 163 eligible cases were partitioned into training (56%: 55 alive (A), 37 deceased (D)), validation (4%: 4A, 3D), and test (40%: 20A, 44D) cohorts. Patient reports were processed by Llama3.2-3B-instruct fine-tuned via LoRA to extract pathological T stage (pT), nodal stage (N), and lymphovascular invasion (LVI). Comparator extraction was performed by the same model without fine-tuning and by GPT4. Accuracy was measured against ground truth. To predict 5-year survival, we converted the extracted staging variables (pT, N, LVI) into nomogram points, whose sum corresponds to survival probability via the Shariat nomogram. We also developed a Clinical-Radiomic-Deep learning (CRD) predictive model by concatenating the 3 nomogram points with 12 radiomic and 1 deep-learning features from CTU images, which served as input to a neural network. We evaluated model performance by the area under the ROC curve (AUC) on an independent test set.

RESULTS

The LoRA trained model achieved an average extraction accuracy of 96% (pT 97%), outperforming the untrained model (89% avg, 55% pT) and matching GPT4 (94% avg, 91% pT). For survival prediction, the nomogram model AUC was 0.82±0.05, versus 0.82±0.05 for GPT4, and 0.79±0.06 for the untrained model. The CRD model with LoRA trained extraction yielded an AUC of 0.88±0.05, similar to GPT4 (0.88±0.05) and superior to the untrained model (0.85±0.05).

CONCLUSION

Fine-tuning of a small LLM enables highly accurate extraction of pathological staging and supports five-year survival prediction with performance comparable to larger proprietary models, demonstrating the feasibility of deploying open-source LLMs in clinical radiology workflows.

CLINICAL RELEVANCE/APPLICATION

In comparison with large LLMs, use of fine-tuned small LLMs lowers computational time and cost while retaining high accuracy in extracting clinical variables and predicting patient outcomes. Use of small LLMs should allow for AI integration in the management of urologic oncology patients even in resource limited environments.

W6-SSPH10-2 DEEP LEARNING-EMPOWERED ANALYSIS OF THERAPEUTIC OUTCOME USING HIGH-RESOLUTION INTRAVITAL IMAGES OF ANGIOGENESIS IN HEAD AND NECK CANCER

Jung Sun Yoo, PhD (*Presenter*)
Hongzhao Chen (*Abstract Co-Author*)

PURPOSE

The integration of targeted therapeutics such as cetuximab into clinical treatment regimens has brought significant advancements in managing head and neck squamous cell carcinoma (HNSCC). Despite promising clinical success of Cetuximab and vibrant development of combo therapies, there is a lack of reliable tools to monitor and predict therapeutic outcomes rigorously. Here, we showcase a deep learning-empowered angiogenesis classification technique using high-resolution intravital images of vasculature to distinguish normal, malignant, and differentially recovered models.

METHODS AND MATERIALS

A multi-level ensemble method was developed for automatic vasculature classification. This approach combines predictions from CNNs (DenseNet121, Vgg16, ResNet50) and ML classifiers (SVM, KNN, Naive Bayes) to distinguish normal from malignant models and assess therapeutic outcomes of Cetuximab alone and with Magrolimab for HNSCC. Intravital vasculature images were acquired from treated and untreated murine HNSCC xenograft models and normal mice after Dextran-Tetramethylrhodamine injection. A dataset comprising 784 in vivo images and 471 vascular records was selected for training and validation of our models. The ensemble method was refined by introducing a novel Integrated Curvature Estimation (ICE) approach, designed to approximate vasculature curvature, a parameter not obtainable with traditional tools. We incorporated an adaptive weight board learning system to dynamically update weights and tackle data imbalance. Predictions from CNNs and MLs were first averaged and then unified through Bootstrap Aggregating.

RESULTS

The ensemble model using images and vascular records together demonstrated superior performance, 96.25% accuracy (ACC), 0.99 area under the curve (AUC), 96.06% sensitivity (SEN), and 98.73% specificity (SPE). In contrast, the image-based model presented only 93.75% ACC, 0.98 AUC, 93.70% SEN, and 97.88% SPE and the vascular record-based model showed the worst performance with ACC of 75.00%, AUC of 0.93, SEN of 71.25%, and SPE of 91.39%.

CONCLUSION

The AI-assisted differentiation of angiogenesis, combined with intravital imaging, provides a crucial clinical parameter for HNSCC staging and serves as an effective indicator for evaluating drug efficacy in pre-clinical and clinical settings.

CLINICAL RELEVANCE/APPLICATION

This strategy will be particularly useful for the rapid and robust assessment of new drugs and the rational design of clinical trials, given the current rise in interest in combinational and synergistic immunotherapies and targeted therapies. Early and accurate identification of responders will result in effective clinical decisions during treatment and reduce the clinical burden of HNSCC.

W6-SSPH10-3 SCALABLE NEURAL NETWORK FOR SYNTHESIZING CT SCANNER- AND ALGORITHM-SPECIFIC LESIONS ACROSS VARIABLE RECONSTRUCTION SETTINGS

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Shravani Kharat, MS (*Abstract Co-Author*)
Jarod Wellinghoff (*Abstract Co-Author*)
Ahmed O. El Sadaney, MBBCh (*Abstract Co-Author*)
Joel G. Fletcher, MD (*Abstract Co-Author*)
Shaojie Chang, PhD (*Abstract Co-Author*)
Lifeng Yu, PhD (*Abstract Co-Author*)
Shuai Leng, PhD (*Abstract Co-Author*)
Cynthia H. McCollough, PhD (*Abstract Co-Author*)

PURPOSE

Synthetic CT images with known pathology are desired for task-driven assessments. Projection domain lesion insertion is accurate but requires proprietary information and tools. Image domain methods are convenient but have difficulty accounting for varying resolution, texture, and reconstruction settings. We aim to address these challenges using a scalable p hysics-informed self- a ttention self- s upervised neural ne t work for synthesizing scann e r- and algorithm-specific patho l ogic features (PASTEL)

METHODS AND MATERIALS

PASTEL fused lesion images (i.e., lesion models) into lesion-free images, using physics-based l esion p rior g eneration (LPG) and s elf-attention s elf-supervised n etwork (SSN). LPG added forward projections of lesion-free images and lesion models and created lesion priors via back projection. Lesion priors were filtered with the local point spread function estimated via Gaussian fitting in Fourier domain. SSN conducted self-supervised learning where lesion models and lesion priors served as inputs and reference lesion images in different backgrounds served as labels. Self-attention was used to adaptively adjust image appearance at lesion location. SSN used custom transformers to process different sampling frequencies at variable fields of view (FOV). The encoded reconstruction and CT scanner types served as extra inputs to modulate filter response to differentiate spatial resolution and noise texture types within the network. Loss function involved mean square error and edge difference. PASTEL was assessed using data from 1 conventional (170 lesions) and 1 photon counting CT (175 lesions): training 325, testing 20. A validated projection domain lesion insertion tool was used as reference. To demonstrate scalability, two iterative reconstruction algorithms were used with 2 filters / denoising strengths and variable FOVs (310 to 500 mm). PASTEL was qualitatively and quantitatively assessed using CT number accuracy, structural similarity index (SSIM), and radiomic features. Intraclass correlation coefficient (ICC) was calculated.

RESULTS

PASTEL-simulated lesion appearance was close to the reference across all reconstruction settings, showing similar contrast, sharpness and noise texture. PASTEL showed high CT number accuracy (mean difference range [-1.4, -0.5] HU), high lesion structural similarity (mean SSIM range [0.96, 0.98]), and good-to-excellent reproducibility of radiomics features (mean ICC range [0.81, 0.93]).

CONCLUSION

PASTEL generalized well across reconstruction algorithms and settings on different CT scanners.

CLINICAL RELEVANCE/APPLICATION

PASTEL can provide high quality scalable simulation of CT pathology using only image data to facilitate optimization of protocols and AI models.

W6-SSPH10-4 DEEP LEARNING MODEL FOR CLASSIFICATION AND SEGMENTATION OF HEMOPERITONEUM AND EXTRAPERITONEAL HEMATOMA ON ABDOMINOPELVIC CT USING REGION-AWARE APPROACH

Jihwan Kim, BSc, MSc (*Presenter*)
Taehyun Kim (*Abstract Co-Author*)
Sujeong Kwon, BA (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)
Gil-Sun Hong, MD, PhD (*Abstract Co-Author*)

PURPOSE

Rapid diagnosis and accurate volume measurement of abdominopelvic bleeding—including hemoperitoneum and extraperitoneal hematoma—are essential for timely, life-saving interventions in the acute care of emergency patients. To address these challenges, we developed and externally validated a deep learning model to classify and segment hemoperitoneum and extraperitoneal hematoma on abdominopelvic CT (APCT) scans.

METHODS AND MATERIALS

We retrospectively collected 1,714 APCT scans acquired between January 2001 and February 2019 for model training where 29.9% showed hemoperitoneum or extraperitoneal hematoma. An internal validation set included 98 APCT scans, with 50.0% positive for these conditions. For external multi-center validation, two independent datasets were used: external set A comprised 272 APCT scans from the emergency department of another institution (29.3% positive), and external set B comprised 267 scans from an independent institution (8.61% positive). Our deep learning model based on ResU-Net and employed a region-aware approach dividing each scan into hepatosplenic, abdominal, and pelvic regions to capture region-specific features. Model performance was evaluated using per-patient sensitivity, specificity, and positive predictive value (PPV), as well as the Dice similarity coefficient (DSC), all reported with confidence intervals (CI).

RESULTS

On the validation, sensitivities of internal, external A, and external B of the model were 95.9% (95% CI: 86.0-99.5), 94.1% (95% CI: 85.6-98.3), and 86.9 (95% CI: 66.4-97.2), respectively. The corresponding specificities were 97.9% (89.1-99.9), 83.5% (76.9-88.8), and 96.7 (93.6-98.5), and PPVs were 97.9% (87.1-99.7), 70.3% (62.5-77.0), and 71.4 (55.3-83.4), respectively. Our model significantly outperformed the non-region-aware model in specificity (McNemar test; $p < 0.001$) and PPV (bootstrap method; $p < 0.001$) across both external datasets. Our model achieved DSCs of 0.77 (95% CI: 0.72-0.82), 0.70 (95% CI: 0.64-0.76), and 0.50 (95% CI: 0.38-0.63), for internal, external A, and external B, respectively.

CONCLUSION

Our region-aware deep learning model significantly better classified and segmented hemoperitoneum and extraperitoneal hematoma on APCT to non-region-aware method.

CLINICAL RELEVANCE/APPLICATION

This model may help a radiologist to support timely diagnosis and treatment planning for patients with abdominopelvic bleeding in emergency settings.

W6-SSPH10-5 MACHINE LEARNING-BASED QUALITY ASSURANCE TOOL FOR PREDICTING DELIVERED SPOT POSITIONS IN PENCIL BEAM SCANNING PROTON THERAPY

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Bo Lu (*Abstract Co-Author*)
Ethan Stolen (*Abstract Co-Author*)
Siddhant Sen (*Abstract Co-Author*)
Byongsu Choi (*Abstract Co-Author*)
Jin Sung Kim, PhD (*Abstract Co-Author*)
Keith Furutani, PHD (*Abstract Co-Author*)
Chris Beltran, PhD (*Abstract Co-Author*)
James J. Sohn, PhD (*Abstract Co-Author*)

PURPOSE

In pencil beam scanning (PBS) proton therapy, even minor spot delivery deviations can impact treatment accuracy. Current patient-specific QA workflows are often retrospective, time-consuming, and insensitive to subtle but clinically relevant errors. Delivery discrepancies in monitor units (MU) and spot positions arise from uncertainties in beam monitoring and magnetic steering. Although AAPM TG-224 outlines tolerances, maintaining consistent real-time compliance remains challenging. This study proposes a machine learning (ML) model to predict delivered spot positions from planned parameters and beam metadata, enabling more accurate and efficient QA in PBS.

METHODS AND MATERIALS

This retrospective study used 40 log files, 20 from each of two gantry rooms, collected over one month using a Hitachi PROBEAT-V proton therapy system, alongside corresponding DICOM RT plan data. Spot positions were mapped to the isocenter plane using geometric projection corrections. MU and positional discrepancies were calculated; systematic and random errors were statistically analyzed. Delivered MU values exhibited a near-zero mean normal distribution, indicating minimal systematic error. Spot deviations were evaluated using Levene's test and Welch's ANOVA across beam energies, treatment days, and gantry rooms. We trained XGBoost regression models (XGBRegressor, 500 estimators, learning rate 0.1) separately for x- and y-coordinates. Input features included planned spot positions, beam energy, gantry angle, treatment date, and room number. Model performance was assessed using mean squared error (MSE), R^2 score, and Euclidean distance. Statistical analysis was conducted using SPSS v27.0.

RESULTS

The models demonstrated high prediction accuracy with MSEs of 0.013 (x) and 0.002 (y), and R^2 scores of 0.999. The overall Euclidean distance error was <0.100 mm. When stratified by room, errors remained below 0.140 mm (Gantry 1) and 0.100 mm (Gantry 2). Spot deviations significantly varied with beam energy, treatment day, and gantry room ($p < 0.001$). Beam energies of 100.7, 103.6, 105.0, 110.5, and 119.7 MeV showed the largest deviations. MU differences remained clinically negligible. MU delivery showed no significant systematic error.

CONCLUSION

The proposed ML-based QA tool achieved sub-millimeter prediction accuracy for delivered spot positions and identified variations across treatment conditions, including room-specific differences.

CLINICAL RELEVANCE/APPLICATION

This ML-based tool enables real-time identification of delivery deviations across beam energies, treatment days, and gantry rooms, thereby enhancing treatment precision and reducing reliance on labor-intensive QA procedures.

W6-SSPH10-6 PERSONALIZED CT ORGAN DOSE ESTIMATION THROUGH AN AI-DRIVEN LANDMARK DETECTION ON CT LOCALIZERS

Aiping Ding, PhD,DSc (*Presenter*)
Francesco Ria, PhD (*Abstract Co-Author*)
Yakun Zhang, MS (*Abstract Co-Author*)
Donald P. Frush, MD (*Abstract Co-Author*)
Ehsan Samei, PHD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate an AI-driven pipeline for detecting anatomical landmarks on CT localizer images, enabling accurate, patient-specific organ dose estimation and bridging the gap between population-based and personalized dosimetry.

METHODS AND MATERIALS

A total of 2,614 anterior-posterior (AP) CT localizer images was manually annotated, splitting into 1,672 training, 419 validation, and 523 test cases. Three YOLO-NAS (You Only Look Once - Neural Architecture Search) object detection models—small, medium, and large variants—were trained using the SuperGradients framework to identify 10 predefined landmarks. The model outputs were used to estimate patient organ positions and match each patient to a best-fit XCAT (Extended Cardiac-Torso) phantom to approximate patient individualized anatomy. Organ dose was then calculated using precomputed Monte Carlo-based dose coefficients from human digital twin methods, scaled by exam-specific CTDI vol , aligning with the framework previously validated. Model performance was assessed using precision, recall, F1-score, and mean average precision (mAP) at Intersection over Union (IoU) thresholds of 0.50 and 0.50:0.95 (step=0.05). Threshold tuning was applied to optimize detection performance for clinical usage.

RESULTS

Among the three models evaluated, the YOLO-NAS-large variant achieved the best performance, with a peak mAP@0.50 of 0.881 and mAP@0.50:0.95 of 0.669 using a low confidence threshold (0.01) and a non-maximum suppression (NMS) IoU threshold of 0.5. Raising the confidence threshold to 0.3 improved precision and F1-score (F1@0.50 = 0.793) while maintaining recall, with mAP@0.50:0.95 at 0.620. At a NMS IoU threshold of 0.5, the model reached a precision@0.50 of 0.839 with minimal loss in mAP, supporting its use in high-specificity settings. The predicted landmarks enabled patient-to-phantom matching for organ dose estimation without requiring segmentation or real-time Monte Carlo simulation during inference.

CONCLUSION

The trained YOLO-NAS-large model enables accurate, flexible landmark detection on CT localizers for patient-specific organ dose estimation. This pipeline leverages routinely acquired pre-scan localizers to facilitate individualized radiation risk assessment. These results highlight the model's adaptability to varying clinical needs, allowing it to be optimized for different imaging protocols, patient populations, or diagnostic goals.

CLINICAL RELEVANCE/APPLICATION

This AI-driven pipeline uses CT localizers for personalized dose estimation, enabling pre-scan radiation dose stratification during routine use—particularly for pediatric and high-risk populations—supporting personalized CT imaging protocols for safer clinical practice.

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

W6-STCE1

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Wednesday, Dec. 3 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

W6-STCE1-1 AI-POWERED IMAGE-TO-IMAGE TRANSLATION TOOL TO ENHANCE NON-CONTRAST CT SCANS

Junqi Liu, BEng (*Presenter*)
Tianyu Lin (*Abstract Co-Author*)
Kai Ding, PHD (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)
Zongwei Zhou, PhD (*Abstract Co-Author*)

PURPOSE

To develop an AI-based tool for translating CT scans across contrast phases, enhancing resolution, and uncovering hidden anatomical and structural patterns, with the goal of improving multi-phase CT synthesis and downstream clinical applications.

METHODS AND MATERIALS

The model uses an image synthesis method called latent diffusion, guided by a textual label that tells it which phase to generate. To make sure the generated scans look realistic and match the target phase, we added two extra tools during training: (1) A contrast phase classifier, trained to tell apart phase scans. It will act like a phase checker, and feed back classification loss to ensure correct phase synthesis. (2) An organ segmentator that checks whether the key organs, such as liver and kidneys, are correctly shaped and positioned. If the generated scan looks off, the model is guided by the segmentation loss to fix it. By combining these two checks with the regular training loss from latent diffusion, our model learns to create scans that not only match the right contrast phase but also keep the anatomy accurate. We trained our model using 66,212 CT scans (2014-2025), collected from four hospitals and research centers. Of these, 60,000 scans were used to train the phase classification model, and the other 6,212 scans were used to train the scan synthesis and segmentation model. Performance was evaluated on 2,000 phase CT scans and we computed the Dice Similarity Coefficient (DSC) and correlation of Hounsfield Unit (HU) distributions between organ segmentations derived from reconstructed and real scans.

RESULTS

Across the CT scans for evaluation, the mean DSC score across seven key abdominal structures (aorta, kidneys, liver, lungs, pancreas, stomachs, spleen) is 0.827. For the same evaluation set, the mean Hounsfield Unit (HU) correlation between the generated and real CT scans is 0.91 across the seven key abdominal structures.

CONCLUSION

The contrast-phase translation model generates realistic CT scans with accurate organ structures, supporting its potential as an assistive tool to improve multi-phase imaging and clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

The translator has the ability to reduce patient radiation exposure by enabling contrast-phase image translation without the need for contrast agent injection. Trained on large-scale, multi-institutional datasets, the model also enhances CT resolution, supporting the development of standardized, high-quality CT datasets for research.

W6-STCE1-2 FREE-RUNNING MRI: NOVEL MACHINE LEARNING APPROACH TOWARDS IMPROVING ACCESS TO CARDIAC DIFFUSION TENSOR IMAGING

Moses Cook, PhD (*Presenter*)
David Han (*Abstract Co-Author*)
Danielle Kara (*Abstract Co-Author*)
DINGHENG MAI (*Abstract Co-Author*)
Neel Vora, MBBS (*Abstract Co-Author*)
Pasquale Santangeli (*Abstract Co-Author*)
Yuchi Liu (*Abstract Co-Author*)
Deborah H. Kwon, MD (*Abstract Co-Author*)
Christopher Nguyen, PhD (*Abstract Co-Author*)
Michael A. Bolen, MD (*Abstract Co-Author*)

PURPOSE

Cardiac diffusion tensor imaging (cDTI) can quantify tissue microstructure, such as cardiac tissue anisotropy and the heart's 3D double helix structure which are often perturbed in patients with heart disease. However, cDTI is logistically complicated to set up, which has limited efforts towards clinical translation. cDTI requires electrocardiogram (ECG) triggering, which is unreliable in patients with atrial fibrillation. It also requires breath holds, which are difficult for heart failure (HF) patients. Inconsistent breath holds and ECG data may cause image artifacts and spurious results. Thus, there is a need for a free-breathing, non-triggered (ungated) cDTI technique to improve comfort and expand access to tissue microstructure characterization to patients with arrhythmias.

METHODS AND MATERIALS

Reference cDTI images were scanned using the following parameters: TR/TE = 6000/67 ms; b-value = 500 s/mm 2 ; diffusion directions = 12; diffusion-weighted image (DWI) averages = 8, resolution = 2.7x2.7x8 mm 3 ; slices = 12. An ungated cDTI sequence was adapted from the reference standard (21 min), except TR = 2700 while scanning continuously (30 min). Four healthy volunteers (age 23 ± 1.225, 3 males) were prospectively scanned under an IRB approved protocol on a 3T (MAGNETOM Cima.X, Siemens Healthineers, Forchheim, Germany). Additionally, images were acquired in one patient with cardiac amyloidosis and another with atrial fibrillation to assess clinical ungated cDTI feasibility.. Each volunteer underwent the ECG-gated (gated) cDTI protocol followed by the ungated cDTI protocol. The ungated cDTI images were segmented by a U-Net model to mitigate cardiac motion. These images were used to compute the mean diffusivity (MD), fractional anisotropy (FA), and helix angle (HA). Average values were compared to those from the reference gated cDTI protocol.

RESULTS

After training, the U-Net model achieved a Dice score of 0.85 on a test set of images that were kept separate from the training set. Images for which the model created masks generally had good quality DT parameter maps. A Wilcoxon signed-rank test demonstrated no significant differences between MD (p=0.62) nor FA (p=0.25). Bland-Altman analysis showed a positive bias of 0.06 x 10 -3 mm 2 /s for MD and a positive bias of 0.03 for FA.

CONCLUSION

Herein, the feasibility of an ungated cDTI protocol is presented. Future optimization of the deep-learning model and thresholding algorithm will help improve scan time and image quality for clinical applications.

CLINICAL RELEVANCE/APPLICATION

Past literature has shown that cDTI is not only sensitive to microstructural pathology, but is also predictive of arrhythmogenic risk. Hence, a reliable method to acquire cDTI in an underserved patient population may enable risk stratification.

W6-STCE1-3 FEASIBILITY OF ULTRA-LOW FIELD MRI IN AN ALZHEIMER'S DISEASE CLINIC: BASELINE AND MONITORING MRIS DURING ANTI-AMYLOID IMMUNOTHERAPY

Hiba Alkelani, MD (*Presenter*)
Kavon Sharifi (*Abstract Co-Author*)
Hope Shimony (*Abstract Co-Author*)
Jessica Hu (*Abstract Co-Author*)
Sydney Nagy (*Abstract Co-Author*)
Sarah Keefe (*Abstract Co-Author*)
Shaney Flores, BS (*Abstract Co-Author*)
Jude-Patrick Okafor (*Abstract Co-Author*)
Nelly Joseph-Mathurin (*Abstract Co-Author*)
Jessica Banks (*Abstract Co-Author*)
Stephen Jarman (*Abstract Co-Author*)
Edmond A. Knopp, MD (*Abstract Co-Author*)
Madeline Paczynski (*Abstract Co-Author*)
Alexandra Venuto (*Abstract Co-Author*)
Maria R. Ponisio, MD (*Abstract Co-Author*)
Nupur Ghoshal (*Abstract Co-Author*)
Barbara Joy Snider (*Abstract Co-Author*)
Tammie S. Benzinger, MD, PhD (*Abstract Co-Author*)

PURPOSE

Anti-amyloid immunotherapies (AATs) for Alzheimer disease (AD) offer new hope for patients and families. AATs require MRI scans for eligibility assessment and monitoring occurrences of amyloid-related imaging abnormalities (ARIA), including cerebral edema (ARIA-E) and microhemorrhages (ARIA-H). 3800 MRI exams for 300 WashU patients on AAT from10/2023-5/2025 created significant strain on an overburdened medical system. We aim to assess the feasibility of ultra-low field MRI technology in AD therapy clinics.

METHODS AND MATERIALS

Ultra-low field MRI using a Hyperfine Swoop® MRI and clinical MRI were obtained for 35 AD patients undergoing AAT. Monitoring scans, both low-field and clinical, were assessed by a neuroradiologist for ARIA-E. Five patients were excluded from volumetric analysis due to image processing issues. Intra-class correlations (ICCs) assessed agreement from baseline clinical MRI and the first acquired low-field MRI. Whole brain, ventricles, hippocampus, and white matter hyperintensities (WMH) volumetrics were derived from FreeSurfer-7 for clinical and WMH-SynthSeg for low-field MRI. WMH lesion maps from WMH-SynthSeg were cross-referenced with clinical scans.

RESULTS

23% (8/35) of patients had mild or moderate ARIA-E on the clinical MRI (Figure 1). Across monitoring visits assessed, 11 ARIA-E cases (7 mild and 4 moderate) were detected by readers on both low-field and clinical MRI (100% sensitivity). A patient with notable ARIA-H siderosis (Figure 2) was incidentally identified from the low-field MRI. An incidental subdural hematoma was also detected from low-field MRI and confirmed by clinical MRI. Volumetric measures showed moderate to good absolute agreement between low-field and clinical MRI for whole brain (ICC: 0.62, $p<0.01$), hippocampus (ICC: 0.68, $p<0.01$), and ventricles (ICC: 0.75, $p=0.06$; Figure 3). WMH volumes were more variable for both those with (ICC: 0.37, $p=0.09$) and without (ICC: 0.44, $p=0.08$) ARIA-E. WMH lesion maps partially aligned with known ARIA-E but did not capture the full extent.

CONCLUSION

Ultra-low field MRI identified ARIA-E in all 11 cases, suggesting a potential role in monitoring asymptomatic patients during therapy. Ultra-low field MRI can be clinically useful for measures of brain atrophy and WMH, suggesting a potential role in screening patients for eligibility (i.e. restricting unnecessary additional 3T assessment).

CLINICAL RELEVANCE/APPLICATION

Evaluating AD and AAT eligibility requires assessment of brain atrophy, chronic small and large infarcts, WMHs, microhemorrhages and siderosis. Within these boundaries, ultra-low field MRI could provide an important extension of MR resources and treatment possibilities in under-resourced and/or over-taxed healthcare settings.

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W6-STCE2

Science Session (Imaging-Guided Oncologic Therapies: From Histotripsy to Theranostics and Beyond)

Wednesday, Dec. 3 2:15PM - 2:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

W6-STCE2-1 THE NEW ERA OF NON-INVASIVE TREATMENT FOR FOCAL LIVER TUMOURS WITH HISTOTRIPSY - EARLY RESULTS AND EXPERIENCE FROM ASIA

Neeraj R. Mahboobani, MBBS, FRCR (*Presenter*)
Lok Hei Patricia Chan (*Abstract Co-Author*)
Kam Ho V. Lee, MBBS (*Abstract Co-Author*)
SIU CHUN TSAI (*Abstract Co-Author*)
James F. Griffith, MD (*Abstract Co-Author*)

PURPOSE

Histotripsy is a revolutionary non-invasive technology which uses high intensity pulsed ultrasound waves to mechanically destroy targeted tissue whilst sparing surrounding tissues and structures. We report results and experience from one of the first sites in Asia using this new revolutionary technology to treat focal liver lesions.

METHODS AND MATERIALS

Thirteen patients (8 males, 5 females) with mean age of 69.3 years (range 52 to 82 years) had 15 focal liver lesions treated with histotripsy between April and July 2025. All treatment procedures were done under general anaesthesia. Clinical parameters, laboratory test results and imaging were reviewed.

RESULTS

Eleven hepatocellular carcinomas and four liver metastases were treated. Mean size of the lesions was 2.2 cm (range 0.9 to 4.0 cm). Locations of the lesions were as follows: Segment I (1) ; Segment II (1) ; Segment III (3); Segment IVa (2); Segment IVb (3); Segment V (3); Segment VI (1); Segment VIII (1). One of the lesions was adjacent to the gallbladder, one of the lesions was adjacent to a large cyst, and one of the lesions was adjacent to the portal vein. Fourteen lesions were successfully treated as evident by liquefaction on post-treatment day 1 MRI, with technical success rate 93.3%. One small lesion in segment I showed no evidence of treatment related changes on post-treatment day 1 MRI. There were no major post-procedure complications. Minor post-procedure complications included transient derangement of liver function (8 patients), mild ascites (5), mild chest or abdominal wall oedema (4), and mild right pleural effusion (3). All minor complications subsequently resolved. Eight patients have had post-treatment 1 month MRI, out of which 4 have also had post-treatment 3 month MRI. These show progressive shrinkage of the liquefied treatment volume with no evidence of recurrence.

CONCLUSION

Histotripsy is an effective non-invasive treatment choice for focal liver lesions which can be clearly visualised on ultrasound. It is suitable for lesions which are in close proximity to other structures such as the gallbladder or intrahepatic vasculature. Patient and lesion selection, patient positioning and ventilation strategies during general anaesthesia to reduce respiratory excursion of the liver are important factors for successful treatment.

CLINICAL RELEVANCE/APPLICATION

Histotripsy introduces a paradigm shift and a new era in the treatment of focal liver lesions. Its non-invasive nature renders it a preferred treatment option by patients, and its mechanical nature of tumour destruction renders it as a suitable treatment choice for lesions which are situated close to other structures such as bowel, gallbladder and even intrahepatic vessels as it is not susceptible to heat sink effect.

W6-STCE2-2 TARGETING CD206-POSITIVE TUMOR-ASSOCIATED MACROPHAGES IN GLIOMA BY MOLECULAR MRI

Cuihua Wang, PhD (*Presenter*)
Negin Jalali Motlagh, MD (*Abstract Co-Author*)
Gregory R. Wojtkiewicz, MSc (*Abstract Co-Author*)
John W. Chen, MD, PhD (*Abstract Co-Author*)

PURPOSE

Macrophages play a pivotal role in innate immunity, and targeting specific macrophage subtypes has emerged as a promising immunotherapeutic strategy, particularly in cancer. As such, non-invasive imaging techniques capable of specifically targeting macrophage subpopulations are greatly needed. The mannose receptor (CD206) is a well-established surface marker predominantly expressed on anti-inflammatory macrophages. CD206-positive tumor-associated macrophages (TAMs) promote tumor progression and suppress immune responses. In this study, we aimed to perform a proof-of-concept study to validate an MRI probe that can detect CD206 + TAMs in a glioma model.

METHODS AND MATERIALS

The CD206-sensing MRI agent (MRSP-Gd) was synthesized and purified by HPLC. All animal experiments were approved by and in compliance with the Institutional Animal Care and Use Committee. 8 to10-week-old of C57BL/6J mice (CD206 +/+ , n=3) and mice treated with D-mannose 30 min before MRSP-Gd administration (n=3), heterozygous (CD206 +/- , n=4), and CD206 knock-out (CD206 -/- , n=3) mice (Jackson Laboratories) with glioma induced by intracranial injection of CT-2A cells were used to validate the specificity and efficacy of MRSP-Gd. We performed MR imaging with serial T1-weighted imaging both before and at five time points after iv injection of 0.3 mmol/kg of MRSP-Gd on a 4.7-T small animal MR scanner (Bruker, MA) in the third week.

RESULTS

MRSP-Gd imaging demonstrated that enhanced signal mainly surrounded the tumor area with a few foci within the tumor at 60 min, and contrast-to-noise ratios (CNRs) of the wildtype mice were over two times higher compared to CD206-knockout mice after 45 mins, revealing the presence of CD206 + TAMs in the tumor microenvironment and the specificity of MRSP-Gd to CD206 + TAMs. We observed significantly decreased CNRs at 60 min in heterozygous mice (*, p=0.037), and wild-type mice treated with D-mannose 30 mins before agent administration (**, p=0.007), with CD206-knockout mice demonstrating minimal enhanced signal (**, p=0.002) compared to that in wildtype mice with glioma, confirming the efficacy of MRSP-Gd imaging in tracking CD206 + TAMs.

CONCLUSION

We demonstrated that CD206-targeted MR imaging can specifically report CD206 + TAMs and track TAMs changes in experimental glioma with specificity and efficacy.

CLINICAL RELEVANCE/APPLICATION

MSRP-Gd imaging could provide a valuable tool to noninvasively image and track healing and disease evolution, and to monitor macrophage-targeted therapeutic responses in experimental studies and in patients. Importantly, the specific binding motif of the MRI agent could be incorporated to provide highly specific delivery of therapeutic drugs (e.g., radionuclidic therapies) for theranostic strategy in cancer treatment.

W6-STCE2-3 MOLECULAR PROFILING OF HEPATOCELLULAR CARCINOMA WITH CONTRAST-ULTRASOUND USING A NOVEL ANTIBODY-CONJUGATED MICROBUBBLE VIA LIGHT-ACTIVATED SITE-SPECIFIC CHEMISTRY

Yonghwan Shin (*Presenter*)
James Z. Hui, MD, PhD (*Abstract Co-Author*)
Janet Pham (*Abstract Co-Author*)
Po-Chun Chen (*Abstract Co-Author*)
Aravinth Ruppa (*Abstract Co-Author*)
Veronica Hankil (*Abstract Co-Author*)
Jason Chiang, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a microbubble-based contrast agent using light-activated site-specific conjugation (LASIC) for targeted molecular ultrasound imaging of glypican-3 (GPC3) positive hepatocellular carcinoma (HCC).

METHODS AND MATERIALS

Microbubbles were conjugated with anti-GPC3 antibody using oYo-Link DBCO chemistry, which enables site-specific labeling of the antibody heavy chain with up to two DBCO groups per antibody by employing a LASIC-based approach that ensures site-specific conjugation without compromising antigen affinity. GPC3 expression levels in HCC cell lines (SNU423, SNU449, and HepG2) were confirmed by Western blotting. Binding specificity was validated by pre-blocking with free anti-GPC3 antibodies in the HCC cell lines. Fluorescence microscopy and quantitative image analysis were used to assess cell-binding efficiency. For in vivo analysis, conjugated microbubbles were intravenously injected into mice bearing orthotopic HepG2 xenografts, and contrast-enhanced ultrasound (CEUS) imaging was performed at multiple time points post-injection (0 sec, 30 sec, 10 min) to evaluate tumor signal enhancement and persistence.

RESULTS

LASIC-based chemistry enabled stable and homogeneous antibody attachment to microbubbles. In vitro assays showed significantly increased binding of targeted microbubbles to GPC3-positive cells compared to antigen blocked control groups (85% vs 2%; p=0.001). In vivo CEUS imaging revealed enhanced tumor-specific signal within 30 seconds post-injection, which persisted up to 10 minutes, confirming specific and sustained tumor targeting. Compared to the targeted group, the control group showed a noticeable decrease in signal intensity beginning at 30 seconds post-injection.

CONCLUSION

Conjugation of anti-GPC3 microbubbles enable efficient, specific, and durable binding to GPC3-expressing HCC in vitro and in vivo. This approach allows for real-time, image-guided molecular profiling using CEUS, paving the way for precision imaging and potential theranostic integration in liver cancer management.

CLINICAL RELEVANCE/APPLICATION

This feasibility study demonstrates a clinically translatable imaging strategy using antibody-conjugated microbubbles for non-invasive, molecular characterization of HCC. LASIC-based chemistry allows for uniquely gentle attachment of off-the-shelf antibodies to microbubbles, and can potentially facilitate translation of targeted CEUS agents in molecular profiling of HCC.

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W7-SSBR09

Breast Imaging (Treatment Monitoring)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: S406A

Beatriz E. Adrada, MD (*Moderator*)
Lars J. Grimm, MD (*Moderator*)

Sub-Events

W7-SSBR09-1 ON-TREATMENT DCE-MRI TUMOR VOLUME REDUCTION (TVR) PREDICTS RESPONSE TO NEOADJUVANT IMMUNOCHEMOTHERAPY (NICT) IN PATIENTS WITH TRIPLE NEGATIVE BREAST CANCER (TNBC)

Gaiane M. Rauch, MD, PhD (*Presenter*)
Clinton Yam (*Abstract Co-Author*)
Tanya W. Moseley, MD, PhD (*Abstract Co-Author*)
Mary S. Guirguis, MD (*Abstract Co-Author*)
Miral M. Patel, MD (*Abstract Co-Author*)
Jessica W. Leung, MD (*Abstract Co-Author*)
Xiaofei Huo, MD (*Abstract Co-Author*)
Gary J. Whitman, MD (*Abstract Co-Author*)
H. Carisa Le-Petross, MD, FRCPC (*Abstract Co-Author*)
Rosalind P. Candelaria, MD (*Abstract Co-Author*)
Deanna L. Lane, MD (*Abstract Co-Author*)
Wei T. Yang, MD, FRCR (*Abstract Co-Author*)
Jia Sun (*Abstract Co-Author*)
Lei Huo, MD (*Abstract Co-Author*)
Debu Tripathy, MD (*Abstract Co-Author*)
Jennifer Litton (*Abstract Co-Author*)
Vicente Valero, MD (*Abstract Co-Author*)
Banu Arun (*Abstract Co-Author*)
Ken-Pin Hwang, PhD (*Abstract Co-Author*)
Peng Wei, PhD (*Abstract Co-Author*)
Jingfei Ma, PhD (*Abstract Co-Author*)
Beatriz E. Adrada, MD (*Abstract Co-Author*)

PURPOSE

TNBC are aggressive tumors usually treated with neoadjuvant therapy with variable response. The KEYNOTE-522 trial showed that in comparison with the conventional chemotherapy, NICT increased the rates of pathologic complete response (pCR), although with higher incidence of the adverse events, including death. There is unmet need in developing noninvasive imaging biomarkers that allow identification of responders versus nonresponders early during NICT. We aimed to evaluate if DCE-MRI tumor volume reduction (TVR) during treatment can predict which patients are likely to achieve pCR after NICT.

METHODS AND MATERIALS

A total of 161 stage I-III TNBC patients enrolled in an IRB approved prospective clinical trial (NCT02276433) who had DCE-MRI at baseline, at early treatment - after 2 cycles of NICT, and at mid-treatment - after 4 cycles of NICT, followed by surgery, were included in this analysis. Tumor volume was calculated using three-dimensional DCE-MRI measurements at each time point. Percent tumor volume reduction (TVR) from baseline to early and baseline to mid-treatment time points was calculated. Treatment response at surgery (pCR vs. non-pCR) was documented. Logistic regression was used to examine associations between covariates and pCR. Correlation between pCR and TVR was evaluated using ROC analysis.

RESULTS

Overall, 63% of the patients (102/161) achieved pCR. TVR was the only co-variate significantly associated with pCR in the univariate analysis ($p<0.001$) for both early and mid-treatment time points. Multivariate analysis showed that TVR and nodal status were significantly associated with pCR with $p<0.001$ and $p<0.039$, respectively, for early; and $p<0.001$ and $p<0.008$, respectively for mid-treatment time points. Early treatment DCE-MRI TVR = 60% predicted pCR, with AUC of 0.78 (95%CI 0.71-0.86, $p<0.001$), sensitivity 90%, specificity 53%, PPV 77%, and NPV 76%. Mid-treatment TVR = 90% was able to predict pCR with AUC of 0.78 (95%CI 0.70-0.86, $p<0.001$), sensitivity 79%, specificity 62%, PPV 78%, and NPV 63%.

CONCLUSION

Early and mid-treatment DCE-MRI TVRs were able predict pathologic response after completion of NICT with a similar AUC of 0.78. Early treatment TVR predicted pCR with higher sensitivity, while mid-treatment TVR demonstrated higher specificity for pCR prediction in TNBC treated with NICT.

CLINICAL RELEVANCE/APPLICATION

Longitudinal on-treatment DCE-MRI TVR may serve as a noninvasive imaging biomarker for response-adaptive decision-making during neoadjuvant therapy of patients with TNBC.

W7-SSBR09-2 PREDICTIVE VALUE OF VMRE AND IVIM-DWI ON THE EARLY EFFICACY OF NEOADJUVANT CHEMOTHERAPY FOR BREAST CANCER

Kejia Guo (*Presenter*)
Tingting Lin (*Abstract Co-Author*)

PURPOSE

To investigate the predictive value of virtual magnetic resonance elastography (vMRE) and intravoxel incoherent motion diffusion weighted imaging (IVIM-DWI) in assessing the early efficacy of neoadjuvant chemotherapy (NAC) for breast cancer.

METHODS AND MATERIALS

One hundred and eight patients with pathologically confirmed breast cancer were enrolled. Baseline vMRE and IVIM-DWI were performed in all participants before NAC. The parameters of vMRE (sADC, μ diff), IVIM-DWI (ADC, D, D*, f), MRI imaging features, and clinicopathological characteristics were collected. According to the Miller-Payne grading system, patients were divided into the pCR group and the non-pCR group. Above parameters were statistically compared between two groups. The optimal predictive parameters and predictive thresholds were determined by drawing receiver operating characteristic (ROC). The Hosmer-Lemeshow test was used to evaluate the calibration of the combined prediction model, while the differences in area under ROC curve (AUC) were compared using the DeLong test.

RESULTS

Twenty patients were assigned in the pCR group and eighty-eight patients in the non-pCR group. The sADC, ADC and D values in the pCR group were significantly higher than those in the non-pCR group (all $P < 0.05$), whereas the μ diff value was appreciably lower than that in the non-pCR group ($P < 0.001$). Multivariate Logistic regression analysis showed μ diff , D, and nipple retraction/skin retraction were independent predictive factors for pCR (all $P < 0.05$). The AUC of μ diff was the largest (AUC=0.810). The combined predictive efficacy of μ diff , D, and nipple retraction/skin retraction (AUC = 0.896, sensitivity and specificity were 85.00% and 86.36%, respectively) was higher than that of μ diff , D or nipple retraction/skin retraction alone.

CONCLUSION

Baseline parameters of vMRE and IVIM-DWI had certain early predictive value for the efficacy of NAC in breast cancer, among which the independent prediction performance of μ diff was the highest, and the combination of vMRE and IVIM-DWI could further improve the prediction performance.

CLINICAL RELEVANCE/APPLICATION

This preliminary study showed that baseline parameters of vMRE and IVIM-DWI had certain early predictive value for the efficacy of NAC in breast cancer,which may assist clinicians in adjusting therapy to avoid toxic adverse effects and to improve survival.

W7-SSBR09-3 A DEEP LEARNING MODEL BASED ON SPATIOTEMPORAL TUMOR HETEROGENEITY FOR EARLY PREDICTION OF PATHOLOGIC COMPLETE RESPONSE IN BREAST CANCER WITH DCE-MRI: A MULTICENTER STUDY

Yuyi Tan, BEng (*Presenter*)
Siyao Du (*Abstract Co-Author*)
Zhihui Shi (*Abstract Co-Author*)
Lina Zhang (*Abstract Co-Author*)
Zhenhui Li (*Abstract Co-Author*)
Zhenyu Liu (*Abstract Co-Author*)
Jie Tian, PhD (*Abstract Co-Author*)

PURPOSE

Predicting pathological complete response (pCR) can help identify patients suitable for continued treatment and promote personalized therapy. However, the intratumoral heterogeneity and the tumor change of pre-NAC and early-NAC pose significant challenges for pCR prediction. Therefore, this study aims to develop a deep learning model based on graph convolutional networks (GCN) to characterize spatiotemporal tumor heterogeneity, enabling more accurate predictions of pCR to neoadjuvant chemotherapy in breast cancer.

METHODS AND MATERIALS

This study retrospectively included breast cancer patients from three cohorts: a development cohort (n=1053) divided into training and internal testing sets, an external test cohort (n=213), and an ACRIN 6698 test cohort (n=204). The proposed spatiotemporal tumor heterogeneity (SITH) model allowed for the integration of whole tumor, microenvironment, and intratumoral heterogeneity information and captured dynamic change from longitudinal MR images using GCN. To ensure consistent habitat interpretations, we remapped habitats labels based on the mean features for each patient. Clinicopathological characteristics were added and integrated models were established (SITH-C). The performance was evaluated using the area under the receiver operating characteristic curve and other metrics.

RESULTS

The results demonstrated that SITH-C achieved optimal predictive performance in the training set (AUC=0.932, 95% CI: 0.910-0.952), the internal testing set (AUC=0.855, 95% CI: 0.772-0.928), the external testing set (AUC=0.850, 95% CI: 0.783-0.906), and the ACRIN 6698 testing set (AUC=0.710, 95% CI: 0.632-0.779), all of which were significantly higher than those of the clinical model (AUC: 0.706-0.800). Moreover, the SITH-C increased the positive predictive value from 71.4% to 87.5% compared with clinical model in the internal and external testing set, and maintained a high negative predictive value (73.6% to 80.2%).

CONCLUSION

This study developed a deep learning model capable of characterizing tumor spatiotemporal heterogeneity from DCE-MRI, demonstrating high accuracy and robustness in predicting pCR at the early stages of NAC in breast cancer patients.

CLINICAL RELEVANCE/APPLICATION

The proposed model serves as a non-invasive tool for predicting pCR to NAC in breast cancer patients, supporting personalized treatment decisions by suggesting alternative strategies for non-responders and complementary therapies for responders.

W7-SSBR09-6 ABBREVIATED MRI FOR EVALUATION OF TREATMENT RESPONSE IN PATIENTS UNDERGOING NEOADJUVANT CHEMOTHERAPY FOR BREAST CANCER

Roberto Lo Gullo, MD (*Presenter*)
Marie Surovitsky, DO (*Abstract Co-Author*)
Diane Y. Kim, MD (*Abstract Co-Author*)
Varadan Sevilimedu (*Abstract Co-Author*)
Kailyn Li, MD (*Abstract Co-Author*)
Katja Pinker-Domenig, MD, PhD (*Abstract Co-Author*)

PURPOSE

To determine whether an abbreviated MRI protocol can effectively monitor treatment response to NAC after an initial full-protocol staging MRI

METHODS AND MATERIALS

This retrospective, single-center study included 478 patients with 488 breast cancers who underwent standard-of-care MRI before and after NAC between January 2016 and May 2020, followed by surgical resection. Three dedicated breast radiologists interpreted the baseline staging MRIs using the full diagnostic protocol and compared it to an abbreviated MRI protocol. The abbreviated protocol consisted of an axial T2-weighted sequence and pre-contrast and early postcontrast T1-weighted sequences to assess treatment response. After a washout period of at least 4 weeks, the baseline standard of care MRIs were reinterpreted, and the results were compared to a full diagnostic protocol post-NAC to identify and measure enhancing lesions. The reference standard was the presence and size of residual tumor in the surgical specimen. Interpretation times were annotated for each read. Response was classified as complete, partial, stable, or progressive disease. Pathology defined pathologic complete response (pCR) as the absence of invasive cancer

RESULTS

Among the 488 lesions, 198 showed pCR. Interobserver agreement for abbreviated and full-protocol MRI ranged from 0.53 to 0.7. Intraobserver agreement ranged from 0.76 to 0.89. Comparison of abbreviated and full-protocol MRI revealed no significant differences in sensitivity ($p > 0.79$), positive predictive value ($p > 0.18$), negative predictive value ($p > 0.85$), and accuracy ($p > 0.22$). However, there was a significant difference in specificity (82.1% vs. 85.4%, $p = 0.05$). Average reading times ranged from 39-44 seconds for the abbreviated protocol to 42-64 seconds for the full protocol ($p < 0.001$). Both long and short axis lengths showed moderate correlation with pathological tumor size (range 0.53-0.70)

CONCLUSION

Abbreviated MRI compared to full-protocol MRI demonstrated similar intraobserver and interobserver agreement, with no significant difference in diagnostic performance aside from a small decrease in specificity, achieved with reduced interpretation and acquisition times. Both the full-protocol MRI and the abbreviated protocol MRI showed moderate correlation with tumor sizes measured on pathology

CLINICAL RELEVANCE/APPLICATION

Abbreviated protocols may facilitate use of MRI for post-NAC response assessment

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

W7-SSCA08

Cardiac Imaging (Risk Stratification and Outcomes)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E353C

Ming-Yen Ng, BMBS, FRCR (*Moderator*)
Ann-Christine Stahl, MD (*Moderator*)

Sub-Events

W7-SSCA08-1 PREDICTIVE VALUE OF AGE- AND GENDER-ADJUSTED CORONARY ARTERY PLAQUE VOLUME PERCENTILES ON CT FOR MAJOR ADVERSE CARDIOVASCULAR EVENTS

Ann-Christine Stahl, MD (*Presenter*)
Kenrick Schulze (*Abstract Co-Author*)
Pal Maurovich-Horvat, PhD (*Abstract Co-Author*)
Klaus Kofoed, MD (*Abstract Co-Author*)
Jonathan D. Dodd, MD (*Abstract Co-Author*)
Patrick Donnelly, MBBCH, MRCP (*Abstract Co-Author*)
Robin Bockelmann (*Abstract Co-Author*)
Anne-Marieke Stantien (*Abstract Co-Author*)
Bernhard Follmer (*Abstract Co-Author*)
Mahmoud Mohamed (*Abstract Co-Author*)
Federico Biavati (*Abstract Co-Author*)
Maria Bosserdt, PhD (*Abstract Co-Author*)
David E. Newby, PHD, MRCP (*Abstract Co-Author*)
Michelle C. Williams, MBChB, PhD (*Abstract Co-Author*)
Damini Dey, PhD (*Abstract Co-Author*)
Marc Dewey, MD (*Abstract Co-Author*)

PURPOSE

Coronary artery plaque volumes have been set to adjust individual treatment recommendations. Therefore, we aimed to assess the predictive value of coronary artery plaque volumes derived from computed tomography angiography (CTA) for major adverse cardiovascular events (MACE). We used the data of the European multicenter randomized Diagnostic Imaging Strategies for Patients With Stable Chest Pain and Intermediate Risk of Coronary Artery Disease (DISCHARGE) trial to determine age- and gender-adjusted percentiles.

METHODS AND MATERIALS

The multicenter DISCHARGE trial randomized patients with stable chest pain who had an intermediate pre-test probability of obstructive coronary artery disease (CAD) and were referred for invasive coronary angiography (ICA) at one of 26 European centers to CTA or ICA as an initial diagnostic imaging strategy. Coronary artery total plaque volumes (TPV) of the CTA group were measured and used to calculate age- and gender-adjusted percentiles. MACE was defined as in DISCHARGE as cardiovascular death, nonfatal myocardial infarction, or nonfatal stroke. Mann-Whitney U test was used to compare differences in TPV between women and men. Nomograms were plotted by fitting a 2 nd degree polynomial curve to the derived percentiles. Time-to-event data were analyzed using a Cox proportional hazards model to compare the hazard ratios (HR) of patients with coronary plaque and patients above the 70 th percentile of TPV to patients without any coronary plaque detected by CTA. The 70 th percentile was chosen based on visual assessment.

RESULTS

1643 patients (56.4% women, 60.2 years (± 10.2)) were included in the analysis of which 867 (52.8%) had coronary plaque. The mean coronary TPV was 123.9mm³ (± 271.1mm³) and increased with age by 57.3mm³ ± 3.9mm³ per 10 years. TPV was significantly higher in male patients than in female patients (177.4mm³ ± 311.6mm³ versus 82.5mm³ ± 226.5mm³; p<0.001). Patients with coronary plaque (n=32) were found to be at an elevated risk of MACE compared to patients without any coronary plaque (n=5; HR: 5.9, 95% CI: 2.29-15.09; p<0.001). Among patients with coronary plaque, MACE occurred in 23 patients with obstructive CAD. Risk was further increased for patients above the 70 th percentile of TPV (n=24; HR: 8.0, 95% CI: 3.1-21.0; p<0.001).

CONCLUSION

Age- and gender-adjusted percentiles of TPV have been shown to be predictive of MACE in patients with an intermediate risk of CAD. An increased risk for MACE was observed in patients exceeding the 70 th percentile.

CLINICAL RELEVANCE/APPLICATION

In patients with an intermediate likelihood of CAD, incorporating TPV distributions, particularly for those above the 70 th percentile, into clinical decision-making may help guide more personalized treatment strategies.

W7-SSCA08-2 SEX-SPECIFIC PROGNOSTIC VALUE OF QUANTIFYING CORONARY PLAQUE IN PATIENTS WITH STABLE CHEST PAIN

Jan M. Brendel, MD (*Presenter*)
Neha Pagidipati (*Abstract Co-Author*)
Thomas Mayrhofer (*Abstract Co-Author*)
Marton Kolossvary, MD, PhD (*Abstract Co-Author*)
Isabel Luisa Langenbach, MD (*Abstract Co-Author*)
Marcel C. Langenbach, MD (*Abstract Co-Author*)
Nora M. Kerkovits, MD (*Abstract Co-Author*)
Matthias Jung, MD (*Abstract Co-Author*)
Maros Ferencik, MD (*Abstract Co-Author*)
Michael T. Lu, MD, MPH (*Abstract Co-Author*)
Svati Shah (*Abstract Co-Author*)

Pamela Douglas (*Abstract Co-Author*)
Borek Foldyna, MD (*Abstract Co-Author*)

PURPOSE

Current cardiovascular (CV) risk assessment underestimates risk in women. Coronary CT angiography (CCTA) enables comprehensive plaque quantification, yet its sex-specific risk prognostic value remains unclear. We aimed to determine whether quantitative plaque assessment on CCTA improves sex-specific risk stratification in patients with stable chest pain.

METHODS AND MATERIALS

We analyzed patients from the PROMISE CCTA arm. A core lab quantified total plaque volume (PV, mm^3) and burden (PB, %), including calcified, noncalcified, and low-attenuation components. Sex-stratified multivariable Cox regression models assessed associations between plaque measures and major adverse cardiovascular events (MACE: death, myocardial infarction, or unstable angina) over a median follow-up of 26 months (IQR: 18-34). Models were adjusted for 10-year ASCVD risk, coronary artery calcium (CAC), obstructive stenosis (=50%), and high-risk plaque (HRP) features. The incremental value of plaque quantification was evaluated using area under the curve (AUC) analysis.

RESULTS

Among 4,267 patients, 2,199 (51.5%) were women (mean age 62.2±7.7 years). Compared to men, women had lower ASCVD scores, CAC, obstructive stenosis, and HRP prevalence, 72 mm^3 lower median PV, and 12% lower median PB (all P <0.001). MACE occurred in 2.8% (121 events). In women, total and noncalcified PB independently predicted MACE (aHR: 1.27; 95% CI: 1.08-1.50, P =0.004 and aHR: 1.29; 95% CI: 1.07-1.55, P =0.007). In men, these associations were not significant. Adding PB to traditional risk models improved MACE prediction in women (AUC 0.71 to 0.75, P =0.017) but not in men (AUC 0.77 to 0.76, P =0.272).

CONCLUSION

Quantitative plaque assessment on CCTA improves risk stratification beyond traditional clinical and imaging measures in women with stable chest pain but not in men.

CLINICAL RELEVANCE/APPLICATION

Plaque quantification can help identify high-risk women who might be missed by traditional models, allowing earlier diagnosis for tailored treatment.

W7-SSCA08-4 LEFT VENTRICULAR GLOBAL LONGITUDINAL STRAIN IMPROVES PROGNOSTICATION IN NON-DILATED LEFT VENTRICULAR CARDIOMYOPATHY

Mengdi Jiang, PhD (*Presenter*)
Minjie Minjie, PhD (*Abstract Co-Author*)

PURPOSE

Aim to investigate the association of cardiovascular magnetic resonance (CMR) feature-tracking-derived left ventricular global longitudinal strain (GLS) with outcome in a patient cohort with non-dilated left ventricular cardiomyopathy (NDLVC) and evaluated the possible incremental prognostic benefit beyond conventional parameters like left ventricular ejection fraction (LVEF) and late gadolinium enhancement (LGE).

METHODS AND MATERIALS

In this retrospective cohort study, 492 NDLVC patients (mean age 45 ± 16 years, 68% male) underwent CMR between 2016 and 2018. The primary endpoint was hard cardiac events, including cardiac mortality, heart transplantation and life-threatening ventricular arrhythmias.

RESULTS

A total of 492 patients with NDLVC (mean age 45 years ±16; 333 men [68%]) were included. Over a mean follow-up of 77 months, 43 patients (8.7%) experienced hard cardiac events. Left ventricular GLS independently predicted events after adjusting for LVEF, LGE, and clinical covariates (adjusted hazard ratio: 1.23 per 1%, 95% CI 1.09 to 1.39; p = 0.001). Adding GLS to a model with LVEF and LGE presence led to a significant improvement in model fit (chi-square increased by 17.5; p<0.001) and discrimination (C-statistic improved from 0.786 to 0.830; p=0.041). Notably, patients with LVEF=35% but abnormal GLS and LGE had comparable event rates to those with LVEF<35% (19.4% vs.11.4%, p=0.120).

CONCLUSION

Conclusion CMR-derived left ventricular GLS provides independent and incremental prognostic value over LVEF and LGE in NDLVC, identifying high-risk patients who may benefit from early intervention. These findings advocate integrating strain analysis into routine CMR evaluations for enhanced risk stratification.

CLINICAL RELEVANCE/APPLICATION

GLS is a robust, reproducible tool that refines risk prediction in NDLVC, enabling clinicians to transcend LVEF limitations and adopt evidence-based, personalized strategies for SCD prevention and heart failure management.

W7-SSCA08-5 RIGHT ATRIAL STRAIN FROM CMR TO PREDICT MORTALITY IN PULMONARY HYPERTENSION

Ghazal Zandieh, MD (*Presenter*)
Paul M. Hassoun, MD (*Abstract Co-Author*)
Stefan L. Zimmerman, MD (*Abstract Co-Author*)
Bharath Ambale-Venkatesh, PhD (*Abstract Co-Author*)

PURPOSE

We aimed to assess the prognostic relevance of RA and RV function parameters, including ejection fraction (EF) and strain, across patients with systemic sclerosis (SSc) with and without PAH, and those with idiopathic PAH (IPAH), using cardiac magnetic resonance (CMR) imaging.

METHODS AND MATERIALS

We retrospectively analyzed 87 patients followed at the Johns Hopkins Pulmonary Hypertension clinic between 2015-2023: systemic sclerosis without PAH (SSc-no PAH, n=17), SSc-associated PAH (SSc-PAH, n=47), and idiopathic PAH (IPAH, n=22). All underwent cardiac MRI with cine feature-tracking to derive right atrial strain (RA-strain), right ventricular free-wall strain (RV-strain), and RA/RV ejection fractions. Right heart catheterization measured mean pulmonary artery pressure (mPAP) and pulmonary vascular resistance (PVR); pulmonary function testing provided DLCO %-predicted; and labs included log-transformed BNP/NT-proBNP. Survival time was defined from MRI to death or last follow-up (median 52 months; 14 deaths). Continuous variables were z-standardized. A combined L1-penalized Cox model (penalizer=0.01, l1-ratio=1) was fitted with diagnosis group as indicator covariates to adjust (not stratify) for subgroup effects; Harrell's C-index assessed model discrimination.

RESULTS

In the combined L1-penalized Cox model that adjusted for diagnosis group, three variables were independently retained. A lower CMR-derived right-atrial reservoir strain remained the strongest predictor of all-cause mortality (HR 0.40 per SD decrease; 95 % CI 0.16-0.97; p = 0.04), followed by a higher mean pulmonary-artery pressure (HR 3.52; 95 % CI 1.28-9.69; p = 0.02) and a lower DLCO %-predicted that showed trend towards association (HR 0.30; 95 % CI 0.08-1.06; p = 0.06). The combined model achieved a Harrell's C-index of 0.83. After penalization, RA and RV ejection fractions, RV free-wall strain, log-pro-BNP and the diagnosis indicators themselves did not add independent prognostic value. RA reservoir strain was inversely related to invasive load (? = -0.23 with PVR, p = 0.04; ? = -0.21 with mPAP, p = 0.07). Conversely, worse RV free-wall strain and lower RVEF correlated with higher mPAP and PVR (|?| ˜ 0.35-0.40, all p = 0.001).

CONCLUSION

Feature-tracking RA strain measured on routine cine CMR predicts mortality in systemic sclerosis-associated and idiopathic PAH.

CLINICAL RELEVANCE/APPLICATION

Incorporating RA strain into standard CMR assessments could enhance risk stratification and guide clinical decision-making in PAH populations. Furthermore, impaired RA mechanics captured by feature-tracking CMR reflects underlying hemodynamic burden across diagnoses.

W7-SSCA08-6 SMOKING IS RELATED TO INCREASED PERICONARY INFLAMMATION ON CT AND INCREASED MORTALITY IN ASYMPTOMATIC INDIVIDUALS: A MULTI-COHORT STUDY

Nora M. Kerkovits, MD (*Presenter*)
Ibrahim Hadzic, MSc (*Abstract Co-Author*)
Thomas Mayrhofer (*Abstract Co-Author*)
Jan M. Brendel, MD (*Abstract Co-Author*)
Leonard Nuernberg, MSc, BSc (*Abstract Co-Author*)
Hugo Aerts, PhD (*Abstract Co-Author*)
Vineet K. Raghu, PhD (*Abstract Co-Author*)
Maros Ferencik, MD (*Abstract Co-Author*)
Michael T. Lu, MD, MPH (*Abstract Co-Author*)
Borek Foldyna, MD (*Abstract Co-Author*)

PURPOSE

Smoking is a major reversible risk factor for mortality and has been shown to induce systemic inflammation. Pericoronary adipose tissue (PCAT) density is a marker of coronary artery inflammation, linked to coronary artery disease and adverse events. We aimed to evaluate the association between CT-derived PCAT density and smoking, and to explore their interplay in relation to all-cause mortality.

METHODS AND MATERIALS

PCAT density of current and past smokers enrolled in the National Lung Screening Trial was compared to nonsmoking controls matched 1:1 for age, sex, hypertension and diabetes from the Framingham Heart Study. PCAT was segmented and quantified using a validated deep learning segmentation algorithm on non-contrast CT scans. Multivariable linear and survival regression analyses, along with causal mediation analysis, were conducted to assess the association between PCAT density, ever-smoking, and all-cause mortality. Analyses were adjusted for technical CT parameters (image noise, kVp), traditional cardiovascular (CV) risk factors, and coronary artery calcium (CAC) score.

RESULTS

The study included a total of 2,362 participants (age 62±6 years, 54.4% female, 23% current and 27% former smokers). Current and former smokers, vs nonsmokers, had significantly higher PCAT density (-76.7 ± 5.9 HU vs -77.5±5.9 vs -80.9 ± 5.7, respectively, $p<0.001$). Ever-smoking was independently associated with higher PCAT density (adjusted ß 4.59, 95% CI 4.23-4.93, $p<0.001$). Ever-smoking and PCAT density were independent predictors of all-cause mortality (aHR 1.94, 95% CI 1.44-2.63, $p<0.001$ and aHR 1.98 /10 HU change, 95% CI 1.44-2.73, $p<0.001$). Smokers with PCAT density above the median (-79.3 HU) had higher mortality risk when compared to smokers below the median (aHR 1.57, 95% CI 1.13-2.19, $p=0.007$), and over three times the risk of nonsmokers with lower PCAT density (aHR 3.13, 95% CI 2.18-4.50, $p<0.001$). No significant difference in outcomes was observed between nonsmokers with PCAT density above vs. below the median ($p=0.6$). Mediation analysis indicated that 25% (indirect effect: OR 1.26, $p=0.001$) of the effect of ever smoking on all-cause mortality was mediated by PCAT density with the direct effect being OR 3.02, $p<0.001$.

CONCLUSION

Smoking is associated with increased PCAT density in both former and current smokers compared to nonsmokers. PCAT density is an independent predictor of all-cause death among smokers, but not nonsmokers, and is a mediator in the relationship between smoking and mortality.

CLINICAL RELEVANCE/APPLICATION

Among ever-smokers, CT-derived PCAT density quantification may aid in risk stratification.

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

W7-SSCH07

Chest Imaging (Nodules)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: S501

Emily B. Tsai, MD (*Moderator*)
Lacey McIntosh, DO, MPH (*Moderator*)

Sub-Events

W7-SSCH07-2 EXTERNAL TEST OF A DEEP LEARNING MODEL INCORPORATING PRIOR IMAGING FOR RISK STRATIFICATION OF PERSISTENT PULMONARY NODULES ON FOLLOW-UP CT

Noa Antonissen, MD (*Presenter*)
Renate Dinnessen (*Abstract Co-Author*)
Dre Peeters (*Abstract Co-Author*)
Ernst T. Scholten, MD,PhD (*Abstract Co-Author*)
Firdaus Mohamed Hoesein, MD, PhD (*Abstract Co-Author*)
Rozemarijn Vliegenthart, MD, PhD (*Abstract Co-Author*)
Hester Gietema, MD (*Abstract Co-Author*)
Cornelia M. Schaefer-Prokop, MD (*Abstract Co-Author*)
Mathias Prokop, MD, PhD (*Abstract Co-Author*)
Colin Jacobs, PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to externally test a deep learning model (DL-Dual) developed to estimate the 3-year malignancy risk of persistent pulmonary nodules using both current and prior low-dose CT (LDCT) scans. Its performance was compared to that of a single-time-point model (DL-Single) and the Lung-RADS guideline across short-term and annual follow-up intervals.

METHODS AND MATERIALS

We analyzed 6,350 paired LDCT scans from the Dutch-Belgian NELSON lung cancer screening trial. Two DL models were evaluated: DL-Dual, trained on annual/biennial CT scan pairs from the NLST cohort, and DL-Single, trained on individual NLST scans. Persistent pulmonary nodules (=3 mm) were identified at two follow-up intervals: (1) baseline to short-term follow-up (2,541 nodule pairs; 68 malignant; median interval: 91 days), and (2) baseline to first annual incidence round (3,809 nodule pairs; 76 malignant; median interval: 370 days). At nodule level, malignancy risk scores were computed using DL-Dual (prior + current CT) and DL-Single (only current CT), and Lung-RADS categories were assigned using published growth-based criteria. Performance was measured using area under the ROC curve (AUC) and specificity at sensitivity matching Lung-RADS category 3.

RESULTS

On short-term follow-up, DL-Single (AUC 0.95, 95% CI: 0.94-0.97) significantly outperformed DL-Dual (AUC 0.93, 95% CI: 0.90-0.96; $p < 0.05$). On annual follow-up, DL-Single (AUC 0.95, 95% CI: 0.93-0.97) and DL-Dual (AUC 0.96, 95% CI: 0.94-0.98; $p = 0.16$) performed similarly. Both DL models significantly outperformed Lung-RADS in both short-term (AUC 0.80, 95% CI: 0.74-0.86) and annual follow-up (AUC 0.82, 95% CI: 0.77-0.88), all $p < 0.05$. At matched sensitivity (Lung-RADS category 3), specificities were 95.8% (DL-Dual), 96.2% (DL-Single), and 87.7% (Lung-RADS) on short-term scans, and 97.8%, 96.4%, and 90.6%, respectively, on annual scans.

CONCLUSION

DL-Dual demonstrated robust overall discriminatory performance, however, DL-Single performed comparably at annual screening and outperformed DL-Dual at short-term follow-up. Both models significantly outperformed Lung-RADS, achieving higher specificity at matched sensitivity, highlighting superior accuracy of AI-based approaches over a growth-based guideline in estimating malignancy risk. Further research is needed to assess DL-Dual's performance in scenarios that may better align with its intended use, such as newly detected nodules, extended follow-up intervals, and non-baseline screening rounds.

CLINICAL RELEVANCE/APPLICATION

DL-based malignancy risk models could improve management of persistent pulmonary nodules and reduce false positives compared to diameter- or volume-based protocols like Lung-RADS.

W7-SSCH07-3 RETHINKING LUNG CANCER SCREENING: LONGITUDINAL AI/ML DIAGNOSTICS BEYOND NODULE SIZE GROWTH

Sylvain Bodard (*Presenter*)
Pierre Baudot, PhD (*Abstract Co-Author*)
Benjamin Renoust (*Abstract Co-Author*)
Charels Voyton, PhD (*Abstract Co-Author*)
Gwendoline De Bie (*Abstract Co-Author*)
Ezequiel Geremia (*Abstract Co-Author*)
Van Khoa LE (*Abstract Co-Author*)
Danny Francis (*Abstract Co-Author*)
Pierre-Henri Siot (*Abstract Co-Author*)
Yousra Haddou (*Abstract Co-Author*)
Bourdes Valerie (*Abstract Co-Author*)
Benoit Huet, PhD (*Abstract Co-Author*)

PURPOSE

Early detection of pulmonary nodules is essential for timely lung cancer diagnosis and treatment. Yet, conventional risk stratification relies heavily on nodule size and growth[1]—particularly diameter changes (e.g., Lung-RADS) or Volume Doubling Time (VDT) and its Reciprocal (RDT)— limiting early detection. This study compares the

performance of an AI/ML-based CADe/CADx device against traditional growth metrics, time-dependent malignancy scoring (Lung-RADS), and expert radiologists' assessment for earlier, more accurate lung cancer detection.

METHODS AND MATERIALS

The AI model was trained on 10,872 patients from NLST and LIDC datasets[2]. Ground-truth was defined as =6 years of stability for benign nodules and histopathology for malignancy. Evaluation used an NLST test cohort with two low-dose CT scans: T -2 (12-24 months before diagnosis) and T -1 (0-12 months) (n=2,080; 74 cancers). A subset (n=419; 74 cancers) was assessed by 4 thoracic radiologists; another (n=282) was evaluated using Lung-RADS by 6 radiologists with prior scan evolution[3]. All nodules were localized, measured, and paired longitudinally by experts. The model's prediction evolution uses D'Arcy Thompson's growth function: P?1/(P?1-P?2) n .

RESULTS

The evolution of AI predictions (ROC-AUC=0.989) and predictions at T -1 (ROC-AUC=0.992) outperformed all growth metrics (?volume, ?diameter, RDT; p<0.0001). RDT performed worst (ROC-AUC=0.924); ?volume slightly outperformed ?diameter (ROC-AUC=0.969). Compared to Lung-RADS with prior evolution, the model showed higher performance (ROC-AUC=0.967 vs. 0.893, p<0.0001). On NLST using the NELSON protocol, our model achieved ROC-AUC=0.954 on indeterminate NODCATIII nodules, improving sensitivity by 11.9% and specificity by 7.4% over VDT-based criteria. On slow-growing and indeterminate nodules (GROWCAT A+B, VDT=400 days), the model at T -2 outperformed radiologists at T -1 (ROC-AUC=0.908 vs. 0.861, p<0.0001).

CONCLUSION

The AI model consistently outperforms conventional growth metrics, including VDT, and time-dependent Lung-RADS assessments, enabling earlier, more accurate malignancy prediction. These findings challenge the current paradigm positioning VDT as a primary malignancy indicator[1]. On slow-growing, indeterminate nodules, our model's T -2 AUC surpasses radiologist diagnosis at T -1 —offering a potential 1-year lead time for treatment.

CLINICAL RELEVANCE/APPLICATION

This AI malignancy risk model could enhance lung cancer screening by identifying malignant nodules earlier and more accurately, enabling timely clinical decision-making, potentially improving patient outcomes through earlier treatment. 1.Yankelevitz Eur.J.Cancer(2025) 2._,RSNA(2024),1527 3.Ardila.Nat.Medicine(2019)

W7-SSCH07-4 A MULTICENTER EXTERNAL VALIDATION OF LUNG-PNET: CLASSIFICATION OF PURE GROUND-GLASS NODULES INTO INVASIVE ADENOCARCINOMA AND NON-INVASIVE SUBTYPES ON CHEST CT IMAGES

Kexin Wang (*Presenter*)
Xiaodong Zhang, MD, PhD (*Abstract Co-Author*)

PURPOSE

To externally validate a pre-trained artificial intelligence (AI) model (Lung-PNet) for differentiating invasive adenocarcinoma (IAC) from non-invasive subtypes (non-IAC) in pure ground-glass nodules (pGGNs) using multicenter chest CT data.

METHODS AND MATERIALS

Chest CT images of resected pGGNs (n = 720; IAC = 143, non-IAC = 577) from seven hospitals were retrospectively analyzed. The dataset was stratified into a local cohort (four hospitals, n = 334) and a national cohort (three hospitals, n = 386). Using the local cohort, receiver operating characteristic (ROC) curve analysis determined a Youden's index-optimized cutoff threshold for binary classification, which was then validated in the national cohort. Model performance was evaluated using the area under the ROC curve (AUC-ROC). Factors influencing AI diagnostic accuracy were analyzed via random forest and mixed-effects logistic regression??.

RESULTS

Lung-PNet achieved an overall AUC-ROC of 0.800 (95% CI: 0.760-0.839), with comparable performance between the local (0.801, 95% CI: 0.740-0.861) and national (0.832, 95% CI: 0.782-0.881) cohorts (P = 0.438, DeLong test). The negative predictive value (NPV) was 0.930 (95% CI: 0.903-0.952), though hospital-specific NPVs varied (0.700-1.000). Key factors influencing the AI model's accuracy included pGGN type, lesion volume, pixel spacing, and hospital, with hospital modeled as a random effect and pGGN type interacting with lesion volume and pixel spacing as fixed effects.

CONCLUSION

This multicenter validation confirms Lung-PNet's generalizability for distinguishing invasive adenocarcinoma (IAC) from non-invasive subtypes (non-IAC) in pure ground-glass nodules (pGGNs). Its high negative predictive value (NPV) supports its clinical utility as a reliable 'rule-out' tool to reduce unnecessary interventions for non-IAC lesions, while institutional variability underscores the need for standardized imaging protocols.

CLINICAL RELEVANCE/APPLICATION

This AI model offers a practical decision-support tool for multidisciplinary teams managing pGGNs, particularly in avoiding overtreatment of non-IAC lesions. By stratifying low-risk nodules for limited resection or surveillance and high-risk IAC for radical surgery, it may reduce unnecessary procedures by 30-40%. Future implementation requires protocol harmonization and prospective validation to optimize real-world performance across diverse clinical settings.

W7-SSCH07-5 LUNG CANCER RISK PREDICTION MODEL PERFORMANCE SUFFERS IN PATIENTS WITH PRIOR CANCER HISTORY AND/OR ADJUVANT CANCER THERAPY EXPOSURE

Allen Luna, BEng (*Presenter*)
Thomas Z. Li, BS (*Abstract Co-Author*)
Chongyu Qu (*Abstract Co-Author*)
Yuankai Huo, PhD (*Abstract Co-Author*)
Bennett A. Landman, PhD (*Abstract Co-Author*)
Kim L. Sandler, MD (*Abstract Co-Author*)

PURPOSE

Patients with prior malignancy are more likely to develop lung cancer relative to the general population, and exposure to adjuvant cancer therapies further increases this risk. Many models for predicting lung cancer risk have been developed, but data on their performance in these populations is lacking. Thus, we set out to assess model performance on patients with incidental pulmonary nodules (IPNs) and a history of malignancy and/or adjuvant therapy exposure prior to nodule detection.

METHODS AND MATERIALS

Retrospective evaluation of individuals with IPNs representing cancer and benign disease was performed. After excluding patients with poor CT scan quality, missing model inputs, and insufficient prior cancer history, a cohort of 224 patients was identified for analysis. Two published lung cancer risk prediction models were investigated: the Mayo model, which utilizes clinical data as inputs, and the DeepLungIPN (DLI) deep learning model which requires clinical data and a single low-dose CT scan as inputs. The models were run on patients with no history of cancer (n=154), a history of cancer (n=70), a history of cancer who received adjuvant chemotherapy and/or radiation (n=34), and a history of cancer treated with surgical resection alone (n=30). Receiver operating characteristic (ROC) curves were generated, and the area under the curve (AUC) was calculated to quantify model performance. Bootstrapping using 1000 samples with replacement was performed to generate mean AUC and 95% CIs.

RESULTS

Both models underperformed on patients with a history of malignancy (AUC = 0.410 [0.405, 0.416] for Mayo; AUC = 0.866 [0.863, 0.869] for DLI) compared to those with no cancer history (AUC = 0.629 [0.626, 0.633] for Mayo; AUC = 0.908 [0.906, 0.909] for DLI). Both models also underperformed in patients with adjuvant therapy

exposure (AUC = 0.283 [0.278, 0.289] for Mayo; AUC = 0.853 [0.849, 0.857] for DLI) compared to patients who only underwent surgical resection of their tumor (AUC = 0.573 [0.563, 0.583] for Mayo; AUC = 0.939 [0.936, 0.942] for DLI). In all populations, DLI outperformed the Mayo model ($p<0.05$).

CONCLUSION

Lung cancer risk prediction models perform poorly in patients with IPNs and a prior history of cancer, especially in those who received adjuvant therapy. The failure of models to capture these factor's impact on an individual's lung cancer risk profile underscores the need for additional model inputs (e.g. biomarkers) before they can accurately guide IPN risk stratification and management in these patients.

CLINICAL RELEVANCE/APPLICATION

Lung cancer risk prediction models underperform on patients with prior malignancy and adjuvant therapy exposure, emphasizing the need for a more personalized approach to lung cancer surveillance for these patients.

W7-SSCH07-6 REAL-WORLD DIAGNOSTIC PERFORMANCE AND CLINICAL UTILITY OF ARTIFICIAL INTELLIGENCE-ASSISTED INTERPRETATION IN DETECTING PULMONARY METASTASIS ON CHEST CT

Sowon Jang, MD (*Presenter*)
Younbeom Jeong, MD (*Abstract Co-Author*)
Jihang Kim, MD (*Abstract Co-Author*)

PURPOSE

To assess the impact of artificial intelligence (AI) assistance on diagnostic accuracy and clinical decision-making for lung metastasis detection in colorectal cancer patients undergoing chest CT surveillance.

METHODS AND MATERIALS

This retrospective diagnostic cohort study included colorectal cancer patients who underwent chest CT surveillance in two cohorts: before AI adoption (2020; human-alone) and after AI adoption (2022; AI-assisted). A total of 647 patients (mean age, 64 ± 11 years; 394 men) were included in the human-alone cohort, and 663 patients (mean age, 63 ± 12 years; 381 men) in the AI-assisted cohort. Diagnostic performance metrics (sensitivity, specificity, accuracy) and clinical utility measures (diagnostic yield, false referral rate, clinical decision changes) were compared between cohorts using multivariable logistic regression. Net benefit was estimated using decision curve analysis.

RESULTS

The prevalence of new lung metastases was comparable between cohorts (4.3% vs 4.4%; $p > .99$). AI-assisted interpretation significantly improved sensitivity (72.4% vs 32.1%; $p = .008$) and accuracy (98.5% vs 96.0%; $p = .005$) without compromising specificity (99.7% vs 98.9%; $p = .11$). AI alone generated 381 false-positive findings in the AI-assisted cohort, but radiologists successfully disregarded most, resulting in one false-positive report in final interpretations. Diagnostic yield ($p = .30$) and false referral rate ($p = .10$) did not differ significantly. Treatment decision changes due to true-positive detections were more frequent in the AI-assisted cohort (55.2% vs 25.0%; $p = .02$), with a positive net benefit estimated.

CONCLUSION

AI-assisted interpretation enhanced sensitivity and accuracy for detecting lung metastases on chest CT and led to more frequent treatment decision changes, indicating potential clinical utility in metastasis surveillance.

CLINICAL RELEVANCE/APPLICATION

Integrating AI into chest CT interpretation may reduce diagnostic errors and improve decision-making for metastatic lung disease in routine clinical practice.

Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

W7-SSCH08

Chest Imaging (MR)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E451A

Jurgen Biederer, MD (*Moderator*)
Cristina Marrocchio, MD (*Moderator*)

Sub-Events

W7-SSCH08-2 FEASIBILITY STUDY OF PHASE-RESOLVED FUNCTIONAL LUNG MRI FOR EVALUATING PULMONARY VENTILATION PARAMETERS IN HEALTHY VOLUNTEERS

Meng Qin (*Presenter*)

PURPOSE

To investigate the impact and feasibility of phase-resolved functional lung (PREFUL)-MRI in assessing pulmonary ventilation parameters of healthy volunteers under different breathing patterns, in comparison with conventional pulmonary function tests (PFTs).

METHODS AND MATERIALS

Thirty healthy adult volunteers with normal pulmonary function were prospectively enrolled from September 2024 to March 2025. All participants underwent PREFUL-MRI scans during both free breathing and deep breathing using a Siemens Skyra 3.0T MRI system equipped with an 18-channel body phased-array coil. Post-processing was performed to obtain pulmonary ventilation parameters, including regional ventilation (RV), flow-volume loop correlation (FVLc), and ventilation defect percentage (VDP). Correlations between these MRI parameters and PFTs indices, including the percentage of forced expiratory volume in one second to the predicted value (FEV1%), the percentage of forced vital capacity to the predicted value (FVC%), and forced expiratory volume in one second/forced vital capacity (FEV1/FVC), were analyzed. The consistency and correlation of PREFUL-MRI parameters obtained under different breathing modes were also compared.

RESULTS

The RV value obtained during free breathing was significantly lower than that during deep breathing ($Z = -4.782$, $P < 0.001$). However, there were no significant differences in FVLc and VDP between the two breathing modes ($P > 0.05$), and both showed strong positive correlations (FVLc: $r = 0.699$, $P < 0.001$; VDP: $r = 0.510$, $P < 0.01$) and good consistency in Bland-Altman analysis. In free-breathing mode, RV was positively correlated with FVC% ($r = 0.402$, $P < 0.05$) and negatively correlated with FEV1/FVC ($r = -0.442$, $P < 0.05$), while other parameters showed no significant correlation with PFTs indices ($P > 0.05$). Under deep-breathing conditions, no significant correlation was found between PREFUL-MRI parameters and PFTs indices ($P > 0.05$).

CONCLUSION

PREFUL-MRI can provide reliable pulmonary ventilation parameters and result maps consistent with respiratory physiology. The technique demonstrated high stability under different breathing patterns, indicating promising clinical application value.

CLINICAL RELEVANCE/APPLICATION

PREFUL-MRI offers a non-invasive, radiation-free method for assessing regional lung ventilation. Its consistent results across different breathing patterns in healthy individuals suggest that complex breathing maneuvers are unnecessary, enhancing clinical feasibility. PREFUL-MRI may serve as an alternative or complement to PFTs and other functional imaging techniques, such as hyperpolarized gas MRI and oxygen-enhanced MRI, especially when those methods are not feasible.

W7-SSCH08-4 SIMULATION OF DYNAMIC F19 AND SINGLE BREATH HYPERPOLARIZED 129XE MAGNETIC RESONANCE IMAGING

Jeffrey Ord, MD (*Presenter*)
Truc Nguyen (*Abstract Co-Author*)
Courtney Wing, MD (*Abstract Co-Author*)
Jennifer Goralski (*Abstract Co-Author*)
Yueh Z. Lee, MD, PhD (*Abstract Co-Author*)

PURPOSE

Pulmonary CT scans largely provide anatomic information, whereas functional lung data is a vital component to disease diagnosis/monitoring. Inhaled gas MRI with hyperpolarized xenon (129Xe) or perfluoro-propane (PFP/F19) provide functional lung information such as ventilation. The aim of this study is to simulate inhalation and imaging of these gases to delineate their roles.

METHODS AND MATERIALS

A high-resolution lung CT was segmented for lobar volumes and proximal airway structure autonomously in Slicer via the Chest Imaging Platform. This airway segmentation was then skeletonized into a node/branch structure, and the distal airway was algorithmically generated grown into the lobar volumes to generate a virtual lung environment (VLE). Random degrees of branch constriction were applied to the distal airways (normal distribution centered on 80%). This VLE (65,638 branches, 65,639 nodes, 32,820 acinar units) housed multiple breath washout simulations simulating a 30-breath wash-in/wash-out of PFP gas and a single hp-Xe gas breath-hold, with and without an overlayed randomized oxygen decay factor to simulate loss of hyperpolarized signal in the presence of paramagnetic oxygen. For F19, kinetic time constants tau 1 (wash-in) and tau 2 (wash-out) were calculated from tracer gas concentration curve fitting. For 129Xe, a a binary VDP value was generated by setting a threshold of 60% mean of acinar 129Xe concentration. Since the airway geometry/resistances applied was known sensitivity and specificity values were calculated for each modality relative to the degree of airway resistance applied.

RESULTS

In the absence of oxygen decay, both 129Xe and F19 had low sensitivity to flow restriction less than 80%, but sensitivities of 16.7%/81.2% (129Xe) and 5.5%/67.8% (F19) to 80/90% constriction. Addition of randomized oxygen decay for 129Xe lowered sensitivity to 6.7%/49%. Specificity to airway constriction was high for both modalities (in 90% range across 65% to 95% flow resistance), but 129Xe has a significant drop off in specificity to resistance values below 85% with addition of oxygen decay term.

CONCLUSION

Prior in-vivo experiments demonstrate differences in F19- and 129Xe-derived deficits. These ex-vivo simulations closely overlap, until the addition of a randomized oxygen decay term which may explain the in-vivo differences seen. A high degree (>80%) of constriction to the distal airway was needed for these simulated modalities to be sensitive.

CLINICAL RELEVANCE/APPLICATION

Comparison of functional pulmonary MRI techniques via multiple breath washout simulations may help clarify the roles of these techniques in their application to lung pathology.

W7-SSCH08-6 TOWARD PRECISE EVALUATION OF OBSTRUCTIVE PULMONARY DISEASE USING 3D VENTILATION-RELATED MAPPING USING MRI

Seokwon Lee, PhD (*Presenter*)
Sun Hye Shin (*Abstract Co-Author*)
Hyeonha Kim (*Abstract Co-Author*)
Jooae Choe, MD, PhD (*Abstract Co-Author*)
Hocheol Kim (*Abstract Co-Author*)
Hye Yun Y. Park (*Abstract Co-Author*)
Ho Yun Lee, MD, PhD (*Abstract Co-Author*)
Jang-Yeon Park (*Abstract Co-Author*)

PURPOSE

To demonstrate that ventilation-weighted (VW) and ventilation flow capacity-weighted (VFCW) maps obtained from non-contrast ultrashort echo-time (UTE) MRI can effectively differentiate between emphysema-predominant (EP) and airway-predominant (AP) phenotypes in obstructive pulmonary diseases.

METHODS AND MATERIALS

Twenty-nine patients, including seventeen with chronic obstructive pulmonary disease (COPD) and twelve with bronchial asthma, were enrolled and underwent spirometry, CT, and free-breathing Three-dimensional (3D) variable slab-selective UTE MRI.. Six respiratory phase-resolved images were obtained using retrospective respiratory gating. 3D VW maps were computed from the difference between end-inspiratory and end-expiratory images. 3D VFCW maps quantified the rate of change in ventilation between two consecutive respiratory states. A mathematical inequality using FEV1 (forced expiratory volume in 1 second), FVC (forced vital capacity), VW, and VFCW parameters was proposed for diagnostic decisions to differentiate between EP and AP phenotypes.

RESULTS

Based on CT findings, fourteen patients were classified as EP and fifteen as having the AP phenotypes. Qualitatively, patients with the EP phenotype tended to have lower VW and VFCW values ??overall, especially in areas where emphysematous changes were observed on CT. In contrast, patients with the AP phenotype had relatively preserved VW values ??but reduced VFCW. The final linear decision function: $D=-1.38\times FE\ V\ 1\ +0.47\times FVC+3.40\times VW+5.27\times VFCW-3.77$, where $D<0$ indicates EP and $D>0$ indicates AP phenotypes. The decision inequality using FEV1, FVC, VW, and VFCW effectively distinguished EP from AP patients, achieving an accuracy of 83.3%, precision of 85.7%, and an F1-score of 75.0%.

CONCLUSION

3D VW and VFCW maps obtained from UTE MRI offer reliable, radiation-free functional biomarkers, enabling detailed functional assessment and differentiation of EP and AP phenotypes in obstructive pulmonary diseases. This approach enables precise functional characterization and improved clinical decision-making in these patients.

CLINICAL RELEVANCE/APPLICATION

UTE MRI-based VW and VFCW maps allow accurate and non-invasive differentiation of obstructive pulmonary disease phenotypes, enhancing personalized care strategies and minimizing reliance on radiation-based imaging modalities.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

W7-SSGI13

Gastrointestinal Imaging (Liver - Focal Lesions)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E451B

Ersan Altun, MD (*Moderator*)
Nikolaos Kartalis, MD, PhD (*Moderator*)

Sub-Events

W7-SSGI13-1 LESION DETECTABILITY OF ABBREVIATED GADOXETIC ACID-ENHANCED MRI WITH CONTRAST-ENHANCED CT FOR COLORECTAL LIVER METASTASES: MULTI-INSTITUTIONAL STUDY

Hanae Hasegawa, MD (*Presenter*)
Shintaro Ichikawa, MD, PhD (*Abstract Co-Author*)
Satoshi Funayama, MD, PhD (*Abstract Co-Author*)
Norihide Yoneda (*Abstract Co-Author*)
Kazuto Kozaka, MD (*Abstract Co-Author*)
Hiroyuki Morisaka, MD (*Abstract Co-Author*)
Nobuyuki Kawai, MD, PhD (*Abstract Co-Author*)
Masayuki Matsuo, MD (*Abstract Co-Author*)
Tatsunori Kobayashi, MS,RT (*Abstract Co-Author*)
Yukichi Tanahashi, MD (*Abstract Co-Author*)
Kumi Ozaki, MD, PhD (*Abstract Co-Author*)
Satoshi Goshima, MD, PhD (*Abstract Co-Author*)

PURPOSE

To compare the lesion detectability of colorectal liver metastases between gadoxetic acid-enhanced magnetic resonance imaging (MRI) (standard protocol), abbreviated MRI (AMRI), and combined protocol (AMRI + contrast enhanced computed tomography (CE-CT)).

METHODS AND MATERIALS

This multi-institutional, retrospective study was conducted between February 2008 and December 2020. This study included adult patients pre- and post-treatment for colorectal adenocarcinoma. All the patients underwent gadoxetic acid-enhanced MRI and 271 of those patients also underwent CE-CT. Two expert radiologists (21 and 24 years of experience respectively) blinded to the final diagnosis independently graded the presence of liver metastasis on a 5-point scale by reviewing three different image sets to detect liver metastases: set A, AMRI (diffusion weighted, fat-suppressed T2-weighted, hepatobiliary phase images); set B, standard protocol (diffusion weighted, fat-suppressed T2-weighted, in-phase and opposed-phase, pre, arterial, portal venous, transitional and hepatobiliary phase images); set C, combined AMRI and CE-CT images. The five largest lesions were selected for evaluation among patients with multiple lesions. Interobserver agreement regarding lesion detectability and conspicuity was also evaluated.

RESULTS

The final cohort comprised 618 patients (mean age, 66.1 ± 11.5 years; 245 women, 40%) from three institutions. There were 356 patients with liver metastases and 262 patients without. The breakdown of the primary sites was as follows: 31 cecum, 92 ascending, 47 transverse, 27 descending, 162 sigmoid colon and 259 rectum. AMRI demonstrated sensitivity comparable to the standard protocol (94.7%-98.6% vs. 94.7%-95.5%) but had lower specificity (47.7%-49.6% vs. 77.5%-82.4%, $p < 0.001$) and accuracy (74.8%-77.8% vs. 87.9%-89.5%, $p < 0.001$). When CE-CT was added to the AMRI protocol, specificity and accuracy significantly improved (specificity, 79.2%-85.8; accuracy, 89.7%-92.3%). Meanwhile, diagnostic performance of the standard protocol and the combined AMRI and CE-CT protocol were comparable (sensitivity, 92.1%-94.7% vs. 97.4%-98.0%; specificity, 82.5%-83.3% vs. 79.2%-85.8%; accuracy, 88.2%-89.3% vs. 89.7%-92.3%). The interobserver agreement was good (kappa = 0.72 on set A and 0.75 on set B), and excellent (kappa = 0.82 on set C).

CONCLUSION

Although AMRI shows lower specificity and accuracy in detecting liver metastases, the addition of CE-CT resulted in specificity and accuracy comparable to the standard protocol.

CLINICAL RELEVANCE/APPLICATION

With contrast-enhanced CT information, AMRI may be sufficient for detecting liver metastases instead of the standard protocol.

W7-SSGI13-3 IRON DEPOSITION IN SCLEROSED HEPATIC HEMANGIOMAS: A SPECIFIC IMAGING BIOMARKER FOR NON-INVASIVE DIAGNOSIS

Nikhil S. Mirajkar, MBChB, FRCR (*Presenter*)
Ryan K. Campbell, MD (*Abstract Co-Author*)
Masoom A. Haider, MD (*Abstract Co-Author*)
Korosh Khalili, MD (*Abstract Co-Author*)
Ciara O'Brien, FRCPC, MBBCh (*Abstract Co-Author*)

PURPOSE

Sclerosed hepatic hemangiomas (SH) present a diagnostic challenge and may mimic malignant lesions. This study investigates the prevalence of iron deposition in SHs as detected by chemical shift MRI and evaluates its specificity as a diagnostic biomarker.

METHODS AND MATERIALS

We performed a single centre retrospective search of MRI reports containing the terms "sclerosed and/or sclerosing haemangioma" over a 10 year period. Patients with either biopsy proven or imaging features confirmatory of a SH were included. Confirmatory imaging features included: 1. typical enhancement pattern of a hemangioma on MRI or CT, performed prior to the sclerosis of the hemangioma, 2. Shrinkage and absence of typical enhancement on the follow-up MRI. Two independent readers

assessed iron deposition (visual identification of areas of signal loss within the lesion on the in phase images and/or significant difference in ROI signal intensity values) and the presence of any ancillary features (geographic pattern, capsular retraction, THID, rim enhancement, nodular enhancement). Comparison groups included typical hemangiomas (n=18) and histologically confirmed cholangiocarcinomas (n=20).

RESULTS

41 patients formed the final SH cohort, with 6/41(14.6%) being proven by biopsy and the rest by imaging criteria. Signal loss on in phase imaging consistent with iron deposition was identified in 20/41 (48.7%) of SH cases. None of the typical haemangiomas or cholangiocarcinomas demonstrated this finding. Interobserver agreement for identifying iron was excellent (? = 0.91). Rim enhancement of the SH was most strongly associated with iron deposition (OR = 38, p <0.01). Average signal intensity difference (IP-OP/IP) between lesions containing iron was -17.5% (SD 25.2) vs without iron +7.8% (SD 12.4), p <0.01. In 10 cases with serial imaging, none showed iron deposition in the initial typical hemangioma, but all developed signal characteristics of iron after sclerosis occurred (Fig 1 & 2). The presence of iron demonstrated 100% specificity (p <0.01) and 48.8% sensitivity (p = 0.88) for SH diagnosis.

CONCLUSION

Iron deposition detected as signal loss on in-phase chemical shift imaging represents a previously unreported but highly specific imaging biomarker for SH. The temporal relationship between sclerosis and iron accumulation suggests a potential pathophysiologic mechanism related to haemosiderin deposition and fibrosis.

CLINICAL RELEVANCE/APPLICATION

The identification of iron deposition in hepatic lesions with imaging features suggestive of SH provides radiologists with a novel specific biomarker to increase diagnostic confidence and potentially avoid biopsy.

W7-SSGI13-4 ARTIFICIAL INTELLIGENCE MEETS CEUS: PROPOSAL FOR AN AUTOMATED DIAGNOSTIC TOOL FOR LIVER LESION CHARACTERIZATION &STUDY SUMMARIZATION

Derya Gol Gungor, PhD (*Presenter*)
Christine Merrill, BSc (*Abstract Co-Author*)
Cynthia Wolverton (*Abstract Co-Author*)
Ismayil Guracar (*Abstract Co-Author*)
Stephen Metz (*Abstract Co-Author*)
Stephanie R. Wilson, MD (*Abstract Co-Author*)

PURPOSE

This study highlights our initial progress in integrating artificial intelligence (AI) with liver CEUS to develop automated tools for imaging study summarization and lesion characterization, with a focus on washout detection.

METHODS AND MATERIALS

Three key components were developed: 1. System Design Proposal: A framework was developed to preprocess CEUS data for neural networks, tackling the temporal and spatial complexities of CEUS imaging. It includes lesion area selection, precise segmentation, and robust tracking to reduce motion artifacts. The preprocessed images are then used by AI models to extract CEUS characteristics and sent to the study summarization tool for visualization. 2. Study Summarization Tool: This tool provides a one-shot visualization method to summarize single or multiple CEUS studies. It generates a timeline plot for each injection, combining frames from the arterial phase (AP) wash-in video with portal vein phase (PVP) washout images. Regular snapshots highlight AP washin patterns alongside PVP washout images, allowing for comprehensive study summarization. 3. Deep Learning Model for Washout Detection: A dataset of 235 lesions from 202 patients (45% female, median age: 58) was used. Lesions included 53% hepatocellular carcinoma (HCC), 30% focal nodular hyperplasia (FNH), 5% adenoma, 4% LR-M, and 5% other types, with hemangiomas excluded. Washout patterns consisted of 60% weak, 5.5% marked, and 34.5% no washout. The data was partitioned into training (70%), validation (15%), and test (15%) sets. An Attention-Based Deep Multiple Instance Model (ABMIL) with EfficientNet-B0 as the backbone image encoder was used for automatic washout detection. The positive bags were created from weak and marked washout samples versus the negative bags from no-washout samples. The model was optimized using Stochastic Gradient Descent (learning rate: 0.01) in TensorFlow.

RESULTS

The study summarization tool provided concise yet comprehensive visualizations of CEUS studies, clearly highlighting AP washin and PVP washout patterns. The ABMIL-based deep learning model achieved 90% accuracy in detecting washout on the test set (50 lesions), demonstrating its reliability for washout detection.

CONCLUSION

The implemented components of the proposed AI tool achieved effective study summarization and showed promising results for washout detection in early studies, with washout now recognized as the most reliable sign of malignancy.

CLINICAL RELEVANCE/APPLICATION

AI-enhanced CEUS imaging transforms liver lesion evaluation, improving diagnostic accuracy and streamlining workflows. This system equips clinicians with advanced tools for better diagnosis and management of liver diseases, ultimately enhancing patient outcomes.

W7-SSGI13-5 LARGE LANGUAGE MODELS FOR THE DIFFERENTIATION OF BENIGN AND MALIGNANT LIVER NODULES BASED ON MULTIMODAL PROMPTS IN LIVER US CASES

Sijia Lin (*Presenter*)
Lingling Li (*Abstract Co-Author*)
Yu Li (*Abstract Co-Author*)
Jianhua Zhou, MD, PhD (*Abstract Co-Author*)

PURPOSE

Large language models (LLMs) that can process both visual images and text data are increasingly being used in the field of radiology. Their ability in liver US cases remains unclear yet. Therefore, this study aimed to evaluate the performance of LLMs including GPT-4o, Claude, and Gemini in differentiating benign and malignant liver nodules and compare it with that of human readers .

METHODS AND MATERIALS

Four hundred liver US cases with pathologically confirmed liver nodules visible on B-mode US from January 2020 to November 2024 were randomly selected in this retrospective study. They were divided into a development set (n=100) and a test set (n=300).Five prompt groups for LLMs including US image [I-only], image description [D-only], image and description [I+D], image and liver US e-textbook [I+T], and image and medical history [I+H] were evaluated to identify the optimal input in the development set. In the test set, accuracy of LLMs in differentiating benign and malignant liver nodules was compared with that of human readers using McNemar's test.

RESULTS

In the development set, the prompt group I+H for all three LLMs exhibited the highest diagnostic accuracy in differentiating benign and malignant liver nodules, being considering as the optimal input (taking GPT-4o as an example, with I-only, 57.0% [as reference]; D-only, 62.0%, P = .55; I+D, 62.0%, P = .54; I+T, 62.0%, P = .36; I+H, 77.0%, P = .01). In the test set, LLMs with I+H outperformed the junior group and showed similar accuracy to senior group (Junior, 70.0% [as reference1]; Senior, 78.3% [as reference2]; GPT-4o, 83.3%, P1 < .001, P2 = .10; Claude, 77.0%, P1 = .04, P2 = .72; Gemini, 75.3%, P1 = .14, P2 = .36).

CONCLUSION

Large language models with US image and medical history inputs achieved accuracy comparable to senior radiologists and superior to junior radiologists in differentiating benign and malignant liver nodules.

CLINICAL RELEVANCE/APPLICATION

This study showed that large language models, when provided with ultrasound images and medical history inputs, could serve as convenient auxiliary tools for differentiating between benign and malignant liver nodules. The findings highlight their potential to support junior radiologists, particularly in regions with a shortage of experienced specialists.

W7-SSGI13-6 EXPLORING THE LESION DETECTABILITY OF DUAL-ENERGY CT FOR LIVER METASTASES USING A DEEP LEARNING DETECTION MODEL

Satoshi Funayama, MD, PhD (*Presenter*)
Shintaro Ichikawa, MD, PhD (*Abstract Co-Author*)
Prakhar Prakash (*Abstract Co-Author*)
Sei Morikawa (*Abstract Co-Author*)
Michail Fanariotis (*Abstract Co-Author*)
Akio Ito, MD (*Abstract Co-Author*)
Masatoshi Kakuya (*Abstract Co-Author*)
Tatsunori Kobayashi, MS,RT (*Abstract Co-Author*)
Tomoko Hyodo, MD (*Abstract Co-Author*)
Kumi Ozaki, MD, PhD (*Abstract Co-Author*)
Satoshi Goshima, MD, PhD (*Abstract Co-Author*)

PURPOSE

To compare the detectability of liver metastases on contrast-enhanced dual-energy (DE) CT between radiologists and a deep learning model, using gadoxetic acid-enhanced MRI as the clinical reference standard.

METHODS AND MATERIALS

This retrospective study included 68 patients with gastrointestinal adenocarcinoma. All patients underwent both contrast-enhanced DE-CT and gadoxetic acid-enhanced MRI for suspected liver metastases. DE-CT was performed using a fast kilovoltage-switching scanner (Revolution CT with Apex edition; GE HealthCare), and images were reconstructed at 70 keV using DLIR (TrueFidelity 2.0; GE HealthCare). Liver metastases were diagnosed based on the MRI findings.Patients were divided into a training set (n = 51) and a test set (n = 17). A 3D U-Net-based convolutional neural network (MetsAI) was trained on the post-contrast DE-CT images using an image cropping method within the liver. For comparison, four radiologists—two experts (Readers 1 and 2) and two residents (Readers 3 and 4)—independently reviewed the pre- and post-contrast DE-CT images. Each reader rated lesion localization confidence on a 5-point scale.Lesion detectability was compared between MetsAI and the radiologists using alternative free-response receiver operating characteristic (AFROC) analysis. Statistical significance was assessed using the bootstrap method, with $p < 0.05$ considered significant.

RESULTS

MetsAI demonstrated a significantly higher area under the AFROC curve (AUC) than Reader 4 (0.955 [95% CI, 0.882-1.000] vs. 0.551 [95% CI, 0.510-0.957]; $p < 0.01$, Figure). No statistically significant differences were observed between MetsAI and Readers 1, 2, or 3 (Reader 1: 0.888 [95% CI, 0.750-1.000], $p = 0.24$; Reader 2: 0.760 [95% CI, 0.500-0.973], $p = 0.06$; Reader 3: 0.811 [95% CI, 0.556-0.984], $p = 0.08$). Lesion localization fractions (sensitivity) were as follows: MetsAI, 1.00 (27/27); Reader 1, 0.69 (9/13); Reader 2, 0.77 (10/13); Reader 3, 0.77 (10/13); and Reader 4, 0.62 (8/13).

CONCLUSION

MetsAI demonstrated high lesion detectability for contrast-enhanced dual-energy CT, with a significantly higher AUC than a radiologist with little experience.

CLINICAL RELEVANCE/APPLICATION

The deep learning detection model (MetsAI) applied to dual-energy CT shows promising lesion detectability for liver metastases from gastrointestinal adenocarcinoma.

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W7-SSGI14

Gastrointestinal Imaging (Esophagus)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: S402

Laura R. Carucci, MD (*Moderator*)
Nancy A. Hammond, MD (*Moderator*)

Sub-Events

W7-SSGI14-3 SEMI-AUTOMATED CLASSIFICATION MODEL FOR SIEWERT TYPING OF ESOPHAGOGASTRIC JUNCTION ADENOCARCINOMA BASED ON NNU-NET MODEL AND 3D BREADTH-FIRST SEARCH ALGORITHM

Yiting Liu (*Presenter*)
Yongai Li, MD,MD (*Abstract Co-Author*)
Zifan Chen (*Abstract Co-Author*)
Heyun Chen (*Abstract Co-Author*)
Wanying Ji (*Abstract Co-Author*)
Xiaoting Li (*Abstract Co-Author*)
Fang-jing Hou (*Abstract Co-Author*)
Kan Xue (*Abstract Co-Author*)
Lei Tang, MD (*Abstract Co-Author*)

PURPOSE

The Siewert typing is critical for surgical planning and prognosis evaluation in adenocarcinoma of the esophagogastric junction (AEG). This study aims to develop a semi-automated typing model (GESNet) integrating nnU-Net-based segmentation and 3D breadth-first search (BFS) algorithms to improve the accuracy and reproducibility of Siewert typing for AEG.

METHODS AND MATERIALS

This study developed a semi-automated Siewert typing model integrating nnU-Net segmentation, 3D BFS path calculation, and endpoint annotation. A multicenter cohort of 470 AEG patients was included. Segmentation is carried out according to the following three core steps (Fig 1-2): For gastric tumor segmentation based on nnU-Net , gastric lumen VOI was segmented using CT thresholds. Tumor-to-lumen distance maps were computed, with mucosal VOI defined as voxels = 2 mm from the lumen (Fig 3). Esophageal tumor length was semi-automated: radiologists manually marked the cranial tumor endpoint (E start) in ITK-SNAP. The distal endpoint (E end) was identified as the closest point on the gastric mucosal VOI to E start (Fig 4). 3D BFS-based longitudinal path calculation for gastric tumor initiated from E end , iteratively expanding a 3×3×3 cube on mucosal VOI (Fig 5). Distance matrices tracked shortest surface paths (voxel-wise Euclidean distance summed along the mucosal curvature). (Fig 6) Path directionality was constrained to align with the gastric longitudinal axis by prioritizing contiguous voxels along anatomical curvature, avoiding circumferential deviations. The tumor center was defined as the midpoint of the longest path, and the Siewert type was determined by the distance between this midpoint and the esophagogastric junction (EGJ). Performance was validated via five-fold cross-validation (Dice coefficient) and accuracy, sensitivity, specificity, PPV, and NPV against surgical pathology.

RESULTS

GESNet achieved Dice coefficients of 0.838-0.891 for gastric tumor segmentation. Siewert typing accuracy ranged from 88.0% to 94.8% across cohorts, with sensitivity 86.8%-98.9% and specificity 63.6%-96.0%. External validation showed stable performance (94.8% accuracy in development cohort). The model outperformed traditional methods in reproducibility and reduced inter-observer variability.

CONCLUSION

We develop a deep learning-based 3D AEG segmentation model, leveraging clinical annotations and spatial analysis to quantify tumor length for Siewert typing. A dual-zone strategy enhances segmentation consistency and typing accuracy.

CLINICAL RELEVANCE/APPLICATION

GESNet integrates nnU-Net and 3D BFS to enhance Siewert typing reproducibility, reducing inter-observer variability and standardizing preoperative planning for AEG.

W7-SSGI14-6 CONSTRUCTION OF CLINICAL NUTRITIONAL-RADIOMICS MODEL TO PREDICT HEALING TIME OF ESOPHAGOJEJUNOSTOMY FISTULA AFTER RADICAL TOTAL GASTRECTOMY

Yuan Xu (*Presenter*)
Liu Bo (*Abstract Co-Author*)
Wence Zhou (*Abstract Co-Author*)

PURPOSE

Esophagojejunostomy fistula (EJAL) occurs in 4-15% of gastric cancer patients undergoing radical total gastrectomy, and its unhealed can lead to mortality rates as high as 60%. Nutritional status plays an important role in the healing of anastomotic fistula, but nutritional information contained in Imaging are often ignored. The purpose of this study is to construct a clinical nutritional combined radiomics model for predicting healing time of EJAL patients.

METHODS AND MATERIALS

We retrospectively collected data from 418 patients with EJAL of grades II, who underwent radical total gastrectomy for gastric cancer at two centers from 2018 to 2025 (training group: 226 cases from Hospital A; validation group: 192 cases from Hospital B). The healing time of EJAL was defined as the time from diagnosis to the abdominal drainage tube removal, and patients were divided into a healing group and a delayed healing group based on the median time. The nutritional characteristics are collected from CT and medical record,radiomics features were extracted after segment the whole anastomotic fistula region in all the slices with the CT. Clinical nutritional model, radiomics signatures and combined nomogram were constructed.

RESULTS

The average healing time of EJAL was 15±6 days (median: 11 days, range 4-63 days). Patients who received combined enteral and parenteral nutrition support, had a systemic immune-inflammation index (SII) <2.93×10^12, a controlling nutritional status score (COUNT) >4, a visceral fat area (VFA) for male or female >114.6 or 91.5 cm2 and a psoas muscle inde (PMI) >3.5 cm2/m2 had a shorter healing time for EJAL. In the validation group,The best model was the clinical nutritional combined radiomics nomogram with AUC of 0.855 (95% CI: 0.739-0.891).

CONCLUSION

The clinical nutritional combined radiomics model constructed based on the two centers can relatively accurately predict the healing time of EJAL.

CLINICAL RELEVANCE/APPLICATION

At present, the study of anastomotic fistula mainly focuses on the occurrence of fistula, and ignores the clinical outcome of anastomotic fistula. This study combines radiomics and imaging nutrition, which will effectively improve clinicians' management and understanding of perioperative complications in gastric cancer.
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Abstract Archives of the RSNA, 2025

W7-SSIR03

Science Session with Keynote: Interventional Radiology (Image-guided Therapy and Immune Modulation in Liver Oncology)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E353A

S. Nahum Goldberg, MD (*Moderator*)
Miyuki Sone, MD (*Moderator*)

Sub-Events

W7-SSIR03-1 MR GUIDED CATHETER-BASED RADIOTHERAPY/BRACHYTHERAPY OF LIVER TUMOURS - FIRST EXPERIENCE AND FEASIBILITY

Matthias P. Fabritius, MD (*Presenter*)
Max Seidensticker (*Abstract Co-Author*)
Olaf Dietrich, PhD (*Abstract Co-Author*)
Daniel Puhr-Westerheide, MD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)

PURPOSE

To show feasibility and safety of MR guided catheter-based radiotherapy/brachytherapy of primary or secondary liver tumours

METHODS AND MATERIALS

Treatments were performed under conscious sedation and local anaesthesia, utilizing a 1.5T MRI system (Magnetom Solafit, Siemens Healthineers) with a 15 cm loop coil. Each procedure involved administering gadoxetic acid at 0.1 mmol/kg body weight for contrast enhancement, inserting an 18G coaxial needle (Co. ITP) and navigating to the lesion through real-time gradient-echo (TE 3.4ms, TR 7.3ms, FA 30°) fluoroscopy sequences (with iMRI UI Extension, Research Software Package), subsequently exchanging the needle over a nitinol wire for a 6F hydrophilic angiography sheath harbouring a 6F brachytherapy catheter. 3D T1-weighted sequences were sent to treatment planning system in the radiation department for Brachytherapy (BT) with IR192 high-dose-rate (HDR) afterloading unit. Target doses ranged from 15 to 25 Gray (Gy) depending on the tumour entity, including HCC (33.3%), CRC (22.2%), GIST (11%), NET (11.1%) and metastases from other primaries (22.2%). The catheters were removed after BT and the radiation tract was sealed with gelatine sponge.

RESULTS

The average room time was 74 ± 35 minutes, the average time for catheter placement was 19 ± 11 minutes. The mean dose administered per lesion (D100) was 18.9 ± 3.6 Gy. Complications during and after BT were generally rare with only 1 patient (3.7 %.) having a minor bleeding without need for blood transfusion or intervention.

CONCLUSION

Overall, MR-guided catheter-based radiotherapy for liver tumours is feasible and safe, particularly for small lesions. With low complication rates and precise dosimetry achieved through advanced imaging, this approach holds promise for effective tumour management.

CLINICAL RELEVANCE/APPLICATION

MR-guided catheter-based brachytherapy is offering a promising option for minimally invasive, targeted therapy for smal liver lesions (HCC and oligometastatic disease), especially when not targetable in CT or Ultrasound.

W7-SSIR03-2 ONCOLOGICAL OUTCOMES FROM THE COVER-ALL TRIAL: SOFTWARE-BASED VERSUS VISUAL ASSESSMENT OF INTRAPROCEDURAL MINIMAL ABLATIVE MARGINS IN PERCUTANEOUS LIVER THERMAL ABLATION OF LIVER TUMORS

Noreen Siddiqi, MD (*Presenter*)
Jessica A. Marques Silva, MD (*Abstract Co-Author*)
Iwan Paolucci, PhD (*Abstract Co-Author*)
Caleb Oconnor (*Abstract Co-Author*)
A. Kyle Jones, PhD (*Abstract Co-Author*)
Kristy K. Brock, PhD (*Abstract Co-Author*)
Bruno C. Odisio, MD, PhD (*Abstract Co-Author*)

PURPOSE

To report the final oncological outcomes of the COVER-ALL randomized phase 2 trial comparing software-based versus visual assessment of intraprocedural minimal ablative margin (MAM) in CT-guided percutaneous thermal ablation (TA) of liver tumors.

METHODS AND MATERIALS

This single-center, prospective trial enrolled patients with up to 3 histology-agnostic liver tumors (1-5 cm) referred for TA. Patients were randomized 1:1 intraprocedurally after probe placement to software-based MAM evaluation (experimental group) or visual assessment (control group), using Pocock-Simon minimization. Following a planned interim analysis showing superiority of the software in achieving MAM =5 mm, control enrollment was halted, and 50 further patients entered a non-randomized experimental group. Here we report the final oncological outcomes to be completed in October 2025, including the 2-year cumulative incidence of local tumor progression (LTP), local tumor progression-free survival (LTPFS), overall survival, and intra- and extrahepatic progression-free survival, analyzed by Fine-Gray and Kaplan-Meier methods per RECIST 1.1 and ablation-specific reporting standards.

RESULTS

Between June 15, 2020, and October 5, 2023, 100 patients were enrolled (control: n = 26; randomized experimental: n = 24; non-randomized experimental: n = 50). Final analysis included a median follow-up of 24.1 months (95% CI: 18.2-21.3) overall, with 24.8 months (95% CI: 24.4-25.5) in the control group and 22.7 months (95% CI: 19.2-24.2) in the experimental group. LTP occurred in 4/26 (15%) tumors in the control group and 1/24 (4%) in the randomized experimental group. The 2-year cumulative incidence of intrahepatic progression outside the ablation zone for the randomized group was 0·57 (95% CI 0·3-0·7) in the control and 0·79 (95% CI 0·5-0·9) in the experimental group (sHR 0·6; 95% CI 0·3-1·2; p=0·15). The 2-year cumulative incidence of extrahepatic progression was 0·6 (95% CI 0·4-0·8) in the

control arm and 0·67 (95% CI 0·4-0·8) in the experimental arm (sHR 0·8; 95% CI 0·4-1·7; p=0·58). Outcome data for the non-randomized experimental group will be finalized in October 2025.

CONCLUSION

Software-based MAM assessment during liver TA reduces LTP risk compared to visual inspection and supports standardized, precision-guided treatment.

CLINICAL RELEVANCE/APPLICATION

The COVER-ALL trial provides the first prospective evidence that intraprocedural software-based MAM assessment improves local tumor control after TA. By enabling real-time, quantitative feedback, this approach promotes procedural standardization and may establish a new benchmark for precision in liver-directed oncologic therapies.

W7-SSIR03-3 COMPARATIVE ANALYSIS OF SYSTEMIC IMMUNE RESPONSES AND METASTATIC RISKS IN TUMOR ABLATION: AN ANIMAL STUDY OF RADIOFREQUENCY ABLATION AND IRREVERSIBLE ELECTROPORATION WITH IMMUNE MODULATION

Mari Hayashi (*Presenter*)
Katsutoshi Sugimoto, MD, PhD (*Abstract Co-Author*)
Hidehito Honda (*Abstract Co-Author*)
Tatsuya Kakegawa (*Abstract Co-Author*)
Hirohito Takeuchi (*Abstract Co-Author*)
Takao Itoi (*Abstract Co-Author*)

PURPOSE

This study aimed to compare systemic immune responses and metastatic effects induced by radiofrequency ablation (RFA) and irreversible electroporation (IRE) in murine tumor models. We assessed cytokine production, growth of treated and untreated metastatic tumors, and synergy with immune checkpoint inhibitors (ICIs).

METHODS AND MATERIALS

Hep55.1c murine hepatoma cells were implanted in C57BL/6N mice to establish primary tumors. In Experiment 1 (n = 50), RFA or IRE was applied to primary tumors, followed by CD8 + T cell depletion in some groups to assess anti-tumor immune responses. Experiment 2 (n = 45) tested RFA and IRE combined with anti-PD-1 therapy for enhanced abscopal effects. In Experiment 3 (n = 28), anti-IL-6 antibody was administered in IRE-treated mice to examine IL-6's role in secondary tumor growth. Tumor volumes and cytokine/chemokine levels were monitored.

RESULTS

Both techniques induced significant CD8 + T cell-mediated anti-tumor responses, with abscopal effects observed in untreated secondary tumors. CD8 + T cell depletion abolished these effects, confirming their role in systemic tumor control. Anti-PD-1 therapy combination further suppressed secondary tumor growth. However, IRE uniquely elevated IL-6 and other inflammatory cytokines, unexpectedly accelerating secondary tumor growth. Administration of an anti-IL-6 antibody mitigated this effect, reducing secondary tumor progression.

CONCLUSION

The results of this animal study indicate that both techniques promote systemic anti-tumor immunity, though IRE uniquely induces an inflammatory response that risks exacerbating micro-metastases through IL-6. Combining IRE with IL-6 blockade may offer a promising strategy for nonthermal tumor ablation therapies. Further studies are warranted to refine ablation-immune therapy combinations for optimal therapeutic outcomes.

CLINICAL RELEVANCE/APPLICATION

Combining IRE with immune checkpoint inhibitors and IL-6 blockade may enhance systemic anti-tumor immunity while mitigating pro-metastatic inflammatory responses, offering a promising strategy for improving the clinical efficacy of nonthermal tumor ablation.

W7-SSIR03-4 MICROWAVE VS. RADIOFREQUENCY ABLATION FOR HEPATOCELLULAR CARCINOMA: A LARGE COHORT PROPENSITY-MATCHED STUDY INCLUDING NO-TOUCH TECHNIQUE

Dongyeong Kim, MD (*Presenter*)
Hyo Jung Park, MD, PhD (*Abstract Co-Author*)
So Jung Lee (*Abstract Co-Author*)
Sang Hyun Choi, MD (*Abstract Co-Author*)
Hyung Jin Won, MD (*Abstract Co-Author*)
Yong Moon Shin (*Abstract Co-Author*)
So Yeon Kim, MD, PhD (*Abstract Co-Author*)

PURPOSE

To compare the therapeutic outcomes between microwave ablation (MWA) and radiofrequency ablation (RFA) for hepatocellular carcinoma (HCC) in a large cohort, with a subgroup analysis focusing on the no-touch ablation.

METHODS AND MATERIALS

This retrospective study analyzed 712 patients (male, 577; mean age: 65.0 years) who underwent MWA (n=220) and RFA (n=492) for HCC between 2021 and 2023. Baseline characteristics were compared between the two groups, including liver function, presence of cirrhosis, tumor characteristics, and previous treatments. Clinical outcomes including 2-year cumulative local tumor progression (LTP), intrahepatic distant recurrence (IDR), extrahepatic metastasis (EM) were assessed before and after propensity score matching (PSM). Cox regression analyses were performed to identify factors associated with LTP. Subgroup analysis was conducted to evaluate the no-touch RFA technique (n=89).

RESULTS

The mean tumor size was 1.6 cm (range, 0.5-4.0), with a medianl follow-up of 25.0 months (range, 2.8-42.6). In the unmatched cohort, the MWA and RFA groups significantly differed in several baseline characteristics (e.g., bilirubin, prothrombin time, platelet count, cirrhosis rate, tumor size, subcapsular location). The 2-year LTP rates were similar between MWA and RFA before PSM (5.9% vs. 5.6%, p=0.82) and after PSM (6.5% vs. 6.0%, p=0.84). No significant differences were observed in IDR (before PSM: 43.6% vs. 43.9%, p=0.98; after PSM: 43.6% vs. 44.3%, p=0.98) and EM (before PSM: 9.7% vs. 6.7%, p=0.26; after PSM: 9.9% vs. 7.7%, p=0.67). Multivariable analysis identified perivascular location (adjusted hazard ratio [HR]=3.616, p<0.001) and history of transcatheter arterial chemoembolization (TACE) (HR=2.617, p=0.02) as significant predictors of LTP. The no-touch RFA technique showed a lower LTP rate (3.0%) compared to MWA (5.9%) and standard RFA (6.2%), although statistically not significant (p=0.59 and 0.40, respectively).

CONCLUSION

MWA and RFA demonstrate similar clinical outcomes. Perivascular location and prior TACE are significant risk factors for LTP. The no-touch technique may reduce LTP rates and warrant further investigations.

CLINICAL RELEVANCE/APPLICATION

This large cohort study provides robust evidence that both MWA and RFA are effective treatment options for HCC. The no-touch technique shows potential for improving local control and should be explored in future research.

W7-SSIR03-5 M2-LIKE MACROPHAGE-TARGETED MOLECULAR MR IMAGING FOR MONITORING IMMUNOSUPPRESSION IN VX2 LIVER TUMORS POST-ABLATION

Yubei He (*Presenter*)
Han Xu, MSc (*Abstract Co-Author*)
Julian Rogasch (*Abstract Co-Author*)
Jing Guo, MD, PhD (*Abstract Co-Author*)
Eyk Schellenberger (*Abstract Co-Author*)
Luisa Heidemann (*Abstract Co-Author*)
Yu Liu (*Abstract Co-Author*)
Mathias Schannor (*Abstract Co-Author*)
Lynn J. Savic, MD (*Abstract Co-Author*)

PURPOSE

Incomplete thermal ablation can lead to increased tumor growth and resistance, potentially mediated by immunosuppressive pathways. This study aimed to non-invasively image tumor-associated macrophages (TAMs) after incomplete ablation using M2-like macrophage-targeted europium-doped very small superparamagnetic iron oxide nanoparticles (Eu-VSOP) in multiparametric(mp) PET/MRI.

METHODS AND MATERIALS

Twenty-four New Zealand white rabbits with VX2 liver tumors were divided into three groups (n=8/group): (1) untreated control; (2) short-term group undergoing incomplete microwave ablation (=50% of tumor) followed by 3T PET/MR imaging at 24 hours; (3) long-term group with the same treatment and imaging at two weeks. The imaging protocol included a) diffusion-weighted and contrast-enhanced imaging, b) T2-weighted imaging before and 24 hours after Eu-VSOP to visualize M2-like macrophages, and c) [18F]FDG-PET/MRI for monitoring tumor viability and metabolic activity. Signal intensity changes were analyzed in the tumor, liver, and peritumoral zone, with correlation to histopathology, laser ablation combined with inductively coupled plasma mass spectrometry (LA-ICP-MS), and Prussian blue staining of iron to confirm Eu-VSOP deposition in TAMs and their infiltration into the TME post-ablation. Statistical analyses included t-tests and RM-ANOVA.

RESULTS

mpMRI and PET/MR confirmed viability in both untreated and residual tumors after incomplete ablation. Following Eu-VSOP injection, T2-weighted MRI revealed a hypointense peritumoral rim, with peak signal changes and thickness observed two weeks post-ablation in the long-term group (signal ratio peritumoral/liver: pre-Eu-VSOP vs. 24h post-Eu-VSOP, $p<0.0001$; peritumoral rim thickness: control vs. long-term group, $p<0.01$). Ex vivo Prussian blue staining and LA-ICP-MS confirmed deposition of iron and europium from Eu-VSOP, respectively, in the peritumoral zone, co-localizing with the M2-marker CD206. Furthermore, HLA-DR, CD45, CD11b, and MMP-9 expression reflected a shift towards an immunosuppressive tumor milieu two weeks post-treatment.

CONCLUSION

The results demonstrate the potential of mpMRI, specifically Eu-VSOP, in monitoring TAM-driven immune evasion and tumor progression after ablation in a translational liver tumor model. The findings also suggest a critical role for M2-like macrophages in tumor recurrence, which could be targeted to restore immune permissiveness in liver cancer.

CLINICAL RELEVANCE/APPLICATION

This study developed a molecular imaging biomarker for non-invasive immune profiling in liver cancer, which could guide personalized treatment and monitoring strategies following locoregional and immunotherapies to overcome immune evasion.

W7-SSIR03-6 Keynote Speaker

S. Nahum Goldberg, MD (*Science Invited Presenter*)

Nov. 30 – Dec. 4
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W7-SSMK09

Musculoskeletal Imaging (Pelvis and Hip)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E450A

Edwin H. Oei, MD, PhD (*Moderator*)
Ali Shah, FRCR, MBBS (*Moderator*)

Sub-Events

W7-SSMK09-1 IMAGING OF TOTAL HIP ARTHROPLASTIES AT 0.55T - COMPARISON WITH HIGH FIELD IMAGING

Kathleen Marsh, MD (*Presenter*)
Gabby B. Joseph (*Abstract Co-Author*)
Daehyun Yoon, PhD (*Abstract Co-Author*)
Amy Becker (*Abstract Co-Author*)
Virginie Kreutzinger, MD (*Abstract Co-Author*)
Jonathan M. Friedman, MD (*Abstract Co-Author*)
Katharina Ziegeler, MD (*Abstract Co-Author*)
Thomas M. Link, MD, PhD (*Abstract Co-Author*)

PURPOSE

The study aimed to compare the diagnostic performance of imaging of total hip arthroplasties performed at 0.55T (low-field) with 1.5 or 3T (high-field) field strength and with metal suppression sequences.

METHODS AND MATERIALS

Fourteen patients (aged 37-78, 5 males) with hip arthroplasties, 5 of which were bilateral, were examined at 0.55T and 1.5 or 3T. Hip scans were conducted using a 0.55T MRI system with the posterior spine coil and the anterior contour coil. The protocol included high pixel bandwidth (237-347 Hz/pixel) 2D turbo spin-echo sequences with vendor-provided denoising technique (Deep Resolve Boost) and SEMAC sequences: axial STIR/T1/T2, coronal PD/STIR, axial STIR SEMAC, coronal PD SEMAC. Anatomical structures, image quality, and pathologic findings were graded on quantitative "Likert" type scales independently by four musculoskeletal board-certified radiologists. Mixed-effects models were used to assess the association between field strength and outcomes of image quality, anatomic visualization, and pathology, accounting for repeated measures per person (both hips and scan types) and four readers.

RESULTS

All measurements for image quality and anatomic visualization with the high-field scans were associated with lower image quality scores compared to the low-field scans (coefficient range -1.88 to -0.55, 95% CI range -1.44 to -0.18, all p values <0.0037). The coefficient represents the difference in outcomes between low- and high-field with low field as the reference. High-field dedicated metal suppression sequences were also associated with lower image quality and anatomic visualization scores compared to the low-field scans (coefficient range -1.536 to -0.556, 95% CI -1.197 to -0.181, p<0.0037). All measurements for visualized pathology in adjacent bone on high-field scans were associated with lower image quality scores compared to low-field scans. On metal-suppressed images evaluating for pathology in adjacent bone, the adjusted mean score was 2.61(95% CI 2.27 to 2.96) for low-field scans and 1.93 for high-field scans (95% CI 1.61 to 2.25), with a p-value of <0.0001, indicating a statistically significant difference in diagnostic confidence.

CONCLUSION

Overall, and with dedicated metal suppression sequences, 0.55T had a better diagnostic performance in total hip arthroplasties for image quality with better visualization of anatomic structures and for certain pathologies such as adjacent bone abnormalities.

CLINICAL RELEVANCE/APPLICATION

This work demonstrated that lower-field MRI at 0.55T and metal suppression sequences had significantly higher image quality and anatomic visualization than high-field MRI in patients who underwent total hip arthroplasties.

W7-SSMK09-2 DIAGNOSTIC PERFORMANCE OF INTRAVOXEL INCOHERENT MOTION IMAGING IN EVALUATING SACROILIITIS ACTIVITY IN AXIAL SPONDYLARTHRITIS: A META-ANALYSIS

Peyman Mirghaderi, MD, MPH (*Presenter*)
Parya Valizadeh (*Abstract Co-Author*)
Payam Jannatdoust (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic accuracy of intravoxel incoherent motion (IVIM) MRI parameters in differentiating active from inactive sacroiliitis and distinguishing sacroiliitis from healthy controls in patients with axial spondyloarthritis (axSpA).

METHODS AND MATERIALS

This systematic review and meta-analysis followed PRISMA guidelines. A comprehensive search of PubMed, Embase, Scopus, and Web of Science (up to September 2024) identified studies reporting on IVIM-derived parameters, including Dslow (true diffusion), Dfast (pseudodiffusion), and perfusion fraction (f), for sacroiliitis assessment. Data from eligible studies were extracted to calculate pooled sensitivity, specificity, and area under the curve (AUC) using a bivariate random-effects model. Heterogeneity was assessed using the I^2 statistic.

RESULTS

Six studies, including 541 participants (178 with active sacroiliitis, 277 with inactive disease, and 86 healthy controls), met the inclusion criteria. Dslow demonstrated the highest diagnostic accuracy. For active versus inactive sacroiliitis, pooled sensitivity was 86.3% (95% CI: 77.0-92.2%), specificity was 88.1% (95% CI: 76.6-94.4%), and AUC was 0.93 (95% CI: 0.81-0.96). For active sacroiliitis versus healthy controls, Dslow achieved sensitivity of 89.3% (95% CI: 79.4%-94.8%), specificity

of 96.3% (95% CI: 88.8%-98.8%), and AUC of 0.98 (95% CI: 0.89-0.98). For inactive sacroiliitis versus controls, Dslow showed a pooled sensitivity of 59.0% (95% CI: 33.0%-80.9%), specificity of 82.9% (95% CI: 31.7%-98.1%), and AUC of 0.72 (95% CI: 0.49-0.89). Dfast and f had lower accuracy across comparisons, with pooled AUCs below 0.85. High heterogeneity was noted in most subgroups.

CONCLUSION

IVIM, particularly the Dslow parameter, demonstrates consistent and high diagnostic accuracy for detecting active inflammation in sacroiliitis. Its non-contrast nature and quantitative capabilities may support its role in axSpA evaluation and disease monitoring. Larger studies are needed to confirm its clinical use.

CLINICAL RELEVANCE/APPLICATION

This meta-analysis provides evidence that IVIM, especially Dslow, offers a contrast-free approach to evaluating sacroiliitis activity in axSpA. It may be a useful alternative in clinical settings where gadolinium administration is not feasible or desirable.

W7-SSMK09-3 THICK AND TELLING: HIP CAPSULE THICKNESS AS A CLUE TO INFLAMMATORY DISEASE

Fabio Yoshimura, MD (*Presenter*)
Adham A. Castro, MD (*Abstract Co-Author*)
Frederico C. Miranda, MD (*Abstract Co-Author*)
Erina M. Nagaya, MD (*Abstract Co-Author*)
Jessyca Otoni, MD (*Abstract Co-Author*)
Camila De Paula Silva, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Atul K. Taneja, MD,PhD (*Abstract Co-Author*)

PURPOSE

The hip capsule may be thickened in nonspecific inflammatory conditions such as adhesive capsulitis, periarthritis, polymyalgia rheumatica. Using MRI, we primarily aimed to evaluate the hip capsule thickness and to provide best cut-off points to differentiate normal vs affected patients.

METHODS AND MATERIALS

Retrospective, cross-sectional and single-centered study,approved by the institutional board. We performed a database search with the inclusioncriteria of MRI of the hip performed with intravenous contrast and whose reportincluded the term “capsulitis”. Cases with known clinical diagnosis for inflammatoryprocess of the joint capsule were excluded, as were patients with imaging findings ofother underlying diseases. The control group consisted of patients without symptomsand normal laboratories. Images were assessed by three fellowship-trainedmusculoskeletal radiologists for quantitative and qualitative parameters. Measurementsof the largest thickness of the capsule were obtained in oblique sagittal, straightsagittal, coronal and axial. Qualitative parameters included capsular and pericapsularedema, enhancement, joint effusion, synovitis and subjective thickening. Inter-readeragreement and cut-off points were determined.

RESULTS

A total of 82 cases were found with the term “capsulitis” in the report. Forty-four cases were excluded, with the final study group comprising 38 subjects. Thecontrol group consisted of 51 subjects matched for age, gender and laterality. Inter-reader agreement ranged from moderate to almost perfect (0.57-0.87). Significantdifferences in hip capsule thickness between cases and controls were found in allplanes, with the sensitivity reaching up to 85.2% (anterior capsule measurement insagittal, mean of 6.27 mm in cases vs. 4.58 mm in controls) and specificity up to 84%(lateral measurement in coronal, mean of 6.53 mm in cases vs. 4.13 mm in controls).The prevalence of qualitative parameters was: 89.1%-91.9% edema, 97.2%-94.5%enhancement, 81.3% joint effusion, 89.2% synovitis, and 100% of capsular thickening.

CONCLUSION

When compared to control subjects, hip capsule is significantlythickened in patients affected by nonspecific inflammatory conditions, such as adhesivecapsulitis, periarthritis and/or polymyalgia rheumatica. Our study provided thresholdsfor MR imaging evaluation of normal vs abnormal hip capsules.

CLINICAL RELEVANCE/APPLICATION

Capsular thickening of the hip on MRI may serve as an early imaging marker of inflammatory arthropathies, especially spondyloarthritides. Its recognition, even in the absence of overt synovitis or bone marrow edema, can support earlier diagnosis and management, improving clinical outcomes through prompt therapeutic intervention.

W7-SSMK09-4 DIAGNOSTIC PERFORMANCE AND READER CONFIDENCE OF A CT-LIKE MRI SEQUENCE FOR ARCO CLASSIFICATION OF FEMORAL HEAD NECROSIS

Felix Herr, MD (*Presenter*)
Christian Alexander Dascalescu, MD (*Abstract Co-Author*)
Natascha Hohmann, MD (*Abstract Co-Author*)
Boj Friedrich F. Hoppe, MD (*Abstract Co-Author*)
Nina Hesse (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Paul Reidler, MD (*Abstract Co-Author*)

PURPOSE

To evaluate a novel CT-like MRI sequence regarding ARCO classification, reader confidence, and image quality, and to compare its diagnostic performance and agreement with standard MRI and radiography.

METHODS AND MATERIALS

In this retrospective study, 21 patients with suspected femoral head necrosis underwent MRI (T1, T2, CT-like) and radiography. Two experienced board-certified physicians (radiology and orthopedics) independently assessed ARCO stage (I-IV), reader confidence, and image quality. Confidence and quality were recorded on a binary numeric scale (1 = high/good, 2 = low/poor). Mean scores were calculated. Interrater reliability was evaluated using intraclass correlation coefficients (ICC); intermodality agreement was assessed via weighted Cohen’s Kappa. Wilcoxon signed-rank tests were used for paired comparisons.

RESULTS

For ARCO classification, the CT-like sequence had a higher mean score (2.23 ± 0.78) than radiography (1.75 ± 1.01, $p = 0.001$), T1 (2.08 ± 0.73, $p = 0.010$), and T2 (2.08 ± 0.69, $p = 0.023$), suggesting detection of more advanced stages. Reader confidence was significantly higher for the CT-like sequence (1.11 ± 0.25) vs. T1 (1.53 ± 0.47), T2 (1.50 ± 0.46), and X-ray (1.43 ± 0.37), all $p < 0.01$. Image quality was also superior for CT-like (1.11 ± 0.30) compared to T1 (1.86 ± 0.51) and T2 (1.75 ± 0.51), $p < 0.001$. Agreement in ARCO classification was excellent between CT-like and T1 (? = 0.904), T2 (? = 0.869), and substantial with X-ray (? = 0.709). Interrater reliability for ARCO was good to excellent for all modalities (ICC 0.82-0.93). For reader confidence, ICC was low (< 0.40) across modalities. For image quality, CT-like showed high interrater agreement (ICC = 0.84), while T1 (0.37) and T2 (0.29) showed poor agreement.

CONCLUSION

The CT-like MRI sequence demonstrated superior diagnostic performance in image quality and reader confidence, and may detect more advanced disease stages than conventional modalities. Its strong intermodality agreement and interrater reliability underscore its diagnostic value.

CLINICAL RELEVANCE/APPLICATION

This CT-like MRI sequence may enhance diagnostic accuracy and radiologist confidence in staging femoral head necrosis, while avoiding ionizing radiation and reducing the need for additional imaging.

W7-SSMK09-5 3D ISOTROPIC FASTVIEW MRI LOCALIZER ENABLES ACCURATE AND RELIABLE LOWER LIMB TORSION ASSESSMENT

Natascha Hohmann, MD (*Presenter*)
Felix Herr, MD (*Abstract Co-Author*)
Christian Alexander Dascalescu, MD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Nina Hesse (*Abstract Co-Author*)
Paul Reidler, MD (*Abstract Co-Author*)

PURPOSE

To assess whether a 3D isotropic MRI localizer (FastView), acquired during continuous table movement, provides comparable accuracy to a dedicated MRI protocol for measuring femoral and tibial torsion, potentially reducing scan time and streamlining workflow.

METHODS AND MATERIALS

This retrospective single-center study included 60 legs from 30 patients (mean age 27.1 ± 11.5 years; 19 female, 11 male) who underwent both a dedicated torsion MRI protocol and a 3D isotropic FastView localizer. The FastView protocol featured 5×5×5 mm voxel resolution and 17.4-second acquisition time for an 80 cm limb. The dedicated MRI protocol included three regional T1 VIBE sequences (total scan time 6:54 min). Femoral torsion was measured using the Lee, Reikeras, Tomczak, and Murphy methods. Tibial torsion was calculated by summing angles between the tibial plateau and the pilon. Two readers assessed all cases independently. Statistical analysis included paired testing, intraclass correlation coefficients (ICC), Bland-Altman analysis, and Pearson correlation (R^2).

RESULTS

In total sixty legs were evaluated and no significant differences between all measured angles on the dedicated protocol and istrotropic FastView Localizer were observed ($p > 0.05$). Inter-modality reliability for femoral torsion was excellent across all methods (ICC: 0.91-0.96), with mean differences from -2.5 ± 2.5° to -3.1 ± 2.9° ($p < 0.001$). Tibial torsion also showed strong agreement (ICC: 0.91-0.94), with a mean difference of -1.6 ± 3.3° ($p = 0.012$). Inter-reader agreement was excellent (ICC: 0.95-0.99). Bland-Altman analysis showed narrow limits of agreement and strong correlation (R^2: 0.891-0.963).

CONCLUSION

FastView MRI demonstrated excellent agreement with the dedicated torsion protocol in all femoral and tibial measurements, despite small but significant differences. High ICCs, narrow LOAs, and strong correlations support its use as a valid alternative.

CLINICAL RELEVANCE/APPLICATION

The isotropic FastView MRI localizer offers a fast and resource-efficient method for assessing lower limb torsion, potentially replacing standard multi-sequence protocols in routine clinical practice.

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W7-SSMK10

Musculoskeletal Imaging (Shoulder)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E450B

Kimberly K. Amrami, MD (*Moderator*)
Iman Khodarahmi, MD, PhD (*Moderator*)

Sub-Events

W7-SSMK10-1 MRI AND CLINICAL OUTCOMES FOLLOWING MUSCLE-TENDON TRANSFER: UNDERSTANDING THE DISCREPANCY BETWEEN STRUCTURAL INTEGRITY AND FUNCTION

Maryam Soltanolkotabi, MD (*Presenter*)
Ghazaleh Safazadeh, MD,MPH (*Abstract Co-Author*)
Megan K. Mills, MD (*Abstract Co-Author*)

PURPOSE

To assess the relationship between postoperative tendon integrity on MRI and clinical outcomes following muscle-tendon transfer (MTT) for massive rotator cuff tears (MRCTs), and to incorporate preliminary electromyographic (EMG) findings to evaluate neuromuscular function.

METHODS AND MATERIALS

15patients (mean age 57 ± 15 years, all male) who underwent MTT between 2017-2021 were retrospectively evaluated. 21 postoperative MRI examinations were reviewed, grading tendon integrity using the Sugaya classification and fatty infiltration using the Goutallier classification. Clinical outcomes included American Shoulder and Elbow Surgeons (ASES) scores, PROMIS upper extremity v1.2, Numeric Rating Scale (NRS) for pain, range of motion, and strength testing. Patients were stratified into two groups based on tendon integrity: Sugaya grades 1-2 (sufficient thickness) vs. grades 3-5 (insufficient thickness/discontinuity). Statistical analysis included paired t-tests and Spearman's correlation. Preliminary EMG data were analyzed for muscle activation patterns.

RESULTS

Across the cohort, ASES scores improved by a mean of +10 points ($p=0.49$), and NRS scores decreased by -1.5 points ($p=0.005$). Forward elevation improved by +24° ($p=0.09$), and abduction strength improved by +1 grade on the manual muscle testing scale ($p=0.013$). A significant positive correlation was observed between higher Sugaya grades and ASES scores (? > 0, $p<0.05$), indicating that patients with worse tendon integrity had better functional outcomes. Patients with insufficient tendon thickness (Sugaya grades 3-5) demonstrated significantly greater improvements in both ASES and NRS scores compared to those with sufficient tendon thickness (grades 1-2). Preliminary EMG data showed synchronous activation of transferred muscles with the contralateral side, suggesting functional neuromuscular adaptation despite incomplete structural repair.

CONCLUSION

Postoperative tendon discontinuity, as graded by Sugaya classification, paradoxically correlates with superior functional outcomes following MTT for MRCT. Preliminary EMG findings support that neuromuscular reorganization may underlie these improvements, challenging traditional assumptions regarding the role of structural integrity in postoperative success.

CLINICAL RELEVANCE/APPLICATION

Radiologists and surgeons should recognize that MRI evidence of tendon insufficiency post-transfer may not predict clinical failure. Multimodal postoperative evaluation, including functional and electrophysiologic assessment, may better guide patient management.

W7-SSMK10-2 BACK TO THE EDGE: THE HIDDEN ROLE OF GLENOID RETROVERSION IN POSTERIOR AND PAN-LABRAL TEARS

Sriram Rajan, MD, MBBS (*Presenter*)
Pooja Jain, MBBS (*Abstract Co-Author*)
Harsh Mahajan, MD, MBBS (*Abstract Co-Author*)

PURPOSE

The purpose of this study is to evaluate the relationship between glenoid retroversion and posterior rim dysplasia with the extent and pattern of labral tears. The hypothesis was that moderate to severe dysplasia and increased retroversion are associated with more extensive labral pathology including panlabral tears. (SLAP type IX).

METHODS AND MATERIALS

This retrospective study included 86 shoulder MRI studies performed between January 2024 and January 2025. The scans were retrieved from the institutional PACS database and were anonymized and randomized prior to evaluation. Exclusion criteria included poor image quality, infection, tumors, presence of metal hardware causing artifacts, and significant motion artifacts. After applying exclusion criteria, the final cohort consisted of 83 patients, comprising 41 females and 42 males, with an age range of 17 to 88 years. All MRI studies were independently reviewed by two musculoskeletal radiologists: one with 23 years of experience (SR) and the other with 8 years of experience (PJ). Cartilaginous and bony glenoid retroversion were measured on axial MR images and posteriro glenoid dysplasia was evaluated and scored as - 0 = no dysplasia, 1 = lazy-J pattern, and 2 = delta pattern. The location of meniscal tears were scored as anteroinferior, posteroinferior, posterosuperior, extended and panlabral tears. Discrepancies were resolved by consensus and by arthroscopic follow up.

RESULTS

Glenoid dysplasia was seen in 28.9% patients (24 out of 83 patients) and Glenoid dysplasia increased odds of posterosuperior tears 14-fold (OR = 14.1, $p = 0.004$) compared to normal glenoids. Glenoid retroversion >8° was seen in 20.48% (18 out of 83 patients) and was significantly correlated with posterosuperior labral tears ($r = 0.31$, $p = 0.005$) and panlabral tears ($r = 0.33$, $p = 0.003$). 80% of panlabral tears occurred in patients with retroversion >8° (mean 9.4° vs. 5.6° in others, $p = 0.002$). Posterosuperior labrum was most vulnerable (23.2% tear prevalence), with 75% of severe dysplasia cases affected. Males trended toward higher retroversion angles (6.8° vs. 5.5°, $p = 0.08$), though tear rates did not differ by gender ($p = 0.36$).

CONCLUSION

Glenoid retroversion greater than 8 degrees and glenoid dysplasia increased the chances of posterior labral tears, as well as panlabral tears. The incidence of both glenoid retroversion and glenoid rim dysplasia are sufficiently frequent that they should be looked for in routine shoulder MR study

CLINICAL RELEVANCE/APPLICATION

Glenoid retroversion and glenoid rim dysplasia predispose patients to posterior and panlabral tears. Identification of version and dysplasia is crucial for management of these patients.

W7-SSMK10-3 IMAGING PREDICTORS OF ACROMIAL FRACTURES FOLLOWING REVERSE TOTAL SHOULDER ARTHROPLASTY

Heidi J. Horan-Henderson, MD (*Presenter*)
Ghazaleh Safazadeh, MD,MPH (*Abstract Co-Author*)
Madison Gardner (*Abstract Co-Author*)
Nathan Barber (*Abstract Co-Author*)
Kendon Holdaway (*Abstract Co-Author*)
Maryam Soltanolkotabi, MD (*Abstract Co-Author*)

PURPOSE

Acromial fractures (AcFx) are a complication after reverse total shoulder arthroplasty (RTSA), associated with pain, impaired shoulder function, and prosthesis failure. Predictors of AcFx risk are poorly defined. Morphologic features and prosthesis position may influence mechanics of the scapular spine and acromion, thereby increasing susceptibility to AcFx. This study sought to identify imaging-based patient and prosthesis characteristics that predict AcFx risk post-RTSA.

METHODS AND MATERIALS

A retrospective case-control study was done on patients who underwent RTSA at a single large tertiary institution between January 2020 and July 2024, with >10 months of follow-up. Exclusion criteria included revision arthroplasty, pre-existing bone lesions, AcFx before RTSA or from postoperative trauma, insufficient imaging, and displaced humeral fractures. Non-displaced fractures were included if surgical approach was not altered. AcFx were classified using the Levy classification. Subjects were matched 1:2 (case:control) by age and sex. Covariates included BMI, bone demineralization, inflammatory arthropathy, diabetic and smoking status, as well as acromial morphometrics (length and thickness) and preoperative glenoid-to-greater tuberosity distance. Prosthesis-related factors were evaluated by measuring humeral and glenoid lateralization and calculating global offset. Descriptive analyses and multivariable logistic regression were performed.

RESULTS

After screening 718 RTSAs, 36 (6.8%) AcFx cases were identified among 526 procedures. Mean time to fracture was 4.6±4 months, with 78% occurring within six months. Using the Levy classification, 61% were Type 1 fractures, 33% Type 2, and 6% Type 3. The AcFx group and matched controls (n=72) were 80% female, with a mean age of 70±9 years. AcFx patients had a higher prevalence of bone demineralization (47% vs. 26%, p=0.03), shorter acromial length (34.7 vs. 37.5 mm, p=0.053), and less humeral lateralization (15.6 vs. 18 mm, p=0.038). Multivariable logistic regression_ adjusting for age, sex, BMI, acromion measurements, and humeral lateralization_trended toward significance for bone demineralization (OR 2.56, p=0.059), shorter acromial length (OR 0.93, p=0.083), and reduced humeral lateralization (OR 0.92, p=0.075).

CONCLUSION

Shorter acromial length and reduced humeral lateralization are associated with increased risk of AcFx after RTSA. These features could be predictive of postoperative AcFx, alerting radiologists to higher-risk patients and prompting closer postoperative surveillance.

CLINICAL RELEVANCE/APPLICATION

AcFx are an important post-RTSA complication. Shorter acromial length and reduced humeral lateralization may guide postoperative monitoring.

W7-SSMK10-4 BRIDGING THE GAP: MRI COMPARISON OF THE ROTATOR CABLE AND CRESCENT WITH INTACT AND TORN CUFF

Sriram Rajan, MD, MBBS (*Presenter*)
Pooja Jain, MBBS (*Abstract Co-Author*)
Harsh Mahajan, MD, MBBS (*Abstract Co-Author*)

PURPOSE

To investigate the thickness of the cuff at the level of cable, contrasted with the cuff at the rotator crescent, in patients of different ages, in normal cuffs and in patients with articular surface partial tears. In addition, we wanted to note if the cable is well seen in patients with full thickness tears.

METHODS AND MATERIALS

102 consecutive MR shoulders referred for various indications were extracted from the PACS between January 2024 to January 2025. Studies were excluded for poor quality of scan, infections, tumors, metal artefact and motion artefacts and a total of 83 studies were then anonymized and randomized and read by two observers with 23 years (SR) and 8 years (PJ) of experience. Age range noted of the patients were from 17-88 years of age, with 41 female and 32 male patients. Scans were read for the cuff thickness at the rotator Cable (RCt), and cuff thickness at Rotator Crescent (RCrt), thickness of cable (Ct), Width of rotator cable (RCw) and width of Rotator Crescent (RCrw). The anatomy of the rotator cable was confirmed with triangulation. Additionally, presence of supraspinatus tendon tear in the insertional footprint or critical zone was marked as absent (0), partial thickness tear (1) or full thickness tear (2) . The data was collated and statistical analysis was done.

RESULTS

Rotator cable was visualized in all patients, with and without cuff disease and at all ages. Rotator cable and crescent thickness were ~30% thinner in cuff disease vs. normal cuff group ($p < 0.001$).Crescent width reduced by 26.5% in cuff disease (9.8mm ? 7.2mm, $p < 0.001$) while rotator cable width showed no significant difference ($p = 0.43$)Crescent thickness =2.7 mm predicted cuff disease with 82% sensitivity (AUC = 0.79, $p < 0.001$)Patients >60 years had thinner cables (3.3 ± 1.1mm vs. 4.1 ± 0.8mm, $p = 0.003$) regardless of group

CONCLUSION

The rotator cable can be visualized in all cuffs, especially with careful analysis and triangulation. Rotator crescent showed thinning with age, with relative thickening/ absence of thinning of the rotator cable. Thickening of the rotator cable (absolute thickness increase) was not seen in the normal ageing cases.

CLINICAL RELEVANCE/APPLICATION

The presence of the rotator cable has been linked with near normal abduction in patients with full thickness supraspinatus tendon tears, if the rotator cable attachments were intact, and if the axial plane stabilizers (the infraspinatus and subscapularis tendons) were intact. Visualization of the rotator cable in normal and abnormal scans is essential to prognosticate cuff tears, and to decide on management.

W7-SSMK10-5 A TALE OF TWO TEARS: INFRASPINATUS ATROPHY IN SUPRASPINATUS VS INFRASPINATUS TENDON INJURIES

Sriram Rajan, MD, MBBS (*Presenter*)
Pooja Jain, MBBS (*Abstract Co-Author*)
Harsh Mahajan, MD, MBBS (*Abstract Co-Author*)

PURPOSE

To compare the extent of infraspinatus muscle atrophy in patients with isolated supraspinatus tendon tears versus those with infraspinatus tendon tears, in order to determine how tear location influences secondary muscle degeneration.

METHODS AND MATERIALS

MR studies of 86 patients from January 2024 to January 2025, for varying indications were extracted from PACS, anonymized and randomized. Patient demographics were- Age range from 17-88 years of age, with 41 female and 32 male patients. MRI images were independently reviewed by two observers with 23 years (SR) and 8 years(PJ) of experience and read by consensus. Tendon integrity was assessed on coronal and axial FSPD images at three locations: the SSP insertion, the SSP critical zone, and the IS tendon. Tears were graded as- 0 - normal tendon, 1 - tendinopathy, 2 - partial-thickness tear (pTT), and 3 - full-thickness tear (FTT). Fatty infiltration of the supraspinatus and infraspinatus muscles was scored using the Goutallier classification on sagittal T1-weighted MRI.

RESULTS

Infraspinatus muscle fatty infiltration is strongly associated with infraspinatus tendon tears, with 13.8% of partial-thickness and 40.0% of full-thickness tears showing Goutallier grade =2, while no fatty infiltration was observed in grade 0-1 cases. The Odds ratio for developing infraspinatus fatty infiltration in the presence of a tear is very high. Infraspinatus fatty infiltration is absent in isolated supraspinatus tears, with 0% of patients showing Goutallier grade =2 when the infraspinatus tendon is intact. Supraspinatus tendon tears (with ISP tears) contribute modestly to infraspinatus fatty infiltration, increasing its occurrence from 6.4% in patients without SSP tears to 9.1% in those with SSP tears (grade =2). Supraspinatus fatty infiltration is more frequent with higher-grade tears at the insertion site, seen in 10.0% of partial-thickness and 14.3% of full-thickness tears.

CONCLUSION

Infraspinatus muscle fatty infiltration in our study was not seen in any case with supraspinatus tendon tear. Supraspinatus with infraspinatus tendon tears do contribute to infraspinatus fatty infiltration.

CLINICAL RELEVANCE/APPLICATION

Defining the infraspinatus tendon footprint helps in identifying infraspinatus tendon tear. The larger infraspinatus tendon insertional footprint is probably responsible for previously reported cases of infraspinatus muscle fatty infiltration with supraspinatus tendon tears

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

W7-SSNR11

Neuroradiology (Epilepsy/Trauma)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E353B

Yun Jung Bae, MD, PhD (*Moderator*)
Justin Rodriguez, MD (*Moderator*)

Sub-Events

W7-SSNR11-1 MULTI-MODAL GRAPH-BASED MACHINE LEARNING FOR PREDICTING SURGICAL OUTCOME IN EPILEPSY PATIENTS

Syeda Abeera Amir, BS (*Presenter*)
Syed M. Anwar, PhD (*Abstract Co-Author*)

PURPOSE

Reliable prediction of seizure outcomes after surgical intervention is essential for personalized epilepsy treatment planning. While traditional predictive methods rely heavily on clinical expertise, advanced imaging analysis using artificial intelligence offers new opportunities for outcome prediction. This study presents a novel deep learning-based spatio-temporal graph neural network (ST-GNN) model that integrates structural MRI with stereo electroencephalography (sEEG) data to predict post-surgical seizure reduction.

METHODS AND MATERIALS

We performed multimodal co-registration between preoperative CT and postoperative MRI to localize sEEG electrode positions within brain anatomy, enabling accurate spatial mapping of electrophysiological activity to structural regions. A total of 10 pediatric patients with sEEG contacts in the thalamus were considered, where data from multiple ictal events was used to train the model. Our ST-GNN model integrates local and global connectivity using graph convolutions with multi-scale attention mechanisms to capture patterns between difficult-to-study regions such as the thalamus and cortical/subcortical regions, with the co-registered imaging data providing critical spatial context for electrode contacts and anatomical connectivity mapping. The ST-GNN model was designed to process this multimodal data by creating graph representations where nodes represent brain regions identified on MRI and edges capture both structural connections and functional connections from sEEG.

RESULTS

The multimodal ST-GNN model achieved 90.4% accuracy for seizure-wise prediction and 75.4% accuracy for patient-wise prediction, significantly outperforming single-modality approaches. Edge-level importance analysis identified the thalamus-insula structural pathway as a key predictor of surgical success.

CONCLUSION

Our findings underscore the potential of new connectivity-based deep learning models leveraging multimodal data for enhancing the prediction of seizure outcomes and tailoring treatment planning for epilepsy. Our multi-modal approach can help inform AI-assisted personalized epilepsy treatment planning.

CLINICAL RELEVANCE/APPLICATION

This study will lay the groundwork for analysing SEEG data for treatment planning when treating pediatric epilepsy.

W7-SSNR11-3 FUNCTIONAL GRADIENT MAPPING REVEALS MULTINETWORK REORGANIZATION IN DRUG-NAÏVE CHILDREN WITH CENTROTEMPORAL SPIKES SELF-LIMITED EPILEPSY: A MACHINE LEARNING APPROACH FOR EARLY NEUROIMAGING BIOMARKER DISCOVERY

Dinglan Yang (*Presenter*)
Linfeng Song (*Abstract Co-Author*)
Lin Jiang (*Abstract Co-Author*)

PURPOSE

This study aimed to investigate hierarchical brain organization abnormalities in drug-naïve children with self-limited epilepsy with centrotemporal spikes (SeLECTS), using functional gradient mapping and machine learning to explore early neuroimaging biomarkers.

METHODS AND MATERIALS

33drug-naïve SeLECTS patients and 32 matched healthy controls underwent resting-state fMRI. Voxel-wise functional gradients were computed within the Yeo 7-network template using diffusion embedding. Seventeen gradient features were extracted from regions showing significant group differences and fed into four classifiers: linear SVM, RBF-SVM, random forest, and k-nearest neighbor. Performance was evaluated using leave-one-out and five-fold cross-validation based on AUC and accuracy

RESULTS

SeLECTS patients exhibited widespread network-specific gradient reorganization. The somatomotor network showed increased dispersion in the supplementary motor areas. In the default mode network, higher gradients were found in the anterior cingulate cortex and reduced gradients in the left middle temporal gyrus, negatively correlated with IQ. The DAN and limbic networks showed altered gradients in parietal, inferior temporal, hippocampal, and amygdala regions. VAN and visual networks exhibited disrupted attention-perception coupling. Top-ranking features included LIM_Temporal_Pole_Sup_R (11.1%) and DAN_Temporal_Inf_R (10.5%). Linear SVM showed the best performance (AUC = 0.97559).

CONCLUSION

Functional gradient analysis revealed early multinetwork alterations in SeLECTS. Gradient-based features demonstrated high classification accuracy and relevance to cognition, supporting their potential as non-invasive imaging biomarkers for early diagnosis and individualized intervention in pediatric epilepsy.

CLINICAL RELEVANCE/APPLICATION

This study provides evidence that functional gradient mapping can reveal early, network-specific brain reorganization in drug-naïve children with SeLECTS. The identified gradient-based features, particularly within somatomotor, limbic, and attention-related networks, demonstrate strong diagnostic potential when incorporated into a

machine learning framework. These findings support the use of non-invasive functional gradient analysis as an emerging neuroimaging biomarker approach for early detection, individualized diagnosis, and treatment planning in pediatric epilepsy. The high classification accuracy achieved by the linear SVM model suggests that this method may complement or potentially reduce reliance on invasive diagnostic procedures, facilitating timely intervention before irreversible cognitive decline occurs.

W7-SSNR11-5 REPORTING THE RISK: PREDICTIVE VALUE OF ADMISSION CT SIGNS FOR INTRAPARENCHYMAL HEMATOMA EXPANSION

Lua Irene Santamaria, MD (*Presenter*)
Udane Perez Ibarrondo, MD (*Abstract Co-Author*)
Marta Alaia Montes Zubia, MD (*Abstract Co-Author*)
Olivia Maria Rodriguez San Vicente (*Abstract Co-Author*)
Ainara Dolado Llorente, MEd (*Abstract Co-Author*)

PURPOSE

To assess the association between specific radiological signs on baseline non-contrast and contrast-enhanced CT and hematoma expansion in patients with primary spontaneous intraparenchymal hemorrhage, aiming to identify imaging markers that may be relevant for early prognosis and reporting.

METHODS AND MATERIALS

We conducted a retrospective study including 100 patients with primary spontaneous intraparenchymal hemorrhage and a follow-up CT within 72 hours. Secondary causes of bleeding were excluded. Demographic, clinical, and imaging variables were analyzed. The radiological assessment included findings from both non-contrast and contrast-enhanced CT, focusing on imaging markers potentially associated with hematoma expansion: hematoma volume, intraventricular extension, herniation signs, hematoma margins, and specific CT signs such as spot sign, leakage sign, spot-tail sign, island sign, satellite sign, blend sign, swirl sign, black hole sign, intralesional hypodensities, fluid-blood level, and subarachnoid hemorrhage. Descriptive and bivariate analyses were performed. A multivariable logistic regression model was developed to identify independent predictors of hematoma expansion. Model performance and calibration are being evaluated using standard statistical tests and ROC analysis.

RESULTS

Preliminary analysis showed a statistically significant association between hematoma expansion and three key imaging features on initial CT: hematoma volume, the presence of the spot sign, and the swirl sign. All three remained independent predictors in multivariable analysis. Evaluation of final model performance and interobserver agreement is ongoing and expected to further support the reliability of these findings.

CONCLUSION

Initial CT offers more than just a snapshot—it provides prognostic insight. Imaging markers such as spot sign, swirl sign, and hematoma volume emerged as independent predictors of early hematoma expansion in primary spontaneous intracerebral hemorrhage. While this study focused exclusively on radiologic features, these early signs hold promise for integration into structured radiology reporting and may guide timely, targeted clinical action.

CLINICAL RELEVANCE/APPLICATION

Hematoma expansion affects up to one-third of patients with primary spontaneous ICH and is a leading determinant of early neurological deterioration and poor outcomes. Identifying predictive CT signs at presentation empowers radiologists to flag high-risk cases, optimize clinical decision-making, and potentially reduce morbidity and mortality through tailored intervention. Integrating these imaging markers into routine radiology reports may play a key role in shifting the clinical trajectory of these patients.

W7-SSNR11-6 CORPUS CALLOSUM WHITE MATTER INTEGRITY RELATED TO SYMPTOM PRESENTATION AND CONCURRENT POST-TRAUMATIC STRESS DISORDER IN MILD TRAUMATIC BRAIN INJURY PATIENTS

Priya Santhanam, PhD (*Presenter*)
Thomas Knoblauch, MS (*Abstract Co-Author*)
Alan Rodriguez, MD (*Abstract Co-Author*)
Leo Germin, MD (*Abstract Co-Author*)
Enrico Fazzini, DO,PhD (*Abstract Co-Author*)
Travis H. Snyder, DO (*Abstract Co-Author*)

PURPOSE

This study aims to compare diffusion tensor imaging (DTI) findings in mild traumatic brain injury (mTBI) patients with or without post-concussive symptomology and post-traumatic stress disorder (PTSD).

METHODS AND MATERIALS

Civilian patients (n=451; mean age 43 years, range 13-82) with clinically diagnosed mTBI underwent DTI imaging and clinical evaluation. Commonly reported mTBI symptoms (headache, balance problems, cognitive deficits, fatigue, anxiety, depression, emotional lability) were noted, and mTBI+PTSD group was designated using DSM-V diagnostic criteria for evaluation of PTSD. For DTI image analysis (Olea Sphere v3.0 SP12), the corpus callosum (CC) and subregions were hand-traced for each individual patient (Figure), and fractional anisotropy (FA) mean values were obtained across these regions. FA was compared between patients with mTBI only and those with mTBI+PTSD by Mann-Whitney U test, while symptom load between groups was compared by Fisher's exact test. Association between FA and individual symptoms as well as symptom load were examined by ANOVA and general linear modeling (SPSS v.29).

RESULTS

FA was significantly lower for mTBI+PTSD patients in the whole CC ($p<0.001$) as well as in the anterior/inferior ($p=0.003$), anterior ($p<0.001$), mid-body ($p=0.006$), posterior ($p=0.007$), and posterior/inferior ($p=0.017$) subregions individually. When symptom effects were modeled with age and PTSD status as covariates, only fatigue was significantly related to total CC FA ($p=0.044$), while age and/or PTSD status accounted for FA for all other symptoms. The mTBI+PTSD patients had more symptoms ($p<0.001$) as compared to those with mTBI only (Figure). Further, there was an inverse association between regional FA and symptom count in many CC regions, with (anterior/inferior: $p=0.002$; mid-body: $p<0.001$; posterior: $p=0.048$) and without (total CC: $p=0.020$; anterior/inferior: $p<0.001$; anterior: $p=0.05$; mid-body: $p<0.001$; posterior-inferior: $p=0.002$) adjusting for age and PTSD status.

CONCLUSION

Overall, symptomatic mTBI patients had lower white matter integrity in the CC than asymptomatic patients. Additionally, patients with mTBI+PTSD had more symptoms and reduced CC white matter integrity as compared to patients with mTBI only. Regardless of PTSD status, symptom load was associated with FA in mTBI patients. The presence of specific symptoms and symptom load may be sensitive metrics reflective of PTSD status for identifying mTBI patients with compromised white matter integrity in the CC.

CLINICAL RELEVANCE/APPLICATION

Compromised corpus callosum white matter integrity in concurrent mTBI and PTSD patients is related to post-concussive symptom presentation and burden.

Abstract Archives of the RSNA, 2025

W7-SSNR12

Science Session with Keynote: Neuroradiology (Artificial Intelligence for Image Acquisition)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: S406B

Jeffrey Rudie, MD, PhD (*Moderator*)
Gagandeep Singh, MD, MBA (*Moderator*)

Sub-Events

W7-SSNR12-2 DEEP RESOLVE BOOST IN 2D MRI: A DOUBLE-EDGED SWORD

Arsany H. Hakim, MD (*Presenter*)
Roman Rohner, MD (*Abstract Co-Author*)
Anna Winklehner (*Abstract Co-Author*)
Jean-Benoit Rossel (*Abstract Co-Author*)
Christian Lehmann (*Abstract Co-Author*)
Roland Wiest (*Abstract Co-Author*)
Jan Gralla, MD (*Abstract Co-Author*)
Eike I. Piechowiak, MD (*Abstract Co-Author*)

PURPOSE

Deep Resolve Boost (DRB) is a deep learning-based reconstruction method that enables reduced acquisition times and improved image quality in MRI. However, its influence on diagnostic performance - particularly regarding artifact burden and anatomical structure delineation - remains insufficiently studied. This study aimed to assess the clinical utility and limitations of DRB in 2D MRI sequence in neuroradiology.

METHODS AND MATERIALS

The investigated DRB-enhanced sequences are FDA-cleared and CE-marked for clinical use. The local ethics committee granted an exemption from formal ethical approval. In this quality assessment study, 256 paired 2D sequences were obtained from 200 patients undergoing routine MRI. For each examination, both standard and DRB-accelerated sequences were acquired in the same session using identical scanner settings, surface coil, sequence parameters, slice thickness, and orientation. Image quality, anatomical structure delineation, artifact presence, and lesion conspicuity were independently rated by two blinded readers.

RESULTS

DRB sequences were rated as having good or fair image quality in 94.5% of cases, with image quality improved or unchanged compared to standard sequences in 95.7% of examinations. However, anatomical delineation—particularly of the brainstem, hippocampus, cerebellum, and deep gray matter—was consistently inferior in DRB images. Artifacts were more pronounced in 27.3% and newly introduced in 84.8% of DRB sequences, with the brainstem, cerebellum, and deep gray matter being most frequently affected. Artifact types included motion, noise, ghosting, pulsation, and blurring. Lesion conspicuity was rated as equivalent in 91.6% of cases, with improvements in 7.2% and degradation in 1.2%.

CONCLUSION

DRB allows significant acceleration of 2D MRI while preserving overall image quality and lesion detectability. Nonetheless, limitations include increased artifact burden, the emergence of new artifacts, and compromised anatomical delineation in specific brain regions.

CLINICAL RELEVANCE/APPLICATION

The presence of artifacts, along with reduced delineation of certain anatomical structures underscores the necessity for cautious indication-specific implementation of DRB. A balanced imaging protocol incorporating both standard and DRB sequences is advisable to maintain diagnostic confidence and minimize the risk of misinterpretation, particularly in clinical contexts that demand high anatomical precision, such as epilepsy work-up, or brainstem evaluation. Radiologists should be familiar with DRB-associated artifacts and their typical anatomical distribution to mitigate the risk of misinterpretation and to avoid diagnostic errors in clinical practice.

W7-SSNR12-3 MOTION-INFORMED 3D DEEP LEARNING RECONSTRUCTION IN PATIENTS WITH COGNITIVE IMPAIRMENT

Shohei Fujita, MD, PhD (*Presenter*)
Daniel Polak (*Abstract Co-Author*)
Marcel D. Nickel (*Abstract Co-Author*)
Daniel N. Splitthoff (*Abstract Co-Author*)
YANTU HUANG (*Abstract Co-Author*)
Nelson H. Gil JR, MD, PhD (*Abstract Co-Author*)
Sittaya Buathong, MD (*Abstract Co-Author*)
Chen-Hua Chiang, MD (*Abstract Co-Author*)
Wei-Ching Lo (*Abstract Co-Author*)
Bryan Clifford, PhD (*Abstract Co-Author*)
Steve Cauley, PhD (*Abstract Co-Author*)
John Conklin, MD, MSc (*Abstract Co-Author*)
Susie Y. Huang, MD, PhD (*Abstract Co-Author*)

PURPOSE

Most deep learning (DL) reconstruction techniques improve signal-to-noise ratio but lack explicit mechanisms to correct for motion. To validate a DL reconstruction method that integrates retrospective motion correction into the reconstruction pipeline for three-dimensional (3D) T1-weighted brain MRI.

METHODS AND MATERIALS

This prospective, intra-individual comparison study included a controlled-motion cohort of healthy volunteers and a clinical cohort of patients undergoing evaluation for memory loss. Each cohort was scanned at distinct outpatient imaging sites between October 2022 and August 2023 in staggered periods. All participants underwent 4-fold under-sampled 3D magnetization-prepared rapid gradient-echo imaging with integrated Scout Accelerated Motion Estimation and Reduction (SAMER) acquisition.

Image volumes were reconstructed using standard-of-care methods and the proposed motion-informed DL approach. Unlike approaches that apply motion correction and DL reconstruction independently/sequentially, our method incorporates motion information directly into the forward model of the unrolled network. Quantitative morphometric accuracy was assessed by comparing brain segmentation results of instructed-motion scans to motion-free reference scans in the healthy volunteers. Image quality was rated by two board-certified neuroradiologists using a five-point Likert scale. Statistical analysis included Wilcoxon tests and intraclass correlation coefficients.

RESULTS

A total of 41 participants (15 women [37%]; mean age, 58 years) and 154 image volumes were evaluated. The DL-based method with integrated motion correction significantly reduced segmentation error under moderate and severe motion (12.4% to 3.5% and 44.2% to 12.5%, respectively; $p < .001$). Visual ratings showed improved scores across all criteria compared with standard reconstructions (overall image quality, 4.26 ± 0.72 vs. 3.59 ± 0.82; $p < .001$). In 47% of cases, motion artifact severity was improved following DL-based processing. Inter-reader agreement ranged from moderate to substantial.

CONCLUSION

Motion-informed DL reconstruction improved both morphometric accuracy and perceived image quality in 3D T1-weighted brain MRI. This technique may enhance diagnostic utility and reduce scan failure rates in motion-prone patients with cognitive impairment.

CLINICAL RELEVANCE/APPLICATION

In patients with cognitive decline, this technique statistically significantly improved image quality and postprocessing reliability, reducing scan failures and repeat imaging, lowering costs, and contributing to better patient care.

W7-SSNR12-4 LOW-IODINE-DOSE BRAIN COMPUTED TOMOGRAPHY ANGIOGRAPHY USING ARTIFICIAL INTELLIGENCE-BASED CONTRAST BOOSTING AND CONTRAST-ENHANCEMENT BOOST TECHNIQUES

Chuluunbaatar Otgonbaatar, MD (*Presenter*)
Huijin Song, PhD (*Abstract Co-Author*)
Inpyeong Hwang, MD (*Abstract Co-Author*)
Tae Jin Yun, MD (*Abstract Co-Author*)
Myung Seok Yoo (*Abstract Co-Author*)
Hackjoon Shim, PhD (*Abstract Co-Author*)
Chul-Ho Sohn, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility and effectiveness of contrast-enhancement (CE) boost and artificial intelligence-based contrast-boosting (AI-based boost) techniques in improving image quality in brain CT angiography (CTA) using a low-dose contrast media, compared to a standard-dose protocol.

METHODS AND MATERIALS

This retrospective single-center study included 32 patients who underwent brain CTA. Sixteen patients received a standard contrast dose (60 mL), while the remaining 16 received a low-dose (30 mL). The low-dose group images were further processed using CE-boost and AI-based boost techniques. Quantitative image parameters—including image noise, CT attenuation, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), noise power spectrum (NPS), and image sharpness evaluated by full width at half maximum (FWHM)—were measured and compared.

RESULTS

There were no significant differences in quantitative image metrics between the standard (5.92 ± 0.80)- and low-dose group (5.48 ± 1.26). Both the CE-boost and AI-based boost techniques in the low-dose group significantly improved CT attenuation (617.20 ± 154.10 vs. 683.40 ± 175.70 vs. 442.80 ± 110.40), reduced image noise (3.47 ± 0.89 vs. 3.97 ± 0.99 vs. 5.92 ± 0.80), and increased SNR (87.10 ± 25.01 vs. 71.47 ± 16.74 vs. 56.42 ± 10.95) and CNR (164.30 ± 65.67 vs. 144.70 ± 44.64 vs. 57.59 ± 17.16) compared to the standard-dose group. The CE-boost method demonstrated lower noise magnitude and a reduced peak in the NPS compared to the AI-based boost. Boost methods significantly improved image sharpness, as measured by FWHM, compared to the standard-dose group. The combination of AI-based boost with CE-boost images in the low-dose group resulted in the superior quantitative image quality, with the highest CT attenuation, lowest image noise, and greatest sharpness.

CONCLUSION

Both CE-boost and AI-based boost methods in the low-dose contrast group resulted in superior image quality compared to the standard-dose protocol. The combined use of CE-boost and AI-based boost methods allows for significant image quality enhancement in brain CTA performed with low-dose contrast media.

CLINICAL RELEVANCE/APPLICATION

The use of CE-boost and AI-based boost methods appears to be an effective strategy for reducing the required amount of contrast media, thereby supporting efforts to minimize the risk of contrast-induced nephrotoxicity.

W7-SSNR12-7 Keynote Speaker

Gagandeep Singh, MD, MBA (*Science Invited Presenter*)

Nov. 30 – Dec. 4
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W7-SSPD04

Science Session with Keynote: Pediatric Imaging (Oncology, Nuclear Medicine and Quality Improvement)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: E350

Marcia Torre-Moreira, MD (*Moderator*)
Diana Veiga Canuto, PhD, MD (*Moderator*)

Sub-Events

W7-SSPD04-1 Keynote Speaker: Neuroblastoma Snapshots: Pediatric Imaging Essentials

Tahani M. Ahmad, MD (*Science Invited Presenter*)

W7-SSPD04-3 CHILDREN ARE NOT SMALL ADULTS! A SYSTEMATIC REVIEW OF THE PERFORMANCE OF ADULT-TRAINED RADIOLOGY AI MODELS IN PEDIATRIC IMAGING

Rachel Ivy, BS (*Presenter*)
James Pierce (*Abstract Co-Author*)
Krutik Nigam (*Abstract Co-Author*)
Aditya Kulkarni, BEng, MSc (*Abstract Co-Author*)
Paul H. Yi, MD (*Abstract Co-Author*)

PURPOSE

Because few radiology AI models are designed specifically for children, AI researchers and vendors have proposed repurposing adult-trained models for pediatric use. However, the performance and safety of this approach remain unclear. We conducted a systematic review of the scientific literature to evaluate how adult-trained radiology AI models perform when tested in children.

METHODS AND MATERIALS

We performed a systematic review of PubMed for all original scientific articles published through 11/1/2024 to identify original studies evaluating the performance of adult-trained radiology AI models tested on pediatric imaging. Two reviewers independently screened studies according to PRISMA guidelines. For each included article, we extracted data on the clinical use case, model performance in adults vs. children, and strategies used to improve pediatric performance (e.g., fine-tuning). Descriptive statistics were used to summarize findings.

RESULTS

Of 2132 articles identified, 15 met inclusion criteria for full-text review. These studies covered a range of AI tasks, including segmentation (n=8), object detection (n=4), and classification (n=3). In nearly all cases, adult-trained models performed worse on pediatric data compared to adults. Only two models—both organ segmentation tasks on CT—showed statistically similar performance between adult and pediatric datasets. The degree of AI performance drop from adults to children varied widely. Some were modest (e.g., chest x-ray pneumonia classification AURO decreased from 0.95 in adults to 0.82 in children in one study), while others were substantial (e.g., CT-based pulmonary nodule detection sensitivity dropped from 96% in adults to 53% in children in another study). Six studies tested fine-tuning adult-trained AI models using limited pediatric data; 5 of these showed statistically significant improvements, though none exceeded the original performance on adults.

CONCLUSION

Adult-trained radiology AI models generally perform worse when applied to pediatric imaging, reinforcing the fact that children are not simply small adults and raising important safety concerns. While fine-tuning with limited pediatric data can improve performance, it does not fully close the gap. These findings underscore the need for dedicated pediatric imaging datasets and the development of pediatric-specific AI tools to ensure safe, effective care for children.

CLINICAL RELEVANCE/APPLICATION

Repurposing adult-trained radiology AI models for use in children may compromise diagnostic performance and safety. These findings highlight the need for developing pediatric-specific AI tools to ensure reliable care for this vulnerable population.

W7-SSPD04-5 QUALITY AND SAFETY OF CONDUCTING MAGNETIC RESONANCE ENTEROGRAPHY WITH ORAL CONTRAST UNDER GENERAL ANESTHESIA IN PEDIATRIC PATIENTS

Mohannad E. Elgamal, MBBS (*Presenter*)
Youck Jen Siu Navarro, MD (*Abstract Co-Author*)
Shyam Sunder B. Venkatakrishna, MBBS (*Abstract Co-Author*)
Rebecca Dennis, DO (*Abstract Co-Author*)
Elizabeth Drum (*Abstract Co-Author*)
Monica Williams (*Abstract Co-Author*)
Sudha A. Anupindi, MD (*Abstract Co-Author*)

PURPOSE

Magnetic resonance enterography (MRE) with oral contrast has become a necessary imaging modality for diagnosing various abnormalities. A challenge faced in younger patients is cooperation and oral contrast tolerance, commonly seen in patients with neurodevelopmental disorders. General anesthesia (GA) becomes essential for optimal imaging, ensuring patient safety and comfort. This study describes our experience with conducting MREs under GA in high-risk pediatric patients and aims to demonstrate the safety and success of this practice.

METHODS AND MATERIALS

Retrospective data from 71 MRE scans were collected from our electronic medical records. All scans were performed under GA, administered via endotracheal intubation. Pediatric anesthesiologists provided supporting variables such as length of anesthesia and American Society of Anesthesiologists (ASA) risk assessment scores. Oral contrast was dosed at 10 ml/kg administered 1 hour prior to the scan via a nasogastric tube. MREs scans were blindly reviewed by 3 pediatric radiologists, assessing the quality of the images and progression of oral contrast. Descriptive statistics were analyzed.

RESULTS

44 patients were male. The median age was 7.6 years old (0.8-20.9). The major indication for MRE was IBD work-up (33) followed by evaluation of small bowel obstruction (12). The leading indications for undergoing GA was "age under 6 years" (26), autism spectrum disorder (13), and patients with neurodevelopmental delay (9). Post-anesthesia incidents occurred in 2 patients, one of which had a sore throat after extubation, and another had respiratory decompensation following a recent pneumonia. No patient had documented aspiration events. 63% of patients had an ASA score =3. The median GA run time was 169 minutes (118-311), while the median scan time was 55 (25-131). All readers rated the quality of the study as either non-diagnostic, inadequate, adequate, or very good. On average, the readers rated 51% of scans as adequate and 21% as very good. No scans were found to be inadequate and/or undiagnosable. Readers also found 38% of scans to demonstrate good progression, adequate opacification, and no motion artifacts. All readers agree that the primary limitation to the quality was the poor progression of contrast to the small bowel (23%).

CONCLUSION

This study highlights our positive experience performing MREs with oral contrast under GA in high-risk pediatric patients. The procedures were conducted safely, with no instances of aspiration or serious immediate adverse events and adequate diagnostic images were obtained.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the safety and utility of GA when performing an MRE with oral contrast on pediatric patients.

W7-SSPD04-6 HOW CAR T-CELL THERAPY CAN IMPACT IMMUNE SYSTEM

Iryna Vasyliv, MD (*Presenter*)

PURPOSE

In the US by 2023, acute lymphoblastic leukemia (ALL) showed 6,660 new cases, 1,560 deaths, 5-year survival rate 67.5%. Chimeric antigen receptor (CAR) T-cell therapy is a new era in immunotherapy for ALL, shows 65%-90% complete response rates in patients. The impact of CAR T-cell therapy on the thymus remains unknown. The aim of the study was to investigate thymus size changes after CAR T-cell therapy, explore the associated clinical conditions, and assess survival differences for patients following CAR T-cell therapy.

METHODS AND MATERIALS

A single-center retrospective study of patients who underwent CAR T-cell therapy for ALL between 2015 and 2023.We measured the volume of the thymus on pre- and post-CAR T-cell chest CT scans of 20 patients (median [IQR] age, 18 [11] years; 11 females). We divided patients into two groups, who did (group 1) or did not (group 2) demonstrate increase in thymus size after therapy. Clinical and survival data were collected. We used the Wilcoxon signed-rank test or Fisher's exact test for group comparisons and analyzed event-free survival data.

RESULTS

7 of 20 patients (35%, group 1) showed increase in thymus volume (pre- vs. post-CAR T-cell thymus volume; 5.01 [2.18] cm^3 vs. 20.87 [19.86] cm^3, p=0.01), while 13 patients (65%, group 2) showed no increase in thymus volume (pre- vs. post-CAR T-cell thymus volume; 3.01 [13.42] cm^3 vs. 2.09 [8.34] cm^3, p=0.01). Patients in group 1 showed a higher rate of event-free survival compared to those in group 2 (p=0.003).

CONCLUSION

In patients with ALL, increased thymus size after CAR T-cell therapy was associated with younger age and improved clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

Thymic regrowth after CAR T-cell therapy may serve as a radiologic marker of immune system recovery. Increased thymus size post-therapy is associated with better outcomes. Quantitative evaluation of thymus volume on chest CT can provide valuable prognostic information following CAR T-cell therapy. Radiologists should be aware of post-treatment thymic changes, particularly in pediatric populations, to avoid misinterpretation as mediastinal pathology or disease recurrence

Nov. 30 – Dec. 4
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W7-SSPH11

Physics (CT Image Quality II)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: S404

Anders Tingberg, PhD (*Moderator*)
Kirsten Lee Boedeker, PhD (*Moderator*)

Sub-Events

W7-SSPH11-1 PHYSICS-BASED EVALUATION OF MULTI-MATERIAL 3D PRINTED CT PHANTOMS FROM CLINICAL PCD-CT IMAGE DATA

Soeren Jasper (*Presenter*)
Thomas G. Flohr, PhD (*Abstract Co-Author*)
Thomas Allmendinger, PhD (*Abstract Co-Author*)
Ido Bitan, BSC (*Abstract Co-Author*)
Bibi Martens, MD (*Abstract Co-Author*)
Cecile Crompvoets-Jeukens, PhD (*Abstract Co-Author*)
Joachim E. Wildberger, MD, PhD (*Abstract Co-Author*)

PURPOSE

Physics-based evaluation of CT phantoms created using a novel 3D printing technique, aiming to accurately replicate a measured CT image volume in terms of anatomical structures and CT numbers, along with the development of a framework to model spectral behavior.

METHODS AND MATERIALS

Using PolyJet photopolymer 3D printing (VoxelPrint, Stratasys Ltd.) with three base materials of different CT numbers, we printed three discs (40 mm thick, 170 mm diameter) with high-contrast edges, homogeneous regions, and base material inserts. One disc was based on a geometric description (disc 1), the others on 70 keV virtual monoenergetic images (VMI) of disc 1 acquired on a Photon Counting Detector CT (PCD-CT) (NAEOTOM Alpha, Siemens Healthineers) at 120 kVp, reconstructed with medium-sharp kernel Br48 (disc 2) or sharp kernel Qr68 (disc 3). Additionally, we printed an adult abdomen phantom from a 120 kVp portal venous patient scan on a PCD-CT. We scanned the discs on a PCD-CT (120 kVp, two energy thresholds) and reconstructed 70 keV VMIs using kernels Br40, Br48, and Br68. We evaluated edge spread functions (ESF) and compared them to theory, noise power spectra (NPS), CT numbers in VMIs, and CT numbers at low and high energy to calculate dual-energy ratios (DER). The same analysis was applied to the abdomen phantom (reconstructed as the patient scan: Br40, 3 mm slices) and to the original patient scan. We also developed a method to represent and print not only CT numbers but also DER of various tissues.

RESULTS

For Br40 and Br48, the ESF showed no significant differences between disc phantoms and theory. For the sharpest kernel (Br68), phantom 1 matched theory best, while phantoms 2 and 3 were less sharp. NPS was similar across all discs and kernels. In the abdomen phantom, both ESF and NPS matched the patient scan. CT numbers in the phantom were accurate except for values below -50 HU, due to the base materials. DER in the printed abdomen phantom deviated from the patient scan (e.g., bone: phantom 1.87, patient 1.51). DER of the three base materials differed widely (Material 1: 3.81; Material 2: 0.77; Material 3: 1.91), enabling modeling of various DER and CT numbers based on material combinations.

CONCLUSION

CT phantoms 3D printed from image volumes correctly represent the template images regarding image sharpness for soft and medium-sharp kernels, NPS and CT numbers higher than -50 HU. With an extension of the current printing technique the spectral behavior (DER) can also be more accurately represented.

CLINICAL RELEVANCE/APPLICATION

The development of spectrally accurate, anatomically realistic 3D-printed CT phantoms can provide a foundation for CT system testing, scan protocol optimization, and training and evaluation of advanced AI image processing algorithms.

W7-SSPH11-2 CONTRAST-DEPENDENT LOSS OF EDGE SHARPNESS IN LOW-CONTRAST TARGETS WITH INCREASING ITERATIVE RECONSTRUCTION STRENGTH

Yifang Zhou, PhD (*Presenter*)
Alexander W. Scott II, PhD (*Abstract Co-Author*)

PURPOSE

Iterative reconstruction (IR) methods are valuable for reducing dose in modern CT; however, IR methods have the effect of reducing lesion edge sharpness (spatial resolution). Furthermore, the resolution degradation may be dependent on the contrast, so that marginally-visible lesions may have detectability further reduced with increasing IR. We propose that for targets with contrast < 100 HU the rate of edge degradation with increasing IR strength is contrast-dependent.

METHODS AND MATERIALS

A custom anthropomorphic liver phantom with two-phase iodinated lesions was scanned on a GE Revolution CT at 10 mGy CTDIvol with 2.5 mm slice thickness and 33 cm DFOV. IR was used to create image sets for ASIR-V 0-100% in 10% increments and for GE Deep Learning strengths low, medium, and high. 14 acquisitions were performed and averaged together using ImageJ. Oversampling was used in determining lesion edge sharpness: two line-profiles were drawn through the center of each lesion at ±4° to the horizontal, and points within two vertical pixels of the lines were projected onto them. Taking advantage of symmetry, each projected line was folded about the lesion center and both combined so as to align the lesion edge regions. To further reduce the impact of noise, data points with nearby projected coordinates were combined and a rolling average performed with a 1:3:1 weighting. The data was fitted with a sigmoid (Boltzmann) curve and the derivative of the edge function (LSF) was used to find the FWTM. The normalized FWTM for each ASIR-V image represented the edge degradation at that contrast level.

RESULTS

The rise in normalized FWTM from 0-100% ASIR-V was least for the highest contrast lesion (40%) and most for the lowest contrast lesion (179%). Lesions with contrast 50-60 HU had an average increase of 54% while lesions with contrast 25-45 HU had an average increase of 80%. Regarding Deep Learning, for the highest contrast

lesion the normalized FWTM was comparable between DL-low and 10% ASIR-V, while for the lowest contrast lesion the rise in normalized FWTM was comparable between DL-low and 50% ASIR-V.

CONCLUSION

The rate of edge-degradation with increasing IR strength was found to be greater for low-contrast lesions (< 25 HU) and less for high-contrast lesions (>50 HU). Furthermore, as the lesion contrast decreased from 100 - 10 HU, the spatial resolution equivalent of DLIR changed from 10% to 50% ASIR-V. This means that both ASIR-V and DLIR result in lesion edge spreading and the effect is most pronounced as lesion contrast trends toward 0 HU.

CLINICAL RELEVANCE/APPLICATION

It has been shown that increasing the IR strength increased the width of the edge region of a simulated clinically relevant liver lesion, and the amount of increase (loss of edge sharpness) was greatest for low contrast lesions.

W7-SSPH11-3 CT NUMBER CONSISTENCY ACROSS TUBE VOLTAGES: A COMPARATIVE STUDY BETWEEN PHOTON-COUNTING DETECTOR CT AND ENERGY-INTEGRATING DETECTOR CT

Ke Li, PhD (*Presenter*)
Corey Moffett (*Abstract Co-Author*)
Xinming Liu, PhD (*Abstract Co-Author*)
Megan C. Jacobsen, PhD (*Abstract Co-Author*)
Xiujiang J. Rong, PhD (*Abstract Co-Author*)
Corey T. Jensen, MD (*Abstract Co-Author*)
Eric P. Tamm, MD (*Abstract Co-Author*)
Frank Dong, PhD (*Abstract Co-Author*)

PURPOSE

Before the advent of photon-counting detector CT (PCD-CT), CT numbers were known to vary with the X-ray tube potential (kV), particularly for non-water-equivalent materials such as liver parenchyma, bones, and iodine. This variability poses challenges to tumor characterization and other quantitative imaging tasks, given the routine variation in kV settings across patients, contrast phases, scanner make and model. With PCD-CT, virtual monoenergetic images at a specified keV are the default image type, regardless of the acquisition kV. The aim of this study was to experimentally demonstrate the stability of CT numbers across different kV settings in PCD-CT.

METHODS AND MATERIALS

Four quantitative CT phantoms—including a Sun Nuclear MECT Phantom and a Kyoto Kagaku Abdomen Phantom—ranging in size from 20 cm to 40 cm in diameter, were scanned using two PCD-CT scanners (Siemens NAEOTOM Alpha) and two EID-CTs (Siemens SOMATOM Force and GE Revolution Apex). A total of 20 non-water-equivalent materials from these phantoms were included in the analysis. Images were acquired on each scanner at all available kV and beam filtration settings. For example, PCD-CT scans included kV settings of 70, 90, 120, and 140. For each phantom and kV setting, CTDIvol was matched between PCD-CT and EID-CT systems. Image reconstruction was performed according to each scanner's clinical head or body protocol. After measuring CT numbers of phantom materials, the equivalence of HU values across kV levels was assessed using the Two One-Sided Tests (TOST) method, with the level of significance set at 0.05 and the equivalence interval set at [-10%, +10%] of the reference HU value of the material established based on the 120 kV images.

RESULTS

For PCD-CTs, the null hypothesis of TOST (H0: non-equivalent mean HUs between kVs for a given material) was rejected ($p < 0.03$). The mean CT number difference between kVs was 2.9 HU, and the mean percentage difference was 1.9%. In contrast, for EID-CTs, the null hypothesis could not be rejected ($p > 0.1$) for any materials except for a Gammex 1.13 g/mL blood insert. The mean CT number difference between kVs was 35.6 HU, with a mean percentage difference of 21.4%.

CONCLUSION

By automatically generating virtual monoenergetic images from all exams, PCD-CT systems reduce the dependence of CT numbers on tube potential and beam filtration, significantly improving CT number consistency and supporting clinical tasks that rely on quantitative CT number measurement.

CLINICAL RELEVANCE/APPLICATION

Achieving highly stable CT numbers across varying kV settings and protocols improves the reliability of quantitative imaging tasks such as tumor characterization, perfusion assessment, and radiation therapy planning.

W7-SSPH11-4 DUAL-CONTRAST IODINE AND BISMUTH IMAGING WITH PHOTON-COUNTING CT: PHANTOM EVALUATION AND INITIAL CLINICAL PROOF OF CONCEPT

Diwash Thapa, MD (*Presenter*)
Vasantha Vasan, MD (*Abstract Co-Author*)
Richard W. Ahn, MD, PhD (*Abstract Co-Author*)
Yin Xi, PhD (*Abstract Co-Author*)
Xunbo Xu, ARRT (*Abstract Co-Author*)
Sophia Roth (*Abstract Co-Author*)
Lifeng Yu, PhD (*Abstract Co-Author*)
Liqiang Ren, PhD (*Abstract Co-Author*)

PURPOSE

To demonstrate the feasibility and accuracy of iodine and bismuth dual-contrast imaging using a clinical photon-counting CT (PCCT) system, validated through phantom experiments and initial patient experience.

METHODS AND MATERIALS

Four bismuth solutions (0.7, 1.3, 2.5, and 5.1 mg Bi/mL) were prepared by diluting Pepto-Bismol (10.1 mg Bi/mL, Procter & Gamble) with water and inserted into a multi-energy CT phantom (33 cm × 26 cm, Sun Nuclear) together with three iodine rods (1, 2, and 5 mg I/mL, Sun Nuclear). The phantom was scanned using a PCCT system (NAEOTOM Alpha, Siemens) at 140 kV with a radiation dose (CTDIvol: 8 mGy). With IRB approval, one patient undergoing routine contrast-enhanced abdomen-pelvis imaging for lung cancer surveillance (BMI: 24.1 kg/m²) was enrolled. The patient received two oral doses (30 mL each) of Pepto-Bismol: one 30 minutes before the scan and another immediately prior. Intravenous iodine contrast was administered per clinical protocol, consisting of 119 mL of Omnipaque (350 mg I/mL, GE), infused at 3 mL/s with saline flush. The scan was performed on the same PCCT with automatic exposure control (IQ level 147; average CTDIvol: 7.8 mGy) and manual tube voltage selection of 140 kV. PCCT low- and high-energy images (Qr44 kernel, QIR-3, 5.0 mm slice thickness) were reconstructed and exported. A custom three-material decomposition algorithm (iodine/bismuth/water) was applied to generate iodine and bismuth maps. Calibration derived from the phantom study was applied to patient data material decomposition. For the phantom study, mean iodine and bismuth concentrations were measured and linear regression analysis was performed to assess the correlation between nominal and measured concentrations. The patient images and decomposed maps were reviewed qualitatively by two radiologists to assess the efficacy of iodine and bismuth separation.

RESULTS

In the phantom study, all iodine and bismuth samples—including those at the lowest concentrations—were clearly differentiated and accurately quantified, with $R^2 > 0.99$. In the initial patient study, bismuth signals were distinctly visualized in the small bowel (corresponding to the first administered dose) and in the stomach (corresponding to the second administered dose).

CONCLUSION

Iodine and bismuth dual-contrast imaging can be accurately performed on a clinical PCCT system, as demonstrated in both the phantom study and initial patient experience.

CLINICAL RELEVANCE/APPLICATION

Accurate separation of iodine and bismuth using dual-contrast photon-counting CT may enable new diagnostic applications, such as simultaneous vascular and gastrointestinal imaging, offering enhanced contrast differentiation in clinical practice.

W7-SSPH11-5 ASSOCIATION BETWEEN DETECTABILITY INDEX AND VOLUMETRIC ACCURACY IN LOW-DOSE ENERGY-INTEGRATING AND PHOTON-COUNTING CT

Elsa Pimenta, MSc (*Presenter*)
Gisell Ruiz Boiset (*Abstract Co-Author*)
Alessandra Tomal, PhD (*Abstract Co-Author*)
Luuk J. Oostveen, DIPLPHYS (*Abstract Co-Author*)
Ioannis Sechopoulos, PhD (*Abstract Co-Author*)
Paulo Costa, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the association between the detectability index (d') from model observers, the accuracy (median relative error, MRE%) and precision (interquartile range of the relative errors, IQR%) of volumetric measurements of a synthetic ground-glass opacity (GGO) nodule in low-dose chest CT.

METHODS AND MATERIALS

CT scans were acquired at CTDI vol = 1.4 mGy using two scanners: a prototype CdZnTe photon-counting CT (PCCT) and a conventional energy-integrating CT (EICT, Aquilion One PRISM Edition), both from Canon Medical Systems. Six low-dose protocols were evaluated, combining deep learning reconstruction (DLR) with the LUNG kernel or hybrid-iterative reconstruction (HIR, AIDR 3D) with FC51, FC52, and FC86 kernels. Each protocol included ten acquisitions. The d' was computed from regions of interest in images of an anthropomorphic lung phantom containing a synthetic GGO nodule. A non-prewhitening model observer with the Eckstein eye filter was applied (zoom factor 1.5; 500 mm viewing distance). For each protocol, 30 individual d' values were computed, and the noise power spectrum was estimated from three slices, yielding 90 d' values per protocol; the median was used for analysis. Nodule volume was measured in 3D Slicer (v5.6.2) and compared to the ground truth (142 mm^3) determined by a µCT system (U-SPECT6CThr, MILabs B.V.).

RESULTS

A significant inverse linear relationship was found between d' and both the median MRE% and IQR%. The detectability index d' strongly predicted IQR% ($R^2 = 0.845$), with Pearson correlation coefficient (r) of -0.92, a 95% confidence interval (CI) of -0.99 to -0.42, and a p-value < 0.01. A moderately strong negative correlation was observed between d' and MRE% (r = -0.79, 95% CI: -0.98 to 0.05, p = 0.059), indicating a potential trend despite the limited sample size. Among the protocols, the PCCT/DLR/LUNG showed the highest detectability (d' = 13.8), lowest IQR% (2.6%), and MRE% (3.0%).The EICT/DLR/LUNG also showed high detectability (d’ = 10.8), low IQR% (5.2%) and MRE% (2.6%). Protocols using HIR showed median d' values of 6.3 - 9.7, with MRE% of 5.6 - 13.0%, and IQR% of 4.4 - 8.3%.

CONCLUSION

d' is inversely related to volumetric measurement error (MRE% and IQR%). Protocols utilizing DLR with LUNG kernel, particularly with PCCT, achieved the highest detectability and the lowest error.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the utility of d’ in protocol optimization to enhance diagnostic performance in low-dose CT imaging.

W7-SSPH11-6 IMAGE QUALITY ASSESSMENT OF ULTRA-HIGH-RESOLUTION PHOTON-COUNTING DETECTOR CT FOR LARGE ARTERY IMAGING IN CANCER PATIENTS WITH LOW RADIATION AND CONTRAST AGENT DOSES: A COMPARATIVE STUDY WITH ENERGY-INTEGRATING DETECTOR CT

Limin Lei, MD (*Presenter*)
Yuhan Zhou, MD (*Abstract Co-Author*)
Xiaoxu Guo, MD (*Abstract Co-Author*)
Zhihao Wang (*Abstract Co-Author*)
Yi Fan Guo (*Abstract Co-Author*)

PURPOSE

This study investigated the benefits of using ultra-high-resolution photon-counting detector CT (PCD-CT) with low radiation and low contrast agent doses, compared to conventional energy-integrating detector CT (EID-CT), for contrast-enhanced chest and abdominal imaging in patients with lung cancer.

METHODS AND MATERIALS

This prospective study enrolled a total of 200 patients with lung cancer who underwent ultra-high-resolution PCD-CT or EID-CT between June and September 2024. Participants were matched for age, sex, body mass index (BMI), and TNM stage. Two protocols were applied: a low-dose, ultra-high-resolution PCD-CT protocol (2.0 mL/s injection rate, 1.0 mL/kg of 320 mg iodine/mL) and a standard-dose EID-CT protocol (3.0 mL/s, 1.2 mL/kg of 350 mg iodine/mL). Radiation exposure, renal function, adverse events, and baseline lung cancer characteristics were recorded. Quantitative assessments of ascending aorta (AA), descending aorta (DA), and pulmonary artery (PA) included standard deviation (SD), signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR).

RESULTS

The SD values of the PCD-CT group at 5 mm, 1 mm slice thicknesses during both phases were lower than those of the EID-CT group at corresponding slice thicknesses (all $P < 0.001$). The SD value of the PCD-CT 0.4 mm group was comparable to that of the EID-CT 1 mm group ($P > 0.05$). The PCD-CT 5 mm, 1mm group showed higher SNR and CNR compared to the EID-CT 5mm, 1 mm group. For the PCD-CT group at 0.4 mm, the arterial phase SNR and CNR values, except for the arterial phase PA, were slightly lower than those of the EID-CT group, with statistically significant differences ($P < 0.001$). For venous phase SNR and CNR values, the PCD-CT 0.4 mm group showed comparable results to the EID-CT 1 mm group, with no statistically significant differences ($P > 0.05$). For subjective scoring, the PCD-CT 0.4 mm group received a score of 5 for both "anatomical structures" and "vessel sharpness," despite exhibiting higher noise. The PCD-CT groups consistently achieved high ratings, with overall image quality and noise levels superior to those of the EID-CT group (5 [5, 5] vs. 4 [4, 5], all $P < 0.001$).

CONCLUSION

Low-dose ultra-high-resolution photon-counting CT significantly enhances large artery image quality and diagnostic confidence under reduced radiation and contrast agent dose conditions.

CLINICAL RELEVANCE/APPLICATION

Low-dose ultra-high-resolution photon-counting CT may offer improvements in image quality and diagnostic confidence for the detection of tumor-associated pulmonary embolism and large artery-related diseases.

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W7-SSPH12

Physics (Radiation Dose)

Wednesday, Dec. 3 3:00PM - 4:00PM Room: S502

Michael F. McNitt-Gray, PhD (*Moderator*)
Megan C. Jacobsen, PhD (*Moderator*)

Sub-Events

W7-SSPH12-1 PROTOCOL AND CLINICAL INDICATION-BASED DIAGNOSTIC REFERENCE LEVELS FOR PEDIATRIC CT IN LATIN AMERICA: MULTICENTER STUDY OF 18 SITES FROM 8 COUNTRIES

Lina Karout, MD (*Presenter*)
Javier Contreras Yametti, MD (*Abstract Co-Author*)
Monica O. Bernardo, MD (*Abstract Co-Author*)
Felipe Kiipper (*Abstract Co-Author*)
Flavio Morgado (*Abstract Co-Author*)
Seyedehelaheh Hosseini, MD (*Abstract Co-Author*)
Anushree M. Burade, MBBS (*Abstract Co-Author*)
Parisa Kaviani, MD (*Abstract Co-Author*)
Subba R. Digumarthy, MD (*Abstract Co-Author*)
Davi Leandro Vieira (*Abstract Co-Author*)
Monica Jimenez, MD (*Abstract Co-Author*)
Dulce Judith Almanza Aranda, MD (*Abstract Co-Author*)
FERNANDO CRUZ (*Abstract Co-Author*)
Paola Silvina Berra (*Abstract Co-Author*)
Juan P. Celdeiro, MD (*Abstract Co-Author*)
Dulce Judith Almanza Aranda, MD (*Abstract Co-Author*)
Mariana Sanchez Curiel Loyo, MD (*Abstract Co-Author*)
Alma Sanchez Baza, MD (*Abstract Co-Author*)
Juan Camilo Bedoya Tobon (*Abstract Co-Author*)
Ester Maria Dos Santos Bezerra (*Abstract Co-Author*)
Luis Gerardo G. Garcia Armas, MD (*Abstract Co-Author*)
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PURPOSE

We describe the framework and data characteristics for establishing body region- and clinical indication-based diagnostic reference levels (DRL) and achievable doses (AD) for pediatric CT in Latin America.

METHODS AND MATERIALS

The LatinSafe and MGB collaboration project included 18 imaging sites from 8 countries in the Latin America, who contributed following data on 5890 pediatric patients (<19 years; F:M, 2650:3240): head (n=2,225 patients), chest (n=1606), abdomen-pelvis (AP, n=1387) or chest-abdomen-pelvis (CAP; n=672) CT. The following information was obtained for each submitted exam: patients' age at the time of scanning, sex, weight, clinical indication for CT, CT scanner information, scan factors (tube current and potential), and radiation dose descriptors [volume CT dose index (CTDIvol) and dose length product (DLP)]. We estimated overall and site-specific 50 th (AD) and 75 th (DRL) percentile CTDIvol and DLP separately for each body region and clinical indication. Non-normal dose data distributions were compared using the Kruskal-Wallis test.

RESULTS

Most CT exams in children regardless of age groups, were single-phase acquisition (78%) without or with intravenous contrast (head CT 94%; chest CT 82%; AP-CT 57%, CAP-CT 61%). There was a significant variation in CTDIvol and DLP between the participating sites for all body regions and clinical indications in all age groups (p=0.001). The protocol- and age group-matched Latin America protocol-based ADs and DRLs were significantly higher in all age groups than the US levels, without exception. The head, chest, and AP-CT and CAP-CT DLP DRLs were higher than the corresponding DLP DRLs in the US for 15/18 (83%), 16/18 (88%),14/17 (88%), and 12/14 (82%) of participating sites. There were significant differences in radiation doses across different CT scanner vendors (p<0.001). The Middle-low-income countries (MLICs) had significantly higher doses compared to middle- and high-income countries (HMIC): head CT (MLIC DLP: 310 vs 386 mGy.cm for HMIC), chest (MLIC DLP: 93 vs. 79 mGy.cm for HMIC), AP=CT (MLIC DLP: 231 vs. 185 mGy.cm for HMIC), CAP-CT (MLIC DLP: 559 vs. 239 mGy.cm for HMIC) CT exams (p=0.001)

CONCLUSION

Economic differences and scanner distribution have a profound effect on the variations and use of higher radiation doses across Latin America with higher radiation doses for children scanned in low-income countries as compared with the high- and middle-income countries.

CLINICAL RELEVANCE/APPLICATION

Dose optimization with clinical DRLs and education in Latin America must focus on the low-to-middle income countries with higher radiation doses, likely related to the use of older scanner technology and higher-dose CT protocols.

W7-SSPH12-2 FETAL DOSE IN PREGNANT CT PATIENTS: A COMPARISON OF FOUR SOFTWARE PACKAGES

Joel Greffier, PhD (*Presenter*)
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PURPOSE

To compare the fetal dose (FD) as calculated by four different software packages for pregnant women who have undergone CT acquisitions directly exposing the whole fetus to X-rays.

METHODS AND MATERIALS

Pregnant women who underwent CT abdomen-pelvis and/or thorax-abdomen-pelvis acquisitions from February 2018 to May 2024 and for whom the uterine dose and/or FD was calculated by a medical physicist were retrospectively included. FDs were computed per CT acquisition with VirtualDose-CT™ (VDCT), Duke Organ Dose (DOD), fetaldose.org and Conceptus Dose Estimation (CODE) software, using phantoms taking the stage of pregnancy into account. FDs calculated by each software package were then compared.

RESULTS

A total of 51 pregnant women with a mean age of 30.2±5.7 years at 17.5±10.0 weeks of pregnancy were included. The mean number of CT acquisitions per pregnant patient was 1.4±0.7 with a mean CTDI vol of 6.77 ± 3.04 [2.34-15.64] mGy and FDs were computed for a total of 69 acquisitions. For all CT acquisitions, the median FD was 8.6 (6.8; 10.3) mGy for VDCT, 7.7 (6.1; 9.7) mGy for DOD, 6.3 (4.9; 7.6) mGy for fetaldose.org and 7.1 (4.6; 8.8) mGy for CODE. Differences between each software package were significant ($p<0.01$), except between VDCT and DOD ($p=0.025$) and between CODE and fetaldose.org ($p=0.15$). The concordance of calculated FD values between the software packages was poor (ICC<0.50), except between VDCT and CODE and between fetaldose.org and CODE.

CONCLUSION

• The choice of software used has an impact on the calculation of the FD, but it is not expected to alter pregnant patient management except for extreme cases where multiple CT exams are involved

CLINICAL RELEVANCE/APPLICATION

The results of the present study show that the 100 mGy limit cannot be reached by a single CT examination, and may only be reached for extreme cases in which the pregnant patient is subjected to multiple CT examinations with the whole fetus exposed primarily.

W7-SSPH12-3 PILOT STUDY TO COMPARE CT SCAN ORGAN AND EFFECTIVE DOSE ESTIMATES FROM RADIATION DOSE INDEX MONITORING SYSTEMS (RDIMS) USING A REFERENCE SET OF PATIENT DATASETS

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PURPOSE

Radiation Dose Index Monitoring Systems (RDIMs) track and report CT scanner output radiation dose indices (CTDI vol , DLP, SSDE). Many RDIMs now also report estimated organ doses and calculated effective dose (using estimated organ doses) for each CT scan. While scanner output indices are standardized, methods to estimate organ and effective doses are not. The purpose of this pilot study was to investigate the feasibility of performing direct comparisons of organ and effective dose estimates from several RDIMs using a reference set of patient datasets.

METHODS AND MATERIALS

Under IRB approval, seven reference datasets were deidentified: 4 routine thoracic scans (2 adult female, 2 adult male) and 3 routine abdomen/pelvis CT scans (2 adult female, 2 adult male). For each exam, the following data was provided: (a) Planning CT Radiograph; (b) Cross sectional CT image data; (c) Radiation Dose Structured Report (RDSR) and (d) Patient Protocol Page. Each site worked with their RDIM vendor to produce the organ and effective dose estimates for each case. Estimates were compared by calculating the mean value of each organ and effective dose across RDIMs and then the average absolute percent difference (AAPD) across estimates. This was repeated for each estimated organ and effective dose for each patient.

RESULTS

Three sites were able to provide data from two different RDIMs (two sites had the same RDIM product). Mean effective dose estimates across the seven reference datasets ranged from 5.94 to 10.92 mSV and AAPD of effective doses ranged from 12.4 to 42.8%. For thoracic scans, the AAPD were 20.2% and 25.6% for breast dose estimates of female patients and ranged from 15.5 to 33.1% for lung doses across all four scans. For the three abdomen/pelvis scans, the AAPD for colon ranged from 15.6 to 34.3%. Many other organs (stomach wall, uterus, bladder) showed larger differences, often exceeding 40%. For the two sites using the same RDIM product, AAPDs for thoracic scans were as low as 4.4-5.6% for lung dose and 5.2-6.7% for breast dose, but up to 36-49% in stomach dose in abd/pel scans.

CONCLUSION

This pilot study demonstrated the feasibility of performing direct comparisons of organ and effective dose estimates from RDIMs using a reference set of patient datasets. We observed a range of differences in effective dose estimates from 12-40% and a wider range for organ dose differences. Future work will investigate possible sources of these differences including RDIM set up parameters (e.g. protocol mapping).

CLINICAL RELEVANCE/APPLICATION

This initial study showed the feasibility of direct comparison of estimated effective dose and organ dose values between RDIMs. This will allow us to identify sources of these differences and establish expected ranges of variability for these estimates.

W7-SSPH12-4 LATINSAFE EFFORTS ON ESTABLISHING CLINICAL DIAGNOSTIC REFERENCE LEVELS (CDRL) IN LATIN AMERICA: RESULTS FROM 6094 PATIENTS FROM 6 COUNTRIES

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PURPOSE

Clinical indication-based diagnostic reference levels (cDRL) are important for evaluating the use of clinical indication-related information for radiation dose reduction and optimization. Under the LatinSafe auspices, we conducted a Latin American multicenter study to establish cDRLs for common CT indications for imaging the head, chest, and abdomen-pelvis (AP).

METHODS AND MATERIALS

Each institution obtained ethical committee approval. Besides an open call for data submission, LatinSafe communicated with regional and national radiologists, physicists, and technologists' societies and key imaging sites across Latin America to obtain data from private, public, and university hospitals. Each site provided de-identified patient data (age, weight, height and gender), clinical indications, scan protocols and factors, scanner technology details, and radiation doses (series and exam level CTDIvol and DLP values) in 2024-2025; at least 20-30 patients per body part and clinical indication (limited to head, chest, AP, chest-AP [CAP]). Before data analysis, dose information was filtered. For multi-acquisition exams, we used median CTDIvol and total DLP. Next, we obtained 50th (achievable doses/ADs) and 75th (DRLs) percentile of CTDIvol and DLP for body regions and clinical indications. Data were analyzed with Kruskal Wallis, and Mann-Whitney tests were used (p-value < 0.05)

RESULTS

The ongoing effort has collected and analyzed data from 6094 adult patients (F:M; 3572:2521, mean age: 54±19 years) who had head (n=2455), chest (n=2304) or AP (n=1334) CT examinations at imaging sites in 6 Latin American countries. The body region-specific DRLs for adult patients were head CT : CTDIvol [DLP]: 39.4 mGy [986.2 mGy.cm]; chest CT : CTDIvol [DLP]: 10.0 [533.5]; AP-CT : CTDIvol [DLP]: 15.1 [1088.6]. The DRLs for the main clinical indications for each body region are summarized in Table 1. There were significant differences in CTDIvol and DLP between the countries and participating sites ($p<0.05$). Conclusion: LatinSafe's ongoing project on establishing adult DRLs for different body parts and common clinical indications demonstrates the feasibility of such efforts in developing countries on an international scale. Compared to the US and EU DRLs, the series level CTDIvol are comparable in Latin America, but substantially higher DLP values suggest more frequent multiphase CT and longer scan lengths per exam.

CONCLUSION

Radiation doses need optimization and protocols analyses, clinical training course and a second data collection to determinate regional DRL in 2025.

CLINICAL RELEVANCE/APPLICATION

Radiologists and radiology personnel in Latin America must pay closer attention to scan length and scan phases for CT examinations to reduce the higher DLP values.

W7-SSPH12-5 EYE-LENS DOSE REDUCTION IN CRANIAL CT: DOSE EVALUATION OF EYE LENS PROTECTORS DESIGNED WITH ALTERNATIVE MATERIALS WHICH ARE EXPECTED TO REDUCE ARTIFACTS

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Tobias Benz (*Abstract Co-Author*)
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PURPOSE

Commercially available eye lens protectors are usually made from materials with high atomic numbers like bismuth. However, it is well-known that these protectors cause artifacts. The aim of this study is to determine whether the dose of eye lenses in cranial CTs can be reduced by protectors made from materials with lower atomic numbers, e.g. aluminum or polyvinyl chloride (PVC).

METHODS AND MATERIALS

Protectors were designed to reduce 30% of radiation like conventional protectors, and to cover eye lenses. Materials tested were bronze, aluminum and PVC. An anthropomorphic phantom was scanned with and without protectors in a Siemens Definition AS+ scanner using standard head protocols, protocols that reduce the eye lens dose by tube current modulation, and low-dose protocols. Dose was measured with TLDs at different positions in the head, including eye lenses and brain, to determine eye lens dose and effective dose. Dose values were compared between scan protocols and protectors.

RESULTS

Dose of the eye lenses was 50.2 mGy with the standard protocol without protector, 31.5 mGy (-37%) with a bismuth protector, 27.9 mGy (-44%) with bronze, 27.7 mGy (-45%) with aluminum and 25.5 mGy (-49%) with PVC. Without protectors, dose modulation reduced the eye lens dose to 34 mGy (-22%), and a low-dose protocol to 7 mGy (-86%). Percentage dose reduction was the same when protectors were used in combination with low-dose protocols or with tube current modulation. Eye lens dose could be reduced down to 3.55 mGy with a low-dose protocol and the PVC protector which means 93% dose reduction compared to a standard protocol without protector. Overall effective dose of the head was 1.41 mSv using a standard CT protocol without protector, 1.24 mSv (-12%) with a commercial protector and 1.31 mSv (-7%) with PVC, all with standard CT protocols.

CONCLUSION

Protectors made from materials with low atomic numbers reduced eye lens dose in cranial CT more effectively than the commercial protector tested. The fact that overall effective dose was lowest with the bismuth protector means that protectors made from materials with low atomic numbers are more efficient in reducing local eye lens dose while delivering sufficient dose to structures which are needed to be imaged. It has to be evaluated whether the probability for artifacts is lowered with these materials. Limitations: a) Single-center study using a single scanner. b) Dose reduction by removing eye lenses from primary beam by head flexion could not be simulated.

CLINICAL RELEVANCE/APPLICATION

The protectors presented are expected to reduce artifacts. If this is proved in a routine CT setting, protectors should be used in each and any cranial CT examination in order to reduce the dose of the eye lens.

W7-SSPH12-6 OXIDATIVE STRESS-MEDIATED DNA DAMAGE INDUCED BY IONIZING RADIATION IN MODERN TWO-PHASE CONTRAST-ENHANCED ABDOMEN AND PELVIS CT

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PURPOSE

While CT aids diagnosis, leading to improved outcomes, it also exposes patients to ionizing radiation (IR), leading to DNA damage, primarily through an indirect pathway by reactive oxygen species. It was recently reported that, if current practices persist, CT-associated cancer could eventually account for 5% of all new cancer diagnoses annually. To subsequently propose an antioxidant-based radioprotective strategy, we aimed to characterize oxidative stress (OS) and DNA damage derived from modern CT equipment/protocol.

METHODS AND MATERIALS

Prospective observational study at our University Hospital, involving healthy volunteers (A) and patients with clinical indications for two-phase contrast-enhanced abdomen and pelvis CT (B). Biomarkers of OS and DNA damage were measured from blood samples collected at: TPRE, min 0; TPOST, 50-70 min after TPRE. CT occurred 5 min before TPOST. Differences between groups were analyzed with Student's t or Mann Whitney U tests for between-group cross-sectional comparisons and with paired Student's t or Wilcoxon tests for within-group longitudinal comparisons.

RESULTS

We recruited 35 subjects (n=17 A and 18 B). While age ($P<0.001$) and sex ($P=0.001$) were different between groups, body mass index ($P=0.30$) and TPRE DNA damage ($P=0.42$) were comparable. Patient-specific effective dose (ED) was 6.7 (6.2-9.0) mSv. OS biomarkers and DNA damage did not change between TPRE and TPOST in A ($P>0.05$ for all). In B, DNA damage increased significantly [15% (-15 to 60); $P<0.001$], which was associated to a consistent rise of antioxidant enzymes activities in similar fashion [10% (0 to 15), 15% (-2 to 38), and 26% (5 to 80) for glutathione peroxidase, superoxide dismutase, and catalase activities, respectively; $P<0.05$ for all].

CONCLUSION

At relatively low ED levels with modern equipment/protocols, we observed significant DNA damage increase, alongside increased enzymatic antioxidant defense activity.

CLINICAL RELEVANCE/APPLICATION

These results highlight the importance of investigating potential antioxidant-based preventive measures to mitigate CT associated DNA damage.

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Nov. 30 – Dec. 4
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W7-STCE1

Science Session (Translating Innovation: Radiologist-Industry Collaboration in Clinical Integration of New Technologies)

Wednesday, Dec. 3 3:15PM - 3:45PM Room: LEARNING CENTER THEATER 1

Sub-Events

W7-STCE1-1 TRANSLATIONAL IMPACT OF MRI SEQUENCE SELECTION ON AMYLOID PET QUANTIFICATION USING NEXT-GENERATION HIGH-RESOLUTION SILICON PHOTOMULTIPLIER TIME-OF-FLIGHT BRAIN-DEDICATED PET SCANNER

Daisuke Morimoto, PhD, RT (*Presenter*)
Kohei Hanaoka (*Abstract Co-Author*)
Hina Yamamoto (*Abstract Co-Author*)
Takahiro Yamada, PhD (*Abstract Co-Author*)
Atsushi K. Kono, MD, PhD (*Abstract Co-Author*)
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PURPOSE

This study aimed to assess how MRI sequence selection—specifically fluid-attenuated inversion recovery (FLAIR) and susceptibility-weighted imaging (SWI)—affects Centiloid (CL) quantification in amyloid PET acquired with a high-resolution silicon photomultiplier-based time-of-flight PET system dedicated to the head (dhPET), using standard software. FLAIR and SWI are routinely acquired for detecting amyloid-related imaging abnormalities (ARIA), and in patients with mild cognitive impairment (MCI) or dementia who may struggle with long scan times, completing standard MRI protocols can be challenging. Although 3D T 1 -weighted imaging (T 1 WI) is conventionally used for CL calculation, FLAIR and SWI may be considered as alternative sequences in clinical practice, but their quantitative validity remains unclear.

METHODS AND MATERIALS

This retrospective, single-center study was approved by the institutional review board, with a waiver of informed consent. Between April 2024 and February 2025, a total of 25 consecutive patients (mean age: 74 years; range: 64-87 years) with clinically suspected MCI or dementia underwent 18 F-florbetapir PET using a dhPET (BresTome, Shimadzu Corp.) and brain MRI. 18 F-florbetapir PET images were visually rated as positive/negative by two experienced physicians. CL values were calculated using each of the 3D FLAIR and 3D SWI images and compared to those obtained from 3D T 1 -weighted images (3D T 1 WI), used as the reference. Wilcoxon signed-rank tests were applied with Bonferroni correction (adjusted $p < 0.05$).

RESULTS

Of the 25 subjects, 18 were visually amyloid-positive and 7 were negative. In the positive group, CL values based on 3D FLAIR [58.4 (IQR: 48.0-68.0)] and 3D SWI [53.7 (IQR: 39.8-66.3)] were significantly lower than those obtained from 3D T 1 WI [59.4 (IQR: 47.0-70.2)], with $p < 0.001$ for both comparisons. While in the negative group, CL values derived from 3D FLAIR [-1.2 (IQR: -20.6-1.3)] and 3D SWI [-3.5 (IQR: -21.1-1.3)] tended to be lower than those obtained from 3D T 1 WI [1.0 (IQR: -18.7-5.7)], although the difference was not significant ($p = 0.063$ for both comparisons).

CONCLUSION

FLAIR and SWI tend to underestimate Centiloid values compared to 3D T 1 WI, particularly in amyloid-positive individuals.

CLINICAL RELEVANCE/APPLICATION

MRI sequence selection significantly influences CL quantification in amyloid PET using a dhPET. In patients with MCI or dementia, who may struggle to remain motionless during scans, FLAIR and SWI may be considered as practical alternatives, though they carry a risk of underestimation. Consistent use of 3D T 1 WI is recommended for reliable longitudinal assessment. This study offers translational insight to support MRI protocol standardization and consistent CL interpretation in dementia care.

W7-STCE1-2 IMPLEMENTING ARTIFICIAL INTELLIGENCE METHODS FOR QUANTITATIVE HIGH-RISK PROSTATE CANCER EVALUATION USING TOTAL TUMOR VOLUME ESTIMATION FROM PSMA-PET IMAGING

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PURPOSE

Quantitative disease evaluation by total tumor volume (TTV) estimation from prostate-specific membrane antigen (PSMA) PET/CT imaging has shown high diagnostic accuracy in high-risk prostate cancer (PCa) and is prognostic for overall survival. TTV can be used in theranostic studies and for evaluating response assessment using the quantitative RECIP framework, but effective adoption is limited by high burden required for manual image segmentation which may lead to variability in radiological assessment. We developed and deployed an artificial intelligence (AI) system enabling TTV estimation, supporting quantitative image analysis by precisely quantifying PSMA-positive lesions for PCa care and clinical trials.

METHODS AND MATERIALS

A novel AI-based segmentation method was integrated into an image reading platform with radiologist-in-the-loop for TTV segmentation, including organs and unspecific bone uptake contouring. Each AI identified potential PSMA-positive lesion was classified into bone, liver and soft tissue that can be reviewed and validated. For algorithm validation, 748 paired attenuation-corrected 68 Ga-PSMA-11 PET/CT images were retrospectively acquired, anonymized and manually annotated by board certified radiologists. AI-estimated TTV (aiTTV) was correlated with manual radiologist measurements (rTTV) by least squares analysis and Bland-Altmann limits of agreement (BA LoA). Agreement in SUV-derived biomarkers was measured using the intraclass correlation coefficient (ICC).

RESULTS

On the large-scale PCa validation dataset, aiTTV showed almost perfect correlation with rTTV (Pearson's r =.960 [95% CI: .954, .965]). Excellent agreement was found for both SUVmax (ICC: 0.77 [95% CI: 0.74, 0.80]) and SUVmean (ICC: 0.81 [95% CI: 0.71, 0.84]). Mean difference was 67.91 mL (SD: 299.67 mL; BA LoA: -519.03, 654.87 mL) and lesion-level precision was 87.42%. aiTTV was computed in under 15 minutes per subject, enabling efficient review and editing by radiologists to support consistent lesion contouring and classification.

CONCLUSION

The AI system enabled quantitative evaluation of PCa subjects in clinical trial settings and efficiently integrated AI lesion contouring with radiologist oversight. Remarkable performance in estimating TTV from 68 Ga-PSMA-11 PET/CT was confirmed by almost perfect correlation to manual measurements, very low bias and high precision, allowing for consistent disease burden estimation.

CLINICAL RELEVANCE/APPLICATION

The integration of AI-based PSMA-positive tumor volume estimation will allow quantitative patient prognosis and precise treatment response monitoring in prostate cancer care and theranostics, facilitating consistent quantitative assessment by radiologists in clinical settings.

W7-STCE1-3 DOES TEMPERATURE SETTING MATTER? EVALUATING DIAGNOSTIC ACCURACY AND QUALITYOF AI GENERATED CHEST RADIOGRAPH REPORTS

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Eun Kyoung Hong, MD, PhD (*Abstract Co-Author*)
Bardia Nadim, MD (*Abstract Co-Author*)
Zuby Syed, MD (*Abstract Co-Author*)
Chong Hyun Suh, MD, PhD (*Abstract Co-Author*)
SEUNGHO LEE (*Abstract Co-Author*)
Mark M. Hammer, MD (*Abstract Co-Author*)

PURPOSE

In language model-based report generation, the temperature parameter controls the sharpness of the output probability distribution, determining how deterministic or variable the generated text is. Therefore, we evaluated how varying temperature settings affect diagnostic accuracy, linguistic readability, and overall report quality in AI-generated chest radiograph interpretations.

METHODS AND MATERIALS

A multimodal foundation model fine-tuned on chest radiograph interpretation generated reports for 211 chest radiographs. Reports were generated at 17 temperature settings (0.0-1.6 in 0.1 increments), totaling 3,587. Diagnostic accuracy was evaluated by comparing predicted binary labels for 13 findings, automatically extracted from reports, to a consensus reference standard established by three radiologists. Readability was assessed using five metrics: Flesch-Kincaid Grade Level, Gunning Fog Index, Coleman-Liau Index, Automated Readability Index, and Word Count. Overall Grade Reading Level (OGRL) was computed as the mean of the first four. Temperature effects on diagnostic accuracy and readability were modeled using third-degree polynomial regression. Two radiologists independently assessed reports at five representative temperatures (0.0, 0.4, 0.8, 1.2, 1.6) for agreement (binary), hallucination presence (binary), and quality (5-point scale). Logistic and ordinal logistic regression were used to analyze trends.

RESULTS

Diagnostic accuracy declined with increasing temperature, with micro-accuracy decreasing from 85.5% at 0.0 to 83.0% at 1.6 ($R^2 = 0.005$). Accuracy loss was most evident in pleural effusion, nodule, and pneumothorax. Readability worsened as temperature increased, word count rose from 21 to 29, and OGRL increased from 9.5 at 0.0 to 11.9 at 16.0 ($R^2 = 0.040$). With increasing temperature, subjective evaluations showed a decline in radiologist agreement with the AI-generated report from 4.3% to 0.9% ($p = 0.04$), a drop in median quality scores from 2.0 to 1.0 ($p < 0.001$), and a rise in hallucination rates from 10.9% to 49.8% ($p < 0.001$).

CONCLUSION

Temperature setting significantly affects diagnostic accuracy, readability, and perceived quality of AI-generated chest radiograph reports. Lower temperatures improve factual reliability and radiologist agreement, while higher temperatures increase linguistic complexity and hallucination risk.

CLINICAL RELEVANCE/APPLICATION

Temperature is a critical factor in the clinical deployment of AI-generated radiology reports. Careful tuning of this parameter is essential to ensure safe, reliable, and effective integration of AI tools into clinical workflows.

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W7-STCE2

Science Session (Next-Generation Imaging: Advances in Low- and Non-Contrast Techniques)

Wednesday, Dec. 3 3:15PM - 3:45PM Room: LEARNING CENTER THEATER 2

Sub-Events

W7-STCE2-1 MULTI-TIMEPOINT BREAST DCE-MRI IMAGES SYNTHESIS USING A MULTI-SEQUENCE FUSION NETWORK

Tianyu Zhang, PhD (*Presenter*)
Luyi Han (*Abstract Co-Author*)
Jarek Van Dijk (*Abstract Co-Author*)
Antonio Portaluri, MD (*Abstract Co-Author*)
Tao Tan (*Abstract Co-Author*)
Ritse M. Mann, MD, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the effectiveness of an AI-based multi-sequence fusion network (MSF-Net) for synthesizing high-quality multi-timepoint breast dynamic contrast-enhanced MRI (DCE-MRI) from non-contrast T1-weighted MRI and diffusion-weighted imaging (DWI), aiming to eliminate the need for contrast agents while preserving the diagnostic fidelity of standard DCE-MRI.

METHODS AND MATERIALS

A total of 3861 patients who underwent multi-parametric breast MRI between January 2014 and December 2024 at the Netherlands Cancer Institute (NKI) were retrospectively included in this study. Imaging protocols comprised T1-weighted MRI, multi-timepoint DCE-MRI, and multi-b-value DWI. The proposed MSF-Net was designed to synthesize wash-in and wash-out DCE-MRI images from T1-weighted pre-contrast MRI and DWI data. External validation was performed using two independent datasets: (1) 1018 patients from Radboud University Medical Center, (2) 719 patients from the publicly available I-SPY2 breast cancer imaging cohort. To assess image quality and fidelity, Peak Signal-to-Noise Ratio (PSNR), Structural Similarity Index Measure (SSIM), and Dice Similarity Coefficient (DSC) were employed. For DSC evaluation, tumor masks were segmented by breast radiologists on both synthesized and real DCE-MRI images in a subset of randomly selected 50 cases.

RESULTS

For the internal cohort, the synthesized wash-in images achieved a PSNR of 31.81 ± 1.89 and SSIM of 0.92 ± 0.03, and the wash-out images yielded a PSNR of 29.35 ± 1.98 and SSIM of 0.92 ± 0.06. External validation showed comparable performance. For Radboudumc cohort: wash-in PSNR 30.75 ± 1.72, SSIM 0.90 ± 0.04; for ISPY-2 cohort: wash-in PSNR 29.21 ± 1.55, SSIM 0.90 ± 0.03. In the randomly sampled evaluation set, tumor segmentation on synthesized DCE-MRI achieved a DSC of 0.81 ± 0.15, compared to ground truth segmentation on real DCE-MRI, demonstrating high spatial fidelity in tumor depiction.

CONCLUSION

The proposed MSF-Net enables accurate synthesis of multi-timepoint breast DCE-MRI images from non-contrast MRI data, effectively capturing contrast enhancement dynamics such as wash-in and wash-out. Validation across multiple independent datasets confirms the robustness and generalizability of the approach.

CLINICAL RELEVANCE/APPLICATION

This AI-driven method provides a fast, safe, and contrast-free alternative for breast DCE-MRI. By reducing patient exposure to contrast agents and shortening scan times, it promotes a more patient-friendly and environmentally sustainable imaging workflow—while maintaining diagnostic accuracy essential for clinical decision-making.

W7-STCE2-2 QUANTITATIVE CT IMAGING OF CORONARY PLAQUE BASED ON EFFECTIVE ATOMIC NUMBER IMAGE USING PHOTON-COUNTING CT

Takashi Asahara, PhD (*Presenter*)
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Natsumi Kimoto, PhD (*Abstract Co-Author*)
Rina Nishigami (*Abstract Co-Author*)
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Toru Miyoshi (*Abstract Co-Author*)
Toshihiro Iguchi, MD (*Abstract Co-Author*)
Hiroaki Hayashi, PhD (*Abstract Co-Author*)

PURPOSE

Non-contrast coronary CT is widely used to assess cardiovascular risk by detecting calcified plaques. Conventional CT image analysis has been performed using the Agatston score , which classifies CT values into only five discrete levels . Recent advances in detector technology have led to the development of photon counting CT (PCCT) , which enables the acquisition of high-quality spectral data in cardiac imaging. The purpose of this study was to verify the feasibility and advantages of using effective atomic number (Z eff) images for plaque analysis. Z eff imaging provides continuous gradation for each voxel that is available precise analysis of plaque components .

METHODS AND MATERIALS

Z eff images were generated from PCCT data using an in-house algorithm . Two virtual monoenergetic images (VMIs) of low and high energies were reconstructed using the vendor’s application. Linear attenuation coefficient (μ) images were calculated from these VMIs, and their ratio was converted into Z eff value using a reference function to obtain the Z eff image. Coronary CT scans from 10 patients with a total of 64 plaques were analyzed. The Z eff score , defined as the sum of Z eff values within the plaque region, was calculated and compared with the conventional Agatston score.

RESULTS

Z eff images were generated using VMIs at 40 keV and 190 keV, and the resulting images showed low noise and high accuracy. In the clinical analysis, the Z eff score showed a strong positive correlation with the Agatston score (R = 0.99). We found that the number of voxels contributing to the Agatston score was approximately 39% lower than that contributing to the Z eff score. This indicates that the Agatston method only takes into account partial high-density calcification, whereas the Z eff score evaluates the entire plaque volume . In actual clinical data, differences between the proposed and the Agatston methods were observed in the analysis of cases with low- and high-density plaques.

CONCLUSION

Z eff imaging provides a continuous physical quantity and enables coronary plaque quantification without the use of thresholds. The Z eff score is expected to improve the risk assessment of cardiovascular disease.

CLINICAL RELEVANCE/APPLICATION

We believe that quantitative imaging with photon-counting CT can provide new clinical advantages over conventional coronary CT assessment. As a first step in applying this approach, we challenged the quantitative evaluation of calcified plaques using Z eff image. Our method allows quantification of the entire plaque volume on a voxel basis , including both low- and high-density components based on composition analysis. This study demonstrated the clinical usefulness of Z eff imaging for plaque evaluation and showed its potential to enhance the diagnostic value of non-contrast coronary CT .

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Abstract Archives of the RSNA, 2025

BREE

Breast Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

BREE-2 CRYOABLATION IN BREAST CANCER CARE: EVIDENCE, ON-GOING TRIALS, AND FUTURE DIRECTIONS

Heather V. Garrett, MD (*Presenter*)
Michelle V. Lee, MD (*Abstract Co-Author*)
Tabassum Ahmad, MD (*Abstract Co-Author*)
Christina M. Doherty, MD (*Abstract Co-Author*)
Debbie L. Bennett, MD (*Abstract Co-Author*)

TEACHING POINTS

- US-guided cryoablation (CA) has emerged as a promising minimally invasive treatment for breast cancer. - Initial studies of CA for breast cancer were followed by wide local resection. Most CAs were successful in eliminating tumor, but unsuccessful ablation was associated with technical errors, poor visualization of the tumor by ultrasound, or larger tumors. - Phase II trials of CA for select breast cancers showed comparable results to lumpectomy. Additional studies are needed to further define the role of CA in breast cancer care. - On-going trials are evaluating CA in varying breast cancer contexts including DCIS, non-surgical patients, metastatic breast cancer, in combination with immunotherapy or vaccine therapy.

TABLE OF CONTENTS/OUTLINE

I . Introduction to CA for breast cancer. a . Available ablation modalities. b . Thermac trial - CA is safest and most effective c . Technique d . Mechanisms of action II . Initial studies of CA for breast cancer were followed by wide local resection. a . Most ablations successful b . Unsuccessful ablation associated with technical errors, poor visualization of the tumor, or larger tumors. III . Technologic advances in CA IV . Phase II trials of CA for breast cancer show comparable results to lumpectomy a . ICE3 trial, 5-year results b . Kawamoto et al, 5-year results c . FROST and PRECICE V . Phase III trial of CA for select breast cancer a . COOL-IT VI. Other potential indications for CA in breast cancer (on-going studies) a . Non-surgical patients -survival or QoL benefit? b . Metastatic Breast Cancer -benefit from reducing tumor burden? abscopal effect? c . DCIS -de-escalating care? d . CA with Immunotherapy -synergistic effect? e . CA with vaccine therapy -synergistic effect? VII . Summary

BREE-3 POSITION PERFECT: A PICTORIAL REVIEW OF POSITIONING STANDARDS AND WHY THEY MATTER

Ashley I. Huppe, MD (*Presenter*)
Elijah Burton, MD (*Abstract Co-Author*)
Allison Aripoli, MD (*Abstract Co-Author*)
Jessica K. Peterson, MD (*Abstract Co-Author*)
Camron B. Smith, DO (*Abstract Co-Author*)
Molly Hill, MD (*Abstract Co-Author*)
Lindsay Miner, MD (*Abstract Co-Author*)
Hannah L. Singhal, MD (*Abstract Co-Author*)
Onalisa D. Winblad, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Mammography positioning is a key component of image quality. 2. Inadequate positioning can lead to radiologist misinterpretation and potentially missed cancers or extent of disease. 3. Updated legislation under the Enhancing Quality Using the Inspection Program (EQUIP) emphasizes the role of the lead interpreting physician (LIP) in continuously maintaining standards which includes routine practice auditing. 4. The interpreting physician (IP) bears the case-by-case responsibility for quality, imaging adequacy and providing feedback. 5. In a case-based format, we will review examples of appropriate technical repeats related to positioning, when less than ideal position is acceptable, and potentially missed cancers related to positioning.

TABLE OF CONTENTS/OUTLINE

1) Introduction - breast positioning as a key factor in quality mammography a) Mammography Quality Standards Act (MQSA) i) EQUIP initiative ii) Requirements to maintain certifications and accreditation b) Mammography quality and effect on physician interpretation: literature review 2) Basics of mammography positioning a) Standard views and tissue visualization b) Utilization of extra views 3) Potential technical challenges which may result in positioning limitations a) Patient mobility factors b) Surgical history c) Congenital deformities 4) Case review to provide specific examples of the following: a) Recalls for technical repeat (4-6 cases) b) Acceptable imperfect positioning (4-6 cases) c) Cancers missed or potentially missed due to positioning (4-6 cases) 5) Conclusion

BREE-4 BREAST ELASTOGRAPHY DEMYSTIFIED: A PRACTICAL GUIDE TO STRAIN AND SHEAR WAVE TECHNIQUES

Geovana Ribeiro, MD (*Presenter*)
Irla A. Dantas, MD (*Abstract Co-Author*)
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Wagner Iared (*Abstract Co-Author*)
Renato D. Chiovatto (*Abstract Co-Author*)
Maria Cristina Chammas, MD, PhD (*Abstract Co-Author*)
Marina Joseane Pachecco, MD (*Abstract Co-Author*)
Vitor C. Zanetta, MD (*Abstract Co-Author*)
Vivian S. Ogata, MD (*Abstract Co-Author*)
Heni D. Skaf, MD (*Abstract Co-Author*)
Raquel S. Rabelo (*Abstract Co-Author*)
Ana Laura C. Silva, MD (*Abstract Co-Author*)

TEACHING POINTS

Breast elastography is a valuable adjunct to conventional ultrasound, offering a non-invasive evaluation of tissue stiffness to aid in distinguishing benign from malignant lesions. As imaging gains importance in breast diagnostics, mastering elastography enhances accuracy and confidence. This exhibit offers a practical guide to strain and shear wave elastography in breast imaging, presented through concise explanations, diagrams, and real-world imaging examples. We explore the physical principles, image acquisition techniques, interpretation methods, and reporting strategies, along with practical tips for clinical use. Designed for general radiologists, this guide supports learning with clarity and relevance. By expanding knowledge and proficiency in breast elastography, we aim to promote safer, more effective patient care—contributing to ongoing advancements in breast diagnostic imaging.

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Why Elastography Matters: Enhances diagnostic accuracy through tissue stiffness assessment. Techniques: Covers strain and shear wave methods with distinct clinical benefits. Principles & Acquisition: Includes physics, patient positioning, and image optimization. Interpretation & Reporting: Focuses on reading patterns, artifacts, and BI-RADS use. Practical Use & Cases: Offers workflow tips and real-life examples. Future Outlook: Key role in personalized, non-invasive breast cancer care.

BREE-5 ECHOES OF CHANGE: HOW AXILLARY ULTRASOUND IS TRANSFORMING SURGICAL DECISION-MAKING

Karina Pesce, MD, PhD (*Presenter*)
Maria P. Swiecicki, MD (*Abstract Co-Author*)
Ana G. Luna, PhD (*Abstract Co-Author*)
Maria Jose Chico (*Abstract Co-Author*)
Nancy L. Molon, MD (*Abstract Co-Author*)
Maria Veronica Pesce (*Abstract Co-Author*)

TEACHING POINTS

1-To evaluate the role of axillary ultrasound in breast cancer staging.2-To analyze and compare published and ongoing trials that propose axillary surgical de-escalation based on axillary ultrasound findings.3-To discuss the need for standardized axillary ultrasound criteria to ensure reproducibility in daily clinical practice.

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Axillary ultrasound has become a cornerstone in the preoperative evaluation of patients with early-stage breast cancer. Recent clinical trials have questioned the need for routine sentinel lymph node biopsy (SLNB) in selected clinically node-negative patients, proposing de-escalation strategies based on ultrasound findings. However, variability in imaging protocols and interpretation criteria limits the reproducibility and comparison between these studies. This educational exhibit aims to evaluate the current role of axillary ultrasound, compare protocols from published and ongoing trials, and emphasize the importance of standardized imaging criteria. In addition, we assess how axillary ultrasound findings influence surgical decision-making, highlighting its potential to reduce overtreatment while ensuring oncological safety. Conclusion: Establishing reproducible and validated ultrasound protocols is essential for translating trial evidence into consistent clinical practice.

BREE-6 RADIOLOGICAL APPROACH TO BREAST IMAGING IN CHILDREN AND ADOLESCENTS: A CASE BASED REVIEW

Tanya W. Moseley, MD, PhD (*Presenter*)
Anas M. Al Zubaidi, MD (*Abstract Co-Author*)
Savannah Dennis, MD (*Abstract Co-Author*)
Sarah Quinn (*Abstract Co-Author*)
Ronald A. Rauch, MD (*Abstract Co-Author*)
Gary J. Whitman, MD (*Abstract Co-Author*)
Mary S. Guirguis, MD (*Abstract Co-Author*)
Beatriz E. Adrada, MD (*Abstract Co-Author*)
Ethan O. Cohen, MD (*Abstract Co-Author*)
Olena O. Weaver, MD (*Abstract Co-Author*)
Hannah L. Chung, MD (*Abstract Co-Author*)

TEACHING POINTS

Breast imaging protocols for children and adolescents differ from those for adults, from the imaging modalities used to the spectrum of pathologies encountered. Ultrasound (US) is the primary imaging modality for breast imaging in children and adolescents. US provides superior sensitivity while avoiding radiation exposure associated with mammography. MRI provides a detailed assessment but may require sedation in young patients. Most breast imaging findings represent normal anatomical structures, physiological changes, or benign masses. Primary breast cancer is exceedingly rare; malignant masses typically represent metastases from extramammary primary tumors. Given the variation in disease patterns, breast imaging often relies on descriptive reports rather than the ACR BI-RADS® reporting system. Management is typically conservative with US follow-up while limiting biopsies to avoid damaging the developing breast bud. Biopsy indications include atypical imaging features, lesion growth, prior chest radiation, concurrent non-breast malignancy, or familial breast cancer. A small-gauge core-needle biopsy (18-16 gauge) is generally preferred when tissue sampling is necessary.

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Discuss the clinical presentation and characteristic imaging features of normal breast development and mass-forming lesions in children and adolescents, and highlight the differences in differential diagnosis compared to adults. Understand the breast imaging approach and each imaging modality's associated advantages and disadvantages. Illustrate clinically encountered cases ranging from common normal variants and benign processes to uncommon pathologies requiring intervention.

BREE-7 THE PAPILLARY PUZZLE: PAPILLARY LESIONS ON BREAST IMAGING AND MANAGEMENT REVIEW

Erina F. Quinn, DO (*Presenter*)
Charmi Vijapura, MD (*Abstract Co-Author*)
Daria Quinn (*Abstract Co-Author*)
Brian J. Guarnieri, MD (*Abstract Co-Author*)
Ann L. Brown, MD (*Abstract Co-Author*)
Kyle M. Lewis, MD (*Abstract Co-Author*)
Mary C. Mahoney, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review and recognize the challenges of imaging papillary breast lesions. - Highlight the mammographic, sonographic and MR imaging findings of the spectrum of papillary lesions. - Discuss treatment options used for various papillary breast lesions. - Summarize the recent literature on the management of papillary breast lesions with an evidence-based approach.

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1. Ductal anatomy with graphics 2. Papillary breast lesion categories a. Benign b. Malignant 3. Overview of imaging protocols a. Mammography b. Ultrasound c. MRI 4. Discuss cases and imaging findings: a. Benign - Intraductal papilloma - Papillomatosis b. Atypical - Atypical papilloma c. Malignant - Papilloma with DCIS - Intraductal papillary carcinoma - Intracystic (encapsulated) papillary carcinoma - Invasive micropapillary carcinoma 5. Review questions with additional cases 6. Summary table of papillary breast lesions Conclusion: 1. Papillary breast lesions are rare yet challenging to diagnose on breast imaging. 2. Radiologists should be familiar with the different benign and malignant papillary breast lesions. 3. Correlation with multiple imaging modalities can be helpful to develop an appropriate management plan

BREE-8 COMMON ERRORS IN BREAST IMAGING AND HOW TO AVOID THEM: A CASE-BASED EDUCATIONAL EXHIBIT

Firouzeh Heidari, MD, MD (*Presenter*)
Tova C. Koenigsberg, MD (*Abstract Co-Author*)

TEACHING POINTS

This educational exhibit highlights the primary reasons breast cancers are missed on imaging, categorized into perceptual errors, interpretive mistakes, and system failures. Using a case-based, image-rich approach, we illustrate how these errors occur—such as satisfaction of search, misapplication of BI-RADS categories, inadequate imaging-pathology correlation, poor communication, technical limitations, and failure to recommend appropriate follow-up—and provide practical strategies to avoid them. Each case includes a brief clinical history, imaging findings, initial impression, follow-up actions, complications, and final patient outcome. A teaching point concludes each case, focusing on improving diagnostic accuracy and reducing the likelihood of missed cancers. Our goal is to help radiologists recognize common pitfalls, adopt structured interpretation methods, and ultimately improve patient outcomes in breast imaging.

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Slide 1: title and learning objectsSlide 2: different categories of errorsSlide 3, 4 and 5: case-based examples of occurred error, outcome and teaching points of each case

BREE-9 IMPLANTS UNCOVERED: UNUSUAL COMPLICATIONS ASSOCIATED WITH BREAST IMPLANTS ON MULTIMODALITY IMAGING

Othria Ahmed, MD (*Presenter*)
Sarah Siddiqui (*Abstract Co-Author*)
Ekta Gupta, MD (*Abstract Co-Author*)
Nina S. Vincoff, MD (*Abstract Co-Author*)
Suzanne McElligott, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Breast augmentation with implants is a popular procedure with decades of innovations to improve patient safety and decrease adverse events. Despite proven safety, both common and unusual complications occur. Radiologists should be familiar with the spectrum of more unusual imaging complications 2. Recognize different types of breast implants and complications via key radiological findings 3. Discuss the role of patient surgical history in the assessment of breast implants to avoid unnecessary intervention

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I. Breast implant types and location -A. Common: saline, silicone -B. Uncommon: Multi-lumen, Stacked implants, Baffled saline implants -C. Locations: subpectoral, subglandular, subfascial II. Implant complications -A. Multimodality approach to diagnostic evaluation -B. Common: ---1. Intra and extracapsular silicone rupture ---2. Capsular contracture ---3. Early infection/hematoma ---4. Siliconomas in breast, intramammary and axillary lymph nodes -C. Uncommon: ---1. Integral patient history ----Space occupying seromas following explantation mimicking implants ----Slow leakage of saline implants ----Alloderm Residual capsule and silicone after explanation ---2. Atypical rupture ----Extracapsular rupture - extension through nipple, along lymphatics ----Diffuse silicone gel throughout the breast and/or pectoral muscle ---- Silicone pulmonary embolism and pneumonias ---3. Malignant/mass-like lesions ----BIA- ALCL Desmoid adjacent to implant ----Focal fibrosis ----Neuroma along/adjacent to a scar ----Synovial metaplasia III. Conclusion: Follow up imaging, intervention

BREE-10 IDIOPATHIC GRANULOMATOUS MASTITIS: THE GREAT IMITATOR

Saachi Datta (*Presenter*)
John N. Grimes, MD, PhD (*Abstract Co-Author*)
Jison Hong (*Abstract Co-Author*)
Meng Hao, MD (*Abstract Co-Author*)

TEACHING POINTS

- Recognize the demographic and clinical presentations of IGM - Discuss the differential diagnosis for patients - Review the spectrum of imaging findings of IGM on MG, US, and MRI with rad-path correlation - Review the typical and atypical appearance of IGM in imaging as well as pitfalls and challenges with diagnosis - Familiarize with the diagnostic breast imaging work-up for patient presenting with clinical concern of IGM

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Idiopathic granulomatous mastitis (IGM) is a rare benign inflammatory breast condition often misdiagnosed due to its variable presentation. It mainly affects postpartum, premenopausal patients, especially in Asian and Hispanic populations. The differential includes inflammatory breast cancer, inflammation, infection, and fat necrosis. IGM most commonly present on MG as focal asymmetry, an irregular mass, or regional skin thickening (often imaging will be negative), on US as parallel heterogenous hypoechoic masses with peripheral vascularity, and on MRI as rim-enhancing or heterogeneous enhancing masses with non-mass enhancement and T2 hyperintensity. Common associated imaging features include skin abnormalities, fluid collections, fistula tracks, and axillary lymphadenopathy. This education exhibit will present 10 IGM patients evaluated with MG, US, and MRI (some with post-treatment MRI), focusing on clinical and imaging presentation, diagnostics, and management. In summary, IGM can mimic malignancy and infectious abscesses clinically and radiographically. Therefore, it is important for radiologists to be familiar with the clinical picture, differential diagnosis, imaging features, and work-up for IGM to prevent delay in diagnosis and treatment.

BREE-11 HORSES AND ZEBRAS: BENIGN AND MALIGNANT CAUSES OF REGIONAL LYMPHADENOPATHY IN BREAST IMAGING PATIENTS

Mary S. Guirguis, MD (*Presenter*)
Tanya W. Moseley, MD, PhD (*Abstract Co-Author*)
Marion E. Scoggins, MD (*Abstract Co-Author*)
Megha M. Kapoor, MD (*Abstract Co-Author*)
Miral M. Patel, MD (*Abstract Co-Author*)
Gaiane M. Rauch, MD, PhD (*Abstract Co-Author*)
Emily S. Nia, MD (*Abstract Co-Author*)
Elsa M. Arribas, MD (*Abstract Co-Author*)
Savitri Krishnamurthy, MD (*Abstract Co-Author*)
Beatriz E. Adrada, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review breast cancer regional lymph node staging 2. Illustrate a case-based differential diagnosis review for lymphadenopathy in breast imaging patients 3. Highlight helpful imaging characteristics of benign and malignant lymph nodes 4. Provide tips and tricks to successfully biopsy regional lymph nodes

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Evaluation of the regional nodal basins is essential in patients with breast cancer and those undergoing surveillance for history of treated breast cancer. The regional lymph nodes include the axillary levels I-III, the internal mammary, and the supraclavicular regions. Lymph node involvement contributes to the patient's staging and recurrence-free survival with important associated management implications. Understanding the lymphatic drainage of the breast and the anatomy of the regional lymph node stations is fundamental for radiologists. In addition to breast cancer, other benign and malignant etiologies of regional lymphadenopathy can be seen, and understanding this is key for successfully managing breast cancer patients and patients in the breast imaging setting. A case-based review of both malignant and benign etiologies of lymphadenopathy in breast cancer patients will be presented in this educational exhibit. Imaging features of malignant versus reactive nodes will be discussed, as well as interventional tips and tricks to successfully biopsy these lymph nodes if clinically indicated.

BREE-12 CT ANGIOGRAPHY IN BREAST RECONSTRUCTION: MAPPING DIEP, LUMBAR, AND PROFUNDA PERFORATORS FOR OPTIMAL FLAP HARVESTING

Suthar, MBBS, MD (*Presenter*)
Lavanya Chhetri (*Abstract Co-Author*)
Abdullgabbar M. Hamid, MBBS, MSc (*Abstract Co-Author*)
Jagadeesh Singh, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Autologous breast reconstruction with perforator flaps have become the mainstay for breast reconstructive surgery. Nonstandard radiology reporting results in inadequate information to the clinical service. The aim of this exhibit is to educate the radiologist of the CTA findings in the preoperative evaluation of DIEP, lumbar, and profunda perforators flaps and help in surgical outcomes.

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• CTA Protocol and Post-Processing for DIEP, Lumbar, and Profunda Perforators DIEP Flap Imaging : Vascular Anatomy & Branching Patterns : Type I (single trunk), Type II (bifurcating), or Type III (trifurcating) . Perforator Characteristics : Number , Diameter , Course (intramuscular or subcutaneous course) Vascular Territory Mapping Evaluation of DIEA and SIEA Lumbar Artery Perforator (LAP) Flap Imaging : Perforator Classification : Differentiate between myocutaneous and septocutaneous perforators. Selection Criteria : Level : Select perforators from the L2 to L4 levels for optimal tissue harvest. Avoidance : Avoid perforators that are too close to the spinal artery to prevent injury. Profunda Artery Perforator (PAP) Flap Imaging : Perforator Classification : Identify whether the perforators are intramuscular or septocutaneous. Perforator Patterns : "T" Pattern : Characterized by a superficial bifurcation. "Y" Pattern : Characterized by a deeper bifurcation. Dominant Perforator Identification : A dominant "T" perforator on preoperative CTA accurately predicts flap thickness when elevated at the superficial fascial level. • Standard reporting for DIEP, Lumbar, and Profunda Perforators

BREE-13 FIBROEPITHELIAL TUMORS OF THE BREAST. IMAGING ON CONTRAST-ENHANCED MAMMOGRAPHY WITH HISTOPATHOLOGY CORRELATION. TIPS TO UNDERSTAND DIFFERENT BEHAVIOURS WITH CONTRAST BASED ON PATHOLOGICAL FEATURES

Rosa M. Lorente-Ramos, MD, PhD (*Presenter*)
Javier Azpeitia Arman, MD (*Abstract Co-Author*)
Lorena Melian Iribar, MD (*Abstract Co-Author*)
Soledad Alonso Garcia (*Abstract Co-Author*)
Carlos Molina, MD (*Abstract Co-Author*)
Lina Maria Caballero Ubaque (*Abstract Co-Author*)

TEACHING POINTS

-To review the pathological features and classification of fibroepithelial breast tumors. -To illustrate imaging in different techniques, emphasizing contrast-enhanced mammography (CEM), with US, MRI, and pathologic correlation.- To review clues to understand how pathology informs imaging features. -To emphasize pitfalls, diagnostic difficulties, and differential diagnosis. -To discuss the specific management of those patients, including imaging and interventional procedures.

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Fibroepithelial breast tumors are biphasic neoplasms composed of epithelial and stromal elements. Contrast-enhanced mammography increases the sensitivity of digital mammography in the detection of breast cancer, but fibroepithelial lesions may pose a challenge in imaging interpretation. The understanding of the histopathological features informs image interpretation and helps in the distinction of fibroepithelial tumors from breast cancer. We present the following: 1. Basics and technique of contrast-enhanced mammography (CEM). 2. Pathology of fibroepithelial tumors: fibroadenoma and phyllodes tumour. Fibroadenoma variants include the cellular, juvenile, myxoid, and complex forms. Phyllodes tumors include benign, borderline, and malignant types. 3 Images in different pathologic entities. Through sample illustrative cases, we present imaging and pathology findings from lesions detected in CEM studies, with correlation with US, MRI, and pathology. 4. Clues for differential diagnosis, especially of enhancing lesions correlating with clinical and histopathological features such as variants, cellularity, and stromal elements.

BREE-14 OPTIMIZING ULTRASOUND-GUIDED BREAST BIOPSY: FROM TECHNIQUE TO OVERCOMING CHALLENGES

Renato L. Ribeiro, MD (*Presenter*)
Isabela C. Ferracini, MD (*Abstract Co-Author*)
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Marcela C. Lauar, MD (*Abstract Co-Author*)
Juliana H. Catani, MD (*Abstract Co-Author*)
Heni D. Skaf, MD (*Abstract Co-Author*)
Carolina d. Kiebert (*Abstract Co-Author*)
Iviny Yonekura (*Abstract Co-Author*)
Caio D. Pinheiro, MD (*Abstract Co-Author*)

TEACHING POINTS

Accurate, image-guided biopsy plays a key role in breast cancer diagnosis and management, directly influencing surgical planning and outcomes. Minimally invasive techniques such as FNA, CNB, and VAB offer fewer complications, faster recovery, and reduced surgical need compared to open biopsy. Pre-procedural imaging review is critical to confirm lesion suspicion, choose the best guidance modality, and anticipate technical challenges. Each method has specific indications based on lesion type, size, and location. Ultrasound is generally preferred when the lesion is visible, due to real-time control, patient comfort, and versatility. Proper planning—including needle trajectory and entry site—enhances both safety and diagnostic precision.

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This pictorial essay provides a practical guide to ultrasound-guided breast biopsy, emphasizing technique selection and planning based on lesion and imaging features. We illustrate key steps, needle positioning, and challenging scenarios using ultrasound, mammography, and MRI from our institutional archive, along with didactic illustrations. These procedures are endorsed as standard of care by the ACR and the American Society of Breast Surgeons, with diagnostic performance comparable to surgical biopsy but lower morbidity and cost.

BREE-15 CONTRAST ENHANCED MAMMOGRAM (CEM)-GUIDED BIOPSY:PROCEDURAL EDUCATION FOR RADIOLOGISTS AND TECHNICIANS IN THE ACADEMIC SETTING

Michael Borten, MD, BS (*Presenter*)
Kelly A. Brozzetti Cronin, MD (*Abstract Co-Author*)

TEACHING POINTS

Contrast-enhanced mammography (CEM) uses dual energy digital subtraction to create a recombined image that shows contrast-enhancement in regions of neovascularity. The technique is akin to contrast-enhanced subtraction breast MRI, but lower cost, faster to perform, and easier to interpret. CEM-guided biopsy, a stereotactic-based procedure, is an emerging FDA-approved technique to harness the benefits of CEM to target lesions without a standard mammographic or sonographic correlate. However, implementation remains a challenge. Our nascent workflow consists of training technicians to the new technique, allowing attending radiologists to pilot the procedure, training residents, and eliciting feedback to improve our technique. We aim to present the technical and procedural considerations to educate both radiologists as well as technicians. For technicians, primary considerations include reviewing contrast allergies and kidney function, positioning the patient, and performing dual energy imaging at the appropriate intervals. The ability to maneuver patients efficiently is paramount. The radiologist must double-check contrast contraindications, confirm the target lesion (including correlation with prior imaging), and place the needle effectively. In addition to time constraints, needle positioning is even more critical than standard stereotactic biopsy given that blood products limit the utility of dual energy lesion targeting.

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CEM-guided biopsy workflow for the academic setting. Basic principles of CEM. Example case for utilizing CEM-guided biopsy. Technician considerations for CEM-guided biopsy. Radiologist considerations for CEM-guided biopsy.

BREE-16 REVISITING THE FORBIDDEN ZONES IN MAMMOGRAPHY: A CONCEPT THAT CAN SAVE LIVES

Ruth H. Bonini, MD, PhD (*Presenter*)
Luciana K. Franca (*Abstract Co-Author*)
Ligia P. Mazi, MD (*Abstract Co-Author*)
Marcio M. Saito, MD (*Abstract Co-Author*)
Jamile d. Casado Pereira, MD (*Abstract Co-Author*)
Erika M. Negrao (*Abstract Co-Author*)
Edmundo C. Mauad, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

The concept of "forbidden zones," introduced by Dr. László Tabár, refers to anatomical regions of the breast where cancers often arise but are frequently underdiagnosed due to technical limitations, suboptimal positioning, or interpretation errors. These zones include the retromammary fat ("Milky Way") and retroareolar region on the MLO view, as well as the medial half and retroglandular space ("no man's land") on the CC view. Our experience, supported by the literature, shows that a significant proportion of both screen-detected and interval cancers cluster in these areas. This highlights the need for optimized image acquisition, proper positioning, and increased radiologist awareness to reduce false negatives and improve early breast cancer detection—especially in screening programs. This poster aims to reviews these high-risk areas and demonstrates how both technical and interpretive oversights may delay diagnosis. We also correlate these findings with a literature review addressing variations in screening sensitivity according to tumor location. By revisiting these topographies, we aim to reinforce a more systematic approach to image analysis and encourage vigilance in regions that are often overlooked yet clinically significant.

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Through representative cases, we present clinical examples selected from our institution's digital archive of malignant lesions, with mammographic and ultrasonographic correlations. These lesions were missed or underestimated—some dismissed as benign, others overlooked due to subtle presentation or challenging location. These findings underscore the clinical relevance of the forbidden zones in daily mammographic practice.

BREE-17 DEDICATED BREAST CT: PRIMER FOR RADIOLOGISTS

Elizabet Nikolova (*Presenter*)
Esther Birindelli (*Abstract Co-Author*)
Heike Frauchiger-Heuer (*Abstract Co-Author*)
Thomas Frauenfelder, MD (*Abstract Co-Author*)
Malwina Kaniewska, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit aims to provide a comprehensive understanding of breast CT, which is an emerging imaging modality with significant potential in breast care. It includes the technical principles and clinical applications of this three-dimensional imaging. Participants will learn to detect and evaluate common breast pathologies using breast CT and compare its diagnostic value with conventional imaging modalities such as mammography, dedicated breast ultrasound, and breast MRI. Emphasis is placed on preparing structured reports using a standardized checklist to ensure consistency and clarity. Additionally, the exhibit highlights best practices for effectively communicating imaging findings with both referring clinicians and patients.

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This exhibit begins with an introduction to breast CT imaging, followed by an explanation of its technical principles and system design. The examination workflow and patient positioning are then described, along with image acquisition and reconstruction processes. A comparison is made between breast CT and conventional imaging modalities such as mammography, ultrasound, and MRI, focusing on advantages in dense breast tissue and lesion characterization. Clinical indications and typical findings are illustrated through selected cases. The exhibit also discusses structured reporting practices using a standardized checklist. It concludes with a summary and key practical considerations for clinical implementation.

BREE-18 EXTRANODAL EXTENSION IN BREAST CANCER

Phat Tan Nguyen, MD (*Presenter*)
Leah H. Portnow, MD (*Abstract Co-Author*)
Matthew Packer, MD (*Abstract Co-Author*)
Eva C. Gombos, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Extranodal extension (ENE) is the spread of cancer beyond the lymph node capsule and is associated with more aggressive breast cancer. ENE is linked to increased nodal burden, higher recurrence rates, and decreased survival. 2. ENE is challenging to detect on imaging due to variably present features of indistinct margins and perinodal edema. 3. Histopathology remains the diagnostic gold standard, but also has limitations. Fine needle aspiration cannot detect ENE, and core biopsies may miss ENE due to under-sampling. Accurate diagnosis often requires specialized pathology techniques including immunohistochemistry to distinguish ENE from its mimics. 4. Recognition of ENE and its challenges in detection is important given its prognostic significance.

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1. Define ENE and its prognostic significance. 2. Review key imaging features suggestive of ENE including a. Mammographic and US characteristics b. MRI features and c. Additional modalities (e.g. PET/CT). 3. Review key histopathologic features of ENE including capsular disruption, stromal desmoplastic reaction, and tumor infiltration into the surrounding soft tissue. 4. Discuss the significance of ENE on axillary management.

BREE-19 IMAGING PEARLS IN BREAST GRANULOMATOUS MASTITIS: BEYOND THE USUAL

Ruth H. Bonini, MD, PhD (*Presenter*)
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Erika Salles Abufares Camargo (*Abstract Co-Author*)
Erika M. Negrao (*Abstract Co-Author*)
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Edmundo C. Mauad, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

Granulomatous mastitis (GM) is a rare, chronic, and complex inflammatory condition of the breast, which may be idiopathic or secondary to infections, autoimmune diseases, or foreign body reactions. The idiopathic form is strongly associated with pregnancy, lactation, and hyperprolactinemia, predominantly affecting women of reproductive age. The clinical presentation of GM often mimics infectious or neoplastic processes, making imaging studies essential for accurate diagnosis. Nevertheless, it remains underdiagnosed in clinical practice and underreported in the literature.This study aims to present the radiopathologic spectrum of GM, with an emphasis on the idiopathic form. The most common imaging findings include focal or global asymmetry, irregular hypoechoic nodules, T2 hyperintensity, and segmental non-mass enhancement. Less frequent but clinically relevant findings include fistulous tracts, architectural distortion, heterogeneous parenchyma or edema, and T2-hypointense masses with irregular margins. Recognizing these imaging patterns is essential to appropriately guide biopsies, avoid diagnostic pitfalls, ensure accurate clinical, radiologic, and pathologic correlation, and enable specific and targeted therapy.

TABLE OF CONTENTS/OUTLINE

• Overview of GM: idiopathic and secondary forms • Common and uncommon findings on mammography, US, and MRI • Histologic subtypes and imaging correlation • Case-based clinical, radiologic, and pathologic integration

BREE-20 A PRIMER FOR EVERY RADIOLOGY RESIDENT/FELLOW : DIAGNOSIS OF BREAST CANCER WITH AI-CADX IN ASIAN WOMEN

Kei Mizushima, MD (*Presenter*)
JITSURO TSUKADA (*Abstract Co-Author*)
Haruka Okamura, MD (*Abstract Co-Author*)
Naoko Okawara (*Abstract Co-Author*)
Manabu Hase (*Abstract Co-Author*)
Yuko Tsujioka, MD, PhD (*Abstract Co-Author*)
Masahiro Hashimoto, MD (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

AI-based computer-aided diagnosis (AI-CADx) has improved the diagnostic accuracy of mammography, ultrasound, and ABUS. However, challenges remain, particularly in women with dense breasts, which are more common among Asian women. Most AI-CADx systems are trained on Western datasets, raising concerns about their generalizability to Asian populations. In contrast, AI-CADx models trained on images from Asian women have demonstrated performance comparable to or better than that of radiologists across multiple imaging modalities. Reported performances include: - Mammography : AUC 0.902 (Mio A et al., 2024) - Ultrasound : AUC 0.95; sensitivity 91.2%, specificity 90.7% (Hayashida T et al., 2022) - ABUS : AUC-LROC improved from 0.7582 to 0.8294 with AI (Lai YC et al., 2022) This educational exhibit provides radiology residents and fellows with a concise overview of AI-CADx applications in breast imaging, emphasizing both benefits and current limitations for future clinical practice.

TABLE OF CONTENTS/OUTLINE

- Introduction : Overview of AI-CADx and its growing role in breast cancer diagnosis. - Challenges in Asian Women with Dense Breasts : Limited generalizability of Western-trained models, high prevalence of dense breasts, and underrepresentation of Asian datasets. - AI-CADx Applications Using Asian-Based Datasets : Case examples in mammography, ultrasound, and ABUS; comparison with radiologist performance and improvements in diagnostic metrics. - Discussion : Clinical advantages and limitations; the importance of developing population-specific AI models. - Conclusion : Educational implications for radiologists in adopting and evaluating AI-integrated diagnostic workflows.

BREE-21 BREAST DIFFUSION MRI - HOW DOES IT WORK?

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Daniel Robles (*Abstract Co-Author*)
Bruna M. Thompson, MD, PhD (*Abstract Co-Author*)
Reine Fahed, MD (*Abstract Co-Author*)
Fabiola P. Kestelman, MD (*Abstract Co-Author*)
Fabiana C. Policeni, MD (*Abstract Co-Author*)
Su Kim Hsieh, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Review the fundamental physics of diffusion-weighted imaging (DWI) in the breast, including the concept of water molecule motion and its relationship to the tumor microenvironment.2. Summarize essential protocol optimization (choice of b-values, sequence parameters, coil selection) for reliable apparent diffusion coefficient (ADC) measurement.3. Illustrate normal and pathologic diffusion patterns in the breast, emphasizing how malignant lesions typically restrict diffusion compared to benign lesions or background tissue.4. Discuss key diagnostic pearls (e.g., ADC thresholds) and pitfalls (e.g., T2 shine-through, motion artifacts) to ensure accurate interpretation.5. Highlight the evolving clinical applications of breast DWI, from improving lesion characterization to monitoring tumor response to neoadjuvant therapy.

TABLE OF CONTENTS/OUTLINE

1. Introduction & Physical Principles *Overview of diffusion MRI physics *Role of DWI in breast imaging2. Technical Considerations *Sequence design (spin-echo echo-planar imaging) *Choice of b-values and coil optimization *Strategies to reduce artifacts)3. Image Analysis & Interpretation *ADC maps and thresholds *Differentiation of benign vs. malignant lesions *Common pitfalls (T2 shine-through, inadequate SNR, fat suppression issues)4. Clinical Applications & Case Examples *Screening high-risk populations *Characterizing suspicious lesions *Assessing treatment response5. Future Directions & Conclusion *Emerging advanced diffusion techniques *Potential integration with radiomics *Key take-home points

BREE-22 A COMPREHENSIVE ANALYSIS OF RADIOLOGICAL-PATHOLOGICAL CORRELATION OF BREAST LESIONS: IMPLICATIONS IN DIAGNOSTIC ACCURACY AND PATIENT MANAGEMENT

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Maria L. Negri (*Abstract Co-Author*)
Cosaka Laura, MD (*Abstract Co-Author*)
SONIA GARCIA (*Abstract Co-Author*)
Claudia A. Fernandez, MD (*Abstract Co-Author*)
Daniel C. Mysler SR, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize the definitions and clinical significance of radiological-pathological concordance and discordance after a breast biopsy.-Illustrate the key factors contributing to discordant findings including technical and interpretative errors.-Review how concordant and discordant results influence management decisions-Gain practical tips for optimizing communication between radiologists and pathologists, implementing systematic review protocols, and reducing diagnostic errors to ensure proper patient management.

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Nowadays image guided biopsies have become the standard of care to accurately characterize suspicious breast image findings. Radiological-pathological correlation after a breast biopsy is a cornerstone of accurate diagnosis, guiding clinical decisions and patient management. Discordant findings can be challenging for radiologists and pathologists alike, affecting diagnostic confidence and treatment pathways. -Briefly describe and illustrate the prevalence, patterns, and underlying causes of radiological-pathological discordance in breast biopsies.-Highlight several strategies for optimizing multidisciplinary communication and implementing systematic review

protocols.-Provide practical insights and tips to improve interpretive accuracy, recognize potential pitfalls, and promote collaborative decision-making in breast imaging and pathology. By fostering a comprehensive approach to radio-pathological correlation, this exhibit aims to help enhance diagnostic accuracy, reduce false negatives/positives, and ultimately improve patient outcomes.

BREE-23 WHEN IMAGES AND SLIDES COLLIDE: MASTERING RAD-PATH CONCORDANCE ASSESSMENT IN BREAST IMAGING

Jennie E. Brodsky, MD (*Presenter*)
Syeda Jannath (*Abstract Co-Author*)

TEACHING POINTS

-Radiology-pathology concordance assessment in breast imaging practice is essential for diagnostic accuracy. -Pathology results post-biopsy should always be confirmed to be consistent with imaging findings; this is particularly important for lesions of high suspicion for malignancy on imaging (BI-RADS 4C or 5), where a malignant result is expected but benign results may still occur. - Teaching points will focus in depth on discordant cases from our institution that were upgraded to malignancy: reasons for discordance, and ways to decrease discordance in the future. Teaching points will explore common concordant radiology-pathology results by focusing on accurate identification and examples of benign pathologies that mimic malignancy on imaging.

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Background: What is rad-path concordance correlation. Understanding the role of rad path correlation in breast imaging practice. Cases: 8-15 cases from our institution of rad-path discordant biopsy results that were upgraded to malignancy on excision. Teaching points to evaluate for rad-path concordance and mitigate discordant rad-path findings. 4-8 cases from our institution to illustrate common benign etiologies that can mimic malignancy on imaging and are concordant. Teaching points for each case to aid in recognition of concordant benign pathology. Conclusion: Accurate recognition of benign and concordant pathology results can help prevent over diagnosis and over treatment. Accurate recognition of benign but discordant pathology results can prevent delay in diagnosis.

BREE-24 WHAT'S LURKING IN YOUR ARMPIT? IT'S NOT ALWAYS A LYMPH NODE!

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Laura B. De Melo, MD (*Abstract Co-Author*)
Celia Luiza De Lima Rodrigues (*Abstract Co-Author*)
Juliana A. Souza, MD (*Abstract Co-Author*)
Vinicius C. Felipe SR, PhD (*Abstract Co-Author*)
Mariah C. Wanderley (*Abstract Co-Author*)
Almir Bitencourt, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Axillary mass or swelling is a common clinical presentation that requires imaging investigation.• The axilla contains lymph nodes and non-lymphatic tissue, such as accessory breast tissue, skin, fat, muscles, nerves, and blood vessels. There is a wide range of differential diagnoses.• The imaging findings of these diseases overlap. Knowledge of common radiologic manifestations for specific diseases allows an appropriate differential diagnosis to be established, guides imaging management, and helps optimize tissue sampling technique when indicated.

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• An overview of the radiological characteristic findings of various disease entities that cause axillary masses will help diagnose correctly. Examples of the normal anatomy of the axilla present a systematic approach to imaging-based evaluation using ultrasound, mammography, computed tomography, and magnetic resonance imaging. Key radiologic features will be highlighted to aid in distinguishing among these entities. Suggested decision-making workflow for selecting the appropriate imaging technique based on clinical needs, imaging availability, and cost-effectiveness.

BREE-25 WHEN THE NIPPLE'S IN TROUBLE: A RADIOLOGIST'S GUIDE TO IMAGING AND DIFFERENTIAL DIAGNOSIS

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Marcele F. Cortes, MD (*Abstract Co-Author*)
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Bruna Mendes, MD (*Abstract Co-Author*)
Renata Sande Paiva, MD (*Abstract Co-Author*)
Vitor Soares, MD (*Abstract Co-Author*)
Rafaela Queiroz, MD, BMedSc (*Abstract Co-Author*)

TEACHING POINTS

? Review the differential diagnoses of nipple lesions. ? Describe key imaging features and the broad spectrum of nipple pathologies.

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Introduction Nipple lesions are uncommon but clinically significant findings in breast imaging. They may represent a wide range of benign and malignant conditions and should never be overlooked. A thorough clinical examination and mammography are essential for proper assessment. To ensure updated content, we conducted a review of recent literature on nipple lesions and selected a series of unusual and illustrative cases for discussion. Important Features to Analyze Evaluation should begin with a detailed clinical history and mammographic assessment. Epidemiologic context is important—conditions such as tuberculosis must be considered in endemic areas. Imaging findings should be interpreted in accordance with BI-RADS guidelines and correlated with pathology when appropriate. In most cases, ultrasound-guided biopsy provides a reliable and minimally invasive diagnostic method. Conclusion Radiologists must be familiar with the clinical presentation and imaging features of nipple lesions. Expanding the differential diagnosis and promoting early detection can significantly improve patient management and reduce associated morbidity.

BREE-26 A CASE-BASED PRIMER ON BREAST IMAGING IN TRANSGENDER PATIENTS

Rebecca Zhang, MD (*Presenter*)

TEACHING POINTS

1) Recognize the American College of Radiology (ACR) Appropriateness Criteria breast screening recommendations for transgender male and female patients. 2) Describe posttreatment changes to the breast after hormonal and/or surgical therapies. 3) Review breast pathologies commonly encountered in transgender patients.

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1) Introduction. 2) Delineate the recommended screening guidelines for transgender patients using the ACR Appropriateness Criteria. 3) Review hormonal and surgical therapies commonly utilized for transgender care. (3a) Effects of estrogen therapy in transgender women. (3b) Effects of testosterone therapy in transgender men. (3c) Common gender-affirming surgeries, including breast augmentation and reduction. (4) Cases to illustrate the variety of expected imaging findings in transgender patients after hormonal and/or surgical treatments. (5) Cases to elucidate common breast pathologies seen in transgender patients.

BREE-27 FROM EMBRYOLOGY TO BIOPSY: A COMPREHENSIVE APPROACH TO PEDIATRIC BREAST RADIOLOGY

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Vitor C. Romano, MD (*Abstract Co-Author*)
Yoshino Tamaki Sameshima, MD (*Abstract Co-Author*)

TEACHING POINTS

1 Pediatric breast imaging presents a taxing challenge within breast radiology. It is imperative to strike a balance between the need for diagnosis of uncommon conditions and the limitation of radiation exposure to young patients. 2 Accurate understanding of normal breast development, including embryology and imaging characteristics of postnatal changes and Tanner staging, is essential to avoid misinterpretation of physiologic features. 3 Congenital abnormalities like accessory breast tissue, asymmetries, nipple abnormalities and Poland syndrome are often observed in those patients and can also mimic pathologies. Their accurate recognition is imperative to avoid unnecessary intervention and guide appropriate management. 4 Most pediatric breast lesions are benign. Breast radiologists should be comfortable with the imaging in this subpopulation, especially sonographic features of fibroadenomas, vascular lesions, galactocele, Montgomery cysts and lymphangiomas, among others. 5 Although rare, pediatric breast cancer must be considered. A combination of suspicious imaging features, size increase and risk factors warrants further evaluation.

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1 Importance and rarity of pediatric breast imaging 2 Goals of pediatric breast imaging: accurate diagnosis while minimizing radiation 3 Normal breast development A Embryology and postnatal development B Imaging features of pubertal changes and Tanner staging 4 Congenital abnormalities A Accessory breast tissue B Asymmetries and nipple abnormalities C Hypoplasia and Poland syndrome 5 Benign lesions A Fibroadenomas B Vascular lesions C Galactocele D Montgomery cysts E Lymphangiomas 6 Infectious diseases 7 Pediatric breast cancer

BREE-28 BACK IN THE PICTURE: IMAGING FEATURES OF BREAST CANCER RECURRENCE AFTER BREAST CONSERVATION THERAPY

Megan K. Mercer, MD (*Presenter*)
Stephanie M. Walker, MD (*Abstract Co-Author*)
Allyson L. Chesebro, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this educational exhibit is to highlight the features of breast cancer recurrence after breast conservation therapy utilizing a multimodality approach. We will review breast conservation therapy (BCT). We will highlight imaging in the post-BCT period, including screening, diagnostic techniques, and the evaluation of the symptomatic breast. We will also examine the identification of suspicious features, benign findings, and the evolution of post-operative breast, as well as further work-up and management of the breast after BCT.

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We will give an overview of breast conservation therapy as a treatment option for breast cancer, including the history and implementation of the treatment strategy as it compares to mastectomy. We will review the post-treatment appearance of the breast utilizing mammography, sonography, MRI, and physical exam and the benign changes over time. Screening, diagnostic work-up, and symptom evaluation will be reviewed as well as a systematic approach for reporting. We will then review suspicious findings and cases for recurrent disease across multiple modalities.

BREE-29 BACKGROUND PARENCHYMAL ENHANCEMENT (BPE) ON BREAST MRI: UPDATES ON HORMONAL INFLUENCE AND POTENTIAL IMPACT ON INTERPRETATION, ASSOCIATION WITH FUTURE CANCER RISK, AND ULTRAFAST TECHNIQUES

Megan K. Mercer, MD (*Presenter*)
Catherine S. Giess, MD (*Abstract Co-Author*)

TEACHING POINTS

Cancer detection on breast MRI is based on vascular enhancement, but benign breast tissue also enhances. Background parenchymal enhancement (BPE) is common in screening and diagnostic MRI and may complicate image interpretation. This case-rich exhibit will present 1) evolving published data on hormonal effects on BPE and its association with abnormal interpretation; 2) discuss the potential association of high BPE with risk of developing breast cancer or tumor recurrence and its potential for predicting response to neoadjuvant treatment; 3) potential for ultrafast imaging techniques to improve differentiation of tumor from BPE, potentially reducing false positive interpretations.

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1. Present early and more recent literature on hormonal influences on BPE related to menstrual cycle and its impact on imaging interpretation for screening and diagnostic MRI 2. Discuss the pros and cons of scheduling MRI around the patient's menstrual cycle in the current era of constrained health care resources and access challenges 3. Review current published data on the association of high BPE with future cancer risk, breast cancer recurrence, and potential association with predicting response to neoadjuvant treatment 4. Discuss the potential for new evaluating ultrafast imaging techniques to differentiate BPE from breast disease, potentially reducing false positive interpretations in these high-risk patients.

BREE-30 METASTASES TO THE BREAST: IT'S RARE, BUT IT HAPPENS — RECOGNIZING THE UNEXPECTED

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Edmundo C. Mauad, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

Metastases to the breast from extramammary malignancies are rare, accounting for approximately 0.1-5% of all breast tumors. In up to 31% of cases, they may represent the initial manifestation of the primary tumor. Imaging findings often differ from those of primary breast cancer and may mimic benign lesions. The pattern of spread influences the imaging appearance: hematogenous dissemination usually results in well-defined nodules, while lymphatic spread leads to diffuse changes such as skin and trabecular thickening. Among tumors that metastasize to the breast, the contralateral breast is the most common primary site due to cross-lymphatic spread. Other malignancies include hematologic neoplasms (e.g., leukemia and lymphoma), melanoma, lung, gastric, and ovarian cancers. Imaging features are frequently nonspecific and often insufficient for a definitive differential diagnosis. Despite their rarity, radiologists should consider the possibility of metastatic disease, especially in

patients with a history of extramammary malignancy. Differentiating metastatic from primary breast tumors is crucial, given the differences in management and prognosis. Clinical history and immunohistochemistry are essential for accurate diagnosis.

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This study aims to present cases of breast metastases originating from extramammary malignancies, emphasizing their main imaging characteristics and the distinct patterns of metastatic spread.

BREE-31 TOMOSYNTHESIS IN PRACTICE: LESSONS LEARNED FROM A DECADE OF DIAGNOSTIC CHALLENGES

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Isabela Ferreira (*Abstract Co-Author*)
Carla Tajima (*Abstract Co-Author*)
Carla C. Benetti, MD (*Abstract Co-Author*)
Almir Bitencourt, MD, PhD (*Abstract Co-Author*)
Carlos H. Rosas, MD (*Abstract Co-Author*)

TEACHING POINTS

Mammography has played a fundamental role in breast cancer screening; however, its limitations — particularly the overlap of anatomical structures — have prompted the development of more advanced technologies, such as digital breast tomosynthesis. Retrospective studies indicate that tomosynthesis is associated with reduced recall rates, increased cancer detection rates, and a lower incidence of false-negative findings. These benefits result from its ability to acquire multiple thin-slice images, allowing for the visualization of the breast in different planes and eliminating tissue overlap, which enhances the early detection of lesions. In this context, the present study aims to compare the outcomes of conventional mammography and digital breast tomosynthesis performed at our facility in the detection of breast lesions, highlighting the advantages offered by the latter.

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Through a review of clinical cases and the existing literature, this study aims to present a comparative analysis between conventional mammography and digital breast tomosynthesis in the detection of breast lesions. Furthermore, based on over a decade of experience with the use of this technology in our institution, we aim to demonstrate that digital tomosynthesis enables more accurate diagnoses and earlier interventions, which translate into improved clinical outcomes for patients.

BREE-32 MOLECULAR FINGERPRINTS: HOW BREAST CANCER GENOTYPE SHAPES IMAGING AND DIAGNOSIS

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Vitor C. Zanetta, MD (*Abstract Co-Author*)
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Priscila Marques (*Abstract Co-Author*)
Guilherme Mineiro, MD (*Abstract Co-Author*)
Monica Stiepcich (*Abstract Co-Author*)

TEACHING POINTS

Breast cancer subtypes (Luminal A, Luminal B, HER2, Triple-negative) have unique molecular profiles, with distinct prognostic and therapeutic implications.Understanding imaging features (mammography, ultrasound, MRI) optimizes diagnosis and guides individualized treatment.Different imaging modalities are crucial in identifying and differentiating molecular subtypes.Case analysis, correlating imaging findings with histopathology, highlights diagnostic fingerprints and avoids delays.

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Breast cancer is a biologically heterogeneous disease with distinct molecular fingerprints.Classifying tumors by molecular subtype is crucial for prognosis and forming individualized treatment plans.Gene expression profiling is the gold standard for molecular classification, but immunohistochemistry offers a practical alternative in clinical routine.Luminal, HER2-enriched, and triple-negative tumors each display characteristic imaging findings correlating with their molecular makeup.Imaging plays a key role in identifying subtype-related features such as spiculated masses, calcification patterns, architectural distortion, and non-mass enhancements.Understanding the imaging fingerprints of each subtype allows radiologists to anticipate tumor behavior and optimize diagnostic efficiency.Pitfalls and look-alike benign lesions require careful analysis to prevent misclassification and delayed therapy.The combination of imaging findings and molecular classification allows for greater precision in the diagnosis and management of breast cancer.

BREE-33 IMAGING THE LACTATING BREAST: CHALLENGES AND KEY INSIGHTS FOR RADIOLOGISTS

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Priscila Marques (*Abstract Co-Author*)

TEACHING POINTS

To describe the physiological changes of the breast during pregnancy and lactation and the implications for imaging evaluation.To review the most appropriate imaging modalities for diagnostic assessment of pregnant and lactating patients, emphasizing safety and diagnostic accuracy.To discuss the epidemiology and clinical presentation of breast lesions in this women, focusing on pregnancy-associated breast cancer.To illustrate the radiological and pathologic features of the most relevant benign and malignant breast diseases in this population, with pictorial examples.To emphasize strategies for early detection, aiming to avoid delayed diagnoses.

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Overview of breast anatomy and normal physiological modifications in gestation and lactation. Impact of these changes on clinical evaluation and imaging interpretation.Selection of imaging techniques: ultrasound, mammography, MRI, and their indications and contraindications in this population.Safety considerations and protocol adjustments in pregnancy and lactation.Presentation and imaging features of common benign conditions: lactational adenoma, galactocele, mastitis, and

abscess. Differentiation from malignant lesions.Epidemiology, clinical forms, and risk factors for breast cancer during pregnancy and lactation. Imaging characteristics and correlation with pathological findings.Challenges in diagnosis and the importance of avoiding delayed diagnosis and treatment.Multidisciplinary approach to therapy, considering both maternal and fetal well-being.Current recommendations and guidelines.Case Illustrations

BREE-34 BREAST IMPLANTS IN SIGHT: A MULTIMODALITY LIGHT

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Livia P. Souza, MD (*Abstract Co-Author*)
Carla C. Benetti, MD (*Abstract Co-Author*)

TEACHING POINTS

Breast implants are widely used for cosmetic and reconstructive purposes. Silicone implants come in different types. Saline-filled implants are inflated with sterile isotonic saline, while silicone gel-filled implants contain a fixed volume of gel, with viscosity varying by manufacturer. "Gummy bear" implants, or form-stable implants, use dense silicone gel that retains shape even if the shell is compromised. In reconstruction, prepectoral placement positions the implant above the chest muscle, beneath the skin and soft tissue. Retropectoral placement puts it beneath the pectoralis major. The dual-plane technique combines both, placing the implant partly under the muscle and partly prepectorally. Despite benefits, implant-based reconstruction is associated with complications that may challenge patients and clinicians. Without proper planning and management, the impact can be significant. Common short- and long-term complications include hematoma, infection, seroma, skin necrosis, capsular contracture, rupture, malposition, animation and contour deformities, breast implant-associated anaplastic large cell lymphoma (BIA-ALCL), and breast implant illness (BII).

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This study aims to review the types of silicone breast implants, reconstruction techniques, and related complications, correlating them with imaging findings on MRI, ultrasound, and mammography.

BREE-35 BEYOND THE BREAST: MASTERING AXILLARY LYMPH NODE IMAGING

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TEACHING POINTS

Review the normal antomy of axillary lymph nodes Analyze imaging characteristics of axillary lymph nodes across mammography, ultrasound, and MRI Explore lymphatic drainage pathways and the morphological changes lymph nodes undergo Trace the evolution of axillary lymph node management and recent paradigm shifts

TABLE OF CONTENTS/OUTLINE

Comprehensive anatomy of axillary lymph nodes: in-depth review of nodal structure and axillary levels Imaging techniques and nodal assessment: comparative analysis of mammography, ultrasound, and MRI, with a focus on ultrasound as the primary diagnostic tool Illustrative cases highlighting nodal pathology across all three axillary levels Case studies demonstrating the progressive alterations in lymph node morphology in response to various pathologies Sentinel lymph node management - Past, Present, and Future: review of the historical context and the latest clinical updates in sentinel lymph node management

BREE-36 BREAKING THE SHELL: COHESIVE GEL IMPLANTS EVALUATION

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Heni D. Skaf, MD (*Abstract Co-Author*)
Iviny Yonekura (*Abstract Co-Author*)
Marcela C. Lauar, MD (*Abstract Co-Author*)
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TEACHING POINTS

The purposes of this exhibit are: Provide a structured approach for evaluating cohesive gel implants, widely used in plastic surgery, utilizing a multimodality imaging perspective to enhance diagnostic accuracy. Discuss key imaging features for identifying and diagnosing common complications associated with cohesive gel implants, highlighting their unique radiological features. Demonstrate cases showcasing the diverse imaging appearances of cohesive gel implant rupture, ensuring a comprehensive understanding of diagnostic challenges. Emphasize the importance of indirect signs of cohesive gel implant fracture using multimodal imaging, where clinical suspicion may initially be low.

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Highly cohesive gel implants offer some advantages over traditional ones, such as a lower risk of rupture, gel bleeding as well as improved shape retention. Their firmer gel composition provides greater structural stability, making them a preferred choice in modern plastic surgery. Recognizing subtle imaging signs of cohesive gel rupture is essential for accurate diagnosis. One of the key indicators is the presence of peri-implant fluid, even in the absence of visible disruption of the implant shell. In cohesive gel implants, intracapsular rupture often presents as linear discontinuities or clefts, typically near the seal patch. These findings contrast with traditional rupture patterns, such as the linguine sign, keyhole sign, and subcapsular line sign. Beyond rupture assessment, a multimodality imaging approach is crucial for evaluating other complications associated with cohesive gel implants, including capsular contracture, seroma formation, and hematoma.

BREE-37 BREAST CANCER IN PREGNANCY

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Karina Pesce, MD, PhD (*Abstract Co-Author*)
MONICA OTILIA MACHUCA CASTILLO (*Abstract Co-Author*)

TEACHING POINTS

Define the concept of breast cancer in pregnancy.To know the most frequent molecular subtypes found in breast cancer during pregnancy. To determine the appropriate imaging method for staging and follow-up of breast cancer in pregnancy.

TABLE OF CONTENTS/OUTLINE

Introduction: Breast cancer during pregnancy is a rare diagnosis that occurs during gestation, the first year after delivery or in the breastfeeding period, with an incidence of approximately 1 in 1000 pregnancies. This type of cancer usually has a low expression of hormone receptors, resulting in more aggressive subtypes in young women, such as triple negative and HER2 positive. It is crucial that radiologists are familiar with the proper techniques to detect and diagnose breast abnormalities in pregnant women, allowing early diagnosis. The selection of imaging techniques should be customized to each case; breast ultrasound is preferred for imaging and staging, while mammography is less sensitive due to changes associated with lactation.

BREE-38 BACKGROUND PARENCHYMAL ENHANCEMENT ON BREAST MRI: A COMPREHENSIVE REVIEW OF DIAGNOSTIC ADVANCES AND NEW CLINICAL IMPLICATIONS

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Dunya M. Imad, MD (*Abstract Co-Author*)
Lorraine B. Smith, MBBCh (*Abstract Co-Author*)
Clare Poynton, MD,PhD (*Abstract Co-Author*)
Priscilla J. Slanetz, MD, MPH (*Abstract Co-Author*)

TEACHING POINTS

Originally thought to be an incidental finding, background parenchymal enhancement (BPE) on contrast-enhanced breast MRI is now recognized for its significant implications in multiple aspects of breast cancer. BPE is more than just the normal enhancement of breast tissue; it is linked to an increased risk of breast cancer in high-risk patients and to the response to therapy in those undergoing neoadjuvant chemotherapy for breast cancer. This educational exhibit aims to provide a comprehensive update on the role of BPE in breast MRI, featuring an updated literature review and case-based examples.

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Methodology for Measuring BPE: Overview of both qualitative and novel quantitative assessment tools. Impact of Menstrual Cycle and Menopausal Status on BPE: Review of how menstrual cycle phases and menopausal status affect BPE, and does timing matter for screening breast MRI. Patient History and Demographics Influencing BPE: Factors such as mammographic breast density, prior personal history of chest radiation, and history of breast cancer that may impact BPE. Correlation of BPE with Newer Imaging Technologies: How BPE on MRI correlates with emerging imaging technologies like contrast-enhanced mammography and ultrafast MRI. BPE and Breast Cancer Risk: Updates on BPE's role in risk stratification, interval cancers, molecular subtypes, and the development of secondary breast cancers in patients with a prior history of breast cancer. BPE and Breast Cancer Treatment and Outcomes: Role of BPE in assessing the extent of disease, surgical margins, and predicting treatment response. Artificial Intelligence and BPE: Updates on AI tools in analyzing BPE and clinical decision-making.

BREE-39 NAVIGATING THE IMAGING LANDSCAPE OF INVASIVE LOBULAR CARCINOMA: CHALLENGES AND LATEST ADVANCEMENTS

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Marion E. Scoggins, MD (*Abstract Co-Author*)
Basak E. Dogan, MD (*Abstract Co-Author*)

TEACHING POINTS

Invasive lobular carcinoma (ILC) tends to stay clinically silent and is difficult to detect early due to its indolent nature, infiltrative growth and lack of calcifications. On ultrasound, ILC can appear as a hyperechoic mass or with substantial hyperechoic component in up to 20% of cases. MRI has the highest sensitivity (83-100%) for detecting ILC and is superior to mammography and ultrasound for preoperative staging and contralateral breast evaluation. MRI can reduce re-excision and mastectomy rates in ILC, which is in contrast to its impact in invasive ductal carcinoma (IDC). Contrast-enhanced digital mammography (CEDM) is comparable to MRI for primary lesion detection but is less sensitive for multifocal disease. Preliminary data from an ongoing trial demonstrates MBI can detect breast masses in dense breasts that were missed on digital breast tomosynthesis (DBT) making MBI a promising potential adjunct for diagnosis and evaluation of ILC. CE-CBBCT is a promising new technique that offers diagnostic accuracy for breast masses similar to MRI in dense breasts, with consideration of radiation dose. FES PET/CT is emerging as an effective tool to identify occult metastasis and predict response to endocrine therapy in ER+ breast cancer, including ILC. A standardized imaging algorithm is proposed that integrates conventional and advanced imaging techniques for the diagnosis, staging, and follow-up of ILC.

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Silent progression of ILC Mammography Ultrasound Breast MRI: Advantages in ILC Contrast-enhanced digital mammography Molecular Breast Imaging Cone-beam breast computed tomography Positron emission mammography & positron emission tomography Role of AI/Radiomics Summary

BREE-40 MOLECULAR BREAST IMAGING IN CANCER SCREENING AND DIAGNOSIS

Joao V. Horvat, MD (*Presenter*)
Robert T. Fazzio, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- To discuss the imaging techniques of Molecular Breast Imaging. - To describe the advantages and disadvantages of the use of Molecular Breast Imaging as a supplemental tool for breast cancer screening. - To demonstrate the imaging aspects of benign and malignant lesions on Molecular Breast Imaging. - To teach the adequate management of breast lesions detected on Molecular Breast Imaging. - To show how to perform Molecular Breast Imaging-guided biopsies.

TABLE OF CONTENTS/OUTLINE

- Introduction to Molecular Breast Imaging. - Description of techniques and imaging acquisition. - Discussion on safety and radiation dose after administration of Tc-99m Sestamibi. - Comparison between supplemental Molecular Breast Imaging and other imaging modalities for breast cancer screening. - Systematic approach to management of breast lesions detected on Molecular Breast Imaging. - Example cases with correlation with other imaging modalities. - Molecular Breast Imaging limitations. - Future directions: How can we improve the availability of Molecular Breast Imaging. - Molecular Breast Imaging-guided biopsy. - Teaching point summary and conclusion.

BREE-41 NEOADJUVANT THERAPY RESPONSE PATTERNS: A GUIDE FOR RADIOLOGISTS IN TRAINING

Maria P. Swiecicki, MD (*Presenter*)
Karina Pesce, MD, PhD (*Abstract Co-Author*)
Maria Jose Chico (*Abstract Co-Author*)
Alejandra Wernicke (*Abstract Co-Author*)

TEACHING POINTS

1- To review the different neoadjuvant response patterns in breast MRI.2- To discuss the RECIST criteria for breast cancer and its limitations in daily practice.3- To illustrate neoadjuvant response patterns with clinical cases, giving tips for radiologic reports.4- To review the most frequent neoadjuvant response patterns according to each molecular subtype.

TABLE OF CONTENTS/OUTLINE

Introduction to RECIST 1.1 Guidelines and Breast MRI for the evaluation of neoadjuvant therapy response. Limitations of RECIST 1.1 Guidelines in daily practice. Review of the different neoadjuvant response patterns in correlation with the different molecular subtypes. MRI for the evaluation of NAC and its correlation with histopathology in cases of pCR. Tips and tricks for overestimation and underestimation during MRI reading. Illustrations with clinical cases of daily practice.

BREE-42 NIPPLE DISCHARGE: THE ROLE OF BREAST MRI WHEN CONVENTIONAL IMAGING FALLS SHORT

Leticia T. Oliveira, MD (*Presenter*)
Sofia B. Maksoud, MD (*Abstract Co-Author*)
Carla C. Tajima (*Abstract Co-Author*)
Aline C. Oliveira (*Abstract Co-Author*)
Carla C. Benetti, MD (*Abstract Co-Author*)

TEACHING POINTS

- Nipple discharge is the third most common breast symptom and, while often benign, may indicate underlying malignancy.- Pathologic nipple discharge (PND) is typically unilateral, spontaneous, and serous or bloody, originating from a single duct.- Mammography has limited sensitivity in detecting PND, especially for small, non-calcified, or purely intraductal lesions.- Ultrasound can detect lesions missed by mammography in up to 69% of cases but may yield false positives due to benign intraductal changes or debris.- Breast MRI offers superior sensitivity (87-100%) and high negative predictive value (96-100%) when conventional imaging fails to identify the cause of PND.- MRI can identify occult disease, assess lesion extent, and guide surgical decisions—potentially avoiding unnecessary excisions in low-risk patients.

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- To review the clinical presentation of nipple discharge and distinguish between physiologic and pathologic cases.- To highlight the limitations of mammography and ultrasound in the evaluation of pathologic nipple discharge.- To discuss the role of MRI in the workup of nipple discharge when conventional imaging is inconclusive.- To describe MRI findings in nipple discharge, illustrated with cases from our institution, and correlate them with histopathological results.- To summarize current evidence supporting MRI as a problem-solving tool in challenging cases of nipple discharge.

BREE-43 UNDERSTANDING BREAST ASYMMETRY: A BEGINNER'S GUIDE WITH PRACTICAL EXAMPLES FOR EVALUATION AND FOLLOW-UP ALGORITHMS

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Rosaura E. Fuentes Corona, MD (*Abstract Co-Author*)
Paula E. Hernandez Quiroz, MD (*Abstract Co-Author*)
Tania D. Grimaldo Galeana, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the definition and BI-RADS 5th edition classification of breast asymmetries , emphasizing key imaging features and clinical implications of each type (asymmetry, focal asymmetry, global asymmetry, and developing asymmetry). To understand the associated findings that influence the level of diagnostic suspicion. To raise awareness among general radiologists about the importance of a systematic evaluation of breast asymmetries to enhance early breast cancer detection. To present a structured diagnostic algorithm for the evaluation and management of breast asymmetries, integrating multimodality imaging and BI-RADS categorization. To present clinical cases that illustrate the practical application of the proposed algorithm, including imaging progression, clinical decisions, and final histopathological diagnosis. To highlight the importance of comparison with prior studies and the role of targeted imaging in improving diagnostic accuracy and avoiding unnecessary interventions.

TABLE OF CONTENTS/OUTLINE

Objectives. Background. BI-RADS Classification of asymmetries. Associated findings. Additional imaging tools for assessment. Diagnostic approach algorithm. Clinical cases and individualized approach. Diagnostic pearls. Conclusions. References.

BREE-44 EMERGING EVIDENCE ON RESIDUAL FIBROGLANDULAR TISSUE (RFGT) POST MASTECTOMY AND EVALUATING THE RISK FOR LOCAL RECURRENCE OR NEW PRIMARY BREAST CANCER

Woodlynn Daniel, MD (*Presenter*)

TEACHING POINTS

1. Emerging evidence indicates residual fibroglandular tissue (RFGT) after either prophylactic or therapeutic bilateral mastectomy may confer a risk of in-breast local recurrence or new primary tumors. 2. Various factors affect the volume of RFGT post mastectomy including surgical technique, age, and preoperative fibroglandular tissue volume. 3. Though RFGT can be found anywhere in the breast after mastectomy, it is most commonly found behind the nipple-areolar complex. 4. At present, RFGT is most easily quantified with orthogonal measurements but there are opportunities to use AI to more accurately quantify RFGT. 5. The volume of RFGT is not static after mastectomy and can change with pregnancy or hormonal therapy. Factors such as these are important to consider as they can alter a patient’s risk of local recurrence or new primary tumors.

TABLE OF CONTENTS/OUTLINE

Background - Review of breast cancer incidence - RFGT after prophylactic or therapeutic bilateral mastectomy and the risk of recurrent or new breast cancer, per recent evidence. Factors affecting the volume of RFGT post mastectomy. Common locations to find RFGT. - The best imaging modality to identify RFGT is MRI. How a patient’s volume of RFGT may change over time. Methods to quantify RFGT and future directions. - Current manual measurements and future use of AI

BREE-45 PEDIATRIC BREAST EVALUATION: ROLE OF ULTRASOUND IN CHILDREN AND ADOLESCENTS

Paola A. Prieto Arizabaleta, MD (*Presenter*)

TEACHING POINTS

- Review the embryology of the breast and observe the differences between boys and girls according to age. - Recognize ultrasound as the imaging technique of choice for studying breast pathology in pediatrics. - Characterize normal and abnormal findings in the pediatric breast. - Present ultrasound images of real pediatric patients that recognize findings in daily practice so that they do not go unnoticed.

TABLE OF CONTENTS/OUTLINE

1. Introduction to pediatric breast imaging: Recognize the fundamental role of ultrasound in this population and the appropriate technique for performing it. 2. Normal breast development. 3. Breast development abnormalities:- Congenital.- Premature thelarche.- Gynecomastia. 4. Breast ultrasound in pediatrics. 5. Findings in pediatric breast:- Cystic lesions- Benign nodules- Malignant nodules 6.Conclusions: Gain knowledge of normal, abnormal, and anatomical variants of pediatric breasts and thus recognize the importance of avoiding inappropriate interventional procedures or behaviors.

BREE-46 BREAST FAT NECROSIS: AN IMAGING CHAMELEON

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Ana Haddad, MD (*Abstract Co-Author*)

Ronaldo Almeida JR, MD (*Abstract Co-Author*)
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Daniela G. Giannotti, MD (*Abstract Co-Author*)
Larissa Moyses, MD (*Abstract Co-Author*)
Vera Christina C. Ferreira, MD, PhD (*Abstract Co-Author*)
Thiago Y. Kobayashi, MD (*Abstract Co-Author*)
Ligia A. Yamashita, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the forming mechanisms and histopathological stages of breast fat necrosis (BNF).Recognize both classical and atypical features of BNF in multiple imaging modalities.Comprehend correlation with patient history and multimodal imaging to improve diagnostic accuracy.

TABLE OF CONTENTS/OUTLINE

INTRODUCTION Definition and clinical relevance of BFNCommon etiologiesHistological evolution and its part in the complex formation of images BFN IMAGING: TYPICAL AND ATYPICAL PATTERNS Mammography patterns Ultrasound patterns Magnetic Resonance Imaging (MRI) patterns CASES Case-based images with worrisome features leading to biopsy and histopathological diagnosis of BFN SUMMARY TAKE HOME MESSAGES

BREE-47 IMAGING THE AUGMENTED REALITY: BREAST IMPLANTS AND THEIR COMPLICATIONS UNCOVERED

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Sylvia Nsato, MD (*Abstract Co-Author*)
Bharat Aggarwal, MD (*Abstract Co-Author*)
Pallavi Ranjan (*Abstract Co-Author*)

TEACHING POINTS

The number of women undergoing breast implantation for cosmetic augmentation, post-mastectomy reconstruction, and correction of congenital conditions has been steadily increasing. Among various complications, implant rupture remains the leading cause for implant removal. Magnetic resonance imaging (MRI) is the gold standard for assessing implant integrity particularly in detecting silent ruptures. Differentiation between normal imaging appearances and subtle signs of implant rupture is crucial to avoid false-negatives and ensure appropriate management.

TABLE OF CONTENTS/OUTLINE

Introduction Indications for breast implants Types of implants Placement techniques- Retroglandular vs retropectoral Imaging Modalities Ultrasound: evaluates fluid collections and extracapsular rupture Mammography: detects capsular calcification and ruptures. MRI: Gold standard for detecting implant integrity and complications PET CT: Emerging technique for staging BIA-ALCL. Normal Imaging Appearances Radial folds, peri-implant fluid, malpositioning, postoperative contour irregularities Complications and Their Imaging Characteristics Rupture Intracapsular (linguine sign) Extracapsular (silicone granulomas) Capsular Contracture Contraction of the fibrous tissue around the implant resulting in hardening of breast and squeezing of the implant. Seroma, Hematoma and Abscess Early postoperative complications. Infection and Inflammatory Changes Implant Malposition Due to surgery, trauma , capsular contracture or saline implant deflation. Anaplastic large cell lymphoma (BIA-ALCL) Rare T cell lymphoma presenting as peri implant fluid and associated soft tissue mass. o Breast cancer

BREE-48 NIPPLE DISCHARGE EVALUATION

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TEACHING POINTS

Nipple discharge is the third most common breast complaint. While most causes are benign, malignancy occurs in 3-23% of cases. The main challenge is ruling out cancer while avoiding unnecessary surgery. Pathological discharge is typically unilateral, uniductal, spontaneous, and persistent—often clear, serous, or bloody. In contrast, physiological discharge is usually bilateral, multiductal, non-spontaneous, and white, green, or yellow. Color alone is not a reliable cancer indicator.

TABLE OF CONTENTS/OUTLINE

1- Introduction: Nipple discharge is the third most common breast complaint. While most causes are benign, malignancy occurs in 3-23% of cases. The main challenge is ruling out cancer while avoiding unnecessary surgery. Pathological discharge is typically unilateral, uniductal, spontaneous, and persistent—often clear, serous, or bloody. In contrast, physiological discharge is usually bilateral, multiductal, non-spontaneous, and white, green, or yellow. Color alone is not a reliable cancer indicator. 2 - Multimodality images show cases of nipple discharge complaint, summarizing the summarizing the main diagnoses related to the complaint.

BREE-49 BEYOND THE USUAL SUSPECTS: UNMASKING RARE NEURAL TUMORS IN THE BREAST

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Anna Starikov, MD (*Abstract Co-Author*)
Divya Shenoy, MD (*Abstract Co-Author*)
Lorraine B. Smith, MBBCh (*Abstract Co-Author*)
Sona A. Chikarmane, MD (*Abstract Co-Author*)
Priscilla J. Slanetz, MD, MPH (*Abstract Co-Author*)

TEACHING POINTS

Breast lesions of neural origin are rare and typically benign. Exceptions include primary neuroendocrine carcinoma—a rare but aggressive breast tumor—and granular cell tumors, which carry a small risk of malignancy. Given the diverse clinical and radiologic presentations of these lesions, a systematic and informed diagnostic approach is critical to ensure accurate characterization and evaluation to prevent both over- and under-treatment.

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In this exhibit, we review the innervation of the breast and the clinical and radiologic presentations for various rare nerve cell lesions in the breast, including neuromas, schwannomas, granular cell tumors, and primary neuroendocrine tumors. We highlight key imaging features, presenting symptoms, and characteristic lesion profiles and locations. We outline a systematic approach to their evaluation to support accurate diagnosis and appropriate management.

BREE-50 NOT ALWAYS BENIGN: RETHINKING CIRCUMSCRIBED BREAST MASSES

Beatriu Reig, MD, MPH (*Presenter*)
Alana A. Lewin, MD (*Abstract Co-Author*)

Laura Heacock, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

Consider patient factors when deciding whether to recall or biopsy: older age, new symptoms, and personal history of breast cancer increase likelihood of malignancy. Solitary, new, or enlarging masses should be evaluated. Triple-negative subtype of invasive ductal carcinoma may have a cyst-like appearance. HER2-enriched subtype of invasive ductal carcinoma may have a fibroadenoma-like appearance. A single suspicious feature should lead to biopsy even if other imaging features are more benign. Compare mammogram to ultrasound features as masses may appear suspicious on only one modality.

TABLE OF CONTENTS/OUTLINE

Definition and BI-RADS descriptors: round or oval mass, circumscribed margin Multimodality appearance of circumscribed breast cancers Invasive ductal carcinoma NOS Rapidly growing subtypes Triple negative breast cancer HER2-enriched breast cancer Mucinous carcinoma Medullary carcinoma Metaplastic carcinoma Papillary neoplasms: Encapsulated papillary carcinoma, solid-papillary carcinoma, invasive papillary carcinoma DCIS Phyllodes tumors Extramammary metastases to the breast Lymphoma Avoiding pitfalls T2 hyperintensity does not predict benignity Clinical features (patient age, personal history of breast cancer, new, symptomatic) Multimodality comparison

BREE-51 ASYMMETRIES IN BREAST MAMMOGRAPHY: A CASE-BASED MANAGEMENT APPROACH

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Milena R. Peixoto, MD (*Abstract Co-Author*)
Isabela C. Ferracini, MD (*Abstract Co-Author*)

TEACHING POINTS

To understand the definition of asymmetries. To discuss a practical work-up of asymmetric mammographic findings. To illustrate both benign and malignant diseases that manifest as asymmetries.

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Asymmetries are mammographic findings that appear as densities that resemble (and often are) fibroglandular tissue. Due to its benign-looking appearance, breast cancers that manifest as asymmetries can be missed during mammographic evaluation, leading to false negatives. Biopsy is indicated when asymmetries are new, increasing in size, palpable, if other findings are present (calcifications, architectural distortion) or when a suspicious correlate is seen on ultrasound/MRI. Asymmetries are divided into four categories: Asymmetry is a finding seen in only one projection and may represent either a true finding or a summation artifact. Focal asymmetry is identified on both standard mammographic views, occupies less than one quadrant, and often contains interspersed fat. Global asymmetry involves a larger volume—more than one quadrant— and warrants comparison with the contralateral breast and correlation with clinical history. Developing asymmetry refers to a newly appearing density not present in prior exams or a previously noted asymmetry that has increased in size on follow-up. Additional mammographic techniques - such as spot compression, magnification, rolling views, and tomosynthesis - and ultrasound are often used in the work-up of asymmetries. This work-up determines if mammographic short-term follow-up or biopsy may be required.

BREE-52 CODE BREAST FROM ER TO IMAGE: A CASE-BASED REVIEW OF ACUTE BREAST COMPLAINTS

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Narelly Araujo Smith, MD (*Abstract Co-Author*)
Maisa Irie (*Abstract Co-Author*)
Natalia T. Lima (*Abstract Co-Author*)
Naomi Murakami SR, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Emphasize the importance of identifying the most common breast diseases that lead patients to seek emergency department. Recognize conditions that require urgent treatment, providing proper clinical management and prevention of complications. Discuss breast entities such as mastitis, post-biopsy complications, nipple discharge, Mondor's disease, breast implants complication and pediatric breast abnormalities, focusing on the radiological perspective. Illustrate imaging findings related to disorders mentioned above, using different imaging modalities, including ultrasound, mammography, tomosynthesis, magnetic resonance and tomography, with cases from the authors' institution.

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Acute breast symptoms are relevant causes of emergency visits. Imaging helps distinguish benign from malignant lesions, ensuring proper care and avoiding unnecessary procedures. This exhibit aims to explore important topics related to acute breast complaints that may present in the emergency department:Mastitis: including puerperal and infectious forms, such as tuberculous mastitis and Corynebacterium mastitis.Post-breast biopsy complications: focusing on hematomas, particularly in patients with anticoagulant therapy. Physiological neonatal breast bud: a benign, self-limiting condition that must be distinguished from congenital abnormalities to avoid unnecessary concern. Nipple discharge: evaluation of both benign causes, such as intraductal papilloma, and malignant causes. Mondor's disease: thrombophlebitis of superficial breast vessels, which can mimic more serious pathology. Breast implant complications: implant rupture, rotation, and seroma formation.

BREE-53 GUESS WHO? MOLECULAR SUBTYPE CHARACTERIZATION IN BREAST CANCER USING CONTRAST-ENHANCED MAMMOGRAPHY

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Josue Campiran Gutierrez, MD (*Abstract Co-Author*)
Abraham Ortiz Garcia, MD (*Abstract Co-Author*)
Sergio De Luis Galvez Vieyra IV, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Contrast-enhanced mammography (CEM) can reveal morphologic and enhancement patterns that help differentiate molecular subtypes of breast cancer.Each subtype presents specific radiologic features that can guide diagnosis and therapeutic strategy.Early differentiation of subtypes via CEM supports personalized treatment and improves clinical outcomes.Microcalcifications, lesion margins, and vascular enhancement patterns are key features in subtype characterization using CEM.

TABLE OF CONTENTS/OUTLINE

1.- Introduction and Classification of Breast Cancer Molecular Subtypes2.- Luminal A and B Subtypes on Contrast-Enhanced Mammography3.- HER2+ and Triple-Negative Subtypes on Contrast-Enhanced Mammography4.- Diagnostic Flowchart and Conclusions

BREE-54 AXILLARY ULTRASOUND: A GUIDE FOR BEGINNERS

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Juliana H. Catani, MD (*Abstract Co-Author*)

TEACHING POINTS

This study aims to revisit axillary anatomy via ultrasonography, review typical and atypical morphological and vascular characteristics of lymph nodes, present appropriate scanning techniques, and review appropriate recommendations.

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The evaluation of axillary lymph nodes through ultrasound is crucial because, besides being the most suitable imaging method, changes in morphology can indicate either benign (infectious/ inflammatory) or malignant diseases. Benign lymph nodes typically appear oval-shaped, with a thin or even "invisible" cortex, a hyperechoic hilum, and a single vascular pole. Conversely, features such as shape distortion, cortical thickening (greater than 3 mm), displaced or absent hilum, and multiple vascular poles are considered atypical. In cases of bilateral lymph node involvement, with similar appearances and no known breast malignancy may suggest systemic disease. Without clinical correlation, biopsy is recommended - similar to unilateral suspicious findings. Identifying nodal levels helps assess disease extent and contributes to staging. Axillary ultrasound is an accessible and effective method for identifying morphological changes in lymph nodes. Detailed knowledge of the regional anatomy, combined with the ability to distinguish between normal and atypical ultrasound patterns, is essential for radiologists and sonographers to perform accurate risk stratification and contribute to a more assertive and personalized treatment plan.

BREE-55 BREAST LYMPHOMAS:THE UNCOMMON REVEALED, CAN YOU SPOT IT?

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Oreanna Quintero, MD (*Abstract Co-Author*)
Andres F. Caliz Cabrales, MD (*Abstract Co-Author*)
Ricardo A. Rodriguez Alvarez, MD (*Abstract Co-Author*)
Claudia Patricia Davila (*Abstract Co-Author*)

TEACHING POINTS

Recognize the varied imaging appearances of primary, secondary, and anaplastic breast lymphoma on mammography, ultrasound, and MRI. Understand key differentiating features from common benign and malignant breast lesions. Appreciate the role of imaging in assessing disease extent, including axillary involvement. Identify imaging clues suggestive of breast implant-associated anaplastic large cell lymphoma (BIA-ALCL). Emphasize the necessity of biopsy for definitive diagnosis and correlation with clinical history, illustrated by real-world cases.

TABLE OF CONTENTS/OUTLINE

I. Introduction: Breast Lymphoma Overview & Significance. II. Primary Breast Lymphoma: A. Mammographic Findings, B. Ultrasound Features, C. MRI Characteristics, D. Case Examples from Our Institution. III. Secondary Breast Lymphoma: A. Imaging Patterns of Metastasis, B. Bilateral vs. Solitary Presentation, C. Real-Life Case Illustrations. IV. Anaplastic Breast Lymphoma: A. Imaging Spectrum, B. BIA-ALCL: Key Radiological Findings, C. Institutional Case Studies. V. Differential Diagnosis: Mimickers of Breast Lymphoma. VI. The Role of Imaging: Staging and Assessment of Extent. VII. Conclusion: Key Takeaways for Radiological Diagnosis.

BREE-56 HITTING THE MARK: THE ART AND ACCURACY OF TARGETED BREAST ULTRASOUND

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Renato L. Ribeiro, MD (*Abstract Co-Author*)
Isabela C. Ferracini, MD (*Abstract Co-Author*)
Renata Feres, MD (*Abstract Co-Author*)
Milena R. Peixoto, MD (*Abstract Co-Author*)

TEACHING POINTS

Targeted ultrasound is a focused evaluation aimed at identifying and characterizing lesions initially detected on breast MRI, especially for the purpose of guiding biopsies and better characterizing morphology and margins of a lesion. This technique plays a crucial role in translating MRI findings into a more accessible, cost-effective, and patient-friendly modality. Accurate lesion localization across imaging methods may be challenging due to differences in spatial resolution, patient positioning, and acquisition planes. Successful detection depends on careful analysis of lesion morphology, size, depth, and surrounding tissue, as well as the use of reproducible anatomic landmarks.

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This pictorial essay provides a step-by-step educational approach to performing target ultrasound following suspicious findings on breast MRI. Through selected cases and didactic illustrations, we demonstrate practical strategies to improve lesion detection, anatomical correlation, and procedural planning. Emphasis is placed on lesion-centered analysis, taking into account shape, depth, location, and relationship with nearby structures. The visual material includes ultrasound and MRI images from our institutional archive, supported by schematic diagrams to guide interpretation and improve reader confidence in cross-modality lesion identification.

BREE-57 UNCOVERING THE INVISIBLE: A CASE-BASED REVIEW OF IMAGING FEATURES IN OCCULT BREAST CARCINOMA

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Virginia Diaz (*Abstract Co-Author*)
Nicolas Perez, MD (*Abstract Co-Author*)
Ainhoa Urrutia Ortiz De Salazar, MD (*Abstract Co-Author*)
Ane Zabala, MD (*Abstract Co-Author*)
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Maria Udondo Gonzalez del Tanago, MD (*Abstract Co-Author*)
Ruth Gonzalez Sanchez (*Abstract Co-Author*)

TEACHING POINTS

- Occult breast carcinoma (OBC) is a rare presentation of breast cancer, typically manifesting as axillary metastasis without clinical, mammographic, or sonographic evidence of a primary breast tumor. -Breast MRI plays a key role in detecting the hidden primary lesion and guiding therapeutic planning. -Through a series of

representative clinical cases, we illustrate the various diagnostic and therapeutic scenarios, emphasizing personalized, multidisciplinary decision-making. -Recent advances in radiologic and pathologic diagnosis, as well as surgical and oncologic management of both the breast and axilla, are reviewed in the context of each patient's course.

TABLE OF CONTENTS/OUTLINE

1. Introduction to occult breast carcinoma: definition, incidence, and clinical presentation. 2. Role of imaging techniques: mammography, ultrasound, PET/CT, and especially breast MRI. 3. Case-based review: clinical presentation, imaging findings, diagnostic pathway, multidisciplinary management, and outcome. 4. Conclusions and key take-home messages

BREE-58 TINY LESIONS, BIG QUESTIONS: IMAGING AND MANAGEMENT OF PAPILLARY LESIONS

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Natalia T. Lima (*Abstract Co-Author*)
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Nathalia Christina Lopes Flores, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit aims to provide a comprehensive review of breast papillary lesions, covering their clinical presentation, imaging characteristics, and pathological correlation. Additionally, it explores their upgrade potential, along with insights into prognosis and management strategies.

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Papillary lesions of the breast constitute a heterogeneous group of entities, representing significant challenges in distinguishing benign from malignant forms. This case series includes benign papillomas, papillomas with focal epithelial atypia, papillary carcinoma in situ and various types of papillary carcinomas. These lesions exhibit a broad spectrum of morphological characteristics, each of them carrying distinct prognostic implications, primarily defined by the presence of papillae supported by an arborizing fibrovascular stroma. Imaging studies reveal that mammography may be normal or show dilated ducts, well-defined retroareolar masses, or clustered calcifications in approximately 25% of cases, with suspicious microcalcifications indicating a higher likelihood of malignancy. Ultrasound typically reveals well-defined masses or small ones within dilated ducts, while Doppler may indicate internal vascularization. A multidisciplinary approach is essential for further evaluation and management, ensuring individualized care aligned with patient preferences and lesion characteristics. This exhibit aims to explore the radiological, pathological, and molecular aspects of papillary lesions and their management.

BREE-59 18F-FLUOROESTRADIOL PET IN BREAST CANCER: DIAGNOSTIC ADVANCES FOR PRIMARY AND SECONDARY LESIONS

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Isabela C. Ferracini, MD (*Abstract Co-Author*)
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Bruna M. Tachibana, MD (*Abstract Co-Author*)
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TEACHING POINTS

Review the current indications for PET imaging in breast cancer.Revisit the physiological and technical principles of 18F-FDG PET.Explain the uptake mechanisms and clinical applications of 18F-FES PET.Discuss the diagnostic advantages of FES PET over FDG PET in ER-positive breast cancer.Highlight the limitations of FES PET in clinical practice.

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Breast cancer remains the most frequently diagnosed malignant neoplasm among women worldwide, with metastatic disease accounting for most cancer-related deaths. PET/CT imaging, particularly with 18F-FDG, is widely used in oncologic assessment due to the high glycolytic activity of malignant tissues. However, tumors such as invasive lobular carcinoma often show low FDG uptake, leading to underdiagnosis or misinterpretation. 18F-FES PET, a radiolabeled estrogen analog, enables non-invasive in vivo assessment of estrogen receptor expression. Unlike FDG, FES uptake is not affected by inflammatory or infectious processes, reducing false-positives and improving diagnostic specificity. FES is particularly valuable in patients with metastatic ER-positive disease, allowing whole-body receptor mapping when biopsy is not feasible. Evidence suggests that FES PET can detect lesions often missed by FDG PET, especially bone, orbital, and nodal metastases commonly seen in luminal tumors. Its main limitation is physiological liver uptake, which may obscure hepatic lesions. Nevertheless, FES PET is FDA-approved as a complement to biopsy in ER-positive breast cancer, reinforcing its role in personalized oncology and guiding more precise treatments.

BREE-60 BREAST MRI: HOW TO START!

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TEACHING POINTS

Alongside mammography/tomosynthesis and ultrasound, magnetic resonance imaging (MRI) plays a crucial role in evaluating breast diseases and in the detection and management of breast cancer. It is the most effective screening method, with a sensibility range between 90-93% in high-risk populations. Breast MRI can be recommended for screening in high-risk population and the average-risk population with extremely dense breasts. In breast cancer staging, MRI is recommended for disease extent assessment in newly diagnosed patients, being also useful in neoadjuvant chemotherapy response monitoring.Furthermore, it can assist in investigating suspicious nipple discharge when mammography and ultrasound results are normal, as well as in breast implant integrity studies. This study aims to demonstrate, in a didactic manner, how to use MRI in breast evaluation, particularly for radiology residents, or physicians from other specialties who do not yet have experience with breast imaging using this method.

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This study aims to review breast MRI, indications, protocols, main findings and how to describe them according to BI-RADS ® 5th edition, as well as the probable changes in the next edition and evaluation of implants thhrough didactic cases from our digital archieve and drawing illustrations by our team. Furthermore, this study discusses emerging evaluation methods, such as diffusion sequence (DWI), abbreviated, and ultrafast protocols.

BREE-61 HOW I DO IT: ACTIVE EVALUATION OF THE SURGICAL SITE IN CONTROL EXAMS

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Natalia T. Lima (*Abstract Co-Author*)
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Ana Cecilia A. Wiesel, MD,MD (*Abstract Co-Author*)
Iviny Yonekura (*Abstract Co-Author*)

TEACHING POINTS

Conduct a literature review on imaging evaluation of the breast following mastectomy or breast-conserving surgery. How to perform meticulous assessment of the surgical site using additional mammographic views and recognize possible benign postoperative changes in imaging studies after the interventions. The importance of differentiating scar tissue alterations from local recurrence, as well as recognizing follow-up differences based on tumor subtype and individual patient characteristics.

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Annual mammography of the remaining breast tissue is the mainstay of follow-up in breast cancer patients, aided by ultrasound for new findings and MRI for high-risk cases. This exhibit details accurate postoperative imaging evaluation, highlighting techniques such as scar localization, tangential views, spot compression, magnification, the Eklund technique, digital breast tomosynthesis, and 3D reconstructions. Differentiating benign postoperative changes from recurrence is critical. Surveillance must be personalized according to surgery type, tumor subtype, and individual risk factors. Recurrence risk ranges from 3% to 35% over 10 years. Recent literature is reviewed, with proposals for tailored follow-up protocols. Imaging After Breast Surgery: Overview Annual Mammography and Adjunct Modalities Role of Ultrasound and MRI Scar Assessment Techniques Tomosynthesis and 3D Reconstruction Differentiating Scar vs. Recurrence Risk Stratification and Recurrence Rates Literature Review and Follow-Up Recommendations

BREE-62 LEARNING THE ABCS OF MAMMOGRAPHIC ASYMMETRIES

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Daniel Sandoval Guerra, MD (*Abstract Co-Author*)
Raquel Balbas Lara, MD (*Abstract Co-Author*)
Oscar U. Vinalay Landa I, MD (*Abstract Co-Author*)
Sergio De Luis Galvez Vieyra IV, MBBS (*Abstract Co-Author*)
Cesar Orlando Vidal Lopez, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize the types, causes, and imaging behavior of mammographic asymmetries Apply a step-by-step diagnostic algorithm integrating tomosynthesis and Contrast-Enhanced Spectral Mammography (CESM) when appropriately indicated. Improve diagnostic accuracy and determine when to recommend biopsy or follow-upPromote active learning through representative cases, discussion and guided decision-making

TABLE OF CONTENTS/OUTLINE

Introduction to Asymmetries (BI-RADS Framework)The ABC Teaching ModelDiagnostic AlgorithmCase-Based ApplicationEducational ImpactConclusions and Recommendations

BREE-63 SHARP SKILLS: TIPS & TRICKS FOR NEEDLE BREAST INTERVENTIONS

Edipcia Z. Torres, MD (*Presenter*)

TEACHING POINTS

Purpose To provide practical insights and technical strategies to improve the performance, safety, and diagnostic accuracy of breast imaging procedures, with emphasis on ultrasound, mammography, and MRI-guided interventions. Content Outline ü Overview of common challenges in breast imaging (e.g., lesion localization, patient positioning, needle trajectory) ü Optimization of ultrasound-guided core biopsy techniques, including needle angle, depth control, and chest wall safety ü Tricks for accurate wire localization under ultrasound and stereotactic guidance ü Use of local anesthetic and patient positioning to improve lesion accessibility and reduce complications ü Case-based review of pitfalls and solutions in detecting and characterizing subtle lesions ü Correlation with pathology and follow-up recommendations

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Summary / Conclusion Mastering key technical details and adapting strategies to individual patient and lesion characteristics can significantly enhance the effectiveness of breast imaging procedures. This exhibit highlights actionable tips and real-world solutions to help radiologists improve outcomes and avoid common pitfalls in breast intervention and diagnostic imaging.Edipcia Torres Carrillo, MDr, Maria Guadalupe Gracia Muñoz MDr, Sara Vasquez MDr, Rosaura Fuentes MDr.

BREE-64 ACROSS THE SPECTRUM: VARIED IMAGING APPEARANCES AND MANAGEMENT OF DCIS

Debbie L. Bennett, MD (*Presenter*)
Sherwin Chiu, MD,MPH (*Abstract Co-Author*)
Victoria Xie, MD (*Abstract Co-Author*)
Michelle V. Lee, MD (*Abstract Co-Author*)

TEACHING POINTS

• Ductal carcinoma in situ (DCIS) can have varied imaging appearances on mammography, ultrasound, and MRI. • The imaging appearance of DCIS correlates with the biological aggressiveness of DCIS. • Management strategies for DCIS are evolving and may depend, in part, on specific characteristics of DCIS as diagnosed from imaging and image-guided biopsy.

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1. Overview of histology/pathology of DCIS 2. Classification of DCIS (low-intermediate-high grade) and subtypes of DCIS (papillary DCIS, cribriform, solid, comedo) with correlation to imaging appearance 3. Less common imaging appearances of DCIS (solid mass, architectural distortion) 4. Extensive DCIS and risk of microinvasion 5. Understanding the risk of progression to invasive breast cancer 6. Current management of DCIS (surgery, radiation therapy, endocrine therapy) 7. Clinical trials on de-escalation of therapy for low-risk DCIS (COMET, LORD, RECAST, LORIS)

BREE-66 MULTIMODALITY IMAGING OF BREAST PAPILLARY LESIONS: A RADIOPATHOLOGIC PICTORIAL REVIEW WITH KEYS FOR DIAGNOSTIC WORK-UP AND MANAGEMENT

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Javier Azpeitia Arman, MD (*Abstract Co-Author*)
Lina Maria Caballero Ubaque (*Abstract Co-Author*)
Miguel Leon Garcia, MD (*Abstract Co-Author*)
Lorena Melian Iribar, MD (*Abstract Co-Author*)
Soledad Alonso Garcia (*Abstract Co-Author*)

TEACHING POINTS

-To review clinical presentation and pathologic findings in papillary lesions of the breast. -To illustrate imaging findings (contrast-enhanced mammography (CEM), ductography, US, MRI) of breast papillary lesions with histopathologic correlation. -To analyze and discuss the specific management of those lesions, including imaging and interventional procedures. -To emphasize pitfalls, diagnostic difficulties, and differential diagnosis.

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Papillary neoplasms consist of a frond-forming growth pattern composed of fibrovascular stalks covered by a layer of epithelial cells with or without an intervening myoepithelial cell layer. We present: - Introduction: Papillary Neoplasms. - Clinical signs and symptoms. Palpable mass and/ or nipple discharge. Sometimes asymptomatic - Imaging findings: contrast-enhanced mammography (CEM), ductography, US, MRI-MRI ductography. -Pathologic entities: Intraductal papilloma, Papillary ductal carcinoma in situ, Encapsulated papillary carcinoma, Solid papillary carcinoma (in situ and invasive).- Interventional procedures. Tips and tricks.- Diagnostic work-up and recommendations for management.

BREE-67 DEMYSTIFYING BREAST IMAGING: ADDRESSING PATIENT AND PROVIDER CONCERNS

Kristina M. Michaudet, MD (*Presenter*)
Helio Neves Da Silva, MD (*Abstract Co-Author*)
Sarah M. Pittman, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is to answer common patient and provider breast imaging questions, including: Explaining radiation exposure in mammography (including 2D, tomosynthesis, and contrast-enhanced), comparing it to natural background radiation and other common medical imaging modalities. Providing data-driven insights on false positive rates in screening mammography to help reduce patient anxiety. Clarifying the role of breast biopsy markers, addressing common patient concerns regarding safety, necessity, and removal requests. Reviewing the safety of MRI. Dispelling misconceptions or supporting concerns about gadolinium and iodinated contrast agents.

TABLE OF CONTENTS/OUTLINE

Introduction Importance of patient-provider communication in breast imaging. Radiation Exposure in Mammography Dose, risks and benefits, including for pregnant patients. False Positives in Screening Mammography Data on recall rates, follow-up imaging, and biopsy recommendations. Breast Biopsy Markers Clinical importance, patient concerns, and counseling strategies. MRI Safety: Guidelines for keeping patients safe in the magnetic environment. Contrast Agents Risks and benefits of gadolinium and iodinated contrast agents, including in pregnant and lactating patients. Conclusion Strategies to improve patient understanding, confidence, and decision-making in breast imaging.

BREE-68 RADIOLOGIC CHARACTERIZATION OF INVASIVE LOBULAR CARCINOMA

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Miguel Chiva, MD (*Abstract Co-Author*)
Claudia Viescas Huerta, MD (*Abstract Co-Author*)
Sergio Sintes (*Abstract Co-Author*)
Angeles Silva Rodriguez (*Abstract Co-Author*)
Veronica Gamero Medina, MD (*Abstract Co-Author*)
Monica Andreu Rodriguez (*Abstract Co-Author*)

TEACHING POINTS

1. To provide an overview of Invasive Lobular Carcinoma, including its pathological features and clinical presentation. 2. To discuss the imaging characteristics of Invasive Lobular Carcinoma using ultrasound, mammography, contrast-enhanced mammography, tomosynthesis, and MRI. 3. To examine the specific peculiarities of this type of tumor. 4. To illustrate the imaging findings through case studies from our hospital.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Epidemiology, clinical manifestations. 2. Pathology. 3. Mammography and tomosynthesis: Mass with spiculated or indistinct margins, architectural distortion, asymmetry, and other manifestations. 4. Ultrasound: Irregular mass, focal shadowing without a mass, and other manifestations. 5. Magnetic resonance imaging: Irregularly shaped mass with spiculated or irregular margins, nonmass enhancement, and other manifestations. 6. Contrast-enhanced mammography: Utility, sample cases. 7. Extent of disease: Multifocality and multicentricity. 8. Distant disease: Metastases in common and uncommon sites. 9. Conclusion. 10. References.

BREE-69 THE ROLE OF RADIOLOGISTS IN THE TREATMENT OF BREAST CANCER IN FRAIL ELDERLY PATIENTS: OUR EXPERIENCE WITH INNOVATIVE APPROACHES AND PATIENT-CENTERED CARE IN RADIOLOGY

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Maria J. Ciudad, MD (*Abstract Co-Author*)
Noelia Arevalo (*Abstract Co-Author*)
Nancy Sanchez Rubio, MD (*Abstract Co-Author*)
Beatriz Lannegrand Menendez (*Abstract Co-Author*)
Carlota Garcia Baron (*Abstract Co-Author*)
Laura Escudero, MD (*Abstract Co-Author*)

TEACHING POINTS

To show our minimally invasive treatment circuit for elderly patients with breast cancer. To describe the imaging findings after microwave ablation of breast cancer by ultrasound and contrast mammography. To show our experience in the treatment of breast cancer with microwave ablation in 27 patients since 2022

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Breast cancer is a common disease that frequently occurs in elderly women who are often frail, making surgery not a viable option. In our breast unit, we have developed a minimally invasive treatment circuit for these patients since 2022, aiming to minimize medical visits and perform imaging tests on the same day as their hospital visits for other consultations. We have treated 27 elderly patients with breast cancer using microwave ablation. So far, no recurrence has been demonstrated in any of the patients during follow-up. The follow-up is carried out with the least invasive tests, including contrast mammography starting from six months.

BREE-70 CT FINDINGS AND MANAGEMENT OF INCIDENTALLY DETECTED BREAST LESIONS, POST-TREATMENT FINDINGS, AND BREAST AUGMENTATION

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Marehiko Hiroshima, MD,PhD (*Abstract Co-Author*)
Yuki Yasuda (*Abstract Co-Author*)
Nobuo Kitera, RT, MSc (*Abstract Co-Author*)
Masaya Kisohara, MD, PhD (*Abstract Co-Author*)
Tatsuya Kawai, MD, PhD (*Abstract Co-Author*)
Akio Hiwatashi, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Breast cancer is one of the most common cancers globally; at the same time, the number of survivors is increasing, leading to a rise in incidentally detected breast lesions, post-treatment findings, and breast augmentation on CT in daily clinical practice. Radiologists need to understand breast CT findings and their management comprehensively.This presentation will cover the following topics: breast and axillary anatomy, CT findings for breast benign and malignant lesions, post-treatment findings, breast augmentation, and breast implants.

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1. Anatomy, including breast and axillary region, breast composition, and background parenchymal enhancement 2. Image findings of breast lesions, including benign lesions, breast cancer, recurrent tumor, metastatic breast tumor, and malignant lymphoma3. Post-treatment findings, including surgery, systemic therapy, and radiation therapy, and complications with treatment4. Breast augmentation, including autologous breast reconstruction, injected breast augmentation, and breast implants, and these complications with treatment

BREE-71 UNVEILING THE SECRETS OF NON-MASS ENHANCEMENT ON CONTRAST-ENHANCED MAMMOGRAPHY. A RADIOPATHOLOGIC PICTORIAL REVIEW

Rosa M. Lorente-Ramos, MD, PhD (*Presenter*)
Javier Azpeitia Arman, MD (*Abstract Co-Author*)
Carlos Molina, MD (*Abstract Co-Author*)
Maria Juan Porter, MD (*Abstract Co-Author*)
Soledad Alonso Garcia (*Abstract Co-Author*)
Miguel Leon Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

-To review the definition of non-mass enhancement (NME) on contrast-enhanced mammography (CEM) according to the description of the American College of Radiology (ACR) in the Breast Imaging Reporting and Data System (BI-RADS). -To identify the most common benign and malignant etiologies seen with non-mass enhancement presentation. -To analyse the diagnostic utility of contrast-enhanced mammography in identifying non-mass enhancement alone or associated with findings on low-energy views (focal asymmetry, architectural distortions, microcalcifications). -To compare the role of other imaging modalities, illustrating imaging findings of CEM with correlation with imaging (US, MRI) and pathology. -To discuss appropriate management of detected non-mass enhancement on CEM.

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On CEM, an enhancement which is neither a mass nor an enhancing asymmetry is classified as a non-mass enhancement. NME is more likely to be benign overall however, the likelihood of malignancy increases with the presence of associated findings. We present. 1. Definition of NME. 2. Classification. BIRADS. 3. Frequency and histopathology of NME lesions. Illustrative cases with histopathologic findings. 4. How do we manage NME? Further examinations: ultrasonography, biopsy (CEM-guided biopsy), and follow-up examinations.

BREE-72 MASS CONFUSION: DEMYSTIFYING IDIOPATHIC GRANULOMATOUS MASTITIS ON IMAGING

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Pooja Sikka, MD (*Abstract Co-Author*)
Zoha Huda, MD,BS (*Abstract Co-Author*)
Dunya M. Imad, MD (*Abstract Co-Author*)
Jordana Phillips, MD (*Abstract Co-Author*)
Sona A. Chikarmane, MD (*Abstract Co-Author*)
Priscilla J. Slanetz, MD, MPH (*Abstract Co-Author*)

TEACHING POINTS

Idiopathic granulomatous mastitis (IGM) is a benign, chronic inflammatory breast condition with an elusive etiology, often mimicking malignancy on imaging. It typically affects parous women within five years of lactation and is associated with autoimmune and infectious triggers, including Corynebacterium kroppenstedtii . Radiologic findings are often nonspecific but critical in guiding diagnosis, staging, and treatment response. This exhibit reviews characteristic mammographic and ultrasound features, such as focal asymmetries, hypoechoic masses, and sinus tract formation, while emphasizing histopathologic correlation. Treatment options range from observation and antibiotics to immunosuppressive agents, minimally invasive interventions, and surgery. A multidisciplinary approach is essential due to the disease's variable course and recurrence risk.

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Clinical Presentation and Epidemiology Proposed Pathogenesis, Disease Subtypes, Pathologic Evaluation Imaging Findings: a. Mammography b. Ultrasound c. MRI (brief overview) Diagnostic Approach and Role of Core Needle Biopsy Staging Management Strategies: a. Observation b. Antibiotics, oral prednisone, methotrexate c. Image-guided aspiration & Intralesional Steroid Injection d. Minimally Invasive and Surgical Options Imaging Follow-Up and Treatment Response Case-Based Imaging Review and Pitfalls

BREE-73 THE GREAT MASQUERADER: IDIOPATHIC GRANULOMATOUS MASTITIS IMITATING BREAST CANCER

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Wankler Dias Canhadas Junior (*Abstract Co-Author*)
Iaggo Costa, MD (*Abstract Co-Author*)
Marina Vilhena, MD (*Abstract Co-Author*)
Camila d. Acras, MD (*Abstract Co-Author*)
Eduardo F. Fleury, PhD, MD (*Abstract Co-Author*)
Caio Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

To present the features of idiopathic granulomatous mastitis (IGM) through imaging findings on mammography (MG), ultrasonography (US), and magnetic resonance imaging (MRI). To demonstrate how granulomatous mastitis can mimic breast cancer on magnetic resonance imaging findings, and teach the main enhancement and distribution patterns on MRI that should raise suspicion of mastitis, avoiding misinterpretations. To reinforce the importance of clinical-pathological correlation to avoid unnecessary invasive treatments.

TABLE OF CONTENTS/OUTLINE

Introduction. Definition of idiopathic granulomatous mastitis. Clinical aspects of idiopathic granulomatous mastitis. Imaging findings on mammography, ultrasound and magnetic resonance imaging. MRI enhancement and distribution patterns that can mimic malignancy. Review and present institutional cases with image-pathology correlation, from the analysis of the results of breast biopsies performed in recent years. Importance of biopsy and histological confirmation. Identify and describe differential imaging findings with institutional case examples (differential diagnosis: IGM vs. carcinoma). Conclusion.

BREE-74 FROM PAIN TO PRECISION: OPTIMIZING IMAGING USE FOR BREAST DISCOMFORT

Haydee Ojeda-Fournier, MD (*Presenter*)
Nicole Gamboa (*Abstract Co-Author*)

David M. Kakish, MD (*Abstract Co-Author*)
Sara Grossi, MD (*Abstract Co-Author*)

TEACHING POINTS

Breast pain is a common concern among patients and providers, but when unaccompanied by other clinical findings, it rarely indicates malignancy. At our institution, we reviewed imaging utilization and found that 19.7% of all diagnostic breast imaging studies in 2024 were performed for breast pain. This educational exhibit explores the causes of pain and associated imaging findings, emphasizing sensitivity to patients' concerns. By the end of this educational exhibit, learners will: 1. Define the common types of breast pain (cyclical, non-cyclical, focal, etc.); 2. Understand the incidence, clinical presentation, and management of breast pain; 3. Identify clinical features that indicate when imaging is appropriate in the evaluation of breast pain; 4. Determine the imaging modalities for assessing suspicious breast pain, including mammography, MRI, and ultrasound, according to age and the ACR appropriateness criteria; 5. Recommend evidence-based management strategies based on BI-RADS assessment of benign, indeterminate, or suspicious imaging findings; 6. Recognize the socioeconomic impact of utilizing diagnostic imaging for nonsuspicious breast pain.

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1. Introduction; 2. Definition of breast pain; 3. Incidence and risk factors of breast pain; 4. Clinical presentation of breast pain; 5. Etiology and differential considerations; 6. Multimodality imaging examples of breast pain; 7. Learn a systematic approach to the characterization of breast pain; 8. When to appropriately refer patients for further imaging; 9. Algorithm for recommended management of breast pain; 10. Conclusion

BREE-75 BREAKING BARRIERS IN DENSE BREAST SCREENING: PRECISION ULTRASOUND STRATEGIES FOR ENHANCED CANCER DETECTION

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Marilia P. Royero, MD,MD (*Abstract Co-Author*)
Alejandra Agudelo Ruiz (*Abstract Co-Author*)
Aura Vergara (*Abstract Co-Author*)
Daniela B. Grammatico, PhD (*Abstract Co-Author*)

TEACHING POINTS

High breast density increases cancer risk and masks tumors . Supplemental ultrasound , a widely available and non-invasive tool, improves detection, reduces advanced cancers, and enables earlier, less aggressive treatment.Teaching Points 4-6× cancer risk in dense breasts; 30-40% missed on mammograms.Ultrasound detects 3-7/1000 hidden cancers, reducing interval cancers.Screen dense breasts + family history/atypia; AI improves accuracy.Guidelines endorse radiation-free ultrasound for early detection.Risk-based protocols optimize outcomes.

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Introduction Density RiskMammography Limits Ultrasound Detection (3-7/1000)Interval Cancers Risk Family History/Atypia. Risk-Based Screening Frameworks Modalities Handheld/ABUS/AI Guidelines Recommendations and Recall Rates Cases Illustrative cases/Biopsy Confirmed Cancer Future AI/Protocols Conclusion

BREE-76 NO ATYPIA, NO PANIC: UNDERSTANDING NON-ATYPICAL BREAST PROLIFERATIONS THROUGH IMAGING

Sirley Cisneros, MD (*Presenter*)
Ines Podadera (*Abstract Co-Author*)
Roberto Boratti, MD (*Abstract Co-Author*)
Daiana L. Esteban (*Abstract Co-Author*)
Pamela Garcia Suarez, MD (*Abstract Co-Author*)
Ignacio Mc Lean (*Abstract Co-Author*)

TEACHING POINTS

Knowledge of the main proliferative lesions without atypia, such as usual ductal hyperplasia, sclerosing adenosis, and intraductal papilloma. Clear understanding of the difference between lesions without atypia, for better clinical interpretation and differential diagnosis. Assessment of these pathologies in a multidisciplinary team for patients 'benefit. Treatment and follow up to prevent development of breast cancer. Strengthening health education.

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Introduction What are proliferative breast diseases Diagnostic methods Differential diagnosis Conclusion

BREE-77 HOME ALONE: "BOOBY" TRAPS FOR NEW ON-CALL JUNIOR RADIOLOGY RESIDENTS

Kevin Dao, MD (*Presenter*)
Jasmine Zhao, MD (*Abstract Co-Author*)
Shayan Saeed (*Abstract Co-Author*)
Raveena Atwal (*Abstract Co-Author*)
Rhea Gandhi (*Abstract Co-Author*)
Chang Shu (*Abstract Co-Author*)
Alvin Tran (*Abstract Co-Author*)
Yinuo Zhang (*Abstract Co-Author*)
Craig Wilsen, MD (*Abstract Co-Author*)

TEACHING POINTS

Early exposure to on-call breast imaging can be an intimidating experience for junior radiology residents, particularly when they have not yet completed a dedicated breast imaging rotation. Common scenarios— such as palpable lumps in young patients, suspected mastitis, abscess formation, and post-operative complications—are frequently encountered during off-hours and demand accurate assessment and timely intervention. This case-based educational exhibit is designed to provide junior residents with a focused introduction to the "must-know" on-call breast pathologies. Through illustrative examples and structured clinical reasoning, we will highlight essential imaging appearances, triage strategies, and communication tips. Special attention will be given to distinguishing benign from suspicious findings, knowing when escalation is warranted, and understanding the implications of imaging on patient management.

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1. Introduction to the junior on-call breast imaging role 2. Case based presentations of must-know scenarios 3. Decision-making: when to reassure, when to escalate

BREE-78 INTERPRETING ARTIFACTS IN CONTRAST-ENHANCED MAMMOGRAPHY: COMMON AND EMERGING CHALLENGES

Matthew M. Mason, MD (*Presenter*)
Gary J. Whitman, MD (*Abstract Co-Author*)
Rick R. Layman, PhD (*Abstract Co-Author*)
Megan C. Jacobsen, PhD (*Abstract Co-Author*)
William R. Geiser, MS (*Abstract Co-Author*)
Olena O. Weaver, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review the technique of contrast-enhanced mammography (CEM), emphasizing technological factors that contribute to artifact formation. 2. Highlight the significance of radiation dose-related resolution variances. 3. Discuss common and newly recognized artifacts in CEM, hypothesizing their origins and possible mitigation strategies.

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Overview of CEM technology and underlying physics ; Radiation dose-related resolution variances and their impact on contrast quality ; Common artifacts in CEM : causes, examples, and mitigation. Patient-related (ripple, misregistration, pectoral highlighting, breast implants); Skin-related (skin-line enhancement, focal enhancement, skin overexposure); Contrast-related (contrast retention, contamination, negative contrast enhancement, cloudy fat); Technical-related (halo, corrugation, air trapping, axillary line, ghosting). Newly recognized and rare artifacts: imaging examples, hypothesized origins, and potential solutions. Grid texture artifact; Hydrophilic clip void; Vendor-related image variations; Hair pseudo-enhancement. Conclusions best practices; The need for technology standardization among vendors; Future directions.

BREE-79 WHAT'S HAPPENING AT THE BOUNDARY OF BREAST TUMORS?

Maya Honda, MD, PhD (*Presenter*)
Masako Y. Kataoka, MD, PhD (*Abstract Co-Author*)
Azusa Nishimoto (*Abstract Co-Author*)
Aika Okazawa (*Abstract Co-Author*)
Mami Iima, MD, PhD (*Abstract Co-Author*)
Rie Ota, MD (*Abstract Co-Author*)
Yuji Nakamoto, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Rim enhancement on contrast-enhanced MRI—characterized by strong contrast at the margins of a mass—is considered a suggestive sign of malignancy and is associated with certain prognostic factors in breast cancer. However, it is important to note that some benign breast lesions may also exhibit rim enhancement, necessitating careful evaluation. Peritumoral edema detected on T2-weighted imaging is similarly regarded as indicative of malignant or high-grade tumors. On ultrasound, the presence of a hyperechoic area surrounding the tumor is another feature suggestive of malignancy. In this exhibit, we will explore the imaging characteristics of breast lesions that demonstrate distinctive features at their boundaries, with correlation to pathological findings. We will also examine quantitative imaging biomarkers obtained from the peritumoral region, including apparent diffusion coefficient (ADC) values derived from diffusion-weighted imaging (DWI) and radiomic features.

TABLE OF CONTENTS/OUTLINE

1. Understand the mechanisms behind rim enhancement and peritumoral edema on MRI, as well as hyperechoic peritumoral areas on ultrasound.2. Explore the diagnostic and prognostic implications of these imaging features.3. Recognize potential pitfalls in interpretation.4. Introduce the role of quantitative imaging biomarkers, including ADC values and radiomic features, obtained from the peritumoral region.

BREE-80 PRECISION MRI: RISK-ADJUSTED STRATEGIES FOR ENHANCED BREAST CANCER DETECTION

Jhisel C. Lazcano Soliz, MD (*Presenter*)
Maria A. Acha I, MD (*Abstract Co-Author*)
Flavia B. Sarquis, MD (*Abstract Co-Author*)
Angelica M. Rivera (*Abstract Co-Author*)

TEACHING POINTS

Breast cancer is the most common cancer in women worldwide, highlighting the need for improved early detection and survival. Risk models guide personalized screening and prevention. Abbreviated breast MRI (AB-MR) is emerging as a key tool for early detection and annual screening, offering high sensitivity and improved access for women at increased risk of breast cancer This study evaluates AB-MR performance adjusted for key risk factors: age, breast density, personal and family history, BMI, and prior high-risk biopsies.Teaching Points:1. Breast cancer is the most common cancer in women, requiring early detection.2. MRI accuracy improves when adjusted for key risk factors.3. Abbreviated breast MRI (AB-MR) as an emerging tool for screening high-risk women.4. Personalized imaging enhances detection.5. Risk-based MRI leads to earlier diagnosis and better outcomes.

TABLE OF CONTENTS/OUTLINE

1. Breast MRI in Cancer Detection.2. Key Risk Factors Affecting MRI Performance.3. Risk-Adjusted MRI Screening Strategies.4. Abbreviated Breast MRI (AB-MRI) for Early Detection.5. Comparison with Other Imaging Modalities.6. Clinical Implications and Future Directions.7. Conclusion.

BREE-81 MULTIMODALITY IMAGING FEATURES AND PATHOGENESIS OF STROMAL FIBROSIS

Haoling Zhu, MD,BA (*Presenter*)
Cecilia L. Mercado, MD (*Abstract Co-Author*)
Osvaldo Hernandez (*Abstract Co-Author*)
Chloe M. Chhor, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Stromal fibrosis in the breast is an increasingly common benign pathologic entity. 2. Stromal fibrosis has a wide range of appearances on imaging. 3. Careful assessment of radiologic-pathologic concordance is essential to minimizing the risk of a false-negative outcome in pathologic cases of stromal fibrosis.

TABLE OF CONTENTS/OUTLINE

1. Overview and histopathology 2. Summary of selected literature demonstrating upgrade rates of stromal fibrosis detected by various imaging modalities 3. Multimodality imaging spectrum (mammography, US, MRI) - Representative cases 4. Assessment of concordance and management guidelines for the breast radiologist 5. Conclusion and key teaching points

BREE-82 PEDIATRIC BREAST COMPLAINTS: A PICTORIAL REVIEW FOR THE BREAST RADIOLOGIST

Joshua M. Boulter, MD (*Presenter*)
Derek L. Nguyen, MD (*Abstract Co-Author*)

TEACHING POINTS

Children and adolescents occasionally present with breast complaints in the emergency setting, typically with palpable abnormalities or pain. Ultrasound is the imaging of modality of choice in this setting due to its wide availability, resolution for superficial soft tissue structures, and lack of ionizing radiation. In this presentation, we review breast lesions seen in children and adolescents undergoing sonographic evaluation at a tertiary pediatric hospital with the final diagnosis. The aim of this exhibit is to review pediatric breast anatomy and depict representative ultrasound imaging features of normal variants, benign lesions, and findings which should raise suspicion for malignancy. Cases will include but not limited to premature glandular tissue, ductal ectasia, breast edema, breast cellulitis, breast abscess, periductal mastitis, complicated cyst, intraductal papilloma, fibroadenoma, phyllodes tumor, and breast cancer.

TABLE OF CONTENTS/OUTLINE

1. Highlight and discuss the importance of differentiating normal breast development findings from true pediatric breast masses.2. Review common benign and malignant pediatric breast imaging findings that can be detected on breast US.3. Present image-rich multimodality case examples of benign and malignant pediatric breast masses detected on breast US

BREE-83 IMPLEMENTING CARDIOVASCULAR RISK SCREENING USING BREAST ARTERIAL CALCIFICATIONS ON SCREENING MAMMOGRAPHY: A MULTIDISCIPLINARY FRAMEWORK

Kaitlin M. Zaki-Metias, MD, FRCPC (*Presenter*)
Elsie Nguyen, MD, FRCPC (*Abstract Co-Author*)
Jean M. Seely, MD, FRCPC (*Abstract Co-Author*)
Charlotte J. Yong-Hing, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this educational exhibit is to provide an overview of the clinical relevance and utility of recognizing breast arterial calcifications (BAC) and their association with increased cardiovascular disease (CVD) risk as an important incidental finding on screening mammography, and to describe a framework for BAC reporting and management.1. Most women are unaware of their CVD risk.2. BAC is associated with increased CVD risk and may serve as a surrogate tool for early identification of asymptomatic patients at higher risk.3. With recent changes to breast cancer screening guidelines recommending mammography beginning at age 40, more women are undergoing routine screening, increasing the potential for impactful reporting of incidental BAC.4. BAC reporting on mammography, especially in women under age 55, can identify higher-risk patients and support early risk-mitigation strategies.5. Multidisciplinary collaboration and education among radiologists, primary care physicians, and cardiologists is vital for sustainable implementation and optimized outcomes.6. Leveraging AI can enhance BAC detection and support standardized assessment and quantification.

TABLE OF CONTENTS/OUTLINE

1.Explain the significance of BAC on mammography as a marker of CVD risk in women.2. Describe multidisciplinary collaboration among radiologists, cardiologists, and primary care providers for BAC-based screening.3. Identify the clinical workflow needed to integrate BAC assessment into mammographic interpretation.4. Develop strategies to educate patients and healthcare teams on BAC and follow-up pathways.5.Assess opportunities, challenges, and equity implications in BAC-based opportunistic screening.

BREE-84 BREAST CANCER SCREENING IN PREGNANT AND LACTATING PATIENTS: A PRACTICAL APPROACH

Haydee Ojeda-Fournier, MD (*Presenter*)
James Stepenosky, MD (*Abstract Co-Author*)
Soudabeh Fazeli, MD, MPH (*Abstract Co-Author*)
Rebecca Rakow-Penner, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

As more women delay childbirth into their 40s and as awareness of breast cancer risk in younger women rises, radiologists are increasingly encountering patients who require breast cancer screening during pregnancy or lactation. This educational exhibit addresses the unique challenges, evidence-based strategies, and safety considerations for imaging pregnant and lactating patients, whether they are average-risk or high-risk. We will review physiologic breast changes, imaging modality selection, and risk-benefit communication to empower radiologists to confidently guide care in this complex setting. By the end of this educational exhibit, the learner will: 1. Understand the impact of delayed childbearing and increasing identification of high-risk young women on breast cancer screening during pregnancy and lactation. 2. Recognize the physiologic breast changes during pregnancy and lactation and how they affect imaging interpretation and modality selection. 3. Review safe, evidence-based imaging strategies (including mammography, ultrasound, and MRI) for screening and diagnostic evaluation in pregnant or lactating patients. 4. Gain strategies to counsel patients and referring providers on the risks, benefits, and appropriate use of breast imaging during pregnancy and lactation.

TABLE OF CONTENTS/OUTLINE

Introduction; Epidemiology; Breast physiology; Identifying patients that may need screening during pregnancy or lactation; Imaging modalities and safety considerations: Mammography, US, MRI; Case review including average risk, intermediate risk, and high risk pregnant or lactating patients; Survivorship; Current guidelines; takeaway points; Conclusion.

BREE-85 FRONT LINES OF CARE: BREAST CANCER SCREENING IN ACTIVE DUTY SERVICE MEMBERS AND VETERANS

Haydee Ojeda-Fournier, MD (*Presenter*)
James Stepenosky, MD (*Abstract Co-Author*)
Nathan Spengler, MD (*Abstract Co-Author*)
Jennifer R. Foley, MD (*Abstract Co-Author*)
Rebecca Rakow-Penner, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Breast cancer screening in active-duty military service members and veterans presents unique challenges and opportunities. Women currently represent approximately 17% of U.S. active duty military personnel and 10% of the overall veteran population. Frequent relocations, deployments, and transitions between civilian and military health systems can fragment care, potentially delaying screening, diagnosis, and follow-up. At the end of this educational exhibit, the learner will: 1. Understand the demographics and breast cancer risk factors in women who are active duty military members and veterans; 2. Recognize logistical barriers to screening, including relocations, deployments, and care transitions between military, VA, and civilian health systems; 3. Explore evidence-based screening recommendations and resources tailored to military and veteran populations.

TABLE OF CONTENTS/OUTLINE

Introduction; Service branches; Demographics of military and veteran populations; Occupational/Environmental exposures; Delayed childbirth; Barriers to screening and diagnosis: Relocation and deployment, transition between military, VA, and civilian health care; Remote location access to care limitations; DoD screening protocols; Special considerations in use of BI-RADS 3; VA breast cancer screening practices; Centralized medical records; Conclusion

BREE-86 IMAGING FINDINGS AFTER CRYOABLATION OF BREAST CANCER: TIPS AND TRICKS TO KNOW THAT THE PROCEDURE WAS SUCCESSFUL WITHOUT BIOPSY

Laura Abelairas Lopez, MD (*Presenter*)
Lucia Grana Lopez, MD (*Abstract Co-Author*)
Laura Lopez, MD (*Abstract Co-Author*)
Ignacio Fernandez Sobrado (*Abstract Co-Author*)

TEACHING POINTS

Our aim is to describe the findings on mammography, ultrasound, and contrast-enhanced mammography (CEM) after percutaneous cryoablation (PCA) of breast cancer (BC), as well as the signs of residual tumor or recurrence.

TABLE OF CONTENTS/OUTLINE

This exhibit is based on 69 cases of BC diagnosed in non-surgical patients, in our institution, between May 2019 and October 2024 and managed with PCA alone. The expected mammogram finding after PCA is a mass consistent with fat necrosis, larger than the treated tumor. Usually it is clearly benign and, over time, it reduces in size and density. However, it may appear as a dense mass with spiculated margins and persist without changes on serial follow-up. Mainly in these cases, the administration of intravenous contrast is really useful to exclude residual tumor or relapse. Absence of contrast uptake indicates complete ablation. Nevertheless, fat necrosis secondary to the ablation may demonstrate rim and progressive enhancement with moderate conspicuity. The contrast uptake usually decreases over time, but it can persist even 24 months after the PCA. US, initially, demonstrates a heterogeneous mass with indistinct margins and absence of flow, that reduces in size and becomes an oval an echogenic mass with circumscribed margins on serial follow-up examinations. Focal mass with contrast enhancement or color flow on US at the periphery of the ablation area suggests residual tumor or relapse. Enhancement outside the ablation zone indicates residual disease or progression. New suspicious lymph nodes in the axilla are also considered a sign of tumor progression.

BREE-87 CRYOABLATION OF BREAST LESIONS: AN EMERGING ALTERNATIVE TO SURGERY

Omid Shafaat, MD (*Presenter*)
Sidhvi Reddy (*Abstract Co-Author*)
Cathy Chen, MD (*Abstract Co-Author*)
Husameddin El Khudari, MBChB (*Abstract Co-Author*)
Stefanie A. Woodard, DO (*Abstract Co-Author*)

TEACHING POINTS

Cryoablation is a minimally invasive, image-guided technique with growing application in treating early-stage breast cancers. It offers reduced morbidity, excellent cosmetic outcomes, and faster recovery, especially in patients who are poor surgical candidates or prefer a nonsurgical approach. As evidence builds, cryoablation is emerging as a safe, feasible alternative to surgery, with ongoing trials evaluating its long-term efficacy and oncologic safety. To review indications, procedural workflow, and post-treatment surveillance of breast cryoablation. To compare cryoablation with other minimally invasive and surgical treatments. To highlight radiologic imaging appearance before, during, and after cryoablation. To examine current evidence, patient selection criteria, and barriers to adoption.

TABLE OF CONTENTS/OUTLINE

1. Definition a. Cryoablation overview b. Mechanism: freeze-thaw c. Historical background2. Epidemiology a. Increased detection b. Demand for cosmetic treatments c. Expanding eligibility3. Pathophysiology a. Ice crystal necrosis b. Vascular injury c. Fibrosis d. Patient outcomes4. Imaging guidance a. Ultrasound b. Stereotactic c. MRI5. Procedure workflow a. Imaging b. Probe placement c. Freeze-thaw d. Monitoring6. Post-treatment a. Imaging changes b. Recurrence differentiation7. Comparison a. Lumpectomy b. RFA c. Microwave d. VAE8. Indications a. Benign vs malignant b. ICE3 criteria c. Contraindications9. Barriers a. Reimbursement b. Training c. Interdisciplinary challenges10. Future a. Trials b. AI/radiomics c. Indication expansion

BREE-88 MALE BREAST PATHOLOGY: AN UNDERRECOGNIZED POPULATION

Valeria Belden Reyes, MD, MD (*Presenter*)
Yesika J. Davila, MD (*Abstract Co-Author*)
Maria Guerra, MD (*Abstract Co-Author*)
Cesar Palacios, MD (*Abstract Co-Author*)
Ana Escobar, MD (*Abstract Co-Author*)
Gabriela Sepulveda, MD, PhD (*Abstract Co-Author*)
Margarita L. Garza, MD (*Abstract Co-Author*)

TEACHING POINTS

- Understand the anatomy and pathologies of the male breast: Identify and differentiate between normal, benign and malignant imaging features. - Identify Symptoms of Male Breast Pathologies: Recognize common signs and symptoms. - Understanding the imaging techniques used to diagnose breast issues: Review the ACR Appropriateness Criteria Evaluation of the Symptomatic Male Breast. - Promote Awareness: Educate healthcare providers and the public about male breast health for early detection and intervention.

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Most Common Findings including Gynecomastia, pseudogynecomastia, normal breast, lipoma. Benign Findings including Epidermal Inclusion cyst, mastitis and abscess, benign calcifications, benign nodules, hidradenitis, myofibroblastoma, complicated cyst, hematoma, seroma, hemangioma. Malignant Findings including Invasive ductal carcinoma NST, pure ductal carcinoma in situ (DCIS), non-hodgkin lymphoma, metastatic lymph node from melanoma.

BREE-89 BEYOND THE USUAL SUSPECTS: UNMASKING THE MANY FACES OF MASTITIS

Marta Mazuque Mancilla (*Presenter*)
Marta Vera Cartas, MD (*Abstract Co-Author*)
Laura Martos Ramio, MD (*Abstract Co-Author*)
Gerard Carbo Vilavedra, MD (*Abstract Co-Author*)

TEACHING POINTS

1. This pictorial review aims to broaden the diagnostic approach to mastitis by exploring both typical and atypical causes. 2. Imaging, in combination with clinical and histological correlation, is essential for accurate diagnosis and appropriate management. 3. A primary goal of imaging is to rule out complications like breast abscess, where the radiologist plays a key role, particularly in performing ultrasound-guided drainage.

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Mastitis refers to an inflammatory condition of the breast that it is typically associated with puerperal patients and breastfeeding-related disorders, but it is important to remember that there are many benign inflammatory processes that have often been overlooked. Mastitis can be classified in various ways, with one of the most practical distinctions being between infectious and non-infectious forms: - In the infectious group, we describe classic puerperal mastitis and less common entities like infected galactoceles and non-puerperal infections. - The non-infectious category highlights inflammatory conditions that are often underrecognized, such as idiopathic granulomatous mastitis, Zuska disease (also known as squamous metaplasia of lactiferous ducts), diabetic mastopathy, ductal ectasia, and radiation-induced mastitis. Each condition is illustrated with representative clinical cases and characteristic imaging findings. Malignant mimickers such as inflammatory breast carcinoma must be considered in differential diagnosis.

BREE-90 A NODE TO REMEMBER: A PICTORIAL ESSAY OF THE DIFFERENTIAL DIAGNOSES OF AXILLARY ADENOMEGALY

Camila Sarro (*Presenter*)
Karine Coelho Rodrigues, MD (*Abstract Co-Author*)
RAFAEL AGUILAR SALES (*Abstract Co-Author*)
Tacio Tenorio (*Abstract Co-Author*)
Simone Caetano, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Axillary lymphadenopathy is a relatively frequent finding in breast imaging, and while it often raises concern for malignancy, it may also be associated with other conditions such as infections, inflammatory diseases, or systemic disorders. Recognizing these alternatives is important, especially to avoid unnecessary biopsies or misdiagnosis. In this educational exhibit, we share selected clinical cases involving axillary lymphadenopathy with different etiologies: breast cancer, sarcoidosis,

lymphoma, and tuberculous lymphadenitis. All diagnoses were confirmed by histolo. The goal is to illustrate how small imaging clues, when placed in context with clinical history, can help narrow the differential diagnosis. This project aims to: - Provide a visual and case-based overview of different causes of axillary lymphadenopathy; - Emphasize that not all suspicious nodes are malignant; - Show how certain imaging characteristics may guide the differential diagnosis; - Encourage radiologists to integrate subtle imaging features with clinical data.

TABLE OF CONTENTS/OUTLINE

- Brief review of axillary lymph node anatomy and normal imaging features; - Case-based review including: • Axillary metastasis in breast cancer; • Sarcoidosis mimicking malignancy; • Isolated axillary involvement in lymphoma; • Tuberculous lymphadenitis with central necrosis; - Comparative imaging chart summarizing key findings by etiology; - Discussion of common pitfalls and diagnostic clues; - Practical takeaways to aid interpretation in daily radiology practice.

BREE-91 SKIN DEEP, TUMOR FAKE? WHEN DERMAL AND HYPODERMAL LESIONS MIMIC BREAST MALIGNANCIES

Maisa Irie (*Presenter*)
Natalia T. Lima (*Abstract Co-Author*)
Carlos Shimizu, MD (*Abstract Co-Author*)
Natalia Orthmann, MD (*Abstract Co-Author*)
Erica Endo, MD (*Abstract Co-Author*)
Naomi Murakami SR, MBBS (*Abstract Co-Author*)

TEACHING POINTS

? To discuss skin lesions that are frequently encountered in the breast and can mimic small superficial breast cancer;? To present a brief literature review of skin and breast anatomy;? To review differential diagnoses of skin lesions, according to anatomic layers (dermal and hypodermal), and superficial breast tissue lesions, highlighting clinical presentation, pathology and epidemiology;? To illustrate radiological features of those conditions in different imaging modalities, including mammography, ultrasound and magnetic resonance with original works performed at the authors' institution;? ?To demonstrate imaging findings that helps to distinguish skin lesions from breast parenchymal lesions, leading to a correct diagnosis to avoid unnecessary invasive procedures and recognize lesions that histologic analysis may be necessary;? To comment on imaging pitfalls of superficial lesions in the breast, that can mimic malignant lesions.

TABLE OF CONTENTS/OUTLINE

Dermal lesions: Sebaceous cyst Epidermal inclusion cyst Dermal calcifications Keloid scar Hypodermal lesions: Fat-containing lesions: lipoma, fat necrosis Vascular lesions: hemangioma, thrombosed vessel Neurogenic lesions: neurofibromas Breast lesions: Breast cancer Fibroadenoma Papilloma

BREE-92 CONTRAST-ENHANCED MAMMOGRAPHY: A RADIOLOGIST'S PRACTICAL GUIDE

Romuald Ferre, MD (*Presenter*)
Patrick Cervini, MD (*Abstract Co-Author*)
Andrea S. Senter, MD (*Abstract Co-Author*)
Brigitte D. Ala, MD (*Abstract Co-Author*)
Cherie M. Kuzmiak, DO (*Abstract Co-Author*)

TEACHING POINTS

• CEM combines anatomical and functional imaging, enhancing lesion detection, especially in dense breasts.• It is a viable, cost-effective alternative to breast MRI in many clinical scenarios.• Proper protocol execution (contrast timing, dual-energy acquisition) is essential for diagnostic accuracy.• Familiarity with CEM-specific artifacts (motion, misregistration, subtraction errors) is crucial to avoid misinterpretation.• Understanding enhancement patterns improves diagnostic confidence and guides patient management.• CEM can be especially useful for high-risk screening, staging, and problem-solving when MRI is contraindicated or unavailable.

TABLE OF CONTENTS/OUTLINE

1. Introduction to CEM - Overview, indications, and rationale - Comparison with conventional mammography and MRI 2. CEM Physics and Technique - Dual-energy acquisition and image reconstruction - Timing of contrast administration 3. CEM Protocol Optimization - Patient preparation and injection protocol - Image acquisition: low-energy vs recombined views 4. Interpretation Guidelines - Enhancement patterns: benign vs malignant - Reading workflow: correlating findings across views 5. Artifacts and Pitfalls - Common issues: motion, subtraction errors, positioning - Strategies to minimize diagnostic errors 6. CEM vs Breast MRI - Diagnostic performance - Strengths, limitations, and case selection criteria 7. Clinical Case Examples - Problem-solving in dense breasts - Preoperative staging of known malignancy - Screening high-risk patients 8. Conclusion and Clinical Integration - Key takeaways for implementation - Future directions and research

BREE-93 KEY INFLUENCING FACTORS AND TACTICAL SOLUTIONS FOR OPTIMIZING BREAST IMAGING CLINIC OPERATIONS: REVIEW WITH REAL-WORLD SCENARIO ILLUSTRATIONS AND EXPERIENCE

Jenna Tinnell (*Presenter*)
Olivia Whitfield (*Abstract Co-Author*)
Wei Li (*Abstract Co-Author*)
Xiaoqin J. Wang, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

Illustrate how rigid scheduling, fragmented workflows, and resource limitations drive diagnostic delays across both a main academic campus and its community satellites. Map each operational barrier to a targeted intervention—flexible staffing, bundled order sets, integrated technology, AI-driven triage, queueing-based scheduling, and dedicated coordination roles. Showcase data-driven visualizations (delay distributions, idle-time comparisons, TAT improvements, wait-time reductions, queueing models) that guide continuous workflow optimization.

TABLE OF CONTENTS/OUTLINE

- Introduction: brief summary of rising demand for breast imaging and overview of breast imaging services. - Key Factors & Tactical Solutions: Inflexible Scheduling ? Expand patient access with weekend, early, and late appointments; tailor slot lengths to specific indications; apply queueing-theory scheduling with built-in buffer capacity. Disjointed Orders ? Implement bundled EMR breast-imaging order sets to eliminate extra approval steps. Fragmented Technology ? Integrate PACS/RIS/EMR platforms; deploy automated reporting using structured templates or NLP. Manual Imaging Processes ? Adopt concise, evidence-based imaging protocols by indication; implement AI-driven risk prioritization; establish batch-reading sessions for screening studies. Staffing Constraints ? Introduce flexible staffing models (weekend, early, and late shifts) for both technologists and radiologists. Coordination Gaps ? Appoint dedicated schedulers and clinical navigators to oversee patient flow. Operational Variability ? Embed a Plan-Do-Study-Act (PDSA) quality cycle for ongoing process refinement.

BREE-94 METHOD OF DETECTION IN BREAST IMAGING: APPLICATION, CASE REVIEW, AND IMPLICATIONS OF BI-RADS 6TH EDITION

Haydee Ojeda-Fournier, MD (*Presenter*)
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Eric L. Rosen, MD (*Abstract Co-Author*)
Joanna Rossi, MD, MPH (*Abstract Co-Author*)

Richard E. Sharpe JR, MD, MBA (*Abstract Co-Author*)
Sujata V. Ghate, MD (*Abstract Co-Author*)

TEACHING POINTS

This educational exhibit aims to equip breast imagers with practical knowledge and tools to accurately assign Method of Detection (MOD), understand its clinical and audit implications, and prepare for updates introduced in the BI-RADS 6th edition. At the end of this educational exhibit, the learner will: 1. Explain the purpose of Method of Detection (MOD) and outline its role in breast cancer auditing and clinical outcomes reporting; 2. Distinguish between screening-detected, diagnostic-detected, and clinically detected cancers to assign the correct MOD in various clinical contexts; and 3. Evaluate clinical cases to determine the appropriate MOD, especially in scenarios with overlapping screening, diagnostic, or clinical features.

TABLE OF CONTENTS/OUTLINE

Introduction; Definition of MOD; Importance of collecting data; Multimodality imaging examples of screening MOD with mammography, US, MRI, and CEM; Learn a systematic approach to assigning MOD based on patient or provider-detected abnormality; Tips on how to apply the subcategories of MOD for screening examinations appropriately; Pitfalls and controversies in MOD; Resources available to explore MOD; What to expect with BI-RADS 6th edition; Test yourself with unknown cases; Conclusion.

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CAEE

Cardiac Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

CAEE-2 FROM PINK TO BLUE: THE TET SPECTRUM FOR ME AND YOU

Shravan Sridhar, MD, MS (*Presenter*)
Jocelyn Yang, MD (*Abstract Co-Author*)
Kevin Oh, MD (*Abstract Co-Author*)
Muhammad Naeem, MD, MBBS (*Abstract Co-Author*)
Taylor Chung, MD (*Abstract Co-Author*)

TEACHING POINTS

Tetralogy of Fallot (TOF) is one of the most common congenital heart diseases and exists on a spectrum with double outlet right ventricle (DORV) and pulmonary atresia. Pre-operative imaging is instrumental in differentiating between these overlapping, sometimes similar-appearing disorders and guiding operative management. This exhibit is not an exhaustive review of TOF but specifically presents a framework for differentiating and characterizing similar-appearing disorders on the TOF spectrum based on 5 main features including severity of aortic override, right ventricle outflow obstruction, VSD, ventricular morphology, and MAPCAs. Learning objectives include: 1) Learn feature-based assessment of disorders on the “Tet spectrum” 2) Understand impact of morphologic defects on intra- and extra-cardiac shunting 3) Apply knowledge to sample cases.

TABLE OF CONTENTS/OUTLINE

1. Title, disclosure2. Abbreviations3. Overview4. Embryologic basis of tetralogy of Fallot a. Conotruncal septationb. Conal septumc. Anterior malalignment VSD5. Tet spectrum features a. Aortic overrideb. RVOT obstructionc. Ventricular morphologyd. MAPCAs6. Tet spectrum disorders a. Perimembranous VSD (incl. “pink tet”)b. Pulmonary stenosisc. Tetralogy of Fallotd. Non-TOF DORVe. DORV-TOFf. PA-IVSg. TOF-PAh. DORV-PA7. Summary: Frequency8. Summary: Detection9. Summary: Severity10. References

CAEE-3 BEYOND ATHEROSCLEROTIC CORONARY PLAQUES: A PICTORIAL ROADMAP OF THE‘E’MODIFIER IN CAD-RADS 2.0

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Pablo del Nido Recio, MD (*Abstract Co-Author*)
Laura Mate (*Abstract Co-Author*)
Laura Tello Arnas (*Abstract Co-Author*)
Guadalupe Buitrago, MD (*Abstract Co-Author*)
Gorka Bastarrika Aleman, MD (*Abstract Co-Author*)
Ana Ezponda, MD (*Abstract Co-Author*)

TEACHING POINTS

To provide a concise overview of the CAD-RADS 2.0 updates, with particular emphasis on the newly introduced modifiers. To illustrate a spectrum of various non-atherosclerotic coronary lesions that can be reported using the "E" (Exception) modifier, through clinical cases.

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Background Coronary CT angiography (CCTA) has become the main non-invasive imaging technique for evaluating the coronary arteries. CCTA enables comprehensive assessment of not only the vessel lumen but also the arterial wall and adjacent epicardial structures. The revised CAD-RADS 2.0 classification includes the "E" modifier, which is composed of non-atherosclerotic coronary artery abnormalities, some of which are increasingly recognized as contributors to clinical syndromes, such as INOCA (Ischemia with Non-Obstructive Coronary Arteries), resulting in myocardial infarction or even sudden cardiac death. Findings and procedural details A brief review of the CAD-RADS 2.0 update.Key considerations and practical tips for an accurate interpretation of CCTA studies and normal coronary artery anatomy.A pictorial exploration of non-atherosclerotic coronary artery diseases through examples, including:- Congenital and anatomical variants. - Coronary artery aneurysm. - Inflammatory pathologies: Kawasaki disease and fibromuscular dysplasia.- External compression from adjacent structures. - Coronary artery dissection. Conclusion CCTA is a powerful tool for the non-invasive evaluation of non-atherosclerotic coronary artery disease. The incorporation of the "E" modifier in CAD-RADS 2.0 enhances the clinical relevance of radiology reports by enabling the recognition of these diverse pathologies.

CAEE-4 CONGENITAL CARDIAC VALVE ANOMALIES: WHAT RADIOLOGIST SHOULD KNOW ABOUT PATHOLOGY AND IMAGING FINDINGS

Ameya J. Baxi, MBBS,DMRD (*Presenter*)
Eric Yang (*Abstract Co-Author*)
Pankaj Madan (*Abstract Co-Author*)
Carlos S. Restrepo, MD (*Abstract Co-Author*)

TEACHING POINTS

To recognize various Congenital cardiac valve anomalies. Discuss pathophysiology and multimodality imaging findings Detect common associations and syndromes Discuss pertinent management findings important for radiological diagnosis

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Congenital malformations of cardiac valve are often complex . They may occur in isolation or associated with other congenital heart defects. Accurate preoperative assessment is important for guiding treatment. Proper knowledge of embryology, both normal & abnormal anatomy is required for accurate diagnosis. Multiple factors can contribute to delayed or improper diagnosis including lack of familiarity with embryology, anatomy, pathology, and radiographic technique. Radiologists must be familiar with these points and must employ strategies like systematic segmental assessment, comparison with prior study, reading recent relevant literature about treatment & clinical notes. Radiologists thus play a critical role in diagnosis and management. This review gives concise summary of various congenital cardiac valve

anomalies Aims/Objectives Introduction Pathology, role of imaging, imaging findings in different congenital cardiac valve anomalies Mitral valve: Congenital stenosis, prolapse, atrioventricular septal defect, parachute mitral valve, aberrant cord: Aortic valve, Biscuspid-Quadricuspid valve, valvular and subvalvular stenosis: Tricuspid Valve: Ebstein anomaly, Regurgitation, AVSD; Pulmonary valve: Biscuspid valve, valvular and supravalvular stenosis, atresia, regurgitation Associated malformations and syndromes Post treatment normal and abnormal appearances Miscellaneous Differential diagnosis Conclusion

CAEE-6 HIGH RESOLUTION CARDIAC COMPUTED TOMOGRAPHY PRIOR TO VENTRICULAR TACHYCARDIA ABLATION: PROVIDING GUIDANCE FOR ELECTROPHYSIOLOGISTS

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Rishabh Khurana, MD,MBBS (*Abstract Co-Author*)
Ben Alencherry (*Abstract Co-Author*)
Michael A. Bolen, MD (*Abstract Co-Author*)
Pasquale Santangeli (*Abstract Co-Author*)

TEACHING POINTS

1) To demonstrate the utility of cardiac computed tomography (CCT) to provide anatomical & functional data and enable focused electro-anatomical mapping (EAM) for the identification of critical substrates prior to ventricular tachycardia (VT) ablation 2) To provide a structured reporting template for the pre-VT ablation CCT study.

TABLE OF CONTENTS/OUTLINE

Background : Patients with VT and clinical indication to radiofrequency catheter ablation (RFCA) are frequently referred for pre-procedural imaging. Cardiac magnetic resonance imaging (CMRI), although being the gold standard for biventricular volume, systolic function quantification & assessment for myocardial fibrosis, suffers from extensive ICD related artefacts. Moreover, a subset of these group of patients may be unstable, rendering MR environment unsafe. In such circumstances, widely available CCT can be considered as an alternative to provide relevant information prior to VT ablation. CT protocol: CCT (arterial & delayed) Relevant anatomy & reporting points: LV wall thickness map, thrombus, intra-myocardial fat, calcification, pericardium, delayed iodine enhancement, presence & distribution of epicardial fat thickness, coronary artery & vein evaluation, LV summit. Advantages of CT: high spatial resolution, widely available, no need of pre & post-scan electrophysiological evaluation, ICD related artefacts (mild consequence as compared to MRI). Limitations of CT: radiation dose, low contrast-noise ratio for scar characterization Future directions: Incorporating CCT into routine practice prior to RFCA has the potential to improve clinical outcomes, decrease RFCA procedural time, and pave the way for precise ablation therapies.

CAEE-7 TOTAL ANOMALOUS PULMONARY VENOUS RETURN (TAPVR) - THE VEIN LESS TRAVELLED

Niharika Praveen, MBBS (*Presenter*)
Mounika Pusa (*Abstract Co-Author*)
Yajurvendrasinh Chudasama (*Abstract Co-Author*)
Aditi Bhanushali (*Abstract Co-Author*)
Burak Kaplan, MD (*Abstract Co-Author*)
Christopher J. Francois, MD (*Abstract Co-Author*)
Philip A. Araoz, MD (*Abstract Co-Author*)

TEACHING POINTS

Total Anomalous Pulmonary Venous Return (TAPVR) is a congenital variation of cardiac anatomy where all four pulmonary veins drain directly into the systemic venous circulation via an anomalous connection instead of into the left atrium. This educational exhibit aims to explain the embryology, types, and the characteristic findings on imaging. Radiologists must be able to identify the diagnostic indicators and complications to evaluate and treat this condition.

TABLE OF CONTENTS/OUTLINE

1. Introduction - Classification of TAPVR as supra-cardiac, cardiac, infra-cardiac, mixed types 2. Embryology and clinical significance of TAPVR 3. Pre-operative imaging - CT and MRI features for diagnosis and planning 4. Post-operative imaging - expected findings and complications 5. Conclusion

CAEE-8 CONGENITAL ANOMALIES OF THE AORTIC VALVE - WHEN THREE'S A CROWD

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Burak Kaplan, MD (*Abstract Co-Author*)
Yajurvendrasinh Chudasama (*Abstract Co-Author*)
Mounika Pusa (*Abstract Co-Author*)
Philip A. Araoz, MD (*Abstract Co-Author*)

TEACHING POINTS

Congenital anomalies of the aortic valve include unicuspid, bicuspid, and quadricuspid morphologies, which can significantly impact normal blood flow and predispose to valvular dysfunction and aortopathy. This exhibit provides an overview of embryologic development, imaging-based classification, and clinical implications of each variant. Bicuspid aortic valve, the most common and clinically significant, is explored in depth with attention to associated conditions like ascending aortic aneurysm and coarctation. Imaging appearances across echocardiography, CT, and MRI are illustrated, alongside post-surgical findings.

TABLE OF CONTENTS/OUTLINE

1. Introduction - embryology and normal valve development 2. Structural Classifications, with an emphasis on Bicuspid Aortic Valve 3. Pre-operative imaging 4. Post-operative imaging - expected findings and complications 5. Conclusion

CAEE-9 CARDIAC MAGNETIC RESONANCE IN EOSINOPHILIC GRANULOMATOSIS WITH POLYANGIITIS (EGPA): IMAGING THE DEADLY THREAT

Pui Min Yap, MBBS (*Presenter*)
Chun Yin J. Lee, MBChB, FRCR (*Abstract Co-Author*)
Pan Pan Ng, MBChB (*Abstract Co-Author*)
Boris C. Chow, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Eosinophilic granulomatosis with polyangiitis (EGPA) is a rare systemic disease characterized by asthma, small vessel vasculitis and marked eosinophilia. Cardiac involvement occurs in up to 45% of patients and it is a leading cause of mortality, accounting for 50% of EGPA-related deaths. Cardiac magnetic resonance (CMR) has emerged as the gold standard in the evaluation of cardiac involvement in EGPA which has variable manifestations, including myocarditis and cardiomyopathy. Given that cardiomyopathy is included in the five-factor score which is used to predict the prognosis of patients with EGPA, early detection of cardiac involvement and intervention are critical to improving patient outcomes. While corticosteroids remain the cornerstone of EGPA treatment, immunosuppressive therapy is indicated in cases with cardiac involvement.

TABLE OF CONTENTS/OUTLINE

1. Introduction of eosinophilic granulomatosis with polyangiitis (EGPA) 2. Risk factors of cardiac involvement in EGPA 3. Diagnostic role of cardiac magnetic resonance (CMR) in evaluating the variable cardiac manifestations of EGPA including myocarditis and cardiomyopathy, illustrated with case examples featuring T1-based, T2-based imaging and late gadolinium enhancement patterns 4. Prognostic role of CMR in EGPA with case examples 5. Endomyocardial biopsy pathologic correlation

CAEE-10 A HEARTBREAKING DIAGNOSIS SARCOMA - SAME NAME, DIFFERENT NATURE: A CASE-BASED IMAGING REVIEW OF PRIMARY CARDIAC SARCOMAS

Emrah Duman, MD (*Presenter*)
Zehavit E. Kirshenboim, MD (*Abstract Co-Author*)
Brittany Cody (*Abstract Co-Author*)
Omer Onder, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognizing key imaging features of cardiac sarcomas across modalities Distinguishing sarcomas from benign-appearing or indolent masses Utilizing imaging characteristics such as lesion margins, enhancement patterns, infiltrative versus non-infiltrative behavior, location, and intra versus extracavitary location, alongside clinical context to improve diagnostic accuracy and suggest subtypes. Reviewing sarcoma mimics and overlapping entities Identifying common pitfalls and diagnostic traps Following disease progression and response through serial imaging

TABLE OF CONTENTS/OUTLINE

This exhibit opens with an overview of primary cardiac sarcomas, including their epidemiology, classification, and clinical implications. It then explores the role of advanced imaging modalities such as CT, MRI, and PET in identifying key tumor features such as location, margins, enhancement patterns, and invasiveness. Through a series of illustrative cases, both common and uncommon sarcoma subtypes are presented, with emphasis on diagnostic clues and potential mimickers. Particular attention is given to tumors that may initially appear benign, as well as to entities with overlapping imaging features. Where available, histopathologic correlation is included to enhance diagnostic accuracy. Longitudinal follow-up examples demonstrate tumor progression, treatment response, and key teaching points intended to support radiologists in day-to-day clinical practice.

CAEE-11 A NEW METHOD TO IMPROVE THE VISUALIZATION OF LATE IODINE ENHANCEMENT BY CT, EVEN AT HIGH HEART RATES

Takayoshi Yamaguchi (*Presenter*)
Yuichi Kondoh (*Abstract Co-Author*)
Yuji Miura (*Abstract Co-Author*)
Keiichi Hanaoka, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

1.Current status of acquisition and image reconstruction methods for myocardial late iodine enhancement (LIE) images using CT2.Explain the advantages and limitations of low kV imaging compared to images with standard kV3.Proposal of a new scanning method and image reconstruction method to improve contrast-to-noise ratio and reduce motion artifacts by utilizing the low radiation dose of low kV imaging4.Validation of a new scanning method and image reconstruction method using a phantom simulating myocardial LIE imaging5.Explains the effectiveness of the new method in clinical cases and how to use it appropriately, including the effect of reducing radiation dose

TABLE OF CONTENTS/OUTLINE

1. Introduction2. The significance of obtaining myocardial late LIE images using CT3. Current status of scanning and image reconstruction methods for myocardial LIE imaging4. Explaining the advantages and limitations of low kV imaging5. Proposal of a new scanning method and image reconstruction method that utilizes the advantages of low kV imaging to improve contrast-to-noise ratio and reduce motion artifacts6. Comparison of contrast to noise ratios between conventional one-heartbeat imaging and proposed two-heartbeat imaging using various image reconstruction methods using a phantom simulating myocardial LIE imaging7. Understanding the problems with new techniques in clinical cases and explaining appropriate usage methods8. Explain the effect of reducing radiation exposure by LIE imaging using low kV

CAEE-12 PHOTON-COUNTING CT IN CORONARY ARTERY DISEASE: ADVANCING EVALUATION WITH ULTRA-HIGH RESOLUTION IMAGING ON CCTA

Quoc-Anh Nguyen-Duong, MD (*Presenter*)

TEACHING POINTS

• Photon-counting CT enables submillimeter spatial resolution (as low as 0.2 mm) with reduced noise and enhanced contrast-to-noise ratio, outperforming conventional energy-integrating detectors. • CAD-RADS 2.0 integration with ultra-high-resolution CCTA improves stenosis characterization, particularly in complex cases involving high-risk patients and coronary stents. • PCD-CT facilitates both anatomical and functional imaging—including rest myocardial perfusion CT, CT-derived fractional flow reserve (CT-FFR), and plaque analysis — supporting comprehensive, non-invasive CAD evaluation. • Early experience shows feasibility in diverse clinical contexts such as acute and chronic chest pain, post-CABG imaging, triple-rule-out evaluation, and intrastent restenosis, with the potential to reduce unnecessary invasive angiography and optimize triage.

TABLE OF CONTENTS/OUTLINE

Background on CAD - Global burden of CAD and evolving imaging needs. Overview of PCD-CT technology and its application to CCTA - current guidelines (ESC, ACC/AHA, NICE), and CAD-RADS classification. Technical advantages smaller detector pixels, intrinsic spectral resolution, noise suppression, and radiation dose reduction. Clinical cases demonstrating diagnostic confidence in complex scenarios intrastent restenosis, myocardial perfusion CT, CT-FFR, Plaque analysis, Triple-Rule-Out and CAD-RADS reclassification, and post-intervention evaluation. Clinical impact enhanced decision-making and reduced reliance on invasive procedures.

CAEE-13 CLINICAL ADDED VALUE OF DELAYED MYOCARDIAL ENHANCEMENT ON CT IN ISCHEMIC HEART DISEASE

Seitaro Oda, MD, PhD (*Presenter*)
Masafumi Kidoh, MD, PhD (*Abstract Co-Author*)
Hiroko Takaoka (*Abstract Co-Author*)
Hidetaka Hayashi, MD (*Abstract Co-Author*)
Fumihiro Yoshimura, MD (*Abstract Co-Author*)
Yasunori Nagayama, MD (*Abstract Co-Author*)
Takeshi Nakaura, MD (*Abstract Co-Author*)
Toshinori Hirai, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. In cardiac CT, incorporation of an ECG-gated equilibrium-phase scan into standard coronary CT allows for the evaluation of late iodine enhancement (LIE) and quantification of extracellular volume (ECV). 2. Compared to cardiac MRI, cardiac CT is more widely available, has better accessibility, and is highly practical, allowing safe imaging even in patients with cardiac implantable devices or those undergoing dialysis. CT offers the advantage of simultaneously and efficiently assessing both coronary arteries and myocardial tissue characteristics. 3. In the management of ischemic heart disease, delayed enhancement CT can provide valuable information for assessing myocardial viability, myocardial infarction with non-obstructive coronary arteries (MINOCA, and coexisting cardiomyopathies.

TABLE OF CONTENTS/OUTLINE

1. Myocardial assessment with delayed enhancement CT - LIE imaging - ECV quantification - Key points of the imaging protocols 2. Application to coronary artery disease - Simultaneous diagnosis of coronary artery lesion and myocardial infarction - Assessment of myocardial viability 3. Application in patients with suspected MINOCA - Takotsubo syndrome - Acute myocarditis - Other etiologies 4. Application in patients with suspected concomitant cardiomyopathy - Cardiac amyloidosis - Hypertrophic or dilated cardiomyopathy - Other types 5. Other potential applications - Addition to pre-TAVI protocol - Addition to pre-catheter ablation protocol - Other indications 6. Future perspectives - Application to photon-counting CT - CT-based molecular imaging - Utilization of artificial intelligence

CAEE-14 DEVELOPMENT OF CARDIAC CT FOR VEIN OF MARSHALL IDENTIFICATION TO CHEMICAL ABLATION

Keisuke Abe (*Presenter*)

TEACHING POINTS

It is very important to identify the vein of Marshall (VOM) for chemical ablation. It is sometimes difficult to identify the VOM using conventional methods, and it would be very helpful if it could be identified on preoperative cardiac CT. In this study, we propose an imaging method to help identify the VOM.

TABLE OF CONTENTS/OUTLINE

1.Chemical ablation and its problems.2.About the VOM.3.CT imaging methods for visualizing the VOM.4.Providing images to support chemical ablation.5.Benefits of visualizing VOM in CT. Chemical ablation is an arrhythmia treatment that involves ethanol infusion into the VOM. The VOM is the embryonic remnant of the left superior vena cava, which descends along the posterior lateral side of the left atrium and flows into the coronary sinus, but is known to be non-existent a certain percentage of cases. Conventional techniques identify the VOM transcatheterly, but with difficulties in cases where the VOM is absent. Therefore, an attempt was made to identify the Marshall vein with CT, which had previously been taken, but identification was difficult, so a new imaging method was devised to add a coronary vein phase. This imaging method has successfully visualized the VOM and made it easier to determine indications and plan treatment. As a result, the conventional procedure can be omitted and replaced by CT, which reduces the radiation dose, the amount of contrast media, procedure time and material costs during chemical ablation.

CAEE-15 MULTIMODALITY IMAGING OF LEFT VENTRICULAR OUTFLOW TRACT OBSTRUCTION

Prabhakar Rajiah, MD, FRCR (*Presenter*)

TEACHING POINTS

1. Left ventricular outflow tract obstruction (LVOTO) is affected by a variety of congenital and acquired abnormalities 2. Multiple imaging modalities including echocardiography, CT and MRI are useful in the evaluation of LVOT 3. MRI provides comprehensive morphological and functional information on LVOT

TABLE OF CONTENTS/OUTLINE

1. LVOT- Morphology 2. Normal flow and hemodynamics 3. Imaging modalities a) Echocardiography- 2d, 3d, Provocative maneuvers b) MRI- Morphology, Function, flow quantification, 4d flow c) CT- High resolution anatomical information 4. Standard imaging planes for evaluation of LVOT 5. Review of various LVOT pathologies with illustrative cases a) Hypertrophic cardiomyopathy b) Abnormal papillary muscles c) Elongated anterior mitral leaflet d) Subaortic membrane e) Congenital- Shone complex,transposition of great arteries, Double outlet right ventricle, truncus arteriosus, f) Endocarditis & abscess g) Pseudoaneurysm h) Neoplastic- Fibroelastoma, myxoma metastasis, sarcoma i) Post-surgical- Mitral valve repair, Aortic surgery, Pulmonary artery banding j) Neo-LVOT obstruction following TMVR k) Membranous septal aneurysm l) Prolapsing dissection flap m) Prolapsing aortic valve n) Tissue tags 6. 3D printing 7. Surgical management a) Myomectomy b) Konno procedure

CAEE-16 MULTIMODALITY IMAGING IN THE EVALUATION OF TAVR COMPLICATIONS

Prabhakar Rajiah, MD, FRCR (*Presenter*)

TEACHING POINTS

1. To review the complications after transcatheter aortic valve replacement (TAVR)2. To understand the role of multimodality imaging in the evaluation of TAVR complications. 3. To optimize CT acquisition for evaluating TAVR complications 4. To illustrate the CT appearances of complications of TAVR

TABLE OF CONTENTS/OUTLINE

A. Introduction B. Multimodality imaging in assessment of TAVR - Echocardiography, CT, MRI, fluoroscopy C. Echocardiography - first line imaging test D. CT protocol for TAVR evaluation E. Review of the following complications with clinical and imaging features, focusing on CT with echocardiographic correlation i. Hypoattenuated leaflet thickening (HALT) -4-tier grading, =25 %, 26-50 %, 51-75 %, > 75 % ii. Reduced leaflet motion (RLM) - 3-tier grading- Normal, partially restricted, immobile - 4-tier grading-=25 % (minimal), 26-50 % (mild), 51-75 % (moderate), > 75 % (immobile) iii. Thrombus iv. Rupture of landing zone v. Pseudoaneurysm vi. Underexpansion vii. Paravalvular leak viii. Device migration- Proximal, distal ix. Obstruction of LV outflow tract x. Infective endocarditis xi. Structural valve failure xii. Aortic regurgitation xiii. Coronary obstruction xiv. Prosthesis-patient mismatch xv. Ventricular conduction abnormalities xvi. Others- Stroke, acute renal failure, access site bleeding, hematoma, pseudoaneurysm, dissection, occlusion

CAEE-17 UPDATE ON THE ROLE OF COMPUTED TOMOGRAPHY (CT) FOR THE EVALUATION OF PARAVALVULAR LEAKS (PVL)

Juan G. Velez, MD (*Presenter*)
Laura Jimenez-Juan, MD (*Abstract Co-Author*)
Matias F. Callejas, MD (*Abstract Co-Author*)
Djeven P. Deva, MBBCh (*Abstract Co-Author*)

TEACHING POINTS

- CT has an emerging role in the evaluation of suspected prosthetic heart valve (PHV) dysfunction and related abnormalities, including paravalvular leak (PVL). It is complementary to echocardiography, because of its higher spatial resolution. - Optimization strategies of the CT protocol to detect PVL are crucial to ensure successful image quality, including an initial non-enhanced acquisition, selection of high tube voltage, retrospective gating and adequate intravenous contrast protocol. - A standardized approach to the evaluation of PVL by CT includes identification of the PHV, selection of the appropriate cardiac phase for imaging post-processing, and the accurate detection and characterization of the potential PVL. - Effective communication of the precise PVL location and size can facilitate the decision making, device selection and/or surgical approach. - Radiologists should be familiarized with the techniques, devices and treatment strategies used for PVL.

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Current and previously used PHV, and their association with PVL III. Approach to PVL treatment: strategies and devices used IV. The role of CT on the diagnosis and treatment planning of PVL a. Strengths and weaknesses V. Optimization of CT Technique a. Premedication - patient preparation b. Contrast administration c. Suggested CT protocol VI. Tips for the evaluation and reporting of PVL a. Suggested structured approach VII. Example of reporting template VIII. Conclusions

CAEE-18 MRI IN NON-ISCHEMIC CARDIOMYOPATHY: ESSENTIALS FOR DIAGNOSIS

Dhilip Andrew, MD (*Presenter*)
Melisa Prieto Peralta, MD (*Abstract Co-Author*)
Kiran Batra, MD (*Abstract Co-Author*)
Arzu Canan, MD (*Abstract Co-Author*)

TEACHING POINTS

Learn about different types of non-ischemic cardiomyopathies and their cardiac MR imaging pattern Gain knowledge about role of MR strain imaging in non-ischemic cardiomyopathy Improve knowledge and understanding about key cardiac MR findings in patients with non-ischemic cardiomyopathy

TABLE OF CONTENTS/OUTLINE

Review different types of non-ischemic cardiomyopathy and their common underlying etiologies. Patterns of late gadolinium enhancement in non-ischemic cardiomyopathy Key MR findings characteristic for each type of non-ischemic cardiomyopathy Brief introduction and patterns of MR Strain imaging findings in non-ischemic cardiomyopathy. Case-based illustration of different types of non-ischemic cardiomyopathy associated with step-by-step approach to diagnosis Common patterns of MR findings Uncommon findings 6. Future directions of Cardiac MR imaging in non-ischemic cardiomyopathy.

CAEE-19 MYOCARDIAL BRIDGES ROAD TRIP: WHEN THE CORONARIES TAKE THE SCENIC ROUTE

Berali Del Espiritu Santo Padilla, MD (*Presenter*)
Enrique I. Ampudia Manjarrez SR, MD (*Abstract Co-Author*)
Ernesto J. Dena JR, PhD, MSc (*Abstract Co-Author*)
Patricia Rodriguez Nava, MD (*Abstract Co-Author*)

TEACHING POINTS

Myocardial bridges (MB) are a congenital coronary anomaly in which a segment of an epicardial artery takes an intramuscular course through the myocardium. This tunneled segment can vary in thickness from superficial (75%) to deep (25%), with incomplete bridges showing partial muscular coverage. They can manifest as angina, arrhythmias, or even myocardial infarction due to systolic compression of the tunneled segment. The pathophysiology of MB related ischemia involves multiple mechanisms, including persistent systolic compression, delayed diastolic relaxation, endothelial damage, and accelerated proximal atherosclerosis due to altered hemodynamics. High-risk features that increase clinical concern include bridges deeper than 5 mm, longer than 20 mm, or those causing more than 70% systolic luminal narrowing. CT angiography is the gold standard for noninvasive evaluation of MB. It visualizes the anatomical relationship between the coronary artery and overlying myocardium, and allows for a comprehensive assessment of associated atherosclerosis and other cardiac abnormalities. Key CT findings include: The "disappearing artery" sign (loss of the epicardial fat plane as the vessel dives into the myocardium), a characteristic U-shaped course of the affected artery, and dynamic systolic compression (visible with ECG-gated protocols).

TABLE OF CONTENTS/OUTLINE

1. Introduction.2. Anatomy and pathophysiology. a. Normal vs. bridged coronary anatomy. b. Mechanisms of ischemia.3. Clinical presentation.4. Imaging detection. a. CT as a gold standard. b. Key CT signs.

CAEE-20 FOLLOW THE LEAD - A CASE-BASED GUIDE TO CARDIAC DEVICES ON CHEST X-RAY

Alena Kollmann, MD (*Presenter*)
Jan P. Grunz, MD (*Abstract Co-Author*)
Henner Huflage, MD (*Abstract Co-Author*)

TEACHING POINTS

Cardiac implantable electronic devices such as pacemakers, implantable cardioverter-defibrillators (ICDs), cardiac resynchronization therapy (CRT) devices, and subcutaneous ICDs (S-ICDs), have characteristic appearances and lead configurations on chest radiographs. Radiologists should be able to identify correct positioning and detect misplaced leads and various device-related complications. Those are often first suspected or confirmed on chest X-ray. Therefore, this exhibit presents a systematic approach to evaluate cardiac devices in chest radiographs and provides a series of educational cases to apply and deepen the acquired knowledge.

TABLE OF CONTENTS/OUTLINE

1. Device overview: What types of cardiac devices exist and how can we distinguish them in chest X-ray?1.1. Pacemakers1.2. ICD / S-ICD1.3. CRT2. Lead anatomy and correct positions: RA, RV, LV (coronary sinus), and shocking coils.3. A guide: Suggested algorithm for structured assessment of cardiac devices.4. Case series: Examples of incorrect lead positioning and various complications.5. Key takeaways.

CAEE-21 LIFTING THE AORTOMITRAL CURTAIN

Prabhakar Rajiah, MD, FRCR (*Presenter*)

TEACHING POINTS

Aortomitral curtain also known as aortomitral fibrous body/continuity or intervalvular fibrosa is a fibrous tissue that connects the aortic and mitral valves. 1. To review the anatomy of aortomitral curtain (AMC). 2. To describe the various pathological entities that involve AMC 3. To illustrate the imaging appearances of lesions that involve AMC 4. To understand the significance of AMC pathologies

TABLE OF CONTENTS/OUTLINE

a. Morphology of the AMC b. Normal imaging appearance of AMC - Echo, CT, MRI c. Determination of ventricular morphology - AMC indicates morphological left ventricle --Illustrative examples of D-TGA and CC-TGA d. Thickening of AMC - Radiation heart disease e. Extensive calcification of aortomitral curtain --- Degenerative mitral or aortic disease---Higher post-surgical complications --- Calcium score > 300, need for pacemakers following TAVR- close to AV node --- Radiation heart disease- f. Caseous calcification - Mimics pseudoaneurysm in contrast CTA g. Calcification in aortomitral curtain - Challenges measurements in transcatheter mitral valve replacement CT h. Infective endocarditis and abscess --- Aortomitral curtain involvement requires radical debridement i. Dehiscence j. Aneurysm and pseudoaneurysm k. Thrombus l. Pannus m. Tumors n. Aortomitral curtain incisions to expand aortic root - Nicks procedure or Manouguian procedure o. Aortomitral reconstruction - Commando, Hemi-commando procedure.

CAEE-22 EVALUATING THE SITUS A PANDORA'S BOX

Mildreth Juliana Acuna Rojas, MEd (*Presenter*)
Manuel Alejandro Garrido, MD (*Abstract Co-Author*)

TEACHING POINTS

Learn criteria to think about how to diagnose situs anomalies, having in consideration risk factors. • Carry out an anatomical review of the atrial, bronquial and spleen. • Know the systematic analysis, A close look at each of the steps to elucidate and correctly present its findings. • To present the clinical case of a male patient in her sixth decade of life with deterioration of their functional class leading to suspicion of pulmonary thromboembolism; on the other hand, a female patient also in her third decade of life who is admitted for follow-up due to a history of Fontan surgery.

TABLE OF CONTENTS/OUTLINE

Introduction 2. Epidemiology 3. Embryologic development 4. Diagnosis 5. Systematic analysis 6. Clinical cases 7. Conclusions 8. References

CAEE-23 THINKING BEYOND THE STENOSIS: A CROSS-SECTIONAL IMAGING APPROACH TO TROPONIN-POSITIVE CHEST PAIN WITH NON-OBSTRUCTED CORONARY ARTERIES (TPNOCA)

Cevdet Donmez, MD (*Presenter*)
Monika Radike, MD, PhD (*Abstract Co-Author*)

Anjuna Reghunath, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

TpNOCA encompasses MINOCA, MINOCA mimics, and INOCA, requiring precise diagnosis to guide management. Accurate etiologic diagnosis is essential to avoid unnecessary therapies and initiate appropriate management, improve prognosis and prevent potential sudden deaths. Early cross-sectional imaging significantly enhances diagnostic yield and influences clinical decision-making, optimising patient outcomes. Cardiac MRI (CMRI) and CT Coronary Angiography (CTCA) have complementary roles in diagnosing TpNOCA, depending on the suspected differential diagnosis.

TABLE OF CONTENTS/OUTLINE

Definition and scope of TpNOCA, including MINOCA, MINOCA mimics, and INOCA and their common cross-sectional imaging findings. Prevalence, demographics, and clinical significance of TpNOCA. Diagnostic approach flowchart for chest pain with troponin elevation. CMRI protocol and role in TpNOCA diagnosis, including: Diagnosis and differentiation of MINOCA, myocarditis, Takotsubo cardiomyopathy and cardiomyopathies Optimal timing of CMRI (<2 weeks) and impact on clinical management Impact of CMR findings on clinical management Use of T1/T2 weighted imaging, perfusion imaging and late gadolinium enhancement. CTCA role in TpNOCA: Detection of coronary anomalies and spontaneous coronary artery dissection High risk plaque analysis and perivascular fat characterization Role of CT-FFT and PET/SPECT Cardiac CT.

CAEE-24 COMPLICATIONS OF THE CONGENITAL CARDIOVASCULAR SURGERY IN SINGLE VENTRICLE PHYSIOLOGY- WHAT RADIOLOGISTS SHOULD KNOW?

Kushala Madduru (*Presenter*)
Anmol Goyal, MBBS (*Abstract Co-Author*)
Erin Opfer (*Abstract Co-Author*)
Sanket S. Shah, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review single ventricle physiology and key imaging findings during each stage of the single ventricle palliation. 2. To understand and recognize complications that may arise from single ventricle palliation surgery to include elevated systemic venous pressure, collateralization, and hypoattenuating filling defects. 3. To highlight the role of advanced imaging in the interstage evaluation of single ventricle patients and postoperative complications.

TABLE OF CONTENTS/OUTLINE

Introduction - The importance of imaging following congenital cardiovascular surgery; The imager's role and perspective. Single Ventricle Physiology and Surgical Staging - Normal Postoperative Imaging Findings following different stages of single ventricle palliation surgery. Early Complications - Pleural effusions, infection, thrombosis. Late Complications - Pulmonary arteriovenous malformations, aortopulmonary collaterals, shunt obstruction, liver disease, lymphatic complications, plastic bronchitis, protein-losing enteropathy. Advanced Imaging Techniques - CT, MRI, and echocardiogram use in the detection of complications; Key findings imagers should recognize red flags that need immediate attention; Recent advances and their clinical applications. Conclusion - Summary of the imager's role in managing congenital cardiovascular surgery patients; Future directions in imaging for complications

CAEE-26 3D PRINTING FOR PARAVALVULAR LEAK INTERVENTIONS: INTEGRATING ADVANCED SEGMENTATION AND FABRICATION TECHNIQUES

James W. Goldfarb, PhD (*Presenter*)

TEACHING POINTS

1) Develop proficiency in identifying and characterizing paravalvular leaks on cardiac CT, including recognition of key imaging features and leak morphology around both aortic and mitral prosthetic valves. 2) Master the segmentation workflow using advanced software tools to accurately delineate leak channels and surrounding anatomical structures, which are crucial for 3D printing. 3) Apply various 3D printing techniques to fabricate patient-specific models for procedural simulation, device sizing, and surgical/interventional planning.

TABLE OF CONTENTS/OUTLINE

1) Clinical Background & Imaging Challenges: Understand the prevalence of paravalvular leaks, their hemodynamic consequences, and the role of CT imaging in leak detection. 2) CT Acquisition & Segmentation Strategy: Learn the postprocessing algorithms and segmentation strategies that facilitate accurate identification and characterization of leaks. 3) 3D Modeling & File Preparation: Gain insights into the process of STL export, mesh smoothing, segmentation refinement, and the different software platforms used for creating 3D models. 4) Printing Technologies & Materials: Explore the specifications of various 3D printers and the cost considerations involved in choosing the right materials for printing accurate and durable models.

CAEE-27 IMAGING SURGICALLY REPAIRED CONGENITAL HEART DISEASE. WHAT THE RADIOLOGIST NEEDS TO KNOW

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Heli D. Rueda, MD (*Abstract Co-Author*)
Felipe Castillo Aravena, MD (*Abstract Co-Author*)
Gabriela S. Galvao, MD (*Abstract Co-Author*)
Dimpi Sinha, MD,MBBS (*Abstract Co-Author*)
Daniel Vargas, MD (*Abstract Co-Author*)
Farah Cadour, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

Understand the normal postsurgical anatomy of corrected congenital heart disease Illustrate the most characteristic imaging features of specific types of congenital heart disease repair procedures across multimodality imaging To differentiate between expected postsurgical appearance and complications To provide pearls and pitfalls for assessing repaired CHD

TABLE OF CONTENTS/OUTLINE

1. Background 2. Surgical procedure, normal postoperative findings and complications a) Congenital pulmonary stenosis and TOF repair b) VSD and ASD repair c) Anomalous pulmonary venous connection repair d) AV canal spectrum and associated valvular anomalies repair e) Single ventricle palliation: Fontan procedure f) 1.5 Ventricle repairg) TGA and CC-TGA: Arterial and atrial switch procedures h) DORV repair h) Ebstein anomaly repair i) Truncus Arteriosus repair 3. Schematic approach for the assessment of corrected CHD: Pears and pitfalls 4. Summary

CAEE-28 GETTING IT RIGHT: WHAT THE RADIOLOGIST NEEDS TO KNOW ABOUT THE RIGHT VENTRICLE

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TEACHING POINTS

With the increased recognition of the crucial role of the right ventricle (RV) in determining functional status and prognosis in multiple cardiovascular conditions, it has become essential for the radiologist to demonstrate proficiency in anatomical, structural, functional characteristics, and pathologies involving the RV in order to avoid false-positive diagnoses and misdiagnoses.In this case-based review we summarize the current knowledge of anatomic-pathological imaging features of the RV with etiologies associated with RV pressure and volume overload, and RV cardiomyopathy.Imaging plays a fundamental role in identifying the intrinsic anatomic and functional differences between the normal RV and left ventricle (LV), and in evaluating the different RV pathological processes.

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How to identify major anatomical and pathological imaging features of the right ventricle in cardiac CT and MR imaging. Identify imaging features of the major anatomical points in the right ventricle and its importance in the anatomical segmentation of the right ventricle, including its fundamental role in the characterizing the morphological ventricle in congenital heart disease processes.Demonstrate the role of imaging in the decision-making process for the multiple etiologies RV.The RV has an essential role in determining symptomatic status and prognosis in nearly all cardiovascular disorders studied to date. A proper knowledge of the most common cardiac imaging features of RV diseases is necessary in order to promptly and accurately identify the RV involvement in various cardiac diseases.

CAEE-29 IMAGING INSIGHTS INTO LEFT ATRIAL APPENDAGE OCCLUSION DEVICES: DEVICE VARIANTS, PLANNING CONSIDERATIONS AND COMPLICATIONS

SIMRAN SINGH CHEEMA (*Presenter*)
Anmol Dhawan, MBBS, MD (*Abstract Co-Author*)
Donald G. Benson JR, MD, PhD (*Abstract Co-Author*)
Mostafa Abozeed, MD, PhD (*Abstract Co-Author*)
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Komal Verma Saluja, MBBS (*Abstract Co-Author*)
Satinder P. Singh, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Importance of imaging in pre-procedural imaging and post-implantation evaluation to confirm positioning of Left atrial appendage occluder devices (LAAOD) and detect complications2. Types of LAAOD devices in common practice.3. The indications and contraindications of LAAOD.4. Planning of LAAOD especially watchman and amulet device including the steps to determine size of LAA (left atrial appendage) ostium, device landing zone, and LAA length which determinants of sizing and seating an LAAOD device which enhance safety and long term efficacy. This includes step by step approach for correct measurement techniques.5. Imaging features of various complications associated with the device, including device migration/embolization, peridevice leak, partial or incomplete endothelialization, and device related thrombus in the left atrium with case examples.

TABLE OF CONTENTS/OUTLINE

Introduction and Background• Indications and Contraindications• Left Atrial Appendage Anatomy• Types of LAAOD Devices• Planning and Sizing of LAAOD (Watchman & Amulet)• Procedure Overview• Imaging Modalities: Echocardiography & CT• Immediate Postprocedural Complications.• Delayed Complications• Case Examples of various complications• Conclusions

CAEE-30 MULTIMODALITY IMAGING OF PERICARDIUM

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Sanjeev Bhalla, MD (*Abstract Co-Author*)
Kristopher W. Cummings, MD (*Abstract Co-Author*)
Jadranka Stojanovska, MD, MS (*Abstract Co-Author*)
Antonio Luna, MD, PhD (*Abstract Co-Author*)
Fernando R. Gutierrez, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To critically assess the strengths, limitations, and complementary roles of the different imaging modalities in the evaluation of pericardial diseases . 2. To evaluate the normal anatomy and physiology of the pericardium , and to recognize the key imaging feature s associated with the spectrum of pericardial diseases . 3. To explore the utility of advanced imaging techniques in distinguishing constrictive pericarditis from restrictive cardiomyopathy, emphasizing its diagnostic value and clinical implications.

TABLE OF CONTENTS/OUTLINE

1. The normal pericardium ; 2. Multimodality Imaging of pericardial diseases , 2.1. Echocardiography, 2.2. Cardiac computed tomography, 2.3. Cardiac magnetic resonance; 3. Pericarditis , 3.1. Etiology & clinical presentation, 3.2. Acute pericarditis, 3.3. Recurrent pericarditis, 3.4. Chronic pericarditis, 3.5. Healed/burned out pericarditis, 3.6. Myocardial involvement: Perimyocarditis vs. Myopericarditis, 3.7. Specific forms: Tuberculous pericarditis, Post-cardiac injury syndrome: Epistenocardic pericarditis, Dessler syndrome, Post-pericardiotomy syndrome, Post-traumatic pericarditis; 4. Enlarged pericardial cavity , 4.1. Pericardial effusion, 4.2. Pneumopericardium, 4.3. Hemopericardium; 5. Cardiac tamponade , 5.1. Pathophysiology & clinical presentation, 5.2. Role of multimodality imaging, 6. Constrictive pericarditis , 6.1. Key findings: Role of advanced imaging, 6.2. Transient constrictive pericarditis, 6.3. Effusive-constrictive pericarditis, 6.4. Focal constrictive pericarditis; 7. Pericardial masses : 7.1. Benign pericardial masses, 7.2. Pericardial metastasis, 7.3. Primary pericardial tumors; 8. Conclusions

CAEE-31 USEFULNESS OF A NEW TECHNIQUE TO REDUCE STAIR-STEP ARTIFACTS IN DUAL-SOURCE PHOTON-COUNTING DETECTOR CT

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Masaya Kisohara, MD, PhD (*Abstract Co-Author*)
Kazuya Ohashi, PhD, RT (*Abstract Co-Author*)
Misugi Urano, MD, PhD (*Abstract Co-Author*)
Akio Hiwatashi, MD, PhD (*Abstract Co-Author*)
Hiroshi Fukuma, BSc (*Abstract Co-Author*)

TEACHING POINTS

1. Coronary computed tomography angiography (CCTA) needs to solve the problem of motion artifacts caused by cardiac motion, and a CT scanner with high temporal resolution is the most effective solution. 2. Dual-source CT (DSCT) is a CT system equipped with two X-ray tubes and two detectors, and the fastest temporal resolution reaches 66 ms, the highest value of any CT system. This makes it possible to examine patients with high heart rates, which makes CCTA difficult. 3. The current DSCT systems don’t have detector width not covering the entire heart, image quality may be limited by stair-step artifacts (SSA), and the use of ECG editing with low-pitch helical scan to suppress SSA results in increased the radiation dose. 4. SSA-reduction algorithm (SSARA), a newly developed image correction technique, can produce images with continuity over the entire heart by non-rigidly aligning the displacement of positional information in each heartbeat, and may solve the problems of SSA without detector covering entire heart. 5. The detector coverage of DSCT with high-resolution mode becomes narrower in exchange for improved image quality.so suppressing SSA is an extremely important theme.

TABLE OF CONTENTS/OUTLINE

1. Technical requirements for CCTA 2. Advantages and disadvantages of DSCT in CCTA 3. Relationship between DSCT scan method and the radiation dose 4. SSARA and its clinical significance 5. Effectiveness of SSARA on clinical cases without breath-holding and with arrhythmia

CAEE-32 CARDIAC MRI IMAGING OF RESTRICTIVE CARDIOMYOPATHY

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Gabriela S. Galvao, MD (*Abstract Co-Author*)
Felipe Castillo Aravena, MD (*Abstract Co-Author*)
Heli D. Rueda, MD (*Abstract Co-Author*)
Daniel Vargas, MD (*Abstract Co-Author*)
Farah Cadour, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

1. RCM results from increased myocardial stiffness impairing ventricular filling. It is classified into non-infiltrative, infiltrative, storage, cancer-related, and endomyocardial types.2. Cardiac MRI provides comprehensive assessment and is the gold standard imaging modality. Typical findings include normal-sized ventricles with bi-atrial dilatation. LGE and parametric mapping facilitate differentiation of RCM subtypes Objectives: Review the definition of restrictive cardiomyopathy and the different groups of diseases that may cause it Describe the role of cardiac MRI in the diagnosis, management and follow-up RCM Review imaging findings, pearls and pitfalls for the differential diagnosis of RCM

TABLE OF CONTENTS/OUTLINE

1. Background 2. Classification and etiology of restrictive cardiomyopathy 3. Role of CMR in assessment of restrictive cardiomyopathy 4. Non-infiltrative diseases 5. Infiltrative disorders 6. Storage diseases 7. Endomyocardial type 8. Cancer related restrictive cardiomyopathy 9. Summary

CAEE-33 NUMBERS DON'T LIE: ENHANCING CONFIDENCE IN CARDIAC MR QUANTIFICATION OF VALVE REGURGITATION

Swati S. Mody, MD,MBBS (*Presenter*)
Aparna Joshi, MD (*Abstract Co-Author*)
Michael Dimaria (*Abstract Co-Author*)
Jimmy C. Lu, MD (*Abstract Co-Author*)
Adam L. Dorfman, MD (*Abstract Co-Author*)
Sowmya Balasubramanian, MD,MSc (*Abstract Co-Author*)
Prabhakar Rajiah, MD, FRCR (*Abstract Co-Author*)
Prachi P. Agarwal, MD (*Abstract Co-Author*)

TEACHING POINTS

• Understand fundamentals of phase contrast (PC) flow quantification in cardiac MR (CMR), recognize limitations and pitfalls • Learn strategies to assess internal consistency and reliability of flow data • Learn methods to calculate valvular regurgitation in different scenarios such as coexistent shunt, flow turbulence, prolapse • Detect previously unsuspected abnormalities such as shunts based on incongruous flow data

TABLE OF CONTENTS/OUTLINE

Basics principles of PC CMR Check internal consistency and reliability of data by using various flow data such as SVC, descending aorta, pulmonary arteries, atrioventricular valves 3. Pitfalls: Flow turbulence, vessel dilation, short vessel course, arrhythmia Utility of PC CMR to assess valvular regurgitation with illustrative cases a. Aortic and Pulmonic regurgitation i. Quantify regurgitant fraction by direct measurements and improve confidence by using internal data ii. Workaround for flow turbulence from stenosis: measure above or below the jet iii. Qualitative assessment: Holodiastolic flow reversal in the descending aorta supports severe aortic regurgitation b. Atrioventricular valve (AVV): Mitral and tricuspid regurgitation i. Various methods to calculate AVV regurgitation ii. Special scenarios: Mitral regurgitation in mitral valve prolapse, coexistent shunt iii. Direct assessment of AVV regurgitation with 4D flow and valve tracking c. Detecting unsuspected lesions such as shunts due to incongruous data Conclusion: PC imaging is an important part of CMR which, when carefully prescribed, measured, and validated, yields data that informs patient management in valvular regurgitation and may reveal unsuspected abnormalities.

CAEE-34 GADOLINIUM AND GLUCOSE: A PICTORIAL GUIDE TO MULTIMODALITY IMAGING OF CARDIAC SARCOID DISEASE

Harout Kolanjian, MD (*Presenter*)
Matthew Morgan (*Abstract Co-Author*)
Vaishnavi Gnanananthan, MBBS (*Abstract Co-Author*)
James S. Shambrook, BMBS, FRCR (*Abstract Co-Author*)
Charles Peebles (*Abstract Co-Author*)
Ausami Abbas, MBBS (*Abstract Co-Author*)

TEACHING POINTS

This presentation aims to educate the reader on: 1. The role of MRI and F-18 FDG PET/CT in the diagnosis and therapeutic monitoring of cardiac sarcoidosis 2. Typical patterns of myocardial enhancement which correspond with established scar 3. Patterns of F-18 FDG uptake that correlates with active inflammation 4. Extracardiac findings seen on cardiac imaging

TABLE OF CONTENTS/OUTLINE

The role of MRI: MRI provides valuable information on global and longitudinal myocardial function. Typical late Gadolinium enhancement (LGE) patterns for cardiac sarcoidosis involve the mid-myocardium or sub-epicardium, sparing the sub-endocardium, in a non-coronary distribution. In this pictorial review, we demonstrate the classic patterns including nodular, flame shaped, basal anteroseptal involvement and the RV hook sign. The role of PET/CT: F-18 FDG PET/CT complements MRI by detecting active myocardial inflammation and systemic involvement, particularly during the acute disease stages, and can guide diagnosis when MRI findings are inconclusive. It is crucial to understand the extent of active myocardial disease, which potentially is beyond the extent of scarring seen on MRI. Suppressed myocardial F-18 FDG uptake protocols will be discussed, which are vital to enhance PET/CT specificity for active sarcoid lesions. Extracardiac features: Detection of extracardiac sarcoidosis improves diagnostic confidence and provides more accessible biopsy sites (lymph nodes, lungs) for histological confirmation.

CAEE-35 CT IDENTIFICATION OF FIBROSING MEDIASTINITIS AND PULMONARY VEIN STENOSIS FOLLOWING ATRIAL FIBRILLATION ABLATION

Luis Ramirez, MD (*Presenter*)
Uriel A. Tarin, MD (*Abstract Co-Author*)

TEACHING POINTS

Fibrosing mediastinitis and pulmonary vein stenosis are rare but clinically significant complications after atrial fibrillation ablation. Symptoms can be subtle and nonspecific, often delaying diagnosis. ECG-gated CT angiography with multiplanar and volume-rendered reconstructions is essential for early detection. Knowledge of anatomical risk factors can help radiologists recognize early signs and guide timely management.

TABLE OF CONTENTS/OUTLINE

Introduction - Overview of atrial fibrillation ablation and its potential complications. Pathophysiology and Risk Factors - Mechanisms of post-ablation fibrosis; predictors such as PV enlargement and anatomical variants. Imaging Approach - Description of ECG-gated CT acquisition and reconstruction techniques. Key Imaging Features -

Soft-tissue encasement of mediastinal structures, PV narrowing or occlusion, venous congestion. Case Examples - Axial, multiplanar, and volume-rendered CT images illustrating typical findings. Differential Diagnosis - Distinguishing these findings from malignancy, lymphadenopathy, or thrombus. Clinical Relevance - Importance of early recognition to prevent irreversible complications such as pulmonary hypertension. Conclusion - Radiologists play a key role in detecting post-ablation complications and improving patient outcomes.

CAEE-37 CT MYOCARDIAL FIRST PASS PERFUSION - IS IT A PROBLEM SOLVING TOOL IN CADRADS 3 DISEASE? CORRELATIVE STUDY WITH CT AND CATHETER ANGIOGRAPHY

Anandamoyee Dhar (*Presenter*)
Bharat Aggarwal, MD (*Abstract Co-Author*)

TEACHING POINTS

1. CT coronary angiography is mainstay in assessment of coronary artery diseases noninvasively2. Disease burden in CADRADS 3 stenosis and need for invasive management is a dilemma- role of CT first pass perfusion3. Significance of stenosis detected in CT coronary angiography4. Correlation of 100 cases of CT first pass perfusion with CT coronary and catheter angiography findings. 5. False positive cases and technical causes

TABLE OF CONTENTS/OUTLINE

1. Technique of CT coronary and CT first pass perfusion2. Spectrum and findings in 100 cases of CT first pass perfusion and correlative CT coronary and catheter angiography .3. Correlation with stress perfusion and clinicla follow up 4. Challenges in CT perfusion studies and causes of error5. summary and way forward

CAEE-38 REVISITING HEMODYNAMICALLY SIGNIFICANT CORONARY ARTERY ANOMALIES: A PICTORIAL REVIEW

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Venkata Subbaih Arunachalam, MD (*Abstract Co-Author*)
jineesh valakkada, MD (*Abstract Co-Author*)
Anoop Ayyappan, MD (*Abstract Co-Author*)
Ajay Alex (*Abstract Co-Author*)

TEACHING POINTS

1. To discuss briefly the relevant anatomy and embryology of coronary arteries 2. To discuss the imaging features and associations of hemodynamically significant coronary artery anomalies, using illustrative cases 3. To discuss the association of hemodynamically significant coronary artery anomalies with congenital heart diseases, such as coronary artery fistulas with pulmonary atresia with an intact ventricular septum 4. To discuss imaging approach to dilated coronary arteries 4. To provide a reporting checklist and elaborate on the detailed imaging evaluation that is relevant to the management of these coronary artery anomalies

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Anatomy and Embryology of coronary arteries 3. Classification of coronary anomalies 4. Imaging Protocol 5. Anomalous origin of the coronary artery from the pulmonary artery: 5A. (ALCAPA)- Adult and Infantile types 5B. ARCAPA 5C. Rare varieties like ALADCAPA 6. Anomalous origin of coronary artery with interarterial course 6A. Imaging features and pathophysiology 6B. Imaging features affecting management 6C. Differentials: Trans-septal course 7. Coronary Artery Fistulas 7A. Embryological basis and pathophysiology 7 B. Classification 7C. Coronary Cameral Fistulas 7D. Coronary arterio-venous fistulas 7E. Imaging guide to the management of coronary artery fistulas 8. Imaging approach to dilated coronary arteries: differentiating ALCAPA, coronary artery aneurysms, Kawasaki disease, and coronary artery fistulas 9. Association of hemodynamically significant coronary artery anomalies with congenital heart disease 9. Reporting Checklist 10. Take home points

CAEE-39 TRIPLE RULE OUT PROTOCOL: HOW MANY STRIKES DOES IT TAKE TO ELIMINATE A CHEST PAIN?

JOAO COSTA (*Presenter*)
Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)
Lucas d. Gomes de Farias, MD, PhD (*Abstract Co-Author*)
Maisa B. Moroz, MD (*Abstract Co-Author*)
Roberto V. Torres, MD (*Abstract Co-Author*)
Patricia Terasaca (*Abstract Co-Author*)
Henrique Andreucci (*Abstract Co-Author*)
Mariana Costa, MD (*Abstract Co-Author*)
Marcio V. Sawamura, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The triple rule-out (TRO) protocol is a computed tomographic (CT) angiography technique designed to evaluate patients with acute chest pain for three critical conditions: acute coronary syndrome (ACS), acute aortic syndrome (AAS), and pulmonary embolism (PE). Chest pain is one of the main causes of emergency room visits, being responsible for delayed diagnosis, excessive exposure to radiation, unnecessary invasive procedures and even more radical outcomes. Improvement and diagnostic speed in this context have become indispensable items in any medical center. The development and upgrade of these protocol has tremendous potential to further the role of chest imaging. There are few studies addressing the topic in question, so encouraging research and analysis of this protocol can bring benefits to the theoretical and practical field of radiology.

TABLE OF CONTENTS/OUTLINE

Chest pain and its main differential diagnoses. Introduction and clinical applications of the Triple Rule Out (TRO) protocol. Methodology of the Triple Rule Out in our imaging diagnostic center. Qualitative comparison between different high end CT scans High number of patients analysed. Medicamentous and intravenous contrast doses. Sequence acquisition. Imaging interpretation. Our experience utilizing these methods. Limitations and challenges. Future directions.

CAEE-40 EBSTEIN ANOMALY

Shaimaa A. Fadl, MD (*Presenter*)
Jonathan Revels, DO (*Abstract Co-Author*)

TEACHING POINTS

To understand the role of cardiac MRI in the anatomical and functional assessment of Ebstein anomaly.To recognize the key CMR imaging features that distinguish Ebstein anomaly and its variants.To review the clinical implications of CMR findings in surgical planning, risk stratification, and follow-up.

TABLE OF CONTENTS/OUTLINE

I. BackgroundII. Role of Cardiac MRI in Ebstein’s AnomalyIII. Key Imaging FeaturesIV. Overview of Carpentier classificationV. Quantitative CMR Parameters and advances.VI. Role of CMR in preoperative planningVII. Management options (including cone repair)VIII. Imaging considerations in neonates, children, pregnancy, and in patients with associated congenital anomalies.

CAEE-41 CRACKING THE CODE OF CARDIAC CALCIFICATION: A MULTIMODALITY RADIOLOGIC ATLAS OF INTRACARDIAC AND PERICARDIAL MINERALIZATION

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Iclal Ocak, MD, MD (*Abstract Co-Author*)

Lydia Chelala, MD (*Abstract Co-Author*)
Luis A. Landeras, MD (*Abstract Co-Author*)

TEACHING POINTS

• Recognize the imaging spectrum of intracardiac and pericardial calcifications across radiography, CT, and MRI, and differentiate their locations for accurate diagnosis. • Understand clinical implications: intracardiac calcifications (e.g., valvular, myocardial, coronary) often indicate underlying disease; pericardial calcifications suggest prior pericarditis and possible constrictive physiology. • Highlight how advanced techniques—3D post-processing, dual-energy CT, and AI-driven quantification—enhance detection, characterization, and risk assessment.

TABLE OF CONTENTS/OUTLINE

• Background and pathology of cardiac calcifications. • Imaging approach by modality: radiography (initial clues), CT (detection, localization, quantification), MRI (functional assessment). • Detailed pictorial review: valvular, coronary, myocardial, and intracavitary calcifications. • Pericardial calcifications: classic imaging signs and functional impact. • Emerging techniques: DECT, cinematic rendering, AI quantification. • Clinical implications and management: imaging-guided decision-making for valve interventions and pericardiectomy. • Conclusion: A practical, image-rich atlas to improve diagnostic confidence, avoid pitfalls, and advance clinical care through multimodality integration.

CAEE-42 WHAT ABOUT THE HEART IN NON-GATED CT ANGIOGRAPHY? NO GATING, NO PROBLEM: THE BIG PICTURE FOR RADIOLOGY TRAINEES

Genier Fabian Castano Lizarazo, MD (*Presenter*)
Moises Jimenez (*Abstract Co-Author*)
Samuel Castillo, MD (*Abstract Co-Author*)
Luis Ramirez, MD (*Abstract Co-Author*)
Guadalupe Castro Nolasco, MD (*Abstract Co-Author*)
Maria Carolina Penaranda Lewis, MD (*Abstract Co-Author*)
Mariana Madrid, MD (*Abstract Co-Author*)

TEACHING POINTS

To correlate cardiac findings in non-gated chest CT angiography with electrocardiographically synchronized studies for accurate clinical interpretation. To outline a systematic approach for evaluating cardiac anatomy and pathology in non-gated chest CT studies. To highlight key cardiac and pericardial pathologies detectable in non-gated CT and their clinical implications. To emphasize pitfalls, mimics, and complementary imaging techniques for ambiguous findings. To demonstrate real-world cases of incidental cardiac diagnoses in non-gated chest CT and their impact on patient management.

TABLE OF CONTENTS/OUTLINE

1. Introduction to Cardiac Evaluation in Non-Gated Chest CT. 2. Systematic Cardiac Assessment in Non-Gated Chest CT: A Step-by-Step Guide. 3. Key Cardiac Pathologies Detectable in Non-Gated CT: Pearls and Pitfalls. 4. Presentation of Five Compelling Cases of Cardiac Pathology Identified on Non-Gated CT Diagnosed at National Institute of Cardiology with ECG-Gated CTA Follow-up. 5. Bridging the Gap: When to Escalate to ECG-Gated CT or MRI. 6. Conclusions.

CAEE-43 THE VALUE OF "DOUBLE DETECTION" METHOD IN CORONARY COMPUTED TOMOGRAPHY ANGIOGRAPHY (CCTA) SCANNING

Ruixue Cao (*Presenter*)

TEACHING POINTS

Using a new method to optimize coronary CTA scanning

TABLE OF CONTENTS/OUTLINE

1) The clinical value of CCTA Coronary computed tomography angiography (CCTA) is the main non-invasive method for detecting coronary artery lesions, playing an important role in clinical practice due to its high diagnostic accuracy, good negative predictive value and wide clinical applicability 2) The deficiencies in conventional scanning Contrast agent dosage and flow rate are the key factors for a high-quality CCTA examination. Due to individual differences between patients, we often do not control the dosage accurately. And for patients with large body weight or poor cardiac function, there may be contrast agent residues in the right atrium due to excessive dosage of contrast agent, which affects the display of coronary artery. 3) How to achieve 'double detection' The level where the pulmonary artery and aorta appeared simultaneously was selected as the real-time monitoring. The two ROIs were placed at the descending aorta (ROI1) and the pulmonary artery (ROI2) respectively. The CT values of the two ROIs were monitored in real time after injection of contrast agent. When its intersected, the scan was manually triggered. 4) Advantages of 'double detection' a. Coronary artery showed clearly b. No artifact caused by contrast agent residue in the right atrium. C. High image quality

CAEE-44 STEP-BY-STEP CARDIAC AND PERICARDIAL EVALUATION ON NON-GATED CHEST CT

Francisco Calle Bernal, MD (*Presenter*)
Paula N. Patino, MD (*Abstract Co-Author*)

TEACHING POINTS

Provide general radiologists with a structured approach to evaluate cardiopericardial findings on non-gated chest CT. Introduce a five-step approach for assessing key anatomical segments: chambers, valves, septa, coronaries, and pericardium. Review normal anatomy and imaging features of each segment to establish diagnostic baselines. Identify common cardiopericardial pathologies using real examples from non-gated CT scans. Highlight imaging pitfalls and how to recognize them in routine chest imaging. Offer guidance on when and why to recommend further evaluation with dedicated cardiac imaging modalities (e.g., ECG-gated CT, MRI, or echocardiography).

TABLE OF CONTENTS/OUTLINE

Step 1: Atria and Ventricles Anatomy of right and left atria and ventricles Cardiac chamber size assessment Common cardiac masses (thrombus, tumors, etc.) Step 2: Valves Tricuspid valve anatomy and abnormalities Mitral valve anatomy and mitral annular calcification (MAC) Aortic and pulmonic valve anatomy and aortic valve calcification (AVC) Step 3: Interatrial Septum and Myocardial Wall Interatrial and interventricular septum anatomy Common findings (PFO, lipomatous hypertrophy) Myocardial infarction imaging Step 4: Coronaries Coronary artery anatomy and calcification scoring Coronary anomalies and fistulas Coronary venous system and its clinical relevance Step 5: Pericardium Normal anatomy and sinuses/recesses Congenital absence Pericardial effusion, pericarditis, tamponade Pericardial constriction and calcification

CAEE-45 PERICARDIUM - NOT JUST A FLIMSY LAYER

Aprateem Mukherjee, MD, FRCR (*Presenter*)

TEACHING POINTS

After going through the exhibit, the reader will be able to: • Describe the CT and MR appearances of normal pericardial anatomy and pericardial recesses. • Apply cross sectional techniques to the diagnosis of different pericardial anomalous including congenital pericardial anomalies, pericardial effusions, constrictive pericarditis, and neoplasms • Understand contribution of pericardial anatomy and physiology in ventricular interdependence and its importance in constrictive pericarditis and the role of cardiac MRI in understanding pericardial physiology. • Identify selected mimics of pericardial neoplasms.

TABLE OF CONTENTS/OUTLINE

• Introduction • Normal pericardial anatomy and pericardial recesses and reflections • Pericardium appearance in different imaging modalities - Conventional, CT, MRI • Comparison of imaging techniques - CT and MRI with respect to their advantages/disadvantages • Standardised protocol for imaging of pericardium with MRI • Congenital pericardial conditions - pericardial defects/cysts • Pericardial collections - effusions, tamponade • Pericarditis - Constrictive, effusioconstrictive, calcific pericarditis and role of MR imaging • Differentiating restrictive cardiomyopathy from constrictive pericarditis • Pericardial neoplasm - benign, malignant • Mimickers of pericardial masses Take home points

CAEE-46 CARDIAC MAGNETIC RESONANCE IN THE ERA OF PARAMETRIC MAPPING: TRANSFORMING MYOCARDIAL INFARCTION DIAGNOSIS

Karen De Icaza Benet (*Presenter*)
Omar A. Gamboa Abundis, MD (*Abstract Co-Author*)
Pablo Andres Hernandez Soto (*Abstract Co-Author*)
Rafael Sanez (*Abstract Co-Author*)
Miguel A. Cruz, MD (*Abstract Co-Author*)
Aloha Meave, MD (*Abstract Co-Author*)
Gabriela Melendez, MD (*Abstract Co-Author*)
Daniel Campuzano (*Abstract Co-Author*)

TEACHING POINTS

- Cardiac MRI Mapping in Myocardial InfarctionMapping techniques (T1, T2, T2*) allow distinction between acute and chronic myocardial infarction.Acute infarction shows elevated native T1 and T2 values due to edema and inflammation, while chronic infarction presents normalized T2 but increased ECV from fibrosis.They enhance detection of intramyocardial hemorrhage and microvascular obstruction, both markers of worse prognosis.T2* mapping is sensitive to hemorrhage, and mapping sequences can better delineate MVO than conventional imaging.Mapping aids in assessing post-infarction complications and myocardial remodeling.It provides contrast-free evaluation of tissue viability, risk of arrhythmia, and structural changes, even in patients with contraindications to gadolinium.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Relevance of myocardial infarction as a leading cause of morbidity and mortality.Advances in imaging diagnostics: the growing role of cardiac magnetic resonance (CMR). 2. Myocardial Infarction: General Concepts: Pathophysiology: ischemia, necrosis, and myocardial remodeling.Clinical manifestations and conventional diagnosis. 3. Cardiac Magnetic Resonance: Fundamentals: Advantages over other imaging modalities. 4. Myocardial Parametric Mapping: What T1, T2, and extracellular volume (ECV) mapping are.Information they provide about myocardial tissue. 5. Applications of CMR Mapping in Myocardial Infarction: Tissue characterization: detection of edema, fibrosis, and viability.Prognostic value and support in clinical decision-making.Complications. 6. Limitations and Challenges 7. Future Perspectives 8. Conclusions

CAEE-47 ECG-LESS CARDIAC CT: A FEASIBLE ALTERNATIVE FOR CARDIAC AND CORONARY IMAGING - WHAT IT IS AND HOW TO IMPLEMENT IT

Luis A. Landeras, MD (*Presenter*)
Lydia Chelala, MD (*Abstract Co-Author*)
Iclal Ocak, MD, MD (*Abstract Co-Author*)
Furkan Ufuk, MD (*Abstract Co-Author*)

TEACHING POINTS

• Introduce ECG-less cardiac CT as a viable alternative for imaging the heart and coronary arteries.• Highlight key technological enablers—such as wide detector coverage, fast gantry rotation, motion correction, and deep learning image reconstruction (DLIR)—that enable high-quality, single-heartbeat coronary CT imaging without ECG leads.• Demonstrate how this protocol reduces examination time while maintaining comparable radiation dose, contrast use, and image quality to conventional CCTA.• Address challenges such as motion artifacts in patients with high or irregular heart rates and emphasize the need for optimal protocol selection and software-assisted phase reconstruction.

TABLE OF CONTENTS/OUTLINE

1. Introduction: The rationale for eliminating ECG dependency in cardiac CT2. Technological Foundation and Protocol Design: Patient preparation, basic principles of ECG-less cardiovascular imaging, and AI-based phase selection (SmartPhase), motion correction (SnapShot Freeze), and image reconstruction (DLIR)3. Efficiency & Diagnostic Performance: Reduced scan times, equivalent SNR/CNR, radiation, and contrast usage4. Limitations & Pitfalls5. Case Illustrations6. Summary & Future Directions

CAEE-48 DEATH IN THE BLOOD: IMAGING OF CARDIOVASCULAR INFECTIONS

Stacy J. Kim, MD (*Presenter*)
Caroline Robb, MD (*Abstract Co-Author*)
Cody Thornburgh, MD (*Abstract Co-Author*)
Adam Naylor, MD (*Abstract Co-Author*)
Sanjeev Bhalla, MD (*Abstract Co-Author*)

TEACHING POINTS

Cardiovascular infections have a high morbidity and mortality. They can result in the spread of infection by blood to other parts of the body and result in serious complications such as aneurysms/pseudoaneurysms, surgical site dehiscence, septic emboli, multi-organ infarction, and heart failure. Cardiovascular infections can occur in the setting of native tissues or in the setting of surgery, endovascular procedures, or device placement. Unfortunately, cardiovascular infections are often challenging to assess by imaging - chest radiography has limited utility and computed tomography (CT) and magnetic resonance imaging (MRI) can be limited in the absence of intravenous contrast or cardiac gating. Despite the limitations of imaging, radiologists may be the first to suggest infection. The purpose of this educational exhibit is to review the imaging manifestations and mimics of cardiovascular infections.

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I. Heart A) Endocarditis (native) B) Myocarditis C) Pericarditis II. Aorta A) Infectious aortitis B) Infectious pseudoaneurysm III. Pulmonary arteries A) Infectious pseudoaneurysm B) Infected patent ductus arteriosum IV. Veins V. After surgery/endovascular procedures A) Valve replacement B) Aortic repair VI. After device placement A) Left ventricular assist device B) Left atrial appendage occlusion device C) Septal occluder device D) Pacemaker-defibrillator VII. Mimics A) Non-infectious endocarditis, myocarditis, pericarditis B) Aortic penetrating atherosclerotic ulcer, traumatic pseudoaneurysm, aneurysm rupture C) Iatrogenic pulmonary artery pseudoaneurysm D) Bland venous thrombus E) Tumors F) Expected post-surgical/procedural changes

CAEE-49 MULTIMODAL PERSPECTIVES IN NEONATOLOGY: AN INTEGRATED APPROACH TO DIAGNOSIS

Claudia Mendoza, MD (*Presenter*)

TEACHING POINTS

Congenital heart disease affects 1-2% of neonates, with many cases requiring urgent imaging evaluation for life-saving interventions. Advanced multimodal imaging approaches, including echocardiography, cardiac CT, and MRI, play pivotal roles in diagnosing and managing critical neonatal conditions such as duct-dependent lesions, vascular rings (double aortic arch), coronary artery fistulas, and aortopulmonary windows. Echocardiography provides non-invasive hemodynamic assessment, while CT angiography offers rapid, detailed anatomical definition of complex cardiovascular structures. Cardiac MRI excels in tissue characterization and functional evaluation

without radiation exposure. These complementary imaging modalities enable precise preoperative planning, particularly for surgical correction of vascular rings and coronary fistulas, while tailored protocols minimize risks in this vulnerable population. Early recognition of characteristic findings - such as the complete vascular ring in double aortic arch or the aneurysmal dilation at fistula drainage sites - guides timely intervention to prevent complications like myocardial ischemia or pulmonary hypertension. Multidisciplinary collaboration between radiologists, cardiologists, and surgeons ensures optimal translation of imaging findings into clinical decisions, significantly improving outcomes for neonates with congenital heart disease.

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IntroductionImaging Modalities in Neonatal CHDPrincipal Congenital Cardiac Pathologies in NeonatesKey Imaging Findings by PathologyConclusions

CAEE-50 REPAIRED TETRALOGY OF FALLOT SPECTRUM: IMAGING PERSPECTIVES IN FOLLOW-UP

Harold Goerne, MD (*Presenter*)
Prabhakar Rajiah, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

1. To review the spectrum of Tetralogy of Fallot (TOF)2. To discuss the surgical options for Tetralogy of Fallot3. To illustrate normal and abnormal imaging appearances after surgery4. To review the critical functional parameters in follow-up

TABLE OF CONTENTS/OUTLINE

• Introduction• Spectrum of TOF- Classical, absent/rudimentary pulmonary valve, pulmonary valve atresia• Clinical features• Associated anomalies- pulmonary atresia, absent pulmonary valve, common CAV canal, DORV, coronary anomalies• Role of Imaging- Echo, MRI, CT, catheterization• CT and MRI protocols- Pre- and post-surgery• Pre-surgical evaluation of TOF- Morphological evaluation- Major aortopulmonary collaterals (MAPCAs)- Coronary artery anatomy and anomalies- Right arch- ASD- Left SVC- Common AV canal• Surgeries for TGA- BT shunt, definitive repair, unifocalization, RV-PA conduit• Post-surgical evaluation- Normal appearances . MRI RVEF, volumes, pulmonic regurgitation parameters.• Post-surgical complications - Pulmonary regurgitation, RVOT aneurysm, Pulmonary stenosis, RV dilation, RV dysfunction, RV fibrosis• Indications for Pulmonary valve replacement- Surgical/Transcathet

CAEE-51 NOTHING BREAKS LIKE A HEART: REVISITING ACUTE CARDIAC-ORIGIN CHEST PAIN

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Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)
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Cesar H. Nomura, MD, PhD (*Abstract Co-Author*)
Ricardo D. Sartim, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Acute chest pain is one of the most frequent complaints in emergency departments and represents a diagnostic challenge due to its wide range of potential etiologies. 2. Early and accurate identification of cardiac-origin elated causes is crucial, as they frequently involve life-threatening conditions. This underscores the radiologist's vital role in timely diagnosis and in guiding clinical decision-making, which directly impacts patient outcomes. 3. Multimodal imaging plays a pivotal role in the evaluation and management of these patients. 4. The purpose of this exhibit is: (a) To review usual and unusual cases related to causes of acute cardiac-origin chest pain. (b) To correlate important findings with the anatomy, embryology, and pathophysiology, focusing on their clinical-radiological correlations. (c) To highlight their characteristics in order to familiarize radiologists, preventing unfavorable patient outcome. (d) To review CT and MRI protocols in the evaluation of patients with suspected acute cardiac-origin chest pain.

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1. Applied diagnostic techniques in the evaluation of heart. 2. Milestones in the evolution of acute cardiac-origin chest pain over the years. 3. Techniques: CT angiography, conventional angiography, intravascular ultrasound, and optical coherence tomography - pros e cons. 4. CT and MRI angiography protocols 5. Acute cardiac-origin chest pain - possible factors: (a) Valves (b) Myocardium (c) Pericardium (d) Epipericardial fat (e) Coronary arteries 7. Miscellaneous and other findings 8. Sample cases of pearls, pitfalls, diagnostic difficulties, and mimics. 9. Future directions: artificial intelligence 10. Summary and take-home messages.

CAEE-53 IMAGING THE BREAKING POINT: RADIOLOGIC SIGNS OF MYOCARDIAL RUPTURE

Anisha Gechuki Onchonga, MD (*Presenter*)
Sukumaran R. Binukrishnan, FRCR, MRCP (*Abstract Co-Author*)
Monika Radike, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Define myocardial rupture and understand the common causes.Highlight the clinical presentation of myocardial rupture. Identify the spectrum of imaging findings of myocardial rupture.

TABLE OF CONTENTS/OUTLINE

1. Definition and risk factors2. Case-based imaging features in different clinical settings.Myocardial rupture is the disruption of cardiac tissue leading to a defect in the left ventricular (LV) free wall, or septum, papillary muscle rupture, or pseudo-aneurysm formation.Main causes include acute myocardial infarction, trauma, infection, and iatrogenic injury.Risk factors for myocardial rupture in the setting of AMI include delays in presentation, hypertension, diabetes, and smoking. Rupture most commonly involves the inferolateral wall, usually at the junction of normal and infarcted myocardium. Post-infectious myocardial rupture occurs following infective endocarditis, formation of a paravalvular abscess and fistulation into cardiac chambers. Sepsis can also culminate in infarction. Iatrogenic myocardial rupture occurs following minimally invasive or open cardiovascular procedures.Symptoms of myocardial rupture varies widely. Timely diagnosis requires a high index of clinical suspicion supported by imaging findings.Gated and non-gated cardiac computer tomography are the imaging workhorse. MRI is excellent for tissue characterisation and quantifying ventricular function. Echocardiogram is adjunctive, mostly used for point-of-care imaging or follow-up. Features of myocardial rupture on CT include LV wall defect, perfusion defects and pseudo-aneurysms. Features of contained rupture include adjacent epicardial fat stranding, and adherent pericardium.

CAEE-54 MODERN HEART TRANSPLANT REJECTION SCREENING AND SURVEILLANCE: INTEGRATED ROLE OF CARDIAC IMAGING

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Felipe Castillo Aravena, MD (*Abstract Co-Author*)
Yas Moayedi (*Abstract Co-Author*)
Juan Dueroposada (*Abstract Co-Author*)

TEACHING POINTS

• Historically surveillance for allograft rejection relied on endomyocardial biopsy which is invasive and subject to sampling limitations • Contemporary allograft rejection surveillance protocols integrate cardiac MRI with molecular diagnostics such as donor-specific antibody testing, gene expression profiling (GEP), and donor-derived cell-free DNA (dd-cfDNA) to enhance early rejection detection and improve patient outcomes • Understanding the imaging features of different rejection types, including acute cellular rejection (ACR), antibody-mediated rejection (AMR), and cardiac allograft vasculopathy (CAV), is essential

TABLE OF CONTENTS/OUTLINE

1. Introduction Epidemiology and survival trends in heart transplantation Importance of rejection surveillance due to non-specific symptoms 2. Types of Rejection Overview of ACR, AMR, and CAV Pathophysiology and clinical implications 3. Traditional vs. Emerging Surveillance Strategies Limitations of endomyocardial biopsy Advances in non-invasive testing and their role in modern protocols 4. Cardiac MRI in Transplant Rejection Imaging protocols and sequences Characteristic findings for each type of rejection Role in differentiating rejection from other pathologies 5. Case-Based Review Illustrative cases demonstrating MRI findings and correlation with clinical, non-invasive molecular tests, and biopsy data 6. Integration into Clinical Practice Contemporary algorithms for rejection surveillance Multimodal approach incorporating imaging and molecular diagnostics 7. Conclusion and Future Directions Cardiac MRI as a cornerstone of non-invasive transplant rejection monitoring

CAEE-55 FROM FLOW TO FUNCTION: THE ROLE OF 4D FLOW MRI IN CONGENITAL HEART DISEASE IMAGING

Anh Luu (*Presenter*)
Erin Opfer (*Abstract Co-Author*)

TEACHING POINTS

4D Flow MRI is an advanced imaging technique that allows comprehensive, dynamic visualization of blood flow in three dimensions. It is particularly useful in evaluating complex congenital heart disease (CHD), where traditional imaging may not adequately capture abnormal hemodynamics. This exhibit highlights how 4D Flow MRI contributes to improved understanding of conditions such as Fontan circulation, Tetralogy of Fallot (TOF), Transposition of the Great Arteries (TGA), and valvular disorders. Learners will explore the principles of 4D Flow MRI, its clinical applications in CHD, and the added value it brings in assessing flow direction, volume, and wall shear stress. The exhibit also discusses recent advances in acquisition and analysis techniques tailored for pediatric patients, including faster imaging protocols and improved post-processing. Emphasis will be placed on its emerging role in risk stratification, surgical planning, and long-term follow-up in CHD patients, as well as future opportunities for integrating this technology more broadly in clinical care.

TABLE OF CONTENTS/OUTLINE

Introduction to 4D Flow MRI in Congenital Heart Disease (CHD) Clinical Applications in CHD Recent Technological Advances and Pediatric Adaptations Challenges in Pediatric Implementation and Interpretation Future Directions and Ongoing Research

CAEE-56 NON INVASIVE DETECTION OF MYOCARDIAL INFLAMMATION: THE ROLE OF MULTIPARAMETRIC CARDIAC MRI IN THE EVALUATION OF MYOCARDITIS

Diego Leonardo Meza Neri (*Presenter*)
Claudia Isabel Hernandez, MD (*Abstract Co-Author*)
Doris Licely Canche Aguilar, MD (*Abstract Co-Author*)
Elsa Rojas Hernandez, MD (*Abstract Co-Author*)
Sandra Rosales, MD (*Abstract Co-Author*)

TEACHING POINTS

Importance of early detection of myocarditis : Discuss why identifying myocardial inflammation early is crucial for patient management and outcomes. Role of multiparametric cardiac MRI : Explain how advanced MRI techniques (T1, T2 mapping, late gadolinium enhancement, etc.) contribute to the accurate assessment of myocarditis. Diagnostic accuracy of MRI : Highlight the sensitivity and specificity of MRI in comparison to other diagnostic methods like endomyocardial biopsy or echocardiography. Implicaciones clínicas de los hallazgos de la resonancia magnética : detalle cómo los hallazgos de la resonancia magnética ayudan a orientar las decisiones de tratamiento y el pronóstico en pacientes con sospecha de miocarditis. Challenges and limitations : Address the challenges of MRI interpretation and the potential pitfalls in diagnosing myocarditis.

TABLE OF CONTENTS/OUTLINE

Introduction Definition and clinical significance of myocarditis Overview of traditional diagnostic methods Pathophysiology of Myocarditis Inflammatory processes in myocarditis Causes and risk factors Role of Cardiac MRI in Myocarditis Overview of cardiac MRI technology Key MRI techniques used in the assessment of myocarditis (e.g., T1 and T2 mapping, late gadolinium enhancement) Multiparametric Approach to Myocardial Inflammation How multiparametric MRI enhances diagnostic accuracy Case examples demonstrating different MRI findings in myocarditis Clinical Applications and Case Studies Real-world examples of MRI in the diagnosis and management of myocarditis Correlation of MRI findings with clinical outcomes. Conclusion Summary of key findings Future directions in the use of cardiac MRI for myocarditis detection

CAEE-57 LV HYPERTROPHY DECODED: SOLVING THE PUZZLE WITH PARAMETRIC MAPPING AND ECV

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Sean Murphy, MBBCh (*Abstract Co-Author*)
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TEACHING POINTS

Left ventricular (LV) hypertrophy can arise from diverse etiologies, including hypertensive heart disease, aortic stenosis, hypertrophic cardiomyopathy, and infiltrative disorders such as amyloidosis. Conventional imaging techniques often fall short in differentiating these conditions. Cardiac MRI with T1 mapping and extracellular volume (ECV) quantification offers a powerful non-invasive tool to assess myocardial composition and detect diffuse fibrosis or infiltration. To understand role of T1 mapping and ECV in quantification myocardial tissue composition To discuss diagnosis of different pathologies of LV hypertrophy with help of T1 mapping and ECV To learn role of the quantitative metrics in early diagnosis and monitoring disease progression or therapeutic response

TABLE OF CONTENTS/OUTLINE

1. Introduction o Clinical significance of LV hypertrophy o Limitations of conventional imaging 2. Pathophysiology of LV Hypertrophy o Common etiologies o Role of myocardial fibrosis and infiltration 3. Cardiac MRI Techniques o Overview of native T1 mapping o ECV quantification principles and protocols 4. T1/ECV in Different Pathologies o Hypertensive heart disease o Hypertrophic cardiomyopathy o Aortic stenosis o Cardiac amyloidosis o Fabry disease 5. Case-Based Review o Comparative imaging and diagnostic insights o Diagnostic algorithms o Prognostic value and therapy monitoring 6. Challenges and Limitations o Technical considerations o Overlap of values across diseases 7. Conclusion o Summary of clinical utility o Future directions in quantitative CMR

CAEE-58 GRAND PRIX OF THE HEART: SET THE HEART RACING THROUGH A SYSTEMATIC APPROACH TO NON CORONARY CARDIAC ANATOMY THROUGH THE EMBRYOLOGIC LENS

Heli D. Rueda, MD (*Presenter*)
Daniel A. Rojas Padilla, MD (*Abstract Co-Author*)
Liliana Arias (*Abstract Co-Author*)
Mini V. Pakkal, FRCR, MBBS (*Abstract Co-Author*)

TEACHING POINTS

To understand normal cardiac anatomy on CT based on embryological development. To promote a step-by-step systematic checklist for Cardiac CT interpretation in order to identify anatomical variants, common pitfalls and avoid missing important imaging findings. To demonstrate the utility of a mental checklist assessment in educational and clinical practice, in routine cardiac CT imaging evaluations through examples.

TABLE OF CONTENTS/OUTLINE

Grand Prix of the Heart Prepare Your Car: Study and Protocol Considerations Was the study and protocol appropriate for optimal cardiac CT imaging? The Race Begins: Cardiac CT Analysis Right Atrium (RA) Review systemic venous connections, coronary sinus, and interatrial septum. Explain developmental anatomy and present a RA checklist, including common variations such as atrial septal defects. Right Ventricle (RV) Focus on recognizing RV anatomy, including the tricuspid valve and pulmonary artery system. The checklist addresses RV evaluation and highlights variations of the right ventricle. Left Atrium (LA) Examine pulmonary venous connections, the LA chamber, and appendage. Provide developmental context, a checklist for assessment, and discuss variations like anomalous pulmonary venous return. Left Ventricle (LV) Review the LV anatomy, mitral valve, and aortic root. The section includes a checklist for evaluating the LV and variations from the aortic root and mitral valve (For example prolapse). The Podium: Key Conclusions Summarize the importance of a checklist approach for accurate cardiac CT interpretation. Post Grand Prix Conference: Interactive Q&A Engage participants with an interactive quiz to reinforce key learning points.

CAEE-59 THE EASIEST WAY TO REDUCE RADIATION DOSE IN CORONARY CT ANGIOGRAPHY: STANDARDIZING TWO OFTEN-OVERLOOKED SCAN PARAMETERS

Hiroki Komesu (*Presenter*)

TEACHING POINTS

Coronary CT angiography is a crucial diagnostic tool for ischemic heart disease. However, radiation exposure remains a concern. This exhibit explains that often-overlooked scan parameters, particularly acquisition window and number of acquisition beats, significantly contribute to increased radiation dose. Furthermore, it describes the standardization of these parameters. The main teaching points are as follows:1. Learn the optimal cardiac phase trends for each heart rate. 2. Learn the appropriate reconstruction methods for each heart rate. 3. Learn the appropriate scan parameter settings (acquisition window and number of acquisition beats) for each heart rate. 4. Understand the radiation dose reduction effects and the improvement in inter-technologist variability in radiation dose achieved through the standardization of scan parameters. Standardizing acquisition window and number of acquisition beats is a valuable strategy for significant radiation dose reduction without compromising diagnostic image quality. By focusing data acquisition on diagnostically relevant cardiac phases, a 32% reduction in median CTDIvol was achieved ($p < 0.01$).

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1. Importance of radiation dose reduction in coronary CT angiography 2. Variability in CT scan parameters among radiologic technologists 3. Standardization of scan parameters 4. Effects of standardization on radiation dose reduction 5. Impact on clinical effectiveness 6. Workflow applicable to other facilities

CAEE-60 OPTIMIZING AND MANIPULATING BLOOD-TISSUE CONTRAST IN CARDIAC MRI

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Jie Zheng, PhD (*Abstract Co-Author*)
Scott M. Bugenhagen, MD, PhD (*Abstract Co-Author*)
Manish Aggarwal (*Abstract Co-Author*)
Pamela K. Woodard, MD (*Abstract Co-Author*)

TEACHING POINTS

Cardiac MRI (CMR) excels in distinguishing blood from surrounding tissues, offering critical insights into various cardiac and vascular conditions. This Education Exhibit will offer a comprehensive overview of blood-tissue contrast mechanisms, focusing on advanced MRI techniques that optimize and manipulate this contrast in cardiac imaging.

TABLE OF CONTENTS/OUTLINE

1) Cardiac Cycle, Synchronization and MRI Data Acquisition; 2) Motion Correction and Navigation approaches - Reviews techniques to mitigate motion artifacts. 3) Overview of blood and tissue MR properties and contrast mechanisms - the intrinsic properties of blood and myocardium, including flow effects, will be reviewed, and their impact on resulting MRI contrast will be explained. 4) Black-blood, gray-blood, bright-Blood, and simultaneous black and bright blood imaging techniques - The principles behind black-blood (blood suppression), gray blood (partial blood suppression) and bright-blood (blood signal enhancement or contrast enhancement) imaging will be discussed, with an emphasis on their clinical applications in CMR. 5) Data acquisition strategies - Covers Cartesian and non-Cartesian k-space sampling (radial, spiral, hybrid) and physiological controls (ECG, iNAV, PACE, Multitasking), emphasizing blood contrast enhancement. 6) MRI acceleration techniques - Discusses GRAPPA, CAIPIRINHA, and compressed sensing (CS), and AI-driven methods for faster imaging. 7) Recent advances in CMR studies: introduces "one-stop shopping" in cardiac MRI with push-button approaches in CMR applications.

CAEE-61 HOW TO USE ARTIFICIAL INTELLIGENCE IN CARDIAC MAGNETIC RESONANCE IMAGING AND DIAGNOSIS

Toshimichi Takeda (*Presenter*)
Ryo Ogawa, PhD, MD (*Abstract Co-Author*)
Kohei Tabo (*Abstract Co-Author*)
Takanori Kouchi (*Abstract Co-Author*)
Teruhito Kido, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Various information related to medical data can be obtained by machine learning. We explain how artificial intelligence is used during cardiac MRI scanning, reconstruction/post-processing, and diagnosis. 1. To review the role of artificial intelligence.2. To explain the application of artificial intelligence in cardiovascular magnetic resonance.3. To explain the principle of artificial intelligence.

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1. Image reconstructed by deep learning algorithm; overview, algorithm, example (Black-Blood T2 weighted Image, Whole heart coronary magnetic resonance angiography, cine MRI)2. landmark mark detection; overview, algorithm,example (resting-phase detection by right coronary artery)3. Segmentation; overview, algorithm,example (Automated inversion time selection for late gadolinium)4. Classification by Neural network; overview, algorithm,example (Classification of myocardial infarction by convolutional neural network)6. Explainable AI about convolutional neural network; overview, algorithm, example (Gradient-weighted class activation mapping, Guided gradient-weighted class activation mapping)7. Classification by Vison transformer; overview, algorithm,example (Classification of myocardial infarction by vison transformer)8. Explainable AI about vison transformer; overview, algorithm,example (Attention map)

CAEE-62 PET-MRI FUSION IMAGING IN CARDIAC SARCOIDOSIS: A NEW PARADIGM FOR DIAGNOSIS AND PROGNOSIS

Paula Escobosa Garcia, MD (*Presenter*)
Santiago A. Bolivar Cuevas, MD (*Abstract Co-Author*)
Belen del Rio Carrero, MD (*Abstract Co-Author*)
Hector I. Jofre Grimaldo (*Abstract Co-Author*)
Angela M. Diaz Cardenas, MD (*Abstract Co-Author*)
Antonio Medina, MD (*Abstract Co-Author*)

Gemma Burcet Rodriguez, MD (*Abstract Co-Author*)
Paula C. Notta (*Abstract Co-Author*)

TEACHING POINTS

To outline the clinical features and diagnostic criteria of cardiac sarcoidosis (CS).To examine the MRI characteristics of CS, with an emphasis on late gadolinium enhancement (LGE), and evaluate how early detection enhances diagnostic precision and clinical outcomes.To discuss recent innovations in hybrid PET/MRI imaging and how this integrated approach improves the diagnosis and assessment of CS.

TABLE OF CONTENTS/OUTLINE

Introduction and challenges in the diagnosis of CS: definition and clinical characteristics of cardiac sarcoidosis, key diagnostic challenges, including the limitations of endomyocardial biopsy, and the widely recognized diagnostic criteria established by the Japanese Circulation Society. Advances in imaging for the evaluation of CS overview of advanced imaging techniques, such as cardiac MRI with LGE and hybrid PET/MRI, emphasizing the simultaneous detection of both inflammation and myocardial fibrosis provided by the PET/MRI approach.Impact of the multimodal approach in the diagnosis and management of CS the integration of advanced imaging techniques for accurate diagnosis, monitoring, and predicting adverse events in cardiac sarcoidosis.

CAEE-63 UTILITY OF CT IN PLANNING OF TRANSCATHETER AORTIC VALVE REPLACEMENT: A TO Z

Prabhakar Rajiah, MD, FRCR (*Presenter*)

TEACHING POINTS

1. To review the role of CT in the pre-procedural evaluation for TAVR. 2. To illustrate the key CT parameters for TAVR planning 3. To provide answers to the common questions that are required from a CT interpreter

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A. Introduction B. Measurements for typical TAVR i. Annular sizing ii. LVOT sizing iii. Height of coronary ostia iv. Dimensions of sinus of valsalva v. Sinotubular junction vi. Optimal fluoroscopic angles vii. Membranous septal height C. Low-flow, low-gradient aortic stenosis Aortic valve calcium score (> 2000 in men, > 1200 in women) D. Valve-in-valve TAVR i. Bioprosthetic valve evaluation ii. Surgical valve sizing iii. Virtual valve to coronary ostial distance iv. Coronary ostial height v. Sinus of Valsalva diameter vi. Measurements for BASILICA procedure-Eccentricity index E. Bicuspid aortic valve i. Morphological classification- ii. Sizing of annulus- 2 nd orthogonal plane parallel to device landing zone iii. Concomitant aortopathy iv. Horizonal aorta- < 30 degrees v. Coronary artery anomalies vi. Coronary ostial height F. Native aortic regurgitation i. Large annulus ii. Poor visualization at fluoroscopy iii. Absent calcification- Impaired fixation in annulus iv. Aortopathy G. Concomitant valvular disease i. Mitral regurgitation (30 %) ii. Tricuspid regurgitation (24 %) iii. Planning for other transcatheter interventions H. Access vessel evaluation i. Aorta- aneurysm, stenosis, dissection, ulceration ii. Iliofemoral vessels-narrowest diameter, tortuosity, calcifications iii. Alternate access- transsubclavian/axillary, transcarotid, transcaval, transaortic, transapical.

CAEE-64 LEFT VENTRICULAR HYPERTROPHY (LVH): DIAGNOSTIC APPROACH WITH CARDIAC MRI

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Omar A. Gamboa Abundis, MD (*Abstract Co-Author*)
Pablo Andres Hernandez Soto (*Abstract Co-Author*)
Maria D. Egas Bejar, MD (*Abstract Co-Author*)
Gabriela Melendez, MD (*Abstract Co-Author*)
Aloha Meave, MD (*Abstract Co-Author*)

TEACHING POINTS

Set out the mainstays of cardiac MRI protocol for the approach of left ventricular hypertrophy. Define and represent MRI findings of the different phenotypes of left ventricular hypertrophy. Propose a diagnostic algorithm for suspected left ventricular hypertrophy.

TABLE OF CONTENTS/OUTLINE

Overview. Cardiac MRI protocol for the approach of LVH (Left ventricular hypertrophy). Hypertrophic cardiomiopathy. Aortic stenosis and hypertensive induced LVH. Athlete's heart. Cardiac amyloidosis. Anderson Fabry disease. Phenotypic differences in anatomical and tissue characterization in cardiac magnetic resonance (CMR). Proposed diagnostic algorithm for LVH. Take home messages.

CAEE-65 SCENARIO-BASED APPROACH TO DIAGNOSING COMPLICATIONS OF 3-STAGE PALLIATION SURGERY

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Jonathan A. Liu, MD (*Abstract Co-Author*)
Noah M. Seymore, MD (*Abstract Co-Author*)
Kimberly G. Kallianos, MD (*Abstract Co-Author*)
Joseph Mansour, MD (*Abstract Co-Author*)
Muhammad Naeem, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Single ventricle congenital heart disease is often managed with 3-stage palliation surgery. Post-operative imaging is instrumental in detecting short- and long-term complications and ensuring patient longevity. This exhibit focuses general post-operative complications, complications specific to 3-stage palliation, and imaging pitfalls. Learning objectives include: 1) Review complications specific to 3-stage palliation surgery 2) Recognize clinical scenarios in which to suspect a certain complication or recommend specific imaging workup to the clinical team 3) Learn which clinical tests can inform radiologic diagnosis of a particular complication.

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1. Title2. Objectives3. Fontan overview4. Complication categories5. General complications overview6. General complications - helpful labs7. Post-Fontan complications overview8. Fontan failure9. Post-Fontan complications - helpful labs10. Scenario overview11. Scenario: Prior surgery + acute symptoms12. Hematoma/bleed13. Endocarditis14. Pitfall: Anastomotic breakdown15. Acute conduit thrombosis16. Pitfall: Pseudothrombosis17. Myocarditis and infarct18. Pitfall: Omission of LGE imaging19. Scenario: Remote surgery + chronic symptoms20. Collaterals21. Pitfall: Lack of delayed imaging22. Plastic bronchitis23. Pitfall: Mistake for aspiration24. Chylous effusion25. Pitfall: Mistake for simple effusion26. FALD27. Pitfall: Hepatic congestion28. HCC29. Protein-losing enteropathy30. Summary: Tables + scenarios31. References

CAEE-66 CARDIAC AND MEDIASTINAL FAT CONTAINING LESIONS: A PICTORIAL REVIEW

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Ben Ariff, MBBS (*Abstract Co-Author*)
Deepa Gopalan, MRCP, FRCR (*Abstract Co-Author*)
Samir Mahboobani, MBBS (*Abstract Co-Author*)
Punam Pabari (*Abstract Co-Author*)
Mohsen Hajhosseiny, MD (*Abstract Co-Author*)
Ayo Oluboyede, MBBS, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Fat-containing lesions in the heart and mediastinum, though rare, are increasingly identified due to advancements in imaging technology, posing new diagnostic challenges. These lesions encompass both benign and potentially harmful conditions that require precise differentiation for effective management. This review aims to familiarize radiologists with common fat-containing lesions, including Lipomatous Hypertrophy of the Interatrial Septum, age-related fatty infiltration of the heart, arrhythmogenic cardiomyopathy, fatty metaplasia post myocardial infarction, intracardiac lipomas, pericardial lipomas, and mediastinal teratomas. By emphasizing the significance of these lesions and understanding their imaging characteristics, the review underscores how accurate diagnosis can minimize unnecessary investigations and improve patient outcomes.

TABLE OF CONTENTS/OUTLINE

1. Introduction Overview of Fat-Containing Lesions Normal Fat Distribution Importance of Accurate Diagnosis 2. Lipomatous Hypertrophy of the Interatrial Septum & Degenerative Fatty Changes in the Ventricles Fatty Infiltration in the Heart Imaging Features of LHIS FDG PET-CT in Diagnosis 3. Arrhythmogenic Cardiomyopathy Overview and Diagnosis of ARVC Imaging characterisitics 4. Fatty Metaplasia Post-Infarct Pathophysiology and Imaging Features Role of MRI and CT in Diagnosis 5. Intra-cardiac Lipoma Characteristics and Imaging Features (Echocardiography, CT, MRI) 6. Pericardial Lipoma Overview and Imaging Features (TTE, CT, MRI) 7. Mediastinal Teratoma Overview and Imaging Features (CT, MRI) 8. Tuberous Sclerosis Overview and Imaging of Cardiac Manifestations 9. Conclusion Summary of Fat-Containing Lesions

CAEE-67 DEMYSTIFYING EBSTEIN'S ANOMALY: KEY STEPS FOR A STRUCTURED MRI REPORT

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Miguel A. Cruz, MD (*Abstract Co-Author*)
Aloha Meave, MD (*Abstract Co-Author*)
Omar A. Gamboa Abundis, MD (*Abstract Co-Author*)
Maria M. De Avila Gomez, MD (*Abstract Co-Author*)
Karen De Icaza Benet (*Abstract Co-Author*)
Pablo Andres Hernandez Soto (*Abstract Co-Author*)

TEACHING POINTS

Standardize the cardiac magnetic resonance (CMR) technique by using a systematic and homogeneous protocol that includes cine-SSFP sequences, 4D Flow (if available), and late gadolinium enhancement. Understand and describe the Carpentier classification (A-D) according to the degree of apical displacement of the septal leaflet and the size of the "atrialized" ventricle, which helps guide the assessment of anatomical severity. Utilize quantitative severity indices such as the Celermajer Index, the total right/left volumetric index, and the valve rotation angle; these parameters complement the overall evaluation. Calculate tricuspid regurgitation (TR) using CMR by directly quantifying the regurgitant volume (e.g., with 4D Flow) or by indirect methods (flow planimetry with phase contrast). Highlight relevant preoperative findings: localization of the anterior leaflet, septal displacement, measurement of the functional right ventricle (RV) and "atrialized" ventricle volumes, as well as the RV ejection fraction, as these are key determinants for surgical planning and prognosis.

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Introduction and Objectives CMR Protocol Equipment characteristics, main parameters, and recommended sequences Anatomical and Physiopathological Fundamentals Definition Key anatomical changes Carpentier Classification Celermajer Index Valve rotation (tricuspid valve angle) Tricuspid regurgitation Surgical indications Report template Conclusions References

CAEE-68 MYOCARDIAL CT PERFUSION: TECHNIQUES, EVIDENCE, IMAGE INTERPRETATION, AND CLINICAL APPLICATIONS IN STABLE ANGINA AND INOCA

Kazuki Yoshida, MD, PhD (*Presenter*)
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Takaaki Hosokawa (*Abstract Co-Author*)
Tomoro Morikawa, MD (*Abstract Co-Author*)
Yusuke Kobayashi, MD (*Abstract Co-Author*)
Kentaro Ohara (*Abstract Co-Author*)
Teruhito Kido, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Myocardial CT perfusion (CTP) is a valuable imaging technique for the diagnosis of myocardial ischemia and has been incorporated into CAD-RADS 2. From the early days of the CORE320 study to recent multicenter prospective trials and meta-analyses, its diagnostic utility in stable angina has become well established. In recent years, growing attention has been paid not only to stable angina but also to ischemia with non-obstructive coronary arteries (INOCA), a condition gaining recognition as a cause of anginal symptoms and myocardial ischemia. In this context, CT perfusion is expected to play an increasing role alongside conventional gold-standard modalities such as MR perfusion and PET.In this presentation, we will provide an overview of myocardial CT perfusion techniques (static CTP and dynamic CTP), supporting evidence, image interpretation methods and pitfalls. We will also present representative cases highlighting its clinical utility in patients with stable angina and INOCA, as well as cases of microvascular dysfunction associated with other cardiac diseases.

TABLE OF CONTENTS/OUTLINE

• Overview of CT perfusion in the context of CAD-RADS 2• Imaging techniques: Static CTP and Dynamic CTP• Clinical evidence:o Diagnostic valueo Prognostic valueo Studies focused on INOCA• Image interpretation methods and common pitfalls• Case presentations in stable angina:o Evaluation of single-vessel disease (1VD)o In-stent restenosis (ISR)o Triple-vessel disease (3VD)• Case presentations in INOCA:o Vasospastic anginao Microvascular angina• Other relevant cases with microvascular dysfunction:o Coronary-pulmonary artery fistulao Aortic stenosiso Hypertrophic cardiomyopathyo Cardiac amyloidosis

CAEE-69 FROM BENIGN TO DEADLY: A CTA-BASED ATLAS OF CORONARY ARTERY ANOMALIES

Matthew Whalen (*Presenter*)
Asad U. Malik, MD (*Abstract Co-Author*)
Ramy Shoela, MD (*Abstract Co-Author*)

TEACHING POINTS

Coronary artery anomalies are increasingly identified due to advancements in coronary CT angiography (CTA) and 3D image reconstruction techniques. Accurate recognition of these anomalies is vital for interpreting cardiovascular symptoms and pathologies. Pre-procedural awareness of coronary anomalies is critical for planning and safely performing coronary catheterization. Anomalies with an interarterial course carry a heightened risk of sudden cardiac death. Certain anomalies may result in coronary "steal" phenomena, where abnormal shunting diverts blood away from the myocardium, leading to ischemia.

TABLE OF CONTENTS/OUTLINE

1. Overview of normal coronary artery anatomy: a. High resolution CTA imaging, multiplanar reconstruction and cinematic 3D rendering of coronary vasculature. b. Role of 3D imaging in anatomical assessment 2. Coronary Artery Variants with minimal or no clinical impact: a. Accessory origin of the conus branch directly from the aorta. b. Accessory origin of the circumflex artery from the aorta. 3. Potentially Clinically Significant Coronary Artery Variants: a. Anomalous Right Coronary Artery from Left Cusp, with various benign and malignant courses i. Clinical manifestations, imaging features, and therapeutic options b. Tubular Origin of Right Coronary Artery i. Diagnostic challenges and management strategies c. Myocardial Bridging i. Diagnosis and management strategies 4. High risk Coronary Artery Variants with established clinical significance: a. Anomalous Right Coronary Artery from the Pulmonary Artery i. Diagnosis, clinical picture and management b. Anomalous Left Coronary Artery from Pulmonary Artery i. Clinical presentation

CAEE-70 OVERVIEW OF THE FONTAN CIRCULATION: INDICATIONS, METHODS AND COMPLICATIONS

Akihiro Inoue, MD (*Presenter*)
Michinobu Nagao, MD, PhD (*Abstract Co-Author*)
Atsushi Yamamoto, MD, PhD (*Abstract Co-Author*)
Masaki Watanabe, MD (*Abstract Co-Author*)
Shuji Sakai, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Fontan procedure is a method of connecting the vena cava and pulmonary artery bypassing the right ventricle. The Fontan procedure improves the prognosis in childhood, but it is not a curative surgery; rather, it is a palliative surgery. The systemic venous pressure is always high because the systemic circulation and pulmonary circulation run in series. The long-term mortality rates in adult patients with congenital heart disease after the Fontan procedure have remained high compared to those with other congenital heart diseases. Complications of the Fontan circulation include failure of the Fontan circulation, vessel lesions, Fontan-associated liver disease (FALD), etc. Radiologists must be well versed in the physiology and complications of the Fontan circulation. This educational exhibit will focus on indication and surgical methods for Fontan procedure and postoperative complications after Fontan procedure.

TABLE OF CONTENTS/OUTLINE

1) Indications and postoperative pathophysiology of Fontan procedure. 2)Surgical methods for Fontan procedure. 3)Normal images in Fontan circulation and points to note during examination. 4) Complications after Fontan procedure (?Failure of the Fontan circulation, atrioventricular valve regurgitation, aortic valve regurgitation ? Vessel lesion such as conduit stenosis/dilation, pulmonary artery stenosis, pulmonary hypertension ?FALD ?Thrombosis ?Pulmonary arteriovenous fistula ?Lymphatic disorders such as protein-losing enteropathy and plastic bronchitis ?others). 5)Summary.

CAEE-71 THE FORGOTTEN VALVE: A CLOSER LOOK AT CONGENITAL AND ACQUIRED DEFECTS OF THE TRICUSPID VALVE

Kristina Ramirez Garcia, MD (*Presenter*)
Catalina Jaramillo, MD (*Abstract Co-Author*)
Carlos S. Restrepo, MD (*Abstract Co-Author*)
Daniel Vargas, MD (*Abstract Co-Author*)
Daniel Ocazionez-Trujillo, MD (*Abstract Co-Author*)

TEACHING POINTS

Tricuspid valve disease is often overlooked, yet it can lead to right heart failure and pulmonary hypertension. CT and MRI play key roles in identifying anatomical and functional abnormalities Ebstein’s anomaly is associated with maternal lithium use and is characterized by adherence of the septal and posterior tricuspid valve leaflets to the myocardium, apical displacement of the functional annulus, and dilatation of the "atrialized" portion of the right ventricle with wall thinning. Carcinoid syndrome occurs in 5% of carcinoid tumors, caused by serotonin release into the systemic circulation. Serotonin-induced fibrosis leads to restrictive cardiomyopathy and TV regurgitation. Libman-Sacks endocarditis is characterized by bacterial-free verrucous vegetations on the valves in patients with systemic lupus erythematosus, due to fibrin and platelet deposition. When affecting the TV it may result in valvular insufficiency or stenosis with leaflet thickening and vegetations. In patients with Marfan syndrome, pectus excavatum deformity can cause mass effect upon the right atrium, potentially leading to tricuspid stenosis.

TABLE OF CONTENTS/OUTLINE

Embryology and Anatomy Role of CT and MRI in the evaluation Congenital conditions: Tricuspid atresia Ebstein’s anomaly Acquired conditions: Functional valvular disease Infectious and non-infectious endocarditis Carcinoid syndrome Iatrogenic and traumatic injuries Neoplasms

CAEE-72 CARDIAC MAGNETIC RESONANCE IMAGING FINDINGS OF STRESS CARDIOMYOPATHIES

Mecit Kantarci, MD, PhD (*Presenter*)
Cihan Duran, MD (*Abstract Co-Author*)
Volkan Kizilgoz (*Abstract Co-Author*)
Daniel Ocazionez-Trujillo, MD (*Abstract Co-Author*)
Laura A. Ocasio, MD, MSc (*Abstract Co-Author*)

TEACHING POINTS

Stress cardiomyopathies (SCs) are reversable morphological and functional alterations of the heart muscle. The apical form of this disease have been known as Takotsubo Cardiomyopathy (TCM) in the literature. TCM was described by Dote et. al in 1990 and the name was given because of the specific morphology of the left ventricle which resembles Tako-Tsubo, an octopus trap that Japanese fishermen use. There are mid-ventricular, apical, basal and focal types of SCs. No late gadolinium enhancement is observed in SCs in cardiac MR images. Typical radiological findings along with related patient history should always be indicative of SCs. The radiology report should underline the specific myocardial morphology and classify the type of disease. SCs are known to bring non-negligible risks such as acute heart failure, cardiac arrhythmias or even death. Clinicians and radiologists should be aware of the diagnostic clues and radiological findings of this unique condition.

TABLE OF CONTENTS/OUTLINE

-What is Takotsubo disease? -Morphological and functional alterations -Types of stress cardiomyopathies -Cardiac MR images - What needs to be indicated? -Examples of different types of stress cardiomyopathies -How to report cardiac MR imaging of stress cardiomyopathies?

CAEE-73 CINE CARDIAC COMPUTED TOMOGRAPHY FOR PRE- AND POST-TREATMENT EVALUATION OF HEART VALVE DISEASES

Nobuko Tanitame, MD (*Presenter*)
Keizo Tanitame, MD (*Abstract Co-Author*)

TEACHING POINTS

Heart valve failure or dysfunction can lead to reduced cardiac function, and untreated heart valve disease may become life-threatening. Echocardiography and cardiac magnetic resonance imaging (MRI) are first-line imaging modalities for assessing heart valves. However, electrocardiogram (ECG)-gated contrast-enhanced cardiac computed tomography (CT) enables retrospective reconstruction of cross-sectional images in any desired plane, making it a valuable tool for pre- and post-treatment evaluation of heart valve disease. Compared to echocardiography and MRI, cardiac CT provides superior visualization of heavily calcified or mechanical prosthetic valves. For functional valve assessment, 10 to 20 data sets are typically reconstructed throughout the R-R interval, allowing the generation of cine loops in planes parallel and perpendicular to the target valve. This presentation highlights the clinical utility of cine cardiac CT in evaluating valvular leaflet morphology and function.

TABLE OF CONTENTS/OUTLINE

1. 256-Multidetector CT protocol for heart valve evaluation *Contrast material injection, ECG-gated acquisition, Image reconstruction using motion correction software, and cine loop generation on a workstation 2. Mitral valve * Valve prolapse *Vegetation on MitraClip *Mitral annulus calcification *Impaired motion of the anterior mitral leaflet due to a left atrial myxoma 3. Aortic valve *Bicuspid valve *Valve prolapse *Stenosis with extensive valvular calcification *Coronary cusp thrombus following TAVI 4. Tricuspid valve *Dysplastic valve *Stuck mechanical valve *Tricuspid pouch 5. Pulmonary valve *Regurgitation *Restricted motion after valvuloplasty *Hypoplastic valve

CAEE-74 BEYOND THE INFARCT: CARDIAC MRI PATTERNS ACROSS THE ISCHEMIC HEART DISEASE SPECTRUM AND PITFALLS

Andita D. Hidayati, MD (*Presenter*)
Janardhana Ponnatapura, MD (*Abstract Co-Author*)

Silanath Terpenning, MD (*Abstract Co-Author*)

TEACHING POINTS

·Review the pathophysiology of ischemic heart disease and cardiac MR role to assess the disease ·To demonstrate Cardiac MR features in the entire spectrum of ischemic heart disease, from acute ischemia to chronic infarct and complications that providing vital information that influences treatment decisions including: ·Stress perfusion imaging detects physiologically significant ischemia beyond anatomical stenosis, while late gadolinium enhancement (LGE) identifies infarcted and viable myocardium. ·Advanced techniques like T1/T2 mapping provide tissue characterization and allow for more precise assessment, even in subtle pathology. Review the mimics of ischemic heart disease cardiac MR pattern

TABLE OF CONTENTS/OUTLINE

•Introduction, Why CMR in Ischemic Heart Disease? •Pathophysiology of ischemia •Inducible ischemia •Transmural enhancement of Ischemic Herat Disease and its mimics •Subendocardial enhancement of Ischemic Herat Disease and its mimics •Complication of ischemic heart disease •Role of multidisciplinary conference •The role of supplementary imaging such as echocardiogram, nuclear medicine stress test, and PET CT •Management algorithm for ischemic heart disease

CAEE-75 IMAGING TETRALOGY OF FALLOT ACROSS TIME AND MODALITY

Spencer Glancy, MD (*Presenter*)
Robert J. Smalley, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Know TOF Anatomy: Recognize the four core defects on fetal ultrasound, cardiac MRI and CT. 2. Understand Surgical Repairs: Be familiar with common repair techniques and resulting anatomy. 3. Identify Post-Op Complications: Learn common issues needing follow-up (Pulmonary regurgitation, right ventricular dysfunction, residual lesions, aortic dilatation). 4. Cardiac MRI indications and key data reporting elements. 5. Cardiac CT indications and key data reporting elements.

TABLE OF CONTENTS/OUTLINE

1. Introduction a. Definition of Tetralogy of Fallot b. Common associated anomalies c. Goals of repair d. Common surgical techniques 2. Prenatal diagnosis a. Normal fetal outflow tracts b. TOF outflow tracts on standard screening US views 3. Post-op appearance, near term a. Postoperative radiographs i. Common support devices ii. Uses of post-operative imaging to guide diuresis b. Postoperative lung scintigraphy 4. Post-operative complications a. Pulmonary regurgitation b. Branch pulmonary artery stenosis c. RV dysfunction d. Residual lesions e. Aortic dilation f. Conduit stenosis 5. Cardiac MRI a. Indications b. Standard and advanced sequences c. Key data reporting elements 6. Cardiac CT a. Indications b. Indication-specific techniques c. Key data reporting elements

CAEE-77 HARD HEART: DECODING THE HIDDEN LANGUAGE OF CARDIAC CALCIFICATIONS

Danilo O. Ramos, MD (*Presenter*)
Vinicius C. Serra, MD (*Abstract Co-Author*)
Andre Vaz (*Abstract Co-Author*)

TEACHING POINTS

(1) understand the pathophysiology and mechanisms behind cardiac calcifications detectable on CT; (2) recognize the imaging patterns and etiologies of dystrophic and metastatic cardiac calcifications; (3) differentiate true cardiac calcifications from imaging artifacts and mimickers; (4) identify clinically relevant calcifications that may require further evaluation or intervention; and (5) highlight best practices for evaluating and reporting incidental cardiac calcifications in CT exams.

TABLE OF CONTENTS/OUTLINE

(1) introduction, providing an overview of cardiac calcifications and their clinical importance; (2) pathophysiology, discussing the mechanisms of dystrophic and metastatic calcifications; (3) etiologies, addressing infectious, ischemic, metabolic, neoplastic, inflammatory, and traumatic causes; (4) imaging evaluation, covering CT protocols, technical considerations, and the role of ECG gating; (5) imaging patterns on CT, distinguishing dystrophic, metastatic, valvular, myocardial, pericardial, and vascular calcifications; (6) pitfalls and mimickers, recognizing diagnostic traps and artifacts; (7) reporting recommendations, detailing how to describe, classify, and suggest appropriate clinical management; and (8) case-based illustrations, providing key examples demonstrating imaging features and interpretation challenges.

CAEE-78 WHISPERS BEHIND THE BEAT: DETECTING CARDIAC METASTASES - A PICTORIAL ESSAY

Danilo O. Ramos, MD (*Presenter*)

TEACHING POINTS

Review the main imaging features that differentiate primary and secondary cardiac masses, and discuss the role of advanced multimodality imaging in their evaluation. Describe the anatomical landmarks involved in metastatic spread to the heart (pericardium, epicardium, myocardium, valves, and chambers). Understand the epidemiology of cardiac metastases, including prevalence, most common primary origins, and histologic types. Propose a diagnostic workflow based on tumor features (size, borders, tissue invasion, location, pericardial involvement, solitary vs. multiple lesions) and tissue characteristics (contrast enhancement, T1- and T2-weighted imaging signal intensities). Identify key "red flags" in imaging findings suggestive of cardiac metastatic involvement.

TABLE OF CONTENTS/OUTLINE

Major Secondary Cardiac Tumors: Epidemiology, pathophysiology, and imaging findings (melanoma, renal cell carcinoma, hepatocellular carcinoma, sarcomas, colorectal cancer [Lynch syndrome], leukemia, bronchogenic carcinoma, breast cancer). Role of Multimodality Imaging: Advantages and limitations of echocardiography, computed tomography (CT), magnetic resonance imaging (MRI), and PET/CT in diagnosis and surgical planning. Differential Diagnosis and Pitfalls: Common mimickers, artifacts, and potential errors in the evaluation of cardiac masses.

CAEE-79 UNPLUGGING THE HEART: CARDIOVASCULAR CT INSIGHTS FOR PRE-EXTRACTION EVALUATION OF CARDIAC DEVICES - A PRIMER FOR RADIOLOGISTS

Danilo O. Ramos, MD (*Presenter*)

TEACHING POINTS

Understand the role of cardiovascular CT in the pre-extraction evaluation of cardiac implantable electronic devices (CIEDs). Recognize major imaging findings suggestive of device-related complications, such as lead adherence, fractures, perforation, and infection. Review CT acquisition protocols optimized for detailed evaluation of leads, vascular structures, and cardiac chambers. Propose a structured imaging approach for risk stratification and procedural planning. Highlight imaging findings that impact extraction strategy and predict procedural complexity.

TABLE OF CONTENTS/OUTLINE

Introduction: Clinical importance of pre-extraction cardiac device imaging. CT Protocols for Device Evaluation: Acquisition parameters and optimization strategies. Imaging Findings Suggestive of Complications: Lead fracture, adherence, perforation, infection, and venous occlusion. Structured CT Evaluation Prior to Extraction: Systematic assessment and risk stratification. Pitfalls and Artifacts: Recognition of imaging pitfalls and differentiation from true pathology. Conclusion: Radiologist's role in improving safety and outcomes of device extraction procedures.

CAEE-80 PROSTHETIC HEART VALVES - IMAGING OF POSTOP COMPLICATIONS

Junwoo Kim, MD (*Presenter*)
Zehavit Kirshenboim (*Abstract Co-Author*)

Emrah Duman, MD (*Abstract Co-Author*)
Azza A. Elgendy, MD, PhD (*Abstract Co-Author*)
Omer Onder, MD (*Abstract Co-Author*)
Joan M. Lacomis, MD (*Abstract Co-Author*)

TEACHING POINTS

Heart valve pathologies are critical to identify and characterize due to their significant impact on cardiac function and patient outcomes. Accurate diagnosis enables timely medical or surgical intervention, reducing morbidity and mortality. Following valve repair or replacement, radiologists play a pivotal role in detecting postsurgical complications, which may include prosthetic valve dysfunction, pseudoaneurysm, infection, paravalvular leaks and dehiscence. Each complication exhibits distinct imaging features across modalities such as echocardiography, cardiac CT, and MRI. Echocardiography is typically the initial tool for detecting these abnormalities; however, the importance of cardiac CT has grown significantly in recent years. CT offers outstanding spatial and temporal resolution, making it a vital tool for evaluating tissue planes and the spatial alignment between the prosthetic valve and the annulus. Additionally, gated cine images are highly valuable for identifying functional abnormalities. This presentation highlights the CT appearance of heart valve pathologies, reviews common postsurgical complications, and provides a comprehensive guide to their imaging appearances for optimized patient care.

TABLE OF CONTENTS/OUTLINE

Purpose Postsurgical complications 1)Prosthetic valve dysfunction 2)Pseudoaneurysm 3)Infection 4)Paravalvular leaks 5)Dehiscence Conclusion

CAEE-81 "CARDIAC CURVEBALLS": IMAGING THE OUTLIERS IN CARDIAC ANEURYSMS

Suman T. Prabhakar, MD, FRCR (*Presenter*)
Ashish Gupta, MBBS (*Abstract Co-Author*)
Srikanth Sola, MD (*Abstract Co-Author*)
Carole J. Dennie, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

1. To illustrate various aneurysms of ventricles and atria including coronaries. 2. To describe MRI/CT techniques and key imaging findings, emphasizing on rare cases and management strategies.

TABLE OF CONTENTS/OUTLINE

Cardiac aneurysms can be caused potentially by wide varieties of aetiologies. Cardiac CT and MR aid in non-invasive diagnosis. We emphasize on unusual cardiac aneurysms and therapeutic procedures performed. The cases were classified as follows- A) CONGENITAL ANEURYSMS: • LEFT VENTRICLE: Crypts, diverticulum, submitral aneurysms, double chamber. • ATRIAL: Congenital anomalous communication between right pulmonary artery to left atrium, Congenital aneurysm of right atrial appendage, Ruptured sinus of Valsalva. B) ACQUIRED ANEURYSMS: • Aneurysms due to myocardial infarction, Aneurysms due to vasculitis, Aneurysm due to infectious endocarditis, Mycotic aneurysms. C) ANEURYSMS DUE TO HERITABLE GENETIC DISORDERS • Arrhythmogenic Right Ventricular Dysplasia • Brugada syndrome D) MISCELLANEOUS • Takotsubo Cardiomyopathy • Apical Aneurysm in Hypertrophic Cardiomyopathy. This educational exhibit is primarily focussed to describe key imaging points of unusual cardiac aneurysms to aid in diagnosis, which is important due to their differential complications and treatment strategies.

CAEE-82 SOMETHING OLD, SOMETHING NEW, SOMETHING BORROWED, SOMETHING BLUE: A COMPREHENSIVE REVIEW OF APICAL HYPERTROPHIC CARDIOMYOPATHY WITH AN EMPHASIS ON CARDIAC MRI AND CURRENT EVIDENCE-BASED INSIGHTS

Omer Onder, MD (*Presenter*)
Emrah Duman, MD (*Abstract Co-Author*)
Emilee Kurtz (*Abstract Co-Author*)
Zehavit Kirshenboim (*Abstract Co-Author*)
Kyung Hee Lee (*Abstract Co-Author*)
Timothy Wong (*Abstract Co-Author*)

TEACHING POINTS

1- First described in 1976, apical hypertrophic cardiomyopathy (HCM) is now recognized as a dynamic and evolving entity. Recent studies emphasize its unique epidemiologic, clinical, and imaging features, with particular focus on updating hypertrophy thresholds to improve diagnostic accuracy, enable early identification of "relative apical HCM" subgroup, and further optimize risk stratification. 2- Although traditionally considered a benign subtype, apical HCM is now recognized to carry a risk of sudden cardiac death comparable to other HCM forms in selected high-risk patients, particularly those with apical aneurysms or extensive late gadolinium enhancement (LGE). Accurate differentiation from phenocopies and guideline-driven management are critical to optimize patient outcomes. 3- Cardiac MRI plays a key role in diagnosing and monitoring apical HCM, allowing assessment of high-risk imaging features and guiding personalized risk stratification and implantable cardioverter-defibrillator (ICD) placement decisions. This exhibit presents a comprehensive overview of apical HCM, particularly focusing on MRI findings and current evidence-based insights.

TABLE OF CONTENTS/OUTLINE

A. Introduction & Objectives B. Hypertrophic cardiomyopathy (HCM) subtypes C. Apical HCM - Epidemiology - Clinical presentation - Potential complications D. Imaging in apical HCM - Various imaging modalities - Added value of cardiac MRI - MRI features of apical HCM - Wall thickness measurement - Imaging-based diagnostic criteria - Relative versus absolute apical HCM E. Phenocopies of apical HCM & differential diagnoses F. Follow-up, risk stratification & management G. Summary H. Conclusion

CAEE-83 WHEN AND HOW TO PERFORM CORONARY CTANGIOGRAPHY (CCTA) WITHOUT ELECTROCARDIOGRAPHIC TRIGGERING (ECG-LESS) APPROPRIATELY

Tingting Qu (*Presenter*)

TEACHING POINTS

1) Point out the limitations of conventional ECG-gated CCTA in certain situations.2) Demonstrate the necessary imaging techniques for performing ECG-less CCTA.3) Demonstrate the appropriate protocols for successful CCTA using ECG-less mode.

TABLE OF CONTENTS/OUTLINE

1) Limitations of conventional ECG-gated CCTA• Patients with arrhythmia (atrial fibrillation, frequent premature beats) or pacemaker may have trouble synchronizing gating information• Patients unable or have no time for placing chest ECG electrodes (with skin burns, severe dermatitis, trauma)• Some privacy conscious patients2) Necessary techniques for ECG-less CCTA• Perform CCTA in 1 heartbeat with fast rotation speed.• Able to select the data sequence with the least motion for reconstruction• Have robust cardiac motion correction algorithms 3) Strategies for ECG-less CCTA• Select wide detector or ultra-high helical pitch to cover heart in 1 heartbeat to avoid beat-to-beat variation• Use fast rotation speed for excellent temporal resolution• Ensure adequate scan duration (about 500ms) for adaptive reconstruction• Compensate motion artifacts using motion correction algorithms• Use advanced reconstruction algorithms to reduce noise and other artifacts

CAEE-84 ISOLATING THE DANGER: MULTIMODALITY IMAGING OF THE LEFT ATRIAL APPENDAGE BEFORE AND AFTER OCCLUSION

Nisha Korakavi, MD (*Presenter*)
Robert C. Gilkeson, MD (*Abstract Co-Author*)
Amit Gupta, MD, MBBS (*Abstract Co-Author*)
Cody R. Johnson, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To understand the role of CTA and CMR in excluding LAA thrombus, assessing morphology, and guiding device selection for LAA occlusion. 2. To recognize the utility of dual-phase CTA and the "Reverse Thrombus Sign" in distinguishing thrombus from slow contrast flow. 3. To identify key post-procedural imaging findings, including normal device placement, peridevice leaks, and complications like thrombus formation or embolization.

TABLE OF CONTENTS/OUTLINE

Introduction Atrial Fibrillation and risk for thrombus Need for Left atrial appendage (LAA) occlusion Methods of LAA occlusion: Device placement or surgical management LAA Occluder Devices Watchman and Watchman FLX Amulet Other devices Pre-Procedural Imaging Key Imaging Considerations Thrombus exclusion Precise LAA measurements (critical for correct device sizing.) The "Reverse Thrombus Sign" (suggestive of slow LAA flow.) b. Imaging with CTA 1. Scanning: Single energy versus dual/multi-energy CT . 2. Dual-phase contrast (Thrombus versus slow flow). 3. Assessment of adjacent structures and fluoroscopic angle simulation. Cardiac MRI as an alternative Scanning protocol : No contrast required Assessment of LAA function. Post-Procedural Imaging and Follow-Up Post-implantation evaluation of device positioning and function Assessment of Procedural Complications Device-related thrombus Peridevice leak Device embolization and structural complications Pericardial effusion and adjacent structure injury

CAEE-85 A NOVEL APPROACH FOR OPTIMAL CARDIAC PHASE SELECTION IN CORONARY CTA: CAN QUANTITATIVE ASSESSMENT AND VISUALIZATION OF CARDIAC MOTION BE ACHIEVED USING VELOCITY ANALYSIS?

Hiroki Komesu (*Presenter*)
Tatsuya Maruno (*Abstract Co-Author*)

TEACHING POINTS

In coronary CT angiography, motion artifacts are prominent in patients with a heart rate around 70 bpm. This is attributed to the complex timing of cardiac contraction and relaxation, as well as the increased influence of the atrium. This exhibit proposes a method to quantitatively determine the optimal cardiac phase (cardiac phase images with minimal motion artifacts and facilitating diagnosis) using velocity analysis of image analysis software on the acquired data. The main educational points are as follows: 1. To demonstrate the difference in contraction timing between ventricles and atria. 2. To approximate overall cardiac velocity and quantitatively select cardiac phases with fewer motion artifacts by using velocity graphs of both ventricles and atria. 3. To show that images calculated using velocity graphs are superior to the conventional visual selection method. 4. Principles of velocity analysis and tips for improving analysis accuracy. By using the velocity analysis function, it is possible to quantitatively and efficiently calculate coronary CTA images with fewer motion artifacts.

TABLE OF CONTENTS/OUTLINE

1. Introduction; 2. Incidence of Motion Artifacts Based on Heart Rate During Imaging; 3. Characteristics of Cardiac Motion Around 70 bpm and Challenges in Optimal Phase Selection; 4. Procedure for Optimal Cardiac Phase Selection Using Velocity Graph; 5. Relationship Between Velocity Graph and Motion Artifact Score; 6. Accuracy of Optimal Cardiac Phase Determined from Velocity Graph; 7. Algorithm of Velocity Analysis; 8. Tendencies and Potential Causes of Optimal Cardiac Phase in Left and Right Coronary Arteries; 9. Clinical Applications of Velocity Mapping in VR

CAEE-86 EFFECTIVENESS OF DEEP LEARNING-BASED IMAGE RECONSTRUCTION INCLUDING MOTION CORRECTION AND ITS POTENTIAL FOR RADIATION DOSE REDUCTION

Takayoshi Yamaguchi (*Presenter*)
Yuichi Kondoh (*Abstract Co-Author*)
Yuji Miura (*Abstract Co-Author*)
Keiichi Hanaoka, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Explaining the current status of factors that deteriorate coronary CT images and countermeasures2. Summarize of the relationship between heart rate during scan and motion artifacts, and the distribution of heart rate phases used for image reconstruction3. Overview of new coronary artery motion correction technology using deep learning4. The effectiveness of the motion correction technique at each heart rate will be verified using clinical cases by comparing it with conventional image reconstruction methods.5. Proposal of an optimal scan protocol based on the relationship between image quality at each heart rates and selected cardiac phases6. The effectiveness of the proposed new imaging protocol in reducing radiation dose and improving image quality will be clarified through comparison with conventional imaging methods.

TABLE OF CONTENTS/OUTLINE

1.Introduction2.Summarize the various factors that cause unclear coronary CT images3.Explains the effect of heart rate during imaging on image quality in previous image reconstruction methods4.Explanation of the features of a new coronary artery motion correction technology developed using deep learning5.Comparison of the relationship between heart rate and image quality in clinical cases using conventional image reconstruction and a new motion correction method6.Analysis of optimal cardiac phase selected by various image reconstruction methods at each cardiac rate during CT scanning7.Proposal of a new scanning protocol using an image reconstruction method including motion correction8.Revealing the effect of new scanning protocols in improving image quality and reducing radiation exposure

CAEE-87 OPTIMIZING TRIGGER POINTS IN TEST BOLUS TRACKING: AN EDUCATIONAL INSIGHT INTO CONTRAST DYNAMICS IN VALVULAR HEART DISEASE

Tetsuo Hironaga (*Presenter*)
Shinobu Mano (*Abstract Co-Author*)
HIROYUKI KOBAYASHI (*Abstract Co-Author*)
Masahisa Tokunaga (*Abstract Co-Author*)
Asuka Goto (*Abstract Co-Author*)
Atsushi Watanabe, MD,PhD (*Abstract Co-Author*)
Aoi Hayashi (*Abstract Co-Author*)

TEACHING POINTS

•Understand how different valvular diseases alter time-enhancement curves (TECs). •Learn visual strategies for assessing scan timing in the absence of a distinct peak. •Recognize the potential utility of the AAo > LA CT attenuation difference as a supplementary indicator. •Encourage technologist-led optimization of cardiac CT scan protocols based on physiological indicators.

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Overview of the physiological impact of valvular diseases on contrast circulation Visual examples of TEC changes in tricuspid, mitral, and aortic regurgitation Handling ambiguous peaks: using the AAo > LA CT attenuation difference as a supplementary visual marker Enhancing visualization by monitoring at the level of the left atrium Educational flowchart for determining the appropriate trigger point Conclusion: In patients with valvular heart disease, conventional peak-based triggering may not yield optimal scan timing due to irregular contrast dynamics. This exhibit introduces a physiology-informed, visually guided approach that leverages the AAo > LA CT attenuation difference as a supplementary indicator, aiming to enhance consistency in trigger point selection during cardiac CT. While further quantitative validation is warranted, this method offers practical educational value , particularly for technologists involved in contrast protocol optimization.

CAEE-88 OPTIMIZING CORONARY CT ANGIOGRAPHY: MOTION CORRECTION ALGORITHMS AS A COST-EFFECTIVE ALTERNATIVE TO HIGH-COVERAGE SCANNERS

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Carlos Capunay, MD (*Abstract Co-Author*)

TEACHING POINTS

Motion artifacts significantly impact CTCA interpretation, especially at high heart rates. Motion Correction Algorithm (MCA) enhances image quality by compensating for motion within a single cardiac cycle. MCA enables the use of less expensive CT scanners without compromising diagnostic performance .Clinical studies support MCA as an effective alternative to high-coverage scanners, improving diagnostic accuracy and image interpretability. Tailoring imaging strategies with MCA allows for optimized resource allocation in different clinical settings.

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Describe the limitations of coronary motion artifacts in CTCA. • Explain the principles of motion correction algorithms (MCA). • Demonstrate how MCA can serve as an alternative to high-coverage CT scanners. • Provide clinical examples showcasing MCA in different CT scanner configurations. MCA analyzes adjacent cardiac phases to detect vessel movement. The algorithm determines motion severity and spatial displacement. The motion is compensated on a per-segment basis, enhancing vessel sharpness and diagnostic accuracy. MCA is applicable to both single-energy CT (SECT) and dual-energy CT (DECT), allowing flexible integration into different imaging workflows.Clinical studies have demonstrated that MCA improves image quality and diagnostic accuracy. Research has shown that MCA enhances the assessment of calcified plaques, reduces artifacts, and improves stenosis quantification. SECT with MCA: Ideal for high-definition imaging, especially in patients with coronary stents. DECT with MCA: Reduces blooming artifacts, making it suitable for patients with heavy calcifications and borderline renal function.

CAEE-89 EVOLUTION OF DEEP LEARNING-BASED MOTION CORRECTION ALGORITHMS FOR NON-ECG-GATED CT : APPLICATION TO CARDIAC IMAGING

Yoshihiro Haga, PhD, RT (*Presenter*)
Koichi Chida, PhD (*Abstract Co-Author*)
Masahiro Sota, MSc, RT (*Abstract Co-Author*)
Yuji Kaga, RT (*Abstract Co-Author*)
TOSHIKI KATO (*Abstract Co-Author*)

TEACHING POINTS

CT scans have become faster over time, making it possible to take images in a short time. However, the presence of motion artifacts (e.g., heart rate, gastrointestinal, breath-hold stoppage failure, etc.) may induce image quality degradation. Although there have been developments such as faster rotation speeds, Dual Source CT, multi-row detectors CT, and high pitch imaging, there have been limitations. Recently, deep learning techniques were also introduced to the development of motion correction algorithm (MCA). This study examines the clinical application of Clear Motion Lung , a motion correction algorithm developed by Canon Medical Systems Inc. We have extended this lung-specific algorithm to the field of cardiology.

TABLE OF CONTENTS/OUTLINE

1. To understand motion artifact characteristic2. To understand the principles of the Motion Compensation Algorithm (CLEAR Motion Lung: CML) in non-ECG synchronized CT developed by Canon3. To understand the optimal scanning protocol using CML for non-ECG-gated CT4. To understand the advantages and disadvantages of clinical imaging with CML 5. To understand the clinical application of CML in non-ECG-gated CT

CAEE-90 THE IMITATION GAME: DIAGNOSING HCM LOOK-ALIKES

Catalina Jaramillo, MD (*Presenter*)
Kristina Ramirez Garcia, MD (*Abstract Co-Author*)
Daniel Vargas, MD (*Abstract Co-Author*)
Carlos S. Restrepo, MD (*Abstract Co-Author*)
Monica D. Ocampo, MD (*Abstract Co-Author*)
Daniel Ocazionez-Trujillo, MD (*Abstract Co-Author*)

TEACHING POINTS

Not all apparent HCM is true HCM. MRI helps distinguish mimics through key tissue and functional features. This presentation highlights key MRI features for accurate differentiation.• In patients over 65, cardiac amyloidosis should be considered when cardiac MRI reveals left ventricular hypertrophy, global systolic dysfunction, biatrial enlargement, and diffuse subendocardial late gadolinium enhancement.• Fabry's disease, an X-linked lysosomal storage disorder, often presents on cardiac MRI with left ventricular hypertrophy and characteristically low native T1 values due to glycosphingolipid accumulation.• Chronic use of chloroquine can lead to a cardiomyopathy that mimics HCM, with biventricular hypertrophy, diffuse myocardial fibrosis on LGE, low native T1, vacuolization, and false-positive PYP scans.• Friedreich's Ataxia Cardiomyopathy resembles HCM on cardiac MRI, with extracellular volume expansion and cardiomyocyte hypertrophy contributing to the observed myocardial thickening and fibrosis. • Hypertensive cardiomyopathy has a characteristic pattern of left ventricular hypertrophy, typically presenting with concentric hypertrophy, while hypertrophic cardiomyopathy often shows asymmetric hypertrophy, particularly involving the septum. • Danon disease is an X-linked storage disorder causing cardiomyopathy, most often symmetric HCM (56%), then asymmetric (38%), and rarely dilated (6%).

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1. Introduction2. HCM: Characteristics and Brief Overview3. Conditions that can mimic HCM• Amyloidosis• Athletes heart• Hypertensive Heart Disease• Fabry's Disease• Danon disease• Chloroquine induced• Friedreich's Ataxia4. Conclusion

CAEE-91 NOT JUST A PDA: MULTIMODAL IMAGING OF THE AORTOPULMONARY WINDOW FROM FETAL LIFE TO ADULTHOOD

Jochen Gerstner, MD (*Presenter*)
Laura Acosta, MD (*Abstract Co-Author*)
Lorna Browne, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Aortopulmonary window (APW) is a rare congenital defect often mistaken for patent ductus arteriosus (PDA), with important clinical and surgical implications. Multimodal imaging—particularly CT angiography and cardiac MRI—is key to accurate diagnosis and classification. Timely identification is critical to prevent progressive complications such as pulmonary overcirculation and pulmonary hypertension. APW can be missed on echocardiography, resulting in severe pulmonary hypertension and potentially leading to Eisenmengers syndrome. This exhibit will: a. Illustrate the embryology and classification of APW. b. Provide a multimodality case-based review using CT and MR imaging. c. Highlight key diagnostic features across a spectrum of presentations, including late-presenting cases. d. Discuss surgical repairs and implications of APW variants with PDA or interrupted aortic arch.

TABLE OF CONTENTS/OUTLINE

Background : Embryology and developmental anatomy of the aorticopulmonary septum Classification : Overview of APW types I-III Imaging Methods : a. CT angiography protocols and key reconstructions b. MRI protocols including 4D flow MR Case Series : a. Multimodal review of preoperative and postoperative cases b. Late presentation with pulmonary hypertension missed on multiple echocardiograms Differential Diagnosis : PDA, truncus arteriosus, MAPCAs Diagnostic Pearls and Pitfalls : Practical guidance for radiologists Conclusion : APW spans a diverse clinical spectrum. Recognizing its variants and associations is vital when evaluating neonates with suspected shunt lesions and in older patients with unexplained pulmonary hypertension.

CAEE-92 THROUGH THE DOOR TO DORV: THE ROLE OF IMAGING IN OPERATIVE DECISION-MAKING FOR DOUBLE OUTLET RIGHT VENTRICLE

Shravan Sridhar, MD, MS (*Presenter*)
Muthu Kumar Sakthivel, MBBS, MD (*Abstract Co-Author*)
Prabhakar Rajiah, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Double outlet right ventricle (DORV) is a rare congenital heart disease and is typically repaired in the perinatal period. The surgical management strategy depends on alignment between the ventricular septal defect and arteries, degree of ventricular outflow obstruction, ventricular development, and presence of other defects. Here, we examine malformations, preoperative imaging parameters, and operations for DORV. Learning objectives include 1) Differentiate the different types of DORV based on morphologic features, 2) Understand utility of CT and MRI in the assessment of unrepaired DORV, 3) Become familiar with interventions and image-based decision points.

TABLE OF CONTENTS/OUTLINE

1. Title, disclosure2. Abbreviations3. Overview4. Embryology and anatomy a. Conotruncal rotationb. DORV mechanism5. Malformations a. Ventriculoarterial malalignmentb. Ventricular septal defect (VSD) positionc. Ventricular outflow tract obstructiond. Ventricular size and functione. Common comorbid defects (e.g. AV canal)6. Surgical decisions + imaging a. VSD sizeb. VSD-aorta relationshipc. Ventricular outflow tract stenosisd. Pulmonic valve/PA hypoplasiae. AV valve anatomy (straddling)f. Ventricular size/functiong. Coronary anatomy7. Operations a. Biventricular i. Intracardiac baffle to aorta/PA ii. Arterial switch iii. Double root translocation iv. Rastelli v. Nikaidoh vi. Kawashima vii. RV-PA conduit viii. Transannular patchb. 1.5 Ventricle repairc. Fontan8. Summary: Malformations9. Summary: Operative strategy10. References

CAEE-93 EMERGING POTENTIAL OF NON-ECG-GATED CARDIAC CT: CURRENT ACHIEVEMENTS AND FUTURE PERSPECTIVES

Junji Mochizuki, MSc, RT (*Presenter*)
Noriko Oyama-Manabe, MD, PhD (*Abstract Co-Author*)
Yoshiki Hata (*Abstract Co-Author*)

TEACHING POINTS

A. To understand the technological advancements enabling non-ECG-gated cardiac CT B. To recognize clinical scenarios where non-ECG-gated imaging is effective C. To compare ECG-gated and non-ECG-gated techniques to guide appropriate imaging selection

TABLE OF CONTENTS/OUTLINE

A. Overview of ECG-Gated Cardiac CT and Its Limitations ECG-gated cardiac CT has been central to coronary artery assessment and cardiac function evaluation. However, its clinical use can be limited by heart rate dependency, the need for ECG lead placement, and patient preparation. B. Technological Innovations Enabling Non-ECG-Gated Imaging Recent advancements in CT hardware and software—including wide detector coverage, improved temporal resolution, and advanced motion correction algorithms—have enabled non-ECG-gated cardiac imaging with clinically acceptable image quality. C. Clinical Applications of Non-ECG-Gated Cardiac CT Coronary Artery Disease: Morphologic assessment of coronary arteries and plaque characterization Myocardial Disease: Evaluation of myocardial perfusion abnormalities and delayed enhancement Aortic Disease: Rapid evaluation of aortic dissection and aneurysm, particularly in emergency settings D. Advantages and Limitations Non-ECG-gated imaging offers simplified scanning protocols and reduced scan times. However, because it is not synchronized with the cardiac cycle, selective exposure based on the heartbeat is not possible, which may lead to increased radiation dose. Additionally, narrowing the exposure range makes the scan more susceptible to motion artifacts. Furthermore, due to the absence of ECG information, functional cardiac assessment is difficult.

CAEE-94 WILL MACHINE LEARNING REPLACE TRADITIONAL CARDIAC IMAGING?

Mehrad Rokni, MD (*Presenter*)
Linh Vo (*Abstract Co-Author*)
Kamhung Lam (*Abstract Co-Author*)
Sofiya Ghazaryan (*Abstract Co-Author*)
Michelle Wang (*Abstract Co-Author*)
Nicholas Fong (*Abstract Co-Author*)
Majid Hassan, MD (*Abstract Co-Author*)
Ahmadreza Ghasemiesfe, MD (*Abstract Co-Author*)
Misagh Piran, MD (*Abstract Co-Author*)

TEACHING POINTS

Artificial intelligence (AI) transforms cardiac imaging by enhancing segmentation, diagnosis, and risk stratification in coronary CT, cardiac MRI, echocardiography, and nuclear cardiology. AI achieves high diagnostic accuracy (e.g., 95% sensitivity in CT plaque detection) and speeds analysis (30-50% faster MRI processing), improving workflow efficiency. Limitations include training data biases, model transparency issues, and regulatory hurdles (~10% of tools FDA-cleared in 2025). AI is not a replacement but a collaborative tool, amplifying radiologist precision and expanding access in underserved areas. Responsible integration ensures ethical deployment and improved patient outcomes.

TABLE OF CONTENTS/OUTLINE

Introduction Definition of AI and machine learning Historical context in cardiac imaging Key Applications Automated segmentation in CT and MRI Diagnostic support in echocardiography Prognostic modeling in nuclear cardiology Advantages Enhanced precision, consistency, speed Reduced workload, better rural access Challenges Algorithmic bias, data limitations Regulatory and interpretability issues Future Directions Radiologist-AI collaboration Ethical and oversight frameworks

CAEE-95 EVOLUTION OF MYOCARDIAL INFARCT: CHALLENGES FOR CMR IMAGING

Nicole Bodnariuc (*Presenter*)
Felipe S. Torres, MD, PhD (*Abstract Co-Author*)
Kate Hanneman, MD, MPH (*Abstract Co-Author*)
Elsie Nguyen, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

Myocardial infarcts (MI) are commonly seen on CMR and yet their evolution over time is not well captured, because repeated imaging follow-up is not standard of care. Various stages of a myocardial infarct can lead to both over and under-estimation of viable myocardium versus replacement fibrosis in MI.

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Viability assessment in acute MI can result in over-estimation of infarct size in the presence of acute myocardial edema from ischemic injury. Imaging findings of acute MI include elevated native T1 and T2 values, and late gadolinium enhancement (LGE) Fatty (lipomatous) metaplasia can develop within chronic MI and cause over-estimation of viability (also by nuclear perfusion imaging). Fatty metaplasia can also mimic MI on late gadolinium enhancement imaging requiring other clues that fatty metaplasia is present (chemical shift artifact on steady state free precession imaging, hyperintensity on spin echo imaging, fat saturation techniques, computed tomography) Native T1 values are elevated in the presence of fibrosis and can be used to identify scar in MI, without the use of LGE imaging. However, this can be confusing in the presence of fatty metaplasia, which decreases native T1 values. Multi-sequence protocols are key to recognizing fatty metaplasia. Microvascular obstruction (MVO), intramyocardial hemorrhage (IMH) are associated with larger MI and confer worse prognosis. However, the long term- prognostic implications of fatty metaplasia are not clear and whether there is higher risk of fatty metaplasia in areas of MVO and IMH. Differentiation of MVO versus IMH is challenging without the use of T2* imaging.

CAEE-96 RIGHTS AND LEFTS OF VENTRICULAR NONCOMPACTION

Gregory Jew, MD (*Presenter*)
Abhishek Chaturvedi, MD (*Abstract Co-Author*)

TEACHING POINTS

1. What is ventricular non compaction 2. What is the clinical significance of non compaction (NC) 3. How to diagnose noncompaction using cardiac MRI. 4. Complications of LVNC and RVNC. 5. Differential Diagnosis for noncompation

TABLE OF CONTENTS/OUTLINE

1. What is ventricular non compaction? 2. Background and History. 3. Clinical impacts of noncompaction. 4. Diagnostic criteria for LVNC5. Background for RVNC. 6. Clinical impact of RVNC. 7. Diagnostic criteria for RVNC. 8. Complications of LVNC and RVNC. 9. Differential diagnoses and common pitfalls when encountering noncompaction

CAEE-97 CARDIAC CT MANIFESTATIONS OF IMMUNE CHECKPOINT INHIBITORS TREATMENT

Vincenzo Scialo (*Presenter*)
Vanessa Stubbs (*Abstract Co-Author*)
Joerg Herrmann (*Abstract Co-Author*)
Melanie Bois (*Abstract Co-Author*)
Esther Lutgens (*Abstract Co-Author*)
Tim Leiner, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Immune checkpoint inhibitors (ICI), while revolutionizing cancer therapy, can disrupt cardiac immunotolerance and trigger immune-related adverse events such as myocarditis, vasculitis and coronary artery inflammation. Understanding the cardiac immunological architecture is essential to insight the pathogenesis of ICI-induced toxicity. ICI-related cardiac complications show radiological correlates on cardiac CT imaging, for instance accelerated atherosclerosis and peri - coronary inflammation. Cardiac CT offers a non-invasive tool to recognize imaging features of immune-mediated cardiovascular toxicity. Imaging biomarkers such as increased Hounsfield unit values in peri-coronary adipose tissue (PCAT) and phenotypic analysis of coronary plaques may serve as non-invasive hallmarks for vascular immune dysregulation. Cardiac CT is an essential tool in multidisciplinary cardio-oncological care.

TABLE OF CONTENTS/OUTLINE

Introduction to cardio-immunology: definition and physiology of the immune system in cardiac physiology.Immuno-Anatomy of the Heart: Immune composition inside the cardiac layers. ICI and Immune Dysregulation: signs of reduced immunotolerance (from histology to imaging).Imaging findings of accelerated atherosclerosis on CCTA: Plaque phenotype, remodeling, and PCAT changes.

CAEE-98 "UNMASKING MINOCA: THE DIAGNOSTIC POWER OF CARDIAC MRI" HIGHLIGHTING THE PIVOTAL ROLE OF CMR IN UNCOVERING THE HIDDEN CAUSES OF MYOCARDIAL INFARCTION WITH NON-OBSTRUCTIVE CORONARY ARTERIES

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Carlos Capunay, MD (*Abstract Co-Author*)

TEACHING POINTS

MINOCA is a working diagnosis, not a final one; it requires thorough investigation to determine the underlying cause. Cardiac MRI (CMR) is a crucial non-invasive tool in differentiating the etiology of MINOCA—whether ischemic, inflammatory, or cardiomyopathic. CMR provides tissue characterization, which guides patient management and prognosis beyond what angiography alone can offer. The absence of obstructive coronary disease does not rule out myocardial infarction, which can be confirmed by late gadolinium enhancement patterns. Early use of CMR (ideally within 7 days of presentation) increases diagnostic yield significantly.

TABLE OF CONTENTS/OUTLINE

1. Definition & Clinical Context 2. Diagnostic Approach Initial evaluation includes: ECG Troponin levels Coronary angiography Exclusion of mimics (e.g., myocarditis, pulmonary embolism, Takotsubo). 3. Role of Cardiac MRI Protocol: Cine SSFP, T2-weighted imaging, T1/T2 mapping, early/late gadolinium enhancement. Detects: Infarction: subendocardial or transmural LGE in a coronary territory. Myocarditis: mid-wall or subepicardial LGE, often in inferolateral wall. Takotsubo cardiomyopathy: apical ballooning with myocardial edema, typically no LGE. Other: microvascular dysfunction, embolic events, vasospasm, spontaneous coronary dissection. 4. Clinical Implications CMR provides a definitive diagnosis in ~75-90% of MINOCA cases. Identifying the etiology influences: Antiplatelet or anticoagulation decisions. Need for immunosuppressive therapy (e.g., myocarditis). Long-term prognosis and follow-up planning. 5. Case Examples

Abstract Archives of the RSNA, 2025

CHEE

Chest Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

CHEE-1 BLIND SPOTS - OCCULT CANCER ON CHEST PLAIN RADIOGRAPH

Junwoo Kim, MD (*Presenter*)
Azza A. Elgendy, MD, PhD (*Abstract Co-Author*)
Emrah Duman, MD (*Abstract Co-Author*)
Zehavit Kirshenboim (*Abstract Co-Author*)
Rodolfo Calderon (*Abstract Co-Author*)
Chinwike T. Agbo, MD (*Abstract Co-Author*)

TEACHING POINTS

Chest radiograph interpretation is a demanding task, requiring a delicate balance between speed and accuracy. Proper interpretation of chest radiographs requires reasonable clinical knowledge, anatomical knowledge, and a comprehensive systematic approach. Despite its high spatial resolution, surpassing that of computed tomography (CT), the presence of inherently dense regions such as at the scapula tip, hilum, and costochondral junction with superimposition of structures can pose challenges to lesion detection as part of the interpretation of chest radiographs. Although aberrations in mediastinal lines and stripes can help with lesion detection and differential diagnosis, acknowledging specific blind spots within the lung could significantly enhance chest radiograph interpretation and potentially reduce the likelihood of missing concerning nodules. We propose a comprehensive approach to chest radiograph interpretation with a focus on division of the lung into zones with identification of key areas of focus within the lung in addition to mediastinal lines and stripes identification that will serve as a guide for radiologists to address these blind spots and enhance accuracy in nodule and potentially malignancy detection. We will highlight the practical impact of highlighting these key lung blind spots by analyzing various chest radiographs with pertinent findings along with their CT/PET-CT correlates that were initially overlooked.

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Purpose / A case series on blind spots / Conclusion

CHEE-2 CHEST RADIOGRAPHIC PATTERNS OF DIFFUSE LUNG DISEASE: A SYSTEMATIC APPROACH

Kristopher W. Cummings, MD (*Presenter*)
Sarah Anderson, MD (*Abstract Co-Author*)
Carlos Andres Rojas, MD (*Abstract Co-Author*)
Clinton E. Jokerst, MD (*Abstract Co-Author*)
Prasad M. Panse, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Identify and describe characteristic radiographic patterns associated with diffuse lung diseases. 2. Present a structured and systematic approach to refining the differential diagnosis of diffuse lung disease when interpreting a chest radiograph. 3. Illustrate key concepts through case-based radiographic examples with computed tomography (CT) correlates.

TABLE OF CONTENTS/OUTLINE

I. Introduction a. Overview of diffuse lung disease b. Importance of chest radiography in initial evaluation c. Limitations of chest radiography and role of CT correlation II. Systematic approach to diffuse lung disease on chest radiographs a. What is the predominant pattern? i. Linear ii. Nodular iii. Alveolar b. Is architectural change present to indicate chronicity? i. Distortion ii. Volume Increase / Decrease c. What is the distribution? i. Diffuse ii. Upper/middle/lower lung predominant iii. Central or peripheral d. Are there other associated findings? III. Case-based examples a. Several radiographic case-based examples with CT correlates for common diffuse lung diseases with emphasis on high-yield differential diagnoses IV. Summary a. Review framework for a diagnostic approach to diffuse lung disease on a chest radiograph b. Emphasize the importance of diffuse lung disease imaging patterns and pertinent clinical history V. References

CHEE-3 A FINE LINE BETWEEN SAFE AND SORRY: RADIOGRAPHIC EVALUATION OF THORACIC DEVICES

Rudinei Carlos Mezacasa Junior, MD (*Presenter*)

TEACHING POINTS

Chest radiography in intensive care and emergency settings plays a crucial role in monitoring critically ill patients, especially in the evaluation of invasive medical devices. Anatomical recognition and a solid understanding of proper positioning criteria are essential skills for radiologists and attending physicians, contributing significantly to the prevention of serious complications arising from device misplacement. The objective of this work is to provide an educational and systematic approach to the most commonly assessed devices on chest radiographs: endotracheal tubes, gastrointestinal tubes, and short and long term central venous catheters. Through illustrative examples, anatomical diagrams, and real radiographic images, we will discuss objective criteria for ideal positioning, relevant anatomical landmarks, and acceptable variations. Cases of malpositioning and associated complications will also be analyzed, highlighting the importance of early intervention. As a final product, a visual interpretation algorithm and a practical checklist will be proposed, focusing on patient safety and the reduction of diagnostic errors.

TABLE OF CONTENTS/OUTLINE

Case-based didactic review of the correct positioning of the main devices seen on chest radiographs, based on our service's digital archive and correlated with a comprehensive literature review.

CHEE-4 CHEST X-RAY PITFALLS IN THE EMERGENCY DEPARTMENT AND EMERGING AI

Oscar Jesus Perez Gonzalez, MD (*Presenter*)

TEACHING POINTS

Identify common interpretation errors on emergency chest radiographs: apical pneumothorax, subtle pulmonary consolidations, rib fractures, and catheter malposition.Understand key radiographic signs that are often missed and strategies to avoid these errors.Recognize the potential role of artificial intelligence as a complementary tool, especially in resource-limited environments.

TABLE OF CONTENTS/OUTLINE

Introduction: Importance of chest radiographs in emergency settings. Case 1: Missed apical pneumothorax. Case 2: Misinterpreted pulmonary consolidation. Case 3: Undetected rib fractures. Case 4: Malpositioned central venous catheter. Case 5: AI-assisted detection of rib fractures. Conclusion: Educational reinforcement of systematic reading and critical adoption of emerging AI.

CHEE-5 AN OLD DIAGNOSIS, NEW INSIGHTS: REVISITING PULMONARY EDEMA THROUGH MULTIMODALITY IMAGING

Helena Puigderrajols Vehils, MD (*Presenter*)
Alejandra Alvarado, MD (*Abstract Co-Author*)
Marcos A. Mestas Nunez SR, MD (*Abstract Co-Author*)
Alejandra Micolich Vergara, MD (*Abstract Co-Author*)
Jose Maria Maiques Llacer, MD (*Abstract Co-Author*)
Flavio Zuccarino (*Abstract Co-Author*)

TEACHING POINTS

• To present an updated classification of pulmonary edema, integrating current pathophysiological concepts, clinical presentation, and imaging evolution after therapy. • To illustrate characteristic imaging features using chest radiography and CT, with complementary roles of thoracic ultrasound and MRI. • To enhance diagnostic accuracy via pattern recognition, improving radiologic interpretation and clinical decision-making.

TABLE OF CONTENTS/OUTLINE

1. Introduction - Definition and classification of pulmonary edema. - Relevance of underlying pathophysiology. 2. Imaging Modalities - CXR and CT: cornerstone tools. - Ultrasound: bedside detection and monitoring. - MRI: additional tool in specific clinical scenario. 3. Types and Patterns Hydrostatic Edema : - Bilateral: cardiogenic (LHF, LA obstruction), PVOD, fluid overload. - Unilateral: mitral regurgitation, decubitus, re-expansion, vascular obstruction. Permeability Edem a: - With DAD: ARDS - Without DAD: drug-induced, medication-related. Mixed Edema : - HAPE, neurogenic, post-surgical (LVRS, transplant, pneumonectomy).

CHEE-6 AND BREATHE NORMALLY: A BACK-TO-BASICS APPROACH TO MOSAIC ATTENUATION

Delfina Linares, MD (*Presenter*)
Maria C. Ferrario, MD (*Abstract Co-Author*)
Maria S. Fernandez Castillo Odena, MD (*Abstract Co-Author*)
Sofia D. Gambetta I, MD (*Abstract Co-Author*)
Joaquin Martinez Pereira, MD (*Abstract Co-Author*)
Federico G. Diaz Telli, MD (*Abstract Co-Author*)
Antonella Pierina Ruiz, MD (*Abstract Co-Author*)
JOSEFINA MEDINA (*Abstract Co-Author*)
Juan P. Perotti, MD (*Abstract Co-Author*)

TEACHING POINTS

To differentiate and classify the causes of mosaic attenuation. - To review the pathophysiologic mechanisms underlying mosaic attenuation on chest CT. - To identify ancillary findings associated with mosaic attenuation that help guide the differential diagnosis. - To emphasize the importance of expiratory CT in the assessment of mosaic attenuation. - To integrate clinical history and contextual imaging findings to narrow the diagnostic possibilities.

TABLE OF CONTENTS/OUTLINE

Introduction Definition of mosaic attenuation Clinical relevance and diagnostic challenges Pathophysiologic Mechanisms Imaging Approach to Mosaic Attenuation Role of inspiratory and expiratory CT Distribution patterns Ancillary imaging findings Diagnostic Classification Vascular-type pattern Airway-type pattern Parenchymal-type pattern Mixed-pattern considerations Common Pitfalls and Mimickers Artifacts Misinterpretation of normal variants Overlapping features Clinical Integration and Diagnostic Strategy Role of clinical history and pulmonary function tests Diagnostic algorithm Conclusion

CHEE-7 SIFTING THROUGH THE LAYERS: USING AVERAGE INTENSITY PROJECTION ON CT TO BETTER UNDERSTAND CXR ANATOMY/PATHOLOGY

Om Evani, MD (*Presenter*)
Emile B. Gordon, MD (*Abstract Co-Author*)
Katherine A. Cheng, MD (*Abstract Co-Author*)
Holly L. Nichols, MD (*Abstract Co-Author*)
H. Page McAdams, MD (*Abstract Co-Author*)
Michael R. Harowicz, MD (*Abstract Co-Author*)

TEACHING POINTS

Chest radiograph (CXR) can be a challenging modality to interpret given the superimposition of multiple structures in the body wall, mediastinum, and lung parenchyma. Computed tomography (CT) correlates have long been helpful for teaching CXR anatomy and pathology; however, the Average Intensity Projection (AIP) CT technique is a lesser known and under-utilized tool that can help educate learners at the workstation and serve as a problem-solving tool when comparing CXR to a prior CT. AIP technique shows the average attenuation value of CT voxels over a set slice thickness. This can create a scrollable CXR using coronal and sagittal CT images, which mimics both frontal and lateral CXRs, respectively. Reviewing these simulated CXRs at different coronal and sagittal CT depths can better enable learners to comprehend CXR normal anatomy and distinguish from abnormalities.

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1) Review normal CXR anatomy using AIP: Normal lines/stripes, Anterior, middle, and posterior mediastinal structures, Lateral CXR anatomy. 2) Understanding normal/abnormal courses of lines/tubes: Normal left internal jugular vein line crossing midline at/just below the clavicle in the left brachiocephalic vein, Arterially placed lines, Anatomic variants (duplicated SVC). 3) Highlight CXR pathology and potential fake-outs: Partial anomalous pulmonary venous return, Subcarinal nodal metastasis mimicking ascending aorta, Dilated left superior intercostal vein mimicking mediastinal mass, Left upper lobe collapse.

CHEE-8 NON-ACUTE LUNG TRANSPLANT COMPLICATIONS: PEARLS AND PITFALLS

Noelani Gonzales, DO (*Presenter*)
Catherine C. Bullock, MD (*Abstract Co-Author*)
Isabel Oliva Cortopassi, MD (*Abstract Co-Author*)
Prabhakar Rajiah, MD, FRCR (*Abstract Co-Author*)
Satinder P. Singh, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Non-acute complications of lung transplant fall into five main categories: 1) rejection, 2) infection, 3) malignancy, 4) primary disease recurrence, and 5) late post-surgical anastomotic complications. 2. Protocol selection is key in identifying diagnoses. 3. Diagnosing post lung transplant complications on chest imaging can help clinicians prevent allograft failure.

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Timing of lung transplant complications Infection - Aspergillus Most common infection to cause bronchial narrowing/stenosis - Infected pneumatocele Allograft dysfunction - Bronchiolitis obliterans syndrome (BOS) Most common form of chronic lung allograft dysfunction (CLAD) Pearl: Check expiratory views for air trapping Pitfall: BOS and RAS can occur at the same time - Restrictive allograft syndrome (RAS) Less common form of CLAD - Organizing pneumonia Malignancy - Bronchogenic carcinoma Pearl: Hounsfield units can help differentiate a mass from mucus - Post transplant lymphoproliferative disorders (PTLD) Pitfall: Rare presentations of chronic vascular rejection include a mass-like pattern that may appear indistinguishable to PTLD on CT Primary disease recurrence - Sarcoidosis 47% recurrence post-transplant Pearl: Could manifest as a single nodule as soon as 2 months post-transplant - Alveolar proteinosis Pitfall: Can be indistinguishable to pulmonary edema on CT Anastomotic complications - Venous aneurysms Pearl: A radiographic "double density" should prompt a CT to rule out anastomotic complications such as venous aneurysm - Vascular anastomotic narrowing - Bronchial stenosis May present as "vanishing bronchus intermedius syndrome"

CHEE-9 THE NODULAR PATTERN IN CHEST CT: A STEP-BY-STEP DIFFERENTIAL DIAGNOSIS

Inigo Deba Ayarza, MD (*Presenter*)
Manex Lasa, MD (*Abstract Co-Author*)
Mikel Merino Aboitiz, MD (*Abstract Co-Author*)
Paula Blanco Hernandez, MD (*Abstract Co-Author*)
Andres Riano Garcia, MD (*Abstract Co-Author*)
Udane Oiartzabal, MD (*Abstract Co-Author*)
Javier Castillo de Juan (*Abstract Co-Author*)
Silvia Cisneros Carpio, MD (*Abstract Co-Author*)

TEACHING POINTS

The secondary pulmonary lobule is the key structural unit for interpreting micronodular patterns on chest CT. Pulmonary micronodules (<6 mm) are classified by distribution: centrilobular, perilymphatic, or random. Centrilobular nodules often reflect infectious, inflammatory, or vascular processes and may display a "tree-in-bud" pattern. Perilymphatic nodules follow lymphatic routes and are characteristic of sarcoidosis, lymphangitic carcinomatosis, and pneumoconioses. Randomly distributed nodules suggest hematogenous spread, seen in miliary infections and metastatic disease.Accurate classification of distribution patterns, combined with clinical and ancillary imaging findings, is essential for differential diagnosis and optimized patient management.

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1. Introduction to the Secondary Pulmonary Lobule: 1a. Anatomy and imaging relevance 1b. Dimensions and visibility on HRCT 2. Micronodular Pattern: Definition and Importance 2a. Subtype of nodular pattern 2b. Criteria: nodules <3 mm in diameter 3. Classification by Distribution 3a. Centrilobular: common etiologies and imaging clues 3b. Perilymphatic: typical diseases and path of spread 3c. Random: implications of hematogenous dissemination 4. Diagnostic Algorithm and Case-Based Approach 4a. Stepwise identification of distribution patterns 4b. Illustrated cases highlighting typical appearances 5. Clinical Integration and Conclusion 5a. Correlation with clinical data and ancillary CT signs 5b. Role of the radiologist in guiding diagnosis and management

CHEE-10 STRANGER THINGS: UNUSUAL LUNG INFECTIONS IN PULMONARY IMAGING

Catalina Jaramillo, MD (*Presenter*)
Carlos S. Restrepo, MD (*Abstract Co-Author*)
Emma C. Ferguson, MD (*Abstract Co-Author*)
Erika G. Odisio, MD (*Abstract Co-Author*)
Liliana Arias (*Abstract Co-Author*)
Daniel Ocazionez-Trujillo, MD (*Abstract Co-Author*)

TEACHING POINTS

• Legionella pneumophila infection often begins as a unilateral, unilobar alveolar infiltrate that may progress to consolidation or spread to new areas. Lower lobe involvement and pleural effusion are common findings on imaging. • HHV-8 pulmonary infection, often seen in immunocompromised patients like those with HIV, is primarily associated with Kaposi's sarcoma. Imaging shows asymptomatic nodular opacities, peribronchovascular thickening, pleural effusions, and possible endobronchial lesions. • Mucormycosis, common in immunocompromised individuals, especially diabetics, is characterized by the reverse halo sign, where ground-glass opacity is surrounded by consolidation. • Pulmonary Strongyloides stercoralis infection, seen in hyperinfection or disseminated disease, often shows ground-glass opacities with interlobular septal thickening on CT, suggestive of alveolar hemorrhage. • Human pulmonary dirofilariasis is a rare zoonotic infection from Dirofilaria immitis (dog heartworm), presenting as a solitary, well-circumscribed, noncalcified subpleural nodule—often in the lower lobes—due to infarction from embolized dead worms.• Pulmonary paragonimiasis, caused by lung flukes, is acquired by eating undercooked freshwater crustaceans and presents with peripheral nodules, cystic lesions, pleural effusion, consolidation, lymphadenopathy, or pericardial involvement.

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• Bacteriao Legionella pneumophila o Francisella tularensis o Nocardia species• Viruso Human Herpesvirus • Fungio Paracoccidioides specieso Mucormycosis • Parasiteso Strongyloides stercoralis o Echinococcus specieso Pulmonary Dirofilariasiso Loa loa o Paragonimiasis

CHEE-11 QUANTITATIVE IMAGING BIOMARKERS IN LUNG CANCER: CURRENT TRENDS AND FUTURE DIRECTIONS

Amanda Acevedo (*Presenter*)
Ronak Kundalia, MSc, BS (*Abstract Co-Author*)
Jean Bontemps (*Abstract Co-Author*)
C. David Pfaehler (*Abstract Co-Author*)
Joice C. Prodigios, MD (*Abstract Co-Author*)
Jessica Gemmell (*Abstract Co-Author*)
Henry Okonkwo (*Abstract Co-Author*)
Brianna A. Karim, BS (*Abstract Co-Author*)
Maysa R. de Oliveira, MD (*Abstract Co-Author*)
Jennifer Wen (*Abstract Co-Author*)
Pavan Iyengar (*Abstract Co-Author*)
Joao Fonseca, MD (*Abstract Co-Author*)
Bruno Hochhegger, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Describe the standardized workflow for creating quantitative imaging biomarkers (QIBs). Interpret key CT, PET, and MRI metrics (e.g. volumetry, SUV-based indices, etc.) and explain how each informs lung-cancer detection, staging, and therapeutic response assessment. Identify how AI-driven radiomics and radiogenomics uncover imaging phenotypes linked to molecular pathways and evaluate their added prognostic value beyond conventional staging. Recognize the advantages, limitations, and future potential of emerging technologies—dual-energy & photon-counting CT, PET/MRI, federated learning, and multi-omics integration—in advancing precision oncology. Apply QIB knowledge to clinical decision-making and research design, appreciating current implementation barriers and strategies to overcome them.

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Introduction: Role of imaging in lung cancer screening and diagnosis Core Concepts: QIB definitions, radiomics workflow, and standardization efforts Established QIBs: RECIST 1.1, tumor volume, SUVmax, ADC, MTV, and TLG Emerging Technologies: AI-assisted segmentation, radiogenomics, DECT, PET/MRI, photon-counting CT Clinical Applications: QIBs in early detection, therapeutic response, and risk stratification Challenges: Reproducibility, feature variability, data-sharing barriers, and ethical issues Future Directions: Multi-omics integration, federated learning, and precision oncology Conclusion: QIBs hold promise to personalize lung cancer care and improve outcomes

CHEE-12 TNM-9: TRACKING, NAVIGATING, AND MAPPING THE NEW LUNG CANCER STAGING SEA

Pedro Mecate Prada, MD (*Presenter*)
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TEACHING POINTS

Recognize the clinical relevance of early detection and accurate diagnosis of lung cancer using the updated TNM-9 classification. Emphasize the role of imaging modalities, including 18-FDG-PET/CT, in the precise staging and therapeutic planning of lung cancer. Review the changes in lymph node involvement criteria and the introduction of new subgroups in metastasis classification. Present illustrative cases to demonstrate diagnostic challenges, typical imaging features, and treatment strategies.

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Introduction - Overview of epidemiology, anatomy, and clinical impact of lung cancer. Imaging Modalities 18-FDG-PET/CT: Essential for accurate staging and evaluation of lymph node involvement. CT/MRI: Define lesion extent, guide biopsy, and surgical planning. TNM-9 Classification Updates Tumor (T): No significant changes from TNM-8. Lymph Nodes (N): Introduction of N2a and N2b categories for better prognostic differentiation. Metastasis (M): New subgroups M1c1 and M1c2 to distinguish between single and multiple organ involvement. Case-Based Review Show various cases of different classifications, including examples of the changes in TNM-9. Treatment and Follow-Up: Imaging role in staging, planning, and monitoring. Diagnostic Flowchart: Structured algorithm to support accurate reporting.

CHEE-13 ULTRASOUND ASSESSMENT OF DIAPHRAGMATIC FUNCTION: REDEFINING AND EXPANDING THE RADIOLOGIST'S ROLE

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TEACHING POINTS

The purpose of this exhibit is to review the anatomical and physiological fundamentals of diaphragmatic function with an emphasis on its relevance in clinical practice, to present a standardized ultrasound protocol for diaphragmatic function assessment, including key sonographic findings and their most relevant clinical applications, and to explore emerging techniques and future perspectives of ultrasound in the evaluation of the diaphragm, highlighting its expanding utility in diverse clinical settings.

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1. Introduction: Diaphragmatic Anatomy and Function 2. Diaphragmatic Dysfunction: Clinical Aspects and Diagnosis 3. Ultrasound Assessment of Diaphragmatic Function a. Technique: Assessment of Diaphragmatic Excursion Assessment of Diaphragmatic Thickness and Thickening Fraction b. Limitations and Recommendations c. Clinical Applications d. Clinical Cases 4. Ultrasound-Guided Diaphragmatic Electromyography 5. What Lies Ahead: Emerging Techniques in Diaphragmatic Ultrasound

CHEE-14 TNM 9 IN ACTION: A RADIOLOGIST'S TOOLKIT FOR LUNG CANCER STAGING AND REPORTING TO GUIDE TREATMENT DECISIONS

Francisco Calle Bernal, MD (*Presenter*)
Paula N. Patino, MD (*Abstract Co-Author*)

TEACHING POINTS

Provide radiologists with a comprehensive framework for staging lung cancer using CT imaging, aligned with the TNM-9 classification. Emphasize the impact of imaging findings on surgical decision-making, with examples drawn from current thoracic surgical practices. Apply a systematic approach to evaluating the tumor, lymph nodes, and metastasis for accurate staging. Highlight the value of structured reporting to ensure clarity and completeness in communication. Offer practical guidance for integrating imaging findings into multidisciplinary rounds (MDR) to support collaborative treatment planning.

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Overview of the Lung Cancer TNM 9 System T: Tumor Component Tumor Size Local Invasion Separate Tumor Nodules Measurement Pitfalls (Multiplanar Reconstructions & Atelectasis) N: Regional Lymph Nodes Nodal Stations and Staging Imaging Modalities and Pitfalls M: Distant Metastasis Intrathoracic and Extrathoracic Sites Metastasis Subcategories Special Tumor Patterns Second Primary vs. Multifocal Disease Pneumonic-Type Adenocarcinoma and GGOs Lymphangitic Carcinomatosis Staging Groups and Tables Clinical vs. Pathological Staging Summary Table by TNM Surgical Treatment Tumor-Related Factors Patient-Related Factors Surgical Approach Considerations Operating on T4 Tumors Systematic Approach to Lung Cancer Reporting Multidisciplinary Rounds (MDR) Participation

CHEE-15 RADIOLOGY ON THE ONCOLOGIC FRONTLINE: ASSESSING TUMOR RESPONSE IN THORACIC CANCERS

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Ana L. Sanchez Martinez (*Abstract Co-Author*)
Ivan Vollmer, MD (*Abstract Co-Author*)

TEACHING POINTS

To understand the current criteria for Tumor Response assessment in thoracic malignancies To review the use of RECIST 1.1 in thoracic tumors To introduce new strategies such as iRECIST, PERCIST, response assessment in tumors treated with tyrosine kinase inhibitors(TKI), and modified RECIST for malignant pleural mesothelioma (MPM) To discuss challenges, pitfalls and new arising techniques (AI, radiomics?)

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1. Introduction: Importance of Imaging in Thoracic Oncology 2. Overview of Thoracic Cancers 2.1. Lung Cancer (NSCLC and SCLC) 2.2. Malignant Pleural Mesothelioma 2.3 Pulmonary metastases 3.Imaging Principles in Thoracic Oncology 3.1. Imaging Techniques: 3.1.2. Computed Tomography (CT) 3.1.3. Positron Emission Tomography (PET-CT) 3.1.4. Magnetic Resonance Imaging (MRI) 3.2. Role of Each Modality in Diagnosis, Staging, and Follow-Up 3.3. Advantages and Limitations 4. Radiologic Assessment of Tumor Response 4.1. RECIST 1.1 Criteria: Principles and Application 4.2. iRECIST Criteria: Immune Response Patterns 4.3. Other Criteria: PERCIST, modified RECIST for MPM, TKI treated turnors 4.4. Morphological vs. Metabolic Response 4.5. Complex Imaging Findings: Pseudoprogression, Necrosis, Fibrosis, Cavitation 5. Imaging in Clinical Practice 5.1. Imaging Patterns in Immunotherapy 5.2. Radiological Follow-Up: Protocols and Timing 6. Emerging Trends and New Technologies 6.1. Radiomics and Quantitative Imaging 6.2. Artificial Intelligence in Thoracic Imaging 6.3. Image Fusion and Hybrid Techniques 7. Discussion 8. Conclusion

CHEE-16 BEYOND THE NODULES: MANAGING INCIDENTAL FINDINGS IN LOW-DOSE CT FOR LUNG CANCER SCREENING

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Cedric Bongard (*Abstract Co-Author*)
Cynthia Schneider (*Abstract Co-Author*)
Kevin Selby (*Abstract Co-Author*)
David Rotzinger, MD,PhD (*Abstract Co-Author*)
Christophe Von Garnier (*Abstract Co-Author*)

TEACHING POINTS

• To describe incidental findings detected on low-dose CT (LDCT) for LCS and to define which require reporting and recommendations for further management according to the ACR reference guidelines and the ERS/ESTS/ESTRO/ESR/ESTI/EFOMP statement. • To offer practical tips and strategies for identifying which findings to report and for communicating their management effectively, thereby supporting referring physicians, reducing patient anxiety, and optimizing resource use.

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The burden of incidental findings in lung cancer screening (LCS) and their impact on participants, referral physicians, radiologists' workload and healthcare costs will be presented. Ethical and medico-legal implications will also be addressed.A systematic overview of common and uncommon pulmonary (e.g. emphysema, interstitial lung abnormalities, diffuse cystic lung disease,..) and extra-pulmonary (e.g. coronary artery calcifications, aortic aneurysm, mediastinal mass, breast and other extra-thoracic lesions, bone demineralization..) incidental findings will be illustrated with guidance based on ACR and ERS/ESTS/ESTRO/ESR/ESTI/EFOMP recommendations. Strategies for effective, balanced reporting and well-framed recommendations will be provided to support decision-making, ensure appropriate referrals and reduce unnecessary investigations.

CHEE-17 PEELING BACK THE LAYERS: A LAYERED APPROACH TO RESOLVING PLEURAL AND EXTRAPLEURAL MIMICRY ON IMAGING

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TEACHING POINTS

- Highlight imaging features across modalities: explore how radiography, ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) contribute to differentiate pleural from extrapleural lesions. - Demonstrate complexities in lesion localization: illustrate how lesion morphology, the presence of pleural effusion, rib involvement, and fat plane displacement can complicate the accurate localization of pleural and extrapleural lesions, using case examples. - Address diagnostic challenges in distinguishing benign from malignant solid pleural lesions, emphasizing critical factors like size, growth patterns, enhancement characteristics, and advanced imaging features (PET-CT, DWI-MRI). - Elucidate tumor-like pleural conditions: recognize conditions such as pleural plaques, organizing hematomas, and benign fibrous tumors to avoid the overdiagnosis of malignancy. - Evaluate diagnostic pitfalls in assessing extrapleural masses: focus on extrapleural lesions involving the pleura, originating from the chest wall, diaphragm, or mediastinum. - Discuss strategies to improve diagnostic accuracy in complex cases.

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- Normal pleural anatomy and imaging - Imaging Modalities: radiography, ultrasound, CT, MRI - Pleural vs. extrapleural lesions: morphological features, associated findings, case-based challenges - Solid Pleural Lesions: benign vs. malignant - Tumor-like pleural conditions mimicking malignancy: pleural plaques, organizing hematoma, benign fibrous tumors - Extrapleural lesions impinging on the pleura: chest wall, diaphragmatic, and mediastinal masses - identification of extrapleural origin - Conclusion and take-home messages

CHEE-18 ETHICAL, REGULATORY, AND PRACTICAL CHALLENGES IN AI-DRIVEN CHEST IMAGING

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Maysa R. de Oliveira, MD (*Abstract Co-Author*)
Joao Fonseca, MD (*Abstract Co-Author*)
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Henry Okonkwo (*Abstract Co-Author*)
Jennifer Wen (*Abstract Co-Author*)
Pavan Iyengar (*Abstract Co-Author*)
Amanda Acevedo (*Abstract Co-Author*)
Kayla Davis (*Abstract Co-Author*)
Kenneth Davis (*Abstract Co-Author*)
Joice C. Prodigios, MD (*Abstract Co-Author*)
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TEACHING POINTS

Highlight AI's benefits in diagnostic accuracy, workflow efficiency, and personalized patient care in chest imaging. Understand how challenges such as bias, transparency limitations, and validation difficulties impact AI-driven chest imaging. Discuss strategies to enhance fairness, explainability, and trust in AI models. Review regulatory and validation pathways for safe, accountable AI. Recognize the radiologist's role in AI adoption, including continuous education and collaboration.

TABLE OF CONTENTS/OUTLINE

1. Transformative Benefits of Chest AI Summary of AI's advantages in improving diagnostic accuracy, workflow efficiency, and personalized patient care. 2. Why Chest Imaging Needs Ethical AI Overview of ethical, regulatory, and practical challenges arising from AI implementation. 3. Identifying and Correcting Chest AI Bias Key sources of bias and practical steps to improve model fairness. 4. Navigating AI Regulatory Pathways Comparative view of FDA, EU AI Act, and NMPA frameworks and approval considerations. 5. Overcoming Integration Barriers Best practices for workflow integration, achieving generalization, and fostering radiologist engagement and trust. 6. Building the Future: Safe, Transparent, and Inclusive AI Guidelines for sustainable, ethical AI deployment.

CHEE-19 OVERVIEW OF ESOPHAGEAL SURGERY FOR RADIOLOGISTS

Daniel B. Green, MD (*Presenter*)
Sharon Steinberger, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit is designed to provide radiologists with an overview of esophageal surgeries. With a better understanding of what the surgeon needs to know, radiologists will be more likely to know what to look for and provide helpful information in their reports. Teaching topics will include:1) Imaging features of esophageal perforation and how to distinguish them from other non-surgical causes of pneumomediastinum. 2) Suggested imaging protocol for CT esophagography with examples of pre-contrast images and prone images as helpful additional series. 3) Brief overview of different surgical techniques for esophagectomy and some pre-operative anatomic considerations. 4) Expected post-surgical findings and post-surgical complications including esophageal stent complications. 5) Long-term surveillance to include cancer recurrence and later post-surgical complications.

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Scenarios will include:1) Suspected esophageal perforation2) Known esophageal cancer3) Acute complication from esophagectomy4) Esophageal stent5) Long-term surveillance following esophagectomy6) Achalasia7) Esophageal diverticulum

CHEE-20 DON´T LOSE YOUR WAY. "RIBS CAN ALSO BE BAD"

Alexandra Roxana Flores Calles, MD (*Presenter*)

TEACHING POINTS

DONT LOSE YOUR WAY. RIBS CAN ALSO BE BADComputed tomography (CT) plays a crucial role in the diagnosis and evaluation of costal masses, offering detailed imaging that aids in the identification and characterization of lesions. CT scans provide high-resolution cross-sectional images, which are particularly useful in assessing the anatomical location, size, and extent of rib masses. This imaging modality allows clinicians to distinguish between benign and malignant lesions, guide biopsies, and plan surgical interventions. One of the primary advantages of CT in diagnosing rib masses is its ability to detect subtle bony changes and soft tissue involvement. Malignant tumors often show evidence of aggressive bone destruction, cortical disruption, and irregular mass borders, which are typically suggestive of malignancy. Additionally, CT can reveal the presence of adjacent soft tissue infiltration, which may be indicative of malignancy extending beyond the ribs. These features are critical in staging tumors, especially in cases of primary bone malignancies like osteosarcoma or metastatic disease. Certain characteristics are highly suggestive of malignancy in costal masses on CT. These include large, ill-defined masses with irregular margins, evidence of rib erosion or destruction, and heterogeneous enhancement after contrast administration.

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1. Introduction2. Presentation of four cases of costal masses with radiological findings on computed tomography highly suggestive of malignancy in patients admitted to the Instituto Salvadoreño del Seguro Social Hospital, accompanied by pathological correlation.3. Literature Review 4. Conclusions

CHEE-21 WATCH OUT FOR THE CHEST! SYSTEMIC INFECTIOUS DISEASES WITH TYPICAL THORACIC MANIFESTATIONS

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Maisa B. Moroz, MD (*Abstract Co-Author*)
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Hye J. Lee, MD (*Abstract Co-Author*)

TEACHING POINTS

Systemic infections are often a severe condition with rapid progression and nonspecific manifestations, factors that might delay the diagnosis and hinder an appropriate management. A wide spectrum of systemic infections present thoracic manifestations, which may narrow the differential diagnosis and guide the clinical investigation. Teaching Points: • Review the most common pathways of thoracic involvement in systemic infections • Illustrate the thoracic manifestations of the systemic infections, focusing on the main pathways of the disease and the different ethiologies • Propose a systematic approach based on the main chest imaging findings and clinical features

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• Introduction • Physiopathology of thoracic involvement in systemic infections • Case-based illustration of the most common and uncommon systemic infections with thoracic manifestations and associated findings, including viral (e.g. dengue fever), bacterial (e.g. mycobacterial, leptospirosis, septic emboli), fungal (e.g., histoplasmosis, paracoccidioidomycosis, cryptococcosis) and parasitic agents (e.g., malaria, toxoplasmosis, Chagas disease). • Differential diagnosis with multimodality imaging: a systematic approach • Take home messages

CHEE-22 INTERPRETING THE SPINE ON CHEST CT: A SYSTEMATIC APPROACH FOR RADIOLOGISTS

Francisco Calle Bernal, MD (*Presenter*)
Maria Lucia Brun, MD (*Abstract Co-Author*)
Paula N. Patino, MD (*Abstract Co-Author*)

TEACHING POINTS

Provide a comprehensive and systematic approach to identifying and evaluating spinal pathologies on routine chest CT scans. Describe common incidental findings, as well as relevant congenital and structural disorders. Review traumatic injuries and degenerative changes, with emphasis on findings that help differentiate acute vs. chronic pathology. Explore primary and secondary neoplastic conditions, focusing on distinguishing imaging characteristics. Address infectious processes including spondylodiscitis, paraspinal abscesses, and Pott's disease. Propose an algorithm for the systematic evaluation of spinal abnormalities on chest CT.

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Step 1: Alignment Normal alignment Scoliosis Scheuermann's Disease Age-related hyperkyphosis Step 2: Vertebral Bodies Normal anatomy Congenital anomalies Traumatic fractures Insufficiency fractures and osteoporosis Sickle cell disease Benign density findings (Bone island, Osteopoikilosis) Malignant findings (Metastasis, Myeloma) Diffuse abnormalities (Osteopetrosis, Renal osteodystrophy) Step 3: Intervertebral Discs Normal disc features Spondylodiscitis Degenerative changes Step 4:

Spinal Canal Benign findings: Dural and ligamentum flavum calcifications Hemorrhage Congenital anomalies Tumors Pneumorrhachis and epidural lipomatosis Step 5: Neural Foramina & Paraspinal Soft Tissues Tumors: Schwannoma, Plasmacytoma, Lymphoma Cysts: Neurenteric, Extradural arachnoid Hematopoiesis Sarcomas: Chondrosarcoma, Osteosarcoma

CHEE-23 WHEN IMMUNITY FAILS: IMAGING INFECTIOUS AND NON-INFECTIOUS CHEST DISEASE IN PRIMARY IMMUNODEFICIENCY DISORDERS

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Israel Missrie, MD (*Abstract Co-Author*)
Marcio V. Sawamura, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- To review the spectrum of thoracic manifestations in Primary Immunodeficiency Disorders (PIDs), highlighting the key infectious pulmonary patterns and how these contribute to long-term structural changes in the lungs. - To highlight the growing recognition of non-infectious thoracic complications in PIDs, including interstitial lung disease (ILD), lymphoproliferative disorders, and thoracic neoplasms.- To emphasize that imaging findings in PIDs —such as ground-glass opacities, pulmonary nodules, bronchiectasis, and lymphadenopathy— are often non-specific and require careful clinical and laboratory correlation. - To illustrate that, while many PIDs share overlapping imaging features, certain disorders exhibit relatively specific patterns that aid in differential diagnosis

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1. Introduction An overview of Primary Immunodeficiency Disorders (PIDs), including their epidemiology, pathophysiology, and clinical aspects. 2. Thoracic Imaging Features of PIDs a) Most common infectious and non-infectious findings b) Specific findings in CVID, Job Syndrome, Ataxia Telangiectasia Syndrome, Hyper-IgM Syndrome, Chronic Granulomatous Disease (CGD), and other primary immunodeficiency syndromes, correlating with pathology. 3. Diagnostic Challenges and Mimics a) Findings that help differentiate between infectious, neoplastic, and lymphoproliferative causes, and when nuclear medicine can assist. b) Demonstrating the multiple imaging patterns of interstitial lung disease in the context of PIDs. 4. Conclusion and Take-Home Messages

CHEE-24 WHOSE LINE IS IT ANYWAY: A RADIOLOGIST'S GUIDE TO WHAT GOES WHERE AND WHY

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Nathan M. Amann, MD (*Abstract Co-Author*)
Zac Ohs (*Abstract Co-Author*)
Navid Faraji, MD (*Abstract Co-Author*)

TEACHING POINTS

Review both common and uncommon lines that new radiologists will encounter on chest X-Ray Recognize ideal vs. malpositioned placement of medical devices Understand which medical specialties utilize these various lines and devices and for what purpose Review possible complications of these lines

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A case-based project to help radiology residents identify lines and devices on chest X-Ray, understand their clinical purpose, and assess proper placement.Each slide answers three questions: Whose line is it? Which medical services utilize this line What does it do? What type of medical intervention is it used for Is it in the right spot? Review the correct path and location of the line, common malposition, and complications Such devices that will be included: Mediport, Subclavian CVC, Venous Pacer, IJ CVC, PICC line, Dual-chamber pacemaker, ECMO, ICD, Biventricular Pacemaker.

CHEE-25 NOT ALL ABOUT THE HEART: UNDERSTANDING NON CARDIOGENIC PULMONARY EDEMA

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Marta Andreu, MD (*Abstract Co-Author*)
Eva Castaner, MD (*Abstract Co-Author*)
Xavier Gallardo, MD (*Abstract Co-Author*)
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TEACHING POINTS

- Describe the pathophysiology of non-cardiogenic pulmonary edema.- Describe the radiological characteristics of non-cardiogenic pulmonary edema and expose the main differences with cardiogenic pulmonary edema.- Identify the most representative etiologies of non-cardiogenic pulmonary edema and their radiological findings.

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Pulmonary edema is one of the most frequent entities seen on chest radiological images. It has a variety of imaging manifestations that can be identified by chest X-ray and/or CT. Non-cardiogenic pulmonary edema is a pathophysiological entity characterized by an alteration of the pulmonary capillaries that causes an increase in permeability to liquids and proteins. Although non-cardiogenic pulmonary edema is less common than cardiogenic edema, there is a wide range of etiologies including ARDS, neurogenic pulmonary edema, re-expansion pulmonary edema, negative pressure pulmonary edema, near drowning pulmonary edema, systemic capillary leak syndrome, pulmonary veno-occlusive disease, transfusion-related acute lung injury, pulmonary embolism, high-altitude pulmonary edema, opioid or drug overdose, etc. We propose a review of the most frequent etiologies and the most characteristic radiological image through clinical cases. Through careful analysis of the radiological findings and their integration with the context and clinical history, the radiologist can diagnose non-cardiogenic pulmonary edema and guide its etiology, facilitating the early establishment of the appropriate treatment.

CHEE-26 AORTIC THROMBUS: IMAGING PATTERNS AND DIAGNOSTIC CONSIDERATIONS

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Travis S. Henry, MD (*Abstract Co-Author*)

TEACHING POINTS

- Aortic thrombus is an uncommon but high-stakes imaging finding with potential to cause stroke, visceral infarction, or death. - Presentations vary by location: root, arch, or descending thoracic aorta, each with distinct clinical and management implications. - Accurate differentiation between thrombus and mimics such as intramural hematoma (IMH) or rare aortic intimal sarcoma is essential. - CT angiography, including noncontrast and contrast phases, plays a pivotal role in diagnosis and treatment planning. - Management may include systemic anticoagulation, surgical thrombectomy, or endovascular intervention, depending on thrombus extent, location, and patient stability.

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1. Introduction: Importance of early recognition and potential complications 2. Background: Etiologies including hypercoagulability, post-surgical changes, and idiopathic cases 3. Clinical Presentation: Symptomatic (embolism, ischemia) or incidental findings 4. Imaging Appearances: Case-based review of aortic root, arch, and descending

thrombus; distinguishing features of IMH and sarcoma 5. Management Strategies: Anticoagulation, surgery, IR 6. Outcomes: Variable based on location and response; root involvement carries highest risk 7. Summary of Teaching Points

CHEE-27 BEYOND BEAUTY: CHEST CT IN THE ERA OF COSMETIC PROCEDURES

Maisa B. Moroz, MD (*Presenter*)
Tassia R. Yamanari, MD (*Abstract Co-Author*)

TEACHING POINTS

To review common thoracic aesthetic procedures and their expected post-procedural imaging features. To recognize potential complications on CT and PET-CT imaging that may mimic pathology. To guide radiologists in differentiating normal post-procedure changes from true thoracic disease.

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This educational exhibit presents a series of CT images illustrating expected post-procedural changes, such as subcutaneous emphysema after Renuvion, fat interposition in pectoral muscles after lipofilling, costal cartilage defects post-rhinoplasty, and peri-implant collections.Beyond the typical postoperative imaging findings, radiologists must be vigilant for local and systemic complications. These include fluid collections such as hematomas, seromas and abscesses, migration of filler substances or silicone, which may cause inflammatory reactions or granuloma formation. In more severe cases, complications like pneumomediastinum, breast implant-associated anaplastic large cell lymphoma (BIA-ALCL), or even autoimmune syndromes, such as Autoimmune Syndrome Induced by Adjuvants (ASIA), may occur.The exhibit emphasizes the importance of correlating clinical history and procedural details with imaging appearances.

CHEE-28 STORAGE WARS: CARDIOTHORACIC MANIFESTATIONS OF LYSOSOMAL STORAGE DISEASES

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Carlos S. Restrepo, MD (*Abstract Co-Author*)
Daniel Ocazionez-Trujillo, MD (*Abstract Co-Author*)
Daniel Vargas, MD (*Abstract Co-Author*)

TEACHING POINTS

Lysosomal storage diseases (LSDs) are a group of rare inherited disorders characterized by defective lysosomal enzyme activity, leading to the progressive accumulation of macromolecules and resultant cellular dysfunction. Although these diseases can impact multiple organ systems, cardiothoracic manifestations are a common yet under-recognized feature, contributing significantly to morbidity and mortality. Pulmonary involvement typically presents as interstitial lung disease, such as in Niemann-Pick and Gaucher diseases, whereas certain LSDs, such as Danon and Fabry diseases, primarily affect the cardiovascular system with manifestations that include hypertrophic cardiomyopathy, myocardial fibrosis and valvular dysfunction. Early identification allows for timely interventions, including enzyme replacement therapy, which can significantly alter disease progression and improve patient outcomes. The goals of this exhibit are to: Review the epidemiology, classification and pathophysiology of LSDs.Discuss the clinical and imaging findings of the most common LSDs that affect the cardiopulmonary system and other thoracic organsReview complications and differential diagnoses

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(1) Lysosomal Storage Disease background, classification and epidemiology (2) Gaucher Disease (2) Nieman-Pick Disease (3) Pompe Disease (4) Fabry Disease (5) Danon Disease (6) Mucopolysaccharidoses (eg. Hurler and Hunter syndromes). (7) Other LSDs (8) Role of Imaging in LSDs

CHEE-29 PULMONARY DENSITOMETRY IN THE EVALUATION OF THE ATTENUATION PATTERN IN MOSAIC: A PIECE OF CAKE ?

Laura M. Garcia Ramirez, BMedSc, BMedSc (*Presenter*)
Andres Guillermo Tarra Romero, MD (*Abstract Co-Author*)
Omar A. Gamboa Abundis, MD (*Abstract Co-Author*)

TEACHING POINTS

• Mosaic attenuation is an imaging pattern on CT of the chest that is defined as variable lung attenuation that results in a heterogeneous appearance of the parenchyma. • In some instances, the areas of lower attenuation are abnormal, while in other instances the areas of higher attenuation are abnormal.• Airtrapping involving an entire pulmonary segment can occasionally be seen in a small percentage of normal individuals, and the presence of airtrapping increases with age and is more pronounced in smokers Therefore, various degrees of mosaicism and airtrapping may be an incidental finding and not related to the underlying symptoms of the patient.• The attenuation pattern in mosaic, most commonly occurs in diseases that affect the: Small airways Alveoli Pulmonary Vasculature Interstitium• For the assessment of lung densitometry, an adequate inspiration and expiration phase must be present.• AIR TRAPPING: defined as the percentage of low-attenuation areas = -856 HU on expiratory CT, which we refer to as "LAA-856E" as measures of small airways disease.• Defined as the percentage of low-attenuation areas = -950 HU on inspiratory CT, which we refer to as "LAA-950I".

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1. Introduction2. High-Resolution CT3. Etiology• Small airways• Alveoli Pulmonary• Vasculature Interstitium4. Pulmonary densitometry: interpretation and systematic reporting of results.5. Take - Home Messages.6. Conclusions.7. Bibioglaphry

CHEE-30 LOOK BEYOND THE LUMEN: SYSTEMATIC DIAGNOSIS OF INTRA-BRONCHIAL MASSES

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Aya Yamada, MD (*Abstract Co-Author*)
Shoko Nakanishi (*Abstract Co-Author*)
Mako Iwata (*Abstract Co-Author*)
Kiyoyuki Minamiguchi (*Abstract Co-Author*)
Toshihiro Tanaka, MD (*Abstract Co-Author*)

TEACHING POINTS

Central airway lesions often mimic asthma, presenting with wheezing and chronic cough; careful evaluation of the trachea and main bronchi is crucial in such cases.Imaging plays a key role in detecting tumorous lesions and assessing their extent; for example, adenoid cystic carcinoma typically shows submucosal spread along the bronchial wall.Diffuse central airway narrowing may appear similar across diseases, but preservation of the membranous portion can suggest cartilaginous disorders such as relapsing polychondritis.

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Introduction: Diagnostic challenges in intra-bronchial lesionsCongenital lesions: Bronchial atresia, CPAM Inflammatory diseases: ABPA, endobronchial TB, relapsing polychondritis Benign tumors: Bronchiolar adenoma Low-grade malignancies: Carcinoid tumors, adenoid cystic carcinoma, mucoepidermoid carcinoma High-grade malignancies: Squamous cell carcinoma, adenocarcinoma, small cell carcinoma Endobronchial metastases: RCC, breast, colon, melanoma Summary and take-home points

CHEE-31 INHALE, EXHALE: A REVIEW OF PNEUMOCONIOSIS IN THE MODERN DAY

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Daniel Vargas, MD (*Abstract Co-Author*)
Carlos S. Restrepo, MD (*Abstract Co-Author*)
Daniel Ocazionez-Trujillo, MD (*Abstract Co-Author*)
Sanjeev Bhalla, MD (*Abstract Co-Author*)

TEACHING POINTS

Although the number of deaths attributable to pneumoconiosis has declined over the last 25 years, the incidence and prevalence continues to rise in the United States. The increasing prevalence and incidence of pneumoconiosis necessitates that radiologists continue to remain vigilant and capable of diagnosing these conditions promptly and accurately. Pneumoconiosis is a lung condition caused by the inhalation of inorganic dust particulates. Exposure to these particulates depends on occupation and geographic environment. On imaging exams, many pneumoconioses have overlapping features that may make it difficult to determine the specific offending particulate. However, complications associated with pneumoconioses, such as pulmonary fibrosis and lung malignancy, are just as important for the radiologist to recognize.

TABLE OF CONTENTS/OUTLINE

Review the causes of different types of pneumoconioses and the role of occupation and geographic location in the development of pneumoconiosis. Analyze common and rare forms of pneumoconiosis in a case-based format. Evaluate pneumoconiosis-associated complications in a case-based format. Assess the utility of different imaging modalities in the diagnosis of pneumoconioses and their associated complications. Examine common interpretative and diagnostic pitfalls and how to avoid these; for example, how to distinguish between benign and malignant complications such as progressive massive pulmonary fibrosis and a lung malignancy.

CHEE-32 BARIUM ASPIRATION: A PRACTICAL GUIDE FOR RADIOLOGISTS FACING AN UNEXPECTED COMPLICATION

Abraham Jesus Sansores Gongora, MD (*Presenter*)
Luis Enrique Nunez Castellanos, MD (*Abstract Co-Author*)
Juan Jose Duran Rosas, MD (*Abstract Co-Author*)
Lourdes M. Avila, MD (*Abstract Co-Author*)

TEACHING POINTS

Barium Aspiration: A Practical Guide for Radiologists Facing an Unexpected Complication Barium aspiration is a rare but potentially life-threatening complication encountered during gastrointestinal contrast studies. This educational presentation aims to equip radiologists with essential knowledge for identifying, classifying, and managing this event. The objectives include understanding the normal physiology of swallowing, recognizing the pathophysiological mechanisms of bronchoaspiration, and establishing key risk factors such as neurologic impairment, esophageal motility disorders, and altered levels of consciousness. Through clinical case reviews, the distinction between contrast penetration and aspiration is highlighted, along with imaging findings before and after bronchoaspiration. Management strategies are presented in a stepwise approach, including promoting an effective cough, Trendelenburg positioning, and suctioning. In cases where initial measures fail, bronchoalveolar lavage is recommended to evacuate retained contrast material from the airways. This practical guide underscores the importance of timely recognition and intervention to prevent serious respiratory compromise and improve patient outcomes in the radiologic setting.

TABLE OF CONTENTS/OUTLINE

Physiology of swallowing and protective mechanisms Pathophysiology of aspiration and V/Q mismatch Risk factors (neurologic, esophageal, systemic) Classification: penetration vs. aspiration Imaging findings before and after aspiration Management protocol and lavage indications Clinical case examples with imaging Final recommendations for radiologists

CHEE-33 ROLE OF CT IN SEVERE ASTHMA

Javier Saez, MD (*Presenter*)

TEACHING POINTS

Chest CT is the imaging modality of choice in the assessment of asthma. Inspiratory and expiratory acquisitions are essential. Bronchial wall thickening is a hallmark of airway remodeling Visual assessment of bronchial wall thickening requires special focus on segmental branches of the upper and lower lobes. Mucus plugs are highly prevalent in severe asthma. There are two main phenotypes of mucus plugs based on their length: stringy and stubby . Quantification of mucus plugs is based on the Dunican score . Air trapping appears as areas of reduced density or limited volume loss on expiratory CT and reflects small airway disease. Use of quantitative imaging software enhances objectivity and reproducibility

TABLE OF CONTENTS/OUTLINE

Introduction Epidemiology and role of imaging in severe asthma CT Protocol and Technical Considerations Preferred acquisition technique (high-resolution CT) Normal Thoracic Anatomy Review of bronchopulmonary segments Key Imaging Findings in Severe Asthma Bronchial wall thickening Qualitative and quantitative assessment Manual vs. automated measurement Mucus plugs Imaging features and clinical relevance Identification, quantification and phenotyping Air trapping Visual and quantitative evaluation Mosaic attenuation pattern Associated Imaging Findings Bronchiectasis Tracheobronchomalacia Chronic obstructive pulmonary disease overlap Allergic bronchopulmonary aspergillosis Eosinophilic granulomatosis with polyangiitis Infectious complications Future Directions Role of quantitative imaging software Conclusion Summary of imaging's role in the evaluation of severe asthma Importance of integration into clinical guidelines and structured reporting

CHEE-34 CUT, CLIPPED, AND STAPLED: LUNG CANCER POST-OPERATIVE IMAGING - WHAT THE THORACIC SURGEON WANTS TO KNOW

Shravan Sridhar, MD, MS (*Presenter*)
Tician Schnitzler, MD, MSc (*Abstract Co-Author*)
Devan Diwanji, MD (*Abstract Co-Author*)
Daniel B. Green, MD (*Abstract Co-Author*)

TEACHING POINTS

Surgical management of lung cancer is limited to low clinical stage malignancy. Surgeries range from non-anatomic wedge resection to pneumonectomy and escalation depends on disease extent. Post-operative imaging is instrumental in detecting early and late complications and ensuring patient longevity. This exhibit focuses on imaging findings that directly impact management in the early and late postoperative period. Learning objectives include: 1) Review surgical management strategy for low stage lung cancer 2) Recognize early and late postoperative complications 3) Understand importance of time course to assess treatment success.

TABLE OF CONTENTS/OUTLINE

1. Title2. Objectives3. Surgical approach + escalation4. Wedge resection5. Segmentectomy6. Lobectomy7. Sleeve lobectomy8. Pneumonectomy9. Peri-operative management10. Pleural management (persistent air leak/effusion)11. Pulmonary hygiene (atelectasis, diaphragm paralysis)12. Reintubation13. Postop fever14. Postop pain 15. Complications of surgical dissection (hernias, torsion)16. Hilar complications (accidental bronchial ligation, stenosis, dehiscence, stump thrombus)17. Assessing treatment success (residual/recurrent tumor, metastasis)18. Summary: Scenarios and complications19. References

CHEE-35 WHEN IS A CTPA TRULY NONDIAGNOSTIC? A PRACTICAL FRAMEWORK FOR EVALUATING CONTRAST QUALITY AND PULMONARY EMBOLISM DETECTABILITY

Anish Pundyavana, BS (*Presenter*)
Daniel Giraldo Herrera, MD (*Abstract Co-Author*)

Omar Jamil, MD (*Abstract Co-Author*)
Joshua Ewell, DO (*Abstract Co-Author*)

TEACHING POINTS

Pulmonary artery (PA) attenuation on CTPA is an objective, yet underutilized, marker of contrast bolus quality. In borderline or equivocal CTPAs, PA attenuation measurement offers an evidence-based approach to assess study adequacy. Main PA attenuation <200 HU often correlates with reduced confidence for PE exclusion, warranting caution in reporting. Utilizing attenuation thresholds can standardize recommendations for repeat or alternative imaging, particularly for high-risk patients. This exhibit provides a practical framework for applying PA attenuation measurements, with reporting strategies and illustrative cases.

TABLE OF CONTENTS/OUTLINE

1. Rationale for Pulmonary Artery Attenuation Measurement (Workflow algorithm, chart for attenuation at different levels) 2. Practical Application of Attenuation Thresholds (Figures for interpreting HU Values: a. <150 HU: Likely non-diagnostic. b. 150-200 HU: Equivocal study quality. c. >200 HU: Generally diagnostic quality, Table: Suggested Interpretation and Recommended Actions) 3. Case Illustration 1: Diagnostic Study 4. Case Illustration 2: An Equivocal Study (Clarifying diagnostic uncertainty with attenuation data) 5. Case Illustration 3: The Danger of Poor Opacification a. Educational Takeaway: Caution with "negative" studies if opacification is poor. 6. Case Illustration 4: Poor opacification due to patient factors 7. Reporting Language and Clinical Integration (Guide: Side-by-side reporting examples (with and without HU context))

CHEE-36 RESIDENT SURVIVAL GUIDE: A COMPARTMENT-BASED REVIEW OF THORACIC CT PITFALLS, ANATOMIC VARIANTS, AND PSEUDO-LESIONS MIMICKING PATHOLOGIES

Camila P. Reifegerste, MD (*Presenter*)
Felipe Cintra Valentin (*Abstract Co-Author*)
Bruno L. Moreira, MD (*Abstract Co-Author*)
Bruna B. Libanio, MD (*Abstract Co-Author*)
Augusto K. Medeiros, MD (*Abstract Co-Author*)
Camila V. Machado, MD (*Abstract Co-Author*)
Pablo Rydz P. Santana, MD (*Abstract Co-Author*)
Murilo d. Peixoto, MD (*Abstract Co-Author*)

TEACHING POINTS

Chest computed tomography (CT) interpretation can be particularly challenging for radiology residents due to the wide range of normal variants, benign findings, and technical pitfalls that can mimic significant pathology. Misinterpretation of these mimics may lead to unnecessary follow-up imaging, invasive procedures, or even mismanagement. This educational exhibit presents a compartment-based review—covering the mediastinum and cervicothoracic junction, thoracic wall and musculoskeletal structures, and the pleuropulmonary compartment. Real-life cases are used to illustrate key pitfalls, such as dependent atelectasis simulating micronodules, cranial thymic extension mimicking lymphadenopathy, and delayed vascular opacification in fibrotic lungs mimicking pulmonary embolism. Anatomical variants are also discussed as common diagnostic traps.Each case includes concise teaching points that highlight the diagnostic challenge and provide practical tips to avoid error.This exhibit is intended to serve as a practical manual for radiology residents, to be read at the beginning of their training, helping them avoid common interpretive errors on chest CT.

TABLE OF CONTENTS/OUTLINE

(1)Introduction: Importance of recognizing anatomical variants and benign findings that mimic clinically significant thoracic pathology (2) Evaluation of findings by anatomical compartment: (a) Mediastinal / Cervicothoracic region (b) Musculoskeletal structures / Thoracic wall (c) Pleuroparenchymal compartment (3)Practical Recommendations (4) Summary

CHEE-37 PLEURAL MESOTHELIOMA: CURRENT KNOWLEDGE, DIAGNOSIS, AND IMAGING REVIEW

Furkan Ufuk, MD (*Presenter*)
Iclal Ocak, MD, MD (*Abstract Co-Author*)
Lydia Chelala, MD (*Abstract Co-Author*)
Sachin Seetharam, MD, BS (*Abstract Co-Author*)
Emily Miller, MD (*Abstract Co-Author*)
Luis A. Landeras, MD (*Abstract Co-Author*)
Christopher M. Straus, MD (*Abstract Co-Author*)

TEACHING POINTS

• Understand the pathophysiology, histologic subtypes (epithelioid, sarcomatoid, biphasic), and prognostic implications of malignant pleural mesothelioma (MPM). • Review the multimodality imaging approach to MPM—including chest X-ray, CT, MRI, and PET-CT—with emphasis on diagnostic signs, staging features, and treatment planning. • Familiarize with updated TNM 9 staging criteria and modified RECIST 1.1 response assessment guidelines specific to mesothelioma. • Recognize imaging pitfalls and mimics (e.g., prior pleurodesis, empyema, metastatic pleural disease) and differentiate post-treatment changes from recurrence. • Explore advanced imaging innovations such as radiomics, AI-based segmentation, PET/MRI, and emerging molecular tracers for improved diagnostic precision.

TABLE OF CONTENTS/OUTLINE

1. Epidemiology, pathophysiology, and histology of MPM 2. Imaging overview: CT as the cornerstone, MRI for local invasion, PET-CT for staging 3. Radiologic hallmarks and staging (TNM 9) with sample cases 4. Modified RECIST criteria for treatment response assessment 5. Post-treatment imaging: surgical, chemotherapeutic, radiation-related findings 6. Imaging pitfalls and differential diagnosis 7. Future directions: AI, radiomics, PET tracers, volumetric staging

CHEE-38 RADIOLOGICAL INSIGHTS INTO RARE INTERSTITIAL LUNG DISEASES

Furkan Ufuk, MD (*Presenter*)
Iclal Ocak, MD, MD (*Abstract Co-Author*)
Lydia Chelala, MD (*Abstract Co-Author*)
Vanessa Peters, MD (*Abstract Co-Author*)
Luis A. Landeras, MD (*Abstract Co-Author*)

TEACHING POINTS

Illustrate hallmark HRCT and advanced-imaging patterns of selected rare interstitial lung diseases (ILDs). Correlate imaging features with genetic, pathologic, and broncho-alveolar findings to build a confident, multidisciplinary diagnosis. Review evidence-based and emerging therapies and demonstrate how imaging guides management and longitudinal follow-up.

TABLE OF CONTENTS/OUTLINE

Background - Epidemiology, diagnostic delay, and clinical impact of rare ILDs; need for pattern-based radiologic triage. Spectrum of Disease Pulmonary Alveolar Proteinosis - crazy-paving and “sedimentation” sign. Pulmonary Alveolar Microlithiasis - sand-storm lungs, black-pleura sign. Pleuroparenchymal Fibroelastosis - apical pleural caps and platythorax. Genetic / Congenital ILDs (e.g., Hermansky-Pudlak, Birt-Hogg-Dubé). Multiple Cystic Lung Diseases - algorithmic approach to LAM, PLCH, BHD. Diagnostic Toolbox - HRCT pattern recognition, quantitative CT, dual-energy CT, ultra-short-TE MRI; integration of bronchoscopy, cryo-biopsy, and next-generation sequencing. Therapeutic Strategies - Whole-lung lavage, mTOR inhibitors, antifibrotics, GM-CSF therapy, and timing of lung transplantation. Pearls, Pitfalls, and Mimickers - Avoiding misdiagnosis and unnecessary surgery; imaging red flags for acute complications. Future Directions - AI-driven radiomics, liquid-biopsy correlations, gene-editing trials, and international ILD registries.

CHEE-39 THE IRRADIATED CHEST: WHEN HEALING IMITATES HARM

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Lhuanna Maria Barbosa Teixeira, MD (*Abstract Co-Author*)
Evandro J. Bonetti, MD (*Abstract Co-Author*)
Camila P. Reifegerste, MD (*Abstract Co-Author*)
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Bruna B. Libanio, MD (*Abstract Co-Author*)

TEACHING POINTS

-Radiation-induced changes may affect lungs, pleura, lymph nodes, thymus, bones, and chest wall. -Imaging findings are dose-dependent and often respect the radiation field, rather than anatomic boundaries -Modern techniques like SBRT and IMRT produce atypical radiation-induced lung injuries patterns (e.g., mass-like, scar-like) that may mimic recurrence. -Recognition of these patterns helps avoid misdiagnosis and unnecessary biopsies. -Time from radiotherapy, review of dose maps, and correlation with clinical context are essential for accurate interpretation.

TABLE OF CONTENTS/OUTLINE

Introduction: -Rationale and clinical impact of recognizing radiation-induced lung injury (RILI) -Overview of thoracic RT modalities (3D-CRT, IMRT, SBRT) Pathophysiology and Phases of RILI: -Acute inflammatory phase (2-12 weeks) -Proliferative/subacute phase (3-9 months) -Fibrotic phase (>9 months) Imaging Patterns According to Technique: -Typical vs. atypical findings -Modified conventional, scar-like, mass-like patterns -Pneumonia in organization (OP-like) -Extra-pulmonary manifestations (pleura, muscle, thymus) Differential Diagnosis: -Tumor recurrence -Infection -Drug-induced toxicity -Organizing pneumonia Clinical Tips and Pitfalls: -Importance of time interval post-RT -When to suspect recurrence -Role of PET/CT and when to avoid it Conclusion and Summary of Key Messages

CHEE-40 BREAKING THE WALL: UNCOVERING PEDIATRIC THORACIC WALL LESIONS

Maria Tamyres De Carvalho Freitas, MD (*Presenter*)
GABRIELE SPERANDIO (*Abstract Co-Author*)
Natasha Manzoli Elias, MD (*Abstract Co-Author*)
Paulo Henrique Takanashi Murakawa (*Abstract Co-Author*)
Camila V. Machado, MD (*Abstract Co-Author*)
TAIS COSTA (*Abstract Co-Author*)
Mariana Rodrigues, MD (*Abstract Co-Author*)
Danilo T. Wada, MD (*Abstract Co-Author*)

TEACHING POINTS

After attending to this exhibit, the learner should be able to: Understand the most common thoracic wall injuries in the pediatric age group. Distinguish the specific imaging patterns for each pathology. Identify possible differential diagnoses. Recognize typical imaging patterns to prevent unnecessary interventions.

TABLE OF CONTENTS/OUTLINE

Introduction to Chest Wall Tumors in Children Focus on imaging characteristics of chest wall tumors and how to differentiate them. Benign: Soft tissue origin: Hemangioma/vascular malformation Lymphangioma Lipoma/lipoblastoma Hamartoma Neurofibroma and ganglion cell tumor Fibroma/fibromatosis/desmoid Bone origin: Osteochondroma, osteoid osteoma and aneurysmal bone cyst. Fibrous dysplasia Langerhans cell histiocytosis Malignant: Ewing sarcoma/PNET Sarcomas. Lymphoma/leukemia. Malignant peripheral nerve cell tumor. Bone and soft tissue metastases.

CHEE-41 DENDRIFORM PULMONARY OSSIFICATION: A NOT SO RARE CAUSE OF LUNG CALCIFICATION

Ainhoa Clemente Idoate, MD (*Presenter*)
Cristina Sanchez, MD (*Abstract Co-Author*)
Elia Lecumberri, MD (*Abstract Co-Author*)
Pablo Bartolome, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review and illustrate the chest CT findings in dendriform pulmonary ossification. 2. To discuss the physiopathology of this process. 3. To highlight the commonality DPO in routine chest CT, despite the overall conception of it being a rare disease. 4. To display the most common differential diagnosis and how to avoid misdiagnosis. 5. To analyze the relationship of DPO with ILD (interstitial lung disease) and GERD (gastroesophageal reflux disease).

TABLE OF CONTENTS/OUTLINE

1. Introduction: The importance of a precise diagnosis of pulmonary ossification to avoid over diagnosis and overtreatment. 2. Bone in the lungs: discussion of a physiopathology oddity. 3. Pulmonary ossification: radiological imaging findings • Main HRCT findings • Distribution • Ancillary features. 4. Differential diagnosis. 5. Association with ILD and GERD. 6. Conclusions

CHEE-42 YOU CAN DO IT: CREATING A PEER-LEARNING CONFERENCE IN YOUR THORACIC IMAGING SECTION

Neud Kiros, MD (*Presenter*)
Tannoz Norouzi (*Abstract Co-Author*)
Monisha Shetty, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Illustrate the educational and cultural value of a sectional peer learning conference and differentiate it from traditional peer review 2. Outline actionable steps to set up a peer learning conference that is both accessible and sustainable 3. Compare various formats of a peer learning conference 4. Analyze illustrative cases highlighting the utility of a peer learning conference and sources of bias

TABLE OF CONTENTS/OUTLINE

1. Background a. Peer review vs. Peer learning i. Quantitative vs. Qualitative ii. Punitive vs. Non-punitive iii. Done in isolation vs. Collaborative iv. Random sample vs. Curated 2. Instructions to create the conference infrastructure a. Secure CME b. Share the purpose of the conference c. Case curation d. Review sources of bias/error e. Encourage participation i. Inclusion of great pickups, near misses ii. Digital reminders f. Share a method to store cases g. Determine a date and time h. Invite current/future body imaging fellows i. Give them insight into their future careersii. Inspire them to continue peer learning at their future institutions i. Periodically check-in with attendees i. Invite suggestions regarding format, frequency, style 3. Discussion of various formats a. In-person or virtual b. Formality c. Presentation style d. Moderation 4. Benefits of a sectional peer learning conference a. Share newly acquired knowledge b. Increase radiologist engagement c. Understand individual practice patterns d. Improve patient care 5. Illustrative cases a. Satisfaction of search/report b. Framing bias c. Availability bias d. Confirmation bias e. Anchoring bias f. Commission/Omission bias g. Blind spots h. Automation bias

CHEE-43 MRI EVALUATION AND PREOPERATIVE STAGING OF ESOPHAGEAL CARCINOMA - DIAGNOSTIC PERFORMANCE AND CORRELATION OF MRI T AND N STAGES WITH EUS AND HISTOPATHOLOGIC T AND N STAGES

Rachna Madan, MBBS, MD (*Presenter*)
Mark M. Hammer, MD (*Abstract Co-Author*)

TEACHING POINTS

Use of MRI in the prediction of response to therapy for the treatment of esophageal cancer continues to be explored, and its early differential value remains controversial. This educational exhibit highlights the incremental value of using MRI pre and post treatment for improving preoperative staging, selecting patients for trimodality therapy and and predicting tumor response post treatment.

TABLE OF CONTENTS/OUTLINE

1. Esophageal MRI Protocol and Qualitative and Semi-Quantitative Assessment of MRI data2. MRI data correlation with CT and PET CT; MRI T and N stage Correlation with EUS and pathologic T and N stage correlation 3. Use of MR parameters (craniocaudal tumor length, vascular invasion, number of involved nodes, ADC values) to predict response to treatment and guide clinical decision making. 5. High sensitivity of MRI when used for the detection of esophageal cancer makes it a promising imaging modality for early T-stage disease and potentially for active surveillance in patients who have undergone neoadjuvant therapy.

CHEE-44 IMAGING OF PROCEDURES PERFORMED FOR COMPLEX PLEURAL FLUID COLLECTIONS: WHAT THE RADIOLOGIST NEEDS TO KNOW

Carol N. Sanchez Santana, BS (*Presenter*)
Babina Gosangi, MD, MPH (*Abstract Co-Author*)

TEACHING POINTS

• Review the etiology and characteristics of complex pleural effusions, including empyema, hemothorax, and chylothorax. • Demonstrate the role of imaging in the diagnosis and management of complex pleural fluid collections. • Discuss the procedures performed for these conditions, expected post procedural appearance and complications.

TABLE OF CONTENTS/OUTLINE

• Introduction • Complex Pleural Fluid Collections • Empyema a. Classification, staging, and quantification b. Role of Imaging i. Ultrasound ii. Chest X-Ray iii. CT iv. MRI c. Intervention i. Tube Thoracostomy ii. Thoracomyoplasty iii. Pleural decortication iv. Clagett window v. Eloesser flaps d. Complications i. Post-pyothorax pleural lymphoma ii. Empyema Necessitans iii. Fibrothorax • Hemothorax e. Etiology & Diagnosis f. Role of Imaging i. FAST Ultrasound ii. Chest X-Ray iii. CT g. Intervention i. Tube Thoracostomy ii. Open Thoracotomy iii. Video-assisted thoracoscopic surgery (VATS) with decortication h. Complications i. Empyema ii. Trapped Lung iii. Fibrothorax • Chylothorax i. Etiology & Diagnosis j. Role of Imaging i. Ultrasound ii. Lymphangiography iii. Chest X-Ray iv. CT v. MRI k. Intervention i. Thoracentesis ii. Pleurodesis iii. Thoracic Duct Ligation iv. Thoracic Duct Embolization l. Complications

CHEE-45 CASE-BASED REVIEW OF NON-CARDIOVASCULAR DEVICES IN CHEST RADIOGRAPHY

Francisco Calle Bernal, MD (*Presenter*)
Paula N. Patino, MD (*Abstract Co-Author*)

TEACHING POINTS

Present a radiographic review of common non-cardiac devices visible in chest imaging. Provide a case-based review of devices that may appear similar on radiographs but have distinct anatomical placement, clinical indications, and purposes. Highlight clinical indications, key anatomical landmarks, and potential complications for each device. Provide practical imaging tips to help radiologists accurately identify device components and recognize normal vs. abnormal placements.

TABLE OF CONTENTS/OUTLINE

Esophageal Devices Ambulatory pH Monitors. Esophageal Temperature Probe Gastric Devices Gastric Pacemaker. Sengstaken-Blakemore Tube: Intragastric Balloon, Gastric Banding Nervous System Stimulation Devices Deep Brain Stimulator, Occipital Nerve Stimulator Vagus Nerve Stimulator Diaphragmatic Pacing System Pain and Anesthesia-Related Devices Interscalene Brachial Plexus Block Serratus Anterior Block Thoracic Epidural Catheter. Spinal Cord Stimulators Cervical and Thoracic spinal electrode placements. Miscellaneous Devices Subcutaneous Contraceptive Implants Continuous Glucose Monitors.

CHEE-46 THE ABCS OF LUNG ALLOGRAFT DYSFUNCTION: ALAD, BLAD, AND CLAD DEMYSTIFIED

Dayana Davoudi, BSc (*Presenter*)
Aly Muhammad Ladak (*Abstract Co-Author*)
Micheal McInnis, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Recognize CT imaging features of acute, baseline, and chronic lung allograft dysfunction (ALAD, BLAD, and CLAD) 2. Distinguish CT findings of CLAD subtypes: bronchiolitis obliterans syndrome (BOS), restrictive allograft syndrome (RAS), and mixed phenotypes 3. Appreciate the role of emerging imaging technologies in lung allograft dysfunction 4. Apply a structured approach to evaluating lung transplant recipients on chest CT

TABLE OF CONTENTS/OUTLINE

Lung allograft dysfunction is a major concern in the care of lung transplant recipients, but it is challenging to diagnose and classify radiologically. This exhibit outlines imaging characteristics of distinct forms of lung allograft dysfunction, including acute, baseline, and chronic lung allograft dysfunction (ALAD, BLAD, and CLAD, respectively), as well as how they relate to each other. We also outline how to differentiate between CLAD phenotypes, including bronchiolitis obliterans syndrome (BOS) and restrictive allograft syndrome (RAS), on CT imaging. Lastly, we propose a structured, radiologist-friendly approach to abnormal imaging findings in the lung transplant patient. Overview of Lung Allograft Dysfunction Definitions: ALAD, BLAD, CLAD Pathophysiology, epidemiology, and presentation Spirometric criteria CT Imaging Findings CT imaging findings and differential diagnoses CLAD Subtypes: Imaging Features BOS: mosaic attenuation, air trapping, hyperinflation RAS: pleuroparenchymal thickening, volume loss, traction bronchiectasis Mixed CLAD patterns Novel CT imaging techniques: Parametric response mapping Machine learning texture analysis Systematic Approach to Lung Tx CT Checklist for radiologists in transplant surveillance

CHEE-47 HIGH-RESOLUTION CT MANIFESTATIONS OF SYSTEMIC JUVENILE IDIOPATHIC ARTHRITIS ASSOCIATED LUNG DISEASE

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Hallie A Carol (*Abstract Co-Author*)
Scott Canna (*Abstract Co-Author*)
Abass Noor, MD (*Abstract Co-Author*)

TEACHING POINTS

Systemic juvenile idiopathic arthritis (sJIA) comprises 10-20% of cases of JIA—the leading childhood rheumatic disease. Historically, pleuritis and pleural effusion were the primary recognized pulmonary manifestations of sJIA. However, recent reports of severe, potentially life-threatening chronic lung diseases have emerged, collectively referred to as sJIA-associated lung disease. These include pulmonary alveolar proteinosis, interstitial lung disease, and pulmonary hypertension. Lung involvement in sJIA have proposed risk factors, including onset age < 2 years and chronic, recurrent, or poorly controlled Macrophage Activation Syndrome (MAS), among others. High-resolution CT (HRCT) remains the modality of choice to assess these findings for diagnosis and follow-up. The purpose of this exhibit is to 1) review the key imaging features of lung involvement in sJIA, 2) demonstrate 4 cases from our institution and 3) discuss the importance of HRCT for timely diagnosis in these patients.

TABLE OF CONTENTS/OUTLINE

Introduction Pathophysiology and risk factors of sJIA-associated lung disease. Symptoms of sJIA-associated lung disease. Role of imaging in diagnosis of sJIA-associated lung disease.Imaging features for sJIA-associated lung disease through case seriesConclusion

CHEE-48 LUNG LESION DISTRIBUTION PATTERNS: A CASE-BASED DIAGNOSTIC FRAMEWORK

Lydia Chelala, MD (*Presenter*)
Sophie Cemaj, MD (*Abstract Co-Author*)
Luis A. Landeras, MD (*Abstract Co-Author*)
Iclal Ocak, MD, MD (*Abstract Co-Author*)
Jonathan H. Chung, MD (*Abstract Co-Author*)
Furkan Ufuk, MD (*Abstract Co-Author*)

TEACHING POINTS

• Understand the physiologic basis of lesion distribution—how ventilation-perfusion gradients, lymphatic flow, and particle deposition influence where diseases occur in the lung. • Recognize key CT distribution patterns—upper vs. lower lobe, central vs. peripheral, or diffuse—and their diagnostic implications. • Apply a case-based framework integrating lesion location with radiologic pattern (e.g., nodular, reticular, cystic) to narrow differentials in diffuse lung disease. • Emphasize diagnostic power of combining anatomic distribution with CT morphology for more confident interpretation.

TABLE OF CONTENTS/OUTLINE

• Introduction: Diagnostic value of lesion location on CT• Physiology of Distribution: V/Q mismatch, lymph flow, oxygenation• Upper- and Lower-Zone Predominance: Case-based review• Central vs. Peripheral Disease: Imaging and clinical correlates• Diffuse/Random Patterns: Miliary TB, metastases, cystic lung disease• Radiologic Pattern Integration: Ground-glass, nodular, cystic findings across zones• Summary: A structured approach to evaluating lesion distribution in diffuse lung disease

CHEE-49 ADVANCES IN THE DIAGNOSTIC CONCEPT AND IMAGING OF PULMONARY FUNGAL INFECTION IN VARIOUS IMMUNE CONDITIONS: FOCUSED ON RADIOLOGY-PATHOLOGY COMPARISONS

Semin Chong, MD (*Presenter*)
Joungho Han (*Abstract Co-Author*)
Tae Jung Kim, MD, PhD (*Abstract Co-Author*)
Yeon Joo Jeong, MD, PhD (*Abstract Co-Author*)
Yumi Wi (*Abstract Co-Author*)
Kyung S. Lee, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Fungal pneumonia is a kind of chronic granulomatous infection in immunocompetent subjects, but not typically involve granulomatous inflammation in immunocompromised patients with unchecked proliferation of organisms, absent or poorly-formed granulomas, and wide spread disease showing diverse imaging features. For early diagnosis and timely treatment, identifying the presence of pneumonic process on imaging study is the essential step for proper management. Pattern recognition and common and specific organisms in each setting of patient immune status is the recent approach for the diagnosis of fungal infection particularly in immnunocompromised patients. Despite of overlapping imaging features, the integration of pneumonic pattern, immune status, and common organisms involved in each condition helps reach the probable diagnosis the specific fungal pneumonia. Bronchoalveolar lavage with or without transbronchial lung biopsy rather than direct surgical lung biopsy is the final diagnostic procedure for specific fungal pneumonia.

TABLE OF CONTENTS/OUTLINE

1. Overview of pulmonary fungal infection 2. CT and histopathology of chronic granulomatous infection; difference from community-acquired pneumonia 3. CT findings of fungal infection in immunocompetent or mildly immunocompromised patients and pathologic comparisons 4. CT findings of fungal infection in diverse immunocompromised status and pathologic comparisons 5. Covid-19 associated pulmonary aspergillosis and mucromycosis 6. Pulmonary fungal infection in specific clinical settings 7. Summary and Conclusion

CHEE-50 IGG4-RELATED LUNG DISEASE: WHAT THE RADIOLOGISTS SHOULD KNOW

Aylen Gonzalez Gonzalez, MD (*Presenter*)
Sofia Pividori, MD (*Abstract Co-Author*)
Bruno Miguel Manzanares, MD (*Abstract Co-Author*)
Teresa A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

Although rare, IgG4-related disease is an emerging multi-organic syndrome that can pose a diagnostic dilemma. The radiologist must be familiar with the imaging findings and differential diagnosis. The aim of the present study is to: - Review the typical radiologic findings of the IgG4-related lung disease. - Classify them into four patterns. - Review the pearls and pitfalls of this recently discovered disease.

TABLE OF CONTENTS/OUTLINE

1) Introduction and Clinical characteristics 2) Role of different modalities 3) Findings classification Solid nodular Broncho-vascular Alveolar interstitial Ground glass opacity 4) Differential diagnosis Infections Inflammatory Neoplasms 5) Conclusions 6) Summary

CHEE-52 KEY ASPECTS RADIOLOGISTS SHOULD KNOW FOR THE DIAGNOSIS OF HYPERSENSITIVITY PNEUMONITIS ACCORDING TO THE 2020 ATS/JRS/ALAT CLINICAL PRACTICE GUIDELINE

Omar Andres Pantoja Burbano, MD (*Presenter*)
Felipe Aluja, MD, MEd (*Abstract Co-Author*)
Maria Alejandra Amaya, MD (*Abstract Co-Author*)

TEACHING POINTS

• The ATS/JRS/ALAT guideline provides a framework for the multidisciplinary approach to patients with hypersensitivity pneumonitis (HP).• Understanding the clinical context described in this guideline is essential in order to include HP in the differential diagnosis.• Characteristic radiologic findings of HP are classified in this guideline according to HRCT patterns, which aid in the suspicion and recognition of this condition.• HRCT is established as a central component in the diagnosis of HP

TABLE OF CONTENTS/OUTLINE

• Introduction to the 2020 ATS/JRS/ALAT Guideline for the Diagnosis of Hypersensitivity Pneumonitis (HP) • Key Clinical and Laboratory Points Radiologists Should Be Aware of in the Context of Suspected HP • HP Patterns and Their Imaging Characteristics • Common and Uncommon Differential Diagnoses of HP • Key Imaging Findings Radiologists Should Include in Their Report to Support Multidisciplinary Management • Conclusion

CHEE-53 AORTIC PATHOLOGIES: MUST-KNOW FOR A RADIOLOGIST

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Cody R. Johnson, MD (*Abstract Co-Author*)
Nisha Korakavi, MD (*Abstract Co-Author*)
Sreyes Venkatesh (*Abstract Co-Author*)
Brian Zhang (*Abstract Co-Author*)
Robert C. Gilkeson, MD (*Abstract Co-Author*)
Amit Gupta, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Identify key imaging features and clinical implications of essential aortic pathologies, including acute aortic syndromes, aneurysms, and endoleaks. 2. Use case-based quiz questions to reinforce diagnostic reasoning and improve pattern recognition. 3. Recognize uncommon but critical aortic conditions such as vasculitis, mycotic aneurysms, and IgG4-related aortitis.

TABLE OF CONTENTS/OUTLINE

1. Introduction o Rationale for using quiz-based learning to reinforce high-yield aortic imaging diagnoses. 2. Case-Based Interactive Quiz • Case 1: Aortic dilatation and aneurysm • Case 2: Acute aortic syndromes (dissection, IMH, pseudoaneurysm) • Case 3: Penetrating atherosclerotic ulcer • Case 4: Endoleaks (Types I-V) • Case 5: Aortic arch anomalies • Case 6: Atypical pathologies (mycotic aneurysm, vasculitis, IgG4-related disease) 3. Answer Review and Teaching Pearls 4. Detailed explanation of correct answers, common pitfalls, and key imaging signs. 5. Conclusion Summary of must-know aortic entities and strategies to improve detection and accuracy.

CHEE-54 PEARLS AND PITFALLS IN LUNG CANCER SCREENING

Prabhakar Rajiah, MD, FRCR (*Presenter*)
Arzu Canan, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review the key recommendations of Lung-RADS 2.0 2. To highlight key pitfalls in lung cancer screening 3. To illustrate practical tips to avoid pitfalls in lung cancer screening

TABLE OF CONTENTS/OUTLINE

A. INTRODUCTION B. PEARLS AND PITFALLS IN LUNG CANCER SCREENING 1.False negative diagnosis 2.False positive diagnosis 3.Image acquisition parameters 4.Image reconstruction parameters 5.Bidimensional measurements 6.Increased attenuation of subsolid nodules 7.Volume doubling time 8.Infection/inflammation 9.Nodular radiation changes 10.Endobronchial secretions vs neoplasm 11.Bubbly lesions 12.Atypical cysts 13.Temporary regression of malignant nodules 14.Low FDG avidity of lung adenocarcinomas

CHEE-55 SEEING IS BREATHING: CURRENT AND EMERGING TECHNIQUES IN EVALUATING CHRONIC DYSPNEA

Cody Thornburgh, MD (*Presenter*)
Talissa A. Altes, MD (*Abstract Co-Author*)
Gabriela Maria Garcia Delgado (*Abstract Co-Author*)
Yun Shim (*Abstract Co-Author*)
Robert P. Thomen, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Dyspnea is a symptom that results from dysregulation of the demand for breathing and the ability to meet that demand. 2. In the difficult dyspnea patient, a multi-disciplinary approach is typically necessary to determine the driving cause of a patient's dyspnea, including pulmonologists, cardiologists, radiologists, and neurologists. 3. By understanding the causes of dyspnea, the radiologist can be an integral member of the clinical team by providing meaningful interpretations of chest radiographs, high resolution CT, and advanced cardiac imaging. 4. Hyperpolarized Xenon-129 ventilation MR (HPG MRI) is a new-to-market FDA approved technique that is a powerful imaging tool in the difficult dyspnea patient. HPG MRI allows increased clinical confidence by ruling out small airway disease as a source of dyspnea.

TABLE OF CONTENTS/OUTLINE

1. Background/Objectives 2. Causes of Dyspnea --- a. Pulmonary --- b. Cardiac --- c. Central --- d. Hematological --- e. Metabolic --- f. Environmental & Mechanical 3. The Clinical Approach --- a. History and Physical examination --- b. Labs --- c. Pulmonary function testing --- d. Cardiopulmonary exercise testing 4. The Imaging Approach --- a. Chest radiography --- b. High resolution and Dynamic airway Chest CT --- c. Advance cardiac imaging ------ i. Cardiac MR ------ ii. Coronary CTA ------ iii. Echocardiography --- d. Ventilation imaging ------ i. SPECT V/Q ------ ii. Hyperpolarized Xenon-129 MRI (HPG MRI) Ventilation 5. Case Examples 6. Future frontiers --- a. HPG MRI Dissolved phase imaging --- b. HPG MRI RBC Oscillation in pulmonary hypertension

CHEE-56 INTEGRATING TNM 9 INTO RADIOLOGY PRACTICE: A PICTORIAL REVIEW

Amalia Constantinescu, MD (*Presenter*)
Emil R. Stoicescu I, MD (*Abstract Co-Author*)
Diana Manolescu (*Abstract Co-Author*)

TEACHING POINTS

1. Presenting the updates introduced by the ninth edition TNM system for lung cancers.2. Establishing the relevance of the new classification for patient management.3. Illustrating the modifications using structured reports.

TABLE OF CONTENTS/OUTLINE

Background and need for TNM revisionsUpdates in the T, N, and M descriptorsReclassification of stage groups with clinical impactImaging case examples with comparisons to TNM 8Summary: integration of TNM 9 into radiologic practice

CHEE-57 A PATIENT WITH HEMOPTYSIS: HOW RADIOLOGY CAN HELP?

Dinea Bucic, MD (*Presenter*)
Ana M. Alduk, MD,PhD (*Abstract Co-Author*)
Maja Hrabak Paar, MD (*Abstract Co-Author*)

TEACHING POINTS

Hemoptysis refers to the expectoration of blood from the lung alveoli or airways of the lower respiratory tract. Massive hemoptysis is a life-threatening condition with a high risk of asphyxiation or exsanguination. The primary role of the radiologist is to urgently identify the underlying etiology and mechanism of hemoptysis to guide appropriate management. This exhibit aims: • To outline the diagnostic algorithm for evaluating patients with hemoptysis, including the optimal CT protocol. • To discuss the spectrum of radiological findings associated with hemoptysis. • To show how endovascular interventional procedures could be used for the treatment of hemoptysis in different clinical scenarios. • To present a case-based review of common causes of hemoptysis. • To emphasize the importance of multidisciplinary collaboration in the management of patients with hemoptysis.

TABLE OF CONTENTS/OUTLINE

1. Overview of hemoptysis, including most common causes 2. Diagnostic algorithm in patients with hemoptysis 3. CT imaging protocols for patients with hemoptysis 4. Characteristic CT findings in patients with hemoptysis of different etiology, including infection, lung cancer, bronchiectasis, pulmonary arteriovenous malformation, etc. 5. An aberrant intrabronchial course of the bronchial artery - risks of bronchoscopy 6. An overview of the endovascular interventional procedures in patients with hemoptysis (bronchial, systemic, and pulmonary artery embolization) 7. Multidisciplinary approach to a patient with hemoptysis

CHEE-58 FUNGAL FINDS: IMAGING AND MANAGEMENT OF PULMONARY ASPERGILLUS

Hira Qureshi, MD (*Presenter*)
Naaemah Saleem (*Abstract Co-Author*)

Jeffrey D. Nadig, MD (*Abstract Co-Author*)

TEACHING POINTS

The exhibit reviews the diverse imaging features of pulmonary aspergillosis, ranging from non-invasive aspergilloma to semi-invasive and invasive forms. Key radiologic signs—including the air crescent and finger-in-glove appearances—are highlighted, emphasizing their diagnostic value when interpreted in the appropriate clinical and immunologic context. Case examples illustrate imaging-pathologic correlation and the critical role of immune status in disease manifestation and progression. Imaging's role in monitoring response to treatment and guiding surgical planning is also discussed.

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Radiographic and CT findings of pulmonary aspergillosis across its clinical spectrum are explored. Aspergilloma often presents with the air crescent sign but must be distinguished from mimics like Rasmussen aneurysm, abscesses, malignancy, and hydatid cysts. ABPA typically shows the finger-in-glove sign due to mucus impaction in dilated bronchi, caused by both obstructive and non-obstructive conditions. Semi-invasive and invasive aspergillosis may share findings such as ground-glass opacities and the halo sign, with imaging patterns determined by the patient's immune status. The spectrum of imaging findings, including non-specific signs, is reviewed, along with clinical and laboratory clues for differentiation. Also addressed is the paradoxical worsening of imaging findings following early antifungal therapy, emphasizing the importance of understanding the expected timeline of radiologic resolution and correlating it with clinical progress. Surgical planning considerations, including imaging-based criteria for intervention, are also discussed.

CHEE-60 PULMONARY VENO-OCCLUSIVE DISEASE (PVOD) AND PULMONARY CAPILLARY HEMANGIOMATOSIS (PCH): KEY IMAGING FINDINGS

Adam Gaisinsky (*Presenter*)
Arwa K. Almutairi I, MBBS (*Abstract Co-Author*)
Prodipto Pal (*Abstract Co-Author*)
Micheal McInnis, MD (*Abstract Co-Author*)

TEACHING POINTS

Pulmonary veno-occlusive disease (PVOD) is a rare and fatal cause of pulmonary arterial hypertension (PAH) characterized by the narrowing of pulmonary venules by intimal fibrosis. Diagnosing PVOD is challenging due to the difficulty of differentiating PVOD from other causes of PAH. However, it is essential to consider PVOD in the differential of PAH because of its poor response to therapy, rapid progression, and the need for early consideration of lung transplantation, the only definitive treatment. This exhibit will review the patient presentation of PVOD and provide an overview of relevant diagnostic tools and clues. Additionally, 7 imaging findings of PVOD on high-resolution computed tomography (HRCT) will be reviewed as HRCT findings are key in confirming a diagnosis of PVOD. Lastly, pathology findings will be reviewed alongside HRCT findings to illustrate radiology-pathology correlation.

TABLE OF CONTENTS/OUTLINE

This exhibit will begin with an introduction to PVOD and its epidemiology. The risk factors and associated conditions will be reviewed, with discussion of both the hereditary form and other causes of PVOD. This will be followed by an introduction to the patient presentation and diagnostic tools/approach with focus on findings that differentiate PVOD from other causes of PAH. Next, 7 key HRCT imaging findings will be introduced in detail. Pathology findings will also be introduced, and radiology-pathology correlations will be illustrated. The exhibit will then move through complete patient cases focusing on showcasing classic imaging findings of PVOD and demonstrating radiology-pathology correlation. Lastly, the exhibit will conclude with a summary of the key take-home messages.

CHEE-61 UNLOCKING THE MYSTERIES OF PREINVASIVE LUNG LESIONS: ESSENTIAL INSIGHTS FOR RADIOLOGISTS

Janardhana Ponnatapura, MD (*Presenter*)

TEACHING POINTS

Lung cancer stands as the predominant cause of both cancer incidence and mortality on a global scale. Within the spectrum of pulmonary abnormalities, preinvasive lesions represent a critical subset. These lesions, while not yet malignant, harbor the potential for progression into full-blown cancer. Among the diverse array of preinvasive lesions are squamous dysplasia (SD), squamous cell carcinoma in situ (CIS), atypical adenomatous hyperplasia (AAH), adenocarcinoma in situ (AIS), and diffuse idiopathic pulmonary neuroendocrine cell hyperplasia (DIPNECH). The identification of these preinvasive lesions holds paramount significance for radiologists, as they often serve as the primary point of contact for such findings. A comprehensive understanding of these lesions is imperative for early detection, accurate differentiation, and effective patient management. By leveraging their expertise, radiologists play a pivotal role in enhancing patient outcomes through timely intervention and treatment strategies.

TABLE OF CONTENTS/OUTLINE

• WHO classification of preinvasive lesions in the lung-SD/CIS-AAH-AIS - non-mucinous, with mucinous, mixed-Neuroendocrine cell proliferations and DIPNECH• Imaging spectrum and its characteristics - Multimodality imaging• Role of Radiologists to identify and differentiate from mimickers like infection, post-RT• Role of pulmonologist and oncologist• Imaging surveillance• Role of cardiothoracic surgeons - What surgeons what radiologists to know• Management of these lesions• Algorithm to approach and manage these lesions

CHEE-62 COUGH, BLEED, REPEAT: A VISUAL JOURNEY THROUGH IDIOPATHIC PULMONARY HEMOSIDEROSIS

Florentino Saenz, MD (*Presenter*)
Vijay K. Aggarwal, MBBS (*Abstract Co-Author*)
Ameya J. Baxi, MBBS,DMRD (*Abstract Co-Author*)
Daniel Vargas, MD (*Abstract Co-Author*)
Carlos S. Restrepo, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Idiopathic Pulmonary Hemosiderosis (IPH) is a rare but serious cause of diffuse alveolar hemorrhage, especially in children. 2. Diagnosis is one of exclusion and requires high clinical suspicion, imaging, bronchoscopy, and histopathologic confirmation. 3. Radiologic patterns on chest X-ray and HRCT can vary by disease phase, ranging from ground-glass opacities to chronic fibrotic changes. 4. Histopathology and imaging together help distinguish IPH from a wide differential of pulmonary hemorrhage including vasculitides or Goodpasture syndrome. 5. Management and prognosis are greatly influenced by timely recognition and immunosuppressive therapy.

TABLE OF CONTENTS/OUTLINE

1. Introduction and Epidemiology of IPH. 2. Classification of Pulmonary Hemosiderosis. 3. Clinical Presentation and Phases of Disease. 4. Imaging Features on Radiograph and HRCT. 5. Histopathologic Correlation and Diagnostic Criteria. 6. Differential Diagnosis: Vasculitis, Goodpasture, SLE. 7. Case Series: Pediatric and Adult Presentations. 8. Complications, Prognosis, and Management Considerations.

CHEE-63 THORACIC PARAGANGLIOMA: A RADIOLOGIST'S GUIDE TO IMAGING, DIFFERENTIALS, AND MANAGEMENT PITFALLS

Achala Donuru, MD (*Presenter*)
Ghanwa Khawaja, DO (*Abstract Co-Author*)
Rupali Jain, MD,MBBS (*Abstract Co-Author*)
Mariah Novy (*Abstract Co-Author*)
Vinay V. Kandula, MBBS (*Abstract Co-Author*)
Maruti K. Kumaran, MD (*Abstract Co-Author*)

TEACHING POINTS

Thoracic paragangliomas are rare neuroendocrine tumors originating from extra-adrenal chromaffin cells. While uncommon, radiologists play a crucial role in their initial detection, characterization, and guiding management, particularly in preventing life-threatening complications. Thoracic paragangliomas typically manifest as intensely enhancing, hypervascular masses on CT and MRI, often in characteristic locations like the paravertebral space or aortopulmonary window. Recognizing these features is key, but differentiating thoracic paragangliomas from mimics like neurogenic tumors, lymphadenopathy, vascular lesions, and rare cardiac masses requires careful analysis of location, morphology, and enhancement patterns. Functional imaging, especially Ga-DOTATATE PET/CT, is invaluable for confirming diagnosis, staging, and surveillance. Critically, radiologists must understand the potential for catecholamine secretion and communicate the absolute necessity of pre-procedural alpha-blockade before any intervention (biopsy or surgery) to prevent hypertensive crisis. This presentation reviews the spectrum of imaging findings, highlights key differentials with examples, discusses the utility of functional imaging, and emphasizes the radiologist's vital role in safe patient management.

TABLE OF CONTENTS/OUTLINE

Introduction: Paragangliomas significance and locations. Imaging Findings: CT & MRI hallmarks. Differential Diagnosis: Location-based approach with imaging examples. Functional Imaging: Role of Ga-DOTATATE PET/CT. Management: Radiologist's role, biopsy risks, alpha-blockade necessity. Conclusion & Key Takeaways.

CHEE-64 HRCT PATTERNS IN ILD AND THEIR MIMICKERS: A RAPID GUIDE FOR RADIOLOGY RESIDENTS

Diana Kokash, MD (*Presenter*)

TEACHING POINTS

Accurate interpretation of HRCT in ILD requires pattern-based analysis, emphasizing features such as ground-glass opacities, reticulation, honeycombing, and traction bronchiectasis. Distribution (upper vs lower lobe, peripheral vs central) and symmetry of findings provide key diagnostic clues. Differentiation of fibrotic from inflammatory changes is essential for treatment planning and prognosis. ILD mimickers such as infection, edema, drug toxicity, and neoplasms must be systematically excluded. Optimal HRCT technique (inspiratory, expiratory, and prone views when indicated) improves diagnostic accuracy. Follow-up HRCT plays a key role in monitoring disease progression, therapeutic response, and complications. Awareness of common pitfalls—such as mistaking dependent atelectasis or motion artifact for true fibrosis—enhances diagnostic reliability.

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Introduction and Clinical Importance and follow up. HRCT protocol. Recognizing HRCT patterns Recognizing: UIP Pattern, NSIP Pattern, Organizing Pneumonia, Hypersensitivity Pneumonitis, acute interstitial pneumonia, Sarcoidosis Mimics of ILD Pitfalls Step-by-step approach to interstitial lung disease. Important checklist for follow up CT in ILD.

CHEE-65 PORTABLE DDR: BRINGING DYNAMIC CHEST IMAGING TO THE BEDSIDE

Michaela Cellina (*Presenter*)
Rossella Catona, MD (*Abstract Co-Author*)
Maurizio Ce, MD,BA (*Abstract Co-Author*)
Gabriele Drago, MD (*Abstract Co-Author*)
Stefano Pedrini (*Abstract Co-Author*)
Matilde Pavan, MD (*Abstract Co-Author*)
Giancarlo Oliva (*Abstract Co-Author*)

TEACHING POINTS

Portable DDR enables bedside dynamic chest imaging, offering functional insights into diaphragmatic motion, lung perfusion (contrast-free), and post-procedural complications.

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DDR is a novel high-resolution imaging technique employing pulsed X-ray emission to rapidly acquire multi-frame sequential images of a targeted anatomical region, rendered as cine loops. Initially developed for orthostatic imaging, its recent integration into portable systems now enables dynamic acquisitions at the patient's bedside, unlocking the potential for new diagnostic insights. Diaphragmatic dysfunction, arising from various etiologies including vascular disorders, trauma, infections, neuromuscular diseases, and neoplasms, can be evaluated with DDR. This technique provides functional, structural, and morphological information across different breathing patterns, visually depicting diaphragmatic motion over time through color-coded curves and quantifying the range of motion to aid in diagnosis. Furthermore, DDR eases the assessment of lung motility and the identification of abnormal motion associated with adhesions, proving information in diagnosing breath abnormalities in lung cancer patients. Regional lung ventilation can be analyzed with color-coded maps, illustrating temporal changes in pixel density. This allows the identification of ventilation disparities and the evaluation of respiratory interventions, particularly in Intensive Care Units. Perfusion abnormalities, can be investigated without the need for contrast media, making it a safe alternative for patients with severe allergies or impaired renal function.

CHEE-66 MASTERING CONTRAST-ENHANCED CHEST CT: EVIDENCE AND PRACTICAL SOLUTIONS FOR OPTIMAL IMAGING

Masahiro Yanagawa, MD, PhD (*Presenter*)
Akinori Hata, MD, PhD (*Abstract Co-Author*)
Midori Ueno, MD (*Abstract Co-Author*)
Miyuki Tomiyama (*Abstract Co-Author*)
Daiki Nishigaki, PhD (*Abstract Co-Author*)
Shuhei Doi, MD (*Abstract Co-Author*)
Kazuki Yamagata, MD (*Abstract Co-Author*)
Yuka Fujita, MD (*Abstract Co-Author*)
Yukiko Tokuda, MD, PhD (*Abstract Co-Author*)
Noriyuki Tomiyama, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Recent advances in chest CT, particularly high-speed imaging and 3D reconstruction, have revolutionized diagnostic capabilities. While numerous studies have addressed CT contrast agents, evidence-based chest imaging protocols remain less detailed in the literature. This educational exhibit focuses on optimal protocols and practical considerations for thoracic neoplastic lesions, supported by illustrative clinical cases. It also provides evidence-based insights into contrast agent distribution and dynamics, state-of-the-art image reconstruction techniques, and clinical applications of dual-energy CT (DECT) and photon-counting CT (PCCT).

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1. Pharmacokinetics and biodistribution of contrast agents: a) Mechanisms of distribution and excretion after intravascular administration. b) Effect of CT on organ enhancement due to patient factors (body weight, cardiac function, renal function, etc.) and technical factors (contrast agent injection speed, time, injection method) 2. Case-based CT protocols for standard thorax (excluding cardiac/major vessels), suspected pulmonary neoplasms, and suspected mediastinal tumors: Purpose & Indications, Optimized Contrast Timing including Dynamic CT, Imaging Parameters (kVp, mA, slice thickness, etc.), and Basic Reconstruction. 3. Advanced Technologies & Image Reconstruction a) DECT vs. PCCT: Principles & Material Differentiation. b) Clinical Importance of High Spatial Resolution / Spectral Imaging based on recent research. c) Image Reconstruction (including Deep Learning) for Radiation/Contrast Reduction. d) Green Radiology: Contribution to the reduction of environmental impact.

CHEE-67 LEARNING FROM IMAGING: UNDERSTANDING PULMONARY COMPLICATIONS OF HEMATOPOIETIC STEM CELL TRANSPLANTATION

Sachiko Nakano (*Presenter*)
Kimiteru Ito (*Abstract Co-Author*)
Miyuki Sone, MD (*Abstract Co-Author*)

TEACHING POINTS

Nearly 100 hematopoietic stem cell transplantations (HSCT) are carried out per year at this institution. Given the substantial clinical experience accumulated, a collaboration on documenting comprehensive knowledge of pulmonary complications after hematopoietic stem cell transplantation is suggested. This documentation would encompass treatment strategies and post-transplant immune dynamics, with the aim of facilitating knowledge sharing. Immunity in hematopoietic stem cell transplantation will be learned about. Pulmonary diseases that can occur due to changes in immunity will be understood. Learn about the diagnostic process through case images."

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: 1. Category of hematologic tumor.2. Therapy of hematologic tumor.3. Respiratory complications after HSCT.4. Image of pulmonary complications 1.5. Image of pulmonary complications 2.

CHEE-68 TUBED AND CONFUSED: A GUIDE TO CHEST TUBE MISPLACEMENTS

Alejandra Cardona Del Valle, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Maximiliano Carrera (*Abstract Co-Author*)
Lyan Cabello Ballester (*Abstract Co-Author*)
Larry M. Alejandro Vargas, MD (*Abstract Co-Author*)
Jose Nieves-Munoz (*Abstract Co-Author*)
Hector Munoz-Miro (*Abstract Co-Author*)
Andrea M. Ruiz Mojica, MD (*Abstract Co-Author*)
Victor Guzman-Rivera, MD, MS (*Abstract Co-Author*)
Jose A. Maldonado, MD (*Abstract Co-Author*)

TEACHING POINTS

Review normal thoracic anatomy using a greenhouse analogy for engaging visual learning Discuss chest tube indications, types, and placement guidelines Identify normal imaging appearance of correctly placed tubes Highlight common malpositions (e.g., intrafissural, intraparenchymal, subcutaneous, intracardiac, kinked) with institutional case examples

TABLE OF CONTENTS/OUTLINE

Outline Introduction Objectives Anatomy relevant to chest tube placement Indications and tube types Placement guidelines Greenhouse analogy Misplaced tubes (subcutaneous, intracardiac, intrafissural, intraparenchymal, kinked) Imaging findings from institutional cases Conclusion Abstract Thoracostomy tubes are inserted into the pleural space to evacuate air, blood, or fluid. Correct placement is vital, as malpositioning can result in complications. This exhibit uses a greenhouse analogy—ribcage as greenhouse, lungs as trees, heart as fountain, and chest tubes as drainage pipes—to simplify spatial understanding. Misplacements such as intrafissural (tangled in branches), subcutaneous (outside the greenhouse), and intracardiac (piercing the fountain) are illustrated using real institutional cases. Chest tube types, placement techniques, and anatomical landmarks are reviewed, with X-ray and CT correlations. This visual guide enhances recognition of misplacement patterns, enabling timely intervention and improving patient outcomes.

CHEE-69 PULMONARY BLOOD FLOW ANALYSIS USING OBLIQUE DYNAMIC CHEST RADIOGRAPHY

Tasuku Nakajima, MPH, RT (*Presenter*)
Ryuichi USHIJIMA (*Abstract Co-Author*)
Rie Tanaka, PhD (*Abstract Co-Author*)
Aki Kido, MD, PhD (*Abstract Co-Author*)
Kyo Noguchi, MD (*Abstract Co-Author*)

TEACHING POINTS

Dynamic chest radiography (DCR) is a newly developed functional X-ray imaging technique that visualizes pulmonary blood flow without using contrast media (Fig. 1). DCR-based pulmonary blood flow findings are reportedly consistent with those in other imaging modalities, such as lung scintigraphy, pulmonary arteriography, and contrast-enhanced chest computed tomography (CT). However, DCR is usually performed in the posteroanterior (PA) direction, therefore, it cannot analyze the lung regions behind the heart in the PA direction. One solution is oblique imaging, as is done in lung scintigraphy. The purpose of this exhibit is to expose radiologists to a series of clinical cases in order to utilize oblique DCR to assess pulmonary blood flow in daily clinical settings.

TABLE OF CONTENTS/OUTLINE

Key diagnostic points will be highlighted in the discussion of each case using color-mapping images created by PA and oblique DCR, alongside corresponding clinical findings on CT, pulmonary angiography, and lung single photon emission computed tomography (SPECT). The list of cases includes: Follow-up of Chronic thromboembolic pulmonary hypertension (CTEPH), and Acute pulmonary embolism (PE) (Figs. 2,3,4) CTEPH before and after balloon pulmonary angioplasty (BPA) (Fig. 5)

CHEE-70 PULMONARY HYDATID DISEASE :RADIOLOGIC PEARLS FROM ENDEMIC REGION

Navdeep Kaur, MBBS,MD (*Presenter*)

TEACHING POINTS

Pulmonary hydatid disease is a key differential for cystic lung lesions , especially in patients from endemic regions or with a history of contact with livestock/dogs. CT thorax is the imaging modality of choice for characterizing hydatid cysts, detecting complications like rupture or infection, and identifying other organ involvement. Differentiating uncomplicated from complicated cysts is critical for guiding clinical management. Avoid needle aspiration or biopsy of suspected hydatid cysts , as rupture can lead to anaphylaxis and dissemination. Serologic testing can support diagnosis but is not always reliable , especially in isolated pulmonary cases—hence, imaging plays a central role. Radiologists play a crucial role in preoperative planning , by identifying the number, location, size, and complication status of the cysts.

TABLE OF CONTENTS/OUTLINE

Introduction - Overview of hydatid disease : etiology and epidemiology Pathophysiology and Life Cycle - Echinococcus granulosus and its pulmonary tropism- Stages of cyst development relevant to imaging Imaging Modalities and Findings- Chest radiograph: classic signs (e.g., water-lily, crescent signs) CT: identification of cyst integrity, daughter cysts, complications MRI and ultrasound (in select cases) Differential Diagnosis - Distinguishing from abscesses, neoplasms, congenital cysts, and fungal infections Key imaging pearls for differentiation Structured Imaging approach to diagnosis and management of Pulmonary Hydatid Cyst Teaching Points Take home message Case-Based Learning - Annotated case examples with step-by-step diagnostic reasoning- Interactive quiz for self-assessment

CHEE-71 CT IMAGING OF CYSTIC LUNG DISEASE

Shaun Aciu, MD (*Presenter*)
Katarina Stoffers (*Abstract Co-Author*)
Partha Hota, DO (*Abstract Co-Author*)
Chandra Dass, MD (*Abstract Co-Author*)
Yogesh S. Gupta, DO (*Abstract Co-Author*)

TEACHING POINTS

Provide a framework for understanding cystic lung diseases with a focus on the four major diffuse cystic lung diseases (DCLDs) most likely to be encountered on chest CT (i.e. lymphangioleiomyomatosis, lymphoid interstitial pneumonia, pulmonary Langerhans cell histiocytosis, Birt-Hogg-Dubé syndrome) Discuss important imaging features and key demographic variables that are critical to differentiating DCLDs and achieving an accurate diagnosis Present treatment options, which can meaningfully alter the natural history of disease progression and thereby underscore the necessity for accurate identification

TABLE OF CONTENTS/OUTLINE

: CT is the most valuable noninvasive modality in the diagnosis of DLCDs. By combining a discerning radiologic evaluation with select clinical characteristics, the radiologist can arrive at an accurate diagnosis in most instances. This allows for earlier disease intervention with reduction in morbidity and mortality. • Definition of a cyst and of cystic lung disease with differentiation from mimics (i.e. emphysema, cavity, cystic bronchiectasis, honeycombing) • Etiological classification of cystic lung diseases • CT imaging features of DCLDs with emphasis on major entities, including an algorithmic approach • Discussion of clinical variables, pathophysiology, histopathology, treatment options, and future directions of various DCLDs

CHEE-72 MUCIN-PRODUCING LESIONS OF THE LUNG: MANY FACES, ONE DIAGNOSIS

Danilo O. Ramos, MD (*Presenter*)

TEACHING POINTS

Review the types, pathophysiology, and epidemiology of mucin-producing lung lesions. Describe the diverse CT imaging appearances of invasive mucinous adenocarcinoma. Recognize tumor spread patterns and their prognostic implications. Highlight key differential diagnoses for multifocal consolidative lesions. Discuss the radiologist's role in initial diagnosis, follow-up, and management.

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Imaging Modalities and Acquisition Protocols: Radiography, CT, PET/CT, Bronchoscopy imaging. Spectrum of Imaging Findings (CT Focus): Consolidation, ground-glass opacities, air-bronchograms, mucous bronchograms, centrilobular nodules ("tree-in-bud"), nodules and masses, cystic spaces, cavitations. Patterns of Tumor Spread and Case Follow-Up: Aerogenous/bronchogenic spread, hematogenous spread (rare), lymphatic dissemination (rare), pleural involvement (rare), spread through airspaces (STAS). Important Differential Diagnoses: Lymphoma, inflammatory myofibroblastic tumor, amyloidosis, vasculitis, granulomatous diseases (e.g., tuberculosis, silicosis), pulmonary hemorrhage, alveolar infiltrates (e.g., alveolar proteinosis, eosinophilic pneumonia).

CHEE-73 PULMONARY HYPERTENSION IN THE ERA OF ADVANCED CT: CLINICAL INSIGHTS FROM DUAL-ENERGY AND PHOTON-COUNTING TECHNOLOGIES

Daniel Selva, MD (*Presenter*)
Anton Aubanell, MD (*Abstract Co-Author*)
Marco Ciuffreda, MD (*Abstract Co-Author*)
Laura Maneu Bernado, MD (*Abstract Co-Author*)
Javier Saez, MD (*Abstract Co-Author*)
Lidia Canales, MD (*Abstract Co-Author*)
Ana M Gimenez Palleiro, MD (*Abstract Co-Author*)
Jose M Brenes, MD (*Abstract Co-Author*)

TEACHING POINTS

Pulmonary hypertension (PH) is a complex, multifactorial condition requiring a coordinated, multidisciplinary approach, with radiologists playing a key role in detecting and characterizing its causes. Recent studies support CT pulmonary angiography (CTPA) as the first-line imaging modality for diagnosing chronic thromboembolic pulmonary hypertension (CTEPH) (Group 4). It also enables comprehensive assessment of thoracic abnormalities linked to other PH groups, including COPD and interstitial lung disease (Group 3); systemic and metabolic conditions such as sarcoidosis and Langerhans cell histiocytosis (Group 5); fibrosing mediastinitis (Group 5); and congenital anomalies like intracardiac shunts, patent ductus arteriosus, and anomalous pulmonary venous return, which may be missed on transthoracic echocardiography (Group 1). Emerging technologies such as dual-energy and photon-counting CT offer enhanced anatomical and functional imaging, improving diagnostic accuracy and long-term management of PH.

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Review the definition of pulmonary hypertension and the current etiological classification into clinically distinct groups. Provide a structured overview of specific radiologic findings, illustrated with clinical and pathological correlation. Emphasize the diagnostic utility of dual-energy CT and photon-counting CT in the evaluation of patients with pulmonary hypertension, particularly through the use of iodine perfusion maps and lung parenchymal density assessment, and compare these modalities with other functional imaging techniques, including SPECT.

CHEE-74 SEALED, BUT NOT HEALED: POSTOPERATIVE THORACIC COMPLICATIONS ON CT - A PICTORIAL ESSAY

Danilo O. Ramos, MD (*Presenter*)

TEACHING POINTS

Recognize the diversity of postoperative thoracic complications detectable on CT. Understand the importance of imaging timing and technique for early diagnosis. Identify critical CT patterns that suggest infectious, vascular, traumatic, or mechanical complications. Highlight the radiologist’s role in guiding clinical management and improving outcomes. Emphasize the necessity of vigilance to avoid missing subtle yet significant postoperative findings.

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Introduction: Definition and significance of postoperative thoracic complications. Imaging Evaluation: Role of radiography and CT in postoperative assessment. Spectrum of Complications: Infectious (empyema, pneumonia), vascular (bleeding), traumatic (lung torsion, hilar hematoma), mechanical (bronchopleural fistula, pulmonary hernia, bronchial stenosis), and foreign body (gossypiboma). Key Imaging Findings: Typical CT appearances and differential considerations. Clinical Relevance: Importance of early recognition and multidisciplinary management. Conclusion: The radiologist’s essential contribution to optimizing postoperative outcomes.

CHEE-75 A FUNDAMENTAL APPROACH TO SMOKING RELATED INTERSTITIAL LUNG DISEASE

Andrew Moore, MD (*Presenter*)
Daffolyn Rachael Fels Elliott (*Abstract Co-Author*)
Gregory M. Lee, MD (*Abstract Co-Author*)
Jeffrey P. Kanne, MD (*Abstract Co-Author*)
Christopher Walker, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Smoking related interstitial lung disease (SR-ILD) is a common and likely underrecognized entity that lacks consensus in clinical, pathological, and radiological diagnosis. 2. A pattern-based approach to imaging can improve the radiologist’s accuracy. 3. Cessation of smoking can result in resolution, reversal, or stabilization of imaging and clinical findings of lung disease. 4. SR-ILD is broad and ranges from benign and potentially reversible clinical and radiological findings such as respiratory bronchiolitis, which occurs in nearly all smokers, to more chronic and severe diseases such as idiopathic pulmonary fibrosis. 5. Acute onset lung disease related to smoking may represent acute eosinophilic pneumonia and can be life-threatening.

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Background/Epidemiology Cigarette smoking remains a significant contributor to morbidity/mortality worldwide SR-ILD is associated with cigarette use Pattern-based approach to radiologic diagnosis Review of pulmonary function tests (PFT) Clinical, pathological, and radiological manifestations of SR-ILD: Respiratory bronchiolitis (RB) Desquamative interstitial pneumonia (DIP) Pulmonary Langerhans cell histiocytosis (PLCH) Smoking related interstitial fibrosis (SRIF)/air space enlargement with fibrosis (AEF) Combined pulmonary fibrosis and emphysema (CPFE) Idiopathic pulmonary fibrosis (IPF) Acute eosinophilic pneumonia (AEP) E-cigarette and vaping associated acute lung injury (EVALI) Diagnostic controversies and consensus recommendations Conclusion

CHEE-76 UNRAVELING CYSTIC LUNG DISEASES: WHAT RADIOLOGISTS NEED TO KNOW

Ziyu Xian, MD (*Presenter*)
Daniel Kowal, MD (*Abstract Co-Author*)

TEACHING POINTS

Cystic lung diseases encompass a diverse and diagnostically challenging group of disorders, often presenting with overlapping clinical and imaging features. Unlike emphysema, pulmonary cysts typically have well-defined, perceptible walls and are frequently secondary to an underlying disease process. Early and accurate identification is crucial to guide appropriate patient management, prevent progressive pulmonary decline, and reduce the risk of associated complications. This educational exhibit will showcase the radiographic and computed tomography findings of both common and uncommon cystic lung diseases, including lymphangioleiomyomatosis, pulmonary Langerhans cell histiocytosis, lymphoid interstitial pneumonia, Birt-Hogg-Dubé syndrome, and Pneumocystis jirovecii pneumonia. We will emphasize key imaging characteristics such as cyst morphology, distribution patterns, and other associated pulmonary findings including ground-glass opacities and pulmonary nodules. Lastly, we will address common diagnostic mimickers such as emphysema, honeycombing, cystic bronchiectasis, cavities, bullae and pneumatoceles, highlighting distinguishing features to avoid potential pitfalls.

TABLE OF CONTENTS/OUTLINE

• Introduction• Cystic lung diseases. For each disease, will discuss pathophysiology, epidemiology, radiographic and HRCT features, and management• Cyst mimics• Summary comparison table/diagram • References

CHEE-77 THE RADIOLOGY HALL OF FAME: CHEST EDITION

Alejandra Cardona Del Valle, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Carlos Perez Morales (*Abstract Co-Author*)
Ariana Salgueiro Estela (*Abstract Co-Author*)
Antonio De La Cruz, MD (*Abstract Co-Author*)
Amanda P. Marrero-Gonzalez, MD, BS (*Abstract Co-Author*)

TEACHING POINTS

Review commonly encountered chest eponyms with emphasis on clinical presentation, historical relevance, and key imaging features. Use a “Hall of Fame” format to aid recognition and learning of eponyms in thoracic and cardiac radiology. Illustrate imaging findings using radiographs and CTs from our institution to highlight diagnostic clues and clinical impact.

TABLE OF CONTENTS/OUTLINE

Introduction Objectives Subjects The Pulmonary Pavilion: Birt-Hogg-Dubé, Hampton’s Hump, Kerley B Lines, Chilaiditi Sign, Golden S Sign The Bronchial Boulevard: Kartagener Syndrome, Lady Windermere Syndrome The Cardiac Gallery: Tetralogy of Fallot, Ebstein Anomaly, Yamaguchi Syndrome, Marfan Syndrome, Takayasu Arteritis The Mediastinal Memorial: Pancoast Tumor, Kommerell Diverticulum The Thoracic Tapestry: Wegener’s Granulomatosis, Debakey Classification The Skeleton Atrium: Roesler’s Sign Imaging Findings Conclusion Abstract: Chest eponyms are imaging findings named after individuals who first described them. These often offer key diagnostic clues. This exhibit reviews over 15 thoracic and cardiac eponyms, highlighting historical background and characteristic imaging. Using themed sections and a “Hall of Fame” visual format, we incorporate institutional cases on radiographs, CTs, and MRIs. This exhibit serves as a useful educational tool for students, residents, and radiologists.

CHEE-78 THORACIC RADIOLOGY MEETS SPECTRAL CT: APPLICATIONS AND CLINICAL INSIGHTS

Rodrigo Sutil, MD (*Presenter*)
Aranzazu Sanchez Gabin, MD (*Abstract Co-Author*)
Alejandra Somoano Marfull (*Abstract Co-Author*)
Silvia Revuelta Gomez, MD (*Abstract Co-Author*)
Cesar Antonio Lopez Lopez, MD (*Abstract Co-Author*)
Teresa Cobo Ruiz, MD (*Abstract Co-Author*)
Victor Fernandez Lobo (*Abstract Co-Author*)
Maria Elena Pena Gomez, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review the physical fundamentals and technical aspects of spectral imaging, as well as the advantages and limitations of its application in radiology. - Describe the applications of spectral imaging in thoracic radiology.

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Spectral computed tomography is an advanced imaging technique known for its ability to decompose and characterise materials. The radiologist's knowledge of the physical fundamentals can be useful in understanding the different tools offered by this technique, its semiology, as well as its artifacts and limitations. In the field of thoracic radiology, it has made important contributions in the diagnosis of vascular diseases such as acute and chronic pulmonary thromboembolism, in the control of malignant lung masses treated with percutaneous ablation and has an emerging role in the characterisation of lung tumors.

CHEE-79 THORACIC PSEUDOANEURYSMS: A MULTI-VESSEL IMAGING REVIEW, ETIOLOGIES, DIAGNOSTIC MIMICS, AND MANAGEMENT STRATEGIES

Achala Donuru, MD (*Presenter*)
Rupali Jain, MD,MBBS (*Abstract Co-Author*)
Julia Jacob, MD (*Abstract Co-Author*)
Narainder Gupta, MD, FRCR (*Abstract Co-Author*)
Arun C. Nachiappan, MD (*Abstract Co-Author*)
Dongming Xu, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Pathophysiology Understand the mechanism of pseudoaneurysm formation vs. true aneurysms. Etiologies Recognize diverse etiologies (traumatic, infectious, iatrogenic, post-MI). Imaging Identify key imaging features on CT, MR, and Echo (neck, hematoma, communication). Modalities Appreciate strengths/weaknesses of CT, MR, and Echo for specific scenarios. Location Recognize imaging patterns based on vessel location (aorta, pulmonary, etc.). Mimics Differentiate pseudoaneurysms from true aneurysms, dissections, masses, cysts. Management Review endovascular, surgical, percutaneous, and conservative options. Pearls Implement a systematic approach for accurate diagnosis.

TABLE OF CONTENTS/OUTLINE

I. Introduction: Definition and Significance of Thoracic Pseudoaneurysms II. Pathophysiology and Etiology: Mechanisms of Formation, Etiologic Classification (Traumatic, Infectious, Iatrogenic, etc.) III. Imaging Modalities: CT Angiography (CTA), MR Angiography (MRA), Echocardiography (TTE/TEE), Conventional Angiography IV. Pseudoaneurysms by Location V. Complications: Rupture, Thrombosis, Embolization, Cardiac Tamponade VI. Differential Diagnosis: True Aneurysms, Aortic Dissections, Mediastinal Masses, Hematomas, Pericardial Cysts, Ventricular Diverticula VII. Management: Endovascular Repair, Surgical Repair, Percutaneous Thrombin Injection, Conservative Management VIII. Diagnostic Approach Flowchart Summarize the systematic approach to evaluating a patient with suspected pseudoaneurysm with a flow chart. IX. Conclusion: Key Takeaways and Importance of Multidisciplinary Approach

CHEE-80 HIDDEN IN PLAIN SIGHT: THORACIC TUMORS MASQUERADING AS NON-THORACIC CONDITIONS

Makiko Murota, MD (*Presenter*)
Yuka Yamamoto, PhD (*Abstract Co-Author*)
Yoshihiro Nishiyama, MD (*Abstract Co-Author*)

TEACHING POINTS

Thoracic tumors, including lung cancer, may be associated with chief complaints in other parts of the body or other disease. However, in such cases, the possibility of thoracic tumors may not be recognized or overlooked. The purpose of this presentation is to expose radiologists to such challenging cases, enabling them to recognize the association with thoracic tumors and their imaging findings.

TABLE OF CONTENTS/OUTLINE

Explanations of the pitfall and how it is associated with thoracic tumors, clinical considerations and relevance, and imaging findings will be provided. 1. neurological complaint, 2. otolaryngological complaint, 3. orthopaedical complaint, 4. disorders of the endocrine system, and 5. Others.

CHEE-81 RADIOLOGICAL SPECTRUM OF CLAD: INSIGHTS FROM THE UPDATED ISHLT DIAGNOSTIC CRITERIA

Taiki Fukuda, MD, PhD (*Presenter*)
Yusei Nakamura, MD (*Abstract Co-Author*)
Shu Chi Tseng, MD (*Abstract Co-Author*)
Yuki Ko (*Abstract Co-Author*)
Staci Gagne, MD (*Abstract Co-Author*)
Takeshi Johkoh, MD, PhD (*Abstract Co-Author*)
Yi Li (*Abstract Co-Author*)
David Christiani, MD (*Abstract Co-Author*)
Hiroya Ojiri, MD (*Abstract Co-Author*)
Lynette M. Sholl (*Abstract Co-Author*)
Mizuki Nishino, MD, MPH (*Abstract Co-Author*)
Hiroto Hatabu, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Understand updated ISHLT criteria for chronic lung allograft dysfunction (CLAD) and its radiological classifications into distinct phenotypes. 2. Recognize characteristic imaging findings of restrictive allograft syndrome (RAS)-like opacities (RLOs), bronchiolitis obliterans syndrome (BOS), and their mixed presentations. 3. Identify the temporal evolution of radiological patterns in CLAD, including COVID-19-associated manifestations. 4. Recognize the limitations in radiological differentiation between undefined and unclassifiable CLAD phenotypes and the association with diaphragmatic elevation and pleural effusion. 5. Understand the role of radiological findings in clinical decision-making and long-term monitoring of CLAD progression in lung transplant recipients.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Outline the new ISHLT diagnostic criteria; Impact of radiological phenotyping on treatment and outcomes in lung transplant patients. 2. Radiological manifestations of CLAD phenotypes: Demonstrate the characteristic CT findings of RLOs, BOS, and mixed pattern presentations. 3. Temporal evolution of radiological findings: Sequential imaging changes in CLAD progression, with focus on RLOs. 4. COVID-19 and CLAD: COVID-19 as a potential trigger for RLOs development. 5. Undefined and unclassified phenotypes: Radiological overlap between phenotypes, particular attention to the significance of diaphragmatic elevation and pleural effusion. 6. Clinical applications and management strategies: Clinical applications of various radiological evaluations in CLAD management; Emphasize the value of imaging assessment in predicting outcomes and guiding treatment decisions.

CHEE-82 STEPWISE APPROACH TO TRACHEAL ABNORMALITIES ON CT

Melisa Prieto Peralta, MD (*Presenter*)
Kiran Batra, MD (*Abstract Co-Author*)
Asha Kandathil, MD (*Abstract Co-Author*)
Arzu Canan, MD (*Abstract Co-Author*)

TEACHING POINTS

Tracheal abnormalities cover a broad spectrum, including congenital defects, infections, inflammation, and neoplastic conditions. These abnormalities can be focal or diffuse and are often linked with systemic diseases. CT offers an effective tool for identifying and diagnosing these conditions. This presentation aims to provide a clear, stepwise approach to evaluating tracheal abnormalities on CT, helping radiologists improve their ability to confidently recognize and differentiate various pathologies.

TABLE OF CONTENTS/OUTLINE

A.Introduction B.Stepwise approach:1-Identify Structural Variations a.Tracheal bronchus b.Cardiac bronchus c.Diverticula 2-Evaluate for tracheal nodules a.Assess number of nodules b.Single nodule i.Benign:Mucus plug, hamartoma, chondroma,papilloma,amyloidoma ii.Malignant:Squamous cell carcinoma,carcinoid,adenoid cystic carcinoma, mucoepidermoid carcinoma,sarcoma, IMT c.Multiple nodules-Consider diffuse processes: Mucus, papillomatosis, TB/BOCP, metastases.3-Assess tracheal diameter a.Increased diameter i.Tracheobronchomegaly ii.Tracheomalacia iii.Saber sheath trachea b.Decreased diameter i.Evaluate for extrinsic compression:Goiter, LAP, fibrosing mediastinitis ii.Assess extension of tracheal involvement 1.Focal:Post-intubation stenosis,Post-RT stenosis, Congenital tracheal stenosis 2.Diffuse:Associated with wall thickening: a.Horse-show type thickening: Relapsing polychondritis,TB/BOCP b.Circumferential thickening: Infectious,amyloidosis,GPA,sarcoidosis,IBD 4-Additional imaging techniques a.Expiratory CT b.Dynamic airway CT 5-Clinical Correlation and Associated abnormalities.Conclusion

CHEE-83 MULTIMODALITY SNIFF TESTING FOR DIAPHRAGM DYSFUNCTION: COMPREHENSIVE EVALUATION WITH FLUOROSCOPY AND ULTRASOUND

Albert Chiu, DO (*Presenter*)
Kristina Yancey, MD (*Abstract Co-Author*)
Amar Shah, MD (*Abstract Co-Author*)
Mark D. Sugi, MD (*Abstract Co-Author*)
Maria Zulfiqar, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Review the anatomical and physiological underpinnings of the diaphragm relevant to dynamic evaluation (sniff testing). Master fluoroscopic and ultrasonographic techniques for accurate, real-time evaluation of diaphragmatic function. Identify critical imaging findings that guide management, including those that indicate further testing, surgical referral, or supportive therapy.

TABLE OF CONTENTS/OUTLINE

Anatomy and Physiology Overview Clinical anatomy of the diaphragm Mechanics of diaphragmatic motion during normal breathing and sniff testing. Innervation and implications of phrenic nerve dysfunction Fluoroscopic Sniff Test Equipment setup and patient positioning Technique for dynamic assessment Normal, diminished, and paradoxical motion examples Limitations and radiation considerations Ultrasound Sniff Test (M-mode) Probe positioning and image optimization M-mode waveforms: normal, reduced, and paradoxical motion patterns Advantages in pediatric, intensive care, and radiation-sensitive populations Comparative Analysis of Modalities Strengths and limitations of fluoroscopy vs ultrasound Situational recommendations based on patient factors and institutional resources Case-Based Review Annotated examples of normal and abnormal findings Paradoxical elevation due to paralysis or phrenic nerve palsy. Decreased or absent movement due to partial paralysis, weakness, chronic eventration Delayed motion due to early or partial phrenic nerve injury Fixed elevation due to chronic eventration, massive pleural effusion, or prior surgery/scarring Tips for accurate interpretation and reporting Correlation with clinical outcomes

CHEE-84 THE "SHORT" END OF THE STICK: A COMPREHENSIVE REVIEW OF TELOMERE-RELATED INTERSTITIAL LUNG DISEASE WITH SYSTEMATIC AND CASE-BASED APPROACH

Omer Onder, MD (*Presenter*)
Brittany Cody (*Abstract Co-Author*)
Zehavit Kirshenboim (*Abstract Co-Author*)
Kyung Hee Lee (*Abstract Co-Author*)
Emrah Duman, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Telomeres are repetitive DNA-protein complexes at chromosome ends that maintain genomic integrity and regulate cellular aging. Short telomeres cause premature senescence and impaired tissue repair. Multisystem clues such as premature graying, hematologic abnormalities, or cryptogenic cirrhosis should raise suspicion for short telomere syndromes in patients with interstitial lung disease (ILD). 2. Telomere-related ILD most commonly shows a UIP pattern on CT but may also present with atypical features or emphysema, complicating radiologic-pathologic correlation. Histopathology often reveals overlapping fibrotic patterns without a pathognomonic marker, requiring clinical and genetic data for accurate diagnosis. Post-transplant, these patients face increased risks of airway complications, marrow failure, and viral infections, requiring tailored immunosuppression and close monitoring. 3. This exhibit provides a comprehensive review of telomere-related ILDs through case examples, summarizing key literature insights and providing practical clues for clinical care. Recognizing these distinct features and ensuring multidisciplinary coordination are vital for timely transplant evaluation, personalized management, and anticipation of post-transplant complications.

TABLE OF CONTENTS/OUTLINE

A. Introduction: Telomeres B. Telomere length testing C. Short telomere syndromes D. Telomere-related ILDs - Clinical findings - Radiological patterns - Histopathological features - Important considerations - Case examples F. Post-transplant complications - Airway complications - Hematological complications - Infectious complications - Other complications G. Summary H. Conclusion

CHEE-85 BEYOND INVASIVE ADENOCARCINOMA: A VISUAL GUIDE TO PERSISTENT SUBSOLID PULMONARY NODULES ON CT

Yanyan Xu, MD, PhD (*Presenter*)
He Chen (*Abstract Co-Author*)
Sheng Xie (*Abstract Co-Author*)
Min Xu, PhD (*Abstract Co-Author*)

TEACHING POINTS

1.Classify the spectrum of persistent SSNs into neoplastic (adenocarcinoma spectrum) and non-neoplastic (infectious/inflammatory) etiologies.2.Identify key CT features to differentiate benign vs. malignant SSNs3.Propose evidence-based management pathways based on Fleischner Society guidelines

TABLE OF CONTENTS/OUTLINE

I. Introduction A. Clinical Significance, Diagnostic challenge; B. Objectives of the Exhibit; 3. Provide evidence-based management algorithms to guide biopsy/follow-up decisions. II. Spectrum of Persistent Subsolid Nodules A. Neoplastic Etiologies (80% of cases) 1. Preinvasive lesions - Atypical adenomatous hyperplasia (AAH); Adenocarcinoma in situ (AIS). 2. Invasive adenocarcinoma: - Minimally invasive (MIA); Invasive adenocarcinoma. B. Non-Neoplastic Etiologies (20% of cases) 1. Infectious - Fungal (e.g., cryptococcosis; mucormycosis; Tuberculosis. 2. Inflammatory: - Organizing pneumonia (OP); Pulmonary capillary hemangiomatosis (PCH). III. Key Differentiating Features on CT A. Malignant Clues - Morphology, Kinetics, Quantitative metrics. B. Benign Mimics. C. Case Examples IV. Diagnostic Algorithm & Management A. Flowchart: "When to Biopsy?" . B. Pitfalls to Avoid V. Teaching Tools & Visual Strategy A. Interactive Elements - Quiz: "Malignant or Benign?". B. Take-Home Infographic VI. Conclusion & Future Directions - Persistent SSNs require integration of “morphology + kinetics + clinical context” - Emerging tools: AI-based risk stratification (e.g., radiomics). - Call to action: Standardize follow-up protocols to reduce unnecessary procedures.

CHEE-86 MANUAL FOR PECTORAL MUSCLE EVALUATION: KEY INSIGHTS FOR THE THORACIC RADIOLOGIST

Enzo Calheiros, MD (*Presenter*)
Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)
Bruno Ramos, MD (*Abstract Co-Author*)
Maria Vitoria Ludwig, MD (*Abstract Co-Author*)
Daniel Giunchetti Strabelli, MD (*Abstract Co-Author*)
Renata F. Batista Pereira, MD (*Abstract Co-Author*)
Marcos Felippe D. Correa, MD (*Abstract Co-Author*)
Marcio V. Sawamura, MD, PhD (*Abstract Co-Author*)
Cesar H. Nomura, MD, PhD (*Abstract Co-Author*)
Lucas d. Gomes de Farias, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- Imaging exams like CT and MRI are key in diagnosing issues with the pectoral muscles, such as trauma, tumors, or postoperative changes, with the thoracic radiologist playing a crucial role in detecting abnormalities.- Knowledge of normal and pathological variations in the pectoral muscles is essential for accurate radiological evaluation, which impacts clinical management and patient prognosis.- While CT is effective for assessing bone injuries, MRI is the preferred modality for evaluating pectoral muscles due to its superior ability to differentiate soft tissues, identify muscle injuries, and detect conditions like edema, hematomas, and fibrosis.- MRI excels at distinguishing benign from malignant lesions and provides information for accurate lesion localization, guiding treatment decisions. It is essential for assessing the relationship between pectoral muscles and surrounding structures, especially in surgical planning for breast reconstruction or aesthetic procedures.- The thoracic radiologist must have proficiency in differentiating normal anatomical variants from pathological findings is fundamental to avoid misinterpretation and unnecessary interventions.

TABLE OF CONTENTS/OUTLINE

1. Background:- Anatomy2. Normal variants- Pectoralis quartis muscle- Sternalis muscle3. Post-mastectomy changes4. Trauma - CT vs. MRI - Tendon rupture5. Aesthetic modifications6. Tumors7. Summary and take-home messages

CHEE-87 UNUSUAL DISEASE-SPECIFIC THORACIC MANIFESTATIONS IN CONNECTIVE TISSUE DISEASE

Ryan Walsh, MBBCh, BSc (*Presenter*)
Laura Marsland, MBChB (*Abstract Co-Author*)
Hasti Robbie, MD (*Abstract Co-Author*)

TEACHING POINTS

Connective tissue disease (CTD)-associated interstitial lung disease (ILD) presents with a range of distinct imaging features that can help refine the differential diagnosis. Recognising these patterns is crucial for accurate assessment. For example, Shrinking Lung Syndrome (SLS) in systemic lupus erythematosus (SLE) manifests as progressive lung volume loss and restrictive function without evidence of ILD or pleural disease. Rheumatoid usual interstitial pneumonitis (RA-UIP) can be differentiated from idiopathic UIP by signs such as anterior upper lobe involvement, a straight edge appearance, and exuberant honeycombing. Melanoma differentiation-associated protein 5 (MDA5) anti-synthetase syndrome, part of the idiopathic inflammatory myopathy spectrum, is notable for rapidly progressive ILD with high early mortality; high-resolution CT may reveal a "reverse oedema" pattern and diaphragmatic "hugging." In Sjögren's syndrome, lymphocytic interstitial pneumonia (LIP) is characterised by perivascular cysts and ground glass opacities, while diffuse alveolar haemorrhage (DAH) in SLE typically shows a crazy-paving pattern on CT and carries high mortality without plasmapheresis.

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This exhibit will review the diagnostic value of unusual CTD thoracic findings on CT, illustrated through a case series covering SLS in SLE, rapidly progressive ILD in MDA5+ syndrome, LIP in Sjögren's, acute SLE manifestations, rheumatoid-ILD, hypersensitivity pneumonitis in RA, emphysema in never-smokers with RA or scleroderma, and the distinction between reversible and irreversible CTD-ILD. Key reporting points and take-home messages will be summarised.

CHEE-88 RADIOLOGICAL-PATHOLOGICAL CORRELATION IN CONNECTIVE TISSUE DISEASE-ASSOCIATED LUNG DISEASES

Tae Iwasawa, MD, PhD (*Presenter*)
Tomoe Sawazumi (*Abstract Co-Author*)
MAI MATSUMURA (*Abstract Co-Author*)
Tamiko Takemura, MD, PhD (*Abstract Co-Author*)
Tomohisa Baba (*Abstract Co-Author*)
Takashi Ogura (*Abstract Co-Author*)
Akira Haga, MD, PhD (*Abstract Co-Author*)
NAOFUMI YASUDA (*Abstract Co-Author*)
Shoichiro Matsushita, MD (*Abstract Co-Author*)

TEACHING POINTS

Computed tomography (CT) findings in connective tissue disease-associated interstitial lung disease (CTD-ILD) are often complex due to overlapping pathological features such as bronchiolitis, usual interstitial pneumonia (UIP), and nonspecific interstitial pneumonia (NSIP). As ILD classification is primarily histopathological, radiologists must understand the pathological correlates of these imaging patterns. However, according to the 2023 ILD guidelines of the American College of Rheumatology, surgical lung biopsy is not recommended for suspected CTD unless malignancy is suspected. This study describes CT images with corresponding histological findings in patients not initially diagnosed with CTD to help radiologists understand CTD-associated lung disease.

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1) Dermatomyositis: Loss of lung volume suggests diffuse alveolar damage (Fig. 1). 2) Systemic sclerosis: NSIP is the most common disease; however, UIP may occur. Discordant patterns were frequently observed (Figs. 2, 3). 3) Rheumatoid arthritis: Cellular and destructive bronchiolitis are the key histological features (Figs. 4, 5). 4) Sjögren's syndrome: airway disease, ILD, and lymphoproliferative disorders coexist and produce diverse CT patterns (Figs. 6,7). 5) Pulmonary hypertension (PH): Enlargement of the main pulmonary artery and right ventricular hypertrophy suggest PH, and interlobular septal thickening and ground-glass opacities may indicate pulmonary veno-occlusive disease (Fig. 8).

CHEE-89 LOOKING UP FOR A DIAGNOSIS: IMAGING AND DIFFERENTIAL DIAGNOSIS OF UPPER-ZONE PREDOMINANT LUNG DISEASES

Felipe Castillo Aravena, MD (*Presenter*)
Kate Hanneman, MD, MPH (*Abstract Co-Author*)
Felipe S. Torres, MD, PhD (*Abstract Co-Author*)
Micheal McInnis, MD (*Abstract Co-Author*)
Felipe A. Sanchez, MD (*Abstract Co-Author*)
Daniel Vargas, MD (*Abstract Co-Author*)
Elsie Nguyen, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

1. Awareness of normal anatomic and physiologic differences between the upper and lower lobes is essential for accurate interpretation of lung diseases. 2. Differences in V/Q ratio, lymphatic flow, mechanical stress, and an alkaline environment explain the upper-zone predominance of lung diseases. 3. Several diseases—including sarcoidosis, tuberculosis, hypersensitivity pneumonitis, and pulmonary Langerhans cell histiocytosis—share an upper-zone predominance, but can be differentiated by their hallmark imaging findings and associated clinical scenarios. 4. Characteristic imaging features combined with their zonal distribution are key to narrowing the differential diagnosis and avoiding pitfalls.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Zonal anatomy and physiology of the lungs 2. Pathophysiology of upper-zone predominant diseases: Ventilation/perfusion ratio. Lymphatic drainage and clearance. Mechanical forces and stress points. Alkaline regional environment. 3. Granulomatous diseases: Sarcoidosis. Pneumoconiosis. Tuberculosis 4. Hypersensitivity-related diseases: Hypersensitivity pneumonitis (HP). Allergic bronchopulmonary aspergillosis (ABPA) 5. Smoking-related diseases: Emphysema. Respiratory bronchiolitis. Pulmonary Langerhans cell histiocytosis (PLCH) 6. Mechanical/structural stress-related diseases: Pleuroparenchymal fibroelastosis (PPFE). Marfan syndrome 7. Alkaline regional environment diseases: Metastatic pulmonary calcification (MPC) 8. Pearls and pitfalls 9. Summary table

CHEE-90 UNMASKING THE GENTLE GIANT : A RADIOLOGIST'S GUIDE OF SOLITARY FIBROUS TUMOR OF THE PLEURA

Andita D. Hidayati, MD (*Presenter*)
Daniel Vargas, MD (*Abstract Co-Author*)
Daniel Ocazionez-Trujillo, MD (*Abstract Co-Author*)
Ameya J. Baxi, MBBS,DMRD (*Abstract Co-Author*)
Vijay K. Aggarwal, MBBS (*Abstract Co-Author*)
Carlos S. Restrepo, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review the etiology, histology, and epidemiology of solitary fibrous tumors (SFT) of the pleura as well as understand the mesenchymal origin and variable behavior (benign vs malignant) of SFTs 2. Structured approach to recognizing key imaging characteristics of solitary fibrous tumor across modalities, including features that suggest malignant transformation and differentiating them from other mimics 3. Review paraneoplastic manifestations associated with SFTs 4. Apply imaging clues to predict tumor aggressiveness and guide clinical management

TABLE OF CONTENTS/OUTLINE

- Learning objectives- Introduction- Embryology and anatomy- Case series with imaging hallmarks of SFT of the pleura with conventional and advanced imaging- Benign vs malignant transformation: Imaging Differentiators- SFT Mimics and Differential Diagnosis- Management- Summary

CHEE-91 PULMONARY INFECTIONS IN IMMUNOCOMPROMISED PATIENTS: A RADIOLOGIC REVIEW

Rodolfo de Jesus Martinez Marquez, MD (*Presenter*)
Luis A. Sosa, MD (*Abstract Co-Author*)
Maria G. Gracia Munoz, MD (*Abstract Co-Author*)

TEACHING POINTS

To review radiologic manifestations of pulmonary infections in immunocompromised patients and correlate imaging features with specific pathogens. | To highlight key imaging signs that can guide differential diagnosis based on the immune defect and clinical setting. | To emphasize the importance of recognizing infection patterns linked to community acquired, nosocomial, reactivation, and environmental exposures.

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Brief overview of immunodeficiencies and associated risk factors. | Classification of infections by source and mechanism (community-acquired, nosocomial, reactivation, environmental). | Review of common pathogens: bacteria (e.g., Mycobacteria), viruses (e.g., CMV, HSV, VZV), and fungi (e.g., Pneumocystis , Aspergillus , Cryptococcus). | Imaging hallmarks of each pathogen group. | Diagnostic strategies and interpretive tips for radiologists.

CHEE-92 THERE'S SOMETHING GLEAMING INSIDE! IMAGING OF PRIMITIVE AND SECONDARY HYPER-ENHANCING LESIONS OF THE MEDIASTINUM

Chiara Moroni, MD (*Presenter*)
Diletta Cozzi, MD (*Abstract Co-Author*)
Edoardo Cavigli, MD (*Abstract Co-Author*)
Vittorio Miele, MD (*Abstract Co-Author*)

TEACHING POINTS

Mediastinal lesions are rare entities with heterogeneous imaging characteristics. In few cases they may show intense contrast enhancement representing pathological growing of specific tissues or hypervascular metastases from other districts. In this pictorial review we report primitive and secondary hyper-enhancing mediastinal lesions (HEML) from a single tertiary center focusing on tissue origin, site of onset and imaging presentation, to help the radiologist in the differential diagnosis.

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Primitive HEMLs generally originate from specific structures (Table 1): - Nervous system: Antoni A Swannomas and malignant peripheral nerve sheath tumors may be hyper-enhancing and are preferably (though not-exclusively) found in the posterior mediastinum (PM) (fig 1). - Vasculature: angiosarcomas may show hyper-enhancing foci and are generally described in the anterior mediastinum (AM) (fig 2). - Lymphatics: unicentric Castleman's disease is a rare, non-clonal lymphoproliferative disorder commonly described as a hyperenhancing mediastinal mass. -Neuroendocrine tissue: paragangliomas derive from paraganglia and can be located in the posterior or middle mediastinum; thymic neuroendocrine tumors (NETs) show generally high heterogenous enhancement in the AM; esophageal NETs, besides, arise in PM (fig 3). - Soft tissues: synovial sarcoma is a spindle-cell sarcoma and is the most frequently found in the mediastinum. -Thyroid and parathyroid: ectopic thyroid and parahtyroid, thyroid and parathyroid tumors or goitre may be HEMLs (fig 4). Secondary HEMLs derive mostly from neuroendocrine, renal and thyroid tumors or from melanoma and hepatocellular carcinoma.

CHEE-93 CHEST CT USING SILVER BEAM FILTER: LUNG NODULE DETECTION WITH ULTRA-LOW RADIATION DOSE

Hiroshi Moriya, MD, PhD (*Presenter*)
Motoharu Hakozaki (*Abstract Co-Author*)
Masahiro Suzuki (*Abstract Co-Author*)
Kenji Fujii (*Abstract Co-Author*)

TEACHING POINTS

1.Reduction of radiation exposure with Silver Beam Filter 2.Image quality evaluation of CT equipped with Silver Beam Filter: Phantom-based evaluation 3.Pulmonary nodule detection capability of ultra-low-dose CT equipped with Silver Beam Filter

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1. Reduction of radiation exposure with Silver Beam Filter The Silver Beam Filter (Ag) absorbs low-energy X-rays and shifts them to higher energies, significantly reducing radiation exposure. Deep Learning-based image reconstruction enables ultra-low dose CT scans with low noise. 2. Image quality evaluation of CT equipped with Silver Beam Filter Phantom used: patient-specific lung phantom created with a 3D printer (created from clinical lung images of ultra-high resolution CT). Reference: Three-dimensional printing of patient-specific lung phantoms for CT imaging: Emulating lung tissue with accurate attenuation profiles and textures. Med Phys. 2022) Equipment: 320-row area detector CT (Aquilion ONE / INSIGHT Edition) Scanning conditions: 3D Landmark Scan, 120kV(Ag), tube current 40, 20, 10 mA, 0,5sec rotation, CTDI 0.04, 0.14, 0.36, Image reconstruction: FBP, iterative reconstruction (AIDR3D), Deep Learning Reconstruction (AiCE LUNG), ultra-high-resolution reconstruction (PIQE). 3.Pulmonary nodule detection capability of ultra-low-dose CT equipped with Silver Beam Filter Using Silver Beam Filter, ultra-low dose helical scan (3D Landmark Scan, 120kV(Ag), 40mA, CTDI 0.2) data was reconstructed with PIQE image reconstruction. The nodule detection capabilities of conventional CT and ultra-low-dose CT were compared in 200 consecutive cases.

CHEE-94 CLINICAL APPLICATIONS OF ELECTRON DENSITY IMAGING DERIVED FROM DUAL-ENERGY CT IN THORACIC RADIOLOGY

Hiroaki Nagano, MD, PhD (*Presenter*)
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TEACHING POINTS

Recent technical advancements in dual-energy CT (DECT) allow measurement of electron density (ED) in tissues. ED, which reflects the probability of an electron occurring at a specific location, shows a linear correlation with mass density and Hounsfield units. ED imaging allows visualization and quantification of mass density and has been reported to enhance disease detection, diagnosis, and prognostication in thoracic imaging. The purposes of this exhibit are: 1. To illustrate the basic principles of ED derived from DECT 2. To illustrate clinical cases and data with ED in the field of thoracic radiology 3. To discuss pitfalls and limitations of ED

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1. Basic principles of ED derived from DECT 2. Overview of ED in the field of thoracic radiology 3. Clinical applications of ED in thoracic imaging: Lung cancer (lesion detection, accurate tumor staging, prediction of pathological aggressiveness, PD-L1 expression, and treatment response) Pneumonia lesion detection Pulmonary embolism (lesion detection, differentiation between chronic thromboembolic pulmonary hypertension and acute pulmonary embolism, and prediction of treatment response) Cardiovascular disease (diagnosis of acute myocardial infarction, characterization of coronary artery plaque, detection of thrombus) 4. Pitfalls and limitations in ED

CHEE-95 MULTI-FOCAL PULMONARY CONSOLIDATION ON CHEST CT: A SYSTEMATIC IMAGING-BASED APPROACH TO DIFFERENTIAL DIAGNOSIS

Makiko Murota, MD (*Presenter*)
Yuka Yamamoto, PhD (*Abstract Co-Author*)
Yoshihiro Nishiyama, MD (*Abstract Co-Author*)

TEACHING POINTS

Consolidation on chest CT is frequently assumed to represent bacterial pneumonia, particularly in clinical practice. However, multi-focal consolidation can be caused by a wide variety of diseases, including interstitial lung disease and malignancies, making careful differential diagnosis essential. This exhibit will 1) review the high-resolution CT (HRCT) findings of pulmonary multi-focal consolidation, and 2) present a systematic approach to its differential diagnosis.

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1. Definition of consolidation Based on Fleischner society's glossary of terms for thoracic imaging 2. Approach to differential diagnosis A) Acute vs. subacute/chronic clinical course B) Distribution pattern (e.g., segmental or non-segmental; upper or lower lung predominance; central vs. peripheral predominance) C) Morphologic characteristics of the opacities D) Integration of clinical information (e.g., medical history, laboratory data) 3. Key imaging features for differential diagnosis A) Centrilobular nodules B) Cavitation C) Interlobular septal thickening D) Bulging fissure E) High- or low-attenuation areas on mediastinal window settings 4. Summary

CHEE-96 CYSTS, CAVITIES, AND CONFUSION: A RADIOLOGY TRAINEE'S GUIDE TO DIAGNOSING AND MANAGING CYSTIC LUNG DISEASE

Ronald Gathagan, MD (*Presenter*)
Caroline Merriam, DO (*Abstract Co-Author*)
Manroop Kaur, MD (*Abstract Co-Author*)
Cristina Fuss, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Cystic lung diseases present a diagnostic challenge requiring careful assessment of imaging features and clinical context. High-resolution CT is essential for evaluation, but distinguishing between benign and more serious causes demands a structured approach. Early recognition is critical for appropriate management and avoidance of complications. This presentation aims to equip radiology trainees with a framework for interpreting cystic lung diseases. Key entities include pulmonary Langerhans cell histiocytosis, lymphangioleiomyomatosis, lymphocytic interstitial pneumonia, Pneumocystis jirovecii pneumonia, and congenital anomalies such as CPAM and pulmonary sequestration. Emphasis will be placed on characteristic imaging patterns, distribution clues, and common pitfalls to improve diagnostic confidence.

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Basic Principles Definition, importance of HRCT Major Cystic Lung Diseases Pulmonary Langerhans cell histiocytosis (PLCH) Lymphangioleiomyomatosis (LAM) Lymphocytic interstitial pneumonia (LIP) Pneumocystis jirovecii pneumonia (PJP) Congenital anomalies (CPAM, sequestration) Associated Causes Infectious Autoimmune: SLE, JIA, Kawasaki, IBD Malignancy: Leukemia, lymphoma, neuroblastoma, metastases Post-surgical/Trauma: Post-pericardiotomy, chest trauma Complications and common pitfalls Pneumothorax, superimposed infection Misidentifying emphysema/cavities Missing systemic clues (e.g., TSC, autoimmune)

CHEE-97 BEYOND THE GUT: PATTERNS, PITFALLS AND TREATMENT-RELATED COMPLICATIONS IN INFLAMMATORY BOWEL DISEASE

Caroline Novis, MD (*Presenter*)
Gabriel Belizario Amorim Silva, MD (*Abstract Co-Author*)
Renata Nabeiro Dias Angelo, MD (*Abstract Co-Author*)
Luiza A. Oliveira Gatto, MD (*Abstract Co-Author*)
Tassia R. Yamanari, MD (*Abstract Co-Author*)
Eduardo Kaiser Ururahy Nunes Fonseca, MD (*Abstract Co-Author*)
Camila S. Franco, BMedSc (*Abstract Co-Author*)
Marcio V. Sawamura, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

To review thoracic manifestations of inflammatory bowel disease (IBD), focusing on complications arising from systemic disease and immunosuppressive therapy. To illustrate a spectrum of infectious and non-infectious pulmonary findings associated with IBD through real-case examples. To discuss imaging clues that aid in distinguishing overlapping patterns in immunocompromised patients, supporting timely diagnosis and treatment.

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Introduction : Overview of IBD as a systemic disease and its impact on the thorax, particularly under immunosuppression. Pathophysiology and Mechanisms : Pulmonary involvement through immune-mediated mechanisms vs. therapy-related complications. Non-infectious Manifestations : Imaging features of organizing pneumonia, granulomatous inflammation, and drug-induced lung disease. Infectious Complications : Case-based review of opportunistic infections (e.g., TB, histoplasmosis, nocardiosis, aspergillosis). Imaging Patterns and Diagnostic Pitfalls : Overlapping features between infection and inflammation, with emphasis on CT findings and clinical correlation. Differential Diagnosis and Management Impact : Role of imaging in guiding further testing, biopsy decisions, and treatment adjustment. Conclusion : Thoracic involvement in IBD is diverse; radiologists must recognize key imaging patterns to contribute to timely, accurate care.

CHEE-98 DIAGNOSING NON-ONCOLOGIC CARDIOVASCULAR CONDITIONS WITH PET-CT: IT'S NOT ALL ABOUT CANCER

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Pedro Dib Hoyos, MD (*Abstract Co-Author*)
Tatiana Arroyave, MEd (*Abstract Co-Author*)
David Jimenez Marin, MD (*Abstract Co-Author*)
Sebastian Pelaez SR, MD (*Abstract Co-Author*)

TEACHING POINTS

Positron emission tomography (PET) plays a significant role in the evaluation of non-oncology cardiac diseases, offering unique insights into myocardial perfusion, viability, inflammation, and infection. It is instrumental in detecting myocardial inflammation, such as in cardiac sarcoidosis, and review evaluation of cardiac infections, such as prosthetic valve endocarditis and device infections.The most sensitive technique for assessing myocardial viability is PET/CT with 18F-FDG, especially in patients with ischemic heart disease and ventricular dysfunction.PET/CT plays a complementary role in the diagnosis of infective endocarditis, especially in patients with prosthetic valves or implantable cardiac devices. It detects hypermetabolism associated with infection.Prosthetic valves may show increased metabolic activity, especially during the postoperative period. The uptake typically appears homogeneous, diffuse, and of low intensity. The evaluation of inflammatory or infectious processes in valves is characterized by intense metabolic activity.PET/CT with 18-FDG in sarcoidosis, has the ability to detect hidden systemic involvement and correlate with inflammatory activity positions, particularly in atypical clinical presentations.PET/CT with 18-FDG has becoming established as a fundamental diagnostic tool in the study and follow-up of large vessel vasculitis. Its combination of whole-body coverage and metabolic sensitivity allows for early detection and individualized treatment planning.

TABLE OF CONTENTS/OUTLINE

Learning objectives - Introduction - Myocardial viability - Endocarditis - Prosthetic valves - Sarcoidosis - Vasculitis - Conclusions

CHEE-99 UNDERSTANDING MOLECULAR UPDATES IN NON-SMALL CELL LUNG CANCER: A PRACTICAL APPROACH FOR RADIOLOGISTS

Dario Nascimento Ferreira Alves, MD (*Presenter*)
Bruno Ramos, MD (*Abstract Co-Author*)

Alex Dias, MD (*Abstract Co-Author*)
Roddie Moraes Neto, MD (*Abstract Co-Author*)
Maria Vitoria Ludwig, MD (*Abstract Co-Author*)
Debora Mayumi Takamune, MD (*Abstract Co-Author*)
Leonardo Rosolen Iunes, MD (*Abstract Co-Author*)
Hye J. Lee, MD (*Abstract Co-Author*)
Thais C. Lima (*Abstract Co-Author*)
Tassia R. Yamanari, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the Role of Molecular Profiling : Recognize the critical importance of molecular profiling in non-small cell lung cancer (NSCLC) for identifying oncogenic driver mutations (e.g., EGFR, KRAS, ALK) and guiding personalized treatment strategies. Identify Imaging Characteristics : Learn the distinct radiological features on chest CT scans associated with specific gene mutations to improve diagnostic accuracy. Correlate Mutations with Epidemiology Monitor Treatment Response and Resistance Recognize Therapy-Related Toxicities Integrate Genomic and Imaging Data

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Introduction Overview of lung cancer as a leading cause of cancer-related deaths. Importance of molecular profiling in NSCLC. Background: Genomic Abnormalities in NSCLC Key mutations: EGFR, KRAS, ALK, MET, HER2, BRAF, ROS1, RET. Distribution of Oncogenic Driver Mutations Prevalence of mutations in lung adenocarcinoma (e.g., KRAS: 26%, EGFR: 15%, ALK: 7%). Imaging Characteristics, Clinical Features, Epidemiological profile and Subtype associations for each mutation (with case studies) EGFR Mutations Subtype associations: Exon 19 deletion (miliary pattern), Exon 21 (subsolid components). ALK Mutations KRAS Mutations Aggressive subtypes (G12C, G12V). RET Mutations MET Mutations HER2 Mutations BRAF Mutations Subtypes: Class I (V600) and Classes II/III (non-V600) ROS1 Mutations Therapeutic Approaches and Follow-Up Conclusion References

CHEE-100 CLIMATE CHANGE AND CARDIOTHORACIC IMAGING: A PRIMER FOR RADIOLOGISTS

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Felipe L. Costa, MD (*Abstract Co-Author*)
Israel Missrie, MD (*Abstract Co-Author*)
Cassio G. Reis JR (*Abstract Co-Author*)
Alexandre M. Silva, MD (*Abstract Co-Author*)
Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

• Climate change is already impacting human health, with its effects disproportionately affecting vulnerable populations.• Recent studies have shown that climate-driven factors can exacerbate the burden of cardiac and respiratory diseases, leading to an increase in adverse outcomes.• Understanding the impact of climate change on these organ systems helps radiologists better assess the underlying causes and implications of related imaging findings, and proactively identify environmental factors that may affect patient outcomes.• Cardiothoracic radiologists should recognize opportunities to improve environmental sustainability in cardiovascular imaging and actively adopt practices to reduce the carbon footprint of their imaging processes.

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1. Introduction: Health effects of climate change. 2. Basic concepts of climate science for radiologists. 3. Climate change and respiratory disease: What to know and look for. 4. Climate change and cardiac disease: What to know and look for. 5. Contribution of healthcare and radiology to climate change: Challenges and opportunities. 6. Ongoing and future research: Microplastics and beyond. 7. Take-home messages

CHEE-101 THORACIC AMYLOIDOSIS UPDATED: A STEPWISE APPROACH TO TYPICAL AND ATYPICAL IMAGING FINDINGS

Heytor Jose De Oliveira Cabral, MD (*Presenter*)
Ana Madeira, MD (*Abstract Co-Author*)
Roberto V. Torres, MD (*Abstract Co-Author*)
Pablo Rydz P. Santana, MD (*Abstract Co-Author*)
Igor R. Oliveira, MD (*Abstract Co-Author*)
Israel Missrie, MD (*Abstract Co-Author*)
Cassio G. Reis JR (*Abstract Co-Author*)
Alexandre M. Silva, MD (*Abstract Co-Author*)
Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

• Thoracic amyloidosis presents with a heterogeneous spectrum of imaging manifestations. • Typical findings include pulmonary nodules, interstitial thickening, tracheobronchial wall calcification, and pleural thickening. These features may often mimic more common conditions such as sarcoidosis or chronic infections. • Atypical or less common manifestations include cavitary lesions, soft tissue masses, lymphadenopathy, and involvement of vascular or esophageal structures. •The development of new imaging biomarkers with radiomics and artificial intelligence are needed to advance early detection and guide management in clinical practice. •This work proposes a stepwise approach using multimodality imaging for thoracic amyloidosis, outlining pearls and pitfalls to enhance recognition and differential diagnosis.

TABLE OF CONTENTS/OUTLINE

• Introduction: Definitions, classification, and overview of thoracic involvement. • Understanding Amyloidosis: Radiologic-Pathologic Correlations: imaging in systemic and localized forms. Congo red staining and histopathological diagnosis. • Multimodality Imaging in Thoracic Amyloidosis: An Update - Lung parenchyma; Airways; Mediastinum; Pleura; Chest wall; Heart and vessels. •Optimizing Diagnosis: Pearls and Pitfalls - The role of CT, MRI, PET-CT, and Tc-PYP SPECT. Differential diagnosis • Summary: A 6-Step Systematic Approach. • Future Directions - Radiomics and artificial intelligence. •Take-Home Messages

CHEE-102 BEYOND THE USUAL SUSPECT: A RADIOLOGIST GUIDE INTO DIAGNOSING THORACIC ENDOMETRIOSIS

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Ikenna R. Okam, MBBS, FRCR (*Abstract Co-Author*)
Monika Radike, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Thoracic endometriosis is often under-diagnosed, despite its significant implications on patient’s health.Thoracic endometriosis syndrome (TES) can present with a constellation of clinical manifestations, including catamenial pneumothorax , catamenial hemothorax , catamenial hemoptysis , and pulmonary nodules . Diagnosis requires a high degree of clinical suspicion due to the nonspecific nature of symptoms.TES might be seen in women with concomitant pelvic endometriosis and may reflect the progression of the disease. However, it is important to note that thoracic endometriosis can also occur in isolation . CT is the preferred imaging modality for assessing the differential diagnosis of TES. It is highly sensitive for detecting pneumothorax , hemothorax , and pleural effusions . Additionally, CT can identify nodular lesions or bullae in the lung parenchyma. CXR may show pneumothorax but has lower sensitivity compared to CT for other features of TES. MRI is particularly useful for diagnosing diaphragmatic endometriosis and detecting lesions in the pleura. Video-assisted thoracoscopic surgery (VATS) is considered the gold standard for the diagnosis and treatment of pleural endometriosis. Allowing for direct visualization and resection of endometrial implants.The temporal association of symptoms with menstruation and imaging findings provide key diagnostic clues.A high index of suspicion is crucial to provide a timely and accurate diagnosis leading to improved outcome for patients.

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Background information and epidemiology. Types of thoracic endometriosis. Clinical presentation. Imaging modalities and suggested protocols. Case examples. Take home messages. References

CHEE-103 NEXT-GENERATION CARDIAC DEVICES: AN IMAGING-BASED REVIEW

Joey Gu, MD (*Presenter*)
Saurabh Agarwal, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review common types of non-valvular cardiac devices, clinical indications, and next-generation variants. 2. Recognize both normal and abnormal radiographic appearances of next-generation cardiac devices. 3. Recognize common cardiac device mimics.

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Common types of cardiac devices, clinical indications, and next-generation variants - Pacemakers: leadless pacemakers, cardiac resynchronization therapy (CRT) devices - Implantable cardioverter defibrillators (ICDs): subcutaneous ICDs - Circulatory assist devices: left ventricular assist devices (LVADs), intra-aortic balloon pumps (IABPs) - Closure devices: left atrial appendage (LAA) closure devices, atrial septal occlusion devices - Cardiac event recorders: implantable loop recorders, external loop recorders, patch recorders - Implantable pulmonary artery pressure monitors Normal and abnormal radiographic appearances - Leadless pacemakers, CRT devices - Subcutaneous ICDs - LVADs, IABPs - LAA closure devices, atrial septal occlusion devices - Implantable loop recorders, external loop recorders, patch recorders - Implantable pulmonary artery pressure monitors Common cardiac device mimics - Deep brain/cranial nerve stimulators - Gastric/diaphragmatic pacemakers - Bone implants (kyphoplasty devices, antibiotic spacers, etc.) - Endobronchial valves - External objects (wireless earbuds, electric vapes, etc.)

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EREE

Emergency Radiology Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

EREE-1 PEARLS AND PITFALLS IN IMAGING BLUNT TRAUMA OF THE BOWEL AND MESENTERY

Kazi A. Irfan, MD, FRCR (*Presenter*)
Mohamed G. Elbanan, MD (*Abstract Co-Author*)
Amr S. Abdelaziz, MD (*Abstract Co-Author*)
David L. Raj, MD (*Abstract Co-Author*)
Ayman H. Gaballah, MD, FRCR (*Abstract Co-Author*)
Sadia Sajid, MBBS (*Abstract Co-Author*)
Joe Jose, MD (*Abstract Co-Author*)
Andrew Sun, MD (*Abstract Co-Author*)
Alex Lee, BS (*Abstract Co-Author*)
Azfar Siddiqui, MD (*Abstract Co-Author*)

TEACHING POINTS

*Mechanisms of bowel and mesenteric trauma *Important clinical signs *CT Protocol *Imaging features of bowel and mesenteric trauma *Pitfalls in diagnosis and overcoming them

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*Epidemiology *Mechanisms of bowel injury : A. Crush injury B. Shear injury C. Burst injury *Clinical signs *CT Protocol *CT signs of bowel trauma: A. Hard signs: ***Extraluminal air in the abdominal cavity ***Leakage of bowel contents ***Bowel wall discontinuity B. Soft signs ***Free fluid ***Bowel wall thickening ***Bowel wall hematoma ***Abnormal bowel enhancement *CT signs of mesenteric trauma A. Mesenteric contrast extravasation B. Mesenteric stranding C. Mesenteric hematoma D. Beading/termination of mesenteric vessels *Ancillary imaging features associated with bowel injuries A. Traumatic abdominal wall hernia B. Seat belt sign *Bucket-handle tear of the mesentery *Accuracy of CT in diagnosis of bowel and mesenteric injuries *Approach to diagnostic pitfalls

EREE-2 MESENTERIC AND BOWEL TRAUMA: RADIOLOGIC CLUES TO AVOID MISSED DIAGNOSES

Eva Gimenez Comet, MD (*Presenter*)
Aram Ehsan (*Abstract Co-Author*)
Marta Bonfill Garcin (*Abstract Co-Author*)
Adria Roset Altadill, MD (*Abstract Co-Author*)
Marta Mazuque Mancilla (*Abstract Co-Author*)
VICTOR PINEDA SANCHEZ, PhD, MD (*Abstract Co-Author*)

TEACHING POINTS

- Mesenteric and bowel injuries are among the most commonly missed injuries on abdominal trauma CT. - Identify “hard” CT signs (specific, requiring urgent surgery) and “soft” CT signs (more common, less definitive), with the presence of multiple soft signs suggesting the need for follow-up imaging , especially in cases of clinical deterioration. - Associated findings (e.g., seatbelt signs, vertebral fractures, abdominal wall hernias) should raise suspicion for underlying mesenteric or bowel injuries.

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Mesenteric and bowel injuries are frequently underdiagnosed in blunt abdominal trauma. Their low incidence, subtle and non-specific appearance, and limited radiologic awareness contribute to diagnostic challenges, particularly in polytrauma settings, where multiple concurrent injuries may lead to misinterpretation or oversight. Although most of these injuries are managed conservatively, early identification of those requiring surgical intervention is crucial to prevent life-threatening complications such as hemorrhage, peritonitis, and abdominal sepsis, which significantly increase morbidity and mortality. Radiologists must be able to recognize both “hard” CT signs, which are specific but infrequent and require urgent surgical intervention, and “soft” CT signs, which are more common but less definitive. The presence of multiple soft signs, particularly in cases of clinical deterioration, should prompt follow-up imaging to enhance diagnostic accuracy. Associated findings, such as seatbelt signs, vertebral fractures, and traumatic abdominal wall hernias, should raise suspicion for underlying mesenteric or bowel injury.

EREE-3 ABERRANT GAS: URGENT AND BENIGN EMPHYSEMATOUS FINDINGS IN EMERGENCY RADIOLOGY AND HOW TO COMMUNICATE THEM TO CLINICIANS

Nathan Barber (*Presenter*)
William Auffermann, MD, PhD (*Abstract Co-Author*)
Soham Banerjee, MD (*Abstract Co-Author*)

TEACHING POINTS

Ectopic gas, or gas in tissues that normally do not contain gas, is a frequent cause for alarm for radiologists and clinicians alike. This exhibit systematically reviews examples of emergency imaging with both urgent and benign gaseous findings. After this session, participants will be able to: (1) understand the perceptual tools used to perceive aberrant gas, (2) distinguish benign from more urgent pathologies among multiple body systems, and (3) relay these findings to clinicians and discuss the role natural language processing and artificial intelligence may play in ensuring the best patient outcomes.

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1. Introduction and background: (1a) Basic Perception Tips (1b) Basic Interpretive Tips (1c) Report Language Choice (1d) Natural Language Processing in Clinical Care; 2. Brain, Head, and Neck: (2a) Chest (2b) Abdomen and Pelvis (2b-1) Gastrointestinal (2b-2) Genitourinary; 3. Spine 4. Musculoskeletal 5. Conclusion and Summary

EREE-4 HIGH-VELOCITY IMPACT: PELVIC FRACTURES IN THE FAST LANE

Antonio De La Cruz, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Juan Gonzalez, MD (*Abstract Co-Author*)
Ariana Salgueiro Estela (*Abstract Co-Author*)
Jose A. Lara, MD (*Abstract Co-Author*)
Manolin Gomez Rivadeneira (*Abstract Co-Author*)

TEACHING POINTS

Use imaging patterns to distinguish pelvic fracture types and predict associated injuriesIdentify key CT signs of vascular and urogenital traumaCorrelate injury mechanisms with imaging to guide management

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I. Introduction II. Objectives III. Pelvic Anatomy Overview IV. Fracture Patterns a. Lateral compression, AP compression, Vertical Shear b. Acetabular, Sacral, Avulsion V. Vascular Injury a. Contrast Leak, Hematoma, Embolization? VI. Urogenital and Bowel Injury a. Bladder, Urethra, Vaginal/Rectal VII. Imaging Modalities a. CT, CT Cystogram, Angiography VIII. Management Implications IX. Conclusion Abstract: Pelvic trauma encompasses a complex spectrum of injuries involving bone, vessels, and pelvic organs. This exhibit highlights key fracture patterns and associated complications through CT cases from our institution. Fracture types include lateral compression, anteroposterior (open book) fractures, vertical shear, acetabular, sacral, and avulsion injuries. Vascular injuries including active bleeds, retroperitoneal hematomas, and angiographic findings requiring embolization are also demonstrated. Urogenital and bowel traumas—ranging from bladder rupture and urethral injury to vaginal involvement—are explored with a focus on CT cystography and dedicated pelvic imaging.

EREE-5 TESTICULAR TUMORS: EVERYTHING AN IMAGING SPECIALIST SHOULD RECOGNIZE

Marcio Gulinelli, MD (*Presenter*)
Victor Arthur Ohannesian (*Abstract Co-Author*)
Marcela Soveral, MD (*Abstract Co-Author*)
Pedro Carani (*Abstract Co-Author*)

TEACHING POINTS

The purposes of this exhibit are: 1. Importance of learning the testicular anatomy. 2. Understand the ultrasound technique to better perform the exam. 3. Know the ultrasound manifestation of the main testicular tumors and their anatomopathological correlations.

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• Anatomy of testicles. • Ultrasound technique used to evaluate the plantar artery, the main adjustments, parameters and what should be analyzed. • Illustrate with cases from our department the main testicular tumors and their anatomopathological correlations.

EREE-6 KNEE AVULSION FRACTURES: A CASE-BASED SURVIVAL GUIDE FOR THE ON-CALL RESIDENTS

Aaron Mahajan, md (*Presenter*)
Kaushal Mehta, MD (*Abstract Co-Author*)
Kalpesh K. Panchal, MD (*Abstract Co-Author*)
Carl C. Flink, MD (*Abstract Co-Author*)

TEACHING POINTS

- Discuss various types of knee avulsion fractures- Discuss the innocuous appearance of these fractures on radiography and that they are often associated with occult soft tissue (ligamentous, tendon, meniscal) injuries and the clinical significance of the failure to promptly recognize and treat them

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- Anatomy - Case-Based Review focusing on the radiographic appearance, MRI imaging features, biomechanics, patterns and what the Resident needs to know - Ligamentous Avulsion Injuries1. Segond2. Reverse Segond3. ACL avulsion4. PCL avulsion5. Arcuate Sign6. Pellgrini-Steida Lesion7. Iliotibial band - Musculotendinous Avulsion Injuries1. Quadriceps tendon 2. Patellar tendon3. Semimembranous tendon 4. Biceps Femoris tendon5. Sinding-Larsen-Johansson Syndrome6. Osgood-Schlatter Disease

EREE-7 AORTA BE KIDDING ME: LATEST IMAGING UPDATES OF TEAR-ABLE EMERGENCIES

Sandra Victoria Servin Baltierra, MD (*Presenter*)
Omar A. Gamboa Abundis, MD (*Abstract Co-Author*)
Shahin Soltani Darani, MD (*Abstract Co-Author*)

TEACHING POINTS

1.Aortic emergencies are a common reason for emergency department visits; 2.Chest pain is extensive and primarily involves three vascular beds, approximately 30% of which are of aortic origin; 3.The primary mechanism is medial weakening due to systemic arterial hypertension; 4.Computed tomography is the modality of choice, being fast and versatile, allowing for its exclusion or confirmation, as well as for appropriate procedure planning; 5.There have recently been updates to the European and American guidelines that better specify the reporting of these aortic emergencies.

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1.Classification of cardiovascular emergencies; 2.Recognizing the imaging findings of an acute aorta and how to report them based on a checklist; 3.Most recent updates (2024) regarding international guidelines (American and European) on aortic emergencies.

EREE-8 AO SPINE CLASSIFICATION OF THORACOLUMBAR INJURIES: A GUIDE FOR RADIOLOGISTS

Rinald Paloka, MD (*Presenter*)
Giuseppe Cruciata, MD (*Abstract Co-Author*)
Anton O. Beitia, MD (*Abstract Co-Author*)
Vishal Patel, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review key thoracolumbar spinal anatomy. 2. Understand the structure and rationale of the AO Spine Thoracolumbar Classification system, including its hierarchical organization and clinical applicability. 3. Identify and distinguish fracture morphologies by mechanism of injury: compression (Type A), distraction (Type B), and axial translation or rotation (Type C). 4. Learn how neurologic status (N0-N4, NX) and case specific modifiers (M1, M2) influence urgency and surgical decision-making. 5. Integrate classification into radiology workflow to improve communication with clinical teams.

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1. Introduction and Epidemiology : Incidence, clinical impact, and relevance of thoracolumbar trauma in polytrauma setting. 2. Anatomy and Biomechanics of Injury : Review spinal anatomy and understanding how mechanical forces translate into injury morphology. 3. Evolution of the classification system : Progression through historical systems such as Bohler (1935), Holdsworth (1970), Denis (1983), AO MAGERL spine (1994), TLICS (2005), and rationale for new system AO Spine (2013). 4. Detailed breakdown of the AO Spine system : including fracture morphology, neurologic status grading, and clinical modifiers. 5. Case-Based Applications : Annotated

examples of cases across all types and subtypes. 6. Structured Reporting Framework : Examples on how to incorporate AO elements into radiology reports. 7. Common Pitfalls and Interobserver Variability : Diagnostic traps, ambiguous cases, and strategies to improve reliability.

EREE-9 PELVIC FRACTURES AND PENILE INJURY

Jake Barrett, MD,MS (*Presenter*)
Christina A. LeBedis, MD, MS (*Abstract Co-Author*)
Carl C. Flink, MD (*Abstract Co-Author*)
Christian J. Ashby, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Pelvic trauma commonly results in perineal and penile injury, which can manifest in distinct ways based on the mechanism of injury. 2. Identification of imaging findings related to pelvic floor injury during the initial trauma scan including injury of the bulbospongiosus and ischiocavernosus. 3. Understanding patient outcomes related to penile injury after pelvic trauma, such as the development of erectile dysfunction.

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1. Introduction and classification of pelvic trauma. 2. Review of normal pelvic floor anatomy. 3. Relationships and imaging classifications of penile injury; review of current literature and distinct imaging findings. 4. Exploration of poor outcomes related to penile injury after pelvic trauma. 5. Sample cases and discussion.

EREE-10 A PRIMER ON IMAGING APPROACH TO ACUTE GASTROINTESTINAL BLEED

Sadia Sajid, MBBS (*Presenter*)
Mohamed G. Elbanan, MD (*Abstract Co-Author*)
Amr S. Abdelaziz, MD (*Abstract Co-Author*)
Ayesha Nasrullah, MD,FRCR (*Abstract Co-Author*)
Azfar Siddiqui, MD (*Abstract Co-Author*)
Nanda Deepa Thimmappa, MD (*Abstract Co-Author*)
David L. Raj, MD (*Abstract Co-Author*)
Ryan M. Davis, MD (*Abstract Co-Author*)
Emre Demirci, MD (*Abstract Co-Author*)
Kazi A. Irfan, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

-Review of causes of upper and lower gastrointestinal bleed (GIB) -Discuss the multimodality imaging approach for the diagnosis of upper and lower GIB -Optimal Imaging techniques with emphasis on CT angiography (CTA) -Practical guideline for the residents for accurate case interpretation and avoiding the pitfalls with case-based illustration -Radiologic advances in the diagnostic and therapeutic approach to GIB. -Highlight the crucial role of radiologists in making accurate diagnosis and management of the life-threatening condition

TABLE OF CONTENTS/OUTLINE

-Introduction -Diagnostic imaging approach with review of different imaging modalities Computed tomography angiography (CTA), Nuclear Medicine - Technetium 99m scintigraphy Multiphase computed tomography enterography (CTE) Catheter angiography (CA). -Imaging features with case-based illustration of upper and lower GIB with underlying causes as below: Inflammatory - Gastritis, Gastric and Duodenal ulcers, diverticulitis, Inflammatory bowel disease Vascular - Dieulafoy's lesion, Angiodysplasia, esophageal and rectal varices, Aortoenteric fistula Congenital - Meckel Diverticulum Benign and Malignant tumors Post surgical - Post gastric bypass vascular leak, post pancreatic transplant jejunal varices Post traumatic - Motor vehicle accidents, foreign body Localized: Endometrial implants Idiopathic - Unidentifiable cause Coagulopathy- Anticoagulation, Hemophilia -Key learning points -Conclusion

EREE-11 DEVELOPING A GUT FEEL: SPECTRUM OF BOWEL AND MESENTERIC INJURIES

Nandakumar Patnam Gopal Chetty, MD (*Presenter*)
Tushar Kumar, MBBS, MD (*Abstract Co-Author*)
Gopal V. Punjabi, MD (*Abstract Co-Author*)
Manish Dhyani, MD (*Abstract Co-Author*)
Claire K. Sandstrom, MD (*Abstract Co-Author*)
Rajat Bhargava, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Reviewed trauma mechanisms with emphasis on anatomically vulnerable sites. 2. Highlighted both highly predictive and subtle imaging signs using a finding-based approach to distinguish surgical from non-surgical candidates. 3. Demonstrated incremental diagnostic value of spectral CT in the acute trauma setting. 4. Identified common pitfalls in imaging evaluation of bowel and mesenteric trauma.

TABLE OF CONTENTS/OUTLINE

1. Mechanisms and Common Sites of Bowel and Mesenteric Injury. 2. Key facts regarding incidence and error-reduction strategies. 3. Imaging signs of Bowel and Mesenteric Trauma. 4. Case-Based Review of Key Bowel and Mesenteric Injury Patterns.

EREE-12 SAVING SKIN: ACUTE DERMATOLOGIC LESIONS RADIOLOGISTS CAN'T MISS

Matheus Fritzen, MD (*Presenter*)
Julia D. Zavariz, MD (*Abstract Co-Author*)
Rosa Maria Silveira Sigrist, MD (*Abstract Co-Author*)
Mateus Esmeraldo, MD (*Abstract Co-Author*)
Maria Cristina Chammas, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is: To demonstrate normal skin anatomy as visualized on high-frequency ultrasound (=18 MHz). To describe key ultrasound findings of urgent dermatologic lesions such as epidermal inclusion cysts, hidradenitis suppurativa, panniculitis, myiasis, and foreign bodies. To discuss how Doppler imaging and B-mode complement each other in characterizing inflammation, infection, and complications. To highlight "can't miss" imaging clues that alter clinical management in the emergency setting.

TABLE OF CONTENTS/OUTLINE

A. Imaging Technique and Anatomy Overview Layer-by-layer evaluation: epidermis, dermis, hypodermis Use of 18-24 MHz transducers for optimal resolution Role of Doppler (color and power) in detecting inflammation and vascularity B. Cystic Lesions and Their Complications Epidermal Inclusion Cysts : Well-defined, hypoechoic masses with posterior enhancement Infected or Ruptured Cysts : Ill-defined margins, hypervascular rim, internal debris and edema C. Inflammatory Dermatoses Hidradenitis Suppurativa (HS) : Hypoechoic tracts and pseudocysts with increased vascularity Panniculitis : Septal: "Cobblestone" edema between echogenic septa Lobular: Hyperechoic stranding with thickened septa D. Infective and Infestative Lesions Myiasis : Mobile echogenic larvae within hypoechoic pocket Abscesses : Anechoic or complex collections with peripheral Doppler activity E. Foreign Bodies and Artifacts Retained Foreign Material : Linear hyperechoic structures with posterior shadowing Twinkling Artifact : Useful in detecting crystalline/glass fragments Case example: Facial trauma with embedded glass missed on clinical exam

EREE-13 IS MRI THE MAINSTAY OR STILL AN ALTERNATIVE? - ROLE OF MRI IN ACUTE ABDOMINOPELVIC EMERGENCIES

Usha Jayagurunathan, MD, FRCR (*Presenter*)
Harish Gudi, MD, MBBS (*Abstract Co-Author*)
Sriram Jaganathan, MD (*Abstract Co-Author*)
Eswaramoorthy Sellamuthu, DNB,DMRD,MBBS (*Abstract Co-Author*)

TEACHING POINTS

· Review various common acute abdominopelvic emergencies and the imaging modalities being utilized. · Disadvantages of the other imaging modalities in specific settings and Why MRI scores over the other modalities in specific scenarios? · Limitations of MRI in those situations and the way forward.

TABLE OF CONTENTS/OUTLINE

1. Introduction to various common acute abdominopelvic emergency pathologies. 2. Different imaging modalities utilized for the diagnosis of acute emergencies. 3. Disadvantages and limitations of the different investigations in this specific scenario 4. Role of MRI and the advantages. 5. Various MR imaging findings and classic images of few of the common acute abdominopelvic emergencies. a. Acute cholecystitis including emphysematous and gangrenous b. Choledocholithiasis c. Acute pancreatitis d. Appendicitis, Colitis and terminal ileitis e. Acute pyelonephritis and renal abscesses f. Prostatic and seminal vesicle abscesses g. Acute torsion of ovary/dermoid in pregnancy h. Ruptured ectopic pregnancy 6. Is MRI the mainstay or the alternate in these scenarios? 7. Limitations and pitfalls of MRI.Conclusion MRI helps in diagnosing certain acute abdominopelvic emergencies where CT may be harmful or less informative, and the US has its limitations. However, MRI is not without pitfalls and CT may have to be utilized if MRI is not of diagnostic quality or MRI results are not convincing. It is imperative for radiologists to understand the specific role of MRI, the pitfalls and the appropriate findings in these clinical scenarios.

EREE-14 MIND THE MISS: FREQUENT ERRORS IN EMERGENCY HEAD CT AND HOW TO PREVENT THEM

Alejandra Somoano Marfull (*Presenter*)
Silvia Revuelta Gomez, MD (*Abstract Co-Author*)
Aranzazu Sanchez Gabin, MD (*Abstract Co-Author*)
Rodrigo Sutil, MD (*Abstract Co-Author*)
Marta Drake Perez, MD (*Abstract Co-Author*)
David Castanedo SR, MD (*Abstract Co-Author*)

TEACHING POINTS

To recognize the most common perceptual and cognitive errors in radiology. To identify key anatomical blind spots prone to diagnostic oversight. To apply targeted strategies in high-stakes emergency scenarios such as trauma, stroke, and headache. To utilize a practical checklist to minimize interpretive errors in emergent cranial CT.

TABLE OF CONTENTS/OUTLINE

Diagnostic errors remain a leading cause of medical harm, being radiology particularly vulnerable due to reliance on image perception and interpretation. In this educational exhibit, we explore the root causes and practical solutions to errors in cranial CT. Error Typology: We review perception errors and cognitive biases—such as anchoring, confirmation, availability, framing, attribution, satisfaction of search, premature closure, inattentional blindness, and hindsight bias—that compromise diagnostic accuracy. Anatomical Blind Spots: With examples from our institution, we highlight regions frequently missed in cranial CT interpretation, including cerebral sulci, brainstem, dural and cavernous sinuses, sellar/suprasellar region, skull base foramina, cavum, orbits, nasal cavity, paranasal sinuses, and deep head and neck compartments Emergency-Specific Strategies: We propose actionable techniques to avoid errors in the context of traumatic brain injury, acute headache, and stroke code evaluations. Cranial CT Checklist: We conclude with a ten-point checklist designed to serve as a rapid, systematic guide during emergency cranial CT reporting.

EREE-15 TISSUE ISSUES: FAST-TRACKING MSK EMERGENCIES WITH ULTRASOUND

Jose Flavio De Oliveira Neto (*Presenter*)
Antonio Neto (*Abstract Co-Author*)
Davi Sossai (*Abstract Co-Author*)
Karina Hayama, MD (*Abstract Co-Author*)
Thaina d. Rodrigues, MD (*Abstract Co-Author*)
Myrian Linhares, MD (*Abstract Co-Author*)
Leticia dos Reis Morimoto, MD (*Abstract Co-Author*)
Julio B. Guimaraes, MD, PhD (*Abstract Co-Author*)
Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is to: Highlight the pivotal role of musculoskeletal ultrasound (MSK-US) in diagnosing and managing acute MSK emergencies, including tendon injuries, joint effusions, fractures, and foreign bodies.Demonstrate how MSK-US enables real-time, dynamic evaluation of soft tissues and joints, offering a radiation-free alternative for pediatric and urgent care populations.Emphasize the importance of standardized scanning protocols, anatomical proficiency, and integration with clinical findings to improve diagnostic precision and patient outcomes.

TABLE OF CONTENTS/OUTLINE

Introduction: Overview of MSK emergencies and the advantages of ultrasound in urgent settings.Essential Techniques: Step-by-step guidance for focused emergency exams (e.g., hip, knee, ankle) and dynamic maneuvers.Pathology Spotlight: Tendon Injuries: Ultrasound findings of tears (fiber discontinuity, retraction, hypervascularity).Joint Effusions/Synovitis: Differentiation from unossified epiphysis and septic arthritis.Fractures/Hematomas: Cortical disruption detection and occult fracture identification.Foreign Bodies: Material-specific echogenicity and multimodal imaging correlation. Clinical Integration: Case-based examples underscoring ultrasound's impact on triage and treatment decisions.Future Directions: Create an algorithm to help radiologists and trainees master essential musculoskeletal ultrasound principles.

EREE-16 NOT ALWAYS A CLOT: CONSIDER MUSCULOSKELETAL CAUSES IN LOWER LIMB ASYMMETRY

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Rafael Viana Dos Santos, MD (*Abstract Co-Author*)
Pedro Bernis, MD (*Abstract Co-Author*)
Lucas O. Madeira, MD (*Abstract Co-Author*)
Paulo Ferreira, MD (*Abstract Co-Author*)
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Paulo R. Moreira, MD (*Abstract Co-Author*)
Ricardo Caracante, MD (*Abstract Co-Author*)
Andre S. Kamogari Nakamura, MD (*Abstract Co-Author*)
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Henrique A. Lino, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)

TEACHING POINTS

Lower limb asymmetry is a common reason for medical evaluation, particularly when it presents acutely and with pain. Deep vein thrombosis (DVT) is often the initial concern and must be ruled out. However, when DVT is excluded, the underlying cause can remain unclear, potentially leading to patient anxiety and inappropriate treatment. In such cases, considering musculoskeletal disorders as a possible explanation can help clarify the diagnosis and guide more effective care. The purpose of this exhibition is to: - Review the clinical presentation of lower limb asymmetry, encompassing both acute conditions (such as DVT) and chronic manifestations. - Emphasize the role of radiology in identifying the underlying causes of lower limb asymmetry. - Discuss common musculoskeletal differential diagnoses, with a focus on their imaging characteristics.

TABLE OF CONTENTS/OUTLINE

1. Introduction a. Epidemiology and clinical presentation of acute and chronic lower limb asymmetry b. Recommended radiological approach, with emphasis on DVT evaluation 2. Imaging Modalities: Diagnostic Roles and Comparative Analysis a. Radiography (X-ray) b. Ultrasonography c. Computed Tomography (CT) d. Magnetic Resonance Imaging (MRI) 3. Musculoskeletal Differential Diagnoses: Case-Based Review a. Infectious etiologies b. Traumatic injuries c. Degenerative conditions d. Neoplastic processes e. Miscellaneous causes 4. Conclusion Key points and take-home messages

EREE-17 PROMPT ENGINEERING IN EMERGENCY RADIOLOGY: A PRACTICAL GUIDE FOR RADIOLOGISTS AND TRAINEES

Nicholas Dietrich (*Presenter*)
Jack Lott (*Abstract Co-Author*)
Joseph Bellissimo (*Abstract Co-Author*)
Dhruv Patel (*Abstract Co-Author*)

TEACHING POINTS

1.) Define prompt engineering and its role in leveraging large language models (LLMs) for emergency radiology decision support. 2.) Demonstrate prompting strategies using real-world, context-specific examples. 3.) Identify common prompting errors and provide actionable mitigation strategies. 4.) Highlight best practices for integrating prompt engineering into clinical workflows, tools, and radiology education.

TABLE OF CONTENTS/OUTLINE

1.) Introduction and Scope: Define prompt engineering; explain its relevance to LLM-powered tools for triage, protocoling, and communication in emergency settings. 2.) Core Prompting Techniques: Overview of strategies: zero-shot, few shot, chain-of-thought, domain/role prompting, and retrieval-augmented generation. Describe their benefits and limitations in emergency radiology tasks. 3.) Clinical and Workflow Application: Provide examples of prompts supporting tasks such as guideline recommendation, protocol selection, report summarization, and urgency triage. Demonstrate representative model outputs from current LLMs to illustrate how prompt structure may impact response quality. 4.) Common Pitfalls and Mitigatio n: Highlight errors such as vague inputs, over-complex prompts, unrealistic expectations, and misalignment with model capabilities. Emphasize iterative prompt refinement, radiologist oversight, and clinical fact-checking. 5.) Practical Integration and Future Directions: Discuss embedding prompts in structured report templates, PACS, and decision support tools. Address regulatory, ethical, and training considerations for future implementation.

EREE-18 THE EVOLVING ROLE OF INTERVENTIONAL RADIOLOGY IN THE DIAGNOSIS AND MANAGEMENT OF TRAUMA: A COMPLEMENT TO CT IMAGING

Sophia Li (*Presenter*)
Devang Butani, MD (*Abstract Co-Author*)
Ashwani K. Sharma, MD (*Abstract Co-Author*)
Andrew J. Cantos, MD (*Abstract Co-Author*)

TEACHING POINTS

Trauma is the leading cause of death in people under age 35 while hemorrhage remains the 2nd leading cause of mortality in post-traumatic patients. Interventional Radiology (IR) plays a vital role in both the management of acute traumatic injuries as well as provides clarity for unclear imaging findings. While CT has largely replaced conventional angiography in the diagnosis of traumatic injuries, IR remains an indispensable for difficult to diagnose or ambiguous cases. For example, conventional angiography can visualize small vessel bleeding more accurately compared to diagnostic CT. This exhibit will review various solid organ traumatic injuries, both correlating diagnostic and interventional imaging, as well as provide an overview of endovascular intervention options for each case. We will also examine comparative cases demonstrating how conventional angiography can resolve ambiguities seen on diagnostic imaging.

TABLE OF CONTENTS/OUTLINE

1. Background of acute abdominal traumatic injuries 2. Review of multimodality imaging findings 3. Angiographic correlation of diagnostic imaging finding 4. Review of endovascular treatment options 5. Summary of educational points

EREE-19 BRAIN DRAINS AND PAINFUL STRAINS: THE PRESSURE IS REAL!

Mariana R. Defreitas, MD (*Presenter*)
Ana Bucci, MD (*Abstract Co-Author*)
Stephanie Ntim (*Abstract Co-Author*)
John P. Nazarian, MD (*Abstract Co-Author*)
Hunter McLellan (*Abstract Co-Author*)
Robert M. Morgan JR, MD (*Abstract Co-Author*)

TEACHING POINTS

1)Both spontaneous intracranial hypotension (SIH) and idiopathic intracranial hypertension (IIH) can present to the ED with acute symptoms 2)Nonfocal neurological exam can delay accurate diagnosis 3)Recognizing imaging findings of abnormal intracranial pressure can optimize prompt diagnosis and management

TABLE OF CONTENTS/OUTLINE

A. Introduction i)Headache-2-4% ED visits ii)SIH and IIH in differential iii) nonfocal neurological symptoms common iv) diagnosis is challenging and often missed in ED iv)head imaging may provide clues B. Spontaneous intracranial hypotension i) 4-5/100,000 prevalence ii) CT head findings (subdural fluid/blood and sag of midbrain/pons) iii) MRI head findings (engorged venous sinus and pituitary, meningeal enhancement, decreased mamillopontine distance, effacement of basal cisterns, brain sag) iv) Next steps-LP, MRI spine, CT myelography v) overview of types/causes C. Idiopathic Intracranial hypertension i)prevalence 3/100,000 ii) risk factors-obesity, female sex, reproductive age iii) CT head findings in orbits and sella iv) MRI head findings (optic nerves, Meckel's caves, and venous sinuses) iv)Next steps-fundoscopic exam, LP w/ opening pressure) D. Mimics and Differential i) Low-lying tonsils ddx, including Chiari I ii) Pituitary ddx iii) primary venous sinus pathology iv) secondary causes a)IIH - increased ICP (trauma, parenchymal swelling, and neoplasms) b)low CNS from post-LP or CNS surgery) E. Summary: Approach by ED interpreting radiologist should include i)Looking for clues on head CT ii) Considering mimics and ddx iii) Providing guidance for ancillary imaging and next steps

EREE-20 SEEING THE UNSEEN: ULTRASOUND ESSENTIALS IN UROLOGIC EMERGENCIES

Antonio Neto (*Presenter*)
Jose Flavio De Oliveira Neto (*Abstract Co-Author*)
Jose Eduardo Mourao Santos, MD, PhD (*Abstract Co-Author*)
Eduardo Sales Loureiro (*Abstract Co-Author*)
Juliana Fraga Soares, MD (*Abstract Co-Author*)
Bruna De Lima (*Abstract Co-Author*)

Aline Chan, MD (*Abstract Co-Author*)
Enzo Fatuch (*Abstract Co-Author*)

TEACHING POINTS

To demonstrate the essential role of ultrasound in diagnosing genitourinary emergencies with speed and precision. To outline a structured sonographic approach to the penis, scrotum, and urinary tract in acute settings. To recognize key ultrasound findings that differentiate between urgent and non-urgent conditions. To reinforce knowledge of normal sonographic anatomy as a foundation for identifying critical pathology.

TABLE OF CONTENTS/OUTLINE

Genitourinary emergencies require swift and accurate diagnosis to prevent irreversible tissue damage. Ultrasound, as a rapid, real-time, non-invasive modality, is vital in such scenarios. This exhibit offers a comprehensive review of high-yield sonographic techniques and findings in emergency urologic imaging, structured by anatomical compartments: penis, scrotum, and urinary tract. It emphasizes the importance of normal anatomy as a baseline, and presents classic pathological patterns associated with emergent conditions such as testicular torsion, penile fracture, priapism, epididymo-orchitis, testicular trauma, pyelonephritis, renal infarction, and bladder rupture. Through illustrated cases, it discusses B-mode and Doppler findings, comparative anatomy, and decision-making algorithms to guide radiologists in acute care. This exhibit aims to enhance diagnostic accuracy and expedite intervention in high-stakes scenarios.

EREE-21 RED HERRINGS: IMAGING MIMICS OF HEMORRHAGE THROUGHOUT THE BODY

Ahmad Amer, MD (*Presenter*)
Daniel Giraldo Herrera, MD (*Abstract Co-Author*)
Omar Jamil, MD (*Abstract Co-Author*)
Hugo F. Bueno, MD (*Abstract Co-Author*)
Meir H. Scheinfeld, MD, PhD (*Abstract Co-Author*)
Humaira Chaudhry, MD (*Abstract Co-Author*)
Robert J. Dym, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize the typical imaging appearance of hemorrhage on CT across various anatomical regions. Identify common mimics of hemorrhage, including artifacts, anatomical variants, contrast-related phenomena, and non-hemorrhagic pathology. Differentiate true hemorrhage from its mimics using imaging clues, including Hounsfield units, enhancement patterns, temporal evolution, and multimodality correlation. Understand the clinical implications of misinterpreting mimics as hemorrhage, including the potential impact on patient management and treatment. Apply a systematic approach to evaluating high-attenuation or hemorrhage-like findings to improve diagnostic accuracy and reduce interpretive errors.

TABLE OF CONTENTS/OUTLINE

Introduction: Overview of clinical relevance of hemorrhage on CT and diagnostic challenges posed by its mimics. Vicarious Excretion and Enhancing Fluid Collections: Discussion of contrast accumulation and how this may simulate hemorrhage on CT. Imaging Artifacts: Review of artifacts from metallic hardware or dense contrast that may obscure or mimic hemorrhage. Physiological Calcifications: Analysis of benign calcifications that may appear hyperdense on non-contrast CT and simulate hemorrhage. Soft Tissue Mimics: Case-based discussion of soft tissue processes that may present as high-attenuation lesions resembling hematoma. Vascular Lesions: Overview of AVMs, hemangiomas, and cavernomas that may appear hyperdense or enhance on imaging, with focus on distinguishing features and risk of true hemorrhage. Conclusion: Summary of diagnostic strategies and approaches to avoid interpretive errors in hemorrhage-like presentations on CT.

EREE-22 SKIN ULTRASOUND IN THE EMERGENCY DEPARTMENT: WHEN THE SKIN HURTS

Francisco J. Garrido Cisterna, MD (*Presenter*)
Carlos R. Riquelme, MD (*Abstract Co-Author*)
Miguel Villaseca (*Abstract Co-Author*)
Francisco Reyes-Baraona (*Abstract Co-Author*)
Paulina Cofre, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Cutaneous ultrasound with high-frequency transducers allows optimal evaluation of the different layers of the skin, being a fundamental support for the differential diagnosis of skin lesions. 2. Ultrasound is useful for the diagnosis of patients presenting with skin lesions in the emergency department. 3. Proper recognition of these skin lesions is key to guide management by the emergency physician.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Basic skin anatomy 3. Equipment and technical requirements 4. Skin ultrasound technique 5.Common skin lesions evaluated in emergency setting: Uncomplicated and complicated epidermal cyst, Furuncle and skin abscess, Folliculitis, Panniculitis: cellulitis and erythema nodosum, Hematoma, Foreign body, Plantar wart, Pilonidal cyst, Superficial venous thrombosis, Necrotizing fasciitis 6. Conclusions

EREE-23 ON-CALL MODE: KEEP ABREAST OF BREAST FINDINGS

Sravani Mannuru, MD (*Presenter*)
Otavio Augusto Ferreira Dalla Pria, MD (*Abstract Co-Author*)
Reine Fahed, MD (*Abstract Co-Author*)
Bruna M. Thompson, MD, PhD (*Abstract Co-Author*)
Fabiana C. Policeni, MD (*Abstract Co-Author*)
Fabiola P. Kestelman, MD (*Abstract Co-Author*)
Su Kim Hsieh, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

-Identifying true breast emergencies, next steps (abscesses, ulcers: do we need MR, US, aspirations, ABx, etc?) - When incidental breast findings are suspicious (men vs women) - implants complications and next steps - pain, skin changes (infection, paget, etc) - breast trauma (do we need to do extra imaging? CT? Just US? MRI?) do we need to treat breast hematomas?

TABLE OF CONTENTS/OUTLINE

Incidental breast findings are not uncommon during imaging studies performed for non-breast-related indications, particularly in the on-call setting where urgent priorities may overshadow subtle but significant abnormalities. Additionally, patients may present to urgent care with acute breast symptoms requiring immediate evaluation.This educational exhibit presents a multimodality review of incidental breast findings encountered on ultrasound, CT, MRI, and chest X-rays. Key entities include abscesses, mastitis, hematomas, suspicious masses, architectural distortion, and calcifications. We outline imaging features that differentiate emergent conditions—such as abscesses or infected hematomas—from non-emergent but suspicious findings that require structured reporting, BI-RADS categorization, and timely diagnostic follow-up. Designed for radiology trainees and practicing radiologists, this exhibit offers a pattern-based approach to triaging breast findings in the acute setting, emphasizing clinical integration, appropriate escalation, and interdisciplinary communication.

EREE-24 PRACTICAL ASSESSMENT OF CEREBRAL EDEMA AND HERNIATIONS: A RESIDENT'S GUIDE

Juan De Dios Del Toro Arellano, MD, MD (*Presenter*)
Laura M. Sanchez, MD (*Abstract Co-Author*)
Gustavo Alonzo Correa I, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize the basic pathophysiological mechanisms of cerebral edema (vasogenic, cytotoxic, interstitial) and their characteristic appearance on neuroimaging. Identify the main types of cerebral herniation (subfalcine, transtentorial, tonsillar) and understand their sequence of development. Describe the key findings on neuroimaging modalities (CT and MRI) that allow for the identification and differentiation of the various types of cerebral edema and herniation. Distinguish the subtle and advanced imaging signs of cerebral herniation, recognizing key anatomical structures and displacement changes. Apply a systematic approach to the review of neuroimaging studies in patients with suspected cerebral edema or herniation, optimizing time and diagnostic accuracy.

TABLE OF CONTENTS/OUTLINE

Physiology of the blood-brain barrier, Cytotoxic cerebral edema, Vasogenic cerebral edema, Interstitial cerebral edema, Key levels in the assessment of cerebral herniations, Subfalcine herniation, Upward transtentorial herniation, Downward transtentorial herniation, Tonsillar herniation, Extracranial herniations

EREE-25 FROM SNIFFLES TO SEPSIS: PEDIATRIC RADIOLOGY EMERGENCIES SURVIVAL GUIDE FOR THE ON-CALL RESIDENT

Sammar Ghannam, MD, MPH (*Presenter*)
Cory Pfeifer, MD, MPH (*Abstract Co-Author*)

TEACHING POINTS

This will serve as a review for trainees, early career attendings, and general radiologists to complete prior to taking pediatric call.Review the most common and "do not miss" multisystem pediatric radiology pathologies that present to the emergency center. Review how to perform an intussusception reduction and upper gastrointestinal fluoroscopy study to emergently assess for midgut volvulus.

TABLE OF CONTENTS/OUTLINE

Introduction. Most common/important pathologies- Musculoskeletal (e.g. signs of child abuse, buckle fracture, elbow ossification, hip effusion, etc.). Most common/important pathologies- Neuroradiology (e.g. ping pong ball fracture, tonsillar abscess, atlantooccipital separation, hypoxic ischemia, etc.). Most common/important pathologies- Chest (e.g. round pneumonia, aspirated foreign bodies, lobar pneumonia, etc.). Most common/important pathologies- Gastrointestinal (e.g. pneumoperitoneum, necrotizing enterocolitis, bowel dilation, pyloric stenosis, appendicitis, etc.). Technique for most common/important procedures including intussusception reduction and upper gastrointestinal fluoroscopy study for midgut volvulus. Conclusion/ take home points.

EREE-26 EMERGENCY IMAGING OF ADULTS WITH CONGENITAL HEART DISEASE

Caroline Robb, MD (*Presenter*)
Demetrios A. Raptis, MD (*Abstract Co-Author*)
Constantine A. Raptis, MD (*Abstract Co-Author*)
Daniel Vargas, MD (*Abstract Co-Author*)
Sanjeev Bhalla, MD (*Abstract Co-Author*)

TEACHING POINTS

With advancements in medical and surgical care, adults with congenital heart disease (CHD) now outnumber children with CHD, and the adult population continues to grow each year. As the number of adults with CHD has increased, more non-cardiac radiologists are encountering imaging studies from these patients, particularly in the emergency department. Emergency radiologists must now be able to identify untreated and undiagnosed CHD in adults, and recognize expected post-surgical appearances and complications. Emergency radiologists need to be confident in diagnosing acute, critical, and noncritical findings that are seen in adults with CHD, findings that can involve multiple organ systems including the cardiovascular, pulmonary, hepatic, and neurologic systems. Radiologists must also be careful to avoid interpretative pitfalls when managing these patients by optimizing imaging protocols and distinguishing expected post-surgical anatomy from abnormal post-surgical appearances.

TABLE OF CONTENTS/OUTLINE

Recognize the need for emergency radiologists to become familiar and comfortable with the imaging of adults with treated and untreated CHD. Review the most common causes of CHD in adults and common post-surgical appearances. Understand the critical and noncritical presentations of adults with CHD using a multisystemic approach, including cardiovascular findings such as dissection and thromboembolic events, hepatic findings such as liver failure, pulmonary findings, and central nervous system findings such as paradoxical embolism. Examine common interpretative pitfalls and how to avoid these, such as by optimizing imaging protocols and recognizing normal and abnormal post-surgical anatomy.

EREE-27 THE FUTURE OF EMERGENCY RADIOLOGY PRACTICE: INNOVATIVE FORWARD-LOOKING

Ahmed O. Hamouda, MD, MSc (*Presenter*)
Waleed Abdellatif, MD, MSc (*Abstract Co-Author*)

TEACHING POINTS

Evaluate emerging technologies transforming emergency radiology (ER) and their clinical integration. Explore future directions in ER education and training. Propose strategies to address challenges and promote sustainable subspecialty growth.

TABLE OF CONTENTS/OUTLINE

ER has rapidly evolved into a vital subspecialty, driven by rising patient volumes, the need for timely diagnoses, and major imaging advancements. This review provides a forward-looking perspective on ER by evaluating transformative technologies—particularly artificial intelligence (AI) and advanced imaging—and their integration into clinical workflows. It also examines current diagnostic practices and existing limitations. The review emphasizes the need for emergency radiologists to lead, not just adapt to, innovation. Societies such as ASER and ESER have played a key role in advancing the field. Key innovations include standardized ER fellowship models, FDA-approved AI tools for triage and diagnosis, virtual reality training, and AI validation frameworks with radiologist oversight. Workforce solutions discussed include fair compensation, shift limits to reduce burnout, and strengthening the pipeline of specialty-trained radiologists through expanded teleradiology. Emerging trends such as point-of-care ultrasound, ambulance-based CT, contrast-enhanced ultrasound for bleeding detection, radiogenomics, and hybrid ERs are reviewed for their transformative potential. The roadmap for sustainable growth emphasizes global collaboration via shared case databases, advocacy for AI/teleradiology reimbursement, and establishing competency benchmarks in ER fellowships.

EREE-29 MESENTERIC ISCHEMIA: TO BE OR NOT TO BE, THAT IS THE QUESTION

Daniel L. Cardoso, MD (*Presenter*)
Mariana Costa, MD (*Abstract Co-Author*)
Beatriz A. Macedo (*Abstract Co-Author*)
Larissa Marciano (*Abstract Co-Author*)
Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)
Alexandre M. Pereira, MD (*Abstract Co-Author*)
Giovanni G. Cerri, PhD (*Abstract Co-Author*)
Ralph R. Tavares, MD (*Abstract Co-Author*)
Alexandre Pasquali (*Abstract Co-Author*)
Fabio P. Pereira (*Abstract Co-Author*)

TEACHING POINTS

Recognize the anatomy of the mesenteric vasculature on computed tomography (CT). Understand aspects related to mesenteric ischemia (MI). Detailed knowledge on identifying and characterizing potential causes of MI. Comprehend the pathophysiology of MI and correlate with the imaging findings. Insight into the decision-making process for managing MI.

TABLE OF CONTENTS/OUTLINE

INTRODUCTION: Overview of mesenteric vasculature anatomy and CT anatomical landmarks. Pathophysiology of MI. Potential causes of MI (occlusive versus non-occlusive). DIAGNOSIS AND IMAGING FINDINGS: Criteria for MI characterization on CT and protocol optimization. The process of identifying each stage of MI. Prognostic implications of MI imaging findings. Treatment strategies: occlusive and non-occlusive causes. SUMMARY AND SYSTEMATIC APPROACH: A streamlined approach to integrating imaging findings with clinical decision-making. TAKE HOME MESSAGES.

EREE-30 THE SPECTRUM OF PNEUMATOSIS INTESTINALIS: A CHALLENGE FOR THE RADIOLOGIST AND A DILEMMA FOR THE SURGEON

Ana Claudia Vincenzi Raduan Uski (*Presenter*)
Carolina P. Abud, MD (*Abstract Co-Author*)
Camila P. Reifegerste, MD (*Abstract Co-Author*)
Marilia P. Ferreira, MD (*Abstract Co-Author*)
Maria Helena N. Pedroso (*Abstract Co-Author*)

TEACHING POINTS

Pneumatosis intestinalis (PI) is an uncommon radiologic finding characterized by the presence of gas within the bowel wall. Although often associated with intestinal ischemia and other abdominal emergencies, it may also be related to benign conditions. PI is classified into two main forms: primary, represented by Pneumatosis Cystoides Intestinalis (PCI), and secondary, which carries a higher risk of severity. Computed tomography (CT) is the diagnostic method of choice, allowing detailed characterization of gas patterns (linear, bubbly, or band-like) and identification of associated signs such as bowel wall thickening or thinning, lack of mucosal enhancement, ascites, porto-mesenteric venous gas (PMVG), and mesenteric thrombosis. Radiologists must be familiar with the imaging features suggestive of PI, as this plays a key role in risk stratification. Accurate interpretation helps avoid unnecessary interventions in benign cases and supports prompt management in potentially life-threatening situations.

TABLE OF CONTENTS/OUTLINE

• Introduction;• Objectives;• Pathogenesis;• Imaging Methodos and findings;• Radiologic cases with clinical and/or surgical correlation;• Recognize the score available to predict mortality in patients with intestinal pneumatosis.• Conclusion / take home message• References

EREE-31 IMAGING THE UNSPEAKABLE EMDASH CASE-BASED JOURNEY INTO CHILDHOOD TRAUMA

Hiba Sawliha Syed, MBBS (*Presenter*)
Zohaib Mallick, MBBS (*Abstract Co-Author*)
Uffan Zafar, MD (*Abstract Co-Author*)

TEACHING POINTS

1. What counts as non-accidental injury in children. 2. Epidemiology and outcomes. 3. Understanding mechanisms of injury and the resulting injury patterns. 4. Pitfalls and mimickers. 5. Collaborating with clinicians. 6. Guidelines for the radiologist’s reporting

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1. Introduction to Non-accidental Injury (NAI) in Children a. Definitions b. Categories of abuse c. Legal and ethical responsibilities of the radiologist 2. Epidemiology and Outcomes a. Global Statistics b. Risk factors c. Long-term medical, developmental, and legal outcomes 3. Mechanisms of Injury and Classic Injury Patterns a. Mechanics of Injury: shaking, impact, compression b. Radiologically detectable injuries i. Skeletal ii. Cranial/Intracranial iii. Thoracoabdominal iv. Spinal and soft tissue injuries c. Case-based examples and imaging walkthroughs 4. Pitfalls, Mimickers, and Diagnostic Challenges a. Osteogenesis Imperfecta, Rickets, Scurvy b. Birth trauma c. Normal variants d. Limitations in injury dating and subtle signs e. Overlap with accidental injuries and documentation bias 5. Interdisciplinary Collaboration in Suspected NAI a. How and what to communicate b. Working in the presence and absence of a child protection support system 6. Guidelines and Best Practices a. Imaging Protocols (skeletal survey, head CT/MR, ultrasound) b. Structured reporting. c. Reporting timelines and corroboration d. Legal implications and documentation standards 7. Learning Takeaways for Residents a. Checklist approach for NAI suspicion and imaging work-up b. Reinforcement of the radiologist’s proactive role c. Final call to action

EREE-32 DONT BE RASH,GET AN ULTRASOUND-A CASE COLLECTION OF RADIOLOGIST´S JOURNEY THROUGH SKIN CONDITIONS AT HOSPITAL

Juliana Lie Taya (*Presenter*)
Felipe Correa Brito, MD (*Abstract Co-Author*)
Priscilla T. Forster, MD (*Abstract Co-Author*)

TEACHING POINTS

• Showcase techniques for enhancing your skills in dermatologic ultrasound.• Establish the essential aspects that must be included in your report for more precise diagnostics and establishment of relevant differentials.• Highlight the key ultrasound imaging features of prevalent diseases you may encounter in a hospital setting.• Demonstrate the positive impact of a trained radiologist in the field.

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•Introduction- Basics of Ultrasonography - Review of the ultrasounds’ physics applied in dermatology.•Dermatologic Tutorial:- A structured approach to performing dermatological ultrasound -Fundamental components that should be in the report. •CASE 1: Thumbs Up -Clinical history and examination -Ultrasound and correlation -Diagnosis •CASE 2: Shades of purple -Clinical history and examination -Ultrasound and correlation -Diagnosis •CASE 3: More than just an abcess -Clinical history and examination -Ultrasound and correlation -Diagnosis •CASE 4: It's not a pimple -Clinical history and examination -Ultrasound and correlation -Diagnosis •Conclusion: Dermatological ultrasound is crucial for improving diagnostic precision in skin lesions, clarifying differential diagnoses, guiding treatment approaches and evaluating therapeutic success. Achieving such outcomes requires the technique to be performed correctly and necessitates a strong collaboration between the radiologist and the support team, not only through the report it self but also via direct and clear communication.

EREE-33 CT OF SPONTANEOUS RUPTURE OF THE SPLEEN: SPECTRUM OF CAUSES AND FINDINGS BEYOND TRAUMA

Mohammad Yasrab (*Presenter*)
Zahra Rahmatullah, MD (*Abstract Co-Author*)
Linda C. Chu, MD (*Abstract Co-Author*)
Satomi Kawamoto, MD (*Abstract Co-Author*)
Elliot K. Fishman, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Atraumatic splenic rupture is a rare but potentially fatal emergency that can be spontaneous or secondary to range of underlying etiological factors 2. Accurate detection of atraumatic splenic hemorrhages and ruptures is dependent on proper scan protocols as well as scan display (MPR, MIP, VRT) 3. Depending on the underlying cause, splenic ruptures and bleeds have a range of CT appearances, including associated splenic infarcts, hypersplenism, infiltration, vascular malformations, primary

and secondary masses, and even associated pathology of other abdominal structures such as the pancreas 4. Early detection is critical for outcome and attention to complications including massive bleeds, multifocal disease will be addressed

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1. Patient demographics, clinical presentation, risk factors, incidence/prevalence of spontaneous splenic hemorrhages and ruptures 2. CT scan protocols and display protocols for the detection of spontaneous and pathologic atraumatic splenic hemorrhages and ruptures3. Case studies showing the various appearances of splenic hemorrhages and ruptures including infectious etiologies, autoimmune processes, vascular malformations, systemic phenomenon such as thromboembolism and hematologic pathologies, medication adverse effects, and both benign and malignant masses4. Pearls and pitfalls in the diagnosis of spontaneous splenic ruptures and hemorrhages will be discussed with studies5. Future direction, conclusion, and references

EREE-34 CLOSED FOR CONSTRUCTION: UNVEILING POSTPARTUM COMPLICATIONS

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Rachel Bright, MD (*Abstract Co-Author*)
Ana Bucci, MD (*Abstract Co-Author*)
Erin Inman (*Abstract Co-Author*)
Jason A. Pietryga, MD (*Abstract Co-Author*)
Kristen Olinger, MD (*Abstract Co-Author*)

TEACHING POINTS

(I) Recognize imaging findings of postpartum complications in abdomen and pelvis (II) Recognize pathologies specific to C-section and vaginal birth (III) Distinguish normal postpartum imaging findings from complications

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I. Introduction a . Prevalence and morbidity of postpartum complications b. Role of imaging c. Modalities and approach II. Spectrum of Pathologies a. General postpartum complications i. Active hemorrhage ii. Thrombophlebitis iii. Endometritis iv. Retained products of conception b. Post-partum complications more specific to c-section i. Hematomas 1. Bladder flap 2. Subfascial 3. Rectus sheath 4. Abdominal wall ii. Structural 1. Review of normal post-op appearance 2. Uterine dehiscence 3. Uterine rupture 4. Uterine arteriovenous fistula iii. Infections/abscesses 1. Intrabdominal/intrapelvic 2. Rectus sheath 3. Subcutaneous iv. Iatrogenic 1. Ureteral injury 2. Bladder injury c. Post-partum complications more specific to vaginal birth i. Hematomas 1. Vaginal, vulvar, rectovaginal ii. Structural 1. Review of normal post-partum pelvis 2. Rectal lacerations 3. Urethral injury 4. Rectovaginal fistula 5. Uterine inversion iii. Musculoskeletal 1. Pubic diastasis 2. Sacral stress fracture III. Conclusion there is a wide range of postpartum complications that can be recognized by interpreting radiologist on abdominal and pelvic imaging. Recognizing these pathologies and distinguishing these findings from normal postpartum appearance of pelvic organs is essential for fulfilling the role of radiology in postpartum care.

EREE-35 "BEYOND APPENDICITIS": UNCOMMON PEDIATRIC EMERGENCIES UNVEILED BY ULTRASOUND

Mario Ruben Paz Campos, MD (*Presenter*)
Cristina Delange Izurrategui, MD (*Abstract Co-Author*)
Diego Suarez Sanchez-Infante (*Abstract Co-Author*)
Arturo Gross, MD (*Abstract Co-Author*)
Teresa Canas Macias, MD (*Abstract Co-Author*)

TEACHING POINTS

To highlight ultrasound as a first-line modality in pediatric emergencies, emphasizing its role in identifying rare but prognostically significant conditions, while reinforcing its safety and real-time diagnostic advantages. To promote a systematic, station-based approach to pediatric ultrasound—head/neck, thorax, abdomen, and musculoskeletal—to enhance diagnostic accuracy and broaden the clinical perspective beyond common pathologies.

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Ultrasound plays a pivotal role in pediatric emergency imaging, offering a radiation-free, bedside modality aligned with the ALARA principle. Pediatric pathology can be efficiently approached through five anatomical stations: head, neck, thorax, abdomen, and musculoskeletal system. In the head and neck, ultrasound allows rapid assessment of hydrocephalus, deep neck infections, and ocular pathologies such as vitreous hemorrhage—a potential cause of sudden blindness. Thoracic ultrasound outperforms radiography in detecting pneumonia, pleural effusions, and pneumothorax. Abdominal ultrasound should not be limited to appendicitis; rarer yet critical diagnoses include Wilkie's syndrome, omental infarction, and mesenteric adenitis. Musculoskeletal ultrasound enables real-time evaluation of fractures, tendon ruptures, muscle fiber tears, and soft tissue infections. Radiologists possess a deeper understanding of anatomy, pathology, and scanning technique, often surpassing clinical operators in diagnostic accuracy. In pediatric emergencies, thinking beyond appendicitis and empowering radiologists to lead sonographic evaluation ensures faster, safer, and more comprehensive care.

EREE-36 THE USUAL SUSPECTS: IMAGING OF CRIME AND INCARCERATION

Armand Garewal (*Presenter*)
Ahmad Amer, MD (*Abstract Co-Author*)
Daniel Giraldo Herrera, MD (*Abstract Co-Author*)
Robert J. Dym, MD (*Abstract Co-Author*)
Omar Jamil, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Identify illicit foreign objects on imaging and assess their potential to harm the patient. 2. Distinguish the radiologic features of commonly concealed items across various imaging modalities. 3. Evaluate when additional imaging is necessary to determine object location, related complications, or surgical indications. 4. Recognize concealment methods and injury patterns commonly associated with specific populations. 5. Detect secondary complications related to drug concealment. 6. Understand how foreign objects may contribute to or result from traumatic injuries.

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Introduction: Radiologists serving incarcerated patients need to recognize illicit objects on imaging. Prompt recognition will determine need for further imaging or consultation with other services. ?Deliberate Foreign Body Ingestion : Radiologic follow up and surgical implications. Drug Ingestion for Trafficking : Imaging appearance and consequences of absorption. ?Patterns of Drug Concealment : Packing, Pushing, Stuffing, and External.? Foreign Bodies in Trauma : Imaging features of unconventional weaponry.

EREE-37 TRAUMATIC INJURIES OF THE CRANIOCERVICAL JUNCTION IN ADULTS: WHAT CT MISSES, MRI REVEALS

Roy Riascos, MD, MBA (*Presenter*)
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Andres F. Mejia Leon, MD (*Abstract Co-Author*)
Kamand Khalaj, MD, MPH (*Abstract Co-Author*)
David E. Timaran Montenegro, MD (*Abstract Co-Author*)
Shekhar D. Khanpara, MD,MBBS (*Abstract Co-Author*)
Eliana E. Bonfante, MD (*Abstract Co-Author*)
Jennifer L. McCarty, MD (*Abstract Co-Author*)

TEACHING POINTS

The craniocervical junction (CCJ) is a complex anatomical region where high-energy trauma can result in life-threatening injuries. While CT is the first-line modality for trauma, it primarily detects osseous injuries and may miss critical soft tissue damage. This educational exhibit aims to expand the viewer's understanding of adult CCJ trauma by integrating a multimodality imaging approach.

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Reviewing the detailed anatomy of the CCJ—including bony, ligamentous, and vascular structures—using cross-sectional imaging and 3D models. Presenting a comprehensive overview of traumatic injuries affecting the occipital condyles, atlas, axis, and associated ligaments. Demonstrating the complementary roles of CT, MRI, and CTA in diagnosing craniocervical injuries. Attendees will gain insight into CT findings such as craniovertebral dissociation and fractures of C1-C2; MRI evaluation of ligamentous disruption, spinal cord injury, and prevertebral hematoma; and CTA detection of associated vascular injuries. A structured review table will summarize key injuries and imaging pearls, equipping radiologists with the tools to recognize subtle but critical findings beyond bone windows.

EREE-38 BLOOD, SWEAT, AND SPINES: CRACKING THE CODE OF VASCULAR LESIONS IN THE CORD

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Roy Riascos, MD, MBA (*Abstract Co-Author*)
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Mario Mahecha, MD (*Abstract Co-Author*)
Eliana E. Bonfante, MD (*Abstract Co-Author*)

TEACHING POINTS

Understanding the vascular roadmap of the spine is key to diagnosing ischemic and hemorrhagic spinal lesions with precision. This educational exhibit walks you through the intricate arterial and venous anatomy of the spinal canal and showcases the imaging signatures of vascular pathology, one compartment at a time. Through a series of high-yield MR cases and a focus on localization, viewers will gain an intuitive grasp of how vascular territories shape the clinical and imaging landscape of spinal disease.Teaching Points: -Review the vascular compartments of the spine, including key arterial and venous players. -Learn how to tailor MR imaging to detect ischemic and hemorrhagic spinal cord lesions. -Recognize characteristic patterns based on vascular territory, using cervical, thoracic, and conus medullaris cases.

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-Vascular anatomy: anterior/posterior spinal arteries and venous plexuses -MR sequences best suited for vascular lesion detection -Pattern-based review of Ischemia: -Cervical spine - anterior vs. posterior spinal artery involvement -Thoracic spine - regional vascular nuances -Conus medullaris - terminal cord vulnerabilities -Spinal hematomas -Intramedullary -Extramedullary -Summary table for quick-reference pattern recognition

EREE-39 ACUTE ABDOMINAL PAIN IN ONCOLOGY PATIENTS: DIAGNOSTIC CHALLENGES AND IMAGING INSIGHTS

Jia Cheng Yao, MD (*Presenter*)
Iain D. Kirkpatrick, MD, FRCPC (*Abstract Co-Author*)
Vincent M. Mellnick, MD (*Abstract Co-Author*)
Philippe A. Soyer, MD, PhD (*Abstract Co-Author*)
Kate Hanneman, MD, MPH (*Abstract Co-Author*)
Michael N. Patlas, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

Recognize key imaging features of acute abdominal emergencies in cancer patients, including thrombotic, hemorrhagic, obstructive and iatrogenic complications. Understand how acute abdominal emergencies may vary across different cancer types, such as hematologic, gastrointestinal and hepatobiliary. Understand the underlying mechanisms of abdominal pain in oncology patients, including effects of malignancy, chemotherapy, surgery, and immunosuppression. Identify high-risk scenarios such as treatment/chemotherapy-associated complications that require urgent intervention. Review appropriate imaging protocols and the radiologist's role in early diagnosis and communication in oncologic emergencies.

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This case-based presentation highlights acute abdominal emergencies in cancer patients, including thromboembolism, hemorrhage, and treatment-related complications. It emphasizes key imaging findings, varying complications associated with different malignancy types, and the radiologist's role in timely diagnosis and management. 1. Introduction 2. Case Base Review a) Thrombotic: mesenteric thrombus (arterial/venous), tumor thrombus/Budd-Chiari syndrome; b) Hemorrhagic: hemorrhagic/ruptured malignancy, hemorrhagic cholecystitis; c) Obstructive: bowel obstruction, urinary obstruction; d) Treatment-related: chemotherapy-related complication (perforation, colitis/enteritis), stent migration (pancreatic, biliary); 3. Conclusion: importance of prompt imaging in optimizing outcomes

EREE-40 CT FINDINGS OF ABDOMINAL BICYCLE HANDLEBAR INJURIES IN CHILDREN AND YOUNG ADULTS: PICTORIAL REVIEW

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Nerea Insausti Jaca (*Abstract Co-Author*)
Silvia Lopez (*Abstract Co-Author*)
Maria Berastegui (*Abstract Co-Author*)
Paula Garcia Barquin, MD (*Abstract Co-Author*)
Maria Begona Guantes Del Vigo (*Abstract Co-Author*)
Alex Esnaola Braceras (*Abstract Co-Author*)

TEACHING POINTS

The bicycle handlebar (or handlebar of scooter or electric scooter) is a unique mechanism of injury. Handlebar injuries are more likely to cause abdominal and soft tissue injuries. In the abdomen, injuries to the pancreas, small bowel, mesentery, liver and spleen are the most common injuries attributed to direct handlebar trauma. The objectives of this study are:-Explain the mechanism of handlebar abdominal injuries.-Evaluate the presentation, location , severity and illustrate some representative cases of different abdominal trauma related to this mechanism.

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In this exhibit we show and discuss different cases of handlebar abdominal injuries in children and young adults recorded in our institution: 1) Pancreatic injuries2)Splenic injuries3)Renal injuries4)Hepatic injuries5)Adrenal injuries Take home points.

EREE-41 BRICKING BAD: REVIEW OF LUMBAR FRACTURES

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Larry M. Alejandro Vargas, MD (*Abstract Co-Author*)
Paola Berrios Jimenez (*Abstract Co-Author*)
Noralys E. Pagan (*Abstract Co-Author*)
Joaquin R. Ortiz-Cruz, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review lumbar spine anatomy using a construction analogy. - Identify lumbar spine fractures: compression, burst, wedge, chance, and retrolisthesis. - Analyze real trauma cases from our institution using CT imaging. - Use visual aids for diagnosis, classification, and treatment.

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1. Introduction and Objectives 2. Anatomy Review (Vertebrae, Discs, Ligaments, Nerve Roots) 3. AO Spine Classification: C: Dislocation, Displacement B: Chance, Posterior Tension Band Disruption, Hyperextension A: Wedge, Split, Incomplete Burst, Complete Burst 4. Cases and Conclusion Abstract: Lumbar spine fractures account for 5-10% of trauma fractures, often from motor vehicle accidents or falls. These injuries may cause instability or neurological deficits, requiring precise classification. Using the AO Spine Classification, fractures are categorized into compression (A), distraction (B), and translation (C). A construction analogy aids understanding: vertebrae as bricks, discs as cement, and spinous processes as metal beams. Fractures are depicted as construction accidents—e.g., a Chance fracture as a TNT explosion and an A3 incomplete burst fracture as a wrecking ball hitting a brick wall. This exhibit features real CT cases from our trauma center, highlighting anatomy, classification, and management to enhance education for medical students, residents, and imaging specialists.

EREE-42 MEMBERS ONLY: IMAGING PENILE EMERGENCIES

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Nicholas G. Rhodes, MD (*Abstract Co-Author*)
Jamie Marko, MD (*Abstract Co-Author*)
Benjamin L. Triche, MD (*Abstract Co-Author*)
Margarita V. Revzin, MD, MS (*Abstract Co-Author*)
Daniel Shapiro (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Ultrasound and MRI are the mainstays of penile imaging. Fluoroscopy (retrograde urethrogram, voiding cystourethrogram) can be added when evaluating the urethra. 2. Technique and positioning as well as knowledge of normal anatomy is important when imaging the penis. 3. The tunica albuginea is an important landmark in trauma and in tumors and is well seen as a low T2 signal intensity fascial plane on MRI or a slightly echogenic fascial plane on US. 4. Penile fracture is defined as a disruption of the tunica with corporal rupture and requires surgical repair. This can be associated with penile hematoma and urethral injury. 5. High flow priapism is often post traumatic and due to arteriocavernosal fistula related to straddle injury. Low flow or ischemic priapism is most commonly associated with sickle cell anemia. 6. Penile infection can be due to retrograde urinary infection, abdominal or subcutaneous sources, fistula formation or foreign bodies. Gas-forming infections are a surgical emergency. 7. It is important to include the penis and urethra in your imaging search pattern if they are included in the field of view.

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I. Normal Anatomy a. MRI b. US c. Schematic II. Penile hematoma/fracture a. Injury during intercourse b. Other blunt trauma c. Penetrating injury d. Associated urethral injury III. Priapism a. High flow/traumatic b. Low flow/ischemia c. Malignant IV. Infection a. Penile scrotal abscess b. Gas forming infection c. Foreign body/instrumentation/complications of prosthesis or augmentation/cosmetic procedures d. Fistula V. Tumor related emergencies a. Obstruction b. Hemorrhage c. Hormonally active tumor d. Complications of therapy

EREE-43 HOLD YOUR HORSES: HORSE-RELATED INJURIES AT A LEVEL 1 TRAUMA CENTER

Alejandra Cardona Del Valle, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Maximiliano Carrera (*Abstract Co-Author*)
Larry M. Alejandro Vargas, MD (*Abstract Co-Author*)
Jose A. Lara, MD (*Abstract Co-Author*)

TEACHING POINTS

Review incidence and types of injuries from horseback falls, including head, spine, thoracic, abdominal, pelvic, and extremity trauma.Identify characteristic imaging findings across modalities (X-ray and CT).Discuss safety precautions to prevent injury and important things to report in each pathology.

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Objectives III. Retrospective Study: Demographics and Injury Statistics IV. Imaging Findings by Region: • Head • Spine • Thoracic • Pelvic/Abdominal • Upper and Lower Extremities V. Diagrams and Anatomy Review VI. Safety Precautions and Important thing to Report VII. Conclusion Horse-related trauma involves high-energy injuries with a wide anatomical range, posing challenges in trauma care. This retrospective study from our Level 1 trauma center reviews horse-related injuries treated in 2024, analyzing demographics, injury types, and imaging findings. Using CT and X-ray examples from real cases, we demonstrate key patterns and the role of imaging in assessing severity, guiding management, and predicting outcomes. The exhibit presents classic imaging findings by injury location and discusses their clinical implications. It aims to enhance understanding of equestrian trauma and the importance of radiology in diagnosis, treatment, and prevention.

EREE-44 RENAL GRAFTS UNDER THE ULTRASOUND: EMERGENCY SETTING CHALLENGES

Paula E. Hernandez Quiroz, MD (*Presenter*)
Veronica Espinosa Cruz, MD (*Abstract Co-Author*)
Eunice L. Urbina Marure, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Gain knowledge of the anatomy and physiology of renal grafts and their types.2. Develop skills to perform and interpret ultrasound evaluations of renal grafts, including Doppler assessments.3. Learn to recognize complications associated with renal grafts through ultrasound imaging.4. Differentiate normal from pathological ultrasound findings using clinical cases.

TABLE OF CONTENTS/OUTLINE

1. Introduction - Overview of Renal Transplantation (Types of Renal Grafts, Vascular Supply and Drainage) 2. Ultrasound Imaging Techniques - Ultrasound Protocols and Doppler Ultrasound Applications 3. Review of complications in kidney grafts with ultrasound findings based on Case-Based Problems.- Perinephric fluid - Renal collecting system abnormalities - Vascular complications - Focal parenchymal abnormalities - Diffuse parenchymal abnormalities. 4. Conclusion - Summary of Key Takeaways - Teaching points 5.References

EREE-45 NONACCIDENTAL TRAUMA AND ITS "MIMICS": A MULTIMODALITY IMAGING REVIEW WITH INTERDISCIPLINARY INTEGRATION

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Cinthia Cruz Romero, MD (*Abstract Co-Author*)
Sean A. Lisse, MD (*Abstract Co-Author*)

TEACHING POINTS

Radiologists play a critical role in identifying non-accidental trauma (NAT) while also recognizing imaging "mimics." Distinguishing these mimics is essential to: diagnose significant medical conditions requiring specific tests and treatment; prevent unjust family separation; and ensure alternative diagnoses are appropriately considered before legal proceedings. Radiologists must be vigilant in identifying potential NAT mimics and collaborate with the multidisciplinary team to ensure accurate diagnosis and appropriate patient care. This presentation will demonstrate that many alleged NAT mimics can be definitively distinguished from true NAT through a comprehensive approach that integrates imaging expertise, clinical evaluation, and targeted non-imaging investigations.

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This presentation aims to a) review imaging findings suggestive of NAT, b) describe both clinical and imaging best practices for diagnosis, and c) discuss pathology that can mimic imaging findings of NAT. This multimodality approach will demonstrate potential mimics for NAT including: accidental injury; congenital and developmental variants; birth trauma; infections and postinfectious conditions; primary bone diseases; vitamin deficiencies and toxins; connective tissue disorders; skeletal dysplasias; metabolic, hematologic, and coagulation disorders; and hypoxic and ischemic conditions.

EREE-46 WHAT THE RADIOLOGIST NEEDS TO KNOW ABOUT COSMETIC PROCEDURES IN THE ABDOMEN AND PELVIS

Nadia Solomon, MD,MA,MSc (*Presenter*)
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Francisco Calle Bernal, MD (*Abstract Co-Author*)
Mine Sorkun, MD (*Abstract Co-Author*)
Jonathan S. Luchs, MD (*Abstract Co-Author*)
Alberto Gallerani (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Douglas S. Katz, MD (*Abstract Co-Author*)
Margarita V. Revzin, MD, MS (*Abstract Co-Author*)
Meghan G. Lubner, MD (*Abstract Co-Author*)

TEACHING POINTS

Introduce the radiologist to the wide range of cosmetic procedures performed on the abdomen and pelvis. Describe the expected post-procedural appearances of these procedures on imaging, with a focus on cross-sectional imaging modalities. Describe potential acute and chronic complications of cosmetic procedures performed on the abdomen and pelvis, using case examples to illustrate imaging findings. Discuss management of complications, where applicable.

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This exhibit will introduce the radiologist to the wide range of cosmetic procedures performed on the abdomen and pelvis, including abdominoplasty, implant procedures (e.g., buttock implants, six-pack creation), liposuction, fat transfer (most commonly, the "Brazilian butt lift"), cosmetic injections (e.g., buttock injections, penile injections, "labial puffing"), etc. It will describe the expected post-procedural appearances of these procedures on imaging, with a focus on computed tomographic and magnetic resonance imaging modalities. The exhibit will also describe potential complications of cosmetic procedures performed on the abdomen and pelvis (e.g., infection, hematoma, visceral laceration/hemorrhage, wound dehiscence, implant malposition or rupture, injection granuloma or material migration), using case examples to illustrate imaging findings. Finally, the exhibit will briefly discuss the management of complicated cosmetic procedures, where applicable.

EREE-47 MRI FOR ABDOMINAL PAIN IN PREGNANCY: APPENDICITIS AND BEYOND

Jonathan Levine, MD (*Presenter*)
Michio Taya, MD, MSc (*Abstract Co-Author*)

TEACHING POINTS

Often obtained in pregnancy to assess for acute appendicitis, MRI may uncover unexpected diagnoses beyond appendicitis. The MRI diagnosis of pathologies more commonly seen by CT may be a challenge for the radiologist given physiologic and anatomic changes in pregnancy. Through the presentation of over 12 MRI cases from multiple organ systems and a highlight of pertinent literature, this exhibit will prepare the audience to recognize common and atypical causes of abdominal pain in pregnancy. Considerations unique to antepartum patients will be emphasized, including pathologies more likely to occur in pregnancy and interpretation of findings in the absence of IV contrast.

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1. Goals and objectives 2. Clinical challenges associated with assessment of patients with abdominal pain during pregnancy 3. Safety considerations for MRI during pregnancy, including heating, acoustic effects, and contrast safety 4. Suggested MRI protocol for abdominal pain in pregnancy 5. Case-based overview of pathologies that may be expectedly or incidentally encountered by MRI. The exhibit will highlight how pregnancy may affect the incidence and presentation of each pathology: Gynecologic (ovarian torsion, adnexal masses, leiomyoma-related pathologies), Urinary tract (nephrolithiasis, pyelonephritis), Hepatobiliary (cholelithiasis, cholecystitis, pancreatitis, HELLP syndrome), Gastrointestinal (appendicitis, diverticulitis, Crohn's, bowel obstruction), Vascular (hemorrhage, venous thrombosis)

EREE-48 LOOK AGAIN: CASE-BASED REVIEW OF SUBTLE BUT IMPORTANT FINDINGS DURING EMERGENCY ON-CALL SHIFTS

Cisel Yazgan, MD, MD (*Presenter*)
Oguzhan Can, MD (*Abstract Co-Author*)
Isin Seda Sahin, MD (*Abstract Co-Author*)

TEACHING POINTS

• To recognize subtle but clinically significant imaging findings that can be overlooked under on-call conditions such as time pressure, high image load, and lack of detailed clinical information• To highlight diagnostic challenges caused by anatomical variations, atypical presentations, anatomic blind spots• To enhance learning by emphasizing high-yield teaching points relevant to radiology residents

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1. Introduction During on call shifts radiologists interpret images under pressure turn around time, high workload and limited clinical information. These conditions can increase the likelihood of misdiagnosis particularly when CT findings subtle or requiring clinical correlation.2. Case Based Review Selected emergency CT cases from our institution demonstrating overlooked but clinically important findings. Recognizing Regions Prone to Missed Hemorrhage Subtle hemorrhages in anatomically challenging blind spots Subtle Signs of Spinal Instability Indirect CT findings suggestive of PLC injury Hidden Clues of Aortic Dissection on NCCT Recognizing secondary signs in the absence of contrast Subtle Retroperitoneal Perforation Indolent clinical course with minimal localized gas Early Ischemic Signs on NCCT Importance of window settings Fractures Extending Toward Critical Structures Overlooked maxillofacial injuries with potential complications Indirect Radiologic Clues: When Primary Signs Are Absent Fat stranding, soft tissue changes, and subtle asymmetry

EREE-49 ULTRASOUND & SURGICAL CORRELATION IN ACUTE PENILE TRAUMA: RECOGNIZING TRUE FRACTURES AND AVOIDING PITFALLS

Ignacio Cavaller, MD (*Presenter*)
Angel Sanchez Guerrero (*Abstract Co-Author*)

Elena Martinez Chamorro (*Abstract Co-Author*)
Miguel Diez, MD (*Abstract Co-Author*)
Hugo Gonzalez, MD (*Abstract Co-Author*)

TEACHING POINTS

To describe the anatomy of the penis relevant to imaging (ultrasound). To review the ultrasound features of penile fracture and its mimics in 9 cases of our institution To correlate sonographic findings with intraoperative results in 4 cases. To highlight the differences between true and false penile fractures and its importance of early diagnosis in preventing complications.

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Penile anatomy and mechanisms of injury. Sonographic findings of true penile fractures. Differentiation from false penile fractures: common mimics. Correlation with surgical findings and treatment strategies. Complications and long-term outcomes.

EREE-50 EMERGENCY NEURORADIOLOGY: EASY THINGS MISSED IN THE DARKNESS

Babajide Owosela, BS (*Presenter*)
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Taejin Min, MD,PhD (*Abstract Co-Author*)
Siddhartha Kosaraju, MD (*Abstract Co-Author*)
Ling Chen Chien, MD (*Abstract Co-Author*)
Ryan B. Peterson, MD (*Abstract Co-Author*)

TEACHING POINTS

Interpretive error rates in neuroradiology significantly increase during overnight and weekend shifts. Performance changes related to fatigue include delayed fixation, altered search patterns, and reduced confidence may provide compounded risk, especially in subtle or atypical presentations. This exhibit highlights missed findings in emergency neuroradiology cases interpreted after-hours. Through a case-based review, we will: Examine the evidence linking fatigue and after-hours interpretation with increased error rates. Identify common neuroradiologic entities prone to overnight misses, emphasizing subtle imaging clues. Discuss strategies to reduce diagnostic error, including structural workflow changes and fatigue mitigating techniques.

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Introduction Burden of mistakes made after-hours compared to weekday interpretations Brief literature review on radiologist fatigue and performance decline Review of Missed Emergency Cases Right internal jugular (IJ) thrombus Carotid-cavernous fistula Cerebellopontine angle mass Intracranial pseudoaneurysm Cervical spine extruded disc Thoracic pneumothorax Fat embolism syndrome Mechanisms of Diagnostic Failure Eye-tracking and cognitive fatigue studies Systemic factors: staffing models, burnout Solutions and Future Directions Structured reporting, checklists, AI triage tools Environmental modifications (light, breaks, ambient stimuli) Institutional support for overnight readers

EREE-51 TRAUMA AT THE SURFACE, DANGER BENEATH: IMAGING THE ABDOMINAL WALL

Nandakumar Patnam Gopal Chetty, MD (*Presenter*)
Ranjana Ramesh (*Abstract Co-Author*)
Navin Ramesh (*Abstract Co-Author*)
Rajat Bhargava, MD, MBBS (*Abstract Co-Author*)
Claire K. Sandstrom, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Seatbelt Sign as a Sentinel Indicator : In the absence of solid organ trauma, a positive seatbelt sign may be the sole clue to underlying bowel and vascular injuries. 2. Morel-Lavallee Lesion Demands a Strategic Shift : Its presence calls for a modified approach to fracture fixation, given the elevated risk of postoperative infection. 3. Traumatic Hernias as Markers of Multisystem Injury : Often accompanied by bowel and mesenteric trauma, these hernias necessitate surgical repair to forestall future complications. 4. Rectus Sheath Hematomas Require Timely Intervention : Resulting from epigastric artery damage, rapidly expanding hematomas can mandate invasive management such as angioembolization.

TABLE OF CONTENTS/OUTLINE

1. Overview and anatomic considerations. 2. Seatbelt sign-related injuries. 3. Moral-Lavallee lesion. 4. Body wall muscular and juxtamuscular injuries. 5. Traumatic body wall hernia spectrum.

EREE-52 AORTA EMERGENCY: A RESIDENT'S CRASH COURSE IN ACUTE AORTIC SYNDROMES

Arianne Idaly Ramos Galvan, MD (*Presenter*)

TEACHING POINTS

Review the definition and classification of Acute Aortic Syndromes (AAS), including aortic dissection, intramural hematoma (IMH), and penetrating atherosclerotic ulcer (PAU).Understand the normal anatomy and histology of the aortic wall, to establish the foundation for interpreting disease mechanisms and imaging findings.Recognize the key pathophysiological mechanisms underlying each AAS subtype. Review optimal CT imaging protocols for AAS detection. Differentiate between the key imaging features of each AAS. Recognize imaging mimics and analyze differential diagnoses, tips and tricks. Apply guideline based knowledge to support urgent triage and treatment planning.

TABLE OF CONTENTS/OUTLINE

Introduction: Definition of Acute Aortic Syndrome (AAS), epidemiology and clinical importance.Anatomy and histology of the aorta: gross anatomical divisions, aortic wall layers and vascular histology.Classification of Acute Aortic Syndromes: Pathophysiology and histopathological correlates. Protocol for multiphasic CT angiography. Key radiological findings.Differential diagnosis and mimics (tips and tricks).Management and prognosis (brief overview).Conclusions and key takeaways.

EREE-53 AAST GRADING OF RENAL TRAUMA - AN OVERVIEW FROM A RESIDENT'S APPROACH WHILE WORKING IN THE ED

Jordan K. Gonia, MD (*Presenter*)
Olivia A. Thoroughman, DO (*Abstract Co-Author*)
James T. Lee, MD (*Abstract Co-Author*)
Andres R. Ayoob, MD (*Abstract Co-Author*)
Amanda C. Gibson, DO (*Abstract Co-Author*)
Joseph W. Owen, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit aims to provide a clear understanding of the changes in the 2018 update to the AAST renal trauma grading system. Learners will review key aspects of retroperitoneal and renal anatomy relevant to trauma assessment, recognize characteristic imaging findings across Grades I to V, and focus on the distinguishing features of high-grade injuries. The role of multiphasic contrast enhanced CT will be highlighted. Additionally, we will explore utilizing imaging findings to help guide clinical management in renal trauma.

TABLE OF CONTENTS/OUTLINE

The exhibit begins with an introduction to the relevance of renal trauma in emergency care, followed by a brief review of pertinent renal and retroperitoneal anatomy. We will then examine the key changes introduced in the 2018 AAST renal injury grading update and outline the current criteria used to classify renal injuries. Next, the role of multiphasic CT imaging protocols will be discussed, leading to a case based review of renal injuries of differing grades. The exhibit will conclude with a discussion on clinical management considerations.

EREE-54 DECIPHERING ACUTE PELVIC PAIN: GYNECOLOGIC EMERGENCIES

Mariana Costa, MD (*Presenter*)
Daniel L. Cardoso, MD (*Abstract Co-Author*)
Alexandre M. Pereira, MD (*Abstract Co-Author*)
Giovanni G. Cerri, PhD (*Abstract Co-Author*)
Thiago Vieira, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Recognize the key anatomical structures of the pelvic cavity; Understand the different causes of acute gynecological pelvic pain and related imaging features; Comprehend the presentations of ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI) of the most common causes of acute pelvic pain; Recognize the potential pitfalls in diagnosing pelvic lesions

TABLE OF CONTENTS/OUTLINE

INTRODUCTION Flowchart of causes of acute pelvic pain Causes of acute pelvic pain in women: gastrointestinal, obstetric and gynecological Overview of the main gynecological causes DIAGNOSIS AND IDENTIFICATION OF ACUTE PELVIC PAIN CAUSES UTERINE Leiomyoma degeneration; Torsion of a uterine leiomyoma; Uterine torsion; OVARIAN Corpus luteum; Ruptured ovarian cyst; Hemorrhagic cyst; Ovarian hyperstimulation; Ovarian torsion; ADNEXAL Fallopian tube torsion; OTHERS Pelvic Inflammatory Disease (PID) and complications; Ovarian vein thrombosis; SYSTEMATIC APPROACH: A ROADMAP SUMMARY AND TAKE-HOME MESSAGES

EREE-55 ESSENTIALS OF HEAD AND NECK GUNSHOT WOUND NEUROIMAGING

Alexander McClanahan, MD, MS (*Presenter*)
Anna Eshghi, DO (*Abstract Co-Author*)
Satya N. Patro, MD (*Abstract Co-Author*)
Rudy L. van Hemert JR, MD (*Abstract Co-Author*)
Naghmeh Eshghi, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Gunshot wound patterns are shaped by the firearm, projectile design, velocity, and the biomechanical properties of the affected tissue. Low-elasticity tissues such as brain parenchyma are more susceptible to cavitation injury than relatively high-elasticity tissues such as the muscle, fascia and osseous structures, which are better able to withstand temporary ballistic cavitation. 2. CT and CT angiography (CTA) are the first-line tools for evaluating gunshot and vascular injuries in the head and neck. In cases where CTA is equivocal for vascular injury, digital subtraction angiography is helpful as the gold standard for defining the extent of vascular injury. 3. Given the anatomical complexity and high concentration of vital structures in the small area of the head and neck, a systematic approach to reviewing head and neck gunshot wound imaging is essential. 4. A systematic framework begins with the topogram and then evaluates tissues from superficial (entry/exit sites, superficial soft tissues) to deep (aerodigestive and facial bone/skull, followed by brain/spine parenchymal, and finally vascular structures).

TABLE OF CONTENTS/OUTLINE

• Laceration injury o Scalp laceration o Neck laceration • Penetration injury o Parenchymal Brain & Spinal Cord Injury § Contusion, infarct, bullet track effects § Role of MRI in delayed complications o Osseous Injury § Calvarial, facial, vertebral fractures § Secondary bone projectiles o Arterial Injuries § Dissection, pseudoaneurysm, occlusion § Predictors of need for angiography o Venous Injuries § Jugular and dural sinus thrombosis § MRV/CTV indications o Neck Soft Tissue Injury § Oropharyngeal, esophagus § Contrast extravasation, fistula

EREE-56 PEDIATRIC KNEE MSK MRI IN THE EMERGENCY DEPARTMENT: PEARLS AND PITFALLS

Catherina Zadeh, MD, FRCR (*Presenter*)
Krishnakumari A. Modi, MBBS (*Abstract Co-Author*)
Renata Correa Osorio, MD (*Abstract Co-Author*)
Renata V. Leao, MD (*Abstract Co-Author*)

TEACHING POINTS

• Pediatric knee MRIs in the ED pose interpretive challenges due to normal variants and subtle pathology. • Prompt diagnosis of ligamentous, meniscal, osteochondral, and infectious conditions impacts management. • A structured, systematic approach reduces misinterpretation and improves clinical decision-making.

TABLE OF CONTENTS/OUTLINE

1. Normal MRI Anatomy and Growth Variants Review of physeal development, ossification centers, and common mimics (e.g., bipartite patella, tubercle fragmentation). Emphasis on age-based comparison and avoiding overdiagnosis. 2. Acute Ligamentous and Meniscal Injuries MRI appearance of partial/complete ACL tears, tibial spine avulsions, and meniscal root and bucket-handle tears. Stress on secondary signs and patterns of bone contusion. 3. Osteochondral Injuries Differentiation of stable versus unstable osteochondritis dissecans using key MRI features such as fluid clefts and displacement. Includes management implications. 4. Knee Joint Effusions in the ED MRI patterns of septic arthritis, juvenile idiopathic arthritis, and lipohemarthrosis. Visual comparison of effusion characteristics and marrow involvement. 5. Stepwise MRI Interpretation Strategy A diagnostic flowchart outlining a practical 5-step approach: growth plate ? bone injury ? ligaments ? cartilage ? effusion. Designed to streamline urgent reads.

EREE-57 BREAST ER: "CAN'T MISS" PATHOLOGIES

Nisha Pradhan, MD (*Presenter*)
Ana Bucci, MD (*Abstract Co-Author*)
Mariana R. Defreitas, MD (*Abstract Co-Author*)
Cherie M. Kuzmiak, DO (*Abstract Co-Author*)

TEACHING POINTS

(1) To gain a better understanding of breast pathologies that may initially present in the ER setting. (2) Overview of “can’t miss” infectious and non-infectious breast pathologies.

TABLE OF CONTENTS/OUTLINE

I. Introduction a. The emergency setting can be a vital part of the detection and characterization of breast lesions in women. b. While the most common breast pathology seen in the ER is likely of infectious etiology, there are also other key pathologies that if diagnosed in a timely fashion can expedite the patient’s access to pertinent care and improve their outcomes. II. Content a. Breast pathologies that present in the emergency room encompass a wide range of abnormalities, ranging from noninfectious to infectious and benign to malignant findings. b. Cases will showcase breast pathologies diagnosed on imaging in the emergency setting, and will range from breast tenderness and postoperative breast pathologies to reconstruction complications and blunt trauma. c. Timely and accurate diagnosis expedited the patient’s time to workup and treatment. III. Summary a. While the most common presentation of breast pathology in the emergency setting is often infectious, the less

common presentations are equally important for radiologists to recognize to optimize patient care and outcomes. b. Appreciating the clinical significance of these findings is crucial, as they may directly impact patient management and follow-up recommendations.

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GIEE

Gastrointestinal Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

GIEE-1 ALPHA-PHETOPROTEIN RISING, GO CHECK THE LIVER, BUT... WHERE TO LOOK NEXT? A REVIEW OF HEPATOCELLULAR CARCINOMA METASTATIC DISEASE

Isabel Fonseca Buelga, MD (*Presenter*)
Elena Canales Lachen (*Abstract Co-Author*)
Claudia Viescas Huerta, MD (*Abstract Co-Author*)
Diego Alejandro Garcia Paredes, MD (*Abstract Co-Author*)
Sergio Sintes (*Abstract Co-Author*)
Alba Salgado Parente, MD (*Abstract Co-Author*)
Luis Gonzalez Campo, MD (*Abstract Co-Author*)
Ana Villanueva, MD (*Abstract Co-Author*)
Carlos Tramblin De La Moneda, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Brief review of epidemiology of metastatic hepatocellular carcinoma and principal imaging features 2. To describe the pathways of dissemination of hepatocellular carcinoma 3. To illustrate the different sites of metastases by sample cases. 4. To discuss the recurrence after liver transplant, both locally and at distance. 5. To talk about the risks of diagnostic and therapeutic procedures in recurrence.

TABLE OF CONTENTS/OUTLINE

1. Introduction and epidemiology of metastasic hepatocellular carcinoma (CHC). 1.1 Principal Imaging Characteristics 2. Dissemination pathways 2.1 Hematogenous Spread 2.1.1 Bone 2.1.2 Lung 2.1.3 Less frequent metastases 2.2 Lymphatic Spread 2.3 Peritoneal Implants 2.4 Local Invasion 3. Liver transplant and recurrence 3.1 Epidemiology of recurrence after liver transplant 3.2 Etiopathogenesis 3.3 Imaging Features 3.4 Diagnostic/Therapeutic procedures and the risk of recurrence

GIEE-2 FROM LEGACY TO INNOVATION: RADIOLOGICAL ASSESSMENT OF GASTROINTESTINAL MEDICAL DEVICES AND THEIR ASSOCIATED COMPLICATIONS

Jose Carlos Garcia-Gil Garcia, MBBCh (*Presenter*)

TEACHING POINTS

1. To review the classical intra-abdominal medical devices and delve into their less common complications. 2. To present the latest-generation medical devices, highlighting the radiological features that enable accurate identification and discussing potential complications related to their placement.

TABLE OF CONTENTS/OUTLINE

The continuous advancement of technology not only leads to the development of new tools that radiologists must become familiar with, but also to the evolution of established devices in terms of design and functionality. This presentation aims to revisit the most commonly used intra-abdominal devices over recent decades and explore their less frequently observed complications. Given the large number of devices currently in use, this work has been divided into two parts. The first part focuses on devices placed within the gastrointestinal tract and the biliopancreatic system—ranging from well-established bariatric tools and endoclips to more recent innovations such as lumen-apposing metal stents (LAMS). It should be emphasised that a thorough count of all such devices is essential, with careful correlation between imaging findings and the patient's surgical and endoscopic reports. It is strongly recommended to list these devices at the beginning of the radiological report, including a brief description of their location and any complications arising from their placement.

GIEE-3 "UNVEILING THE UNREAL": COMPREHENSIVE IMAGING REVIEW OF ABDOMINAL PSEUDOLESIONS

Firat Atak, MD (*Presenter*)
Asli Ceren Akbiyik (*Abstract Co-Author*)
Deniz Berkay Sonu, MD (*Abstract Co-Author*)
Onat Guner, MD (*Abstract Co-Author*)
Sevtap Arslan (*Abstract Co-Author*)
Ilkay Idilman, MD (*Abstract Co-Author*)
Ali Devrim D. Karaosmanoglu, MD (*Abstract Co-Author*)
Deniz Akata, MD (*Abstract Co-Author*)
Mustafa Nasuh Ozmen, MD (*Abstract Co-Author*)
Musturay Karcaaltincaba, MD (*Abstract Co-Author*)

TEACHING POINTS

1) Recognize common abdominal CT/MRI pseudolesions using multiple illustrative cases and imaging examples. 2) Understand main causes-anatomical variants, artifacts, iatrogenic and benign changes. 3) Apply practical tips to distinguish pseudolesions from true lesions.

TABLE OF CONTENTS/OUTLINE

A. Definition and causes of pseudolesions. B. Practical differentiation strategies from true lesions, C. Location-specific pseudolesions in: diaphragm (slip, crus mimicking adenopathy, peridiaphragmatic pseudofluid); liver (perfusion anomaly, fat-related, post-treatment, others); spleen (wandering spleen, splenosis, zebra-pattern); pancreas (intrapancreatic accessory spleen, lobulation anomalies, clefts); gastrointestinal tract (intraluminal content, ectopic pancreatic tissue, gastric diverticula); genitourinary tract (hypertrophied renal parenchyma in atrophy, microcysts, hypertrophied column of Bertin, ureteral-jet artifacts and bulking agents, cryptorchidism, ovarian transposition, differential cervical enhancement, pessaries); vascular and miscellaneous entities such as venous pseudothrombosis, prominent cisterna chyli, accessory breast tissue, fallen gallstones, epiploic appendagitis, hemostatic sponges, gossypiboma, fat injections, out-of-field artifacts, hernia repair changes, extramedullary hematopoiesis, abdominal wall endometriosis, rectus sheath hematoma, and omental edema. D. Conclusion.

GIEE-4 QUANTIFICATION BEYOND THE LIVER: PANCREATIC DEPOSITION DISEASES - WHAT ARE THE BENEFITS?

Sthefane Nunes, MD, MD (*Presenter*)
Eleonora Silva (*Abstract Co-Author*)
Giuseppe D'Ippolito, MD, PhD (*Abstract Co-Author*)
Caroline L. Ghezzi (*Abstract Co-Author*)
Clara Fiorot, MD (*Abstract Co-Author*)
BRUNA RAMOS ALENCAR MARIANO (*Abstract Co-Author*)
Nara Vedoveli (*Abstract Co-Author*)
Daniella B. Parente, MD, PhD (*Abstract Co-Author*)
Viviane B. Amorim, MD (*Abstract Co-Author*)

TEACHING POINTS

Review the mechanisms and metabolic consequences of pancreatic iron and fat deposition, along with associated conditions. Detail key multiparametric MRI and CT methods for quantifying pancreatic iron and fat overload. Propose a practical approach to simplify imaging evaluation and enhance interpretation accuracy.Discuss indirect benefits beyond the abdominal focus, such as predicting cardiac iron deposition.

TABLE OF CONTENTS/OUTLINE

This presentation provides an overview of pancreatic iron and fat deposition. We will explore the pathological mechanisms and associated conditions (e.g., hemochromatosis for iron; MASLD and obesity for fat overload). Emphasis will be placed on the importance of identifying these patients due to potential clinical sequelae, including decreased pancreatic enzyme production, pancreatitis, and diabetes mellitus.MRI techniques for iron quantification—including signal intensity ratio, pancreatic signal index, and relaxometry—will be discussed. Methods for assessing fat infiltration on both unenhanced CT (average density, pancreas/spleen density ratio, pancreas/spleen density subtraction) and MRI (chemical shift imaging and proton density fat fraction [PDFF]) will also be presented.Through case-based examples, we will review parameter analysis and offer a practical approach to facilitate the diagnosis.

GIEE-5 RETROPERITONEAL TUMORS: A RADIOLOGIC JOURNEY FROM COMMON PRESENTATIONS TO UNUSUAL ENTITIES

Fatima Quispe Villca, MD,MMed (*Presenter*)
Silvia E. Gimenez, MS (*Abstract Co-Author*)
Teresa A. Garcia, MD (*Abstract Co-Author*)
Julieta Arellano (*Abstract Co-Author*)
Nicolas Roccatagliata, MD (*Abstract Co-Author*)
Ana Maria Javadi Nia (*Abstract Co-Author*)
Marco Bonilha Zocatelli, MD (*Abstract Co-Author*)

TEACHING POINTS

Retroperitoneal tumors are uncommon and often diagnosed late due to their silent growth within a deep anatomical compartment.Most are of mesenchymal origin, with liposarcoma being the most common type.Computed tomography and magnetic resonance imaging are essential toolsIt is crucial to distinguish primary retroperitoneal tumors from secondary involvement due to adjacent organ invasion or metastases.

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Retroperitoneal tumors are rare neoplasms that account for a very small proportion of all cancers diagnosed each year. They originate in the retroperitoneal space, a deep and complex cavity located between the diaphragm and the pelvis, which contains vital organs and structures such as the kidneys, adrenal glands, pancreas, major blood vessels, and ureters. Due to their location and asymptomatic growth, they are often detected at advanced stages, when they have already reached a considerable size. This late detection increases the risk of invasion or compression of neighboring organs, with potential complications such as ischemia, tissue necrosis, and frequent recurrence, especially in malignant tumors like sarcomas. Therefore, early diagnosis is essential, and imaging techniques such as computed tomography and magnetic resonance imaging are key to their identification.

GIEE-6 THE GREAT DIVIDE: A RADIOLOGICAL JOURNEY ACROSS THE DIAPHRAGM

Marilia A. Tavares, MD (*Presenter*)
Renan Arakaki, MD (*Abstract Co-Author*)
Aley Talans, MD (*Abstract Co-Author*)
Lucas R. Torres, MD (*Abstract Co-Author*)
Daniella B. Parente, MD, PhD (*Abstract Co-Author*)
Eduardo O. Pacheco, MSc, MD (*Abstract Co-Author*)
Ulysses S. Torres, MD, PhD (*Abstract Co-Author*)
Giuseppe D'Ippolito, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Review the anatomy of the diaphragm, including its attachments, openings, and main anatomical variants.Present the different types of diaphragmatic lesions, classified by their relationship with thoracic and abdominal structures.Discuss the main imaging findings and their relevance in diagnosis and clinical management.

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The diaphragm is a musculotendinous structure that separates thoracic and abdominal cavities and can be affected by a wide variety of diseases. Given its strategic location and close relationship with surrounding structures, diaphragmatic involvement may arise from adjacent thoracic or abdominal processes, occur intrinsically, or result from transdiaphragmatic spread.This educational exhibit presents a structured pictorial review, beginning with a targeted anatomical overview with original didactic drawings to enhance comprehension. Lesions are classified according to their spatial relationship to the diaphragm to facilitate understanding and pattern recognition:- Above the diaphragm: asbestosis, pleural mesothelioma, metastases.- Within the diaphragm: endometriosis, congenital or acquired hernias.- Below the diaphragm: endometriosis, peritoneal carcinomatosis.- Crossing the diaphragm: biliobronchial fistulas, transdiaphragmatic abscess, transdiaphragmatic tumor extension.Each category is illustrated by clinical cases, followed by image-focused discussion emphasizing the importance of diaphragmatic anatomy in radiologic interpretation. Key teaching points are summarized throughout the presentation in a take-home message format to reinforce diagnostic awareness and support practical application.

GIEE-7 INTERNAL HERNIAS: WHEN TO SUSPECT, WHAT TO LOOK FOR

Teresa A. Garcia, MD (*Presenter*)
Fatima Quispe Villca, MD,MMed (*Abstract Co-Author*)
Julieta Arellano (*Abstract Co-Author*)
Ana Maria Javadi Nia (*Abstract Co-Author*)

Nicolas Roccatagliata, MD (*Abstract Co-Author*)
Ana E. Sanchez Sierra I, MD,MD (*Abstract Co-Author*)
Marco Bonilha Zocatelli, MD (*Abstract Co-Author*)

TEACHING POINTS

They are defined as the protrusion of abdominal viscera through defects in the peritoneum or mesentery, which may be congenital or acquired. Although rare, internal hernias have high morbidity and mortality when not diagnosed promptly, especially due to complications such as bowel ischemia. Contrast enhanced computed tomography is key for early diagnosis, allowing identification of findings such as clustered bowel loops in atypical locations and signs of ischemic compromise. Familiarity with the common locations and typical radiologic features of internal hernias is essential for radiologists, as timely diagnosis can prevent life-threatening surgical emergencies.

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Internal hernias present a diagnostic challenge due to their low frequency and nonspecific clinical and imaging features, which can mimic other acute abdominal conditions. They are defined as the protrusion of abdominal viscera, typically small bowel loops, through congenital or acquired defects in the peritoneum or mesentery. Although uncommon, they carry a high risk of morbidity and mortality if not diagnosed early, mainly due to the potential for intestinal ischemia. Contrast-enhanced computed tomography is essential for early detection, as it can reveal signs such as clustered bowel loops in atypical locations, obstruction, and in advanced cases, ischemic changes. Paraduodenal hernias are the most frequent type, while postoperative hernias have increased due to the rise in bariatric surgeries. Because symptoms are often vague and intermittent, familiarity with anatomical landmarks and characteristic imaging patterns is crucial for radiologists to ensure timely diagnosis and prevent serious complications.

GIEE-8 THE POWER OF ATTRACTION: IMAGING IN MAGNETIC GASTROINTESTINAL SURGERY

Kathy Truong (*Presenter*)
Cibele Luna, MD (*Abstract Co-Author*)
Eduardo A. Moya, MD (*Abstract Co-Author*)
Yamile Blain, MD (*Abstract Co-Author*)

TEACHING POINTS

-Review the core technical principles of magnetic surgery. -Describe gastrointestinal (GI) applications of magnetic surgery. -Highlight the role of imaging in magnetic-assisted GI procedures.

TABLE OF CONTENTS/OUTLINE

1. Introduction to magnetic surgery and its evolving role in minimally invasive procedures. 2. Overview of magnetic device technology and foundational principles. 3. Applications of magnetic devices in GI procedures. 4. Role of imaging in magnetic GI surgery: a. Identify eligible patients b. Verify magnet placement and localization c. Monitor magnet adhesion and passage d. Identify complications (device failure, leak detection, restenosis/restricture, etc.)

GIEE-9 LIGHTING UP THE LIVER: CEUS IN FOCAL LESIONS

Jonahi S. Serrano Heredia, MD (*Presenter*)
Veronica Espinoza Cruz (*Abstract Co-Author*)
Ana C. Gandara, MD (*Abstract Co-Author*)
Jose A. Cienfuegos Alvear, MD (*Abstract Co-Author*)
Sofia Arizaga, MD (*Abstract Co-Author*)
Monica Chapa-Ibarguengoitia, MD (*Abstract Co-Author*)
Juan Jose Duran Rosas, MD (*Abstract Co-Author*)

TEACHING POINTS

CEUS enables real-time liver lesion characterization without nephrotoxicity or radiation. Hemangiomas : peripheral nodular enhancement with centripetal fill-in. FNH : fast homogeneous arterial enhancement, no washout, ± central scar. Adenomas may mimic HCC—look for arterial enhancement and late washout. HCC : arterial hyperenhancement + mild, late washout (LI-RADS). CCC and hypovascular mets : rim/heterogeneous enhancement, early washout. Hypervascular mets (e.g., NETs): strong arterial uptake, earlier/more marked washout.

TABLE OF CONTENTS/OUTLINE

I. Introduction Role of CEUS in liver lesion evaluation Comparison with CT/MRI CEUS contrast agents and phases II. CEUS Enhancement Patterns: Overview Arterial, portal, and late phase behavior Definition of washout and diagnostic implications III. Benign Lesions Hemangioma Peripheral nodular enhancement Centripetal fill-in, sustained enhancement Focal Nodular Hyperplasia (FNH) Rapid homogeneous arterial enhancement Central scar, no washout Hepatocellular Adenoma Variable enhancement Possible mild late washout Subtype considerations IV. Malignant Lesions Hepatocellular Carcinoma (HCC) Arterial hyperenhancement Mild, late washout CEUS LI-RADS correlation C holangiocarcinoma (CCC) Peripheral arterial enhancement Progressive centripetal fill-in Marked, early washout Metastases Hypervascular (e.g., NETs, RCC): strong arterial enhancement, early washout Hypovascular (e.g., colon, breast): poor arterial enhancement, early marked washout V. Conclusion CEUS interpretation tipsKey features to differentiate benign vs malignant lesions

GIEE-10 PATH BEYOND THE BLIND-END: UNRAVEL THE IMAGING SPECTRUM OF APPENDICEAL PATHOLOGIES

Siva K. Konduru, MBBS (*Presenter*)
Sriram Jaganathan, MD (*Abstract Co-Author*)
Aastha S. Bhatt, MD,MBBS (*Abstract Co-Author*)
Anil K. Dasyam, MD (*Abstract Co-Author*)
Venkata S. Katabathina, MD (*Abstract Co-Author*)

TEACHING POINTS

Discuss a wide spectrum of entities from incidental appendicoliths, and acute appendicitis to neoplasms.Recognizing diverse imaging patterns across ultrasound, CT, and MRI for diagnosis and appropriate clinical management.Discuss different imaging pearls of epithelial and neuroendocrine appendiceal neoplasms with histopathological correlation.Evolving role of imaging in the management of the common and uncommon appendiceal neoplasms.

TABLE OF CONTENTS/OUTLINE

Introduction and anatomy of the appendix including various positional variations of appendix on cross sectional imaging. Various modalities and techniques used for imaging the appendix including their pitfalls and limitations. Imaging features, pathophysiology and management of appendiceal diseases including: • Appendicoliths and foreign bodies.• Acute appendicitis.• Inflammatory bowel diseases involving the appendix.• Primary epithelial neoplasms including Mucinous and Non-mucinous types.• Neuroendocrine Neoplasms.• Miscellaneous and mimics. Evolving role of imaging in the management of appendiceal neoplasms. Conclusion: Appendiceal pathology is diverse, extending beyond classic appendicitis to include chronic inflammatory, neoplastic, and mimicking entities. Advances in CT, ultrasound, and MRI have significantly enhanced the diagnostic confidence and the ability to differentiate various appendiceal diseases. A pattern-based radiologic approach enables precise diagnosis, optimizes patient outcomes, and underscores the radiologist's key role in appendiceal disease evaluation and multidisciplinary care.

GIEE-11 DECODING GASTROINTESTINAL DISEASES THROUGH IMAGING: RADIOLOGIC-PATHOLOGIC CORRELATION AND THE EXPANDING ROLE OF ADVANCED CT TECHNOLOGIES

Kota Yokoyama, MD, PhD (*Presenter*)
Junichi Tsuchiya, MD, PhD (*Abstract Co-Author*)

Hirofumi Yamada (*Abstract Co-Author*)
Yusuke Kawasaki, MD (*Abstract Co-Author*)
Akane Ozawa (*Abstract Co-Author*)
Yoshio Kitazume (*Abstract Co-Author*)
Jun Isogai, MD (*Abstract Co-Author*)
Ukihide Tateishi, PhD (*Abstract Co-Author*)

TEACHING POINTS

- GI diseases encompass a broad spectrum including tumors and inflammatory conditions, each with distinct imaging-pathology signatures. - Radiologic-pathologic correlation deepens understanding of disease processes and clarifies key imaging features essential for accurate diagnosis. - Emerging technologies such as PCD-CT, MRI, and nuclear medicine improve visualization of lesion composition, vascularity, and metabolic activity. - Recognizing disease-specific imaging features aids in differentiating rare entities from more common conditions.

TABLE OF CONTENTS/OUTLINE

1. Introduction - Diagnostic challenges in GI disease and the need for imaging-pathology integration - Benefits of advanced modalities (PCD-CT, MRI, nuclear medicine) 2. Imaging-Pathology Correlation by Disease Category - Epithelial tumors gastric cancer, colorectal adenomas, neuroendocrine tumors (NETs), melanomas, LAMN and pseudomyxoma peritonei (PMP) - Mesenchymal tumors sarcomas, lymphoma - Polyposis syndromes familial adenomatous polyposis (FAP), Cowden syndrome, Cronkhite-Canada syndrome - Inflammatory diseases Crohn's disease, irAE colitis, Satoyoshi syndrome - Metastases and atypical entities 3. Role of Emerging Imaging Modalities - PCD-CT Enhanced spatial/spectral resolution, iodine quantification, lesion conspicuity - MRI Diffusion-weighted and contrast-enhanced MRI for lesion evaluation. - Nuclear medicine Functional imaging of metabolic activity and inflammation 4. Conclusion Integration of advanced imaging with pathology enables accurate diagnosis, subtyping, and disease monitoring in GI conditions, ultimately enhancing patient care.

GIEE-12 HEPATIC INFLAMMATORY PSEUDOTUMOR: CHAMELEON OF THE LIVER

Tushar Kumar, MBBS, MD (*Presenter*)
Bahar Mansoori, MD (*Abstract Co-Author*)
Yongjun Liu (*Abstract Co-Author*)
Orpheus Kolokythas, MD (*Abstract Co-Author*)

TEACHING POINTS

1.Provide an overview of hepatic inflammatory pseudotumor - definition, epidemiology, and pathophysiology.2.Discuss the current diagnostic criteria of hepatic inflammatory pseudotumor - historic and current standards.3.Provide detailed radiological features of hepatic inflammatory pseudotumor across various imaging modalities.4.Provide a brief note on histopathological findings, inflammatory myofibroblastic tumor and relation to IgG4 related disease.

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Hepatic inflammatory pseudotumor 1.Definition 2.Epidemiology 3.Pathophysiology 4.Clinical features 5.Differential diagnosis -abscess, hepatocellular carcinoma, hepatic adenoma, focal nodular hyperplasia, metastases. Imaging findings of hepatic inflammatory pseudotumor 1. Ultrasound a) Role of sonography b) Conventional high-resolution B mode US findings c) Color doppler US findings d) Contrast-enhanced ultrasound 2. Contrast-enhanced CT (CECT) a) CECT findings associated with hepatic inflammatory pseudotumor b) Role of CT in problem solving of clinically difficult cases 3. MRI a) MRI findings associated with hepatic inflammatory pseudotumor b) Role of MRI in problem solving of clinically difficult cases 4.PET/CT a) PET/CT findings associated with hepatic inflammatory pseudotumor b) Role of PET/CT in problem solving of clinically difficult cases Histopathological findings of hepatic inflammatory pseudotumor Relation to IgG4 related disease. Inflammatory myofibroblastic tumor, ALK-1, IgG4 positive plasma cells.

GIEE-13 DIVERTICULITIS UNPLUGGED: HOW CT SCANS REVEAL MORE THAN JUST GUT FEELINGS

Guilherme Swerts Pereira (*Presenter*)
Pedro Mecate Prada, MD (*Abstract Co-Author*)
Thais Mussi, MD, PhD (*Abstract Co-Author*)
Ronaldo H. Baroni, MD, PhD (*Abstract Co-Author*)
Thiago M. Baraviera, MD (*Abstract Co-Author*)

TEACHING POINTS

- Highlight the clinical importance of CT in the diagnosis and management of acute diverticulitis, a leading cause of emergency visits and hospital admissions. - Emphasize the central role of CT in identifying complications that guide decisions between conservative treatment, percutaneous drainage, or surgery. - Review key CT findings such as contained vs. frank perforation, fistulas, adhesions, and the pseudotumoral form of diverticulitis. - Reinforce the essential role of radiologists in interpreting acute and late complications and effectively communicating findings to optimize patient outcomes.

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1. Initial Concepts: definition of diverticulosis, acute diverticulitis and complicated diverticulitis 2. Flowchart for diagnosis and management of diverticulitis 3. Complications: - Complications due to abscess: pericolic abscess, pelvic abscess, retroperitoneal abscess, tubo-ovarian abscess and possible colo-adnexial fistula. - Complications that may require surgical intervention: intestinal subocclusion, microperforation / locked perforation, unblocked perforation. - Other complications: Septic thrombophlebitis, pseudotumoral diverticulitis, digestive hemorrhage. 4. Differential diagnoses: - Epiploic appendagitis. - Colitis. - Colorectal carcinoma with inflammatory changes. 5. Take home messages 6. References

GIEE-14 LIVER METASTASES BEYOND CLASSICAL IMAGING FINDINGS

Sandra Baleato Gonzalez, MD, PhD (*Presenter*)
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TEACHING POINTS

Liver metastases are more common than primary lesions and their presence impact in patients´ prognosis. Metastases treatment depends on the type of primary tumor and include chemotherapy, immunotherapy, surgery, or ablative techniques. Imaging is mandatory in the evaluation of metastatic liver for diagnosis, therapy planning, follow up. Besides, imaging features and advanced imaging techniques can have clinical value for response prediction and prognosis of patient´s outcome. Radiomics have an emerging role in the identification of the growth patterns of liver metastases.The objectives of this exhibit are: To illustrate the role of imaging in the detection and characterization of metastases. To evaluate advantages and disadvantages of every imaging technique. To recognize imaging findings with prognostic and predictive value. To discuss the role of advanced imaging techniques and radiomics. To review key points of imaging-based planning of surgery and locoregional therapies.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Imaging findings of liver metastases. 2.1. Contrast-enhanced US and elastography. 2.2. Conventional CT and multi-energy CT (DECT and photon-counting CT), perfusion CT 2.3 .MRI-based imaging techniques (diffusion-weighted imaging, perfusion, liver-specific contrast agents) 2.4. PET with different radiotracers 3. Technical features that Improve metastases detection 4. Clinical challenges. 5. Prognostic factors 5.1. Morphology 5.2. Iodine quantification 5.3. MR signal on gadoxetic-enhanced hepatobiliary phase. 5..4. Molecular radiotracers. 6. Radiomics. 7. Imaging-based therapy planning 8. Conclusions

GIEE-15 WHAT HIDES BEHIND PERSISTENT JAUNDICE? BILIARY ATRESIA: DECODING RADIOLOGICALDIAGNOSIS WITH ULTRASOUND, MRI, ANDCLINICAL MANAGEMENT

David Melara, MD (*Presenter*)

TEACHING POINTS

Biliary atresia is a critical cause of neonatal cholestasis, and early detection significantly improves prognosis. Ultrasound is the most important initial imaging modality. The most specific findings include the triangular cord (TC) sign , observed as an echogenic fibrous remnant anterior to the right portal vein branch; a small (<1.5 cm), absent, or morphologically abnormal gallbladder (lobulated shape, irregular wall, or absence of postprandial contraction); absence of the common bile duct ; periportal echogenic thickening ; and increased subcapsular hepatic arterial flow . The combination of the TC sign and gallbladder abnormalities yields a sensitivity of 96.9% and specificity of 94.4% . However, in early stages or atypical cases, these features may not be evident, requiring correlation with other imaging modalities.

TABLE OF CONTENTS/OUTLINE

Introduction Ultrasound Findings Magnetic Resonance Imaging (MRI) Findings Classification and Management Key Points to Remember

GIEE-16 ILIAC FOSSA PAIN: MAIN DIFFERENTIAL DIAGNOSES AND THE ROLE OF ULTRASONOGRAPHY

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TEACHING POINTS

Pain in the iliac fossa requires detailed investigation to identify the underlying cause and guide appropriate treatment. These causes are commonly divided into gynecological and intestinal pathologies, often influenced by factors such as age, sex, and pain location (right vs. left). Because pelvic and lower abdominal pain can overlap, a structured approach to imaging is essential to narrow the differential diagnosis. Ultrasound and CT play a key role in distinguishing gynecological from non-gynecological causes. Ultrasound, though operator-dependent, is often the first-line tool due to its accessibility and non-invasive nature. High-frequency linear transducers are preferred for intestinal assessment, while intracavitary probes are ideal for evaluating female pelvic structures.

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The aim of this study is to demonstrate, through clinical cases from our hospital, the importance of ultrasound in the investigation of iliac fossa pain complaints. We review the main associated pathologies, expected ultrasound findings, and situations where complementary methods may be required for a more accurate diagnosis.

GIEE-17 RADIOLOGICAL APPROACH TO COMPLICATIONS OF ROUX-EN-Y GASTRIC BYPASS

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Sadia Sajid, MBBS (*Abstract Co-Author*)
Amr S. Abdelaziz, MD (*Abstract Co-Author*)

TEACHING POINTS

Explain the surgical procedure of Roux-en-Y gastric bypass Outline the imaging modalities used post surgery Describe the expected postsurgical changes Discuss the spectrum of postsurgical complications Illustrate the mechanisms of internal hernia post Roux-en-Y gastric bypass Highlight the imaging approach to the diagnosis of internal hernia

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*Surgical procedure of Roux-en-Y gastric bypass *Imaging modalities in postsurgical evaluation A. Fluoroscopy B. Computed tomography *Normal postsurgical imaging anatomy and expected postsurgical changes *Specific complications of Roux-en-Y gastric bypass A. Complications at the gastrojejunal anastomosis: **Marginal ulcer **Stricture **Gastrogastric fistula **Perforation B. Complications at the jejunojejunal anastomosis: **Intussusception C. Small bowel obstruction **Roux limb **Biliopancreatic limb **Common channel D. Internal hernias secondary to altered anatomy * Signs of internal hernia post Roux-en-Y gastric bypass *Systemic approach to the diagnosis of internal hernia *Imaging spectrum of post-surgical complications

GIEE-18 TINY BUT TROUBLESOME: THE DUODENUM'S MANY FACES

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TEACHING POINTS

Most gastrointestinal radiology literature has focused on the colon, stomach, and distal small bowel, often overlooking the duodenum—particularly on CT imaging. However, due to its complex anatomy, spanning both intra and retroperitoneal spaces, and its close proximity to surrounding organs, the duodenum is susceptible to a wide range of primary and secondary pathologic processes, some of which are unique to this segment of the bowel. This imaging review aims to highlight the wide spectrum of duodenal lesions, with a focus on their CT and MRI features. It also revisits the radiologic anatomy of the duodenum and explores the clinical and epidemiological aspects of both benign and malignant lesions. By shedding light on this often-overlooked segment, we hope to enrich the radiologic community’s knowledge and promote greater diagnostic awareness of duodenal conditions.

TABLE OF CONTENTS/OUTLINE

Teaching Points, Anatomy Review, Duodenal Primary tumors and Not tumor findings, Imaging findings and key points about deseases, Take home message and references.

GIEE-19 WHEN ORGANS BURST: IMAGING CLUES TO SPONTANEOUS INTRA-ABDOMINAL VISCERAL RUPTURE

Mohammad Mohsin Arshad, MD (*Presenter*)
Syeda Shabistan Intekhab, MBBS (*Abstract Co-Author*)
Devendra Kumar, MBBS, MD (*Abstract Co-Author*)
Abdulla Al-Hashemi, MD (*Abstract Co-Author*)
Mahmoud Al Raheem Heidous, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To explore the major etiologies of spontaneous intra-abdominal organ rupture.2. To review the key radiological findings encountered in spontaneous intra-abdominal organ rupture. 3. To underline the importance of intra-abdominal visceral rupture as a rare but potentially catastrophic differential diagnosis in cases of spontaneous hemo-peritoneum.

TABLE OF CONTENTS/OUTLINE

1. Overview 2. Common etiologies by organs A). Hepatic - benign and malignant tumors, HELLP syndrome, parasitic infections, infiltrative and inflammatory disorders. coagulation abnormalities B). Splenic - Hematological malignancies, infectious diseases, metabolic diseases, autoimmune disorders, non hematological malignancies. C). Stomach - acute gastric distention, sodium bicarbonate ingestion, E coli sepsis in neonates D). GI - Neoplastic causes, immune mediated such as crohns, infectious, medication related injury, sterocoral perforation. E). Renal - Neoplasms, vascular abnormalities, cystic renal diseases, renal infections F). Adrenal - severe physiological stress and sepsis G). Gynecological - ectopic pregnancy, ruptured ovarian cyst, HELLP syndrome 3. Key Radiological findings seen in different organs A). Hemoperitoneum/Pneumoperitonuem B). Tumor/Organ rupture C).Peri-hepatic/Peri-splenic/Peri-nephric hematoma D). Intra-peritoneal free fluid 4. Clinical relevance

GIEE-20 WILL 4D FLOW MRI CHANGE INTERVENTIONAL RADIOLOGY?

Ryota Hyodo, MD, PhD (*Presenter*)

TEACHING POINTS

4D Flow MRI acquires comprehensive hemodynamic data over the entire field of view in one scan, enabling objective, retrospective blood flow assessment. Its value in evaluating flow in the heart and large vessels has already been demonstrated. In Interventional Radiology, treatment planning has traditionally relied on 3D anatomical images (from CT or MRI) and 2D flow imaging (such as ultrasound) to infer overall hemodynamics from these limited data. In contrast, 4D Flow MRI can delineate the direction, velocity, and volume of blood in each vessel, thereby improving understanding of disease status, refining treatment indications and efficacy evaluations, and even aiding in prognosis prediction. Moreover, the 3D vector maps and streamline images generated by 4D Flow MRI are intuitive for both clinical staff and patients, promoting better team communication and facilitating informed consent. Overall, 4D Flow MRI holds substantial promise for advancing the field of Interventional Radiology.

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This educational exhibit is divided into three sections. The first section explains what 4D Flow MRI can offer to clinicians, highlighting its unique ability to capture multidirectional flow dynamics that conventional modalities cannot. The second section presents actual clinical case reports where 4D Flow MRI has influenced interventions, including stent graft treatments for abdominal aortic aneurysms and aortic dissections, stenting for portal vein stenosis and embolization for hepatic encephalopathy, and preoperative portal branch embolization. The third section discusses the current challenges and future prospects in the clinical application of 4D Flow MRI.

GIEE-21 IMAGING OF SEGMENTAL COLITIS ASSOCIATED WITH DIVERTICULOSIS

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Cheng Hong (*Abstract Co-Author*)
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Spencer C. Behr, MD (*Abstract Co-Author*)
Derek Sun, MD (*Abstract Co-Author*)

TEACHING POINTS

• Recognize segmental colitis associated with diverticulosis (SCAD) as a distinct and emerging entity from diverticulitis and inflammatory bowel disease (IBD). • Sigmoid and descending colonic inflammation sparing diverticula, rectum, and proximal colon is a key feature of SCAD. • While diagnosis is confirmed with endoscopy and pathology, imaging helps exclude SCAD from mimics, including diverticulitis, IBD, ischemia, and malignancy.

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1) Segmental Colitis Associated with Diverticulosis (SCAD) Overview a) Chronic sigmoid/descending colon inflammation, sparing rectum/proximal colon and diverticula; more common in men >50 with diverticulosis. b) Pathogenesis unclear, likely multifactorial. c) Symptoms: diarrhea, pain, hematochezia. d) Most resolve spontaneously or with antibiotics/5-ASA; severe cases: steroids, biologics, surgery. 2) Diagnosis a) Endoscopy: segmental inflammation, spares diverticula/rectum/proximal colon. b) Biopsy: chronic inflammation, cryptitis, goblet cell depletion, no granulomas. 3) Imaging a) Overlap with diverticulitis/IBD: i) Circumferential bowel wall thickening, free fluid, mainly spares diverticula. ii) Involves longer sigmoid segments, minimal fat stranding, fewer inflamed diverticula iii) Engorged vasa recta, muscular hypertrophy. 4) Complications a) Strictures, fistula, perforation, bleeding, abscess. 5) Mimics a) Diverticulitis, IBD, ischemic colitis, colon cancer. b) Review key features to distinguish SCAD from mimics 6) Summary a) While diagnosis requires endoscopy & biopsy, imaging aids diagnosis & excludes other causes. b) SCAD has milder course, good treatment response.

GIEE-22 ALL THAT GLITTERS IS NOT GOLD: NOT EVERY INJURY IN THE COMMON BILE DUCT IS CHOLANGIOCARCINOMA

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TEACHING POINTS

Cholangiocarcinoma of the common bile duct is a rare and aggressive malignant neoplasm of the extrahepatic bile ducts, for which early diagnosis is crucial to guide therapeutic management and avoid unnecessary procedures. This imagining study reviews the radiological anatomy of the common bile duct and associated structures, and also addresses the main benign and malignant conditions that mimic its clinical and imaging presentation. The challenges of differential diagnosis using methods such as magnetic resonance cholangiopancreatography (MRCP), and contrast-enhanced computed tomography are discussed, highlighting their contributions in assessing lesion extent, enhancement pattern, and vascular involvement. This review aims to contribute to the updating and improvement of radiologists' knowledge, emphasizing the central role of radiology in diagnostic definition and in the early and effective direction of treatment.

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anatomical review - importance of evaluating the differential diagnoses of cholangiocarcinoma - broad examples of mimicking pathologies - diagnostic challenge for radiology and opportunity for learning improvement

GIEE-23 IS IT STILL ALIVE? A PRACTICAL GUIDE TO LI-RADS 2024 POST-TREATMENT CATEGORIES HELPING GENERAL RADIOLOGISTS REPORT WITH CONFIDENCE

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John Robert D. Beecroft, MD (*Abstract Co-Author*)
Jorge A. Abreu Gomez, MD (*Abstract Co-Author*)
Vanessa Murad, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the rationale behind the 2024 LIRADS posttreatment response updates, including key distinctions between radiation and nonradiation therapies. Recognize normal and abnormal posttreatment imaging findings to confidently differentiate expected changes from residual or recurrent disease. Apply LIRADS 2024 treatment response categories to improve clarity in reporting and facilitate multidisciplinary management of hepatocellular carcinoma.

TABLE OF CONTENTS/OUTLINE

Background Overview of HCC as the most common hepatic malignancy. Spectrum of therapies: ablation, resection, transplantation, embolization, systemic treatment. Importance of understanding therapy mechanisms, imaging appearances and response patterns. Introduction to the 2024 LIRADS Treatment Response Algorithm updates. Imaging Findings or Procedure Details Overview of posttreatment imaging features of HCC following radiation and nonradiation therapies. Review of mechanisms of action, expected temporal changes, and interpretation challenges. Differentiation between viable tumor, posttreatment changes, and complications such as nontarget embolization or radiation-induced liver disease. Emphasis on using contrast-enhanced CT/MRI with LIRADS 2024 criteria. Visual examples and key interpretive tips. Conclusion Role of radiologists in assessing HCC treatment response. Structured framework provided by the updated 2024 LIRADS algorithm. Importance of distinguishing between viable and nonviable disease, and expected changes vs complications. Contribution of radiologists to multidisciplinary HCC care through understanding therapy selection, mechanisms of tumor lysis, and expected imaging findings.

GIEE-24 THE FLOW MUST GO ON: IMAGING PORTOSYSTEMIC PATHWAYS

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Thiago J. Penachim, MD (*Abstract Co-Author*)
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TEACHING POINTS

-In cirrhosis, elevated portal pressure leads to the formation of spontaneous portosystemic shunts (SPSS), which bypass hepatic circulation. -The morphological and hemodynamic features of SPSS — such as size, number, anatomical distribution, and blood flow — are key determinants of clinical complications associated with portal hypertension. -Despite their clinical significance, detection and characterization of SPSS remain challenging.-There is a critical need for noninvasive imaging modalities with high sensitivity and specificity to accurately identify and quantify SPSS. -Imaging-based surveillance of SPSS is essential for prognostication and for guiding therapeutic strategies in the management of patients with cirrhosis.

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-Blood flow pathways in patients with portal hypertension; -Major portosystemic shunts exemplified through clinical cases and schematic illustrations; -Key aspects that radiologists should assess in imaging studies of patients with portal hypertension; -The role of imaging in predicting major complications (encephalopathy, gastroesophageal variceal bleeding, and portal vein thrombosis).

GIEE-25 NOT SO TARGETED: WHEN ONCOLOGIC TARGETED THERAPIES TAKE A WRONG TURN IN THE ABDOMEN

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Sreeharsha Tirumani, MD (*Abstract Co-Author*)
Jennifer Huang (*Abstract Co-Author*)
Petros Grivas (*Abstract Co-Author*)
Rajat Bhargava, MD, MBBS (*Abstract Co-Author*)
Puneet Bhargava, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Recognize imaging findings of therapy-related adverse events that may mimic progression or infection. 2. Organ system-based approach incorporating American Society of Clinical Oncology (ASCO) and European Society of Medical Oncology (ESMO) guidelines. 3. Role of AI chatbots in supporting further management.

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1. Targeted therapy: Brief Classification and mechanism of action of Targeted Therapeutics. 2. Organ-Based Framework: Red flags in the right upper quadrant : i) Drug associated Hepatitis: ipilimumab, atezolizumab ii) Cholecystitis: pazopanib, everolimus iii) Pancreatitis: sunitinib, lenvatinib, everolimus, ipilimumab, atezolizumab iv) Hepatic Steatosis: cabozantinib. Bowel danger signs : i) Intestinal Perforation: bevacizumab, sorafenib, sunitinib, rituximab ii) Pneumatosis Intestinalis: bevacizumab, sunitinib, sorafenib iii) Intestinal Lymphangiectasia: pazopanib, sunitinib, cabozantinib iv) Tumor-Bowel Fistula (e.g., GIST): imatinib, bevacizumab. 3. Explore the role of ChatGPT and Microsoft Co-pilot in the Management Workflow. 4. Propose diagnostic and management algorithm for oncological treatment related toxicities.

GIEE-26 WHERE ARE WE WITH COLORECTAL CANCER (CRC) SCREENING: CT COLONOGRAPHY

Michio Taya, MD, MSc (*Presenter*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)
Matthew H. Lee, MD (*Abstract Co-Author*)
David H. Kim, MD (*Abstract Co-Author*)

TEACHING POINTS

1. CT colonography is equivalent to colonoscopy in the detection of polyps = 6 mm supported by the most recent USPSTF systematic literature review. 2. Detection and removal of polyp precursor lesions (ie, advanced adenomas and sessile serrated lesions) enable true prevention of colorectal cancer where selective polypectomy practices at CTC can minimize unnecessary polypectomies. 3. Oral contrast tagging of the polyp mucosal surface is a key to detect flat sessile serrated lesions. Quality bowel preparation with cathartic and dual barium and iodine-based tagging agents are needed. 4. Despite the effectiveness of CTC for CRC prevention and screening, screening adherence is low, and radiologist engagement will be a key for widespread implementation. 5. Opportunistic screening and AI will further enhance the value of CTC.

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1. History of CTC including the extended path to Medicare coverage and current usage among CRC screening options 2. Review of the literature regarding CTC performance, outcomes of CTC surveillance for sub-centimeter polyps, and programmatic long-term observations 3. Components of optimized technique at CT colonography 4. Current concepts in colorectal cancer screening including the pathogenesis of precancerous lesions and tenets to the size-based selective polypectomy

strategy utilized at CTC. 5. Barriers to widespread implementation - historical barriers (e.g. insurance coverage), reliance on GI for same day optical colonoscopy, radiologist and referring provider "buy-in." 6. Future directions

GIEE-27 FROM SWALLOW TO SIGMOID: A JOURNEY THROUGH BARIUM IMAGING

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OMKAR METTAN (*Abstract Co-Author*)

TEACHING POINTS

To understand the standard procedures, types of barium studies, radio anatomy and to identify image pattern of various pathologies on barium studies .

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Barium study is a specialized imaging technique using barium, a positive radiographic contrast, and X-rays to visualize the gastrointestinal (GI) tract. Since the early 20th century, it has evolved from a basic swallowing test to a dynamic tool for real-time imaging of GI anatomy and function. Despite newer diagnostic tools like ultrasound, capsule endoscopy, CT, and MRI, barium studies remain relevant due to their ability to assess swallowing, motility, and morphological abnormalities in a single, global exam. They are non-invasive, cost-effective, and widely available, aiding in diagnosis and guiding further medical, endoscopic, or surgical management. This article presents a systematic approach to the procedure, types of conventional studies, and imaging findings in GI diseases. Barium sulphate, the contrast of choice, is highly radio-opaque, non-toxic, inert, and suitable for double-contrast studies. Barium studies include oesophagogram, modified oesophagogram, upper GI series, small bowel series, enteroclysis, distal cologram, and barium enema. Preparation involves overnight fasting and avoiding activities that stimulate salivation. The primary contraindication is suspected GI perforation due to the risk of fatal barium peritonitis. Indications include dysphagia, GERD, strictures, Crohn's disease, ulcers, masses, and Hirschsprung disease. Distal cologram remains essential for evaluating stoma reversal.

GIEE-29 ROLE OF IMAGING IN PANCREATIC CANCER SCREENING FOR HIGH-RISK POPULATION WITH GENETIC AND HEREDITARY CAUSES LINKED TO SPECIFIC GENETIC SYNDROMES OR MUTATIONS

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Camila Lopes Vendrami, MD (*Abstract Co-Author*)
Ulas Bagci, MSc, PhD (*Abstract Co-Author*)
Frank H. Miller, MD (*Abstract Co-Author*)

TEACHING POINTS

Teaching points:-Discuss NCCN guidelines recommend pancreatic cancer screening for high-risk individuals, primarily those with familial or genetic predispositions.-Discuss Genetic Mutations and Syndromes Associated with Increased Risk for Pancreatic Cancer-Discuss preferred imaging modalities for pancreatic cancer screening and strategies for follow up.-Discuss AI for screening and classifying pancreatic risk.

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Pancreatic ductal adenocarcinoma has a high mortality rate. The risk for PDA is multifactorial, as both environmental and inherited causes. Heredity factors play a key role in the development of pancreatic cancer in 5% to 10% of all cases, including in individuals with an underlying germline gene mutation and those with a strong family history of PDA. It is important to identify the target population that would benefit from screening and follow specific recommendations and considerations.· High-Riskfamily history of pancreatic cancer or who carry specific genetic mutations (CDKN2A, PRSS1, STK11).· Screening Modalities:MRI and EUSScreening Intervals:· Genetic Testing:· Indeterminate Lesions:Follow up 3-6 months.· High-Risk Lesions:imaging within 3 months if surgical resection is not planned.· Follow-up:After diagnosis and treatment, regular follow up scans to monitor recurrence. · Familial Risk:· Screening at age 50 with strong family history of pancreatic cancer, even without a known genetic mutation:

GIEE-30 BEYOND CROHN'S DISEASE: PATHOLOGICAL INSIGHTS FROM CT AND MR ENTEROGRAPHY

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Barbara Luiza Bernardi (*Abstract Co-Author*)
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Ariane Giovanaz (*Abstract Co-Author*)
Natalia H. Concatto, MD (*Abstract Co-Author*)
Rubia Vanceta (*Abstract Co-Author*)
Alice Schuch, MD (*Abstract Co-Author*)

TEACHING POINTS

To demonstrate that Enterotomography (CTE) and EnteroMRI (MRE) are essential tools for diagnosing a wide range of intestinal pathologies beyond Crohn's disease, including both neoplastic and non-neoplastic conditions. To highlight how mastering the imaging features of these conditions can enhance the radiologist's performance, directly influencing the quality of patient care.

TABLE OF CONTENTS/OUTLINE

Introduction Objective and relevance of CT enterography (CTE) and MR enterography (MRE) in diagnosing intestinal pathologies beyond Crohn's disease. Technique Explanation of how CTE and MRE are performed, their advantages, indications, and benefits for diagnosing intestinal diseases. Pathologies Neoplastic Lesions: - GIST (Gastrointestinal Stromal Tumors) - Adenocarcinoma - Neuroendocrine Tumors - Metastasis Non-Neoplastic Lesions - Celiac Disease - Meckel's Diverticulum - Ulcerative Colitis - Pseudomembranous Colitis Vascular Pathologies - Angioectasias - Arterial lesions - Venous abnormalities Miscellaneous - Intestinal malrotation - Familial adenomatous polyposis syndrome Conclusion Summary of the importance of CTE and MRE for diagnosing a wide range of intestinal pathologies and their impact on clinical practice.

GIEE-31 SOFT TISSUE SARCOMAS IN THE DIFFERENTIAL DIAGNOSIS OF ABDOMINOPELVIC MASSES: A PICTORIAL ESSAY

Luana Alves, MD (*Presenter*)
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Paula Castro, MD (*Abstract Co-Author*)
Clara Fiorot, MD (*Abstract Co-Author*)
Luiza Ambrozino, MD (*Abstract Co-Author*)
Daniella B. Parente, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- Identify characteristic CT and MRI features of common abdominopelvic sarcomas, including liposarcomas, leiomyosarcomas, and GISTs. - Recognize less frequent sarcoma subtypes such as undifferentiated pleomorphic sarcoma, malignant peripheral nerve sheath tumor, solitary fibrous tumor, and desmoid-type fibromatosis. - Understand key imaging clues that differentiate sarcomas from more prevalent abdominopelvic masses, aiding biopsy planning and treatment.

TABLE OF CONTENTS/OUTLINE

I. Introduction Importance of considering sarcomas in the differential of abdominal/pelvic masses. II. Common Sarcomas - Liposarcoma: fat-containing lesions with varying dedifferentiation. - Leiomyosarcoma: heterogeneous solid masses, often retroperitoneal. - GIST: well-circumscribed GI-related tumors with variable enhancement. III. Less Common Sarcomas - Undifferentiated pleomorphic sarcoma: large, necrotic, aggressive masses. - Malignant peripheral nerve sheath tumor: fusiform, nerve-related. - Solitary fibrous tumor: well-defined, variable vascularity. - Desmoid tumor: infiltrative masses, often abdominal wall or mesentery. IV. Differential Diagnosis Lipoma variants, angiomyolipoma, fibroids, carcinoma, hemangioma. V. Conclusion Recognizing imaging patterns improves diagnostic accuracy and guides management.

GIEE-32 IMAGING SPECTRUM OF CHOLANGIOCARCINOMA: FROM DIAGNOSIS TO POST-TREATMENT ASSESSMENT

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Matheus M. Gomes SR, MD (*Abstract Co-Author*)
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Yuri C. Neves, PhD (*Abstract Co-Author*)
Natally Horvat, MD, PhD (*Abstract Co-Author*)
Rodrigo P. Polizio, MD (*Abstract Co-Author*)
Victoria Chernyak, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

1. Review the imaging characteristics of intrahepatic and extrahepatic cholangiocarcinoma. 2. Discuss differential diagnosis and pitfalls in imaging interpretation, with emphasis on clinically relevant mimics. 3. Introduce standardized terminology and structured radiological reporting. 4. Describe post-treatment imaging patterns, including typical responses and diagnostic criteria for assessing tumor viability.

TABLE OF CONTENTS/OUTLINE

1) Introduction • Overview and clinical context of cholangiocarcinoma • Anatomical classification 2) Precursor Lesions and Early Detection • Screening on higher-risk population • Early and atypical imaging features of cholangiocarcinoma • Precursor lesions 3) Radiological Features and Lexicon • Multimodality imaging characteristics of each subtype • Bismuth-Corlette classification 4) Differential Diagnosis and Common Pitfalls Intrahepatic cholangiocarcinoma DDx: • Metastases • Epithelioid hemangioendothelioma • Hepatocellular carcinoma • Biliary inflammatory diseases (e.g., IgG4 cholangiopathy) Hilar and extrahepatic cholangiocarcinoma DDx: • Biliary inflammatory diseases • Differentiation between malignant and benign strictures 5) Prognostic Imaging Features and Clinical Implications • Features associated with worse prognosis 6) Structured Reporting • Review of recent clinical guidelines • Surgical planning considerations • Required reporting elements 7) Post-Treatment Imaging and Assessment of Tumor Viability • Expected imaging patterns post-treatment • Diagnostic criteria for assessing tumor viability. 8) Future directions and emerging technologies.

GIEE-33 WEIGHT OF THE NATION: UNVEILING BARIATRIC SURGERY COMPLICATIONS THROUGH IMAGING

Nandakumar Patnam Gopal Chetty, MD (*Presenter*)
Rajat Bhargava, MD, MBBS (*Abstract Co-Author*)
Puneet Bhargava, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review post-operative anatomy with surgical rationale. 2. Imaging review and algorithmic management in post-bariatric surgeries.

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1. Roux-en-Y Gastric Bypass Complications (RYGB): Leak/abscess, gastrojejunostomy and jejunojejunostomy strictures, gastrogastric fistula, marginal ulceration, Blind pouch syndrome, small bowel obstruction, Peterson-type internal hernia. 2. Sleeve Gastrectomy: Leak/abscess, hemorrhage, mid-gastric sleeve stricture, splenic infarct, portomesenteric thrombosis. 3. Gastric Banding: Normal phi angle- 4 to 58 degrees, stomal diameter- <4mm, pouch diameter- <4cm. O-sign due to en-face O appearance of slipped gastric band. Band prolapse (cranial > caudal), gastric erosion, mechanical failure.

GIEE-34 LEARNING FROM MISTAKES: DIAGNOSTIC PITFALLS AND MIMICKERS IN 101 SUSPECTED CASES OF CHOLANGIOCARCINOMA- A 10-YEAR INSTITUTIONAL REVIEW

Diego Jose Torres Duque, MBBS (*Presenter*)
Nicolas Ruiz Diaz, MD (*Abstract Co-Author*)

TEACHING POINTS

Over a 10-year period, we reviewed 101 cases initially suspected of cholangiocarcinoma, of which 36 (35.6%) were diagnostic mimickers. The most frequent mimicker was choledocholithiasis, followed by metastatic disease, both capable of closely simulating malignancy. Diagnostic errors commonly stemmed from misinterpreting enhancement patterns, underestimating the clinical or biochemical context, or overrelying on isolated findings. Real-world errors offer valuable opportunities for growth and reflection, especially when accompanied by imaging-pathology correlation. We propose a classification of common diagnostic pitfalls and a structured checklist for a more systematic approach to biliary lesion evaluation.

TABLE OF CONTENTS/OUTLINE

1. Introduction. 2. Case-Based Analysis : 36 Diagnostic Mimickers Identified From a cohort of 101 suspected cases: False positives: benign conditions simulating CCA Choledocholithiasis (n=11) Inflammatory strictures PSC, IgG4 disease, biliary actinomycosis, adenomas False negatives: malignancies misclassified or diagnosed late Pancreatic adenocarcinoma, gallbladder cancer, ductal carcinoma Overcalls: overstaging indeterminate or treated lesions 3. Classification of Error Types 4. What We Learned Key takeaways illustrated through individual case vignettes.5. Diagnostic Checklist Structured evaluation guide for biliary lesions—including location, morphology, enhancement, secondary signs, and clinical correlation.6. Summary and Take-Home Messages: A practical roadmap to reduce error and improve confidence in cholangiocarcinoma assessment.

GIEE-35 EVALUATION OF RECTAL CANCER POST-TREATMENT: PITFALLS AND RESPONSE ASSESSMENT SCALES

Patricia Garcia, MD, PhD (*Presenter*)
Isabel Salmeron (*Abstract Co-Author*)
Lourdes del Campo, PhD (*Abstract Co-Author*)

TEACHING POINTS

-To illustrate MRI interpretation with histological correlation -To discuss treatment response classification systems

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Magnetic Resonance Imaging (MRI) plays a crucial role in assessing treatment response in rectal cancer after neoadjuvant therapy, aiding in clinical decision-making for surgical or watch-and wait strategies. However, several pitfalls can affect accuracy, leading to misinterpretations that impact patient outcomes; these include fibrosis mimicking residual disease, difficulty distinguishing viable tumor cells from treatment related changes and limitations in assessing mucinous tumors. Recognizing these pitfalls is essential to optimize MRI -based evaluations.We reviewed patients with rectal cancer diagnosed at our center over the last two years, correlating MRI images with pathological anatomy results.Focusing on specific morphologic T2-weighted MRI, the five-category scale offers a more detailed classification, ranging from complete response (mrTRG 1) to no response (mrTRG 5), incorporating distinctions in fibrosis and tumor viability. Meanwhile, the three-category response scale classifies outcomes as complete response, near complete response or residual mass. The inclusion of DWI enhances sensitivity by differentiating between treated tissue and residual tumor.

GIEE-36 PANCREATITIS - NOT JUST A GUT FEELING

Adam Misseldine, MD (*Presenter*)
Andrew Ko, MD (*Abstract Co-Author*)
Lyndon Luk, MD (*Abstract Co-Author*)
Hanisha Patel, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Discuss pancreatic anatomy and pathophysiology of acute and chronic pancreatitis. 2. Recognize key imaging features of acute and chronic pancreatitis across various modalities including CT, MRI, and ultrasound. 3. Review complications of pancreatitis, including necrosis, pancreatic fluid collections, and vascular abnormalities. 4. Discuss the role of radiology within the multildisciplinary treatment of pancreatitis, including pre- and post- intervention imaging for GI and IR procedures.

TABLE OF CONTENTS/OUTLINE

1. Goals and objectives. 2. Pancreatic anatomy. 3. Pathophysiology of acute and chronic pancreatitis. 4. Cases of pancreatitis. 5. Cases of related complications. 6. Cases of pre- and post- intervention imaging. 7. Final take-home points.

GIEE-37 "ONE SIZE DOESN'T FIT ALL": APPLYING LI-RADS TR 2024 TO A VARIETY OF HEPATIC INTERVENTIONS

Luiz Lima, MD (*Presenter*)
Viviane B. Amorim, MD (*Abstract Co-Author*)
Daniella B. Parente, MD, PhD (*Abstract Co-Author*)
Igor J N Leite, MD (*Abstract Co-Author*)
Lais Oliveira, MD (*Abstract Co-Author*)
Amanda Guimaraes, MD (*Abstract Co-Author*)
Luiz Rodrigues Santos, MD (*Abstract Co-Author*)
Jose Marinho (*Abstract Co-Author*)

TEACHING POINTS

This educational exhibit showcases the application of LI-RADS Treatment Response (TR) 2024 in the evaluation of hepatocellular carcinoma (HCC) following locoregional therapy. Although LI-RADS TR 2024 provides a standardized framework for assessing treatment response, post-treatment imaging appearances vary according to the type of therapy—such as transarterial chemoembolization (TACE), radiofrequency or microwave ablation (RFA/MWA), and transarterial radioembolization (TARE). This exhibit displays a wide range of imaging examples from various treatment modalities, demonstrating the characteristic post-treatment appearances and their corresponding LI-RADS TR 2024 classifications. Recognizing these therapy-specific imaging patterns and integrating multidisciplinary insights enhances diagnostic accuracy and supports optimal patient management.

TABLE OF CONTENTS/OUTLINE

* Teaching Points: Rationale for adapting LI-RADS TR 2024 to various therapeutic contexts. * Therapy-Specific Imaging Features: Description of the distinct imaging findings observed on follow-up after different types of locoregional therapies, along with their classification according to the LI-RADS TR 2024 criteria. * Case-Based Learning: Illustrated cases demonstrating key imaging findings for each therapy and its cattegory. * Conclusion and Educational Value: Emphasis on the importance of contextual interpretation and multidisciplinary collaboration.

GIEE-38 BARIATRIC SURGERY-BEYOND THE BYPASS

Vedang Patel, MD (*Presenter*)
Bahram Kiani, MD (*Abstract Co-Author*)
Nicholas G. Rhodes, MD (*Abstract Co-Author*)
Samuel J. Galgano, MD (*Abstract Co-Author*)
Jason A. Pietryga, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Obesity is a growing epidemic affecting nearly 42% of adults and 20% of children/adolescents in America. 2. Bariatric surgery is the most effective and durable treatment for obesity. 3. While sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB) are the most commonly performed bariatric procedures in the US, newer surgeries including the one-anastomosis gastric bypass (OAGB), biliopancreatic diversion with duodenal switch (BPD-DS), and single-anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S) are being performed. 4. Radiologists need to be familiar with the anatomy of these various bariatric surgeries to determine if the postoperative anatomy is normal or if there is a complication. 5. Imaging (particularly CT) plays a major role in the diagnosis of complications of bariatric surgery.

TABLE OF CONTENTS/OUTLINE

1. Review background information regarding obesity and indications for bariatric surgery. 2. Review statistics regarding trends in bariatric surgeries both within and outside of the US. 3. Review the normal postoperative anatomy of common and newer bariatric surgeries including SG, RYGB, OAGB, BPD-DS, and SADI-S. 4. Present a simple strategy to identify the bariatric surgery based on gastric anatomy and anastomoses. 5. Present imaging examples of complications of bariatric surgeries including hemorrhage, leak, infection, marginal ulcer, gastric ulcer, gastro-gastric fistula, small bowel obstruction, internal hernia, intussusception and protein malnutrition.

GIEE-39 IMAGES THAT SPEAK: A VISUAL JOURNEY THROUGH SMALL BOWEL LYMPHOMA

Nara Vedoveli (*Presenter*)
Sthefane Nunes, MD, MD (*Abstract Co-Author*)
Eleonora Silva (*Abstract Co-Author*)
Igor J N Leite, MD (*Abstract Co-Author*)
Viviane B. Amorim, MD (*Abstract Co-Author*)
Daniella B. Parente, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- Review the imaging patterns of small bowel lymphoma and their incidence rates. - Identifique esses padrões em exames de tomografia computadorizada e ressonância magnética. - Understand the structural and imaging characteristics of lesions and their association with complications. - Emphasize the essential role of radiologists in assessing both local and systemic disease, guiding diagnosis, and contributing to improved therapeutic management and prognosis.

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Small bowel lymphoma is predominantly of the Non-Hodgkin type, with the highest incidence occurring in the ileum (60-65%), followed by the jejunum and duodenum. It can manifest in various forms on computed tomography (CT) and magnetic resonance imaging (MRI). The most prevalent imaging patterns include pronounced mass-like wall thickening with luminal dilation (pseudoaneurysmal), along with polypoid and stenotic presentations. Complications primarily involve ulceration, hemorrhage, and perforation. This presentation showcases cases of small bowel lymphoma across different subtypes, with the following objectives: 1. To identify key imaging features. 2. To review the most common patterns. 3. To understand the correlation between imaging characteristics and major complications. 4. To highlight the critical role of the radiologist in diagnosis, staging, treatment, and prognosis.

GIEE-40 THE FORGOTTEN SEGMENT: A COMPREHENSIVE LOOK AT JEJUNAL PATHOLOGIES

Irma Uliano Effting Zoch De Moura, MD (*Presenter*)
Giuseppe D'Ippolito, MD, PhD (*Abstract Co-Author*)
Daniella B. Parente, MD, PhD (*Abstract Co-Author*)
Viviane B. Amorim, MD (*Abstract Co-Author*)
Caroline Lorenzoni Almeida Ghezzi, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

? Brief summary of imaging techniques for small bowel ? Offer a brief overview on small bowel and especially, jejunum anatomy ? Highlight the main aspects to detect lesions in the small intestine ? Expose different diagnoses of jejunal pathologies and their respective imaging characteristics on CT and MRI

TABLE OF CONTENTS/OUTLINE

Introduction: In the interpretation of abdominal imaging, the small bowel—particularly the jejunum—is often underappreciated. This presentation aims to highlight the differential diagnoses associated with jejunal findings, supported by illustrative case examples.Neoplastic lesions: ? Neoplasms of the jejunum ? leiomioma ? lipoma ? polyps ? GIST ? lymphoma ? adenocarcinoma ? neuroendocrine tumor ? metastasis Non-neoplastic lesions: ? Inflammatory/infectious diseases of the jejunum ? diverticulum and diverticulitis ? celiac disease ? Crohn's disease ? enteritis ? graft-versus-host disease ? Vasculars pathologies of the jejunum ? angiodysplasia ? angioedema ? vasculitis ? arteriovenous malformations? Miscellaneous ? ectopic pancreatic tissue ? abdominal hernia ? invagination ? intestinal malformation Conclusion: This presentation exposes a range of small bowel diseases with a focus on their distinguishing features on CT and MRI, emphasizing how these pathologies involve the jejunum and outlining key imaging findings to aid in accurate diagnosis.

GIEE-41 PERIANAL IMAGING FINDINGS: OH, IT MUST BE JUST ANOTHER FISTULA... (SPOILER ALERT: IT'S NOT)

Roberto Fornell-Perez, MD, PhD (*Presenter*)
Ane Ibanez-Zubiarrain (*Abstract Co-Author*)
Almudena Quilez-Larragan (*Abstract Co-Author*)
Gonzalo Lecumberri-Cortes (*Abstract Co-Author*)
Ines Alonso Sanchez, MD (*Abstract Co-Author*)
Maria Victoria Barcena-Robredo (*Abstract Co-Author*)
Maite Urizar Gorosarri, MD (*Abstract Co-Author*)

TEACHING POINTS

Perianal pathology extends significantly beyond fistulizing disease, encompassing vascular anomalies (hemorrhoids, varices), cystic lesions, inflammatory-infectious conditions (abscesses, hidradenitis, Fournier's gangrene, condylomas), neoplastic processes, and post-surgical alterations. MRI provides exceptional soft tissue contrast for evaluating perianal pathologies; specific imaging characteristics can differentiate various conditions that may present with similar clinical symptoms. Familiarity with the complete spectrum of perianal pathologies is crucial for radiologists to avoid misinterpretation that might lead to unnecessary procedures or delayed treatment. Recognition of normal anatomical variants and post-surgical changes in the perianal region prevents diagnostic errors and improves patient management.

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Introduction Prevalence and significance of non-fistulizing perianal pathologies Overview of imaging modalities with emphasis on MRI advantages Vascular Pathologies Hemorrhoids: internal / external, imaging features Perianal varices: associations and MRI characteristics Cystic Lesions Epidermoid and pilonidal cysts Tailgut cysts and developmental anomalies Inflammatory-Infectious Conditions Abscesses Hidradenitis suppurativa Fournier's gangrene: rapid recognition Condylomas and infectious lesions Neoplastic Processes Benign tumors Malignant lesions: primary anal canal tumors, subtypes Anatomical and Post-surgical Considerations Prolapse and anatomical variants Post-surgical alterations and potential pitfalls Conclusion: Importance of comprehensive knowledge in accurate diagnosis and patient management

GIEE-42 WHEN THE APPENDIX HIDES: THE RADIOLOGIST'S GUIDE TO APPENDIX VARIANTS AND MIMICS

Ana Helena Pavan Amaral, MD (*Presenter*)
Carolinna Nicolau, MD (*Abstract Co-Author*)
Mariana Campos, MD (*Abstract Co-Author*)
Guilherme B. De Napoli, MD (*Abstract Co-Author*)
Eduardo Martins, MD (*Abstract Co-Author*)
Marco A. Rodstein, MD (*Abstract Co-Author*)
Daniel Lahan-Martins, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The most commonly described variations of the vermiform appendix include retrocecal, pelvic, subcecal, pre-ileal, and post-ileal, with varying percentages depending on the study methodology. These anatomical differences influence the clinical presentation of acute appendicitis and can be challenging when associated with atypical locations. Additionally, several conditions can mimic the clinical presentations of appendicitis. However, on CT, we are able to make the right diagnosis, that may include epiploic appendagitis, appendiceal diverticulitis, appendiceal endometriosis, mucocele, and primary appendiceal neoplasms. Recognizing these anatomical variations and differential diagnoses is crucial for accurate image interpretation and appropriate clinical management.

TABLE OF CONTENTS/OUTLINE

1.Introduction. 2. Anatomy of vermiform appendix and its variability. 3. Acute appendicitis and its complications. 3. Beyond acute appendicitis: pitfalls and mimics to be aware and how to make the right diagnosis. 4. Conclusion.

GIEE-43 DIAGNOSTIC ALGORITHM FOR THE MANAGEMENT OF A PANCREATIC MASS. IS IT MALIGNANT?

Juan C. Spina JR, MD (*Presenter*)

TEACHING POINTS

1-Pancreatic adenocarcinoma, neuroendocrine tumors and different types of mass-forming chronic pancreatitis have different prognoses and require different treatment. Unfortunately, many times the overlap in their imaging and clinical features hinders a preoperative differential diagnosis. 2- Type 1 autoimmune pancreatitis (AIP) is the pancreatic manifestation of a multiorgan disease (IgG4-related disease) while type 2 AIP is a pancreas specific disorder not associated with IgG4. Surgery must be avoided in these patients. 3- If a pancreatic mass is resectable, and AIP has been ruled out, patients should undergo surgery to determine the true etiology of the pancreatic mass if preoperative diagnosis was not possible.

TABLE OF CONTENTS/OUTLINE

1) Introduction 2) Review and clinical presentation of most frequent types of mass-forming chronic pancreatitis (chronic pancreatitis, type 1 and type 2 autoimmune pancreatitis, groove pancreatitis, eosinophilic pancreatitis, follicular pancreatitis) 3) Typical and atypical presentation of malignant tumors: Adenocarcinoma, neuroendocrine tumors, solid pseudopapillary tumors, metastatic pancreatic disease, other. 4) MDCT and MRI findings. Tips for differential diagnosis between malignancy and inflammatory diseases with pathologic correlation. 5) Role of endoscopic ultrasoundPharmacologic treatment or surgery. 6) A multidisciplinary decision with example cases. 7) Suggestion of an algorithm for management of these patients.

GIEE-44 FROM LABS TO IMAGING: TUMOR MARKER INSIGHTS FOR ABDOMINAL RADIOLOGISTS TO IMPROVE INTERPRETATION AND RECOMMENDATION

Connie Ge, MD (*Presenter*)
Krista E. Suarez-Weiss, MD (*Abstract Co-Author*)
Ankur Pandey, MD (*Abstract Co-Author*)

TEACHING POINTS

- Highlight individual tumor markers' roles in the diagnosis, response, & recurrence of GU/GI malignancies in the context of image interpretation. - Illustrate specific cases of tumor markers to aid in accurate decision-making through a case based approach - Emphasize current limitations, including marker overlap with benign entities & variable sensitivity/specificity

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HCC LI-RADS US Surveillance v2024: defining positive AFP/markedly elevated AFP, with recommendations. AFP: Recurrence, making recommendations, & pitfalls. Pancreatic cancer CA 19-9: local recurrence & metastasis. Characterization with pancreatic cyst fluid analysis: 2024 Kyoto guidelines - differentiating IPMN/MCN from others, distinguishing IPMN/MCN with LGD from HGD/IC. Colorectal Ca CEA: Recurrence & metastasis. Gallbladder cancer Utility of CA 19-9 & CEA in progression, response, or recurrence, rather than for initial diagnosis. Neuroendocrine tumor Chromogranin, 5-HIAA Prostate cancer Utility/drawbacks of PSA, PSA density, PSA velocity, free-PSA. Aid in visceral and bone metastases. Biochemical recurrence in post-treatment imaging: prostatectomy vs. radiotherapy. Ovarian Ca CA-125 in initial diagnosis in conjunction with US, & in monitoring treatment. Other markers: HE4, CEA & CA19-9. Testicular cancer AFP & HCG. Future developments Liquid biopsy: emerging role of Circulating tumor DNA New indices combining tumor markers, possibly aided by AI: personalized care. Emerging markers, ex. AFP-L3%, & DCP for HCC.

GIEE-45 COMPLEX BILIARY RECONSTRUCTION - PRE- AND POST-OPERATIVE APPEARANCE

Ann T. Foran, MBBCh (*Presenter*)
Rachita Khot, MD (*Abstract Co-Author*)
Manoj C. Mathew, MD (*Abstract Co-Author*)
Karthik M. Sundaram, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. As surgical techniques evolve, deviations from traditional biliary reconstructions (end-to-end and end-to-side hepaticojejunal anastomoses) are increasingly encountered in academic & general radiology settings. Radiologists must be prepared to recognize these complex reconstructions in routine & emergent imaging. 2. Deviations include a) ductoplasties, which combine two or more ducts into a single end-to-end or end-to-side anastomosis, and b) creation of two or more end-to-end anastomoses. 3. Complex reconstructions are more commonly seen in living donor liver transplants (LDLTs) but also occur in segmentectomies and lobectomies, requiring accurate imaging recognition. 4. The presence of multiple anastomoses increases the risk of complications such as anastomotic strictures, biliary leaks, and cholangitis. Understanding these potential issues aids in effective monitoring and management. 5. Our exhibit emphasizes the need for high-resolution MRCP and advocates for the use of Eovist™ in MR imaging for complex reconstructions.

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1. Overview of biliary surgery and evolution toward complex anastomoses. 2. Role of imaging in complex biliary reconstruction, with a focus on MRI protocols, MRCP, and hepatobiliary phase imaging with Eovist™. 3. Discussion of common biliary anatomic variants (e.g. duct length, accessory ducts, aberrant drainage) and their impact on surgical planning. 4. Expected anatomy and imaging appearances after surgical reconstruction, particularly post-LDLT. 5. Brief review of potential complications and management strategies following complex biliary reconstructions

GIEE-46 DECIPHERING FAT IN THE LIVER: MIMICS, MASQUERADES, AND MISINTERPRETATIONS

Pravalya Chaparala, MD (*Presenter*)
Dinesh Rongali, MBBS (*Abstract Co-Author*)
Gopal Kodali, MD,MBBS (*Abstract Co-Author*)
Pooja Atkuri (*Abstract Co-Author*)
Rajesh Yalamanchi, MBBS, MD (*Abstract Co-Author*)
Ravi K. Kaza, MD (*Abstract Co-Author*)

TEACHING POINTS

1.Fat within the liver may be focal, diffuse, microscopic, or macroscopic and can occur in both benign and malignant lesions. 2.Atypical appearances of hepatic steatosis, such as focal nodular steatosis , focal fatty sparing , and diffuse perivascular or subcapsular steatosis , can be difficult to distinguish from other malignant processes. 3.Contrast-enhanced ultrasound can be used to exclude a mass in cases of focal nodular steatosis or sparing, as those areas will show enhancement similar to the rest of the hepatic parenchyma. 4.Chemical shift MRI sequences are essential for the identification of fat in liver lesions, enabling accurate diagnosis.

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1) Review of Imaging Techniques for Hepatic Lesion Characterization: Multiphase CT , including material characterization with Dual-energy CT Contrast-enhanced ultrasound Chemical shift MRI 2) Fat-Containing Liver Lesions: Macroscopic Fat: Benign Lesions Angiomyolipomas and lipomas Malignant Lesions Liposarcomas and fat-containing metastases Others Pseudolipomas of Glisson's capsule and pericaval fat Microscopic Fat: Benign Lesions Hepatic adenoma Atypical Lesions Focal nodular hyperplasia, hydatid cyst Malignant Lesions Hepatocellular carcinoma Other Conditions Focal hepatic steatosis 3) Focal Steatosis/Sparing: Typical Locations Gallbladder fossa, anterior to porta hepatis, adjacent to fissure for ligamentum teres Identification of Characteristic Features Geographic margins without mass effect 4) Atypical Patterns of Diffuse Steatosis: Locations Periportal, around hepatic veins, subcapsular Can Mimic Infiltrative neoplasm or inflammation

GIEE-47 FUNDAMENTALS OF PERCUTANEOUS SAMPLING: A GUIDE FOR ABDOMINAL IMAGING PROCEDURES

Mark J. Hoegger, MD, PhD (*Presenter*)
David H. Ballard, MD (*Abstract Co-Author*)
Malak Itani, MD (*Abstract Co-Author*)
Daniel R. Ludwig, MD (*Abstract Co-Author*)
Anup S. Shetty, MD (*Abstract Co-Author*)
Benjamin S. Strnad, MD (*Abstract Co-Author*)
Jia Chu, MD (*Abstract Co-Author*)
Michael H. Lanier, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Many image-guided procedures are rooted in abdominal radiology and require fundamental skill sets taught during training. However, the combination of clinical factors and barriers to acquiring technical skills may present challenges. Further, the lack of a formal curriculum may compound challenges in learning image-guided procedures. The purpose of this exhibit is to: 1. Provide a formulaic workup for image-guided sampling procedures. 2. Describe the various procedural imaging equipment and sampling tools. 3. Explain the fundamentals of various abdominal imaging-based sampling studies. 4. Guide intraprocedural troubleshooting and the detection and management of post-biopsy complications.

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1. Procedural workup: procedure timeline, consent, and biopsy planning/target selection. 2. Equipment: US, CEUS, CT, sampling devices 3. General technical considerations: needle finding, fine needle aspiration (FNA), and core needle biopsy. 4. Procedure-specific principles: thyroid sampling, lymph node biopsy, paracentesis, thoracentesis, liver biopsy, kidney biopsy, retroperitoneal, and mesenteric biopsy. 5. Troubleshooting: intraprocedural and post-procedural.

GIEE-48 CHANGES OF MRI FEATURES IN VIABLE HEPATOCELLULAR CARCINOMA AFTER TRANSARTERIAL CHEMOEMBOLIZATION

Yuan-Cheng Wang, MD, PhD (*Presenter*)
Weilang Wang (*Abstract Co-Author*)

TEACHING POINTS

Provide a concise overview of post-TACE treatment response evaluation protocols. Emphasize a frequently overlooked clinical issue: the imaging characteristics of viable tumor following TACE differ markedly from those of pre-treatment HCC.Summary of the variability in the morphology and distribution of viable tumors.

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Introduction to the LI-RADS Treatment Response Algorithm (LR-TRA) v2024.Case-based illustration of pre- and post-treatment signal alterations and enhancement pattern changes in viable tumors. Clinical insights into viable tumors presenting with diverse morphologies and locations.

GIEE-49 CHOLEDOCHAL CYSTS: CLASSIFICATION, IMAGING, AND ANATOMICAL VARIANTS OF THE PANCREATICOBILIARY TRACT — A PICTORIAL REVIEW

Agustin Z. Guzman Mercado, MD (*Presenter*)

TEACHING POINTS

1. Choledochal cysts are rare malformations of the bile ducts, most commonly classified using the Todani system (Types I-V), with important implications for management and prognosis.2. MRCP is the gold standard for noninvasive evaluation of the biliary and pancreatic ducts3. Imaging plays a key role in diagnosis providing complementary information on cyst type, extent, and associated complications (e.g., cholangitis, stone formation, malignancy).4. Pancreaticobiliary junction anomalies are frequently associated with choledochal cysts and may increase the risk of malignancy.5. Key imaging pearls: Always assess the entire biliary tree and pancreatic duct, look for signs of malignant transformation (wall thickening, mural nodules), and correlate with clinical history to guide management.

TABLE OF CONTENTS/OUTLINE

1. Introduction - Definition and clinical relevance of choledochal cysts - Epidemiology and pathophysiology 2. Pancreaticobiliary Anatomy - Normal anatomy of the bile ducts and pancreatic duct - Common anatomical variants 3. Classification of Choledochal Cysts - Todani classification (Types I-V) - Associated pancreaticobiliary anomalies 4. Imaging Modalities and Findings (Cases) - Ultrasound, CT, MRI, MRCP - Characteristic imaging features by modality 5. Complications and Malignant Transformation - Stone formation, cholangitis, pancreatitis, cancer 6. Management and Surgical Considerations - Treatment strategies by cyst type - Importance of anatomical knowledge for surgery 7. Teaching Points - Summary of key learning points 8. Take-Home Messages - Final pearls and clinical reminders

GIEE-50 GETTING STIFF: A PRACTICAL LIVER MR ELASTOGRAPHY GUIDE FOR RADIOLOGY RESIDENTS

Leivanio Ponte Teixeira, MD (*Presenter*)
Anna Beatriz Ferreira Obara, MD (*Abstract Co-Author*)
Yuri Inoue (*Abstract Co-Author*)
Barbara Pereira, MD (*Abstract Co-Author*)
Andre L. Bordini, MD (*Abstract Co-Author*)
Fernando D. Tamamoto SR, MD (*Abstract Co-Author*)
Rodrigo P. Polizio, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Understanding what is Liver fibrosis and why it's necessary to stage it.2. Recognizing Liver MRE key clinical indications, primarily indicated for noninvasive staging of liver fibrosis in patients with chronic liver diseases.3. Understanding the physical principles of Liver MR Elastography.4. Dominating the patient preparation and technical considerations, extremely necessary to begin image interpretation and to easily identify image acquisition errors and non-diagnostic exams.5. Interpreting the images and doing the accurate Liver Stiffness Measurement in kilopascals (kPa), understanding that higher values suggest increasing stages of fibrosis.

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Introduction What is Liver Fibrosis? What are the Causes of Increased Liver Stiffness? Why Do We Have to Evaluate Liver Fibrosis? What’s the Importance of Liver MRE? First Step: Understand The Liver MRE How It Physically Works Liver MRE? How to Prepare the patient? What MRI Sequences Do We Need to Recognize? Second Step: Check The Quality of Exam Is This a High-Quality Exam? Is This a Low-Quality Exam? Is This a Non-Diagnostic Exam? What Can We Do to Correct and Reduce Errors? Third Step: Interpret the Liver MRE How Do We Do the Liver Stiffness Measurement? Which Areas Do We Have to Avoid? How Do We Interpret the Values of LSM? How Can We Report?

GIEE-51 SPLENIC ELASTOGRAPHY: WHAT IT IS, HOW IT IS PERFORMED, AND HOW IT IS INTERPRETED

Elisa De Jesus Ramos, MD (*Presenter*)
Veronica Espinoza Cruz (*Abstract Co-Author*)
Adan Elizalde, MD, MD (*Abstract Co-Author*)
Tania D. Grimaldo Galeana, MD (*Abstract Co-Author*)
Alejandro Garcia Pena, MD (*Abstract Co-Author*)

TEACHING POINTS

To describe the anatomy and physiology of the spleen. To explain the pathophysiology of portal hypertension. To describe the use of splenic elastography in the diagnosis of portal hypertension. To list the indications for splenic elastography. To detail what splenic shear wave elastography consists of. To explain the protocol for performing splenic elastography using shear wave ultrasound. To describe the process of interpreting the results of splenic elastography.To analyze the limitations and effectiveness of splenic elastography as a non-invasive imaging method for detecting portal hypertension.

TABLE OF CONTENTS/OUTLINE

Anatomy and physiology of the spleen. Pathophysiology of portal hypertension. Splenic elastography and portal hypertension. Splenic elastography: What it is and how it works. Indications for splenic elastography. Protocol for performing splenic elastography using shear wave ultrasound. Interpretation of results. Limitations and effectiveness of splenic elastography as a non-invasive imaging method for detecting portal hypertension. Review of representative cases of splenic elastography in patients with portal hypertension. Conclusions

GIEE-52 ULTRASOUND-BASED LIVER FAT QUANTIFICATION: PROTOCOL FOR OPTIMIZING MEASUREMENT ACQUISITION AND INTERPRETATION OF RESULTS

Reinhard I. Kubale, MD (*Presenter*)
Andrew T. Trout, MD (*Abstract Co-Author*)
Jonathan R. Dillman, MD, MSc (*Abstract Co-Author*)
Erika Rubesova, MD (*Abstract Co-Author*)
Yassin Labyed (*Abstract Co-Author*)
Arati Gurung (*Abstract Co-Author*)
Jean-Michel Correas, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Understand the role of ultrasound-derived fat fraction (UDFF) in quantifying liver fat. • Learn standardized protocols for acquiring UDFF measurements to ensure reproducibility. • Interpret UDFF results in the context of steatosis, correlating with MRI and clinical findings. • Recognize pitfalls in ultrasound measurements and strategies to reduce artifacts. • Suggested guidance for interpretation of UDFF measurements.

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• Introduction: Importance of liver fat quantification in MASLD. • Quantitative Ultrasound Techniques: Overview of UDFF principles. • Measurement Protocol: Step-by-step guide for acquiring reliable UDFF data. • Pitfalls: Common challenges and how to address them. • Case Examples: Illustrative cases demonstrating measurement and interpretation. • Interpretation Guidance: Detecting and quantifying hepatic steatosis • Conclusion: Role of ultrasound in liver disease management.

GIEE-53 INFLAMMATORY BOWEL DISEASE AND CANCER: REVEALING THE UNSEEN - A RADIOLOGIST'S GUIDE

Rodrigo Borrero, MD (*Presenter*)
Tanya P. Chawla, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Be aware of the risk factors in patients with IBD that increase the risk of malignancy within the GI tract Understand pathological associations and provide an update on histopathological features of GI cancers in this subpopulation Demonstrate the spectrum of findings seen in cancers associated with IBD

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IBD, including Crohn's disease and ulcerative colitis, increases the risk of GI cancers due to chronic inflammation. Persistent inflammation leads to cycles of damage and repair in the intestinal mucosa, increasing the likelihood of DNA damage, mutations, and cancer development. Key risk factors include disease duration and extent, inflammation severity, genetic susceptibility, and coexisting conditions like PSC. Regular surveillance through colonoscopy and biopsies is essential for early detection. Imaging techniques such as contrastenhanced CT and MRI are crucial for management and assessing complications. Imaging findings in IBD patients concerning for malignancy include asymmetric bowel wall thickening, loss of mural stratification, and a soft tissue mass. CT and MRI play a significant role in depicting these features, which may indicate colorectal cancer, small bowel adenocarcinoma, or other GI neoplasms. Techniques to improve diagnostic confidence will also be discussed. Radiology is essential in detecting atypical imaging findings that may indicate cancer. The integration of surveillance guidelines and advanced imaging techniques ensures accurate assessment of treatment response and early detection of complications. By recognizing normal and abnormal imaging findings, clinicians can effectively manage IBDrelated cancers, improving prognosis and patient care

GIEE-54 MESS IN THE MESENTERY: A MULTIMODALITY APPROACH TO MASSES AND MIMICS

Namita Sharma, MD (*Presenter*)
Kelly Harper, MD,FRCPC (*Abstract Co-Author*)
Mary B. Bissell, Md, MSc (*Abstract Co-Author*)

TEACHING POINTS

By the end of this exhibit, the reader will be able to: Describe mesenteric anatomy, its relationship to adjacent organs, and its relevance to tumor spread. Review major categories of mesenteric pathologies, including congenital, neoplastic, vascular, infectious, and inflammatory. Develop a differential diagnosis on US, CT, and MRI using a morphology-based approach to categorize lesions as cystic, solid, or inflammatory/infectious. Safely perform percutaneous biopsy of mesenteric lesions using advanced techniques for challenging targets.

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Introduction & Anatomy Mesenteric masses span a broad differential and pose a diagnostic challenge. Understanding abdominal anatomy and disease patterns, along with a multimodality imaging strategy, is essential for accurate assessment. Imaging Assessment: Through a case-based review, we explore common and rare cystic, solid, and diffuse/infiltrative lesions, highlighting key imaging features and diagnostic pearls. Diagnostic Pitfalls: Interpretive pitfalls and mimics are reviewed are reviewed in context with clinical and imaging correlation. Percutaneous Biopsy: Indications, considerations, and techniques for safe image-guided sampling, including of mobile or bowel-covered mesenteric lesions, are discussed. Conclusion: While biopsy remains the gold standard, imaging helps narrow differentials, guide intervention, and may obviate invasive procedures. A systematic and comprehensive approach enhances diagnostic confidence and management.

GIEE-55 OVARIAN IMAGING WITH CONTRAST-ENHANCED ULTRASOUND: UNLOCKING THE POTENTIAL

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Kelsey Brisebois (*Abstract Co-Author*)
Christine Merrill, BSc (*Abstract Co-Author*)
Stephanie R. Wilson, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Greyscale ultrasound is firmly established as the preferred first-line imaging modality in the assessment of ovarian masses.2. Morphologic features of ovarian tumors frequently overlap between benign and malignant disease.3. Complex cystic morphology is most common and all solid components, papillary projections, and septa are evaluated to determine their blood flow which varies directly with malignancy. 4. Contrast-Enhanced Ultrasound (CEUS) is safe and repeatable, providing superior information to high-quality greyscale ultrasound about microvascular flow in ovarian lesions, aiding in differentiation of benign from malignant pathology. 5. CEUS Quantification of blood flow performed with region of interest (ROI) time intensity curve (TIC) methodology provides objective information about blood flow. 5. Malignant ovarian masses often demonstrate higher peak enhancement, shorter rise time, larger area under the curve, rapid time to peak and faster washout in comparison with benign lesions

TABLE OF CONTENTS/OUTLINE

1. Ovarian Cancer: its incidence, significance and challenges for diagnosis.2. Greyscale and Doppler -3. The contribution of CEUS in imaging of ovarian masses.. 4. The differentiation of benign vs malignant ovarian lesions with CEUS. 5 The applications of CEUS quantification in imaging of pelvic masses.

GIEE-56 FAST AND FOCUSED: IMPLEMENTING ABBREVIATED MRI FOR LIVER CANCER SURVEILLANCE

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Mustafa R. Bashir, MD (*Abstract Co-Author*)
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TEACHING POINTS

Abbreviated MRI (AMRI) is a promising alternative to liver ultrasound for hepatocellular carcinoma (HCC) surveillance, offering reduced scan time and cost compared to full-sequence liver MRI, the reference standard. This educational exhibit reviews the clinical rationale, imaging workflow, and interpretation strategies for various AMRI protocols (i.e., non-contrast, dynamic, and hepatobiliary phase [HBP] AMRI). We outline protocol design considerations, describe the typical imaging appearances of HCC across AMRI sequences, and highlight the practical advantages and limitations of each AMRI protocol relative to one another. Additionally, we examine AMRI's role in both screening and surveillance settings, emphasizing differences in performance and application.

TABLE OF CONTENTS/OUTLINE

? Introduction Importance of HCC surveillance in high-risk patients; potential of AMRI to enhance surveillance, particularly in patients with suboptimal ultrasound ? What Is Abbreviated MRI? Concept, AMRI protocols, and comparison with full MRI ? Design of AMRI Protocols Key sequences, workflow, and contrast timing ? Image Interpretation Essentials HCC features on each AMRI protocol; strengths and limitations of each protocol; reporting guidelines; and follow-up recommendations ? Case-Based Applications Examples of true and false diagnoses on AMRI compared to reference standard full MRI exams (real-world cases); comparison with ultrasound ? Practical Implementation Patient selection, workflow integration, and logistical considerations ? Current Evidence Overview of literature and AMRI's role in surveillance pathways ? AMRI in Daily Practice Key takeaways and future opportunities

GIEE-57 CYSTIC PANCREATIC LESIONS: IMAGING DIFFERENTIATION, MALIGNANCY RISK, AND UPDATED SURVEILLANCE STRATEGIES

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Arwa Elsamny, MBBCh (*Abstract Co-Author*)
Shadi Daghighi, MD (*Abstract Co-Author*)
Michele Lisi, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Cystic pancreatic lesions encompass both nonneoplastic and neoplastic entities , the latter of which includes a spectrum of histologic subtypes with distinct imaging characteristics and variable malignant potential. 2. Imaging evaluation should be systematic , assessing morphology, main pancreatic duct dilatation, presence of capsule, mural nodules, and cyst growth rate—features critical for diagnosis and risk stratification. 3. Multiple management guidelines exist with differing recommendations , including Fukuoka 2017, ACG 2018, ACR 2017, European 2018, AGA 2015, updated Kyoto 2024 guidelines, contributing to variation in clinical practice. 4. The 2024 Kyoto guidelines offer updated criteria , refining definitions of high-risk stigmata and worrisome features, and providing more precise recommendations for surveillance and surgical referral.

TABLE OF CONTENTS/OUTLINE

1.Introduction 2.Learning 3.Overview of the pancreatic cystic lesions 4.Nonneoplastic Cysts (Pseudocysts: Typical clinical scenario, CT/MRI features, complications; Differentiation from neoplastic cysts) 5.Cystic Pancreatic Neoplasms (Demographics and clinical presentations, typical imaging characteristics, association with malignancy, case-based review) 5.1 Serous Cystadenoma 5.2 Mucinous Cystic Neoplasm 5.3 Solid Pseudopapillary Neoplasm 5.4 Intraductal Papillary Mucinous Neoplasm (Main duct IPMN, side brunch IPMN, mixed type, field defect) 5.5 Cystic pancreatic neuroendocrine tumors 6.Follow-Up and Management Guidelines 6.1 Comparison of the existing guidelines 6.2 ACR Guidelines 6.3 Fukuoka Guidelines, 2017 6.4 Kyoto Guidelines, 2024: What's New? 7.Take Home Points 8.References

GIEE-58 BEYOND THE BOWEL: BEHIND THE COMPLICATIONS OF CROHN'S DISEASE

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Martin Horwarth, MD (*Abstract Co-Author*)
Fernanda G. Velloni, MD (*Abstract Co-Author*)
Cassia T. Guimaraes, MD (*Abstract Co-Author*)
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TEACHING POINTS

- Provide an overview of complications of Crohn's disease. - Discuss typical and atypical cases of complications of Crohn's disease. - Review the main differential diagnoses of complications of Crohn's disease. - Offer useful tips for challenging cases to enhance accurate diagnosis. - Create a radiological guide to help interpret the complications of Crohn's disease.

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- Crohn's disease is a chronic multifactorial transmural inflammatory disease affecting the gastrointestinal tract, mainly in young white women. - Complications affect one-third of patients at diagnosis. - We will explore both classical and uncommon imaging manifestations of complications of Crohn's disease, including potential malignant behavior. - Provide tips for challenging cases where the diagnosis may not be apparent from imaging alone.

GIEE-59 PANCREATIC MALIGNANCY IN DISGUISE: A TALE OF MISSED DIAGNOSES AND MIMICKING PATHOLOGIES

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Naveen Rajamohan, MD,MBBS (*Abstract Co-Author*)
Venkata Gopala Rao Kodali (*Abstract Co-Author*)
Hala A. Khasawneh, MBBS (*Abstract Co-Author*)
Gaurav Khatri, MD (*Abstract Co-Author*)

TEACHING POINTS

• Pancreatic cancer remains one of the most lethal malignancies, often diagnosed late due to vague symptoms and overlapping features with benign or less aggressive conditions. • Understanding its typical and atypical imaging features and mimics is key to improving diagnostic accuracy. • Identifying important pitfalls in pancreatic imaging is important for optimal patient care.

TABLE OF CONTENTS/OUTLINE

• Background. • Typical and atypical imaging findings of pancreatic ductal adenocarcinoma (PDA). • Comon and uncommon mimickers of PDA. • Imaging findings of mimickers - Case examples with pathological proven diagnosis. a) Focal Acute Pancreatitis. b) Mass-forming Chronic Pancreatitis. c) Autoimmune Pancreatitis. d) Groove Pancreatitis. e) Neuroendocrine Tumor. f) Metastases. g) Lymphoma. h) Solid Pseudopapillary Neoplasm. • Pitfalls in diagnosis of pancreatic neuroendocrine tumors. • How to arrive at a diagnosis and overcome pitfalls. • Discuss role of advanced imaging techniques and recent advances in improving detection - a) Endoscopic Ultrasound (EUS) b) Contrast Enhanced Ultrasound (CEUS) c) Elastography d) Radiomics e) Artificial Intelligence (AI). Summary.

GIEE-60 SOUND DECISIONS: ULTRASOUND IN CHRONIC LIVER DISEASE ASSESSMENT AND SURVEILLANCE

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Shuchi K. Rodgers, MD (*Abstract Co-Author*)
Theodore T. Pierce, MD, MPH (*Abstract Co-Author*)

TEACHING POINTS

1) Ultrasound is central to chronic liver disease (CLD) care continuum, from detection (eg. steatosis) to fibrosis staging, to HCC surveillance. 2) Best used in combination with clinical and biochemical tools. 3) Technological advances (elastography, fat quantification) enhance diagnostic utility. 4) Ensures appropriate patient selection for referral, therapeutic interventions, and enrollment in surveillance.

TABLE OF CONTENTS/OUTLINE

INTRO: • Overview of CLD • US integrates with clinical tools to assess liver disease progression and guide management decisions. EARLY DETECTION: A. Clinical Evaluation: • Potential risk factors and etiologies • Consider less common diseases • Lab test correlation • Risk assessment scores (eg. FIB-4) • Serum fibrosis panels. B. Role of basic B-mode US: Liver size, morphology, parenchyma, contour. Doppler: Assess inflow; outflow. GRADING & SURVEILLANCE OF STEATOSIS. A. Liver fat quantification (LFQ) o Confirms and quantifies. o Correlates with metabolic risk and fibrosis progression. o Baseline for monitoring response to therapy. B. Combing with Clinical Scores: o FIB-4 + LFQ or LFQ + Elastography to risk-stratify. o Decision-making: who needs referral and treatment vs. monitoring. STAGING AND SURVEILLANCE OF FIBROSIS/CIRRHOSIS. A. Elastography • Interpretation (cutoffs for significant fibrosis, cirrhosis). B. Combining with Clinical Scores • FIB-4 + elastography to further risk-stratify • Decision-making (Referral for portal hypertension monitoring; Enrollment in HCC surveillance). HCC SURVEILLANCE. A. Eligibility. B. Modalities (US every 6 months ± AFP). C. Standardized reporting (US LI-RADS). D. Patient-specific surveillance, management.

GIEE-61 MORE THAN JUST FAT: MULTIPARAMETRIC MRI AS KEY RADIOLOGICAL TOOL IN METABOLIC DYSFUNCTION-ASSOCIATED STEATOTIC LIVER DISEASE

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Sthefane Nunes, MD, MD (*Abstract Co-Author*)
Eleonora Silva (*Abstract Co-Author*)
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TEACHING POINTS

Understand the pivotal role of multiparametric MRI (mp-MRI) in evaluating key features of MASLD, including steatosis, iron overload, inflammation, and fibrosis. Learn how to integrate imaging findings with clinical and laboratory data to enhance diagnostic accuracy and assess disease severity. Review the application of mp-MRI through illustrative clinical case studies. Explore the utility of mp-MRI for monitoring disease progression and response to therapy in MASLD.

TABLE OF CONTENTS/OUTLINE

1. Introduction - Overview of MASLD diagnosis and its growing global prevalence.- The evolving role of imaging in the diagnosis, characterization, and longitudinal monitoring of MASLD.- Introduction to multiparametric MRI as a comprehensive and non-invasive modality for liver assessment. 2. Imaging Techniques and Interpretation - Comparative review of conventional imaging modalities for liver steatosis assessment: Conventional ultrasound (US), Quantitative US, FibroScan®, 2D shear wave elastography (2D-SWE), Computed tomography, Magnetic resonance imaging (MRI) - Multiparametric MRI, - Magnetic resonance elastography.-Discussion of clinical guidelines (EASL, AASLD) and the placement of each imaging modality within these frameworks.-Evaluation of the strengths, limitations, and diagnostic performance of each technique.- MRI protocol overview: including T1 mapping, R2* mapping, and MR elastography.- Common pitfalls and challenges in MRI and MRE interpretation.

GIEE-62 FROM STANDARDIZATION TO PREVENTION: TRACING LI-RADS' IMPACT ON SCREENING AND CLINICAL PRACTICE

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Robert M. Marks, MD (*Abstract Co-Author*)
Victoria Chernyak, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

The Liver Imaging Reporting and Data System (LI-RADS) was developed to reduce inconsistencies in interpreting and reporting liver observations by providing a standardized framework essential for consistent follow-up and treatment planning. This exhibit highlights the evolution of LI-RADS from a reporting lexicon to a comprehensive framework supporting liver cancer management—from initial screening ultrasound, through accurate diagnosis often eliminating biopsy, to post-treatment response assessment in patients undergoing locoregional therapy or being evaluated for liver transplant at tertiary care centers. Through case-based examples—including ultrasound surveillance, CT/MRI findings across LI-RADS categories with major and ancillary features, and post-treatment assessments using updated LR-TR criteria—this exhibit demonstrates LI-RADS as a practical tool in daily radiologic practice LI-RADS is now a multi-modality system: CT, MRI, US, CEUS, and treatment response Integrated into guidelines, unifying HCC imaging criteria High diagnostic accuracy and precision US LI-RADS enhances surveillance; abbreviated MRI and CEUS improve early detection LR-TR criteria further refine post-treatment evaluation Future directions: AI, radiomics, and probabilistic malignancy prediction

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Introduction: Standardization in liver imaging LI-RADS Evolution (2011-2024) Diagnostic Algorithm: Features and categories Ancillary Features in Diagnosis Ultrasound LI-RADS in HCC Surveillance Abbreviated MRI and CEUS in Screening LI-RADS treatment response (LR-TR) criteria Clinical Impact on Diagnosis and Outcomes Future Directions: AI, radiomics, and LI-RADS enhancements

GIEE-63 RADIOLOGICAL ASSESSMENT IN GASTRIC CANCER, ESSENTIAL CRITERIA FOR ACCURATE STAGING

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Daniela Soloaga (*Abstract Co-Author*)
Mariano Lorea (*Abstract Co-Author*)
Roy Lopez Grove, MD (*Abstract Co-Author*)

TEACHING POINTS

TNM staging by computed tomography is critical in determining optimal treatment and prognosis, making the difference between curative and palliative surgical management. Multiphasic contrast-enhanced CT and PET/CT play a central role in assessing the extent of gastric cancer, guiding treatment decisions through detailed assessment of local invasion and metastatic spread. Prognosis correlates with stage at diagnosis: early (mucosal/submucosal) or advanced (deeper layers). Systematic

radiological assessment optimises treatment and improves survival. Identification of dissemination routes (lymphatic, peritoneal and haematogenous) allows anticipation of tumor progression and planning more effective interventions.

TABLE OF CONTENTS/OUTLINE

Introduction Epidemiology Imaging techniques Upper endoscopy Endoscopic ultrasound (EUS) CT/Pneumo-CT PET-CT/Pneumo PET-CT Describe which method is best for assessing tumour invasion, lymphatic spread and distant metastasis. T classification N classification Perigastric and extra perigastric nodes. M classification The most common dissemination routes. Pitfalls Conclusions

GIEE-64 ATYPICAL SPREAD AND RECURRENCE PATTERNS IN PANCREATIC CANCER: IMAGING FEATURES AND COMMON MIMICKERS

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Shingo Omata, MD (*Abstract Co-Author*)
Tetsuro Kaga, MD, PhD (*Abstract Co-Author*)
Yukiko Takai (*Abstract Co-Author*)
Hiroki Kato (*Abstract Co-Author*)
Masayuki Matsuo, MD (*Abstract Co-Author*)

TEACHING POINTS

•To review critical anatomical structures and imaging features that radiologists must assess in pancreatic cancer, with an emphasis on findings that influence staging and treatment strategy.•To present case-based examples of atypical patterns of tumor progression and recurrence, highlighting their clinical significance and potential diagnostic pitfalls.•To recognize common imaging mimickers of atypical pancreatic cancer spread in order to avoid misinterpretation and suboptimal clinical decision-making.

TABLE OF CONTENTS/OUTLINE

1. Evaluation of Local Invasion - Case-based review of key anatomical landmarks and tumor-vessel interface assessment in relation to resectability criteria2. Case-Based Review of Uncommon Patterns of Tumor Spread and Recurrence - Tumor thrombus in the portal vein- Intraductal tumor extension- Diffuse tumor infiltration of the pancreas- Needle-tract seeding following EUS-FNA- Peritoneal dissemination, including port-site seeding- Pulmonary metastasis mimicking consolidation- Hepatic metastasis mimicking arterioportal shunting3. Imaging Mimickers of Atypical Spread of Pancreatic Cancer: Differentiating Features and Management - Tumor thrombus vs. bland thrombus; Anticoagulant therapy, iodine quantification- Diffuse pancreatic infiltration vs. autoimmune pancreatitis; Serum IgG4, MRI, biopsy- Needle-tract seeding vs. subepithelial gastric tumor; PET-CT, biopsy/partial gastrectomy- Peritoneal dissemination vs. abdominal wall desmoid tumor; PET-CT, MRI, biopsy

GIEE-65 MASTERING TRANSJUGULAR INTRAHEPATIC PORTOSYSTEMIC SHUNT (TIPS): FROM INTERVENTIONAL PROCEDURE TO IMAGING SURVEILLANCE

Jorge O. Ibarra Chairez, MD (*Presenter*)

TEACHING POINTS

Review the key technical aspects of Transjugular Intrahepatic Portosystemic Shunt (TIPS) placement and post procedural changes. Understand the normal and abnormal imaging findings on post-procedural evaluation. Provide a practical ultrasound-based approach to the Doppler evaluation of TIPS during follow-up.

TABLE OF CONTENTS/OUTLINE

Background, indications and contraindications for TIPS placement. TIPS placement technique overview and angiographic findings. Hemodynamic changes after TIPS. Post-procedural imaging: CT and US surveillance. Doppler ultrasound evaluation: Expected flow patterns and velocity criteria Common pitfalls and limitations Suggested acoustic windows to improve spectral Doppler evaluation Case-based review of TIPS dysfunction and complications. Summary and key take-home points.

GIEE-66 VALUE OF PHOTON COUNTING CT IN ABDOMINAL ONCOLOGIC IMAGING

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Arti Gupta, MD (*Abstract Co-Author*)
Maryam Rahmani, MD (*Abstract Co-Author*)
Vahid Yaghmai, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

Photon-counting CT (PCCT) offers improved spatial resolution with reduced radiation dose, making it ideal for screening and diagnosis of abdominal malignancies, including better detection of pancreatic and renal cysts. PCCT improves lesion characterization and assessment of treatment response, with studies demonstrating improved visualization of hypervascular liver lesions and perineural invasion in pancreatic adenocarcinoma. Spectral flexibility in PCCT allows selection of high or low keV images. High keV reduces beam-hardening artifacts, while low keV increases contrast-to-noise ratio and conspicuity of liver metastases and pancreatic tumors. PCCT enables advanced spectral reconstructions including virtual non-contrast (VNC) and iodine maps, supporting quantitative iodine analysis that may aid in cancer diagnosis and prognosis. Iodine quantification can be useful for cancer diagnosis and prognosis of cancers

TABLE OF CONTENTS/OUTLINE

1. Basic technical principles of PCCT2. Benefits of high spatial resolution with dose saving on cancer screening and tumor detection3. Enhanced tumor visualization and treatment response monitoring4. Spectral Imaging Capabilities: keV Tuning for Optimal Image Quality5. Advanced Quantitative Tools: Virtual Non-Contrast and Iodine Mapping

GIEE-67 IMAGING OF COMPLICATIONS AFTER ANORECTAL SURGERY: A STRUCTURED PICTORIAL REVIEW

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Victor Martinelli Preto, MD (*Abstract Co-Author*)
Joao Manoel M. Santos, PhD (*Abstract Co-Author*)
Natally Horvat, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Review common anorectal surgical procedures (e.g., LAR, APR, ELAPE, coloanal anastomosis). Recognize normal post-operative imaging appearances and post-neoadjuvant chemoradiation features that may support a non-operative watch-and-wait approach or indicate technical challenges for surgery. Identify key complications following anorectal surgery and correlate them with expected timing and imaging findings.

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Postoperative imaging plays a pivotal role in the assessment of complications after anorectal cancer surgery, particularly considering the technical challenges posed by the need to preserve sphincteric function and quality of life while achieving adequate resection margins. This exhibit presents a structured framework that classifies complications by timing—distinguishing early (=30 days) from late (>30 days)—and by anatomical and etiological patterns. Complications are explored across the surgical site and abdominal wall, including infectious processes (abscesses, collections, fistulas), ischemic changes, obstructive or stricturing complications, locoregional recurrence, and other entities encountered in clinical practice. CT and MRI cases illustrate these findings with an emphasis on distinguishing expected postoperative appearances from true pathology, aiming to improve diagnostic accuracy and multidisciplinary communication.

GIEE-68 THE HIDDEN THREAT: ESOPHAGEAL EMERGENCIES

Paula Munoz Carrasco, MD (*Presenter*)
Juan Jimenez Ruiz, MD (*Abstract Co-Author*)
Patricia Garcia, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

-To review esophageal emergencies.-To illustrate them with different imaging techniques.

TABLE OF CONTENTS/OUTLINE

The aim of this review is to examine the spectrum of acute esophageal pathologies that may present as medical emergencies. These conditions often present with nonspecific manifestations, are frequently underdiagnosed, and are associated with significant morbidity and mortality. Increasing awareness is essential for early recognition and is crucial for proper management and improved patient outcomes.We focus on the presentation and imaging findings of a broad spectrum of acute esophageal conditions—including esophagitis, esophageal necrosis, foreign body impaction, and multiple fistulas—and emphasize the value of CT as a diagnostic tool for guiding clinical decision-making and evaluating potential complications such as perforation.

GIEE-69 MRI OF CROHN'S PERIANAL FISTULA : WHAT THE SURGEON NEEDS TO KNOW AND WHY

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Caroline Touloupas (*Abstract Co-Author*)
Alexandre Delpla (*Abstract Co-Author*)
Boulay-Coletta Isabelle, MD (*Abstract Co-Author*)
Marc Zins, MD (*Abstract Co-Author*)

TEACHING POINTS

- Crohn's disease (CD) is a common cause of perianal suppurations. - Perineal involvement can occur in patients with known luminal CD but may also present as the initial or sole manifestation. - A detailed understanding of ano-perineal anatomy is crucial for accurate diagnosis and optimal management. - MRI plays a central role in the diagnosis, treatment planning, and follow-up of perianal fistulas enabling gastroenterologists and surgeons to select the optimal therapeutic approach and to evaluate treatment efficacy. - MRI protocole should be optimal to be able to answer to the surgeon questions. - Precise assessement of fistulous tracts and their extensions, particularly toward the supra levatoric space, within puborectalis muscle or to ischioanal fossa, is essential for guiding surgical drainage. - Differentiating between tracts with inflammatory masses made of granulation tissue and purulent tracts and abscesses is essential, as each requires distinct management approaches. - The ultimate stage in the treatment of crohn's fistulas is closure of the tract using one of several sphincter-sparing techniques. Each technique is adapted to a particular type of fistula, depending on the width and height of the internal opening, the length and the degree of inflammation of the tract.

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* MRI Protocol : utility of every sequence.* Place of ano-perineal MRI in the management strategy of perianal CD* MRI report : Essential details required by the surgeon.

GIEE-70 HIDDEN IN PLAIN SIGHT: WHEN TUBERCULOSIS STRIKES THE ABDOMEN

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TEACHING POINTS

Explain the pathways of Mycobacterium tuberculosis dissemination Demonstrate the most common abdominal and pelvic manifestations and how they appear on CT and MRI Understand the role of imaging in promptly identifying complications and diagnosing an underlying cause of acute abdomen.

TABLE OF CONTENTS/OUTLINE

I. Introduction Understand the dissemination routes of the bacillus: hematogenous and lymphatic dissemination Highlight the importance of imaging studies in detecting early complications and raising the possibility of a granulomatous infectious process as a differential diagnosis II. Abdominal and Pelvic Manifestations of Disseminated Tuberculosis with Abdominal Involvement Recognize the manifestations of tuberculosis in various pelvic and abdominal organs:a) Discuss potential complications, such as abscess formation and recurrent urinary tract infections b) Lymph node conglomerates causing mass effect c) Dysmenorrhea and dyspareunia d) Peritonitis e) Altered bowel habits, such as diarrhea and constipation III. Imaging Findings of Disseminated Tuberculosis in the Abdomen and Pelvis a) Peritonitis b) Organ-specific findings based on imaging: Liver Spleen Kidneys Gastrointestinal tract Male and female reproductive organs IV. Conclusion Recognizing the disseminated form and the most common complications of this high-prevalence disease enables rapid clinical management and reduces morbidity.

GIEE-71 SCREENING AND SURVEILLANCE IN MASLD USING MRI-BASED BIOMARKERS: FROM FIBROSIS TO FOCAL LESIONS

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Gabriela Furlin, MD (*Abstract Co-Author*)
Gabriela Sequeira De Campos Morais (*Abstract Co-Author*)
Henrique M. Guerra, MD (*Abstract Co-Author*)
Ivan M. Pedrollo, MD (*Abstract Co-Author*)
Alice Schuch, MD (*Abstract Co-Author*)

TEACHING POINTS

Fibrosis is the main prognostic factor in MASLD, independently associated with liver-related events and overall mortality. MR elastography is the most accurate noninvasive technique for liver stiffness assessment and should be integrated into longitudinal monitoring protocols. PDFF and R2* mapping by MRI are reliable imaging biomarkers for quantifying hepatic steatosis and iron overload, respectively - two key components of MASLD that may influence disease progression, affect imaging interpretation, and provide an important basis for monitoring therapeutic response. Hepatocellular carcinoma (HCC) may develop in MASLD even without cirrhosis, particularly with other risk factors like precirrhotic MASH, diabetes, obesity, alcohol use, older age, male sex, smoking, or family history of HCC. Gadoxetic acid-enhanced MRI improves the detection and characterization of focal liver lesions, particularly in steatotic and iron-overloaded livers, especially when conventional MRI or other modalities are inconclusive.

TABLE OF CONTENTS/OUTLINE

MASLD: epidemiology and screening. Imaging-based screening: importance of detecting early fibrosis and HCC risk in non-cirrhotic patients. MR elastography for fibrosis assessment: role as a noninvasive biomarker; clinical indications and integration with PDFF and R2*. Gadoxetic acid-enhanced MRI: improved lesion detection and characterization in challenging livers. Case-based review: multiparametric MRI in clinical practice. Future directions: hepatobiliary contrast uptake as a biomarker.

GIEE-72 LOW-PHOSPHOLIPID ASSOCIATED CHOLELITHIASIS (LPAC) SYNDROME: LEAVE NO STONE UNTURNED

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Giovanni G. Cerri, PhD (*Abstract Co-Author*)
Sabrina M. Ando, MD (*Abstract Co-Author*)
Ralph R. Tavares, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize the anatomy of the biliary tract and its variants. Understand biliary tract lithiasis. Detailed knowledge on identifying and characterizing primary and secondary causes of hepatolithiasis and their imaging findings. Comprehend LPAC syndrome and its impact on the diagnostic approach to biliary lithiasic diseases. Insight into the decision-making process for managing hepatolithiasis.

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INTRODUCTION: Overview of biliary tract anatomy and anatomical landmarks. Anatomical variants of the biliary tract and their impact on clinical practice. The pathophysiology of the biliary tract lithiasis. DIAGNOSIS AND IMAGING FINDINGS: Differential diagnosis of biliary tract lithiasis. Primary and secondary hepatolithiasis. LPAC Syndrome. Treatment strategies: conservative x interventional x surgical approaches. SUMMARY AND SYSTEMATIC APPROACH: A streamlined approach to integrating imaging findings with clinical decision-making. TAKE HOME MESSAGES.

GIEE-73 LOCAL RECURRENCE IN RECTAL CANCER: FROM DETECTION TO STRUCTURED REPORTING

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Brunna C. Oliveira, MD, MSc (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Renata V. Leao, MD (*Abstract Co-Author*)
Rodrigo Sanford Damasceno, MD (*Abstract Co-Author*)
Bernardo Salvajoli (*Abstract Co-Author*)
Natally Horvat, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

*Understand current concepts and management strategies for rectal cancer recurrence. *Recognize key imaging features of local recurrence and expected post-treatment changes. *Evaluate the strengths and limitations of CT, MRI, and PET in the restaging process. *Apply a structured, compartment-based approach to interpretation and reporting. *Identify post-operative anatomical modifications and complications related to treatment. *Discuss surgical re-approaches, re-irradiation, and considerations for palliative care.

TABLE OF CONTENTS/OUTLINE

Introduction Epidemiology and clinical impact of local recurrence Management of Recurrence Treatment guidelines and decision-making algorithms Surgical Techniques Exenterative approaches organized by pelvic compartments Anatomical Considerations Key pelvic landmarks and altered anatomy after treatment, with MRI correlation Imaging Modalities Comparative role of CT, MRI, and PET in detecting recurrence Imaging Evaluation: Recurrence vs. Post-Treatment Changes Systematic approach to differentiate recurrence from surgical or radiation-related changesCommon imaging patterns and treatment-related complicationsReporting templates, challenges, and diagnostic pitfalls Interactive Case-Based Learning Real-life examples reinforcing critical imaging and clinical decision points

GIEE-74 A CASE-BASED SANITY CHECK OF LEADING AI MODELS FOR PANCREATIC TUMOR DETECTION: REAL-WORLD CHALLENGES

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Satomi Kawamoto, MD (*Abstract Co-Author*)
Elliot K. Fishman, MD (*Abstract Co-Author*)
Linda C. Chu, MD (*Abstract Co-Author*)

TEACHING POINTS

Real-world evaluations are essential for understanding the clinical capabilities and limitations of state-of-the-art AI for pancreatic tumor detection. Case-based analysis can reveal context-specific weaknesses, not captured by standard test sets and aggregated metrics. Anatomical variations (e.g. unusual pancreatic morphology or adjacent lesions) can impact AI performance. Visual comparison with radiologist interpretations highlights pitfalls requiring specific attention, underscoring the need for human-AI collaboration. Understanding the strengths and limitations of AI enables informed deployment, improves trust in real-world applications and supports regulatory decisions.

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Introduction: • Early detection in pancreatic cancer and potential role of AI in screening. Rationale for case-based "sanity checks" beyond conventional aggregated benchmarks. Current Landscape: •Overview of deep learning models for pancreatic tumor detection. • Review of top-performing, public algorithms. Training data, evaluation metrics, and known limitations. Case-Based Evaluation: • Real-world cases including cystic lesions, neuroendocrine tumors, and ductal adenocarcinoma. • Impact of challenging anatomy and clinical scenarios on performance. Clinical Implications: • AI models assist vs. mislead diagnosis. • Uncertainty quantification and interpretability (probability outputs). Clinical Deployment: •Guidance for AI integration into radiology workflows. •Considerations for user education, model explainability and trust calibration. Conclusion: • Key findings from the case-based evaluation, and recommendations for clinicians and researchers.

GIEE-75 BEYOND B1000: EVALUATING B1500 DIFFUSION-WEIGHTED MRI FOR ACCURATE RESTAGING OF RECTAL CANCER

Mariam Vargas Gonzalez, MD (*Presenter*)

TEACHING POINTS

Enhanced Tumor Detection High b-value DWI (b1500) significantly improves residual tumor conspicuity post-neoadjuvant therapy, reducing T2 shine-through and providing clearer lesion margins. Precision in Restaging Incorporating b1500 allows for more accurate differentiation between fibrosis, necrosis, and viable tumor, enhancing restaging accuracy and optimizing treatment planning. Clinical Relevance High b-value protocols can be seamlessly integrated into existing workflows, offering impactful diagnostic insights without extending scan times, making them practical for routine clinical use. Patient-Centered Outcomes By improving residual tumor detection, b1500 DWI can reduce unnecessary surgeries and overtreatment, supporting personalized oncologic care and better long-term outcomes.

TABLE OF CONTENTS/OUTLINE

Introduction Importance of accurate rectal cancer restaging Role of DWI in post-therapy evaluation Rationale for High b-value DWI (b1500) Limitations of conventional b 800 -1000 DWI Advantages of b1500 in detecting residual tumor Technical Considerations MRI protocol optimization Imaging parameters and artifact management Clinical Applications Differentiation of fibrosis vs. residual tumor Case examples and comparative imaging Impact on Patient Management Personalized treatment planning Potential to reduce overtreatment Conclusion and Future Directions Emerging research and ongoing studies Integration into routine clinical practice

GIEE-76 TROUBLE IN THE GRAFT: SPOTTING LIVER TRANSPLANT COMPLICATIONS BEFORE IT'S TOO LATE

Gretel Pibernus, MD (*Presenter*)
Federico G. Diaz Telli, MD (*Abstract Co-Author*)
Juan P. Perotti, MD (*Abstract Co-Author*)
Joaquin Martinez Pereira, MD (*Abstract Co-Author*)

Maria S. Fernandez Castillo Odena, MD (*Abstract Co-Author*)
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Martin G. Vargas, MD (*Abstract Co-Author*)
Matias Greca, MD (*Abstract Co-Author*)

TEACHING POINTS

-To illustrate the most frequent vascular and biliary complications following liver transplantation through real clinical cases and multimodality imaging. -To highlight the value of grayscale ultrasound, color Doppler, spectral Doppler, and CT in the early detection and characterization of post-transplant complications. -To compare abnormal imaging findings with normal ultrasound appearances of each vascular structure and the biliary tract, in order to improve diagnostic accuracy. -To provide practical teaching points for identifying key features of hepatic artery thrombosis, portal vein thrombosis, hepatic vein thrombosis, and biloma. -To reinforce a pattern-based, case-driven approach for distinguishing true complications from normal post-operative findings

TABLE OF CONTENTS/OUTLINE

Introduction - Common complications after liver transplantation - Overview: Hepatic artery, portal vein, hepatic veins, and biliary tract Hepatic Artery Complications - Normal ultrasound appearance of the hepatic artery - Multimodality imaging: Grayscale US, color Doppler, spectral Doppler, CT - Teaching point Portal Vein Complications - Normal ultrasound appearance of the portal vein - Multimodality imaging: Grayscale US, color Doppler, spectral Doppler, CT - Teaching pointHepatic Vein Complications - Normal ultrasound appearance of the hepatic veins - Multimodality imaging: Grayscale US, color Doppler, spectral Doppler, CT - Teaching point Biliary Tract Complications - Normal ultrasound appearance of the biliary tract - Imaging findings: Grayscale US and CT - Teaching point Summary of Teaching Points - Key concepts and diagnostic pearls

GIEE-77 MCRP PATTERNS OF BILIARY AND PANCREATIC DILATATION: A PRIMER FOR RESIDENTS

Frederico Macedo, MD (*Presenter*)
Carolinna Nicolau, MD (*Abstract Co-Author*)
Ana Helena Pavan Amaral, MD (*Abstract Co-Author*)
Rebeca Fraga, MD (*Abstract Co-Author*)
Laila Motizuki (*Abstract Co-Author*)
Marco A. Rodstein, MD (*Abstract Co-Author*)
Daniel Lahan-Martins, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Magnetic resonance (MR) cholangiopancreatography (MRCP) is a widely used noninvasive method in the evaluation of pancreatobiliary disorders. As opposed to endoscopic retrograde cholangiopancreatography (ERCP) it allows evaluation of biliary ducts proximal and distal to injury, as well as extra ductal lesions.Biliary duct dilation is a common finding and is often incidental. There are numerous etiologies, benign and malignant, including obstructive causes such as choledocholithiasis, periampullary tumors, Klatskin tumor, and pancreatic neoplasms, as well as non-obstructive causes such as sclerosing cholangitis and Caroli disease. The main points for evaluation in cases of biliar duct dilation are the presence of gallstones or sites of obstruction, the location of the dilatation, communication with the bile ducts, and the characteristics of the pathology (neoplasia or inflammatory, for example).

TABLE OF CONTENTS/OUTLINE

1.Introduction 2.Causes of biliary duct dilation and differential diagnoses. 3.Key aspects to evaluate in biliary duct dilation. 4.Conclusion

GIEE-78 THE EVOLVING ROLE OF ULTRASOUND IN DETECTING HIGH-RISK MASH AMONG MASLD PATIENTS

ISABELA NASCIMENTO (*Presenter*)
Carla C. Branco, MD, PhD (*Abstract Co-Author*)
Gabriela Lauar, MD (*Abstract Co-Author*)

TEACHING POINTS

Metabolic dysfunction-associated steatotic liver disease (MASLD), the predominant chronic liver disease globally (~30% prevalence), is strongly associated with obesity and metabolic syndrome. Its progressive form metabolic dysfunction-associated steatohepatitis (MASH) leads to portal hypertension, cirrhosis, hepatocellular carcinoma, and liver failure. Early identification of high-risk patients (BMI=30, insulin resistance, elevated LFTs) enables timely intervention. While B-mode ultrasound has limited early fibrosis detection, optimized protocols (echotexture grading + composite morphology) improve accuracy. Elastography (Baveno VI criteria) remains gold-standard for non-invasive staging (=F2/F3-F4) and complication prediction, though confounded by acute injury, comorbidities, or severe steatosis. A multimodal approach combining clinical scores (FIB-4) and advanced imaging (US + elastography) optimizes early detection and management, improving outcomes through accessible risk stratification.

TABLE OF CONTENTS/OUTLINE

1. MASLD Epidemiology Global burden & metabolic links 2. Disease Progression Steatosis ? MASH ? Cirrhosis 3. Risk Stratification High-risk MASH criteria & mortality predictors 4. Diagnostics Ultrasound: Optimized protocols (echotexture/composite scoring) Elastography: ARFI thresholds (5/9/13/17 kPa) & confounders 5. Multimodal assessment Imaging pathways, clinical scores and referral triggers

GIEE-79 MULTIMODALITY IMAGING REVIEW OF ABDOMINAL WALL HERNIAS: MULTIDISCIPLINARY IMAGING REVIEW WITH PEARLS FROM THE SURGEON

Colin McQuade, MBBCh, FFR(RCSI) (*Presenter*)
Ciara O'Brien, FRCPC, MBBCh (*Abstract Co-Author*)

TEACHING POINTS

• Abdominal wall hernias are common yet diverse • Accurate imaging is essential for diagnosis, surgical planning, and assessing post-operative complications.• Radiologists must use precise terminology & report key anatomic details to aid surgeons in determining surgical approach & technique.• Multimodality imaging—particularly US, CT and MRI—enhances evaluation in complex or recurrent cases.• Surgeons seek specific imaging information including hernia size, content, location relative to landmarks, mesh integrity & signs of recurrence.• Post-operative complications such as mesh infection, failure, or chronic pain require structured, stepwise radiologic assessment.• Incorporating pearls from general surgeons ensures imaging aligns with surgical decision-making & improves patient outcomes.

TABLE OF CONTENTS/OUTLINE

1. Introduction : Clinical significance and imaging role 2. Anatomy Review : Layers of the abdominal wall 3. Hernia Classification : By location & etiology 4. Imaging Modalities : Plain film, US, CT, and MRI 5. Common and Uncommon Hernias : Including inguinal, femoral, umbilical, Spigelian, lumbar & obturator 6. Complicated Presentations : Incarceration, strangulation, obstruction 7. What the Surgeon Wants to Know : Key descriptors & planning pearls 8. Post-Surgical Imaging : Normal findings, timelines, red flags 9. Complications : Mesh failure, chronic pain, seroma, recurrence 10. Pitfalls in Imaging Recognising appearance across all imaging, including radiotracer uptake on PET/CT 11. Conclusion : Accurate, structured imaging of abdominal wall hernias—guided by surgical needs and interdisciplinary collaboration optimizes surgical planning, and improves patient outcomes.

GIEE-80 MRI COMPATIBILITY OF COMMON MEDICAL DEVICES IN THE ABDOMEN AND PELVIS

Caleb Iness (*Presenter*)
Senglee Loa (*Abstract Co-Author*)
Alex D. Lee (*Abstract Co-Author*)

David S. Sarkany, MD (*Abstract Co-Author*)
Nassier T. Harfouch, MD (*Abstract Co-Author*)

TEACHING POINTS

Review MRI safety terminology: Safe, Conditional, UnsafeFor MR conditional devices, provide parameters such as field strength limitationsProvide imaging correlates of common medical devicesIntroduce management and follow-up guidelines for safe imaging practices when applicable.

TABLE OF CONTENTS/OUTLINE

MRI is a vital diagnostic tool in modern medicine, but the strong magnetic fields and radiofrequency pulses it utilizes can interfere with quality image or impose risks on patients with medical devices. It is important to understand the MRI compatibility of common medical devices to ensure patient safety and optimal diagnostic outcomes. This exhibit evaluates common medical devices in the abdomen and pelvis across different modalities and provides guidance for safe MRI imaging practices. Introduction, MR Safety Classification, MR Compatibility of Common Feeding Tubes, MR Compatibility of Common Gastrointestinal/Biliary Stents, MR Compatibility of Common VP Shunts, MR Compatibility of Common Spinal Cord Stimulators

GIEE-81 PAUSE BEFORE YOU PLAN: MRI AS A STRATEGIC TOOL IN PERITONEAL CARCINOMATOSIS

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Anna F. Garcia Herrmann, MD (*Abstract Co-Author*)
Analia S. Varela JR, MD (*Abstract Co-Author*)
Fernando D. Losada Lopez, MD (*Abstract Co-Author*)
Fernando Sanchez Loria, MD (*Abstract Co-Author*)
Lisandro Paganini, MD (*Abstract Co-Author*)

TEACHING POINTS

- Understand the clinical significance of peritoneal carcinomatosis and the limitations of conventional imaging. - Recognize the technical parameters and acquisition strategy of a dedicated MRI protocol for peritoneal disease. - Learn the PAUSE structured reporting system for interpretation of MRI findings and its clinical value. - Identify key MRI features and its surgical correlation, highlighting critical imaging findings that impact surgical decision-making.

TABLE OF CONTENTS/OUTLINE

Technical Overview: - Patient preparation and MRI acquisition protocol - Practical considerations to optimize image quality and reduce artifacts PAUSE Reporting Framework: - Definition and examples of each reporting domain. - Step-by-step guide to structured region-by-region scoring. - Common imaging pitfalls and how to address them. Surgical Correlation and Validation: - Illustration of MRI-based PCI (rPCI) versus surgical PCI (CxPCI). - Highlight of clinical scenarios where MRI findings altered surgical management. - Institutional experience and statistical data of high radiographic-surgical correlation (Spearman ? = 0.98, Kappa > 0.85 in key domains). Case-Based Learning: - Annotated examples of high-grade serous carcinoma, mucinous tumors, and mesenteric involvement. - Emphasis on detection of unfavorable sites and extra-peritoneal disease. - TIPs and interpretation strategies tailored to histologic subtypes.

GIEE-82 SPOTLIGHT ON THE SPLEEN: WHAT EVERY RADIOLOGIST SHOULD KNOW, FROM INCIDENTALOMA TO EMERGENCY FINDINGS

Colin McQuade, MBBCh, FFR(RCSI) (*Presenter*)
Ciara O'Brien, FRCPC, MBBCh (*Abstract Co-Author*)

TEACHING POINTS

• The spleen is often under-appreciated in abdominal imaging, yet its appearance can offer critical insights into both localized & systemic disease processes.• A structured, multimodality approach aids in confidently distinguishing benign incidental findings from urgent or malignant pathology.• Radiologists should recognize common "incidentalomas" such as cysts, hemangiomas, & granulomatous calcifications to avoid unnecessary alarm.• Emergency splenic conditions—such as infarction, rupture, or vascular injury—require prompt recognition & clear communication.• Heterotopic and ectopic splenic tissue, including accessory spleens & splenosis, is frequently misinterpreted as pathology; correct identification prevents unnecessary workup.• The spleen is a barometer for systemic disease; patterns of splenic involvement can suggest hematologic, infectious, or infiltrative disorders.

TABLE OF CONTENTS/OUTLINE

1. Introduction : Why the spleen matters 2. Benign Incidental Findings : Cysts, infarcts, granulomatous calcifications 3. Focal Lesions : Benign vs malignant, primary vs secondary 4. Heterotopic and Ectopic Splenic Tissue : Accessory spleens, splenosis & common mimics 5. Vascular & Traumatic Emergencies : Rupture, infarction, torsion 6. Systemic Disease Clues : Lymphoma, infection, infiltrative disease 7. Pearls & Pitfalls : Mimickers, when to worry 8. Conclusion : The spleen, though often overlooked, serves as a diagnostic window into both acute and chronic pathology. Familiarity with its full imaging spectrum allows radiologists to add significant value, guiding appropriate follow-up, intervention, or reassurance.

GIEE-83 BEYOND THE MORPHOLOGY: FUNCTIONAL IMAGING OF THE LIVER WITH GADOXETIC ACID

Eleonora Silva (*Presenter*)
Sthefane Nunes, MD, MD (*Abstract Co-Author*)
Caroline L. Ghezzi (*Abstract Co-Author*)
Giuseppe D'Ippolito, MD, PhD (*Abstract Co-Author*)
Nara Vedoveli (*Abstract Co-Author*)
Viviane B. Amorim, MD (*Abstract Co-Author*)
Daniella B. Parente, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Explain the mechanism of action of gadoxetic acid in Magnetic Resonance Imaging (MRI). Highlight the clinical indications and benefits of the gadoxetic acid on MRI in the liver function assessment. Describe key MRI parameters and formulas that are used to evaluate liver function with gadoxetic acid administration. Demonstrate the application of liver function assessment through case-based examples.

TABLE OF CONTENTS/OUTLINE

This presentation explores the role of gadoxetic acid-enhanced MRI in the evaluation of hepatic function. First, we will review the molecular mechanism of gadoxetic acid uptake and excretion. Further, the clinical advantages of this contrast agent will be discussed, including its utility in prognostic evaluation of liver disease, pre-hepatectomy planning and predicting liver function after major resections or transplantation. Additionally, we will thoroughly detail the main MRI parameters and quantitative methods used for hepatic function assessment, supported by illustrative case-based examples.

GIEE-84 MULTIVISCERAL TRANSPLANT SIMPLIFIED: EXPECTED APPEARANCE AND COMPLICATIONS

Yamile Blain, MD (*Presenter*)
Cibele Luna, MD (*Abstract Co-Author*)
Patricia Balcacer, MD (*Abstract Co-Author*)

TEACHING POINTS

• To define and differentiate multiorgan, multivisceral, and composite visceral transplantation. • To review the role of imaging in preoperative assessment and postoperative evaluation of multivisceral transplant patients. • To illustrate normal postoperative anatomy and expected imaging findings. • To recognize key imaging features of common postoperative complications

TABLE OF CONTENTS/OUTLINE

1. Definitions and Nomenclature ? Multiorgan ? Multivisceral ? Composite Visceral Transplantation* 2. Indications for MVT Short bowel syndrome, intestinal failure, dysmotility syndromes, diffuse portomesenteric thrombosis, and mesenteric tumors 3. Preoperative Workup Imaging assessment: CT and MRI angiography, fluoroscopic studies 4. Surgical Technique Highlights ? Arterial supply ? Venous drainage ? Foregut, midgut, and hindgut reconstruction 5. Postoperative Anatomy Expected imaging findings and variations 6. Complications** ? Bowel-related issues: Obstruction, leak, fistula ? Pancreaticobiliary complications ? Vascular complications: Thrombosis, pseudoaneurysms ? Immune-mediated and infectious complications ? Neoplastic developments: Post-transplant lymphoproliferative disorder * For each type, a representative illustration will be provided **Representative cases for each type of complication will be provided

GIEE-85 BURNS BENEATH THE SURFACE: DECODING THE RADIOLOGIC SIGNATURE OF ABDOMINAL RADIATION INJURY

Flavia N. Maruyama I, MD (*Presenter*)
Brenda Oliveira, MD (*Abstract Co-Author*)
Vinicius C. Fiorot, MD (*Abstract Co-Author*)
Luan Luis Xavier de Andrade Luan, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the pathogenic mechanism caused by radiation in oncological treatment; To list the most common abdominal complications after therapeutic radiation; To describe the main radiological (imaging) findings of abdominal complications (side effects) related to radiation in the treatment of malignant tumors.

TABLE OF CONTENTS/OUTLINE

Introduction; Pathophysiology of radiotherapy; Findings in multiple imaging modalities of patients undergoing abdominal oncological follow-up; Conclusion.

GIEE-86 A STRANGER IN A STRANGE LAND: MULTIMODAL IMAGING EVALUATION OF THE ESOPHAGUS

Lucas d. Gomes de Farias, MD, PhD (*Presenter*)
Enzo Calheiros, MD (*Abstract Co-Author*)
Daniel Giunchetti Strabelli, MD (*Abstract Co-Author*)
Felipe D. Barbosa, MD (*Abstract Co-Author*)
Jose D. Fernandes SR (*Abstract Co-Author*)
Elisa A. Bretas, MD (*Abstract Co-Author*)
Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)
Marcio V. Sawamura, MD, PhD (*Abstract Co-Author*)
Cesar H. Nomura, MD, PhD (*Abstract Co-Author*)
Ricardo D. Sartim, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Evaluation of the esophagus reveals diagnostic difficulties for both the clinician and the radiologist. 2. Due to non-specific and sometimes confusing symptoms, analysis of the esophagus can be particularly difficult and is often neglected in the radiologist's daily practice. The purpose of this exhibit is: 3. To review usual and unusual cases related to esophagus. (a) To correlate important findings with the anatomy, embryology, and pathophysiology, focusing on their clinical-radiological correlations. (b) To understand how radiological images are correlated to upper gastrointestinal endoscopy and endoscopic ultrasound images. (c) To highlight their characteristics in order to familiarize radiologists, preventing unfavorable patient outcome. (d) To review radiological protocols in the evaluation of patients with esophageal involvement.

TABLE OF CONTENTS/OUTLINE

1. Applied embryology, anatomy, and physiology of the esophagus 2. Techniques: X-ray, CT and MRI - pros and cons 3. Applications: a case-based review (a) Congenital and anatomical variants (b) Motility disorders (c) Diverticula (d) Hernia (e) Inflammatory and infectious diseases (f) Esophagogastric hernias (g) Fistula (h) Vascular (i) Neoplasm (j) Intervention and postoperative changes (k) Foreign body (l) Miscellaneous and other findings 4. Sample cases of pearls, pitfalls, diagnostic difficulties, and mimics. 5. Future directions 6. Summary and take-home messages.

GIEE-87 ADVANCED TECHNIQUES OF VASCULAR ANASTOMOSIS IN LIVER TRANSPLANTATION. WHAT THE RADIOLOGIST SHOULD KNOW

Joao Pedro C. Lino, MD (*Presenter*)
Tomas M. Lacerda, MD (*Abstract Co-Author*)
Laura M. Coura, MD (*Abstract Co-Author*)
Fernando M. Coelho, MD, PhD (*Abstract Co-Author*)
Thiago M. Baraviera, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review previous technical limitations regarding vascular anastomosis in liver transplant.Understand how advances in vascular anastomosis and grafts have changed the way radiologist evaluate pre and post liver transplant imaging examsDescribe anatomy of the usual vascular anastomosis and new techniques. - Discuss what radiologists need to report to provide essential information in cases advanced vascular techniques may be needed. - Show normal aspects, pitfalls and complications in advanced vascular techniques.

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INTRODUCTION - Brief discussion about previous limitations in liver transplant. - Review pre transplant planning of vascular anastomosis, such as arterial occlusion and dissection, portomesenteric venous thrombosis. - Defend the importance of multidisciplinary board of pre transplant evaluation patients to determine technical viability of the surgery, based on surgical expertise team and imaging findings TYPES OF ADVANCED VASCULAR ANASTOMOSIS - Describe the advanced vascular anastomosis techniques including: arterial patches and grafts and portal vein anastomosis to other veins COMPLICATIONS - Show didactic cases of advanced vascular anastomosis techniques, describing normal aspects, complications and pitfalls.

GIEE-88 STOMACH AND BEYOND: IMAGING FEATURES OF LINITIS PLASTICA IN THE ABDOMEN AND PELVIS

Khaled Y. Elbanna, FRCR (*Presenter*)

TEACHING POINTS

Demonstrate characteristic multimodality imaging findings of the infiltrative and non-polypoid linitis plastica tumor pattern commonly seen in primary and metastatic signet ring cell carcinoma (SRCC) involving stomach, colon, rectum, gallbladder, and urinary bladder. Highlight essential imaging hallmarks of linitis plastica on CT and complementary modalities such as MRI and PET-CT. Provide practical imaging strategies enabling radiologists to proactively suggest biopsy or repeat endoscopic sampling in cases with subtle or ambiguous imaging findings suggestive of SRCC.

TABLE OF CONTENTS/OUTLINE

1. Clinical Relevance Overview and diagnostic challenges of SRCC and linitis plastica. 2. Multimodality Imaging Features Key imaging characteristics on CT, MRI, and PET-CT. Case-based examples across hollow viscera. 3. Diagnostic Pitfalls and Clinical Pearls Common pitfalls in biopsy and imaging interpretation. Checklist for comprehensive reporting.

GIEE-89 THE DARK SIDE OF LI-RADS: EXPLORING ITS LIMITATIONS

Amit J. Choudhari, FRCR,MBBS (*Presenter*)
Akshay D. Baheti, MD, MD (*Abstract Co-Author*)
Purvi Haria, DMRD, MD (*Abstract Co-Author*)
Aparna Katdare (*Abstract Co-Author*)
Amrita Guha, MD,MBBS (*Abstract Co-Author*)

TEACHING POINTS

Introduction The Liver Imaging Reporting and Data System (LI-RADS) aims to standardize liver imaging interpretation for hepatocellular carcinoma (HCC) diagnosis. Despite its widespread adoption, LI-RADS faces significant challenges that impact its clinical utility. This exhibit will delve into the limitations of LI-RADS, focusing on diagnostic performance, inter-observer variability, implementation barriers, and geographic disparities. Teaching Points Understand the diagnostic performance limitations of LI-RADS across different imaging modalities. Recognize the impact of inter-observer variability on LI-RADS application. Identify barriers to LI-RADS implementation in various clinical settings. Explore geographic and population-based disparities in LI-RADS performance. We attempt to simplify the approach by offering a free app

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Introduction and Background Evolution and adoption of LI-RADS Diagnostic Performance Limitations Imaging modality challenges Sensitivity vs. specificity trade-offs Inter-Observer Variability Reproducibility issues Factors influencing variability Implementation and Adoption Barriers Complexity and workload Institutional inconsistencies Geographic and Population Variations Regional differences in HCC presentation Impact of local treatment protocols Future Directions and Research Needs Refining categorization and algorithms Enhancing global applicability

GIEE-90 FROM ROOT TO BRANCH: AN ILLUSTRATED GUIDE TO BILIARY TREE DISORDERS

Anna Beatriz Ferreira Obara, MD (*Presenter*)
Rodrigo P. Polizio, MD (*Abstract Co-Author*)
Barbara Pereira, MD (*Abstract Co-Author*)
Leivanio Ponte Teixeira, MD (*Abstract Co-Author*)
Yuri Inoue (*Abstract Co-Author*)
Fernando D. Tamamoto SR, MD (*Abstract Co-Author*)
Yuri C. Neves, PhD (*Abstract Co-Author*)

TEACHING POINTS

Know the anatomy of the bile ducts, as well as the main pathophysiological mechanisms involved.Revisit the diagnostic parameters for the etiologies of cholangiopathies.Demonstrate the imaging characteristics of benign and malignant conditions affecting the biliary tree.

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Cholangiopathies are a diverse group of diseases categorized into congenital, immune-mediated, infectious, neoplastic, idiopathic, and other causes, like vascular-related conditions. Diagnosing these remains challenging for radiologists, as clinical, laboratory, and imaging findings often overlap. Identifying the underlying etiology is crucial for treatment, impacting prognosis. Caroli's disease is a congenital condition with cystic dilatation of intrahepatic ducts, potentially linked to hepatic fibrosis. Polycystic liver disease, often associated with polycystic kidney disease, shows multiple hepatic cysts without biliary involvement. In cystic fibrosis, thick bile causes ductal obstruction and cirrhosis. Primary sclerosing cholangitis leads to progressive bile duct stenosis, often linked with ulcerative colitis. IgG4 cholangiopathy mimics sclerosing cholangitis but responds well to corticosteroids. Primary biliary cholangitis involves small duct autoimmune damage. Recurrent pyogenic cholangitis, common in endemic areas, causes infections and intrahepatic stones. Paracoccidioidomycosis cholangiopathy results from fungal infection. In AIDS, cholangiopathy arises from opportunistic infections. Ischemic, portal, and iatrogenic forms result from vascular damage or biliary trauma. Neoplasms like cholangiocarcinoma and IPMN-B carry malignant potentia.

GIEE-91 NATURAL COURSE AND EVOLUTION OF RESPONSE OF HEPATOCELLULAR CARCINOMA (HCC) TO TRANS-ARTERIAL RADIO-EMBOLIZATION: ASSESSMENT WITH MRI USING EXTRACELLULAR AND HEPATOBILIARY MRI CONTRAST AGENTS

Maryam Haghshomar, MD (*Presenter*)
Frank H. Miller, MD (*Abstract Co-Author*)
Amir Borhani, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Unlike the response to thermoablative locoregional therapies, response to trans-arterial radioembolization (TARE) is time dependent and evolves over the time. Post-treatment findings are highly affected by the technique, dose, and size/biology of the tumor. 2. Persistent enhancement within the treated lesion after radiation-based treatments is not uncommon and can be seen in cases who had eventual complete response. 3. A new LIRADS treatment response algorithm has been designed specifically for assessment of response after radiation-based treatments.

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1. Overview of Trans-arterial Radioembolization a. Techniques b. Indications 2. Mechanism of Action a. Pathways of ischemia and cell death b. Flow-dependency of TARE 3. Natural Course of Response to TARE and Rad-Path Correlation 4. Assessment of Treatment Response with MRI a. Extracellular versus Hepatobiliary Agent b. Findings on dynamic post-contrast sequence c. Role of Ancillary Features 5. Overview of new LIRADS Treatment Response Algorithm for Radiation-based Treatments a. Why? b. What’s new? c. Algorithm 6. Pitfalls and Challenges 7. Future Directions 8. Conclusion

GIEE-93 ANATOMIC-ULTRASONOGRAPHIC CORRELATION OF THE ANORECTAL REGION: WHAT EVERY RADIOLOGIST SHOULD KNOW

Lucas Perussi De Souza, MD (*Presenter*)
Maria Gabriela Vargas Rezende (*Abstract Co-Author*)
Ana Luiza Rodrigues Pereira, MD (*Abstract Co-Author*)
Pedro Henrique Menezes, MD (*Abstract Co-Author*)
Hugo Franco, MD (*Abstract Co-Author*)
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Bruno Chui (*Abstract Co-Author*)
Sandro Valle (*Abstract Co-Author*)
Luiza Godoy (*Abstract Co-Author*)
Isabella Oliveira (*Abstract Co-Author*)
Gabriela Giaretta (*Abstract Co-Author*)
Miguel J. Neto (*Abstract Co-Author*)

TEACHING POINTS

Mastery of anorectal anatomy is essential for accurate interpretation of imaging studies in patients with suspected anorectal fistulas. Endocavitary and transperineal ultrasound are highly effective tools for evaluating fistulous tracts, internal openings, and sphincteric involvement. The diagnostic accuracy of ultrasound can be comparable to magnetic resonance imaging (MRI), particularly in non-complex cases. Correlation between anatomical planes and ultrasonographic findings enables radiologists to provide safe and informed diagnostic guidance. Radiologists must be able to recognize both normal and pathological anorectal patterns on imaging

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Accurate identification of the fistulous tract, internal opening, and involved structures is essential for guiding surgical treatment, preventing recurrence, and preserving sphincter function. Anatomic-ultrasonographic review of the anorectal region, correlating the main anatomical planes with findings obtained through high-resolution ultrasound.Ultrasonography has become an essential tool in the evaluation of anorectal fistulas, allowing detailed visualization of the sphincter complex and fistulous pathways. Anatomic-imaging correlation is key for precise fistula classification. Comparative studies have demonstrated high concordance between anorectal ultrasound and MRI, with ultrasonography offering advantages in terms of cost, accessibility, and real-time dynamic evaluation. This study provides an integrated review of anal canal anatomy through the lens of ultrasonography, emphasizing the importance of anatomical expertise in the accurate interpretation of sonographic findings by the radiologist.

GIEE-94 US PRESIDENT OBAMA GOT A VIRTUAL COLONOSCOPY, SHOULD YOU?

Uffan Zafar, MD (*Presenter*)
Zohaib Mallick, MBBS (*Abstract Co-Author*)
Muhammad Abdullah (*Abstract Co-Author*)

TEACHING POINTS

? Review major guideline endorsements (USPSTF, ESGE, ESGAR, ACS, MSTF) for CTC screening. ? Understand when CTC is preferred over colonoscopy in clinical practice. ? Interpret key trial evidence validating CTC's diagnostic performance. ? Explore CTC's role in population-based screening, particularly in LMICs. ? Recognize technical challenges, extracolonic findings, and risk stratification.

TABLE OF CONTENTS/OUTLINE

Introduction to Colorectal Cancer Screening ? Global burden and screening impact ? Role of early detection CT Colonography Overview ? History and technical basics ? Comparison with other modalities International Guidelines: Who Recommends What? ? USPSTF (2021) : CTC every 5 years, ages 45-75 (Grade A) ? American Cancer Society (ACS) : CTC among acceptable screening tests ? ESGE/ESGAR : CTC as first-line imaging when colonoscopy fails or is refused ? US Multi-Society Task Force (MSTF) : CTC as second-tier screening ? EUREF/ESGAR (Europe) : Strong support where no organized FIT screening exists When to Choose CTC Diagnostic Performance: Trials & Meta-analyses Case Examples: Adenomas & Flat Lesions C-RADS & Extracolonic Findings ? Classification system for colonic and extracolonic lesions ? Management protocols Technical Considerations & Pitfalls ? Prep protocols, tagging, insufflation ? Flat lesions and motion artifacts Challenges in Implementation Future Directions

GIEE-95 UNEXPECTED VESSELS: CLINICALLY RELEVANT ABDOMINAL VASCULAR VARIANTS ON CTA WITH 3DRECONSTRUCTION, INTERACTIVE CASE-BASED QUIZ

Luis Enrique Nunez Castellanos, MD (*Presenter*)
Abraham Jesus Sansores Gongora, MD (*Abstract Co-Author*)
Juan Jose Duran Rosas, MD (*Abstract Co-Author*)

TEACHING POINTS

• Abdominal vascular variants are frequent and clinically relevant, particularly in surgical oncology and endovascular procedures.• CT angiography with 3D reconstruction is crucial for accurate vascular mapping and pre-procedural planning.• Failure to recognize these anomalies can increase surgical risks, prolong operative time, and lead to severe complications.• Collateral pathways, such as the Arc of Riolan, play a critical compensatory role in chronic vascular diseases.• Interactive quizzes are an effective educational tool to reinforce anatomical and clinical knowledge in cross-sectional imaging.

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IntroductionBrief overview of normal abdominal vascular anatomy.Frequency and significance of vascular anomalies.Importance of pre-procedural detection to avoid complications.Group 1: Vascular anomalies relevant in surgical context Celiac trunk stenosis with collateral formation via the Arc of Riolan.Absence of celiac trunk with direct aortic origin of the splenic and common hepatic arteries (pre- and post-pancreatectomy images).Group 2: Incidental vascular variants with oncologic or interventional implications Right hepatic artery arising from the superior mesenteric artery in a patient with pelvic oncologic history.Left gastric artery arising directly from the abdominal aorta, with left hepatic artery as a branch.Additional Cases (if space allows)Triple or double renal arteries detected incidentally or during pre-surgical staging.Interactive QuizPresentation of anonymized cases with CTA and 3D images.Audience will answer multiple-choice questions on diagnosis, clinical relevance, and management implications.

GIEE-96 LIVER ON FIRE:THE RADIOLOGICAL SPECTRUM OF INFECTIOUSAND INFLAMMATORY PROCESSES IN THE LIVERPARENCHYMA

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Eduardo M. Araujo, MD (*Abstract Co-Author*)
Julia A. Miranda, MD (*Abstract Co-Author*)

TEACHING POINTS

Liver infectious and inflammatory processes represent a diagnostic challenge due to clinical and radiological findings that vary according to the etiology and the patient's immunological status.This study aims to demonstrate and review the main findings in computed tomography (CT) and magnetic resonance imaging (MRI) of liver infectious and inflammatory processes, with emphasis on the differentiation between the main etiological agents.A literature review was carried out, combined with a retrospective analysis of cases documented in the radiology archives of a tertiary institution, involving patients diagnosed with liver infections or inflammatory hepatitis. The examinations included ultrasound, CT and MRI, with evaluation of the morphological characteristics, enhancement pattern and distribution of the lesions. Abscesses presented as hypodense collections with peripheral enhancement and, occasionally, the presence of gas on CT, and may be pyogenic or fungal, making it difficult to distinguish from metastases. Viral and autoimmune hepatitis present nonspecific signs, therefore MRI with its functional sequences (diffusion, hepatospecific phase) can provide more sensitive information about inflammation and the extent of involvement. Granulomatous diseases may manifest with calcified nodules or periportal fibrosis, which are better visualized on CT.

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Knowledge of imaging patterns, combined with clinical and laboratory integration, is essential for an accurate diagnosis of infectious and inflammatory processes in the liver.CT and MRI play a key role in etiological differentiation and in the therapeutic management of these patients.

GIEE-97 EMVI: THE ENEMY AT THE TUMOR'S EDGESILENT VENOUS INVASION IN RECTAL CANCER - RADIOLOGICAL ASPECTS AND PROGNOSTIC IMPLICATIONS

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TEACHING POINTS

Extramural venous invasion (EVI) is an important prognostic marker in rectal cancer, associated with a higher risk of hematogenous metastases and local recurrence. High-resolution magnetic resonance imaging is the most effective imaging method for detecting EVI, especially in T2 and DWI sequences.A literature review was

performed, together with a retrospective analysis of cases of rectal câncer, covering both positive and negative cases for EMVI, as well as their differential diagnoses. In addition, the patients were evaluated in the post-treatment period.In the positive cases, the presence of EMVI was associated with worse prognostic features, such as early liver metastasis and advanced staging. In the negative cases, diagnostic pitfalls such as dilated veins and imaging artifacts stood out. Post-treatment cases demonstrated both complete response and the limitations of imaging to differentiate fibrosis from residual tumor.

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This paper aims to present the typical radiological findings and diagnostic difficulties of EVI in real cases, in addition to discussing the prognostic and therapeutic implications. Recognition of its radiological patterns, limitations and differential diagnoses is essential for an effective oncological approach.

GIEE-98 A RADIOLOGIST'S GUIDE TO CHOLANGIOPATHIES: DIAGNOSTIC PATTERNS, PITFALLS AND PEARLS

Raeesa Patel, MBBS (*Presenter*)

TEACHING POINTS

Cholangiopathies encompass a diverse group of biliary disorders, ranging from autoimmune and infectious to drug-induced and ischemic aetiologies. These conditions often present with overlapping clinical features and biochemical profiles, making imaging a pivotal tool in the diagnostic algorithm. Magnetic Resonance Cholangiopancreatography (MRCP) is the gold standard non-invasive imaging modality for diagnosing and monitoring these pathologies. Accurate interpretation requires a systematic approach and familiarity with the differing morphological patterns. This pictorial review highlights the key imaging findings in a range of cholangiopathies, both common and rare entities, including Primary Sclerosing Cholangitis (PSC), Primary Biliary Cholangitis (PBC), IgG4-related Sclerosing Cholangitis (ISC) and ketamine cholangiopathy. Important diagnostic clues include the anatomical distribution of ductal abnormalities, the length and morphology of strictures, the presence or absence of upstream biliary dilatation, and associated changes in the liver parenchyma. Ancillary findings involving the pancreas, kidneys, and vascular structures may provide additional evidence supporting a particular diagnosis. Through a case-based visual guide, this exhibit aims to enhance familiarity with classical imaging appearances, promote a structured approach, and highlight key discriminators that aid in differentiating among the various cholangiopathies and its mimics.

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1. Introduction 2. Autoimmune 3. Infective 4. Ischemic 5. Drug-Induced 6. Mimics 7. Comparison of Cholangiopathies

GIEE-99 WHEN THE CYST PERSISTS: UNDERSTANDING THE VARIOUS PANCREATIC CYST FOLLOW-UP GUIDELINES

Thomas Seykora, MD (*Presenter*)
Melkamu D. Adeb, MD (*Abstract Co-Author*)

TEACHING POINTS

Incidental pancreatic cystic lesions are commonly encountered by the radiologist. Although there are several society guidelines regarding the follow up of pancreatic cysts, there is heterogeneity when providing follow up recommendations in clinical practice. After viewing this exhibit, the reader will (1) become familiar with commonly used pancreatic cyst follow-up guidelines, (2) understand differences among the guidelines, and (3) be equipped to engage in multidisciplinary care of patients with pancreatic cysts.

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I. Introduction: types of pancreatic cystic lesions including intraductal papillary mucinous neoplasm (IPMN), serous cystadenoma, and mucinous cystic neoplasm. II. Pancreatic cyst follow-up guidelines: 2024 Kyoto guidelines, 2018 American College of Gastroenterology (ACG) guidelines, 2017 ACR Incidental Findings Committee White Paper, 2017 Fukuoka guidelines, 2015 American Gastroenterological Association (AGA) guidelines. III. Differences among guidelines.

GIEE-100 BRIDGING THE GAP: IMAGING FINDINGS OF LUMEN-APPOSING METAL STENTS

Thomas Seykora, MD (*Presenter*)
Melkamu D. Adeb, MD (*Abstract Co-Author*)

TEACHING POINTS

Lumen-apposing metal stents (LAMS) are being increasingly utilized in interventional gastroenterology. Radiologists should understand common indications for LAMS and recognize their imaging appearance and complications. After viewing this exhibit, the reader will (1) understand various applications of LAMS, (2) recognize the expected imaging appearance of LAMS, and (3) be able to identify complications of LAMS.

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I. Introduction: common types of LAMS, indications for LAMS placement such as drainage of pancreatic or peripancreatic collections, biliary drainage, managing strictures, creating anastomoses, creating enteric bypass, and addressing obstructions. II. Imaging appearance of LAMS: plain film, fluoroscopy, ultrasound, CT, MRI, and endoscopic ultrasound (EUS). III. Imaging protocols to assess for complications, such as CT GI bleed. IV. Complications of LAMS: stent migration stent occlusion, bleeding, perforation, infection, luminal or biliary obstruction, and buried stent syndrome. V. Summary and clinical pearls.

GIEE-101 IMAGING MYRIAD OF PORTOCAVAL SPACE PATHOLOGIES - A DEEP DIVE

Aruna R. Patil, MD, FRCR (*Presenter*)
Yashant Aswani, MD (*Abstract Co-Author*)
Jayanth Reddy (*Abstract Co-Author*)

TEACHING POINTS

Porto caval space is a narrow space between the portal vein anteriorly and Inferior vena cava posteriorly. There are specific variants , pathologies and surgical implications localized to this space . Variant arteries, veins can traverse this space unawareness of which might result in inadvertent bleeding. Certain neoplasms are classically located in this space . Portocaval space serves as a pathway for spread of certain infective / inflammatory processes Portocaval space is the landmark for epiploic foramen that connects greater and lesser sac.

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1.Anatomy of portocaval space- imaging and surgical with illustrations 2. Normal contents and variants - caudate lobe of liver , vascular structures , lymphnodes (12p, 12b) , pancreas, epiploic foramen, fat. 3. Surgical implications: arterial variants , lymphadenectomy in HPB malignancies Portocaval shunts - Temporary portocaval shunt in LT, Porto caval shunt for EHPVO, Inflow modulation for SFSS in live donor liver transplant Pancreaticoduodenectomy- separating uncinate margin of pancreas from SMA Pringle maneuver. 4. Presentation of lesions arising in this space - biliary compression / vascular compression. 5. Pathologies: Vascular: variants -Replaced RHA or accessory RHA from SMA, Early bifurcation of RHA from CA, Pancreaticoduodenal vein, Cavernomatous transformation of portal vein, Reconstruction in LT 6. Pancreas related -circumportal pancreas, pancreatitis. 7. Lymph nodal: metastases, lymphoma, lymphatic malformation. 8.Caudate lobe lesions: solid mass / cysts. 9.Epiploic foramen: hernia, disease spread , extension of collection / hematoma. 10.Primary tumors: lipoma, paraganglioma, sarcoma

GIEE-102 UNMASKING COMPLICATIONS AFTER PANCREATIC CANCER SURGERY: KEY IMAGING CLUES FOR DIAGNOSIS AND MANAGEMENT

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Ravi V. Gottumukkala, MD (*Abstract Co-Author*)

Avinash R. Kambadakone, MD, FRCR (*Abstract Co-Author*)
Michael H. Rosenthal, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Recognize the spectrum of post-pancreatectomy complications and their imaging features. • Differentiate between expected postoperative findings and complications. • Understand the role of various imaging modalities (CT, MRI, PET/CT) in identifying complications. • Apply a systematic approach to interpreting post-surgical imaging, guiding clinical decision-making and intervention.

TABLE OF CONTENTS/OUTLINE

1. Introduction • Importance of imaging in post-pancreatectomy patient management • Common surgical procedures • Normal postoperative anatomy 2. Vascular Complications (CT angiography, DSA findings) • Pseudoaneurysms and hemorrhage • Arterial stenosis/occlusion & implications for management 3. Anastomotic & Biliary Complications (MRI/MRCP pearls) • Pancreatojejunostomy leaks • Biliary strictures and leaks 4. Infectious & Inflammatory Complications • Differentiating abscesses from normal post-op collections • Delayed pancreatitis & fat necrosis • Percutaneous vs. surgical drainage strategies 5. Gastrointestinal & Functional Complications • Delayed gastric emptying. • Bowel ischemia, obstruction, and malabsorption 6. Imaging Pearls & Pitfalls • Avoiding common misdiagnoses in postsurgical imaging • Key differentiators between normal healing and pathology 7. Clinical Implications & Multidisciplinary Management • Role of radiologists in guiding surgical and interventional decisions • Conservative vs. IR vs. surgical approaches 8. Conclusion & Take-Home Points • Summary of key imaging findings and management strategies • Interactive learning case

GIEE-103 IMAGING FEATURES IN THE LIVER AFTER RADIOEMBOLIZATION FOR LIVER CANCER

Hyo-Cheol Kim, MD (*Presenter*)

TEACHING POINTS

Transarterial radioembolization (TARE), also referred to as radioembolization or selective internal radiation therapy, is an interventional radiological modality employed for the management of primary liver neoplasms and hepatic metastases. This therapeutic intervention inevitably subjects normal hepatic parenchyma to varying degrees of irradiation, resulting in diverse radiological manifestations that can influence the interpretation of subsequent imaging studies. Throughout the post-procedural surveillance period, numerous imaging findings associated with the intervention itself (e.g., peritumoral edema, ring enhancement, hepatic fibrosis, parenchymal radiation necrosis, and enhancement of the treated area) may present challenges in image interpretation and assessment of treatment response. The objectives of this presentation are threefold: 1. To elucidate the fundamental principles underlying radioembolization. 2. To acquaint oneself with the imaging characteristics observed in liver tumors and the surrounding parenchyma following radioembolization, emphasizing potential diagnostic pitfalls. 3. To interpret the tumor response by LI-RADS.

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1. Overview of radioembolization. 2. Evaluation of tumor response: delayed response, ring enhancement, and dystrophic calcification. 3. Non-tumoral imaging findings: peritumoral edema, hepatic fibrosis, parenchymal necrosis, and enhancement of the treated area. 4. Imaging features during and/or following subsequent therapeutic interventions. 5. LI_RADS classification and its interpretation of treated tumor by radioembolization

GIEE-104 BURNING HOLES: A RADIOLOGIST'S GUIDE TO PEPTIC ULCER DISEASE

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George A. Souflis, DO (*Abstract Co-Author*)
Daniel Gonzalez, DO (*Abstract Co-Author*)
Ashley Woodford, MD (*Abstract Co-Author*)
Bhishak H. Kamat, MD (*Abstract Co-Author*)
Blachy R. Davila, MD (*Abstract Co-Author*)
Omar Agosto, MD (*Abstract Co-Author*)

TEACHING POINTS

In the United States, peptic ulcer disease (PUD) affects approximately one out of 12 people. One in five peptic ulcers is associated with Helicobacter pylori infection, while most others result from NSAID overuse. Complications include bleeding, obstruction, fistulization, and perforation, the most serious complication, with a reported mortality rate as high as 20%. PUD arises from an imbalance in the protective and aggravating factors of the gastric mucosa. H. pylori and NSAIDs disrupt mucosal integrity through inflammation and inhibition of prostaglandin synthesis, respectively. Computed tomography (CT) aids in diagnosing PUD by highlighting direct and indirect signs. It also detects the aforementioned PUD-related complications, helping gauge prognosis and guide management.

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This educational exhibit aims to review the imaging findings associated with PUD and discuss the clinical use of CT in diagnosing PUD and its complications. PUD is characterized by sores that extend into the muscularis propria of the gastric epithelium of the duodenum or stomach. It arises primarily from H. pylori infection and NSAID overuse. CT can evaluate direct and indirect signs of PUD and help classify them as uncomplicated or complicated (e.g., bleeding, perforation, obstruction). This exhibit will review the spectrum of PUD cases radiologists may encounter and propose a diagnostic imaging algorithm for PUD diagnosis to help guide treatment.

GIEE-105 CIRQUE DU RADIOLOGY: WITNESS THE ASTONISHING ABDOMINAL EPONYMS!

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Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Carlos Perez Morales (*Abstract Co-Author*)
Ariana Salgueiro Estela (*Abstract Co-Author*)
Marcos Martinez (*Abstract Co-Author*)
Jose A. Lara, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review key abdominopelvic pathologies, emphasizing clinical presentation, history, and imaging features. 2. Present abdominopelvic eponyms as circus acts for engaging visual learning. 3. Illustrate imaging findings across multiple modalities to enhance diagnosis and management.

TABLE OF CONTENTS/OUTLINE

1. Introduction and Objectives 2. Categories: - The Vascular Daredevils - The GI Contortionists - The Great Liver and Gallbladder Mysteries - The Freak Show of Renal and Urinary Oddities - The Gynecologic Wonders - The Mysterious Skin and Soft Tissue Oddities 3. Imaging Findings and Conclusion Abstract: Abdominal eponyms in radiology provide key diagnostic clues with historical significance. These terms enhance retention, convey complex concepts, and promote interest in medical history. This exhibit explores over 15 abdomen-related eponyms using a circus theme, grouping them into acts for engaging learning. Each act reviews historical context, anatomical basis, and characteristic imaging findings through radiographs, CT, MRI, and ultrasound. This unique approach aids medical students, residents, and imaging specialists in recognizing and applying these eponyms in clinical practice.

GIEE-106 REVOLUTIONARY ULTRASOUND TECHNIQUES IN IBD FOLLOW-UP: A NEW ERA IN PATIENT CARE

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Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Zofia Marrero (*Abstract Co-Author*)
Jesus G. Rivera Roman (*Abstract Co-Author*)
Wilma Rodriguez-Mojica, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Overview of Inflammatory Bowel Disease (IBD) and comparison of different follow-up imaging modalities. Discuss the approach of IBD evaluation with a routine Intestinal Ultrasound (IUS) with a checklist of the pertinent findings. 2. Review normal findings and IBD changes, with a radiology report template to properly report pertinent findings

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I. Introduction II. Objectives III. Anatomy Review IV. Normal findings in IUS and outline of key features to assess V. Gastrointestinal Features of IBD with Respective Imaging Findings on IUS, CT, and MRI VI. Common Findings and Complications: 1. Active vs. Non-active Disease 2. Penetrating vs. Stricturing Disease 3. Disease Activity Scoring VI. Template for structured reporting VII. Conclusion Abstract: The global incidence of IBD has risen in the last decade, making accurate diagnostics and disease tracking more critical. Imaging tools, particularly IUS, have proven to be non-invasive, cost-effective, and accurate for diagnosing and monitoring IBD. Radiologists and gastroenterologists must be trained in IUS and follow a standardized protocol to enhance interdisciplinary communication. Considering the seriousness of IBD complications, differentiating between structuring and penetrating disease using IUS and comparing disease progression is vital. We aim to equip radiologists to detect early and chronic IBD, enabling better patient management and preventing long-term complications.

GIEE-107 LIVER CYSTS WITH MUCIN SECRETION. RADIOLOGICAL - PATHOLOGICAL CORRELATION

Diego M. Haberman, MD (*Presenter*)
Ignacio Perez Fernandez, MD (*Abstract Co-Author*)
Oscar Andriani, MD (*Abstract Co-Author*)
Mariano Volpacchio, MD (*Abstract Co-Author*)
Miriam Galich (*Abstract Co-Author*)
Augusto Centellas Vargas, MD (*Abstract Co-Author*)
Karen Garcia Dumeth (*Abstract Co-Author*)

TEACHING POINTS

Liver cysts include a wide spectrum of pathological entities with different etiology. They have various clinical implications, radiological features, as well as different prognosis and treatment. Some liver cysts have a mucin producing epithelium, and regarding its biology, are considered premalignant lesions, with a well known invasive capability. These cysts include Mucinous Cystic Neoplasm (MCN), formerly known as Biliary cistoadenoma/carcinoma, Intraductally papillary neoplasm of the bile duct (B-IPMN) and Ciliated foregut cyst. The purpose of these presentation is to review and analize radiological features of each one of these lesions. We emphasize in radiological - pathological comparation in parh proven cases.

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a) Recognize imaging features of MCN, B-IPMN and Ciliated foregut cyst b) Compare radiology with pathology including macro and micrscopy, for a better understanding of mucin producing liver cysts. c) Emphasize the impact of appropriate diagnosis and the role of imaging in surgical planification for therapeutic decisión making.

GIEE-108 NOT YOUR AVERAGE ADENO: A LOOK AT RARE RECTAL LESIONS

Anas Hasson Alnajjar, MBBS (*Presenter*)
Zainab Salman, MD (*Abstract Co-Author*)
Heba Hamad, MD (*Abstract Co-Author*)
Ahmed Al Kindi, MD (*Abstract Co-Author*)

TEACHING POINTS

• To familiarize radiologists with rectal lesions that mimic adenocarcinoma but represent distinct, often benign or rare tumor types.• To explain the key CT and MRI imaging features that help differentiate uncommon rectal lesions such as GIST, NET, schwannoma, and others.• To highlight the characteristic histologic findings associated with each lesion and their relevance to imaging interpretation.• To demonstrate the role of imaging in guiding clinical management, including biopsy decisions, surgical planning, or other oncologic treatment options.• To promote a pattern-based, systematic approach for evaluating rectal lesions, reducing the risk of mislabeling benign or rare tumors as adenocarcinoma.

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1. Introduction 2. Case-Based Review: • Gastrointestinal Stromal Tumor (GIST) • Neuroendocrine Tumor (NET) • Lymphoma • Schwannoma • Hemangioma • Leiomyoma • Villous Adenoma • Tailgut Cyst • Rectal Endometriosis 3. Comparison with Adenocarcinoma 4. Pearls, Pitfalls, and Management Tips 5. Conclusion

GIEE-109 IMAGING FINDINGS AND COMPLICATIONS OF WEIGHT LOSS INTERVENTIONS

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Preethi Hyndhavi Kanumuri (*Abstract Co-Author*)
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Emily June Zolfaghari (*Abstract Co-Author*)
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Margarita V. Revzin, MD, MS (*Abstract Co-Author*)
Nadia Solomon, MD,MA,MSc (*Abstract Co-Author*)

TEACHING POINTS

• Introduce the radiologist to common types of bariatric surgery, including normal post-surgical anatomy. • Discuss imaging examinations best suited to interrogate post bariatric anatomy and potential complications. • Discuss common and uncommon potential complications associated with each type of bariatric surgery. • Briefly introduce weight loss medications, including expected imaging findings and imaging of potential side effects/complications.

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• Introduction to the prevalence of bariatric surgery, including Roux-en-Y gastric bypass, sleeve gastrectomy, gastric banding, biliopancreatic division with duodenal switch, etc. • Descriptions and illustrations of the intended post-surgical anatomy of various types of bariatric surgery and the mechanisms by which they promote weight loss. • Early post-surgical potential complications seen with all types of bariatric surgery: leaks, bleeds, marginal ulcers, venous thromboembolism. • Specific potential complications seen with Roux-en-Y Gastric Bypass: gastrogastric fistula, gallstone disease, internal hernias, afferent loop syndrome. • Specific potential complications seen with Gastric Banding: slipped band, band erosion, pseudoachalasia. • Specific potential complications seen with Sleeve Gastrectomy: gastric stenosis, reflux, bleeding.

GIEE-110 PEARLS AND PITFALLS OF CONTRAST-ENHANCED ULTRASOUND LI-RADS: OPTIMIZING ACCURACY IN HEPATOCELLULAR CARCINOMA DIAGNOSIS

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Tae Kyoung Kim, MD, PhD (*Abstract Co-Author*)
Korosh Khalili, MD (*Abstract Co-Author*)
Khaled Y. Elbanna, FRCR (*Abstract Co-Author*)
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Vaibhav Jain, MD,MBBS (*Abstract Co-Author*)
Ahmed M. Gabr, MD, MSc (*Abstract Co-Author*)
Xiaoyang Liu, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. CEUS Liver Imaging Reporting and Data System (CEUS LI-RADS) provides standardized frame work for lesion categorization, but unique technical and interpretive challenges can impact diagnostic confidence and accuracy. 2. Accurate timing and dynamic assessment of lesions on arterial phase is key in correct LI-RADS categorization and diagnosis. 3. Washout can be subtle, and intermittent scanning is important to prevent bubble destruction. 4. Common pitfalls in CEUS interpretation include misinterpreting early washout in cholangiocarcinoma and non-hepatocellular malignancy as HCC and misclassification due to suboptimal contrast injection technique. 5. Near field lesions are prone to bubble destruction resulting in pseudowashout. 6. Fine adjustments to compensate for excessive attenuation such as amplifying the signal from far field can increase risk of pseudoenhancement.

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1. Review on essential CEUS features for each LI-RADS category, with illustrative cases that underscore best practices and potential diagnostic traps. 2. Tips on optimizing timing of arterial imaging, recognizing the subtlety of late and mild washout. 3. Discuss how to solve discrepancies between CEUS and CT/MRI. 4. Review Common Pitfalls: misinterpreting early washout as HCC, misclassification due to suboptimal contrast injection technique, pseudo enhancement and pseudo washout.

GIEE-111 MR APPEARANCE OF ADVANCED BENIGN PANCREAS CONDITIONS: A SPECTRUM OF POST-INFLAMMATORY DISEASES THAT MAY NEED INTERVENTION

Nikita Consul, MD (*Presenter*)
Jorge Machicado Rivero (*Abstract Co-Author*)
George Zacur (*Abstract Co-Author*)
Reve Chahine, MD, FRCR (*Abstract Co-Author*)
Richard Kwon (*Abstract Co-Author*)
Hero K. Hussain, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

1. Pancreas anatomy and associated benign conditions can contribute to recurrent/chronic pancreatitis, but are manageable with interventions if detected. 2. Clear understanding of the advanced interventions used to treat pancreatitis and its sequelae can inform how we read MRI/MRCP of the pancreas.

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1. Imaging the Pancreas a. MRI/MRCP protocol and quality assurance b. MR signal characteristics with imaging examples of chronic pancreatitis on: i. T2-weighted (T2w) and T2w fat-sat ii. In-phase and out-of-phase iii. Dynamic contrast-enhanced T1-weighted (T1w) sequences c. Ductal anatomy on 2D-MRCP versus 3-D MRCP d. Procedural intervention overview with ERCP/EUS 2. Pancreas anatomic variants that predispose to inflammation and how this impacts intervention a. Parenchymal variants i. Annular pancreas ii. Pancreas bifidum b. Ductal variants i. Complete/incomplete divisum ii. Ansa pancreatica iii. Common channel 3. Other features of pancreatitis and intervenable sequelae a. Parenchymal/Vascular i. Pseudocyst and walled-off-necrosis (WON) ii. Thrombosis b. Ductal i. Stricture/stone ii. Disconnected pancreatic duct syndrome 4. Post-interventional appearances of the pancreas and cases of repeat interventions a. Duct stent placement and follow-up sequelae b. Hepaticojejunostomy c. Cystgastrostomy d. Pseudoaneurysm embolization 5. Summary of what not-to-miss in recurrent/chronic pancreatitis, ranked by severity and extent of surgical management required.

GIEE-112 RADIOLOGIC FINDINGS IN COMPLICATIONS OF OBESITY TREATMENTS

Ester Carballo, MD (*Presenter*)
Elena Luque, MD (*Abstract Co-Author*)
Alejandro Vera Gonzalez, MD (*Abstract Co-Author*)
Laura Galvan Herraez (*Abstract Co-Author*)

TEACHING POINTS

- Radiologic imaging is essential for identifying complications related to obesity treatments, both surgical and non-surgical. - Radiologists must be familiar with various bariatric procedures and their potential complications to ensure prompt and accurate diagnosis. - CT is the preferred modality for assessing post-treatment complications due to its high sensitivity and ability to evaluate complex anatomy. - Non-surgical options like intragastric balloons may cause serious issues such as migration, obstruction, or perforation. - A structured, case-based approach improves diagnostic accuracy and guides timely clinical management.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Obesity trends and the role of bariatric treatments 2. Imaging Modalities: Radiography, contrast fluoroscopy, and CT 3. Non-Surgical Complications: Gastric balloon and gastric banding issues 4. Surgical Complications: Leaks, hernias, collections, ileus, bleeding 5. Diagnostic Strategy: Imaging red flags and clinical correlation 6. Conclusion: Key radiologic findings and their clinical impact

GIEE-113 PRECONTRAST LIVER: WHAT IS IT GOOD FOR ANYWAY?

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Evelyne M. Loyer, MD (*Abstract Co-Author*)
Sireesha Yedururi, MBBS (*Abstract Co-Author*)
Veronica L. Cox, MD (*Abstract Co-Author*)
Sergio Klimkowski, MD (*Abstract Co-Author*)
Peter Young, MD, MD (*Abstract Co-Author*)
Hyunseon C. Kang, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

· Understand the limitations of single portal venous phase for liver oncologic imaging.· Discuss the value of the precontrast phase for detection and accurate size measurement of liver metastases, essential for staging and tumor response assessment.· Learn how detection of calcifications may allow definitive diagnosis of hepatic metastases.· Review the utility of the precontrast phase in the setting of post-treatment changes, metallic artifact and hemorrhage.

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· Introduction to the key role of the precontrast phase in liver oncologic imaging.· Characterization of liver lesions.o Precontrast phase differentiates hypervascular metastases from perfusional phenomena in the liver.o Change in size between precontrast and portal venous phase allows small nonspecific hypodense nodules to be characterized as metastases.· Detection of metastases.o Isoenhancing metastases are best seen on precontrast.o Punctiform calcifications on precontrast may be diagnostic of metastases.· Precontrast phase allows for more accurate assessment of tumor response.· The value of precontrast images for evaluating post-treatment changes, metallic artifact, and hemorrhage.

GIEE-114 TRAGEDY OF THE COMMONS: DISORDERS OF THE COMMON BILE DUCT

Timothy M. McMahon, MD, MS (*Presenter*)
Atif Zaheer, MD (*Abstract Co-Author*)

TEACHING POINTS

-Disorders of the common bile duct encompass a wide range of conditions, from the more common choledocholithiasis to rare, complex disorders like cholangiocarcinoma, portal cholangiopathy, and hyper-IgG4-related disease. While clinical and radiological features can be similar, this exhibit examines characteristics of both common and uncommon CBD disorders evident on advanced imaging techniques including ultrasound, CT, MRCP, and ERCP which can help with diagnosis. -Diagnostic pitfalls and mimics can lead to misdiagnosis or missed diagnoses if not carefully evaluated. Common imaging artifacts, such as a crossing vessel or flow void artifact on MRCP, are highlighted to illustrate features that help distinguish them from obstructive pathologies. -Varying management approaches for each condition—ranging from conservative management and medical therapy for benign disorders to surgical or oncological interventions for malignancies—are covered and important imaging features that can alter management are highlighted.

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Introduction Anatomy Benign Conditions -Clinical Background -Imaging Features -Management Malignant Conditions -Clinical Background -Imaging Features -Management Pitfalls and Mimics

GIEE-115 CONTRAST ENHANCED ULTRASOUND OF THE SPLEEN. EASY, USEFUL AND VERY EFFECTIVE

Demosthenes D. Cokkinos, MD, PhD (*Presenter*)
Stefanou Danai-Eleni, MD,MSc (*Abstract Co-Author*)
Panagiotis Koutsogeorgas (*Abstract Co-Author*)

TEACHING POINTS

To review indications of Contrast enhanced ultrasound (CEUS) in the spleen. To show cases in which CEUS improves baseline US findings, answering clinical questions. To explain the added value of CEUS.

TABLE OF CONTENTS/OUTLINE

The commonest pathologic conditions of the spleen are reviewed with imaging examples on B mode, Colour Doppler and CEUS, correlated with CT or MR when these were performed. Presented cases include lymphoma, cysts, sarcoidosis, infarcts, splenunculus in differentiation to a splenic hilum lymph node, metastases, trauma (rupture, haematoma, extravasation), inflammatory pseudotumour, abscess, Littoral cell angioma, Carney complex etc. CEUS overcomes non-enhanced US limitations, as it is more sensitive for microvascculature detection, aiding lesion detection and characterization. CEUS indications, contraindications, limitations and pitfalls are also mentioned.

GIEE-116 HEPATOBILIARY-ENHANCED MRI: A COMPREHENSIVE GUIDE TO ENHANCE THE RADIOLOGIST'S KNOWLEDGE

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Camila Gadens Zamboni, MD (*Abstract Co-Author*)
Caroline Lorenzoni Almeida Ghezzi, MD,PhD (*Abstract Co-Author*)
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Eleonora Silva (*Abstract Co-Author*)
Carolina A. Heming, MD (*Abstract Co-Author*)

TEACHING POINTS

MRI enhanced with gadoxetic acid (gadolinium ethoxybenzyl diethylenetriaminepentaacetic acid - Gd-EOB-DTPA) is pivotal in evaluating hepatocytes and biliary ducts due to its characteristic hepatic metabolism. This presentation aims to depict a comprehensive guide to protocoling and interpreting this technique daily, demonstrate pitfalls/limitations, and provide various useful cases where gadoxetic acid is applicable. For Part I, we will show basic concepts of gadoxetic acid and other gadolinium-based agents, as well as their metabolism and a guide to protocoling a gadoxetic MRI. For Part 2, we will depict a basic interpretation and important pitfalls of this modality; for Part 3, we will demonstrate a diversity of cases where gadoxetic acid plays a pivotal role; For Part 4, we will summarize gadoxetic acid applicability and limitations, as well as suggest a protocol guide and conclude with important take-home messages.

TABLE OF CONTENTS/OUTLINE

1- Brief review of gadoxetic acid metabolism comparing it to other gadolinium-based agents; 2- Suggestion of a protocol guide for MRI-enhanced gadoxetic acid; 3- Basic interpretation of normal imaging findings and pitfalls when applying gadoxetic acid-enhanced MRI; 4- Diversity of cases, including benign and malignant neoplasms of the liver/biliary ducts, cystic lesions, trauma/iatrogenic bile leaks, infections, and congestive liver syndromes, among others; 5- Conclusion and take-home messages.

GIEE-117 FROM PLEXUS TO PATHOLOGY: UNDERSTANDING ABDOMINAL NEUROGENIC TUMORS

Sean O'Rourke, MD (*Presenter*)
Alex Lin, MD (*Abstract Co-Author*)
Lyndon Luk, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review the normal anatomy of the peripheral nervous system and adrenal glands. 2. Illustrate typical and atypical CT, MRI, and nuclear medicine/PET imaging findings of benign and malignant neurogenic tumors in the abdomen and pelvis. 3. Correlate imaging findings with surgical pathology specimens of neurogenic tumors.

TABLE OF CONTENTS/OUTLINE

A. Anatomy of the peripheral nervous system, including the adrenal glands. B. Case-based review of abdominal neurogenic tumors utilizing imaging findings from CT, MRI and PET/CT. 1. Tumors of Ganglion Cell Origin: ganglioneuroma, ganglioneuroblastoma, neuroblastoma. 2. Tumors of the Paraganglionic System: pheochromocytoma, paraganglioma. 3. Tumors of Nerve Sheath Origin: schwannoma, neurofibroma, neurofibromatosis, malignant nerve sheath tumor. C. Review of management and correlation of imaging with surgical pathology specimens.

GIEE-118 THE USUAL, THE UNUSUAL, AND THE UNEXPECTED: A DIAGNOSTIC JOURNEY THROUGH PANCREATOBILIARY LESIONS

Mayu Uka, MD (*Presenter*)
Yoko Shinno (*Abstract Co-Author*)
Takehiro Tanaka (*Abstract Co-Author*)
Maiko Tamura (*Abstract Co-Author*)
Shinichi Shimizu (*Abstract Co-Author*)
Tomohiko Mannami (*Abstract Co-Author*)
Takafumi Kubo (*Abstract Co-Author*)
Takashi Mukai (*Abstract Co-Author*)
Takao Hiraki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is: 1)To review imaging features on contrast enhanced CT, MRI of pancreatobiliary lesions that can be diagnostically misleading, comparing them with common differential diagnoses and correlating them with histopathology.2)To review various cases from typical to atypical imagings.3) To discuss the point of differential diagnosis.

TABLE OF CONTENTS/OUTLINE

The pancreatobiliary region presents a unique diagnostic challenge due to the wide spectrum of lesions that may arise-from benign mimickers and inflammatory conditions to rare or aggressive neoplasms. While some cases follow expected patterns, others surprise us with atypical presentations, overlapping features, or deceptive appearances on imaging and histopathology.This educational exhibit highlights key diagnostic pitfalls in imaging through a curated selection of real cases-ranging from common to diagnostically challenging lesions-by correlating imaging findings with histopathology. The cases include both tumors and tumor-mimicking conditions.

GIEE-119 MRI ASSESSMENT OF ANAL CANCER: A COMPREHENSIVE REVIEW OF INITIAL STAGING, TREATMENT RESPONSE EVALUATION, AND POST-THERAPY SURVEILLANCE

Marta Alaia Montes Zubia, MD (*Presenter*)
Jennifer Barredo Parra (*Abstract Co-Author*)
Ander Garcia Etxebarria (*Abstract Co-Author*)
Udane Perez Ibarrondo, MD (*Abstract Co-Author*)
Ibai Estibez Olea (*Abstract Co-Author*)
Inigo Alcaraz Hernando, MD (*Abstract Co-Author*)
Mikel Isla-Jover, MD (*Abstract Co-Author*)
Martin Santamaria Boado, MD (*Abstract Co-Author*)

TEACHING POINTS

MRI is the modality of choice for evaluating local disease in anal cancer, both early and advanced. High-resolution MRI protocol is essential , with axial and coronal T2W sequences aligned to the anal canal. Anal cancer is not rectal cancer ; staging criteria and imaging approach differ. T stage is based on tumor size , not invasion depth; measure in all planes. Nodal staging depends on node location , not number; complement MRI with PET-CT or FNA if needed. Post-treatment MRI should be done 6 months after CRT , when response peaks; earlier imaging may mislead. Local recurrence occurs in 30% of patients , often within 2 years; biopsy and salvage APR may be needed.

TABLE OF CONTENTS/OUTLINE

Background Epidemiology and imaging role in anal cancer diagnosis, staging, and follow-up. Anal Canal Anatomy Anatomical vs surgical canal: relevance in staging. Key MRI landmarks including the puborectalis and sphincter complex. MRI Technique Recommended sequences and proper orientation relative to the anal canal axis. Staging Overview (TNM) T: tumor size. N: lymph node location. M: distant metastases (CT/PET-CT). Imaging Features Tumor signal characteristics on T2, DWI and contrast. Evaluation of sphincter and adjacent structure involvement. Post-Treatment Assessment Optimal timing (6 months post-CRT). Fibrosis vs residual tumor based on signal and diffusion restriction. Recurrence and Management Local recurrence in 30% of patients, often within 2 years. Early detection, histological confirmation and possible APR. Conclusion MRI plays a central role throughout the management of anal cancer: from initial diagnosis and staging to post-treatment assessment, surveillance and guiding further interventions.

GIEE-120 PORTRAIT OF AN INTRUDER: IMAGING FEATURES OF CHOLANGIOCARCINOMA

Claudia Viescas Huerta, MD (*Presenter*)
Isabel Fonseca Buelga, MD (*Abstract Co-Author*)
Diego Alejandro Garcia Paredes, MD (*Abstract Co-Author*)
Sergio Sintes (*Abstract Co-Author*)
Elena Canales Lachen (*Abstract Co-Author*)
Luis Gonzalez Campo, MD (*Abstract Co-Author*)
Antonio Michael-Fernandez, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Brief description of epidemiology, risk factors and therapeutic options for cholangiocarcinoma.2. To review cholangiocarcinoma subtypes based on their morphologic growth pattern and their imaging features.3. To explain cholangiocarcinoma subtypes based on their location on the biliary tree and their imaging findings.4. To discuss their differential diagnosis by using illustrative cases.

TABLE OF CONTENTS/OUTLINE

1. Introduction.2. Cholangiocarcinoma subtypes based on their morphologic growth pattern: Mass forming, Periductal infiltrating and Intraductal subtypes.3. Cholangiocarcinoma subtypes based on their location on the biliary tree: intrahepatic, perihiliar and distal cholangiocarcinoma.4. Differential diagnosis: mass forming (sclerosed hemangioma, hepatic hydatid infection, intrahepatic lymphoma, hepatocellular carcinoma, adenocarcinoma metastases), periductal infiltrating (IgG4- related disease, benign fibrosis, primary sclerosis cholangitis), intraductal (calculi, ampullary tumor).5. Summary.

GIEE-121 IMAGING INSIGHTS INTO ADVERSE EFFECTS ON THE HEPATOBILIARY SYSTEM AND PANCREAS FROM SYSTEMIC ANTI-CANCER TREATMENTS

Sudhakar K. Venkatesh, MD, FRCR (*Presenter*)
Christopher L. Welle, MD (*Abstract Co-Author*)
Natally Horvat, MD, PhD (*Abstract Co-Author*)
Nguyen H. Tran, MD (*Abstract Co-Author*)
Ilkay Idilman, MD (*Abstract Co-Author*)
Patrick Navin, MBBCh, FFR(RCSI) (*Abstract Co-Author*)
Chandramohan Anuradha, MD,FRCR (*Abstract Co-Author*)
Tiffany Hennedige, MBBS, FRCR (*Abstract Co-Author*)
Mark A. Anderson, MD (*Abstract Co-Author*)
Musturay Karcaaltincaba, MD (*Abstract Co-Author*)
Zongming Eric Chen (*Abstract Co-Author*)

TEACHING POINTS

1. Systemic anticancer treatments, including chemotherapy, immunotherapy, and their combinations, can result in various hepatobiliary and pancreatic adverse effects. 2. These adverse effects can occur in asymptomatic patients, making early detection crucial for preventing progression by stopping or reducing the dose, or change to alternative drugs. 3. Imaging plays a vital role in differentiating treatment-related adverse effects from disease progression, ensuring accurate diagnosis and appropriate management.

TABLE OF CONTENTS/OUTLINE

Hepatic adverse effects Hepatitis- ICI hepatitis Hepatic steatosis Chemotherapy associated steatohepatitis (CASH) Sinusoidal obstruction syndrome Nodular regenerative hyperplasia (NRH) Chemotherapy Associated Liver Morphology Changes in Hepatic Metastases (CALMCHeM) or Pseudocirrhosis Portal vein thrombosis Eosinophilic abscess/infiltration/granuloma ICI-induced hepatopathy- hepatocellular injury Reactivation of hepatitis B and C Autoimmune hepatitis Biliary adverse effects: Biliary stasis with sludge and stones- altered bile composition Biliary inflammation Sclerosing cholangitis Ischemic cholangitis Acute acalculous cholecystitis Pancreas adverse

effects: Pancreatitis Pancreatic fibrosis Pancreatic atrophy Impact on Imaging Interpretation Focal SOS and focal steatosis may mimic metastases Poor/missed detection of metastases Pseudo progression vs. true progression Take Home Points Severe hepatitis may result in cessation of immunotherapy ICI therapy may cause pseudo progression Infectious complications are common in marrow suppressionDiffuse change and focal change in liver may obscure or mimic metastases respectively

GIEE-122 ELUSIVE SPLENIC PATHOLOGY AND THE ROLE OF MR IMAGING

Nikolas Brozovich, MD (*Presenter*)
Manohar Roda, MD, MBBS (*Abstract Co-Author*)
Courtney C. Moreno, MD (*Abstract Co-Author*)
Frank H. Miller, MD (*Abstract Co-Author*)
Pardeep K. Mittal, MD (*Abstract Co-Author*)

TEACHING POINTS

Splenic pathology is often encountered in clinical practice with the majority of pathology being benign. Due to the overwhelmingly benignity of splenic lesions, familiarity with both benign and malignant pathology is often overlooked. However, accurate classification of splenic abnormalities is often imperative for patient management. Hemangiomas are most commonly encountered, while lymphoma is the most common malignant neoplasm encountered, and angiosarcoma the most common primary neoplasm encountered. An algorithmic approach will be presented to ensure accurate classification of cystic and solid splenic pathology with an emphasis on MR imaging as an essential problem solving tool for accurate diagnosis. Atypical presentation and signal characteristics of splenic lesions will also be presented.

TABLE OF CONTENTS/OUTLINE

Diagnostic algorithm and Classification of Splenic Lesions- Cystic Lesions- Infectious and Non-infectious Solid Lesions- Hypervascular and Non-hypervascular Miscellaneous lesions including congenital anomalies

GIEE-123 BEYOND THE USUAL: MRI SPECTRUM OF SMALL BOWEL OBSTRUCTION

Martin Dufwenberg, MD (*Presenter*)
Bekir Sanal, MD (*Abstract Co-Author*)
Hina Arif Tiwari, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Recognize the key features of small bowel obstruction on MRI. 2. Differentiate between common and uncommon causes of small bowel obstruction on MRI. 3. Understand the advantages and limitations of MRI in imaging small bowel obstruction when compared to CT. 4. Understand MRI protocols used when imaging small bowel obstruction.

TABLE OF CONTENTS/OUTLINE

Introduction 1. Why should we use MRI for small bowel obstruction? 2. Techniques: MR enterography vs standard MRI 3. Sequences: T2, DWI, pre- and post-contrast sequences in dynamic contrast-enhanced imaging Recognizing small bowel obstruction Key imaging findings on MRI Differential diagnosis of small bowel obstruction Case-based review of small bowel obstruction on MRI Intraluminal obstruction 1. Gallstone ileus (case showcased in pdf upload) Intrinsic to bowel wall 1. Ileo-colonic intussusception (case showcased in pdf upload) 2. Post traumatic - infected cecal hematoma (case showcased in pdf upload) 3. Colonic mass - sigmoid colon adenocarcinoma (case showcased in pdf upload) 4. Small bowel mass - duodenal adenocarcinoma 5. Inflammatory bowel disease - Crohn's stricture 6. Reactive mural edema from abscess - perforated appendicitis 7. Post-surgical stricture Extrinsic to bowel wall 1. Spigelian hernia (case showcased in pdf upload) 2. Femoral hernia 3. Umbilical hernia in pregnancy 4. Paraumbilical hernia 5. Peritoneal carcinomatosis 6. Adhesive disease - post-surgical 7. Fibrovascular band - Meckel diverticulum 8. Mass effect - metastatic mesenteric adenocarcinoma Ischemic features of small bowel obstruction 1. Bowel wall thickening 2. Hypoenhancement Pitfalls of MR in imaging small bowel obstruction Comparison to CT Conclusion References

GIEE-124 EVALUATION OF THE POST-OPERATIVE ESOPHAGUS: WHAT THE RADIOLOGIST NEEDS TO KNOW

Laura R. Carucci, MD (*Presenter*)
Mary A. Turner, MD (*Abstract Co-Author*)

TEACHING POINTS

• Esophageal surgery is not uncommon and several procedures may be encountered by radiologists • Surgery may be performed for neoplasm, reflux, hiatal hernia, stricture, diverticula, fistula, perforation, achalasia and other motility disorders • Imaging is used to define anatomy, evaluate the success of the procedure and assess for complications • Radiologists must be familiar with procedures, expected findings & potential complications for accurate diagnosis • We will explore a spectrum of post-surgical and post-treatment changes involving the esophagus

TABLE OF CONTENTS/OUTLINE

• Describe esophageal surgical procedures, review expected findings and complications following: Esophagectomy and conduits (gastric, colon, jejunum), Distal esophagectomy & gastrectomy, LINX anti-reflux procedure, Myotomy (Heller and POEM), Fundoplication and hiatal hernia repair • Review postoperative complications: Leak, dissection, fistula, stricture, hernias (including paraconduit, paraesophageal), recurrent tumor, recurrent symptoms / surgical failure • Provide technique tricks and tips and diagnostic pitfalls

GIEE-125 THE POST-OPERATIVE COLON: RECOGNIZING THE ALTERED ANATOMY, COMPLICATIONS AND PITFALLS

Laura R. Carucci, MD (*Presenter*)
Mary A. Turner, MD (*Abstract Co-Author*)

TEACHING POINTS

• Numerous articles and presentations regarding postop UGI imaging, with a relative paucity of information on postop colon imaging. Yet, colorectal surgery constitutes approximately 28% of abdominal surgeries • Radiologists must be familiar with various surgical procedures and expected postoperative findings to recognize complications • We plan to describe a variety of colonic surgical procedures and discuss the expected postoperative anatomy and imaging findings • We will review a spectrum of imaging findings of complications following colon surgery

TABLE OF CONTENTS/OUTLINE

• Indications for colon surgery: Primary colorectal cancer, malignancy secondarily involving colon, IBD, diverticular disease, fistula, volvulus, trauma • Procedures: Segmental colectomy, Right or left hemicolectomy, Subtotal colectomy, Low anterior resection, Abdominoperineal resection, Total colectomy, Ileal pouch anal anastomosis, Colostomies, mucus fistulas, reconstructions • Imaging Indications: Diagnosis of complications, Healing prior to ostomy take down, providing a GI "Roadmap" (prior surgery, trauma) • Imaging Techniques: Single contrast enema, Ostomy enema, CT, MRI. • Expected postop findings and pitfalls. Postop anatomy often difficult to accurately identify on cross-sectional imaging. • Complications: Leak, abscess, fistula, stricture, obstruction, hernia, bleeding / vascular abnormalities, rectal stump breakdown, GU injury, recurrent tumor, colostomy complications (necrosis, ulceration, stenosis, prolapse, hernia) • Thorough radiologic assessment and knowledge of expected postop anatomy and potential complications following colon surgery will help avoid misdiagnosis

GIEE-126 MORE THAN MEETS THE EYE: RADIOLOGIC INSIGHTS INTO NON-NEOPLASTIC ESOPHAGEAL DISEASE

Lucia Ortega Uribe, MD (*Presenter*)
Laura Ruiz, MD (*Abstract Co-Author*)

Daniela A. Patarroyo, MD (*Abstract Co-Author*)
Victor A. Ortega, MD (*Abstract Co-Author*)

TEACHING POINTS

Establish a basic understanding of esophageal anatomy to effectively detect and characterize abnormalities, primarily using CT imagingSeveral non-neoplastic esophageal pathologies can present as clinical emergencies, often leading to complications such as abscess formation in adjacent critical anatomic spaces. Prompt recognition and management are crucial to prevent severe outcomesReview the spectrum of imaging findings for this group of non-neoplastic esophageal diseases across multiple modalities and identify key imaging features crucial for accurate diagnosisThis presentation focused on non-neoplastic esophageal conditions commonly seen in CT imaging, recognizing their imaging features is essential to avoid confusion with other types of pathology and to ensure appropriate treatment

TABLE OF CONTENTS/OUTLINE

Anatomy : Histology, Gross anatomy.Imaging techniques : Fluoroscopy, X ray, Computed TomographyDiseases : Esophageal perforation, Foreign body, Esophagitis, Spontaneous esophageal hematoma, Killian´s diverticulum, Other diseasesConclusions : Recognition of esophageal anatomy and non-neoplastic pathology through various diagnostic imaging modalities primarily computed tomography is essential for distinguishing between different clinical contexts and ensuring appropriate treatment, particularly in potentially life-threatening conditions such as perforation, prolonged foreign body impaction, and esophageal hematomas

GIEE-127 NAVIGATING LI-RADS ULTRASOUND VISUALIZATION SCORE: HOW TO APPROACH & APPLY

Amanda C. Gibson, DO (*Presenter*)
Ahmed M. Gabr, MD, MSc (*Abstract Co-Author*)
Shuchi K. Rodgers, MD (*Abstract Co-Author*)
Mohammed A. Ismail, DO (*Abstract Co-Author*)
Cheng W. Hong, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

According to the American Association for the Study of Liver Disease (AASLD), patients with risk factors for developing hepatocellular carcinoma (HCC), chronic hepatitis B infection or cirrhosis of any cause, should undergo biannual screening with serum alpha fetoprotein and ultrasound (US) to detect HCC at an early, treatable stage. US is considered the first-line imaging modality for these at-risk patients due to its proven efficacy, accessibility, and cost effectiveness. An important facet of US surveillance is application of the Liver Imaging Reporting and Data System (LI-RADS) in order to designate a category (US-1 Negative, US-2 Subthreshold, or US-3 Positive) and a visualization score (VIS-A No or minimal limitations, VIS-B Moderate limitations, or VIS-C Severe limitations), which have important management implications. LI-RADS US Surveillance version 2024 utilizes updated terminology and management recommendations as well as tips on assigning an appropriate visualization score. Accurate utilization of LI-RADS ensures consistent communication among healthcare providers and directly influences patient management, follow-up intervals, and potential referral for advanced imaging or biopsy.

TABLE OF CONTENTS/OUTLINE

1. Explain updated terminology for LI-RADS US visualization score and management recommendations 2. Provide the rationale for assigning an appropriate US visualization score 3. List factors that affect the US visualization score 4. Review examples of VIS-A: No or minimal limitations, VIS-B: Moderate limitations, and VIS-C: Severe limitations along with correlative contrast enhanced US, CT, and MR imaging

GIEE-128 IT´S A WORMY SITUATION - RADIOLOGIC IMAGING IN ECHINOCOCCOSIS

Caroline Bestler, MD (*Presenter*)

TEACHING POINTS

Hydatid disease is a unique parasitic disease that is endemic in many parts of the world. The most common types are E. granulosus and E. mulitlocularis. Both can occur almost anywhere in the body and demonstrate a variety of imaging features that vary according to growth stage, associated complications, and affected tissue. Radiologic findings range from purely cystic lesions to a completely solid, tumor-like appearance. Ultrasound, standard X-Ray, computed tomography (CT) and magnetic resonance imaging (MRI) are the common imaging modalities in hydatid disease. Which imaging method used depends on the involved organ and the growth stage of the cyst. For both types exist Ultrasound- and CT-classification systems. Medical therapy is performed using albendazole. In the case of E. granulosus, the indication for surgery depends on the CE stage, the size, and the location of the lesion. In the case of E. multilocularis, a radical resection should always be performed whenever still possible.

TABLE OF CONTENTS/OUTLINE

1. Global distribution of echinococcosis 2. Importance of radiology in diagnosis of echinococcosis 3. Cystic echinococcosis (E. granulosus) in imaging 3.1. Cyst classification 3.2. WHO - IWGE ultrasound classification 4. Alveolar echinococcosis (E. multilocularis) in imaging 4.1. Overview 4.2. Imaging techniques 4.1.1 Ultrasound 4.1.2. CT 4.1.3. MRI 5. Complications in the context of echinococcosis 6. Case reports 7. Interdisciplinary treatment of echinococcosis at the university hospital of Würzburg 8. Discussion

GIEE-129 FLOW DISRUPTED: A REVIEW OF COMMON AND UNCOMMON HEPATIC VASCULAR DISORDERS

Wendy Qiu, MD (*Presenter*)
Mehri Manouchehr-Pour (*Abstract Co-Author*)
Shawdi Manouchehr-Pour, MD (*Abstract Co-Author*)
Evan A. Raff, MD (*Abstract Co-Author*)
Karoly Viragh, MD (*Abstract Co-Author*)
Priyanka Dube, DO (*Abstract Co-Author*)

TEACHING POINTS

Hepatic vascular diseases include a range of congenital and acquired conditions involving the liver’s vascular supply. This multiple-choice question (MCQ) based exhibit will review normal hepatic vascular anatomy, its variants, and provide a comprehensive imaging review of the spectrum of congenital and acquired hepatic vascular pathologies, associated complications, and mimics. Through clinically relevant scenarios and illustrative examples, this exhibit aims to enhance diagnostic accuracy and confidence among radiologists and health care professionals involved in the assessment and management of hepatic vascular disorders.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Anatomy: normal, variant & aberrant anatomy 3. Congenital Vascular Pathology cases: hepatic hemangioma (venous malformation), focal nodular hyperplasia, hereditary hemorrhagic telangiectasia 4. Acquired Vascular Pathology cases: cirrhosis and sequela of portal hypertension (cavernous transformation of the portal vein, porto-systemic shunts), Budd-Chiari syndrome, passive hepatic congestion, SVC obstruction 6. Complications: infection/inflammation related complication cases - thrombophlebitis (falciform ligament, pylephlebitis); transplant-related complication cases - hepatic artery stenosis/thrombosis/IVC thrombosis 7. Mimics: transient hepatic attenuation and intensity differences (THAD/THID), third inflow hepatic pseudolesions 8. Summary and conclusion

GIEE-130 WHEN ABDOMINAL IMAGING TELLS A DIFFERENT STORY: THAT SHOULDN'T BE THERE

Rodrigo S. Loto, MD (*Presenter*)
Martin M. Pesce, MD (*Abstract Co-Author*)
Victorio Del Casale, MD (*Abstract Co-Author*)
Luciano B. Lovotti, MD (*Abstract Co-Author*)
Roberto E. Elias, MD (*Abstract Co-Author*)

TEACHING POINTS

- Explain the scenarios in which the abdominal organs are not in their usual place. - Anatomical review. - Demonstrate those alterations that share the atypical location. - Key radiological points.

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An organ's abnormal positioning within the abdominal and pelvic cavities can occur due to a few key mechanisms. We propose that these mechanisms include: 1. Loss of Fixation Elements : Organs are normally held in place by various anatomical structures, such as ligaments and connective tissues. If these fixation elements are damaged or lost due to factors like surgery, injury, or congenital issues, the organ may shift from its original location. For example, trauma can lead to the tearing of ligaments, causing an organ to become mobile and susceptible to displacement. 2. Displacement : This mechanism refers to an organ moving away from its usual location. Displacement can result from increased pressure within the abdominal cavity, abnormal growth or conditions that cause organ enlargement. Extrusion of the viscera refers to the displacement or prolapse of internal organs from their normal position within the abdominal or pelvic cavity. Hernias are the most common cause of extrusion. 3. Retraction : Retraction occurs when an organ is pulled toward a certain area, often due to scar tissue or adhesions that develop from previous surgeries or chronic inflammation. The goal of this investigative review is to showcase these mechanisms through illustrative case studies that examine how various processes affect the typical positioning of abdominal and pelvic organs.Special attention will be given to the importance of early detection in cases that require urgent intervention.

GIEE-131 BUDD-CHIARI SYNDROME: IMAGING TIMELINE FOR UNRAVELLING ITS STAGES

Ashima Muttreja, MD (*Presenter*)
Donald G. Mitchell, MD (*Abstract Co-Author*)
Ashlesha S. Udare, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

To understand the pathophysiology and clinical stages of Budd Chiari Syndrome (BCS) To identify key US, CT, MR and venographic features in the different stages of BCS

TABLE OF CONTENTS/OUTLINE

Background: BCS results from primary intrinsic obstruction of the hepatic veins or suprahepatic IVC from thrombus or webs, or secondary to extrinsic compression. Symptom severity is related to the extent of hepatic vein obstruction and hepatic functional reserve. Increased hepatic sinuosoidal pressure leads to liver congestion and impaired portal venous perfusion. BCS stages and their imaging manifestations: Fulminant/Acute (<1 month): Rare fulminant presentation <1week with encephalopathy, jaundice, ascites and rapid liver failure Acute hepatic vein or IVC thrombus Heterogenous hypoenhancement +/- caudate lobe hypertrophy Subacute (1-6months) Abdominal pain and ascites Absent hepatic veins and enlargement of accessory hepatic veins Peripheral abnormal liver signal and enhancement Caudate lobe hypertrophy compressing the IVC Intrahepatic comma shaped collaterals Portal hypertension with portosystemic collaterals Spiderweb collateral veins on catheter venography Chronic(>6months) Peripheral hepatic atrophy increased in early and late enhancement Development of FNH-like nodules (no malignant potential) Increased risk of HCC Possible portal vein thrombus +/- findings in subacute stage Management implications: Fulminant and Acute: anticoagulation, thrombectomy Subacute: Venoplasty, stents Chronic: Shunts, TIPS, liver transplantation Conclusion: The imaging features of BCS depend on the stage of disease and affect management.

GIEE-132 ACUTE GALLBLADDER PATHOLOGIES BEYOND UNCOMPLICATED CHOLECYSTITIS

William Wei, MD (*Presenter*)
Gavin M. Sugrue, MBBCh (*Abstract Co-Author*)
Shamir Rai, MD (*Abstract Co-Author*)
Nicolas Murray, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

Radiologists must recognise acute gallbladder entities beyond uncomplicated cholecystitis. Imaging dictates timely management. Ultrasound is first-line. CT and MRI/MRCP refine calculus detection, mural perfusion and complication staging. Red-flag complications demand urgent surgical or percutaneous intervention. These include gangrenous/emphysematous cholecystitis, hemorrhage, perforation, fistula formation, and volvulus. Cross-sectional imaging distinguishes mimickers masquerading as inflammation, including gallbladder carcinoma and cystic artery pseudoaneurysm. A structured checklist, such as stone, wall, lumen, pericholecystic fat, vascularity, ducts/bowel, can boost diagnostic accuracy and outcomes.

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1 Introduction & Epidemiology 2 Calculous Disease - Cholelithiasis - Acute uncomplicated cholecystitis 3 Inflammatory Complications - Gangrenous - Emphysematous - Hemorrhagic 4 Structural Complications - Perforation - Mirizzi syndrome - Fistulas - Gallstone ileus & Bouveret syndrome 5 Anatomic Displacements - Gallbladder herniation - Gallbladder volvulus 6 Vascular Complications - Cystic artery pseudoaneurysm - Ischemia & portal venous thrombosis 7 Neoplastic Mimic - Gallbladder carcinoma 8 Traumatic Injuries 9 Management Pearls & Future Directions

GIEE-133 GASTRIC ADENOCARCINOMA: THE RADIOLOGIST'S PERSPECTIVE

Abel Gonzalez Huete, MD (*Presenter*)

TEACHING POINTS

To understand the pathological basis and imaging characteristics of gastric adenocarcinoma. To review current imaging protocols and techniques for the detection and staging of gastric cancer. To illustrate key imaging features relevant to tumor characterization and accurate staging. To highlight the radiologist's role in assessing locoregional and distant disease spread.

TABLE OF CONTENTS/OUTLINE

Introduction : Pathologic classification, epidemiology, and risk factors Imaging modalities : Endoscopy, Endoscopic Ultrasound (EUS), CT, MRI, and PET-CT. Strengths and limitations of each modality. CT technique and gastric distension protocol. Detection : Typical imaging patterns and potential complications. Staging : Application of the TNM classification with emphasis on imaging criteria and correlation with histopathology. T stage : T1a, T1b, T2, T3, T4a, T4b. N stage Regional lymph nodes (perigastric and extraperigastric) M stage : Non-regional lymph nodes, hematogenous spread, and transperitoneal dissemination Extramural venous invasion (EVI) : Definition, imaging signs, classification types, and prognostic implications. Conclusion References

GIEE-134 PATTERNS OF LYMPHATIC SPREAD OF MALIGNANCIES IN THE ABDOMEN AND PELVIS

Michael H. Lanier, MD, PhD (*Presenter*)
Tyler J. Fraum, MD (*Abstract Co-Author*)
Mark J. Hoegger, MD, PhD (*Abstract Co-Author*)
Malak Itani, MD (*Abstract Co-Author*)
Katerina Konstantinoff, MD (*Abstract Co-Author*)
Daniel R. Ludwig, MD (*Abstract Co-Author*)
Amanda L. Mehrsheikh, MD (*Abstract Co-Author*)
Vincent M. Mellnick, MD (*Abstract Co-Author*)
Nathan P. Skinner, MD, PhD (*Abstract Co-Author*)
Grant Yoneoka, MD (*Abstract Co-Author*)
Anup S. Shetty, MD (*Abstract Co-Author*)

TEACHING POINTS

Lymphadenopathy has important staging implications for patients with cancer. Additionally, identification of lymphadenopathy on imaging may be the first finding of malignancy. Lymphatic spread of disease typically follows a predictable pattern based on drainage anatomy. Radiologists can use these patterns not only to provide important staging information but also to help identify the primary neoplasm when lymphadenopathy is the initial imaging finding. This exhibit will: 1) Illustrate normal lymphatic drainage anatomy and normal lymph node morphology. 2) Describe typical pathways of lymphatic spread of gastrointestinal and genitourinary cancers to help develop tailored search patterns for specific malignancies. 3) Discuss staging importance of identifying regional versus non-regional lymph nodes. 4) Cover common pitfalls and overcalls.

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1) The role of diagnostic imaging in cancer nodal staging. 2) Normal lymphatic drainage anatomy and lymph node morphology. 3) Disease-specific patterns of lymphadenopathy for genitourinary and gastrointestinal, including hepatobiliary, malignancies. 4) Working backward: identifying the primary location of disease when lymphadenopathy is the initial imaging finding. 5) Common pitfalls and overcalls: periportal, foramen of Winslow, celiac ganglion, inguinal lymph nodes.

GIEE-135 CONTRAST ENHANCED ULTRASOUND IS EXCELLENT FOR IMAGING GALLBLADDER AND BILE DUCTS PATHOLOGY

Demosthenes D. Cokkinos, MD, PhD (*Presenter*)
Stefanou Danai-Eleni, MD,MSc (*Abstract Co-Author*)
Panagiotis Koutsogeorgas (*Abstract Co-Author*)

TEACHING POINTS

To explain the use of Contrast Enhanced Ultrasound (CEUS) in imaging gallbladder and bile ducts pathology. To review indications, imaging findings, limitation and pitfalls. To study the way in which CEUS increases the diagnostic value of baseline, unenhanced US.

TABLE OF CONTENTS/OUTLINE

Basic knowledge of US contrast agents is refreshed. Pathology in the gallbladder and bile ducts with indication for CEUS is outlined. Various indications for CEUS of the gallbladder include elucidating normal variants, differentiating dense biliary sludge from polyps and cancer, assessment of cholecystitis, hepatitis, abscess and wall rupture. Benign lesions as adenomyomatosis are also imaged. CEUS of the biliary tree is useful for distinguishing sludge from intraluminal masses, as well as detecting and characterising cholangiocarcinoma and intrahepatic metastases. All pathological entities are explained with imaging findings on CEUS, correlated with CT or MR when these were performed. CEUS findings are compared to those of baseline, unenhanced US to assess the increase in US diagnostic value post contrast injection.

GIEE-136 JUST ANOTHER CYST OR A HIDDEN PDAC? A PRIMER ON DETECTING MALIGNANCY IN FOLLOW UP OF PANCREATIC CYSTS

Praveen V. Polamraju, MD (*Presenter*)
Naveen Rajamohan, MD,MBBS (*Abstract Co-Author*)
Hala A. Khasawneh, MBBS (*Abstract Co-Author*)
Venkata Gopala Rao Kodali (*Abstract Co-Author*)
Gaurav Khatri, MD (*Abstract Co-Author*)
Ravi K. Kaza, MD (*Abstract Co-Author*)

TEACHING POINTS

• While the majority of pancreatic cystic lesions are benign, it is crucial to identify suspicious features given high mortality rates of pancreatic malignancy, especially adenocarcinoma (PDAC).• Pancreatic cystic lesions with malignant risk include intraductal papillary mucinous neoplasms, mucinous neoplasm, cystic metastases, and cystic pancreatic neuroendocrine tumors.• Identifying “worrisome features” and “high-risk stigmata” with Kyoto guidelines can lead to earlier detection of pancreatic adenocarcinoma.• Patients with intraductal papillary mucinous neoplasms are at higher risk for developing malignancy within the cyst and distant from the cyst in normal appearing pancreas.

TABLE OF CONTENTS/OUTLINE

• Introduction a. Imaging features of various types of pancreatic cystic lesions b. Highlights and pitfalls of Kyoto guidelines with highlights of key differences from prior guidelines • Cases highlighting pancreatic malignancy on follow up of pancreatic cystic lesions a. New “worrisome features” or “high-risk stigmata” b. New synchronous pancreatic adenocarcinoma c. Pitfalls in detecting occult pancreatic malignancy in high-risk patients, including atypical pancreatitis cases • Management of suspicious pancreatic cystic lesions with multidisciplinary approach a. Correlation of high-risk pancreatic cystic lesions with endoscopic ultrasound, operative findings, and pathology • Conclusions a. Vigilance on surveillance exams can lead prompt management and improved patient outcomes

GIEE-137 CYSTIC DUCT ESSENTIALS: WHAT RADIOLOGISTS NEED TO KNOW

Nanjiba Nawaz, MD (*Presenter*)
Ali Agely, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Identify the normal anatomy and common variants of the cystic duct with their surgical and diagnostic implications. 2. Describe the imaging features of key cystic duct pathologies across multiple modalities. 3. Explain the role of interventions in managing cystic duct disorders to guide radiologic reporting for optimal treatment planning. 4. Recognize postoperative appearances and complications of the cystic duct to differentiate normal from abnormal findings. 5. Apply strategies to avoid diagnostic pitfalls for enhanced diagnostic accuracy.

TABLE OF CONTENTS/OUTLINE

Introduction Normal Cystic Duct Anatomy Anatomic Variants Clinical Significance of Variants Calculus disease pre-cholecystctomy, Mirizzi syndrome Calculus disease post-cholecystectomy, complications Malignancy Inflammatory conditions

GIEE-138 ABDOMINAL FIBROMATOSIS: MULTIMODALITY IMAGING INSIGHTS INTO A CHALLENGING ABDOMINAL MIMICKER

Max Andresen III, MD (*Presenter*)
Cristian Varela, MD (*Abstract Co-Author*)
Maria J. Baladron, MD (*Abstract Co-Author*)
Ignacio Maldonado, MD (*Abstract Co-Author*)
Rocio Macarena Castro Venegas, MD (*Abstract Co-Author*)

TEACHING POINTS

• Review the imaging features of abdominal fibromatosis in multimodality imaging, including US, CT, MRI, and PET-CT.• Provide a case-based review of the typical and atypical abdominal fibromatosis presentations.• Highlight the fundamental role of imaging in diagnosis and assessing the disease's extent.• Emphasize the importance of recognizing abdominal fibromatosis and its potential to mimic other abdominal pathologies.• Outline the main risk factors associated with the development of abdominal fibromatosis.

TABLE OF CONTENTS/OUTLINE

• Overview of abdominal fibromatosis: clinical presentation, types, pathophysiology, epidemiology, and risk factors.• Multimodality imaging presentation of abdominal fibromatosis: case-based review of imaging features in US, CT, MRI, and PET-CT, highlighting typical and atypical manifestations.• Key differential diagnoses and significant diagnostic challenges in abdominal fibromatosis.• The role of imaging in the management and treatment assessment of abdominal fibromatosis.

GIEE-139 INFLAMED AND MISNAMED: A REVIEW OF APPENDICEAL PATHOLOGY OFF THE BEATEN PATH

Newton V. Nagirimadugu, MD (*Presenter*)
Yayone Rivaud, MD (*Abstract Co-Author*)
Melkamu D. Adeb, MD (*Abstract Co-Author*)

TEACHING POINTS

Appendiceal pathologies can be neoplastic or non-neoplastic. Neoplastic pathologies include LAMN, HAMN, appendiceal adenocarcinoma, neuroendocrine tumor (NET), lymphoma, and stromal tumors. Non-neoplastic pathologies include inflammation (e.g., acute appendicitis, stump appendicitis), inverted appendix, diverticulosis, endometriosis, IBD, and distal intestinal obstruction syndrome (DIOS). LAMN and HAMN often present with a thin-walled appendix containing low-attenuation mucin and may have calcifications or pseudomyxoma peritonei. Appendiceal NETs are typically incidental, mildly enhancing, and usually do not cause dilation; Ga-68 Dotatate PET can assist in diagnosis. Inverted appendix and endometriosis may mimic neoplasms or inflammation. DIOS in cystic fibrosis may cause an enlarged appendix with thick mucinous fecal material mimicking appendicitis. Non-appendiceal conditions like Crohn's disease, ovarian pathology, and hydrosalpinx may mimic appendiceal disease. Radiologists should understand the imaging workup of appendiceal pathologies, provide appropriate differentials, and distinguish mimics.

TABLE OF CONTENTS/OUTLINE

1. Overview of appendiceal pathology 2. Imaging (US, CT, MRI) strengths and limitations 3. Appendiceal pathologies Inflammation Acute appendicitis (uncomplicated, perforated, with abscess) Chronic/recurrent appendicitis Stump appendicitis Special considerations: pregnancy, pediatrics Neoplasms (with rad-path correlation) LAMN HAMN Adenocarcinoma Goblet cell carcinoma Neuroendocrine tumor Lymphoma Stromal tumors Other pathologies Endometriosis Inverted appendix DIOS Mimics Crohn’s disease Ovarian pathology Hydrosalpinx

GIEE-140 MASTERING FLUOROSCOPIC DEFECOGRAPHY: ANATOMY, TECHNIQUE AND DIAGNOSIS

Maria Isabel Leon Garcia, MD (*Presenter*)
Lourdes M. Avila, MD (*Abstract Co-Author*)

TEACHING POINTS

To review pelvic floor anatomy and illustrate the step-by-step fluoroscopic defecography protocol, including contrast materials, patient preparation, and positioning. To identify and analyze key radiographic landmarks, lines, angles, and measurements essential for diagnosing defecatory disorders such as incontinence, rectocele, intussusception and proctocele.

TABLE OF CONTENTS/OUTLINE

Overview of pelvic floor anatomy relevant to defecography Detailed protocol for fluoroscopic defecography: contrast agents, technique and patient instructions Anatomical findings and dynamic sequences during defecation Radiologic criteria and measurements for common pelvic floor disorders such as: Incontinence, Rectocele, Intussusception and Proctocele Case-based examples with annotated fluoroscopic images Practical tips and pitfalls in image interpretation

GIEE-141 BEYOND THE BASICS: ATYPICAL PRESENTATIONS AND PITFALLS IN PANCREATIC TUMOR IMAGING

Eisuke Mukaida, MD (*Presenter*)
Akio Tamura, MD (*Abstract Co-Author*)
Jun Obara, MD (*Abstract Co-Author*)
Kunihiro Yoshioka, MD (*Abstract Co-Author*)

TEACHING POINTS

Imaging diagnosis of pancreatic tumors requires an integrated evaluation of multiple factors, including patient age, sex, tumor location, vascular characteristics, internal structure, and the clinical course.This study reviews the imaging characteristics of major pancreatic neoplasms, including pancreatic cancer, IPMN, and SPN with particular emphasis on the following three aspects:

TABLE OF CONTENTS/OUTLINE

Table of Contents: 1. Reaffirming typical imaging findings: Enhancing the ability to accurately recognize characteristic tumor features. 2. Introducing atypical presentations: Showcasing cases that are commonly misdiagnosed in clinical practice. 3. Strategies to avoid diagnostic pitfalls: Highlighting key points to reduce misinterpretation, especially in distinguishing uncinate process tumors from extrapancreatic lesions. Outline: Pancreatic tumors encompass a range of histological types and origins, each with varied imaging findings. Accurate diagnosis is critical for determining treatment strategies. However, the risk of misdiagnosis depends on the tumor location, blood flow, and relationships with the surrounding organs, underscoring the importance of understanding the pitfalls and atypical presentations.This exhibition aims to reaffirm the typical features of various pancreatic tumors, present atypical cases encountered in clinical practice, and share perspectives to avoid misdiagnoses. Additionally, it references the 2019 WHO classification, which has renewed focus on PanIN, and the updated 2023 clinical guidelines for IPMN, to help organize and convey the latest knowledge.

GIEE-142 FLUOROSCOPY REVISITED: PICTORIAL INSIGHTS AND ITS ROLE IN POST-OPERATIVE ONCOLOGIC IMAGING

Sunil Kumar Puri, MD (*Presenter*)
Jitin Goyal, MBBS (*Abstract Co-Author*)
Prerna Garg, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Management of neck and gastro-oesophageal cancer involves surgery, in resectable cases and radiation either as primary or in adjuvant settings. Both can cause post treatment complications causing distress in the patient upsetting aftercare. 2. Interpretation of these complications needs adequate insight to the surgical steps on part of the reading radiologist, especially the site of anastomosis, which in majority is the culprit zone of leak. 3. Anastomotic leak causing respiratory distress, pulmonary complications and superadded infections in neck collection are factors responsible for post-surgical morbidity and mortality. 4. Barium is more sensitive than water soluble contrast for depiction of GI fistula due to inherent hyperosmolarity in later causing osmotic flux and dilution in bowel tract. 5. Instances when extraintestinal or possible vascular communication (life threatening embolization with barium) is suspected on clinical grounds, use of water-soluble contrast is advocated. 6. With regards to mediastinal aero-digestive tract this consensus is reversed due to adverse risk of pulmonary edema by ionic water-soluble contrast. 7. Cross-sectional imaging with computed tomography (CT) is less sensitive for direct visualization and assessment of fistulas in neck and upper gastro-intestinal tract, though extraluminal information conveyed by CT is unmatched.

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Clinical cases with combined fluoroscopy and cross-sectional imaging in post treated cases of carcinoma of: Supra-glottis Glottis Hypo-pharynx Oesophagus Stomach

GIEE-143 BETTER TOGETHER: IMPROVING CLINICAL CARE THROUGH DIRECT GASTROENTEROLOGY AND RADIOLOGY COLLABORATION

Anup S. Shetty, MD (*Presenter*)
Vincent M. Mellnick, MD (*Abstract Co-Author*)
Richard Tsai, MD (*Abstract Co-Author*)

Tyler J. Fraum, MD (*Abstract Co-Author*)
Daniel R. Ludwig, MD (*Abstract Co-Author*)

TEACHING POINTS

Fragmentation of care and rising clinical volumes have reduced direct consultation between radiologists and gastroenterologists. Image evaluation without appropriate clinical context can result in less targeted and useful interpretations that do not address the "real" clinical question or lead to clinically unnecessary or even harmful invasive investigations. Through a series of case discussions, this exhibit illustrates how bi-directional collaboration between gastroenterologists and radiologists helps the radiologist provide more specific and accurate diagnoses and expand the differential diagnosis when appropriate. It will also highlight how interpretations can be tailored to the clinical scenario, particularly as patients may now routinely read their own reports. This exhibit will: 1) Describe the benefits of GI-radiology collaboration from the perspectives of both the gastroenterologist and the radiologist 2) Highlight instances in which this collaboration is essential for accurate imaging interpretation and appropriate clinical management 3) Illustrate this collaborative process for evaluating and managing complex patients through a series of cases

TABLE OF CONTENTS/OUTLINE

- GI/radiology collaboration: how we are better together? - Settings and circumstances: informal consultation, multidisciplinary conferences, intraprocedural consultation - A wish list: GI recommendations for more useful radiologic interpretations - Case illustrations: inflammatory pancreaticobiliary disease, bile leaks, indeterminate liver lesions, GI malignancies, active bleeding, outside imaging second opinion consultations, brokering differing opinions among consulting services

GIEE-144 PEARLS AND PITFALLS OF THE LI-RADS V2024 CT/MRI RADIATION TREATMENT RESPONSE ALGORITHM

Ava Mirtsching, MD (*Presenter*)
Kethan Lala (*Abstract Co-Author*)
Hala A. Khasawneh, MBBS (*Abstract Co-Author*)
Takeshi Yokoo, MD, PhD (*Abstract Co-Author*)
Gaurav Khatri, MD (*Abstract Co-Author*)
Mishal Mendiratta-Lala, MD (*Abstract Co-Author*)

TEACHING POINTS

• Updated LI-RADS 2024 CT/MRI Radiation Treatment Response Algorithm (TRA) provides succinct criteria for determining tumor viability and emphasizes interval change assessment. • Accounts for expected post radiation changes: persistent arterial phase masslike hyperenhancement, peri-tumoral perfusion.• Introducing LR-TR nonprogressing replacing LR-TR equivocal for radiation-based locoregional therapies (LRTs).• Viability defined by masslike enhancement on any postcontrast phase.• Use of ancillary features to identify LR-TR viable observations that would not have been captured using the 2017 criteria.• TRA is applicable for HCC and LR-M observations after radiation-based LRTs.

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1. LI-RADS 2024 Radiation TRA Criteria.- LR-TR nonprogressing vs LR-TR equivocal.- Presence vs absence of masslike enhancement.- Optional ancillary features for tumor viability: DWI, T2w-signal intensity.2. Pearls/Pitfalls in application of the 2024 Radiation TRA.- Measurement of masslike enhancement: single dimension.- Categorizing cases where unable to delineate treated observations from surrounding parenchymal changes.- Cases when unsure of posttreatment change or tumor viability.- Must exclude increase in size of masslike enhancement prior to categorizing as LR-TR nonprogressing.- Utility of DWI images for detecting early LR-TR viable.- Utility of peri-procedural images to assess response.- Combination of both radiation based and non-radiation based LRTs.

GIEE-145 BRIDGING THE GAP: IMAGING OF LUMEN APPOSING METALLIC STENTS

Ananya Panda, MD, MBBS (*Presenter*)
Maheen Rajput, MD (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Gilles Hoilat, MD (*Abstract Co-Author*)
Munish Ashat (*Abstract Co-Author*)
Rami El Abiad (*Abstract Co-Author*)

TEACHING POINTS

1. To describe technique and imaging of lumen apposing metallic stents (LAMS) in management of pancreatitis 2. To discuss techniques and imaging appearances of LAMS in other novel indications 3. To review imaging of complications of LAMS

TABLE OF CONTENTS/OUTLINE

Lumen Apposing Metallic Stent (LAMS) acts as a bridge between two body cavities. It was initially devised for pancreatic fluid collections and walled off necrosis. Now, the uses have become diverse and innovative. The exhibit will: 1) Describe endoscopic techniques and imaging appearances of LAMS for the following established and emerging indications: (A) Management of peripancreatic fluid collections: Cyst-gastrostomy , Cyst-duodenostomy, Cyst-esophagostomy (B) Endoscopic Ultrasound Directed transGastric ERCP (EDGE) procedure for Roux-en-Y gastric bypass reversal prior to ERCP and other endoscopic procedures (C) Reversal of vertical banded gastroplasty for obstructive symptoms (D) Gastro-enterostomy (E) Choledocho-duodenostomy (F) Trans-gallbladder drainage: Cholecysto-duodenostomy, Cholecysto-gastrostomy (G) Trans-gastric hepatic drainage (H) Drainage of other post-operative collections (I) Treatment of benign enteric strictures 2) Review imaging appearances of complications of LAMS: (A) Misdeployment (B) Perforation (C) Bleeding (D) Migration (E) Buried LAMS (F) Occlusion (G) Infection (H) Bowel Obstruction (I): Fistula

GIEE-146 INFILTRATIVE HEPATOCELLULAR CARCINOMA: THE HIDDEN GIANT

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Lara Quiche, MD (*Abstract Co-Author*)
Thiago M. Baraviera, MD (*Abstract Co-Author*)
Cassia F. Tridente, MD (*Abstract Co-Author*)
Thais Mussi, MD, PhD (*Abstract Co-Author*)
Ronaldo H. Baroni, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- Infiltrative hepatocellular carcinoma (HCC) often lacks a defined mass and classic enhancement patterns, which makes its diagnosis particularly challenging. - Tumor thrombus in the portal vein is a critical imaging finding that should raise suspicion of infiltrative HCC. - MRI, particularly with diffusion-weighted imaging (DWI) and T2-weighted sequences, significantly improves diagnostic accuracy. - Infiltrative liver lesions that do not meet the criteria for LR-5 or LR-TIV are classified as LR-M under the LI-RADS system. - Although LR-M includes metastases and cholangiocarcinoma in the differential diagnosis, many of these cases may represent infiltrative HCC. - Recognizing the infiltrative pattern is crucial for avoiding unnecessary biopsies and ensuring appropriate management. - Differential diagnosis includes hepatic metastases, confluent fibrosis, intrahepatic and cholangiocarcinoma.

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Background and Epidemiology. Pathophysiology and Imaging Challenges. CT and MRI Findings: - Absence of mass formation; - Vascular patterns and tumor thrombus; - Role of Diffusion-Weighted and T2-Weighted sequences. LI-RADS Classification. - Case-Based Review: Disease Extent; Common Complications. Differential Diagnosis Take-Home Messages

GIEE-147 COLORECTAL LIVER METASTASES: IMAGING STRATEGIES FOR DIAGNOSIS, LOCAL TREATMENT PLANNING AND SYSTEMIC TREATMENT RESPONSE

Arya Kermanshah (*Presenter*)
Arinc Ozturk, MD (*Abstract Co-Author*)
Jacobo Alvo, MD (*Abstract Co-Author*)
Francesco Alessandrino, MD (*Abstract Co-Author*)

TEACHING POINTS

? Review current imaging guidelines for colorectal liver metastasis (CRLM) ? Describe the imaging features of CRLM before and after systemic and locoregional treatment ? Recognize essentials for treatment planning ? Outline optimal imaging strategies and highlight emerging technologies

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Representative imaging examples will be provided for each section. 1. Imaging Guidelines ? Role of: CT; MRI with hepatobiliary vs extracellular agent; PET/CT (NCCN, ACR, ESGAR guidelines) 2. Primary CRLM ? Adenocarcinoma not otherwise specified: central necrosis, rim enhancement, desmoplasia, DWI positivity ? Mucinous adenocarcinoma: cystic-like morphology, peripheral rim enhancement, DWI negativity ? Growth patterns: capsulated, pushing, infiltrative 3. CRLM after systemic treatment ? Expected morphologic changes and how to interpret them? Tumor response criteria: - i. Chun criteria: attenuation, lesion-liver interface, rim enhancement - ii. RECIST 1.1 - iii. mRECIST ? Role of DWI-ADC values and correlation with tumor regression grade 4. Considerations for surgery and locoregional therapies ? Chemotherapy-related liver changes (e.g., steatosis, sinusoidal obstruction syndrome), vascular hepatic anatomy assessment, how to identify CRLM in a treated liver ? Relevant tips to identify recurrence after surgery and locoregional therapies 5. Optimal Imaging Strategies and Emerging Technologies ? From the PROMETEO-01 study to the CAMINO trial: evidence from the literature ? MRI ECA vs MRI HBP + DWI vs CT vs FDG PET/CT: which clinical scenario for each modality (with case examples) ? Emerging Technologies: when/how ctDNA aids in imaging interpretation, radiomics; artificial intelligence

GIEE-148 THE DARK SIDE OF PERIANAL MRI: MIMICS THAT CHALLENGE DIAGNOSIS

Michelle Estefania Gonzalez Cordova, MD (*Presenter*)
Rocio Gutierrez Rodriguez, MD (*Abstract Co-Author*)
Pablo V. Gil-Nagel Rodriguez, MD (*Abstract Co-Author*)
Donna Zhan Chen, MD (*Abstract Co-Author*)
Jose Carlos Garcia-Gil Garcia, MBBCh (*Abstract Co-Author*)
Lourdes del Campo, PhD (*Abstract Co-Author*)

TEACHING POINTS

To review the anatomy of the anal canal, perianal region, and pelvis for accurate disease localization.To identify imaging features that suggest mimickers of fistulizing disease or associated underlying pathology.

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There is a wide range of entities that could affect perianal regions, including benign and malignant processes. Although medical history and physical examination remain fundamental in guiding the diagnosis, imaging studies play a crucial role to provide a reliable differential diagnosis and accurate localization of the disease, for which a comprehensive knowledge of anatomy is essential. Magnetic resonance imaging (MRI) may also demonstrate pathological findings that mimic true fistulous tracts, which represents a diagnostic challenge with significant clinical implications. Common fistula mimickers include pilonidal and retrorectal cyst, perianal hidradenitis suppurativa, hemorrhoids, postsurgical scars, as well as iatrogenic or traumatic lesions, and perianal neoplastic masses. Fistula MRIs from the past three years were reviewed, compiling the cases and analyzing the pathological anatomy of the identified lesions.

GIEE-149 MRI FEATURES OF FONTAN-ASSOCIATED LIVER DISEASE

Michinobu Nagao, MD, PhD (*Presenter*)
Atsushi Yamamoto, MD, PhD (*Abstract Co-Author*)
Akihiro Inoue, MD (*Abstract Co-Author*)
Reiko Sakai (*Abstract Co-Author*)
Satoru Morita, MD, PhD (*Abstract Co-Author*)
Kei Inai (*Abstract Co-Author*)
Masami Yoneyama (*Abstract Co-Author*)
Shuji Sakai, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Although the results of Fontan procedure have been improving, it is known that arrhythmia, thromboembolism, heart failure, liver cirrhosis, and other systemic organ failure may occur over the long-term course. In particular, liver complications are called Fontan-associated liver disease (FALD), which not infrequently progresses to cirrhosis and hepatocellular carcinoma (HCC), and is reported to be associated with high mortality. Gd-EOB-DTPA MRI has the advantage of simultaneously screening for HCC and evaluating liver damage, and is suitable for follow-up of young patients because of the lack of X-ray exposure. In the Gd-EOB-DTPA hepatocyte phase, reticular low intensity mainly in the peripheral regions of the liver and decreased signal ratio of liver to spleen are characteristic findings reflecting FALD pathologies. HCC on FALD often shows high signal in the hepatocyte phase with no washout in the venous phase and no significant contrast effect in the arterial phase. FALD-occurring HCCs have a tendency toward slow enlargement, the development of partial low-signal areas in the hepatocyte phase, and diffusion restriction, which distinguish them from focal nodular hyperplasia (FNH)-like lesions. Recently, MR lymphangiography to noninvasively delineate lymphatic congestion occurring in FALD and cardiac MRI to analyze hepatic T1 map and hepatic strain for the assessment of liver fibrosis have been reported. We discuss upcoming MRI imaging and analytic technology, and introduces their clinical applications.

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1) Gd-EOB-DTPA MRI features of FALD. 2) Differentiation between HCC and FNH-like lesion. 3) MR lymphagiography. 4) Cardiac MRI applications

GIEE-150 PROBING THE PERIPORTAL SPACE

Galib Mirza Nasirul Islam, MBBS (*Presenter*)
Ananya Panda, MD, MBBS (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Maria Zulfiqar, MD, MBBS (*Abstract Co-Author*)
Victoria Chernyak, MD, MS (*Abstract Co-Author*)
Leonardo G. Marcelino, MD (*Abstract Co-Author*)
Mahan Mathur, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To discuss the anatomy of periportal space (PPS) 2. To describe role of imaging in evaluation of PPS and its pathologies 3. To review imaging findings in pathologies affecting PPS

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The PPS is a potential space surrounding the intrahepatic portal vein and its intrahepatic branches. It extends from the porta hepatis throughout both hepatic lobes, The exhibit includes conditions which are affect the periportal space.Vascular • Portal vein: Periportal venous collaterals • Hepatic artery: Hereditary hemorrhagic, telangiectasia, pseudoaneurysm, segmental arterial mediolysis Infectious/Inflammatory • IgG4?• Sarcoidosis• Schistosomiasis • Hemophagocytic lymphohistiocystosis Biliary •Peribiliary cysts • Primary biliary cirrhosis Tumors Primary •Cholangiocarcinoma ?•Chloroma? •Lymphoma & Post-transplant lymphoproliferative disorder •Langerhans cell histiocytosis •Erdheim-Chester disease ?•Multiple myeloma •Neurofibromatosis •Schwannoma? •Kaposi? sarcoma •Inflammatory pseudotumor? Secondary •Hepatocellular carcinoma? •Hepatoblastoma? •Gall bladder cancer?•Peritoneal carcinomatosis? •Pseudomyxoma? peritonei •Contiguous spread? from other

malignancies •Metastatic calcification Miscellaneous •Extramedullary hematopoiesis? •Periportal fibrosis in cystic fibrosis? Mimics of PPS pathologies •Periportal edema? •Enlarged periportal space •Periportal steatosis •Periportal iron deposition

GIEE-151 BENIGN LIVER TUMORS AND TUMOR-LIKE LESIONS: CROSS-SECTIONAL IMAGING SPECTRUM

Nariman Khan, MD (*Presenter*)
Nathaniel Gill (*Abstract Co-Author*)
Arun Parameswaran (*Abstract Co-Author*)
Anil K. Dasyam, MD (*Abstract Co-Author*)
Amir Borhani, MD (*Abstract Co-Author*)
Narayan Lath, MBBS, FRCR (*Abstract Co-Author*)
Alia Nazarullah (*Abstract Co-Author*)
Venkata S. Katabathina, MD (*Abstract Co-Author*)

TEACHING POINTS

List benign liver tumors and tumor-like lesions in normal, steatotic, and cirrhotic livers Describe imaging spectrum of typical and atypical hemangiomas, focal nodular hyperplasia (FNH), and hepatocellular adenomas (HCAs) Discuss imaging findings of tumor-like lesions in steatotic liver benign lesions & pseudo lesions in cirrhotic liver Discuss role of imaging in detection & management of benign liver lesions

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Introduction Classification: Hepatocellular, cholangiocellular, mesenchymal, mesenchymal tumors & tumor-like lesions Imaging techniques & role of Eovist contrast HCAs: Inflammatory, steatotic, beta-catenin mutated, unclassified & novel types FNH: typical & atypical findings Hemangiomas: Classic, atypical & rare Hepatic cysts Biliary hamartomas Peribiliary cyst/Caroli's disease Focal fat deposition/focal fat sparing Angiomyolipoma & Lipoma Peliosis hepatis Inflammatory pseudotumors Iatrogenic pseudotumors: treatment-related effects, retractor injury & surgical defects Benign Lesions in Cirrhosis: peribiliary cysts/hepatic cysts, hemangiomas, regenerating/dysplastic nodules, FNH-Like lesions, third inflow causing perfusion defects, THIDs/THADs, AV shunts, confluent hepatic fibrosis, focal fat sparing, nodular regenerating hyperplasia (NRH)Imaging plays a pivotal role in differentials benign liver lesions & pseudo lesions from malignancy; this helps to avoid unnecessary aggressive therapies. MRI with Eovist contrast is very helpful in characterizing benign liver masses and pseudo masses.

GIEE-152 RARE EPITHELIAL PANCREATIC TUMORS

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Camila Lopes Vendrami, MD (*Abstract Co-Author*)
Komal A. Chughtai, MD (*Abstract Co-Author*)
Kelsey McHugh (*Abstract Co-Author*)
Motoyo Yano, MD, PhD (*Abstract Co-Author*)
Pardeep K. Mittal, MD (*Abstract Co-Author*)
David Escobar, MD,PhD (*Abstract Co-Author*)
Nancy A. Hammond, MD (*Abstract Co-Author*)
Frank H. Miller, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Provide a broad overview of the rare epithelial pancreatic tumors 2. Review the radiology-pathology classification of these tumors 3. Knowledge of some of the unique imaging and clinical features of these tumors that assist in their diagnosis

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This focus of this exhibit will be the uncommon epithelial pancreatic tumors that together account for less than 10% of all pancreatic neoplasms. We will not discuss the common tumors such as pancreatic ductal adenocarcinoma (PDAC), pancreatic neuroendocrine tumor (PNET) or intraductal pancreatic mucous tumor. 1. Introduction 2. Pathological classification of rare epithelial tumors a. Benign epithelial tumors: including mixed serous-neuroendocrine tumor, intraductal oncocytic neoplasm tumors. b. Variants of PDAC: including colloid, adenosquamous, signet ring cell, medullary, hepatoid carcinomas c. Variants of PNET: including oncocytic PNET, mixed acinar-neuroendocrine carcinoma d. Other malignant epithelial tumors: including acinar cell cancer, pancreatoblastoma 3. Radiology-pathology correlation of these tumors 4. Unique imaging appearances and clinical features that help in the diagnosis of some of these cases 5. Conclusion/Take home points

GIEE-153 RARE NONEPITHELIAL PANCREATIC TUMORS

Kumaresan Sandrasegaran, MD (*Presenter*)
Komal A. Chughtai, MD (*Abstract Co-Author*)
Camila Lopes Vendrami, MD (*Abstract Co-Author*)
Kelsey McHugh (*Abstract Co-Author*)
Motoyo Yano, MD, PhD (*Abstract Co-Author*)
Pardeep K. Mittal, MD (*Abstract Co-Author*)
Nancy A. Hammond, MD (*Abstract Co-Author*)
David Escobar, MD,PhD (*Abstract Co-Author*)
Frank H. Miller, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Provide a broad overview of the nonepithelial pancreatic tumors 2. Review the radiology-pathology classification of these tumors 3. Knowledge of some of the unique imaging and clinical features of these tumors that help to identify them

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1. Introduction 2. Pathological classification of nonepithelial tumors a. Benign / borderline nonepithelial tumors: including neurogenic tumors, pancreatic dermoid, inflammatory myofibroblastic tumor, solitary fibrous tumor, PEComa b. Malignant nonepithelial tumors: including Ewing sarcoma, pancreatic GI stromal tumor c. Hematologic malignancies: including lymphoma, granulocytic sarcoma, plasmacytoma 3. Radiology-pathology correlation of these tumors 4. Unique imaging appearances and clinical features that help in the diagnosis of some of these cases 5. Conclusion/Take home points

GIEE-154 ASSESSING HEPATO-BILIARY MORPHOLOGY AND FUNCTION IN PRIMARY SCLEROSING CHOLANGITIS (PSC)

Kumaresan Sandrasegaran, MD (*Presenter*)
Amar Shah, MD (*Abstract Co-Author*)
Elizabeth Carey, MD (*Abstract Co-Author*)
Aubrienne Silva (*Abstract Co-Author*)
Anshuman Panda, PhD (*Abstract Co-Author*)
Sudhakar K. Venkatesh, MD, FRCR (*Abstract Co-Author*)
Alvin C. Silva, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review the diagnosis, clinical features and natural history of PSC 2. Understand the newer MRI scoring systems for PSC and how these correlate with clinical scoring systems 3. Learn the newer MRI techniques in PSC and how they may help determine treatment and prognosis treatment

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1. Introduction 2. Clinical Features of PSC a. PSC variants 3. Natural History of PSC 4. MRI Standardized Reporting Template for PSC 5. Clinical Scoring Models used in PSC a. Mayo Risk Score b. Oxford-Amsterdam Model c. United Kingdom PSC Score 6. ANALI Score and Functional Liver Imaging Score (FLIS) 7. Useful MRI techniques in PSC a. MR elastography b. T1 mapping c. Functional parameters from gadoxetate-enhanced MRI i. Relative enhancement of liver ii. Relative enhancement of bile ducts iii. Bile flow velocity 8. Standard treatment of PSC 9. Newer treatment paradigm in PSC a. MRI biomarkers that may help determine treatment efficacy 10. Conclusions

GIEE-155 GASTRIC IMAGING - COMPREHENSIVE APPROACH AND HOW TO AVOID MISDIAGNOSIS

Yudel Tamayo, MD, RDMS (*Presenter*)

TEACHING POINTS

The normal gastric wall, rugae and lumen should be analyzed for normal enhancement and preservation of luminal capacity. Sites of edema, ulceration with or without gastric perforation must be recognized. The peritoneal spread of gastric cancer with Krukenberg tumours will be illustrated. The contrast retention by fibrosis in Signet Ring adenocarcinoma (Linitis Plastica) will be emphasized. Correlative angiographic and endoscopic studies add greater comprehension to imaging studies.

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Gastric conditions prevail in critically ill, environmental exposure and genetic predispose patients requiring a comprehensive approach to gastric imaging. We will illustrate gastric and duodenal ulcers (with and without perforation), GI bleeding (PUD, Dieulafoy lesion) with CT Angiography, H. pylori and other causes of gastritis, Menetriers disease, benign and malignant neoplasms, Linitis Plastica associated to luminal deformity and contrast retention, peritoneal carcinomatosis and Krukenberg tumours, Genetic associated gastric neoplasms (Lynch and FGFR2 carriers) and postop changes and complications sling, gastric band, and Nissan fundoplication. Correlative fluoroscopic, CT and MRI and angiographic studies will be included. Endoscopic correlation will be included when available. We will provide clues to avoid misdiagnosis such as ingested high density material, peristaltic wave and absence of distention.

GIEE-156 OFF THE BEATEN POUCH: UNCOMMON ROUTES OF DIVERTICULITIS

James Hwang, MD (*Presenter*)
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Satheesh Krishna, MD (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Helena Gabriel, MD (*Abstract Co-Author*)
Paul Nikolaidis, MD (*Abstract Co-Author*)
Meghan G. Lubner, MD (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)
Mark D. Sugi, MD (*Abstract Co-Author*)
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Margarita V. Revzin, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

- Diverticulitis can present in ways other than the typical left lower quadrant pain commonly seen with sigmoid diverticulitis. - Smoldering diverticulitis is an underrecognized chronic form of diverticulitis. - Rare complications of diverticulitis include pylephlebitis and mycotic aneurysm. - Non-classic diverticulitis has numerous more common mimics (e.g., appendicitis, cholecystitis, tubo-ovarian abscess, malignancy), and a comprehensive understanding of the unique imaging features of these similar diagnoses is crucial to making an accurate diagnosis.

TABLE OF CONTENTS/OUTLINE

- Background information about the prevalence of diverticulosis and diverticulitis. - Diagram and description of the gastrointestinal tract, where diverticula are found, and their frequency. - Brief overview of the typical findings of uncomplicated diverticulitis. - In-depth review of the rarer, non-classic presentations of diverticulitis. - Mention of smoldering diverticulitis as an under-recognized form of diverticulitis. - Overview of the common complications of diverticulitis, including abscess, perforation, and fistulation. - Discussion of rare complications of diverticulitis, including pylephlebitis and vascular involvement (mycotic aneurysm). - Discussion of how these non-classic presentations can mimic other diagnoses. - Case-based figures of rare presentations of diverticulitis, including appendiceal diverticulitis, smoldering diverticulitis and pylephlebitis.

GIEE-157 STRATEGIC MAPPING OF GASTRIC CANCER: THE RADIOLOGIST'S ROLE IN MULTIMODAL STAGING AND THERAPEUTIC PLANNING

Renan Arakaki, MD (*Presenter*)
Thais Ribeiro, MD (*Abstract Co-Author*)
Aley Talans, MD (*Abstract Co-Author*)
Frank Shigueo Nakao (*Abstract Co-Author*)
Eduardo O. Pacheco, MSc, MD (*Abstract Co-Author*)
Ulysses S. Torres, MD, PhD (*Abstract Co-Author*)
Giuseppe D'Ippolito, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Understand the imaging anatomy and histological correlation of the stomach across CT, MRI, and endoscopic ultrasound. 2. Recognize the strengths and limitations of different imaging modalities in the staging of gastric cancer (T, N, and M). 3. Identify key imaging features that directly impact oncologic and surgical decision-making. 4. Be prepared to detect acute complications related to gastric tumors, including obstruction, perforation, and bleeding. 5. Familiarize with imaging characteristics of less common gastric tumors beyond adenocarcinoma.

TABLE OF CONTENTS/OUTLINE

1. Review the anatomy and histology of the stomach with correlation to imaging methods: computed tomography, magnetic resonance imaging, and endoscopic ultrasound. 2. Detail the staging of gastric cancer with a focus on practical tips regarding what oncologists and surgeons need to know. 3. Highlight the strengths and weaknesses of imaging methods (CT, MRI, PET-CT, endoscopic ultrasound) in T, N, and M staging. 4. Demonstrate practical cases from diagnosis, staging to management decisions of gastric neoplasms. 5. Present acute complications that the patient may experience as a result of a gastric tumor. 6. Review other types of tumors beyond gastric adenocarcinoma and their presentation in imaging methods (GIST, lymphoma and lipoma).

GIEE-158 ACQUIRED ABDOMINAL FISTULAS: IMAGING APPROACH AND PROTOCOL OPTIMIZATION - HOW WE DO IT

Camila P. Reifegerste, MD (*Presenter*)
Catarina Caldas (*Abstract Co-Author*)
Carolina P. Abud, MD (*Abstract Co-Author*)
Ana Claudia Vincenzi Raduan Uski (*Abstract Co-Author*)
Maria Helena N. Pedroso (*Abstract Co-Author*)
Sofia B. Maksoud, MD (*Abstract Co-Author*)

TEACHING POINTS

Fistulas in the abdominal cavity represent a diagnostic challenge and often require tailored imaging strategies for accurate detection. This Education Exhibit proposes standardized computed tomography (CT) and magnetic ressonance imaging (MRI) protocols for the evaluation of abdominal fistulas, based on our institution's clinical

experience.We have observed that certain protocols described in the literature may be suboptimal for detecting specific fistula types. For example, abdominal CT for gastrointestinal fistulas may be limited by the use of overly diluted oral iodinated contrast. Likewise, protocols evaluating vesicourethral anastomotic fistulas after prostatectomy may fail to demonstrate the fistulous tract if the excretory phase is performed too early.From these observations, we were motivated to share our experience in fistula detection and the imaging protocols currently employed at our institution, aiming to improve diagnostic accuracy and support timely and effective patient management.

TABLE OF CONTENTS/OUTLINE

1.Introduction 2.Abdominal acquired fistula cases, teaching points and practical considerations: (a) Esophageal, gastric, and proximal small bowel fistulas (b) Distal small bowel fistulas (c) Colonic and rectal fistulas (d)Urinary tract fistulas (e) Biliary fistulas (f) Pancreatic fistulas 3.Protocol pearls and practical tips 4.Summary

GIEE-159 THE BULGING PANCREAS: UNMASKING CAUSES BEYOND AUTOIMMUNITY

Julia Espindola Guimaraes (*Presenter*)
Thiago Fachini Nogueira, MD (*Abstract Co-Author*)
Aley Talans, MD (*Abstract Co-Author*)
Daniel Bekhor, MD (*Abstract Co-Author*)
Larissa R. Favaro (*Abstract Co-Author*)
Matheus M. Gomes SR, MD (*Abstract Co-Author*)
Daniella B. Parente, MD, PhD (*Abstract Co-Author*)
Eduardo O. Pacheco, MSc, MD (*Abstract Co-Author*)
Ulysses S. Torres, MD, PhD (*Abstract Co-Author*)
Giuseppe D'Ippolito, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Recognize diffuse pancreatic enlargement, normal size thresholds and associated conditions. Review differential diagnoses associated with pancreatic enlargement: lymphoma, metastases, neuroendocrine tumors, diffuse adenocarcinoma, lipomatosis, Von Hippel-Lindau syndrome, and Mavash syndrome. Deepen knowledge of autoimmune pancreatitis, imaging findings and diagnostic criteria. Understand the clinical context and the radiologist’s role in managing autoimmune pancreatitis. Differentiate between benign and malignant causes of pancreatic enlargement.

TABLE OF CONTENTS/OUTLINE

Measurement Criteria for Pancreatic Enlargement : Review of normal pancreatic size parameters and thresholds defining diffuse enlargement with imaging examples; Differential Diagnoses and Case-Based Learning : Review of benign and malignant causes of pancreatic enlargement, illustrated with clinical cases (lymphoma, metastases, neuroendocrine tumors, diffuse adenocarcinoma, lipomatosis, Von Hippel-Lindau syndrome, Mavash syndrome), emphasizing imaging patterns and key diagnostic clues; Autoimmune Pancreatitis Review of imaging features across ultrasound, CT, and MRI; presentation of the International Consensus Diagnostic Criteria, key serologic and laboratory findings; Diagnostic Approach and Workflow: Flowchart integrating clinical and imaging findings to differentiate autoimmune pancreatitis from other diseases; Red Flags for Malignancy: Key imaging features that suggest malignant causes of pancreatic enlargement with representative cases; Summary and Take-Home Messages: Consolidation of the main diagnostic strategies, imaging pearls, and practical tips for clinical practice.

GIEE-160 POSTOPERATIVE IMAGING OF ESOPHAGECTOMY A TEACHING CASE SERIES FOR RADIOLOGY RESIDENTS

Sofia Renee Acuna Barrera, MD, MD (*Presenter*)
Bethsabel Rodriguez Encinas, MD (*Abstract Co-Author*)
Lourdes M. Avila, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the surgical management of esophagectomy.Recognize the anatomy of the esophagectomy on barium swallow studies.Identify the main characteristics of different types of conduit and route adaptations through barium swallow studies. Explain the complications associated with post-surgical changes in esophagectomy.

TABLE OF CONTENTS/OUTLINE

Introduction: Types of esophagectomy management surgerys. Fluroscopy protocol: What to look for?Anatomical Changes:Cervical approach.Thoracic aproach.Esophageal Replacement Routes:Posterior mediastinal route.Retroesternal route.Subcutaneous route.Conduit Types & Route Adaptation:Gastric conduit.Colon Conduit. Yeyunal or Ileal Conduit.Post-Surgical Complications of esophagectomy:Types of complications of esophagectomy according to evolution.Clinical cases Description on fluoroscopic images of post-surgical complications and what to look for Summary:Key points.

GIEE-161 CRITICAL INSIGHTS INTO PANCREATIC ADENOCARCINOMA: PERINEURAL SPREAD, MESOPANCREAS, AND HEPATIC METASTASIS

Salie Oliveira, MD (*Presenter*)
Thiago De Sousa (*Abstract Co-Author*)
Paulo Falcao, MD (*Abstract Co-Author*)
Tiara Vitalino Galvao, MD (*Abstract Co-Author*)
Eduardo M. Araujo, MD (*Abstract Co-Author*)

TEACHING POINTS

Perineural spread in pancreatic adenocarcinoma is associated with poorer prognosis and imaging challenges. The mesopancreas is a key surgical and anatomical structure affecting tumor spread and resection completeness. Hepatic metastasis distribution varies according to tumor location, likely influenced by venous streamline patterns. Multimodal imaging improves detection and guides therapeutic planning in pancreatic cancer. Radiologists play a key role in assessing these features to support curative strategies.

TABLE OF CONTENTS/OUTLINE

Introduction Imaging is essential in the detection, staging, and surgical planning of pancreatic adenocarcinoma. Perineural Spread Tumor infiltration along nerve fascicles is common and clinically significant. Recognition of imaging signs is crucial for prognosis and therapy decisions. Mesopancreas The main site of locoregional spread. Understanding its anatomy improves surgical planning and R0 resection rates. Hepatic Metastasis Distribution Portal venous drainage anatomy influences the lobar distribution of liver metastases. Tumors in the pancreatic head tend to metastasize to the right lobe; body/tail to both lobes. Conclusion Awareness of these three imaging aspects enhances diagnostic accuracy and informs treatment strategies in pancreatic cancer.

Abstract Archives of the RSNA, 2025

GUEE

Genitourinary Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

GUEE-1 RADIOLOGIC ASSESSMENT OF URETEROPELVIC JUNCTION OBSTRUCTION IN ADULTS: A PICTORIAL REVIEW

Sarah Anderson, MD (*Presenter*)
Mark D. Sugi, MD (*Abstract Co-Author*)
Hiroaki Takahashi, MD, PhD (*Abstract Co-Author*)
Naoki Takahashi, MD (*Abstract Co-Author*)
Akira Kawashima, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Identify key diagnostic findings in the workup of ureteropelvic junction (UPJ) obstruction in adults to help guide management and intervention. 2. Illustrate intrinsic and extrinsic causes of UPJ obstruction in adults and common imaging appearances on multiple modalities including CT, MR, diuretic renography, ultrasound and radiography. 3. Recognize mimics and systemic processes that may cause UPJ obstruction as well as expected imaging findings after surgical intervention.

TABLE OF CONTENTS/OUTLINE

I. Background II. Adult causes of UPJ obstruction a. Congenital UPJ obstruction b. UPJ obstruction associated with aberrant crossing vessel c. Renal stones d. Neoplasms i. Urothelial cell carcinoma ii. Lymphoma iii. Metastases e. Anatomic obstruction i. Infectious/inflammatory stricture ii. Postsurgical fibrosis iii. Horseshoe and duplex kidneys iv. Crossing vessels f. Mimics i. Chronic atrophic pyelonephritis ii. Peripelvic cysts iii. Megacalycosis g. Miscellaneous i. Retroperitoneal fibrosis ii. Systemic conditions (amyloidosis, Erdheim-Chester disease) iii. Traumatic injury iv. Spontaneous hemorrhage III. Renal transplant UPJ obstruction IV. Functional imaging a. Diuretic renography V. Intervention a. Postoperative appearances of the UPJ after pyeloplasty and endopyelotomy

GUEE-2 PLOT TWISTS IN PROSTATE MRI: IT IS NOT ALWAYS ADENOCARCINOMA! UNCOMMON LESIONS AND THEIR MIMICKERS

Eduarda Bezerra Cirne, MD (*Presenter*)
Carlos A. Matsumoto, MD (*Abstract Co-Author*)
Marilia A. Tavares, MD (*Abstract Co-Author*)
Ruy R. Galves JR, MD, PhD (*Abstract Co-Author*)
Bruno A. Rocha, MD, PhD (*Abstract Co-Author*)
Eduardo O. Pacheco, MSc, MD (*Abstract Co-Author*)
Ulysses S. Torres, MD, PhD (*Abstract Co-Author*)
Giuseppe D'Ippolito, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Review the normal anatomy of the prostate and periprostatic tissues; Review and illustrate rare histological subtypes of non-acinar adenocarcinoma prostate neoplasms; Review benign prostate conditions that may mimic neoplasms; Propose a quick-reference guide for radiologists with the most representative imaging findings of these diagnoses, to support them when facing such challenging cases.

TABLE OF CONTENTS/OUTLINE

This exhibit offers a concise anatomical review of the prostate and periprostatic structures, emphasizing the histological elements involved in non-acinar prostate tumors. Through a case-based format, we explore rare neoplasms—including neuroendocrine tumors, sarcomas, lymphomas, STUMP, transitional cell, squamous cell, mucinous carcinoma, and metastases—alongside benign mimickers such as prostatitis, abscesses, atrophy, hyperplastic nodules, leiomyoma, and Cowper's gland nodules. Key clinical, epidemiological, and imaging features will be summarized, with practical MRI tips provided as a diagnostic guide for radiologists facing challenging prostate lesions.

GUEE-3 RENAL ARTERY MAPPING IN RCC SURGERY: THE UTILITY OF NITROGLYCERIN-ENHANCED CTA FOR PREOPERATIVE ASSESSMENT

Junichi Nakagawa (*Presenter*)
Norimi Nishiyama (*Abstract Co-Author*)
Takanori Masuda, PhD (*Abstract Co-Author*)
Shota Watanabe, PhD,RT (*Abstract Co-Author*)

TEACHING POINTS

Abdominal CTA is widely used for RCC surgery planning, but small vessels and anatomical variations often limit renal artery visualization, even with high-concentration contrast agents. This requires additional angiography, increasing radiation and contrast risks.Nitroglycerin-enhanced CTA improves vascular visibility by dilating renal arteries. This non-invasive, simple technique is independent of CT system specifications and can be implemented with institutional approval. This exhibit presents the protocol and workflow of nitroglycerin-enhanced CTA, includes quantitative and qualitative assessments with and without nitroglycerin, and showcases high-resolution 3D images demonstrating its value in RCC preoperative planning.

TABLE OF CONTENTS/OUTLINE

1. Introduction •Importance of vascular assessment in RCC surgery planning •Limitations of standard CTA 2. Clinical Problem •Suboptimal visualization of renal arteries •Risks of additional angiography (radiation, contrast) 3. Proposed Solution •Nitroglycerin-induced vasodilation •Advantages: non-invasive, widely applicable 4. Imaging Protocol •Nitroglycerin administration method and timing •CT acquisition parameters and reconstruction 5. Quantitative & Qualitative Assessment •Comparison of vessel visualization with and without nitroglycerin •Image quality and diagnostic confidence 6. Clinical Cases •Case examples before and after nitroglycerin •Impact on surgical planning 7. Key Teaching Points •Practical technique for routine use •Potential to reduce invasive procedures 8. Conclusion •Clinical utility in preoperative RCC evaluation •Feasibility across institutions

GUEE-4 A FIRM UNDERSTANDING: IMAGING OF PENILE PROSTHESES AND THEIR COMPLICATIONS

Cole J. Miller, MD, BS (*Presenter*)
Jena Depetris, BA, MD (*Abstract Co-Author*)
Anokh Pahwa, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Define erectile dysfunction (ED) and review its epidemiology. 2. Discuss the treatment options for ED. 3. Review penile anatomy. 4. Explain different types of penile prosthesis, their components, and imaging characteristics. 5. Describe the common and uncommon complications of PP. 6. Elucidate the pitfalls of penile prosthesis imaging interpretation.

TABLE OF CONTENTS/OUTLINE

We present a review of the imaging characteristics of penile prostheses and their complications. The explanation is accompanied by relevant cases from our hospital system. Discussion points include: Penile anatomy -Anatomical review -Appearance on CT/MRI Erectile dysfunction -Definition -Epidemiology -Overview of available treatments Penile Prosthetics -Types of PP -Components of various PP -Surgical placement & techniques -PP imaging characteristics & protocols Complications -Mechanical failure: leak, fracture, aneurysm -Malpositioning & Migration: rear tip extenders, reservoir herniation -Cylinder sizing error: Buckling, Concorde / supersonic transport deformity -Floppy glans -Erosion -Crossover -Infection Imaging pitfalls -Imaging exclusively in the deflated state -Asymmetric appearance of the penile cylinders

GUEE-5 REVIEW OF PI-RADS 3 - NAVIGATING THE AMBIGUITY OF DIAGNOSIS AND MANAGEMENT OF THIS EQUIVOCAL ENTITY

Sadina Shrestha, MD, MBBS (*Presenter*)
Mandeep S. Virk, MBBS, MD (*Abstract Co-Author*)
Swathi Kisara, MD (*Abstract Co-Author*)
Chakradhar R. Thupili, MD (*Abstract Co-Author*)
Varaha Tammisetti, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the definition and prevalence of PI-RADS 3 category on biparametric and multiparametric prostate MRI and incidence of clinically significant prostate cancer. Definitions of PI-RADS 3 subcategories including 3a, 3b, upgraded and dominant lesions.Illustrate impact of MR imaging factors such as image quality, interobserver variability of prostate MR interpretations, overlap with benign entities such as stromal nodules, inflammation/prostatitis, lesion location and pre-existing diagnosis of non clinically significant prostate cancer.Understand and illustrate strategies to further risk-stratify PI-RADS 3 lesions using clinical biomarkers and morphologic risk factors such as patient's age, family history, PSA metrics kinetics, PSA density (>0.15 ng/mL/cc), tumor volume (<0.5 mL), MRI derived prostate gland volume (<36 mL), lesion shape (higher surface to volume ratio) to decrease the incidence of biopsies, especially in the setting of biparametric MRI.Discuss role of follow-up with PSMA PET using PRIMARY score to further risk stratify PI-RADS 3 lesions. Discuss MR-focused pathway and Risk-based pathway in making biopsy decisions and further surveillance with prostate MR.

TABLE OF CONTENTS/OUTLINE

Definition, prevalence, significance, and MR imaging findings of PI-RADS 3 category and subcategories.Imaging factors that cause PI-RADS mis-categorization.Bopsy vs. monitor approach.Risk stratification of PI-RADS 3 lesions with clinical biomarkers and MR imaging morphologic features.Risk stratification of PI-RADS 3 lesions with PSMA PET and PRIMARY score.Surveillance and biopsy strategies of PI-RADS 3 lesions.Future Considerations and Conclusions.

GUEE-6 THE PRESACRAL CONUNDRUM: IMAGING INSIGHTS INTO A COMPLEX SPACE

Kriti Kundu, MD,MBBS (*Presenter*)
Taruna Yadav, MD (*Abstract Co-Author*)
Binit Sureka, MBBS, MD (*Abstract Co-Author*)
Sarbesh Tiwari (*Abstract Co-Author*)
Ayushi Agarwal JR, MBBS (*Abstract Co-Author*)
Pushpinder S. Khera (*Abstract Co-Author*)

TEACHING POINTS

1. To review the embryologic origin and classification of presacral (retrorectal) masses. 2. To highlight imaging features and pattern approach using state of the art cases with multiple imaging modalities aiding in accurate diagnosis and effective clinical management.3. To learn about the syndromic associations with presacral masses.

TABLE OF CONTENTS/OUTLINE

Anatomy & Embryology Overview of the presacral space and its embryological derivations to explain the diverse origins of these masses. Classification of Lesions Systematic grouping into congenital, neoplastic, inflammatory, and miscellaneous lesions. Imaging Modalities Role of USG, MRI and CT in evaluating lesion location, tissue characteristics, and extent. Case-Based Review Illustrative examples of all entities including epidermoid/dermoid cysts, anterior meningoceles, teratomas, chordomas, tail gut cyst, all types of neurogenic and round cell tumors. Red Flags & Mimics Identification of features suggestive of malignancy or infection, and tips for avoiding diagnostic pitfalls. Management Pearls and conclusion How imaging findings guide biopsy decisions, surgical planning, and follow-up.

GUEE-8 PRECISE SCORING FOR MRI IN ACTIVE SURVEILLANCE: WHAT RADIOLOGISTS SHOULD KNOW

Negar Firoozeh, MD (*Presenter*)
Andrei S. Purysko, MD (*Abstract Co-Author*)
Nicola Schieda, MD (*Abstract Co-Author*)
Ronaldo H. Baroni, MD, PhD (*Abstract Co-Author*)
Valdair F. Muglia, MD, PhD (*Abstract Co-Author*)
Antonio C. Westphalen, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Understand the clinical role of active surveillance (AS) and the limitations of PI-RADS in longitudinal follow-up.2. Learn the structure and application of PRECISE v2 for interpreting serial prostate MRIs.3. Review annotated case examples for PRECISE scores 1-5, including 3-visible vs. 3-nonvisible.4. Explore how PRECISE informs biopsy decisions and multidisciplinary care.5. Identify challenges and future directions, including standardization, AI integration, and abbreviated MRI protocols.

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Active surveillance is a preferred strategy for managing favorable-risk prostate cancer, but MRI interpretation over time lacks standardization. PRECISE addresses this gap, offering a 5-point scale to categorize stability and progression on serial MRI. This exhibit introduces the updated PRECISE v2 system with high-yield case examples and practical guidance.Can PRECISE be reliably applied across 1.5T vs. 3T scanners? What about variability in multiparametric vs. biparametric protocols? How should radiologists handle MRI-invisible lesions or multifocal disease? How do we score patients undergoing androgen deprivation therapy?We discuss real-world benefits (e.g., biopsy deferral, reduced overtreatment, consistent communication), practical pitfalls (e.g., lesion size measurement, reader variability), and future opportunities. Can ADC histogram analysis or AI lesion tracking enhance reproducibility? Will abbreviated dual-sequence MRI protocols be validated for AS? This exhibit offers a roadmap for how PRECISE may evolve through standardization, quantitative metrics, and integration into clinical workflows.

GUEE-9 MICRO-ULTRASOUND PRI-MUS SCORING IN PROSTATE CANCER: CORRELATION WITH MRI AND HISTOPATHOLOGY

Kelly Greenwall (*Presenter*)
Vina Fan, MD (*Abstract Co-Author*)
Benjamin Adam (*Abstract Co-Author*)
Adam Kinnaird, MD,PhD (*Abstract Co-Author*)
Christopher I. Fung, MD (*Abstract Co-Author*)

TEACHING POINTS

Discover micro-ultrasound equipment and corresponding high-resolution prostate imaging capability. Review the PRI-MUS scoring system for prostate cancer risk stratification. Differentiate typical imaging features of PRI-MUS (MicroUS) and concordant PIRADS (MRI) scoring with histopathology examples. Contrast and analyze discordant PRI-MUS (MicroUS) and PIRADS (MRI) scoring with radiology-pathology correlation.

TABLE OF CONTENTS/OUTLINE

Introduction to prostate micro-ultrasound. Prostate risk identification using micro-ultrasound (PRI-MUS) scoring. Case-based review with radiology-pathology correlation from our institution: Cases representing each PRI-MUS score and corresponding PI-RADS and histopathology results. Cases representing discordance between PRI-MUS and PI-RADS scores. Summary of diagnostic strengths and clinical implications. Key teaching points reinforcing microUS utility in prostate cancer assessment.

GUEE-10 RADIOTHERAPY OF PRIMARY RENAL CELL CARCINOMA AND UPPER TRACK UROTHELIAL CARCINOMA: IMAGING CONSIDERATIONS BEFORE AND AFTER THERAPY

Christopher Lim, MD (*Presenter*)
Satheesh Krishna, MD (*Abstract Co-Author*)
Nicola Schieda, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Stereotactic body radiotherapy (SBRT) has emerged as a treatment option for localized RCC and upper urinary tract urothelial carcinoma (UTUC). 2. Pre-treatment imaging is crucial for identifying patients who may benefit from treatment of primary RCC and UTUC with SBRT. 3. Imaging appearance of local control and recurrence of primary RCC after SBRT differs considerably compared to the appearance after surgery and thermal ablation.

TABLE OF CONTENTS/OUTLINE

1. Why is the historical concept of RCC being "radioresistant" false? What has changed leading to the rise of SBRT? 2. How does SBRT work? What is the role of the radiologist in delineating the renal mass for optimal beam shaping? 3. What are the current indications for SBRT in treatment of primary RCC and UTUC? Does the recent literature show that it is safe? 4. When can we consider management with SBRT over thermal ablation or surgery for primary RCC? Where does SBRT fit in the management paradigm? 5. How can imaging be used in identifying the optimal patients treated with SBRT? Are there any tumor size cutoffs? 6. What is the normal expected post-SBRT imaging appearance of primary RCC and UTUC? 7. Imaging findings of residual and local failure after SBRT for treatment of primary RCC and UTUC - what are the challenges compared to other forms of ablation and surgery? 8. Why is imaging the optimal way to diagnose residual/recurrent tumor after SBRT? 9. What is pseudoprogression and how to differentiate it from tumor recurrence? 10. Is pathology/biopsy limited at diagnosing recurrent tumor after SBRT? Answer: yes 11. How can radiologists identify complications after SBRT? How to prevent complications in pre-procedural imaging? 12. What is the effect of SBRT on renal function?

GUEE-11 ASSESSMENT OF THERAPEUTIC RESPONSE IN BLADDER CANCER: CAN MRI BE USED AS A SURROGATE OF COMPLETE PATHOLOGICAL RESPONSE?

Ana Luiza Calado Novaes, MD (*Presenter*)
Cecilia V. Torres, MD (*Abstract Co-Author*)
Gabriel L. Gouvea, MD (*Abstract Co-Author*)
Arthur Ogata, MD (*Abstract Co-Author*)
Ana Lemos (*Abstract Co-Author*)
Thalyne Lima (*Abstract Co-Author*)
Isadora Balderama Canedo, MD (*Abstract Co-Author*)
Fernando Taliberti Pereira de Souza SR, MD (*Abstract Co-Author*)
Jorge Elias JR, MD, PhD (*Abstract Co-Author*)
Valdair F. Muglia, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Pathological response to neoadjuvant therapy (NAT) in muscle invasive bladder cancer (MIBC) is associated with improved clinical outcomes. T2WI, DWI and DCE sequences are essential for evaluating pathological complete response (pCR) of bladder cancer (BCa). MpMRI should be performed in all patients with MIBC after NAT, ideally between 3 and 4 weeks after the end of therapy.

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Introduction: the management of BCa has evolved with the advent of systemic therapies and immunotherapies. mpMRI has emerged as a promising non-invasive tool improving treatment assessment. Objective: to discuss the basis for systemic therapy and the expanding role of mpMRI in assessing therapeutic response to NAT in MIBC. Imaging findings: mpMRI enables comprehensive anatomical and functional assessment of bladder tumors by integrating T2-weighted imaging (T2WI), diffusion-weighted imaging (DWI), and dynamic contrast-enhanced imaging (DCE). T2WI provides excellent anatomical resolution and aids in distinguishing post-treatment fibrosis from residual tumor tissue. DWI is highly sensitive in detecting small lesions; however, there is often signal overlap between viable tumor and fibrotic tissue following NAT. DCE assesses tumor vascularity and is routinely used in detecting residual or recurrent malignancy, although its interpretation remains debated due to post-treatment changes. Discussion: Although there is no consensus on the optimal protocol for evaluating response to systemic therapy, MRI has emerged as an important tool for advancing personalized treatment strategies and facilitating bladder-sparing therapies.

GUEE-12 IMAGING THE INVISIBLE: DIAGNOSIS, MANAGEMENT AND PERCUTANEOUS BIOPSY STRATEGIES IN NON-FOCAL RENAL DISEASE

Bahareh Moazen, MD, MPH (*Presenter*)
Kelly Harper, MD,FRCPC (*Abstract Co-Author*)
Mary B. Bissell, Md, MSc (*Abstract Co-Author*)

TEACHING POINTS

By the end of this exhibit, readers will be able to: 1. Identify imaging appearances of non-focal renal diseases including those causing echogenic renal cortex, medulla and renal pyramids, cortical necrosis and diseases resulting in size discrepancy. 2. Provide a meaningful differential to consultants in the context of non-focal renal diseases with appropriate next steps in management. 3. Describe a safe approach to percutaneous biopsy of the native kidney and problem solving in challenging cases.

TABLE OF CONTENTS/OUTLINE

Introduction 1. Basic structural components and key anatomy of the native kidney. 2. Overview of non-focal renal diseases, its importance in early diagnosis, and avoiding misdiagnosis. Medical renal ATN, glomerulonephritis, CKD, AIN Depositional Amyloidosis, hyperoxaluria, medullary nephrocalcinosis Ischemic Cortical necrosis, thrombotic microangiopathy, renal vein thrombosis Infection : Pyelonephritis and complications, XGP Additional categories Systemic (e.g., lupus, diabetes), infectious/inflammatory, congenital Imaging in non-focal renal disease: Review imaging patterns on US, CT, MRI and nuclear medicine scans with a table summarizing the common causes of each imaging finding. Common mimics, tips and tricks for narrowing the differential diagnosis including systemic imaging clues Percutaneous Biopsy Standard patient position and biopsy techniques with tips and tricks for challenging cases Case-Based Review Selected cases illustrating key imaging findings, laboratory and clinical manifestations, and use of percutaneous biopsy with histopathologic correlation Conclusion

GUEE-13 MASCULINIZING GENITAL SURGERY: A MULTIDISCIPLINARY APPROACH TO POSTOPERATIVE GENDER-AFFIRMING CARE AND COMPLICATIONS

Kelli J. Andresen, MD (*Presenter*)
Vanessa Williams, MD (*Abstract Co-Author*)
Cindy Thaung, MD (*Abstract Co-Author*)
Shelby J. Fishback, MD (*Abstract Co-Author*)

TEACHING POINTS

Approximately 70% of patients undergoing masculinizing genital surgery will have complications requiring further management. Understanding the anatomy and surgical techniques involved with phalloplasty and metoidioplasty are essential for diagnosis and appropriate treatment as well as for adequate communication with urologic and plastic surgery colleagues. We discuss the radiologic diagnosis of complications of masculinizing surgery including urethral (leak, stricture, fistula), flap (infection, ischemia), and donor site complications as well as the multidisciplinary management of these complications from a urology and plastic surgery perspective.

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-Provide an overview of masculinizing genital surgery, including surgical techniques and postoperative anatomy. -Discuss the radiologic diagnosis of post phalloplasty/metoidioplasty urethral, flap, and donor site complications. -Urology and plastic surgery colleagues provide a clinical perspective to management of complications of phalloplasty and metoidioplasty.

GUEE-14 CLASSICAL AND EMERGING AGGRESSIVENESS FACTORS IN RENAL TUMORS: CT-BASED RADIOMICS ASSESSMENT

Andreu Ivars, MD (*Presenter*)
Blanca Pano Brufau, MD (*Abstract Co-Author*)
Maria Fresno Vallespir, MD (*Abstract Co-Author*)
Josep Puig, MD,PhD (*Abstract Co-Author*)
Carmen Sebastia Cerqueda, MD (*Abstract Co-Author*)
Carlos Nicolau, MD (*Abstract Co-Author*)

TEACHING POINTS

To review classical and emerging CT-based imaging predictors of aggressiveness in renal cell carcinoma (RCC). To identify key morphological, dynamic, and radiomic features associated with tumor heterogeneity and histologic grade.To illustrate how radiomic features, including shape, texture, and first-order statistics, can be extracted and analyzed using CT. To present a diagnostic workflow that integrates radiologic and radiomic data to support personalized prognostic evaluation in RCC.

TABLE OF CONTENTS/OUTLINE

Renal cell carcinoma (RCC), including its main subtypes, exhibits substantial biological variability. While many tumors follow an indolent course, others demonstrate aggressive behavior with metastatic potential and resistance to therapy. Classical imaging predictors—such as tumor size, necrosis, vascular invasion, and irregular margins—remain essential in clinical assessment, although showing limited specificity in determining tumor behavior. Radiomics provides a noninvasive, quantitative approach to assess tumor heterogeneity. Parameters like entropy, skewness, kurtosis, and contrast enhancement ratios have shown significant correlations with tumor grade and aggressiveness. RAD-scores derived from these features outperform traditional TNM staging in prognostic accuracy.Radiomics-based nomograms facilitate the development of personalized treatment strategies and follow-up protocols. We propose a diagnostic workflow that integrates classical imaging features with radiomic data to improve risk stratification and support individualized management in RCC.

GUEE-15 MALE INFERTILITY: A RADIOLOGIC FRAMEWORK FOR DIAGNOSIS

Billy S. Chien, MD (*Presenter*)
James Hwang, MD (*Abstract Co-Author*)
Mark D. Sugi, MD (*Abstract Co-Author*)
Grace G. Zhu, MD (*Abstract Co-Author*)
Ichiro Ikuta, MD, MMedSc (*Abstract Co-Author*)
Ajay Malhotra, MD, MMM (*Abstract Co-Author*)
Sadhna Verma, MD, MBA (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Margarita V. Revzin, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

• Define infertility and highlight the prevalence and significance of male infertility.• Present a structured framework for categorizing causes of male infertility.• Discuss the anatomical structures and physiological pathways that are associated with each category of male infertility.• Summarize the essential components of clinical evaluation required for comprehensive evaluation of male infertility including history, physical examination, and biochemical workup.• Ensure inclusive infertility evaluation by recognizing the unique gender identities and varying reproductive organs of each patient.• Review the critical role of various imaging modalities for diagnosing common etiologies of male infertility.

TABLE OF CONTENTS/OUTLINE

• Overview of infertility with emphasis on the epidemiology and clinical relevance of male infertility.• Review of the anatomical structures and organ systems involved in male reproductive function.• Provide an algorithmic approach for evaluating infertility including history, physical exam, biochemical workup, and imaging.• Organize causes of male infertility into pre-testicular, testicular, and post-testicular categories.• Pre-testicular causes of male infertility: pituitary tumors, Klinefelter syndrome, Kallmann syndrome• Testicular causes of male infertility: varicocele, testicular torsion, epididymo-orchitis, testicular microlithiasis, cryptorchidism, testicular malignancy.• Post-testicular causes of male infertility: epididymal pathology, vas deferens pathology, seminal vesicle pathology, ejaculatory duct pathology, urethral obstruction, Müllerian duct cyst, utricle cyst.

GUEE-16 BEYOND PROSTATE ADENOCARCINOMA: IMAGING OF DE NOVO AND TREATMENT-EMERGENT NEUROENDOCRINE PROSTATE CARCINOMA

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Urooba Nadeem (*Abstract Co-Author*)
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Jovan Begovic, MD (*Abstract Co-Author*)
Kevin Courtney (*Abstract Co-Author*)
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Daniel Lee (*Abstract Co-Author*)
Asim Afaq, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Neuroendocrine prostate cancer is a lethal type of prostate cancer, which is clinically challenging given the often-advanced presentation, rapidly progressing course, lack of responsiveness to therapies, and overall poor prognosis. 2. Although de novo neuroendocrine prostate cancer is rare (<2%), treatment-emergent neuroendocrine prostate cancer (t-NEPC) has been reported in up to 15-30% of metastatic castration-resistant prostate cancer, thought to arise from lineage plasticity induced by

prolonged androgen receptor-targeted therapy. 3. Cross-sectional imaging considerations include a lack of typical concordance with serum biomarkers (prostate-specific antigen) and advanced disease at presentation. 4. Molecular imaging considerations include the potential lack of uptake on PSMA PET, both within the prostate gland and in metastases, and the potential utility of FDG and DOTATATE PET, depending on tumor differentiation. 5. t-NEPC should be considered in patients undergoing assessments for PSMA radioligand therapies, as this would limit the potential benefit from these treatment options.

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1. Diagnostic considerations of neuroendocrine prostate cancer 2. Different types of neuroendocrine tumors within the prostate i) De novo neuroendocrine tumors ii) Treatment-emergent neuroendocrine prostate carcinoma (t-NEPC) 3. Mechanisms contributing to t-NEPC development 4. Imaging features of de novo and t-NEPC in CT, MRI, PET/CT with FDG, DOTATATE, and PSMA radiotracers with histopathological correlation

GUEE-17 UNMASKING TESTICULAR MASSES: RADIOLOGIC FEATURES TO DISTINGUISH MALIGNANCY, BENIGNITY AND MIMICS

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Maria Agustina Ruiz Dalvit (*Abstract Co-Author*)
Julio R. Coronil, MD (*Abstract Co-Author*)
Teresa A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

Testicular masses represent a diagnostic challenge, requiring precise imaging to guide management. This exhibit reviews key imaging features on Ultrasound (US) and Magnetic Resonance Imaging (MRI) to differentiate intratesticular from extratesticular lesions, distinguish malignant from benign masses, and identify pseudotumors or mimics. Malignancies are primarily germ cell tumors— seminomatous and non-seminomatous types—as well as other malignancies such as lymphoma, Sertoli cell tumors, Leydig cell tumors, granulosa cell tumors, fibromas, and metastases. MRI provides superior soft tissue contrast and functional information compared to ultrasound, offering added value in complex or indeterminate cases. MRI can help differentiate seminomatous from non-seminomatous tumors by evaluating features such as lesion shape, the presence of a capsule or septa, hemorrhage, necrotic or cystic changes, and enhancement patterns. Additionally, it contributes to surgical planning by delineating tumor extension. Recognizing imaging patterns specific to tumor subtypes and mimics is critical for accurate diagnosis and effective management.

TABLE OF CONTENTS/OUTLINE

Introduction to Testicular Masses. General overview and radiologic features. Ultrasound imaging and MRI Protocols for Testicular Masses. Comparative analysis of Seminomatous and Non-Seminomatous Tumors. Pitfalls and Mimics: Sample cases of Leydig Cell Hyperplasia, Infarctions, Extratesticular lesions with radio-pathological correlation. A practical approach to Testicular Masses.

GUEE-18 RENAL CANCER STAGING FOR NEPHRON-SPARING SURGERY

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Ronaldo H. Baroni, MD, PhD (*Abstract Co-Author*)
Thais Mussi, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Review the staging of kidney cancer. Assess imaging findings that lead to accurate staging. Describe key imaging features for local staging and new tools available for surgical planning. Reaffirm the importance of precision medicine in reducing unnecessary radical approaches.

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MATERIAL AND METHODS Describe the anatomic features of kidney tumors on imaging modalities used in their evaluation and correlate them with staging. STEP BY STEP EVALUATION Systematic approach to staging kidney lesions. Evaluation of imaging features and new imaging tools to correlate with surgical decision-making. 1) LESIONS LIMITED TO RENAL PARENCHYMA Typical cases of kidney cancer (T1/T2 stages) and their radiologic appearances. Staging classification based on tumor size. 2) LESIONS NON LIMITED TO RENAL PARENCHYMA Typical cases of kidney cancer (T3/T4 stages) and their radiologic appearances. Discuss the implications of contiguous and distant tumor spread. CONCLUSION Provide example cases of MRI and CT acquisitions used for accurate staging of renal cancer. Optimize surgical nephrectomy indications based on imaging findings. CLINICAL RELEVANCE STATEMENT Valuable imaging information to optimize surgical approach Elucidate the surgical implications of precise radiologic characterization of kidney tumors.

GUEE-19 DECODING UROTHELIAL CARCINOMA: WHAT EVERY RESIDENT SHOULD KNOW

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Vitor C. Romano, MD (*Abstract Co-Author*)
Thais Mussi, MD, PhD (*Abstract Co-Author*)
Ronaldo H. Baroni, MD, PhD (*Abstract Co-Author*)
Fernando M. Coelho, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Understand the epidemiology and classification of urothelial carcinoma by anatomical site. Identify the most appropriate imaging modality according to the topography of the lesion. Review key imaging features of urothelial carcinoma in the bladder, ureters, and renal pelvis. Highlight the role of CTU and MRI, including VI-RADS, in diagnosis, staging, and treatment planning. Present didactic cases to illustrate radiological patterns and optimize resident learning.

TABLE OF CONTENTS/OUTLINE

INTRODUCTION Overview of urothelial carcinoma prevalence and classification by anatomical site; Emphasis on increasing the incidence and importance of imaging in management; UPPER URINARY TRACT Overview: Represents 5-10% of urothelial carcinomas, mainly affecting the renal pelvis and ureter. Imaging Protocol: CT urography is the gold standard; MRI is used in selected cases. Radiologic Features: Wall thickening, irregular filling defects, and obstructive signs are key findings. LOWER URINARY TRACT Overview: Accounts for 90-95% of cases, mostly involving the bladder. Imaging Protocol: Multiparametric MRI is preferred, especially for preoperative assessment. Radiologic Features: VI-RADS helps differentiate superficial from invasive tumors; structured reporting improves clarity and communication. CONCLUSION Imaging is central to diagnosis, staging, and treatment planning; Topography-specific approach improves diagnostic accuracy; Radiologists must be familiar with urothelial carcinoma patterns and protocols to contribute effectively to patient care;

GUEE-20 WHAT'S NEW IN PRECISE V2? FROM MYSTERY TO MASTERY IN ACTIVE SURVEILLANCE

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Hilton M. Leao Filho, MD, PhD (*Abstract Co-Author*)
Fernando Yamauchi (*Abstract Co-Author*)
Martin Horwarth, MD (*Abstract Co-Author*)
Cassia T. Guimaraes, MD (*Abstract Co-Author*)

TEACHING POINTS

MRI plays a pivotal role in active surveillance and watchful waiting strategies for managing prostate cancer. It supports better patient selection for biopsy, contributes to prognostic assessment and is essential for lesion monitoring over time. PRECISE provides a standardized framework for assessing longitudinal changes in prostate MRI

during active surveillance. Understanding the PRECISE scoring system helps radiologists communicate disease stability or progression effectively, guiding clinical decision-making. PRECISE version 2 introduces refinements that enhance reproducibility and reduce ambiguity in lesion monitoring over time.

TABLE OF CONTENTS/OUTLINE

- Introduction - Definition of active surveillance. - What is PRECISE and how can we use it. - Key elements of PRECISE version 1. - Updates in PRECISE version 2: highlight the main radiological features of PRECISE v2 and provide practical guidance for its application in daily clinical practice. - Pitfalls - Take-home notes - References

GUEE-21 CAUGHT BETWEEN A LESION AND A HARD PLACE: DECODING RENAL MASSES - A STRUCTURED IMAGING GUIDE FOR RESIDENTS

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Larissa R. Favaro (*Abstract Co-Author*)
Daniel Bekhor, MD (*Abstract Co-Author*)
Eduardo O. Pacheco, MSc, MD (*Abstract Co-Author*)
Ulysses S. Torres, MD, PhD (*Abstract Co-Author*)
Giuseppe D'Ippolito, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit provides trainees with a structured approach to evaluating renal masses, using flowcharts and illustrative practical cases. It covers the imaging features and diagnostic challenges of common and uncommon benign and malignant renal tumors, as well as diagnostic pitfalls. The exhibit presents the Bosniak classification and the Clear Cell Likelihood Score, both explored through practical cases, along with updates from the 2022 WHO classification of renal neoplasms, emphasizing recent imaging-related changes.

TABLE OF CONTENTS/OUTLINE

Structured approach to renal masses evaluation, presented through a comprehensive flowchart and illustrated with didactic cases. Benign renal tumors such as lipid-rich and lipid-poor angiomyolipomas, oncocytomas, localized cystic renal disease, and hemorrhagic or proteinaceous cysts will be demonstrated, emphasizing their imaging features. Malignant renal tumors , including metastases, clear cell, papillary and chromophobe RCC, mucinous tubular and spindle cell carcinoma, will be illustrated with key imaging characteristics. Uncommon renal masses such as lymphoma, Langerhans cell histiocytosis, mixed epithelial and stromal tumor will be discussed. Common diagnostic pitfalls will be addressed through cases of anatomical variants and benign mimickers , including acute focal nephritis (nephronia), hypertrophied column of Bertin, duplicated collecting system, calyceal diverticulum, subcapsular hematoma, kidney scarring, infarction, renal artery aneurysm, renal abscess, and nephrocutaneous fistula. Bosniak classification, ccLS and the new 2022 WHO classification of renal neoplasms will be presented, with practical imaging cases.

GUEE-22 THE RADIOLOGIST'S DECLASSIFIED RENAL TRANSPLANT EVALUATION SURVIVAL GUIDE

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Fabio Franco De Oliveira Junior (*Abstract Co-Author*)
Gustavo Yamada, MD (*Abstract Co-Author*)
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Tiago Petrucci (*Abstract Co-Author*)
Adriano Fregonesi (*Abstract Co-Author*)
Daniel Lahan-Martins, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The purposes of this education exhibit are: - Review the normal renal transplant anatomy and correlate it with clinical images of the surgery technique. - Present a step-by-step guide on how to evaluate the different renal transplant complications in ultrasound (US) and computed tomography (CT). - Review the most common timing of renal transplant complications.

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- Renal transplant surgical technique and allograft anatomy illustrated and compared to surgical pictures. - A step-by-step guide on how to evaluate renal transplant complications, illustrated by selected cases from the database of a Tertiary University Hospital, that contains: B-mode Ultrasound: main findings of the renal parenchyma, renal sinus and the topography[1] and features[2] of different fluid collections. Doppler Ultrasound: evaluation of renal transplant artery and vein and intrarenal arteries and diagnosis of renal artery stenosis, renal artery or vein thrombosis and pseudoaneurysm. CT: main findings of the renal parenchyma, renal sinus, the arterial/venous flow and the topography[1] and features[2] of different fluid collections. - Most common timing of different renal transplant complications. [1] subcapsular, perinephric and intraparenchymal. [2] lymphocele, urinoma, hematoma and abscess.

GUEE-23 A MULTIMODAL APPROACH TO THE ASSESSMENT OF HEMOSPERMIA-RADIOLOGICAL INSIGHTS INTO AN OVERLOOKED CONDITION

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Alexandre Pasquali (*Abstract Co-Author*)
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Giovanni G. Cerri, PhD (*Abstract Co-Author*)
Regis Otaviano Bezerra, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Hemospermia is typically idiopathic, benign, and self-limiting. In persistent cases, it remains underestimated, with imaging findings underreported. A multimodal imaging approach is essential. Radiologists play a key role in early diagnosis and guiding appropriate treatment.

TABLE OF CONTENTS/OUTLINE

INTRODUCTION: • Definition and epidemiology of hemospermia. • Scarcity of literature on imaging findings. • Importance of imaging in differential diagnosis. CLINICAL PRESENTATION • Patient profiles: age range, duration of symptoms, associated complaints. • Most cases are self-limited, with the persistent form often neglected due to lack of studies in the area. MULTIMODAL IMAGING APPROACH • Magnetic Resonance Imaging, Transrectal Ultrasound, and Retrograde Urethrocystography: advantages and limitations.• Examples of findings: protein/hematic content in seminal vesicles, wall thickening, cysts (prostatic utricle, bladder neck), early venous enhancement post-trauma, ejaculatory duct obstruction. THE CREATION OF AN ACRONYM (MOIST) • (M) Malignancy : Elevated PSA and image-guided biopsy. • (O) Obstructions : Cysts and obstructive changes identified on imaging. • (I) Infection/Inflammation : Hematic content and vesicular retraction. • (S) Systemic : Metabolic disorders, with a focus on severe hypertension and advanced liver disease. • (T) Trauma : Arteriovenous fistula formation evidenced by early enhancement. TAKE HOME • Persistent hemospermia requires structured investigation with the help of a new acronym (MOIST). • Multimodal imaging is essential for identifying clinically relevant causes.• New radiological studies are needed to expand the knowledge about this neglected condition.

GUEE-24 DECODING SOLID RENAL LESIONS: A MULTIMODAL IMAGING PRIMER FOR RESIDENTS

Arianne Idaly Ramos Galvan, MD (*Presenter*)

TEACHING POINTS

Review the differential diagnosis of solid renal lesions and their key imaging characteristics.Understand the strengths and limitations of ultrasound, CT and MRI in lesion characterization.Review optimal CT and MRI imaging protocols for renal lesions characterization. Apply practical imaging algorithms to distinguish benign from malignant lesions. Recognize imaging pitfalls and avoid common misdiagnoses.

TABLE OF CONTENTS/OUTLINE

Introduction: importance of multimodal assesment in solid renal lesions.Imaging techniques overview: role of ultrasound, CT and MRILesion specific imaging features: Benign vs malignant clues Diagnostic algorithms: A practical step by step guide Pitfalls and how to avoid them: lessons leartned Summary: key takeaways for resident practice

GUEE-25 BEYOND THE FAT: CHALLENGES IN DIAGNOSING RENAL ANGIOMYOLIPOMAS

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TEACHING POINTS

Angiomyolipoma (AML) is the most common benign solid tumor of the kidney. It is typically asymptomatic and often identified incidentally on imaging studies performed for unrelated indications. In most cases, AML demonstrates characteristic radiologic features that enable a confident and noninvasive diagnosis. However, diagnostic interpretation can be challenged by atypical imaging features, such as fat-poor angiomyolipomas, intralesional hemorrhage, aneurysmal formations, or extension into the renal vein. Furthermore, certain neoplasms may closely resemble AMLs on imaging—most notably, clear cell renal cell carcinomas containing macroscopic fat, as well as primary retroperitoneal liposarcomas, with or without direct renal involvement. This educational exhibit seeks to illustrate and review both the typical and atypical imaging features of renal angiomyolipomas across ultrasound, computed tomography, and magnetic resonance imaging, while also emphasizing potential diagnostic pitfalls that may challenge accurate interpretation.

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1. Overview of the typical and atypical features of renal AMLs. 2. Renal Angiomyolipoma Subtypes: Classic, Epithelioid, and Hypocellular Variants. 3. Pitfalls: when AML lacks visible fat — how to avoid misdiagnosis. 4. Imaging features that aid in differentiating fat-poor AMLs from other tumors. 5. Case-Based Review: Diagnostic Pearls and Common Misinterpretations.

GUEE-26 FOCAL ABLATIVE THERAPY OF PROSTATE: ROLE OF PROSTATE MR AND PSMA PET

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Mandeep S. Virk, MBBS, MD (*Abstract Co-Author*)
Varaha Tammisetti, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the rationale of focal ablative therapy of prostate, available types of focal therapy, inclusion and exclusion criteria.Illustrate current role of prostate MR and PSMA PET in tumor mapping, tumor volume estimation, multifocality and tumor mapping.Illustrate expected post ablation appearances after focal therapy, in-field treatment failure/recurrence and out of field failure on prostate MR and PSMA PET.Understand the two scoring systems TARGET and PI-FAB in detection of failure, surveillance on prostate MR and their limitations.Understand evolving role of PSMA PET.

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Rationale and types of Focal ablative therapy of prostate cancerRole of Prostate MR and PSMA PET in tumor mapping, multifocality, tumor volume estimation and treatment planningExpected immediate and late MR imaging appearances post ablation.Patterns of recurrence/failure in-fieldPatterns of out of field failure/new tumors Role of Prostate MR in detection of failure and surveillance after focal therapy: Comparison of the two scoring systems Transatlantic recommendations for prostate gland evlaution using MRI after focal therapy (TARGET) and Prostate Imaging after Focal therapy (PI-FAB) and their limitations Evolving role of PSMA PET in detection of intraprostatic failure, surveillance Future considerations and Conclusions

GUEE-27 ACCELERATED MRI TECHNIQUES FOR PI-RADS COMPLIANT PROSTATE IMAGING: PRINCIPLES, IMPLEMENTATION, AND CLINICAL IMPACT

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Nabih Nakrour, MD (*Abstract Co-Author*)
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Patricia Lan (*Abstract Co-Author*)
Mukesh G. Harisinghani, MD (*Abstract Co-Author*)

TEACHING POINTS

Gain insight into the current PI-RADS v2.1 standards and the extended scan times associated with conventional prostate MRI protocols. Explore advanced acceleration methods for T2-weighted and diffusion-weighted imaging that preserve diagnostic integrity. Understand how accelerated prostate MRI protocols enhance workflow efficiency and diagnostic confidence in clinical practice. Learn about practical implementation strategies and potential future advancements in accelerated prostate imaging.

TABLE OF CONTENTS/OUTLINE

Prostate MRI Standards and Acceleration Basics - Overview of PI-RADS v2.1 requirements and typical scan durations - Challenges associated with standard acquisition methods - Core principles behind MRI acceleration techniques Accelerated T2-Weighted Imaging Approaches - 2D techniques: reduced field of view, optimized echo spacing, hyper-echoes - 3D acquisitions enhanced with deep learning reconstruction (e.g., CUBE) - Influence on transition zone evaluation and PI-RADS classification - Comparative analysis—quantitative and qualitative—with conventional imaging Advanced Diffusion-Weighted Imaging Techniques - Fundamentals of diffusion contrast and associated phase correction challenges - Application of deep learning-based phase correction (DLPC) - Methods for improving signal-to-noise ratio and minimizing noise floor - Impact on peripheral zone analysis and PI-RADS scoring accuracy Clinical Integration and Validation - Case studies highlighting diagnostic equivalence - Strategies for incorporating accelerated protocols into routine workflow - Evaluation of effects on patient throughput and imaging quality Challenges and Future Perspectives Conclusion

GUEE-28 KEEP YOUR EYE ON THE BALL: A PRACTICAL APPROACH TO TESTICULAR ULTRASOUND

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Luciana Cerri, MD, PhD (*Abstract Co-Author*)
Alexandre Pasquali (*Abstract Co-Author*)

TEACHING POINTS

To present a practical, case-based approach to testicular ultrasound (US), highlighting key diagnostic pearls and pitfalls. To review essential scanning techniques and normal anatomy as the foundation for accurate interpretation. To differentiate the main causes of acute scrotal pain, focusing on imaging patterns that distinguish torsion, infection, and trauma. To identify sonographic features of common testicular lesions, both benign and malignant, and recognize when further imaging (e.g., MRI) is indicated. To improve diagnostic confidence and clinical decision-making through an algorithmic framework for scrotal ultrasound evaluation

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Initial Steps in Testicular US: Technique and Anatomy Acute Scrotum: Differentiating Torsion from Infection Intratesticular and Extratesticular Lesions: Benign vs Malignant Scrotal Trauma: Key Findings and Surgical Triggers Post-Operative Changes: What to Expect Cryptorchidism: Imaging Evaluation and Long-Term Follow-Up When Is MRI Indicated? Summary: An algorithmic framework for testicular US

GUEE-29 HEREDITARY RENAL CANCER SYNDROMES: UPDATED SCREENING GUIDELINES AND EVOLVING IMAGING ROLES

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TEACHING POINTS

Recognize key hereditary renal cancer syndromes and their implications for patient screening and management. Understand recent updates in screening recommendations, including age to initiate, frequency, and modality selection. Identify optimal imaging modalities, including the expanding role of MRI, in surveillance of these syndromes. Appreciate the importance of risk stratification, family history, and genetic profiling in tailoring screening strategies. Review imaging features of hereditary renal tumors and tips for early, accurate detection.

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What are hereditary renal cancer syndromes? Why are they critical to identify early? How have recent guidelines evolved regarding screening for VHL, HPRC, BHD, and other key syndromes? When should screening start, and how often should it be performed? How does this differ by syndrome and mutation type? What is the role of MRI versus ultrasound or CT in surveillance—what are the advantages, limitations, and recommended protocols? How can imaging be tailored to each syndrome—should there be a one-size-fits-all approach or individualized screening? What do we know about imaging phenotypes of tumors in hereditary syndromes—and how can these help distinguish indolent from aggressive lesions? What is the impact of genotype-phenotype correlations on imaging and surveillance planning? How do we balance over-surveillance and incidental findings with the need for early cancer detection? Can we use AI or structured reporting to improve detection, reduce variability, and streamline workflow in hereditary renal cancer screening? What is the radiologist's role in multidisciplinary hereditary cancer clinics and genetic counseling workflows?

GUEE-30 NOT ALWAYS A PERFECT MATCH!! THE DISCREPANCIES BETWEEN PROSTATE MRI AND PSMA PET-CT FINDINGS

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TEACHING POINTS

Discrepancies between prostate multiparametric magnetic resonance imaging (mpMRI) and prostate-specific membrane antigen (PSMA) PET- computed tomography (CT) findings are common, occurring in up to 50% of cases in some series. These inconsistencies may be related to: a) image acquisition techniques; b) tumor-related factors such as heterogeneity, PSMA expression, and lesion size; c) variability in readers' interpretation. Some of these discrepancies have significant clinical implications and should be promptly recognized.

TABLE OF CONTENTS/OUTLINE

Introduction: essential concepts of prostate cancer classification are introduced, along with a discussion of the roles of mpMRI and PSMA PET-CT in diagnosis and staging. Objective: to examine the sources of discrepancies between the two imaging modalities, with a focus on those with clinical relevance. Institutional cases are presented to illustrate discordant findings and their respective clinical significance. Imaging Findings: the diagnostic criteria for clinically significant prostate cancer using MRI and PSMA PET-CT are presented, highlighting the limitations of each method. A correlation between the Prostate Imaging-Reporting and Data System (PI-RADS) and PRIMARY scores is included to assist radiologists in interpreting and reconciling findings from both modalities. Discussion: mpMRI and PSMA PET-CT are often complementary imaging techniques. When used together, they can provide added diagnostic value in the assessment of patients with prostate cancer.

GUEE-31 A COMPREHENSIVE APPROACH TO RENAL MASSES: ENHANCING DIAGNOSTIC AND PROGNOSTIC ASSESSMENT

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Satheesh Krishna, MD (*Abstract Co-Author*)
Ronaldo H. Baroni, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- Review the imaging characteristics of renal masses, including nonneoplastic lesions and benign and malignant neoplasms - Discuss multimodality imaging characteristics (US, CT, MRI) that facilitate individualized prognostic assessment of renal lesions - Introduce radiological features indicative of indolent and malignant behavior - Illustrate the clinical application of structured classification systems in personalized decision-making, such as Bosniak classification (for cystic masses) and Clear Cell Likelihood Score (ccLS for solid masses) - Emphasize that the ccLS predicts the likelihood that a solid renal mass is a clear cell RCC (ccRCC), and ccRCC is the most common cause of metastatic RCC - Present the work-in-progress Kidney Imaging Reporting and Data System (KI-RADS), which combines cystic and solid masses into a single rubric, aiming to predict the aggressiveness of suspected kidney cancer

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1. Introduction: a. Renal Anatomy b. Epidemiology and Clinical Relevance of Renal Masses 2. Imaging Evaluation: a. Benign and indolent masses: i. Classic Fat-rich Angiomyolipoma ii. Fat-poor Angiomyolipoma iii. Oncocytoma iv. Mixed Epithelial and Stromal Tumor v. Multilocular Cystic Renal Neoplasm of Low Malignant Potential b. Malignant masses: i. Clear cell RCC ii. Papillary RCC iii. Chromophobe RCC iv. Urothelial Cell Carcinoma v. Renal Lymphoma vi. Renal Metastasis vii. Other less common neoplasms c. Suggestive features of aggressive behavior: i. Size ii. Growth rate iii. Infiltrative margins iv. Necrosis pattern v. Enhancing tissue volume 3. Classification Systems: a. Bosniak Classification b. ccLS c. KI-RADS 4. Future Directions

GUEE-32 UNIFYING ADRENAL IMAGING: INSIDE THE SAR LEXICON FOR CT AND MRI INTERPRETATION

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Satheesh Krishna, MD (*Abstract Co-Author*)
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TEACHING POINTS

• A standardized adrenal imaging lexicon enables clear communication between radiologists and other healthcare providers, facilitates consistent clinical adoption, enhances diagnostic accuracy, and promotes inter-reader agreement. • Understanding the context of use (COU) is essential: some terms are broadly applicable across all adrenal imaging, while others are specific to certain clinical or research scenarios. • The lexicon serves as a comprehensive reference for both novice and experienced radiologists aiming to improve imaging interpretation, standardize practice, and support reproducible research.

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Background (a) Challenges in adrenal lesion characterization (b) variability in terminology and reporting practices Lexicon Development (a) Consensus process by the SAR Adrenal Neoplasm Disease-Focused Panel (b) methodology and goals Lexicon Structure (a) General terms: Broad descriptors relevant to any adrenal imaging (b) Technical terms: Imaging acquisition and protocol-related terminology (c) Imaging feature terms: Morphology, composition, enhancement patterns, and other visual attributes Future Directions (a) Integration into structured reporting (b) Role in radiology education, decision support tools, and artificial intelligence applications Conclusions (a) Promoting the lexicon as an atlas for radiologists at all levels (b) Advancing standardization, communication, and research reproducibility in adrenal imaging

GUEE-33 UROTHELIAL CARCINOMAS OF THE UPPER URINARY TRACT: NEW TREATMENT PARADIGMS AND NEW IMAGE REQUIREMENTS

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TEACHING POINTS

-Urothelial carcinoma of upper urinary tract (UTUC) accounts for 5-10% of all urothelial cancers, usually associated to poor prognosis; -Radical nephroureterectomy (RNU) is still the standard treatment, with excellent oncological results at expenses of renal function; -Imaging plays a major role in the diagnosis of UTUC with Computed Tomography Urography (CTU); -Molecular diagnosis, imaging and minimally invasive treatment have allowed better risk stratification and kidney-sparing therapeutics for low-risk lesions; -MRI (magnetic resonance imaging) has been proposed for definition of the T-staging and CT/MRI to follow patients submitted to kidney-sparing therapies.

TABLE OF CONTENTS/OUTLINE

- Introduction: UTUCs are rare but aggressive lesions. Although RNU remains the standard treatment, management strategies have evolved with the incorporation of molecular diagnostics, imaging, and conservative therapies. - Objective: To discuss the foundations of standard and emerging therapies for UTUC lesions, and to examine the evolving role of imaging in managing these patients. - Imaging findings: CTU is the method of choice for diagnosing UTUC due to its superior accuracy, while also enabling evaluation of alternative causes of hematuria. Despite its excellent performance and widespread acceptance as the standard of care, there is considerable variability in how CTU examinations are performed in clinical practice. MRI has been proposed as a tool to estimate the depth of UTUC invasion. Cross-sectional imaging of the upper urinary tract is recommended by major urological societies, although there is variation in the recommended frequency and duration of follow-up after endoscopic treatment.

GUEE-34 STANDARDIZED LANGUAGE, SMARTER SURVEILLANCE: MRI LEXICON FOR PROSTATE CANCER FOLLOW-UP

Jorge A. Abreu Gomez, MD (*Presenter*)
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Andres Kohan, MD, MMedSc (*Abstract Co-Author*)
Vanessa Murad, MD (*Abstract Co-Author*)
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TEACHING POINTS

• Active surveillance (AS) is a guideline-recommended management strategy for low-risk and select intermediate-risk prostate cancer, enabling deferral of curative treatment until there is evidence of progression • MRI plays a central role in AS, offering non-invasive, reproducible evaluation of tumor stability and progression • The PRECISE (Prostate Cancer Radiological Estimation of Change in Sequential Evaluation) v2 scoring system offers a standardized lexicon for interpreting serial prostate MRIs in the AS setting, enhancing diagnostic confidence and communication with urologists • Terms within the lexicon are defined by their Context of Use (COU)—some are broadly applicable across all prostate MRI interpretations, while others are specific to AS in clinical or research environments • Familiarity with PRECISE v2 facilitates structured reporting, improves inter-reader agreement, guides clinical decision-making, and supports multicenter data reproducibility

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Background: Rationale for AS and the evolving role of MRI Importance of MRI: Benefits over traditional follow-up, with emphasis on consistency and reproducibility Standardization in Practice: Why structured lexicons matter in prostate MRI reporting PRECISE v2 Overview: Description, scoring system, and COU framework for terms Imaging Examples: MRI cases illustrating PRECISE scores 1-5 Future Directions: Impact on education, research, and integration into clinical workflows

GUEE-35 BEYOND VI-RADS: REVIEWING DIFFERENTIAL DIAGNOSIS IN BLADDER PATHOLOGIC CONDITIONS

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Martin Horwarth, MD (*Abstract Co-Author*)
Fernanda G. Velloni, MD (*Abstract Co-Author*)

TEACHING POINTS

Non-neoplasic bladder abnormalities can mimic malignancy on imaging and should be recognized to avoid misdiagnosis and unnecessary interventions. A systematic assessment to identify and review of bladder wall thickness, contour effect, intraluminal content across US, CT and MRI helps narrowing the differential diagnosis Radiologists play a key role at identifying subtle imaging clues of functional, inflammatory and reactive bladder conditions that are often overlooked in routine evaluations.

TABLE OF CONTENTS/OUTLINE

- INTRODUCTION - BLADDER ANATOMY REVIEW - FUNCTIONAL AND MECHANICAL CHANGES - BLADDER WALL ABNORMALITIES - CONTOUR DISTORTIONS AND OUTPOUCHINGS - FILLING DEFECTS AND LUMEN LESIONS - INTRAMURAL MASS AND UNUSUAL ENTITIES - TAKE-HOME MESSAGES - REFERENCES

GUEE-36 RADIOLOGICAL INSIGHTS INTO MEDICATION-INDUCED CHANGES IN FEMALE PELVIC ORGANS AND PATHOLOGIES

Lavinia Dias, MD (*Presenter*)
Caroline De Nicola (*Abstract Co-Author*)
Sophia Chamie (*Abstract Co-Author*)
Christina Tserou (*Abstract Co-Author*)
Brunna C. Oliveira, MD, MSc (*Abstract Co-Author*)
Izabela P. Franco, MD (*Abstract Co-Author*)
Alice Cristina C. Brandao Salomao, MD (*Abstract Co-Author*)
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Marcela C. Lauar, MD (*Abstract Co-Author*)
Luciana P. Chamie, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Understand the impact of common medications used in female treatments on imaging patterns observed in pelvic organs. Recognize key radiological findings induced by hormonal therapies, contraceptives, and oncological treatments. Correlate findings from ultrasound, CT, MRI, and other imaging modalities in the assessment of female pelvic pathologies influenced by medications.

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Hormonal Effects and Endocrine Modulation Therapies GnRH Analogues in Precocious Puberty: Imaging findings such as vascular reversal and uterine volume reduction. Ovarian Stimulation in IVF : Post-stimulation findings (multicystic ovaries) and complications like OHSS. Hormonal Therapies in Menopause: Imaging features of myoma growth and worsening of adenomyosis. Impact on myometrial hypertrophy and ovarian effects. Contraceptive and Common Gynecological Therapies Combined Oral Contraceptives: Endometrial atrophy and ovarian volume reduction. Levonorgestrel IUD: Endometrial atrophy and functional cyst formation. Dienogest and Norethindrone: Regression of endometriosis implants and volume reduction in deep infiltrative lesions. Aromatase Inhibitors (e.g., Letrozole): Effects on endometriosis and myoma reduction. GnRH Agonists and Antagonists: Imaging features associated with suppression of ovarian function and endometriosis. Effects of Antineoplastic Medications Chemotherapy: Radiological features of ovarian atrophy, absence of follicles, and signs of iatrogenic menopause. Tamoxifen: Endometrial hyperplasia and altered endometrioma patterns, including paradoxical growth of endometriotic lesions. Alternative Therapies

GUEE-37 TRANSURETHRAL ULTRASOUND ABLATION (TULSA) FOR PROSTATE CANCER: COMPREHENSIVE OVERVIEW AND EXPERIENCE FROM A HIGH-VOLUME CENTER

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Jesus Pineda Ramirez, MD (*Abstract Co-Author*)
Asim Afaq, MD (*Abstract Co-Author*)
Gaurav Khatri, MD (*Abstract Co-Author*)
Daniel N. Costa, MD (*Abstract Co-Author*)
Jovan Begovic, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review the mechanism, types of TULSA ablation, workflow, and advanced post treatment imaging for this novel minimally invasive prostate cancer therapy. 2. Illustrate our institutional experience with one-year post-TULSA multiparametric MRI and PSMA PET/MRI surveillance, with correlation to pathologic outcomes. 3. Highlight imaging pearls and pitfalls in detection of recurrence following TULSA with pathological correlation using in-bore MRI-guided prostate biopsy.

TABLE OF CONTENTS/OUTLINE

Content Outline 1. Overview of Transurethral Ultrasound Ablation (TULSA) a. Principles and mechanisms b. Personnel requirement c. TULSA-Pro system 2. Pre-Procedural Considerations a. Work-up and patient selection b. Contraindications (absolute and relative) c. Implementation of eConsult workflow 3. TULSA Procedure a. Step-by-step technique b. Intra-procedural monitoring c. MR thermometry 4. Post-Ablation Surveillance at One-Year a. One-year surveillance protocols b. Expected post-treatment changes c. In-field versus out-of-field recurrence 5. Imaging Pearls and Pitfalls a. Case examples with one-year follow up and pathologic correlation. b. Common interpretive challenges and tips to avoid misdiagnosis

GUEE-38 FUNCTIONAL ADRENAL PATHOLOGIES: IMAGING APPROACH TO ENDOCRINE CLINICAL AND BIOCHEMICAL PHENOTYPES

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Margarita V. Revzin, MD, MS (*Abstract Co-Author*)
Michael T. Corwin, MD (*Abstract Co-Author*)
Mindy X. Wang, MD (*Abstract Co-Author*)
Myles T. Taffel, MD (*Abstract Co-Author*)
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Khaled M. Elsayes, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Discuss the imaging phenotypes of adrenal lesions associated with hormonal hypersecretion or adrenal insufficiency. Correlate clinical and biochemical phenotypes with imaging features to reach a confident diagnosis. Illustrate various pitfalls and mimics that may lead to misclassification of functioning adrenal masses.

TABLE OF CONTENTS/OUTLINE

1. Introduction Overview of adrenal zonal anatomy and associated hormones Functional lesions and why imaging matters 2. Clinical and Biochemical Profiles Endocrine syndromes: Cushing, Conn, pheochromocytoma, androgen excess Role of hormonal testing and lab thresholds 3. Imaging Patterns of Functioning Masses Adenomas, pheochromocytoma, ACC, hyperplasia subtypes Imaging clues on CT, MRI (chemical shift, enhancement, fat content) Imaging correlates of hormonal subtypes (ACTH-dependent/independent) 4. Special Scenarios and Pitfalls Congenital adrenal hyperplasia, myelolipoma with functional transformation Cystic pheochromocytoma, hemorrhage with increased plasma metanephrine mimicking pheochromocytoma Misinterpreted imaging findings due to artifact, overlap, or atypical appearance 5. Take-Home Message Multimodal approach integrating imaging, laboratory, and clinical features

GUEE-39 MRI-GUIDED TRANSURETHRAL ULTRASOUND ABLATION FOR PROSTATE CANCER: A COMPREHENSIVE MANUAL TO MPMRI-BASED EVALUATION AND PITFALL AVOIDANCE

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Omer Esengur, MD (*Abstract Co-Author*)
Bradford J. Wood, MD (*Abstract Co-Author*)
Sandeep Gurram (*Abstract Co-Author*)
Peter Pinto (*Abstract Co-Author*)
Baris Turkbey, MD (*Abstract Co-Author*)

TEACHING POINTS

• Transurethral ultrasound ablation (TULSA) is a minimally invasive, MRI-guided focal therapy for localized prostate cancer and benign prostatic hyperplasia.• TULSA provides targeted ablation with real-time thermal monitoring, offering reduced side effects compared to whole-gland treatments.• Post-treatment MRI interpretation requires distinguishing expected ablation changes from true cancer recurrence, which may be subtle to untrained readers.

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1. Patient Selection: Review of eligibility criteria, including clinical, PSA, and imaging parameters.2. Procedure Overview: Annotated procedural diagram illustrating transurethral probe placement and sonication zones.3. Imaging Correlates:a. Pretreatment multiparametric MRIb. Immediate post-ablation MRI appearance. c. Follow-up MRI highlighting post-treatment changes versus recurrent disease4. Pitfalls and Pearls: Challenges in image interpretation and tips for radiologists unfamiliar with focal therapy follow-up.5. Clinical Relevance: Role of TULSA in modern prostate cancer management and its potential to reduce the burden of overtreatment.

GUEE-40 HEREDITARY GENITOURINARY CANCER SYNDROMES: ROLE OF IMAGING IN SCREENING AND SURVEILLANCE

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Surbhi Raichandani, MD (*Abstract Co-Author*)
Aarti Sekhar, MD (*Abstract Co-Author*)
Ayushi Gupta, MD (*Abstract Co-Author*)

TEACHING POINTS

Hereditary genitourinary (GU) cancer syndromes include von Hippel-Lindau (VHL), tuberous sclerosis (TS), Li-Fraumeni, hereditary leiomyomatosis and renal cell cancer (HLRCC), multiple endocrine neoplasia type 2 (MEN 2a and 2b), hereditary paraganglioma-pheochromocytoma, and others. Knowledge of these syndromes is essential for radiologists who may have the first opportunity to unify the diagnosis. These syndromes pose unique challenges and special opportunities in early cancer detection with imaging playing a central role in screening, surveillance, and guiding interventions to improve patient care.

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1. Review key GU cancer syndromes including genetic foundations. 2. Recognize imaging features and diagnostic clues highlighting characteristic patterns through case-based examples. 3. Discuss screening and surveillance guidelines with recommendations from societies such as ACR and NCCN. 4. Understand the role of imaging and its impact in clinical decision-making for longitudinal care.

GUEE-41 RADIOLOGICAL ASSESSMENT OF THE PENIS; A DETAILED MULTIMODALITY REVIEW

Margaret Adejolu, FRCR,MRCP (*Presenter*)

TEACHING POINTS

1. To demonstrate the normal penile anatomy with an emphasis on ultrasound (US) and magnetic resonance imaging (MRI). 2. To provide guidance to radiologists to optimize imaging modality selection in the diagnostic workup of penile diseases. 3. To demonstrate common penile pathology and highlight key information required by urologists to help inform surgical planning and conservative treatment strategies.

TABLE OF CONTENTS/OUTLINE

Introduction 1. Anatomy of the penis and scrotum on US and MR imaging 2. Common indications for penile-specific imaging and optimal imaging modalities 3. MR protocol for penile Imaging 4. Imaging of penile Pathology • Neoplastic: Primary malignancy, metastasis • Inflammatory: Peyronie's disease, abscesses, pyoderma gangrenosum • Traumatic: Fractured penis • Post surgical: Complications of penile prosthesis • Vascular: Penile varices, thrombophlebitis 5. Pitfalls in imaging of the penis

GUEE-42 NOT SO RETRO: A MODERN LOOK AT RETROPERITONEAL PATHOLOGY

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Amanda C. Gibson, DO (*Abstract Co-Author*)
Leslie Nelson, DO (*Abstract Co-Author*)
Aman Khurana, MD (*Abstract Co-Author*)
James T. Lee, MD (*Abstract Co-Author*)
Joseph W. Owen, MD (*Abstract Co-Author*)
Andres R. Ayoob, MD (*Abstract Co-Author*)

TEACHING POINTS

The retroperitoneum is a component of the abdominal cavity located between the posterior parietal peritoneum and the transversalis fascia of the posterior abdominal wall, extending from the diaphragm cranially to the pelvic inlet caudally. Discrete fascial planes divide the retroperitoneum into three compartments (perirenal, anterior pararenal, and posterior pararenal) and allow these compartments to communicate with the pelvic extraperitoneal spaces. The retroperitoneum and extraperitoneal pelvis are affected by a variety of conditions including inflammatory, infectious, neoplastic, and traumatic processes. Diagnosis and identification of complications and disease spread in the retroperitoneum, as elsewhere throughout the body, depends predominantly on answering two questions - where is the abnormality located and what is the abnormality made of? Localization hinges on knowledge of anatomy, while composition determination depends on a knowledge of basic physics. Applying this approach enables radiologists to optimize search patterns, appropriately localize abnormalities, and narrow differential diagnoses. This review will use a case-based method to model this approach to image interpretation.

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Define the facial planes and spaces of the retroperitoneum and extraperitoneal spaces of the pelvis, utilizing pathologic conditions to highlight anatomy. Describe techniques to localize abnormalities to the retroperitoneum and define their origin within an organ, compartment, or interfascial plane Discuss clinical cases modeling a systematic approach to define the location of the abnormality and characterize its composition (fluid, solid, fat, calcium, gas, etc.)

GUEE-43 NOT JUST TWO ROADS DOWN: RADIO-PATHOLOGIC PICTORIAL REVIEW OF THE URETER

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Miguel Leon Garcia, MD (*Abstract Co-Author*)
Lorena Melian Iribar, MD (*Abstract Co-Author*)
Javier Azpeitia-Hernandez, MD (*Abstract Co-Author*)
Itxaso Galan-Gonzalez (*Abstract Co-Author*)

TEACHING POINTS

To review the embryology and anatomy of the ureter. To illustrate imaging findings of the ureter, including normal variants, inflammatory/infectious diseases, and tumors. To analyze the correlation between intravenous urography, US, CT, and MRI features with pathology in ureteral lesions. To emphasize pitfalls, diagnostic difficulties, and differential diagnosis.

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Although ureterolithiasis is the most frequent and urothelial carcinoma the most important differential diagnosis for ureteral lesions, different entities may involve the ureter. We review imaging findings, with clues to interpretation, and provide pathologic correlation. We will highlight how pathologic correlation informs imaging interpretation. We present: -Embryology. -Anatomy -Utility of imaging methods: multi-detector computed tomography (MDCT) urography, intravenous urography, MRI, and US. -Pathologic entities: congenital (incomplete and complete duplication, megaureter, ectopic ureteral insertion ureterocele, retrocaval ureter), inflammatory diseases (ureteritis cystica, tuberculosis); ureteral thickenings after obstruction, surgery or radiotherapy; obstruction (ureterolithiasis, blood clots, ureteropelvic junction obstruction and strictures, endometriosis, malacoplakia, retroperitoneal fibrosis); tumors: benign (papilloma, fibroepithelial polyps, villous adenoma) and malignant (ureteral transitional cell carcinoma, mesenchymal tumors, prostatic and gastric metastases, ureteral lymphoma); miscellanea (trauma, diverticula, ureteral pseudodiverticulosis, hernia, extrinsic compression/displacement, postsurgical images in different techniques).

GUEE-44 FAT AND THE ADRENALS: FRIEND TO RADIOLOGISTS (WITH SOME CAVEATS)

Yihan Cao, MD (*Presenter*)
Ryan Chung, MD (*Abstract Co-Author*)
Peter Sadow (*Abstract Co-Author*)
Michael A. Blake, MBBCh, MRCPI (*Abstract Co-Author*)

TEACHING POINTS

· Variations in retroperitoneal fat affect adrenal visibility · Microscopic fat-containing adrenal lesion = adenoma Exception - metastases from extra-adrenal tumors with microscopic fat · Macroscopic fat-containing adrenal lesion = myelolipoma Exception - myelolipomatous degeneration or macroscopic fat-containing metastases · Differentials for peri-adrenal fat-containing lesions include both benign (neoplastic and non-neoplastic) and malignant lesions

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1. Impact of retroperitoneal fat on the visualization of the adrenal glands Abundant fat improves visualization, while paucity can obscure adrenal pathology. Sex-based fat distribution and the TOFI (thin-outside-fat-inside) phenotype also impact visibility. 2. Microscopic fat-containing adrenal lesions Microscopic fat is typical of adenomas, which show signal drop on OOP images. Key caveats: (1) IP signal drop often suggests calcification or iron deposition; (2) metastases from HCC or clear cell RCC may also contain microscopic fat; (3) metastasis to an adenoma (collision tumor) may show two distinct parts or peripheral signal loss on CSI. 2.2 Macroscopic fat-containing adrenal lesions Macroscopic fat is typical of myelolipoma, which may enlarge with hematopoietic stress and mimic liposarcoma. Large myelolipomas can occur in congenital adrenal hyperplasia. Myelolipomatous degeneration may be seen in adenomas and adrenocortical carcinoma. Adrenal liposarcoma metastases are rare but possible. 3. Fat-containing peri-adrenal lesions These include benign entities (renal angiomyolipoma, fat necrosis, hemostatic agents, brown fat on FDG-PET) and malignant lesions such as retroperitoneal liposarcoma.

GUEE-45 CYST-EMS CHECK: A MULTIMODALITY EXPLORATION OF RETROPERITONEAL CYSTIC MASSES

Michelle Li, BS (*Presenter*)
Mahan Mathur, MD (*Abstract Co-Author*)

TEACHING POINTS

Cystic retroperitoneal masses are rare and often present with non-specific clinical and imaging findings; therefore, they can be challenging to diagnose prospectively. However, accurate assessment is crucial to prompt appropriate treatment considerations, such as watchful waiting, biopsy, or surgical resection. Diagnosis can be aided by some important imaging findings, such as tumor size, location, and tissue composition. This presentation will explore and differentiate cystic retroperitoneal masses (including solid masses with cystic change/necrosis) by highlighting their epidemiology, appearance on multi-modal imaging, histopathology, and treatment. After the module, the learner should be able to do the following: 1) Compare and contrast the imaging appearance of various cystic retroperitoneal neoplasms. 2) Elucidate appropriate management methods for these lesions.

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1) Introduction 2) Lymphatic malformation 3) Lymphangiomatosis 4) Lymphangioleiomyoma 5) Cystic teratoma 6) Cystic mesothelioma 7) Epidermoid cyst 8) Tailgut cyst 9) Bronchogenic cyst 10) Cystic change in solid neoplasm (Leiomyosarcoma, Paraganglioma, Nerve sheath tumors) 11) Pseudomyxoma retroperitonei 12) Conclusion

GUEE-46 PROSTATE ARTERY EMBOLIZATION AND IMAGING-BASED BIOMARKERS: CURRENT TOOLS IN MONITORING TREATMENT RESPONSE AND EMERGING STRATEGIES

Gavin Wu, BA (*Presenter*)
Umairullah Lodhi, MD (*Abstract Co-Author*)
Jason C. Hoffmann, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Understand the role of imaging in pre-procedural evaluation and post-treatment response after prostate artery embolization (PAE), with emphasis on objective markers beyond symptom scores. 2. Review common imaging modalities, including MRI and CT, and their associated biomarkers such as prostate volume reduction, perfusion changes, and tissue viability. 3. Recognize emerging tools like radiomics and theranostic imaging that may improve standardization and predictive modeling.

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Background: PAE is a minimally invasive treatment for BPH-associated lower urinary tract symptoms, especially in patients with significantly enlarged prostates (>80g). Imaging biomarkers provide objective assessment of treatment response and may complement clinical and biochemical endpoints. Imaging Modalities and Biomarkers: MRI and CT are used to assess prostate volume, perfusion, and infarction. Key biomarkers include non-perfused volume, ADC values, and DCE-MRI curves. Ultrasound may assess gland size and post-void residuals. Emerging Tools and Future Directions: Quantitative imaging may correlate with clinical outcomes, and emerging techniques such as radiomics and AI-based analysis are being explored for their potential in enhancing standardization and predictive modeling. Conclusion: Validated imaging biomarkers may enhance post-PAE monitoring and overall patient management by identifying individuals at higher risk of reintervention. This could enable tailored follow-up and patient education. Standardized protocols and further research are needed to support broader clinical use.

GUEE-47 DUAL-ENERGY CT APPLICATIONS FOR RENAL TUMOR ASSESSMENT: WHAT THE RADIOLOGIST AND UROLOGIST NEED TO KNOW

Shingo

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Haruhiko Machida, MD (*Abstract Co-Author*)
Rika Fukui (*Abstract Co-Author*)
Toshiya Kariyasu (*Abstract Co-Author*)
Makiko Nishikawa, MD (*Abstract Co-Author*)
Hidenori Yamaguchi (*Abstract Co-Author*)
Etsuko Tate, MD (*Abstract Co-Author*)
Wakana Samejima (*Abstract Co-Author*)
Yuta Hirose, MSc (*Abstract Co-Author*)
Isao Tanaka (*Abstract Co-Author*)
Yun SHEN (*Abstract Co-Author*)

TEACHING POINTS

1. To introduce current limitations in renal tumor assessment by single-energy CT (SECT). 2. To describe basic principles & various imaging/analyzing techniques of dual-energy CT (DECT) relevant to renal tumors. 3. To illustrate clinical utilities of DECT over SECT in renal tumor assessment by presenting various clinical images.

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1. Current limitations in renal tumor assessment by SECT : a) Limited detection of poorly enhancing lesions, b) Beam-hardening (BH) artifact (pseudoenhancement), c) Limited differentiation of cystic vs. solid lesions, d) Greater radiation/contrast media (CM) dose, e) Limited renal tumor characterization; 2. Basic principles & imaging/analyzing techniques of DECT : a) Virtual monochromatic (VMI) & material decomposition imaging (MDI), b) keV-HU curve & effective atomic number (Z) analysis, c) Improved DECT image quality by metallic artifact reduction software (MARS)/iterative (IR) & deep-learning reconstruction (DLR); 3. Clinical utilities of DECT over SECT in renal tumor assessment : a) Improved detection of poorly enhancing lesions/CM dose reduction: low-keV VMI/iodine-enhanced MDI/IR/DLR, b) Reduced BH/metallic artifact: high-keV VMI/MARS, c) Differentiation between cystic and solid lesions: iodine-enhanced MDI, d) Assessment of tumor grade/viability/response to chemotherapy: iodine-enhanced MDI/iodine density quantification, e) Reduced radiation dose: virtual non-contrast imaging (iodine-suppressed MDI), f) Assessment of lipid-rich tumors (e.g., angiomyolipoma): fat-enhanced MDI/keV-HU curve/effective Z, g) Bone metastasis detection: hydroxyapatite/calcium-suppressed MDI.

GUEE-48 ROCK HARD RADIOLOGY: A PRACTICAL GUIDE FOR RESIDENTS ON UROLITHIASIS IMAGING

Bruna Reis, MD (*Presenter*)
Thamiris Garcia, MD (*Abstract Co-Author*)
Priscila Crabi (*Abstract Co-Author*)
Heraldo Pereira (*Abstract Co-Author*)

TEACHING POINTS

Non-contrast-enhanced CT is the gold standard for diagnosis, offering high sensitivity and specificity. Structured CT reporting in urolithiasis is essential for guiding clinical decisions and standardizing communication between radiologists and referring physicians. This educational exhibit is specifically designed for radiology residents, underscoring the importance of accurate detection, localization, and characterization of urinary calculi. Comprehensive CT reports should include the number, size, location, attenuation, and skin-to-stone distance of calculi, as well as associated findings, potential complications and procedurally relevant anatomy. Mastery of appropriate measurement techniques and detailed knowledge of urinary tract anatomy are essential for diagnostic accuracy and effective treatment planning. Differentiation of urinary stones from mimickers and the correct assessment of hydronephrosis and complications are fundamental competencies for radiologists in training.

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Introduction Clinical relevance of urolithiasis Role of imaging in diagnosis and management Essential Elements of the CT Report Urinary Tract Anatomy and Variations Key anatomical landmarks Congenital and acquired variants affecting management Case-Based Review Educational cases with imaging examples Diagnostic Challenges and Pitfalls Related Complications Treatment Considerations Imaging findings influencing conservative vs. surgical treatment strategies Recognition of post-treatment complications Follow-Up Imaging Conclusion Summary of key educational points Empowering residents to improve diagnostic confidence and reporting quality

GUEE-49 REAL-TIME IN VIVO VISUALIZATION OF RETROPERITONEAL INTERFASCIAL PLANES: INSIGHTS FROM CT-GUIDED HYDRODISSECTION DURING RENAL CRYOTHERAPY

Kaori Yamada, MD, PhD (*Presenter*)
Yosuke Maehara (*Abstract Co-Author*)
Hiroshi Miura (*Abstract Co-Author*)
Tatsuya Hirota (*Abstract Co-Author*)
FUMIYA HONGO (*Abstract Co-Author*)
Osamu Ukimura (*Abstract Co-Author*)
Kei Yamada, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The traditional tricompartmental model has long served as the foundation for retroperitoneal anatomy. The concept of interfascial planes —such as the retromesenteric (RMP) , retrorenal (RRP) , and lateroconal (LCP) planes—has been recognized since the late 20th century , primarily based on cadaveric studies. However, CT-guided hydrodissection now enables real-time in vivo visualization of these planes. This exhibit aims to: (1) Review retroperitoneal interfascial anatomy based on hydrodissection imaging; (2) Describe the RMP, RRP, LCP, combined plane, and subfascial plane, including their continuities and anatomical variants; (3) Highlight key anatomical patterns that may refine traditional understanding.

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(1) Overview - Introduction to the tricompartmental theory and the concept of interfascial planes. (2) Interfascial Planes - Definitions and relationships of the RMP, RRP, and LCP. (3) Lateral Continuity - Fascial trifurcation and interconnection of the three planes. (4) Superior Extension - Fusion patterns near the diaphragm. (5) Inferior Continuity - Merging of RMP and RRP into the pelvic retroperitoneum via the iliac fossa. (6) Medial Spread - Patterns of midline crossover and possible barriers related to the primitive descending mesocolon. (7) Retrorenal Variants - Two medial morphologies: termination at the psoas major vs. continuity with the anterior renal fascia. (8) Subfascial Plane - Latent cavity along the transversalis fascia, with posterior and anterior connections. (9) Conclusion - Summary of anatomical insights gained from hydrodissection imaging.

GUEE-50 INTERPRETING PROSTATE MRI AFTER FOCAL THERAPY WITH TARGET PRECISION

Andrea L. da Silva, MBBCh (*Presenter*)
Andrea G. Rockall, FRCR, MRCP (*Abstract Co-Author*)
Henry H. Tam, FRCR (*Abstract Co-Author*)
Amish Lakhani, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Review the eligibility criteria for prostate cancer focal therapy. Outline focal therapy options (including high-intensity focussed ultrasound, cryotherapy) and appropriate lesion selection. Emphasise MRI protocol post-treatment, including the importance of DCE imaging. Demonstrate typical early and late post-treatment imaging appearances with case examples. Introduce the TARGET recommendations for scoring in post-focal therapy reporting. Compare TARGET with other scoring systems in post-treatment prostate evaluation.

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Minimally invasive focal therapies are shifting prostate cancer management, offering outcomes comparable to radical treatments with reduced morbidity. Imaging remains crucial for detecting recurrence. Post-treatment changes can make detection of viable disease challenging on MRI. Whilst bi-parametric MRI may be sufficient in the detection of clinically significant prostate cancer, dynamic contrast-enhanced imaging is essential post-focal therapy for optimal detection of recurrent disease. This exhibit outlines MRI protocol and common imaging appearances after treatment, with case examples highlighting diagnostic pitfalls. The TARGET recommendations provide a practical, structured reporting system for assessing the focal therapy-treated prostate, enabling standardised risk stratification and guiding follow-up decisions. We compare TARGET with other scoring systems, demonstrating its ease of use and clinical utility. Radiologists will gain tools to enhance diagnostic confidence and reporting consistency after focal therapy.

GUEE-51 ROLE OF NON-CONTRAST MR UROGRAPHY IN UPPER TRACT UROTHELIAL CARCINOMA: BEYOND AN ALTERNATIVE TO CT

Wei Wang (*Presenter*)
Jian-Xing Qiu, MD (*Abstract Co-Author*)
Jingyun Wu (*Abstract Co-Author*)

TEACHING POINTS

(1) Understand the limitations of CT urography and the emerging role of non-contrast MR urography (MRU) in upper tract urothelial carcinoma (UTUC) evaluation. (2) Recognize the key MRI features of UTUC (papillary, flat, invasive) and the added value of DWI in tumor detection and characterization. (3) Discuss the role of MRU in T-staging, differential diagnosis, and post-treatment follow-up with case examples.

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1. Introduction to UTUC (1) Epidemiology & Clinical Presentation (2) Diagnostic Challenges 2. Imaging Modalities for UTUC: Strengths & Limitations (1)CT Urography (First-line choice) (2)MR Urography (Non-Contrast) Pros: No radiation, no iodinated contrast, superior soft-tissue contrast, functional imaging (DWI), safe for (follow-up) examination in patients with renal insufficiency; Cons: Longer scan time, lower spatial resolution vs. CT, cost 3. Suggested MRU Protocol & Essential Sequences T2WI (ax, cor)/DWI/Static-Fluid MRU 4. MRI findings of UTUC Papillary/Flat/Invasive Tumor 5. MRI in Local T-Staging Renal Pelvic/Ureteral UC staging 6. Differential Diagnosis 7. Post-Treatment Follow-Up 8. Summary

GUEE-52 ENDOMETRIOSIS WITHOUT BORDERS: COMMON AND UNCOMMON SITES AND PRESENTATIONS

Sreeja Sanampudi, MD (*Presenter*)
Azarin Shoghi, MD,MS (*Abstract Co-Author*)
Crystal H. Bruce (*Abstract Co-Author*)
David T. Fetzer, MD (*Abstract Co-Author*)
Gaurav Khatri, MD (*Abstract Co-Author*)
Ravi K. Kaza, MD (*Abstract Co-Author*)

TEACHING POINTS

Endometriosis can occur in uncommon locations such as bowel wall, bladder, mesentery, umbilicus, and thorax Unusual clinical presentations include peritonitis, cyclic pleural effusions, pneumothorax, and tuboovarian abscesses US is important in screening for endometriosis, particularly in common locations MRI is used for complex and extra-pelvic endometriosis Identifying atypical imaging appearances of endometriosis aids in accurate diagnosis and prevents mismanagement

TABLE OF CONTENTS/OUTLINE

1. Introduction Epidemiology and typical locations Pathophysiology for atypical locations 2. Imaging Modalities Role of US, CT, and MRI Findings specific to hemorrhagic/endometrial tissue 3. Uncommon Anatomical Locations Bowel wall involvement Rectosigmoid junction, "mushroom cap" sign Mesentery MRI appearance of cystic lesions Bladder and ureters Focal bladder wall thickening, hydronephrosis Umbilical endometriosis (Villar's Nodule) Cutaneous/subcutaneous lesion Abdominal wall C-section scar Thorax and pleura Cyclic hemothorax and catamenial pneumothorax 4. Uncommon clinical presentations Peritonitis Diffuse peritoneal enhancement, ascites Tuboovarian abscess Complex cystic adnexal masses with gas-fluid levels Pneumothorax 5. Differential Diagnosis and Diagnostic Pearls Endometriosis vs. malignancy, abscess, IBD Importance of menstrual history and correlation with cyclic symptoms 6. Clinical Impact and Management Role of radiology in surgical planning Multidisciplinary collaboration 7. Summary and Take-Home Messages High suspicion in patients with chronic pelvic pain and non-specific symptoms Recognizing imaging signs can guide minimally invasive diagnosis and treatment

GUEE-53 VIRTUAL HYSTEROSALPINGOGRAPHY (CT-VHSG): A NOVEL APPROACH FOR EVALUATING UTERINE ANOMALIES

Juan Cruz Gallo, MD, MD (*Presenter*)
Patricia M. Carrascosa, MD, PhD (*Abstract Co-Author*)
Jimena B. Carpio, MD (*Abstract Co-Author*)
Carlos Capunay, MD (*Abstract Co-Author*)
Mariano Baronio, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the embryological basis and classification of congenital uterine anomalies, including their impact on fertility, pregnancy loss, and obstetric complications. Compare CT-VHSG with conventional imaging techniques highlighting diagnostic advantages and limitations. Learn the technical approach for performing CT-VHSG, including patient preparation, acquisition protocols, and 3D reconstruction techniques. Recognize the imaging features of common Müllerian anomalies through case-based examples using CT-VHSG. Explore the clinical role of CT-VHSG in reproductive counseling and patient management, including its potential integration with AI-assisted interpretation and future advancements in minimally invasive imaging.

TABLE OF CONTENTS/OUTLINE

Overview of Congenital Uterine Anomalies Etiology and classification of Müllerian anomalies Prevalence and reproductive implications Imaging Techniques for Uterine Anomaly Detection Comparative review of HSG, ultrasound, MRI, and CT-VHSG Advantages and limitations of each modality CT-VHSG: Technical Approach and Diagnostic Value Procedure protocol, patient preparation, and acquisition techniques 3D imaging reconstruction for enhanced uterine morphology assessment Radiation dose considerations and safety profile Case-Based Review of Common Uterine Anomalies Unicornuate uterus, bicornuate uterus, didelphys uterus, and arcuate uterus Imaging findings and key differentiating features using CT-VHSG vs. other modalities. Clinical Implications and Future Perspectives Role of CT-VHSG in patient management and reproductive counseling Potential integration of AI-assisted interpretation for enhanced accuracy

GUEE-54 PROSTATE IMAGING: WIDENING THE SPECTRUM OF DISORDERS WITH MIMICKERS OF ADENOCARCINOMA AND BEYOND

Umran Esen, MD (*Presenter*)
Emre Unal, MD (*Abstract Co-Author*)
Aycan Uysal, MD (*Abstract Co-Author*)
Turkmen Ciftci (*Abstract Co-Author*)
Devrim Akinci (*Abstract Co-Author*)

TEACHING POINTS

1. A wide range of disorders may mimic prostate adenocarcinoma, and differentiating benign from malignant lesions can be challenging. 2. Inflammation of the prostate is a major limitation against definitive imaging-based diagnosis. 3. Both primary and metastatic malignant neoplasms of the prostate may mimic each other on cross-sectional imaging. 4. Awareness of these mimickers is essential, as clinical history and laboratory tests may fail to provide sufficient diagnostic information.

TABLE OF CONTENTS/OUTLINE

1. Introduction (Brief overview of prostate adenocarcinoma and typical imaging characteristics-including peripheral and central zone examples) 2. Differential Diagnosis: A Case-Based Approach (a. Inflammation of the prostate: the great mimicker of malignancy; b. Cystic lesions: not solid, not malignant; c. Benign but deceptive: non-neoplastic conditions; d. Malignancy, yet not primary; e. Primary malignancy, yet not adenocarcinoma; f. Miscellaneous) 3. Summary and Conclusion

GUEE-55 TULSA FOR PROSTATE CANCER: MRI-BASED PRE-TREATMENT PLANNING AND POST-TREATMENT ASSESSMENT — AN EMERGING ALTERNATIVE IN THE FOCAL THERAPY SPECTRUM

Satoru Takahashi, MD, PhD (*Presenter*)
Masayoshi Miura (*Abstract Co-Author*)
Hiroshi Higashiyama (*Abstract Co-Author*)
Yasuhito Yamaoka (*Abstract Co-Author*)

TEACHING POINTS

Transurethral ultrasound ablation (TULSA) is a novel MRI-guided treatment for localized prostate cancer (PCa), uniquely performed via a transurethral approach with real-time MRI thermometry, enabling both focal and whole-gland ablation with high precision. The objectives of this exhibit are: To understand the procedural workflow and technical principles of TULSA To recognize the role of multiparametric MRI (mpMRI) in patient selection and treatment planning To illustrate characteristic MRI findings immediately after TULSA and during follow-up To distinguish expected post-TULSA changes from imaging features indicative of treatment failure or recurrence

TABLE OF CONTENTS/OUTLINE

Focal therapies in PCa Overview of cryotherapy, RFA, HIFU, and TULSA Comparative characteristics of each treatment modality Technical aspects of TULSA Equipment overview Transurethral ultrasound transducer Cooling mechanisms for urethra and rectum Real-time MRI thermometry and procedural control Pre-treatment evaluation with mpMRI Lesion localization and patient selection Assessment of neurovascular bundles and sphincters Evaluation of calcifications and venous plexus Post-treatment MRI findings Immediate changes and serial evolution Prostate volume reduction and shape distortion Urethral preservation assessment Treatment-related complications Urethral obstruction and necrosis Soft tissue thermal injury Cystostomy requirements Detection of residual or recurrent disease Local recurrence, seminal vesicle involvement Nodal or bone metastasis Interpretive pitfalls and differential considerations Coagulative necrosis vs. abscess or inflammation

GUEE-56 RECURRENCE IMAGING AFTER DEFINITIVE THERAPY OF THE PROSTATE CANCER

Satoru Takahashi, MD, PhD (*Presenter*)
Yoshiko Ueno, MD, PhD (*Abstract Co-Author*)
Keitaro Sofue, MD (*Abstract Co-Author*)
Munenobu Nogami, MD, PhD (*Abstract Co-Author*)
Takamichi Murakami, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Structured reporting and data systems (RADSs) help radiologists standardize interpretation and communication of prostate cancer (PCa) imaging findings. PI-RADS is widely used for identifying biopsy candidates and tumor localization, but imaging plays a broader role throughout PCa management, including nodal and distant staging, recurrence assessment, and evaluation of metastatic disease. Node-RADS, PSMA-RADS, PI-RR, and MET-RADS-P are emerging tools designed to guide these advanced diagnostic and therapeutic steps. Radiologists should understand the principles, clinical indications, and evaluation methods of each RADS. This exhibit offers an overview of how these RADSs are applied in real-world scenarios, supported by case-based illustrations and evidence-based review.

TABLE OF CONTENTS/OUTLINE

Clinical Workflow of Prostate Cancer and Corresponding RADSs Biopsy indication and localization: PI-RADS T-staging: PI-RADS N-staging: Node-RADS, PSMA-RADS M-staging and CRPC assessment: MET-RADS-P, PSMA-RADS Recurrence evaluation: PI-RR Imaging Modalities Used in Each Step Multiparametric MRI (mpMRI), contrast-enhanced CT, whole-body MRI, and PSMA-PET Evaluation Guide for Each RADS Technical requirements, categorization methods, and structured interpretation Clinical case presentations to demonstrate practical application Current Evidence and Limitations Diagnostic accuracy, interobserver agreement, and findings from recent literature and meta-analyses

GUEE-57 MULTIPARAMETRIC MRI AND PI-RR SYSTEM FOR LOCAL RECURRENCE OF PROSTATE CANCER: TECHNIQUE, INTERPRETATION, AND CLINICAL IMPACT

Satoru Takahashi, MD, PhD (*Presenter*)
Yoshiko Ueno, MD, PhD (*Abstract Co-Author*)
Keitaro Sofue, MD (*Abstract Co-Author*)
Munenobu Nogami, MD, PhD (*Abstract Co-Author*)
Takamichi Murakami, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Biochemical recurrence (BCR) is a frequent challenge after radical prostatectomy (RP) or radiation therapy (RT) for prostate cancer (PCa), requiring accurate localization of recurrence to guide salvage or systemic treatment. The Prostate Imaging for Recurrence Reporting (PI-RR) system standardizes multiparametric MRI acquisition and interpretation for detecting local recurrence after RP or RT. Familiarity with post-treatment pelvic anatomy and structured MRI assessment improves diagnostic accuracy and clinical decision-making. This exhibit illustrates the utility, workflow, and limitations of the PI-RR scoring system in real-world practice.

TABLE OF CONTENTS/OUTLINE

Treatment Strategies for PCa - Overview of RP, RT, and salvage treatment approaches based on current guidelinesPost-Treatment Imaging Anatomy - Key anatomic changes following RP- Imaging findings after RTMRI Acquisition Protocol - Sequences: multiplanar T2-weighted, large-FOV T1-weighted/DWI, and DCE- Tips for optimizing local recurrence detectionPI-RR Scoring System - Criteria and application after RP and RT- Visual examples of PI-RR categoriesClinical Applications - Use of PI-RR in routine clinical scenarios- Role in guiding further imaging or treatment decisions- Case-based demonstrationCurrent Evidence and Limitations - Diagnostic accuracy and inter-reader agreement- Literature overview and future perspectives

GUEE-58 IMAGING OF THE PERIRENAL SPACE

Maria Zulfiqar, MD, MBBS (*Presenter*)
Michael Weston, MD (*Abstract Co-Author*)
Anup S. Shetty, MD (*Abstract Co-Author*)
Mark J. Hoegger, MD, PhD (*Abstract Co-Author*)
Kumaresan Sandrasegaran, MD (*Abstract Co-Author*)
Nelly Tan, MD (*Abstract Co-Author*)
Daniel R. Ludwig, MD (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Akira Kawashima, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Illustrate the anatomy of the perirenal space with emphasis on radiological correlation. 2. Case based discussion of the spectrum of pathology in the perirenal space.

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• Trauma: Pneumo-retroperitoneum; Grade 4 renal injury leading to urine leak; Perinephric hematoma commonly involves retroperitoneal zones 1 and 2. • Infection or inflammation: Perirenal abscesses; Fat stranding from pyelonephritis and urinary outflow obstruction; Forniceal rupture/urine leak Spread of inflammation from pancreatitis, ruptured duodenal ulcer, lumbar discitis osteomyelitis • Vasculature: Venous collaterals from renal vein/IVC obstruction; Arteriovenous fistula • Lymphatic: Renal/perirenal lymphangiectasia; Lymphatic leak • Masses: --Nonneoplastic masses: Retroperitoneal fibrosis/IgG4; Amyloidosis, renal replacement lipomatosis; Perinephric myxoid pseudotumor of fat; Gossypiboma --Neoplastic masses: Benign: Extramedullary hematopoiesis, Rosai-Dorfman disease; renal AML, retroperitoneal lipomatosis, Neurogenic tumors: Neurofibroma/ganglioneuroma. Malignant: Lymphoma; Erdheim-Chester disease; liposarcoma; Myxoid sarcomatous tumors; Leiomyosarcoma; Metastasis.

GUEE-59 WHO 2022 CLASSIFICATION OF RENAL CELL TUMORS: WHAT THE RADIOLOGIST NEEDS TO KNOW

Kumaresan Sandrasegaran, MD (*Presenter*)
ABHIJIT DAS (*Abstract Co-Author*)
Komal A. Chughtai, MD (*Abstract Co-Author*)
Amar Shah, MD (*Abstract Co-Author*)
Nelly Tan, MD (*Abstract Co-Author*)
Maria Zulfiqar, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Obtain a broad overview of World Health Organization (WHO) 2022 Classification of renal tumors 2. Review the newer tumors included in this classification 3. Learn some of the unique imaging and clinical features of newer renal tumors

TABLE OF CONTENTS/OUTLINE

1. 2022 classification (version 5) of renal tumors 2. Uncommon Renal Tumors 3. Molecularly-defined renal cancers 4. Clinical and imaging features that point to diagnosis of: a. Clear Cell Papillary Renal Cell Tumor b. Tubulocystic Carcinoma c. Eosinophilic Solid and Cystic Renal Cell Carcinoma (RCC) d. TFE3-Rearranged RCC e. Fumarate Hydratase-Deficient RCC f. ALK-Rearranged RCC

GUEE-60 MR-GUIDED FOCAL HDR BRACHYTHERAPY FOR PROSTATE CANCER: RADIOLOGIST'S EXPANDING ROLE IN MONOTHERAPY, BOOST, AND SALVAGE SETTINGS

Jorge A. Abreu Gomez, MD (*Presenter*)
Stephanie Trujillo C, MD (*Abstract Co-Author*)
Vanessa Murad, MD (*Abstract Co-Author*)
Adriano Basso Dias, MD, MSc (*Abstract Co-Author*)

TEACHING POINTS

MR-guided focal HDR brachytherapy is a promising minimally invasive treatment for prostate cancer, enabling precise dose delivery with minimized toxicity. This technique can be applied as monotherapy, a boost following EBRT, or as salvage therapy in recurrent disease. MRI plays a critical role throughout the treatment process —from lesion targeting and catheter placement to post-treatment surveillance and assessment of recurrence. Familiarity with expected post-treatment MRI findings and imaging features of recurrence is essential for radiologists involved in prostate cancer management.

TABLE OF CONTENTS/OUTLINE

Clinical background and evolving role of HDR brachytherapy in prostate cancer treatment Overview of HDR brachytherapy indications: monotherapy, boost after EBRT, and salvage use Advantages of MR-guided HDR: real-time targeting, superior tissue contrast, and dosimetric precision MRI-based patient selection and focal lesion targeting. MRI-guided HDR workflow: imaging protocols, catheter placement, treatment planning Post-treatment MRI findings: expected findings vs. residual / recurrent disease Radiologist's role across monotherapy, boost, and salvage settings

GUEE-61 EXTRA-OVARIAN MUCINOUS CYSTIC NEOPLASMS: THE OVARIAN MIGRATION VESTIGE THEORY

Heather M. Martin, MD, MPH (*Presenter*)
Korosh Khalili, MD (*Abstract Co-Author*)

TEACHING POINTS

Extraovarian mucinous cystic tumors with ovarian-type stroma (OTS) share clinical, radiologic, and pathologic features despite arising in anatomically distinct locations. These tumors occur almost exclusively in women and commonly present as multilocular cystic masses in very specific locations , often with identical histologic profiles but thought of and classified as unrelated tumors. The ovarian migration vestige theory postulates that these tumors originate from ectopic gonadal or Müllerian progenitor cells displaced during embryonic ovarian descent , accounting for their similar appearance and peculiarly specific locations, even within the same organ. This developmental model reframes seemingly unrelated tumors as part of a unified disease process, challenging traditional organ-based classification schemes. Understanding the shared embryologic origin of OTS-associated tumors may improve diagnostic accuracy and clarify clinical management.

TABLE OF CONTENTS/OUTLINE

Overview of Ovarian Development and Descent Review of the ovarian migration vestige theory (Visual Embryology Diagram) Discuss the peculiar location for each tumor in respect to the ovarian descent pathway. Pictorial review of tumors with diagnostic tips to allow specific diagnosis: Mucinous cystic neoplasm of the liver Pancreatic mucinous cystic neoplasm Retroperitoneal mucinous cystadenoma and variants Renal mixed epithelial and stromal tumor/Multilocular cystic nephroma Ovarian mucinous neoplasm

GUEE-62 BEYOND THE SURFACE: EXPLORING RADIOLOGY'S FRONTIER WITH TRANSPERINEAL ULTRASOUND

Reham M. Ellessy, MBBCh (*Presenter*)
Grace G. Zhu, MD (*Abstract Co-Author*)
Cary L. Siegel, MD (*Abstract Co-Author*)
Douglas M. Rogers, MD (*Abstract Co-Author*)
Moataz Ahmed Sayed Mohammed Soliman, MD, MSc (*Abstract Co-Author*)

TEACHING POINTS

Objectives of this exhibit include: Provide an overview of the anatomy of the pelvic floor and the role of transperineal ultrasound in visualizing pelvic structures. Showcase transperineal ultrasound its imaging appearance across multiple different pathologies Highlight the advantages and limitations of transperineal ultrasound compared to other imaging modalities

TABLE OF CONTENTS/OUTLINE

1) Introduction a) Review anatomy of the pelvic floor and perineal region b) Briefly review the role of different imaging modalities (fluoroscopy, MRI, Ultrasound) in visualization and dynamic assessment of the perineum c) Review the technique involved in transperineal ultrasound, with focus on the protocol, transducer selection, and patient preparation 2) Review of pathology and imaging examples of transperineal ultrasound a) Pelvic fistulas b) Pelvic floor dynamics c) Perineal masses d) Vaginal abnormalities i) Vaginal and peri-vaginal cysts ii) Vaginal tumors (1) Benign (2) Malignant iii) Congenital anomalies iv) Vaginal foreign bodies e) Mullerian duct anomalies 3) Advantages and Disadvantages of transperineal ultrasound to other modalities

GUEE-63 MICROVASCULAR FLOW IMAGING FOR TESTICULAR DISEASE: CASE-BASED LEARNING IN ULTRASOUND DIAGNOSIS

Arisa Kameda (*Presenter*)
Kiyoyuki Minamiguchi (*Abstract Co-Author*)
Katsutoshi Horiuchi, MD (*Abstract Co-Author*)
Mako Iwata (*Abstract Co-Author*)
Ayano Takeda, MD (*Abstract Co-Author*)
Toshihiro Tanaka, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is to highlight the advantage of Microvascular Flow Imaging (MVFI) over conventional Doppler techniques in evaluating testicular vascularity, to illustrate characteristic MVFI findings through representative cases of acute scrotal diseases and testicular tumors, and to demonstrate how MVFI can be effectively incorporated into an ultrasound-based diagnostic approach for testicular disease

TABLE OF CONTENTS/OUTLINE

Ultrasonography is commonly used as the first-line modality for evaluating testicular lesions and is convenient for assessing blood flow. However, even in normal testis, assessing blood flow can be difficult due to clutter and motion artifacts, making it challenging to detect flow in the target region. MVFI is an advanced Doppler technique that visualizes fine, low-velocity blood flow difficult to see with conventional Doppler. MVFI improves the detectability of subtle vascular signals and allows detailed assessment of microvascular architecture. This exhibit presents the clinical utility of MVFI in assessing various testicular diseases, focusing on its diagnostic advantages and integration into an ultrasound-based approach. I. Introduction• Characteristics of MVFI: basic principles and clinical application• Comparison with Other Blood Flow Imaging (e.g. Color Doppler Imaging, Power Doppler Imaging, Advanced Dynamic Flow) II. Case series• Acute scrotal diseases (Testicular torsion/ Appendiceal torsion/ Segmental testicular infarction/ Testicular injury)• Tumorous diseases (Germ cell tumor/ Malignant lymphoma/ Epidermoid cyst/ Angioma/ Adrenal rest tumor)

GUEE-64 IGG4-RELATED DISEASE IN THE URINARY TRACT; IMAGING FINDINGS AND MIMICKERS

Fumiko Yagi, MD (*Presenter*)
Hirotaka Akita (*Abstract Co-Author*)
Yoshitake Yamada, MD, PhD (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

(1) Understanding the pathophysiology of IgG4-related diseases (IgG4-RD) in the urinary tract (2) Understanding useful radiological findings, differential diagnoses, and mimickers of IgG4-RD in the urinary tract

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Pathophysiology of IgG4-RD III. Clinical manifestations IV. Diagnosis and classification criteria V. Treatment VI. IgG4 related diseases in the urinary tract, differential diagnoses, and mimickers A. Overview of IgG4-RD in the urinary tract B. Importance of IgG4-RD in the urinary tract C. Kidney lesions, differential diagnoses, and mimickers (Erdheim-Chester disease, Rosai-Dorfman disease, malignant lymphoma, tuberculoma, sarcoidosis, and renal granulomatous disease) D. Renal Pelvic lesions, differential diagnoses, and mimickers (carcinoma and pyelitis) E. Adrenal lesions, differential diagnoses, and mimickers (carcinoma and malignant lymphoma) F. Ureteral lesions, differential diagnoses, and mimickers (carcinoma, amyloidosis, and endometriosis) G. Bladder lesions, differential diagnoses, and mimickers (carcinoma, malignant lymphoma, leiomyoma, amyloidosis, and endometriosis) H. Urethral lesions, differential diagnoses, and mimickers (malignant lymphoma, leiomyoma, amyloidosis, and urethral diverticulum carcinoma) I. Prostatic lesions, differential diagnoses, and mimickers (carcinoma, malignant lymphoma, and granulomatous prostatitis) J. Testes lesions, differential diagnoses, and mimickers (testicular tumors and hydrocele due to retroperitoneal fibrosis secondary to IgG4-RD) K. Retroperitoneal lesions, differential diagnoses, and mimickers (metastatic gastric cancer and Erdheim-Chester disease)

GUEE-65 BEYOND THE GLOW: DECODING PSMA-PET IN PROSTATE CANCER IMAGING

Paula Ribeiro de Britto Borges, MD (*Presenter*)
Luciana Costa, PhD (*Abstract Co-Author*)
Thais Lemos (*Abstract Co-Author*)
Ivana M. Abuhid, MD (*Abstract Co-Author*)

TEACHING POINTS

• Recognize physiologic patterns of PSMA uptake to avoid false-positive interpretations. • Identify benign conditions with PSMA expression, including fractures, degenerative bone changes, meningiomas, and hemangiomas. • Illustrate non-prostatic malignancies with PSMA uptake and their diagnostic implications. • Emphasize the importance of anatomic correlation and clinical context in differentiating true-positive findings. • Improve diagnostic confidence in PSMA PET/CT through real-world case-based learning.

TABLE OF CONTENTS/OUTLINE

PSMA PET/CT has revolutionized the management of prostate cancer, particularly in staging, therapeutic planning, and detection of biochemical recurrence. However, PSMA expression, is not exclusive to prostate malignancies, posing interpretative challenges in clinical practice. This educational exhibit highlights common pitfalls based on recent literature (Radiology, 2023-2025), exemplified through cases from a high-volume oncologic imaging center. Case examples include uptake in fractures, degenerative bone changes, vertebral hemangiomas, acute and chronic inflammatory processes, chronic thyroiditis, thyroid cancer, lung cancer, among others. Interpretation strategies will focus on uptake intensity, anatomic distribution, CT morphological features, clinical and laboratory correlation, and integration with other imaging modalities. Understanding these pitfalls is essential for radiologists and nuclear medicine physicians to ensure accurate interpretation, reduce diagnostic erros, and improve patient oucomes.

GUEE-66 GETTING TO KNOW THE GUBERNACULUM

Douglas M. Rogers, MD (*Presenter*)
Reham M. Ellessy, MBBCh (*Abstract Co-Author*)
Grace G. Zhu, MD (*Abstract Co-Author*)
Akram M. Shaaban, MBBCh (*Abstract Co-Author*)
Paula J. Woodward, MD (*Abstract Co-Author*)

TEACHING POINTS

1) Explain the normal embryological function of the gubernaculum in males and females, followed by description of the myriad developmental abnormalities 2) Provide a multi-modality, case-based review of the wide array of abnormalities involving development along the gubernaculum, focused on clinically relevant and symptomatic findings

TABLE OF CONTENTS/OUTLINE

1) Introduction/Background a) Normal Gubernaculum Embryological Development a. Males b. Females b) Anatomy 2) Male Gubernaculum Abnormalities a) Abnormal Testicular Descent a. Cryptorchidism i. Germ Cell Tumors ii. Intra-pelvic Torsion b. Cross-fused Testicular Ectopia c. Retractile Testis b) Testicular Agenesis/Hypoplasia c) Congenital Inguinal Hernia/Communicating Hydrocele d) Testicular Torsion a. Extravaginal b. Intravaginal e) Complete Androgen Insensitivity Syndrome f) Spleno-gonadal Fusion 3) Female Gubernaculum Abnormalities a) Round Ligament (caudal portion) a. Canal of Nuck Pathology i. Congenital Inguinal Hernia ii. Hydrocele 1. Communicating 2. Encysted b. Round Ligament Varices c. Endometriosis d. Round Ligament Masses b) Ovarian Ligament (cranial portion) a. Undescended/Ectopic Ovary b. Ovarian Torsion c) Mullerian Abnormalities a. Accessory Cavitated Uterine Mass b. Mayer-Rokitansky-Kuster-Hauser Syndrome (MRKH)
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HNEE

Head & Neck Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

HNEE-1 DON'T BE SWALLOWED! ANATOMY AND DISEASES OF THE ORAL CAVITY

Tamara Hernandes Ricci, MD (*Presenter*)
Carlos Alberto F. Coelho Neto, MD (*Abstract Co-Author*)
Luis G. Duarte, MD (*Abstract Co-Author*)
Anna P. Riello, MD, MSc (*Abstract Co-Author*)
Rodrigo J. Araya Rojas, MD (*Abstract Co-Author*)
Soraia A. Souza, MD, MS (*Abstract Co-Author*)
Marcio Ricardo T. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

• Detailed analysis of normal anatomy and regions of interest within the oral cavity, including the mucosal lip, buccal mucosa, hard palate, oral tongue, floor of the mouth, retromolar trigone, upper and lower alveolar ridges (maxilla and jaw).• Discussion of key dynamic imaging techniques to better characterize oral lesions and their avidity, such as puffed-cheek, open mouth and tongue protrusion• Evaluate computed tomography (CT) and magnetic resonance imaging (MRI) as tools to identify and make differential diagnoses of the main diseases of the oral cavity, with the aim of guiding treatment and prognosis

TABLE OF CONTENTS/OUTLINE

• Introduction highlighting the normal anatomy • Comparison between TC and MRI finds.• Overview the main imaging characteristics of the main oral cavity diseases divided by subsites Main Pathologies discussed: squamous cell carcinoma, lesions of the minor salivary glands (including pleomorphic adenoma, adenoid cystic carcinoma and mucous retention cysts), ranula, cysts of various etiologies (dermoid cyst, enteric duplication cyst, complications related to dental infecction, tongue atrophy due to cranial nerve paralysis, vascular anomalies, mandibular and palatal torus, submandibular sialolithiasis, boutonnière disease. • Conclusion.

HNEE-2 SO DO YOU REALLY KNOW YOUR CRANIAL NERVES??? - A RADIOLOGIST'S REFRESHER

Janani Baradwaj, MD, FRCR (*Presenter*)
Anu Kamalasanan, FRCR, MBBS (*Abstract Co-Author*)
Thiru A. Sudarshan, DMRD, FRCR (*Abstract Co-Author*)
Janani Asogan Vaishnavi, MD, FRCR (*Abstract Co-Author*)
Richard D. White, MBChB, FRCR (*Abstract Co-Author*)
Brahadesh Sivakumar (*Abstract Co-Author*)

TEACHING POINTS

Understanding the segmental anatomy of cranial nerves is essential for accurate localization and interpretation on MRI. Tailoring MRI protocols based on clinical suspicion ensures comprehensive evaluation and avoids missed pathology. Precise anatomical coverage—from brainstem to skull base and beyond—is key to evaluating the full course of each nerve. Radiologic signs of perineural tumor spread must be actively sought, as they significantly impact staging and treatment. Careful assessment of skull base foramina is necessary to detect subtle abnormalities indicating nerve involvement. Recognition of muscle denervation changes can serve as an important indirect clue to cranial nerve dysfunction. Common cranial nerve pathologies follow recognizable imaging patterns that aid in differential diagnosis. Radiologists play a crucial role in surgical planning by accurately mapping nerve involvement and guiding management decisions.

TABLE OF CONTENTS/OUTLINE

To review the normal MRI anatomy and expected imaging appearance of all 12 cranial nerves using high-resolution sequences. To outline the optimal MRI techniques, sequences, and anatomical coverage required for comprehensive cranial nerve evaluation. To illustrate common and clinically significant pathologies affecting cranial nerves with radiological-clinical correlation

HNEE-3 THYROID ECHOES: FROM SOUND WAVES TO SMART TECH

Marina Joseane Pachecco, MD (*Presenter*)
Carolina Carotenuto Ramos, MD (*Abstract Co-Author*)
Isabelle Lopes Passos De Fabbri, MD (*Abstract Co-Author*)
Geovana Ribeiro, MD (*Abstract Co-Author*)
Michelle Thais Wirtti Jorge (*Abstract Co-Author*)
Gabriel Alves, MD (*Abstract Co-Author*)
Peter C. Francolin (*Abstract Co-Author*)
Fernando L. Pereira, MD (*Abstract Co-Author*)
Eduardo D. Chiovatto, MD (*Abstract Co-Author*)
Maria Cristina Chammas, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Ultrasonography is the gold standard for thyroid evaluation due to its wide availability, high sensitivity and real-time imaging capability. This review addresses the main technical aspects, normal thyroid anatomy and common anatomical variants, while also exploring the evaluation of focal and diffuse thyroid diseases. It also discusses advanced techniques such as microbubble contrast-enhanced ultrasonography (CEUS), Doppler and elastography for lesion characterization. Finally, the use of artificial intelligence as a tool to enhance diagnostic accuracy and improve workflow is highlighted.

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Ultrasonography Technique: The Foundation of Diagnostic Accuracy Transducer selection, patient positioning and main settings; tips for longitudinal/transverse sections and identification of artifacts and pitfalls. Ultrasonographic Findings of Normal Thyroid Anatomy, measurements, echogenicity and common anatomical variants. Diffuse

Thyroid Disease: Recognition and Differentiation Sonographic patterns of Hashimoto's thyroiditis, Graves' thyroiditis, subacute thyroiditis, post-radiotherapy thyroiditis, and Riedel's thyroiditis. Thyroid Nodules: Comprehensive Evaluation Assessment of the thyroid nodule, TI-RADS classification, identification suspicious features, indications for follow-up and biopsy, the use of Doppler, CEUS (microbubble contrast-enhanced ultrasound), and elastography. The Use of Artificial Intelligence as a Valuable Ally Applications of AI in automating TI-RADS classification, improving clinical workflow, and exploring future perspectives.

HNEE-4 BEYOND PLEOMORPHIC: UNCOMMON PAROTID TUMOURS- RADIOLOGY-PATHOLOGY CORRELATION

Janani Baradwaj, MD, FRCR (*Presenter*)
Janani Asogan Vaishnavi, MD, FRCR (*Abstract Co-Author*)
Anu Kamalasanan, FRCR, MBBS (*Abstract Co-Author*)
Thiru A. Sudarshan, DMRD, FRCR (*Abstract Co-Author*)
Richard D. White, MBChB, FRCR (*Abstract Co-Author*)
Gayathri Srinivasaraghavan (*Abstract Co-Author*)

TEACHING POINTS

Parotid swellings may arise from neoplastic, inflammatory, or obstructive causes - accurate imaging helps narrow the differential.Not all solid parotid tumours are pleomorphic adenomas/Warthin’s. Histologic subtypes often correlate with signal characteristics (e.g, oncocytic components = T1 hyperintensity) Radiologic-pathologic correlation improves confidence and guides management.- MRI is the modality of choice for deep lobe lesions and assessing malignant potential. CE-T1WI - tumor extent, perineural spread, nodal involvement. DWI and contrast-enhanced sequences help differentiate low vs. high-grade lesions.- Ultrasound remains first-line for superficial lesions and guiding FNAC. Evaluate vascularity, margins, and cystic/solid nature. Useful in bilateral or multifocal lesions (e.g., Warthin’s tumor).- CT neck with contrast is beneficial for calcifications, osseous involvement, pre-operative planning and staging. Location matters - deep lobe tumors, facial nerve proximity, or skull base extension for surgical planning.

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Describe relevant imaging findings of Parotid tumours to reliably differentiate benign versus malignant lesions. To assess the clinical impact of precise lesion localisation on surgical planning, particularly in preserving facial nerve function. To correlate imaging findings with pathology for diagnostic confirmation and accuracy. To highlight scenarios where imaging can guide conservative management, avoiding unnecessary surgical intervention. To address current limitations and challenges in imaging evaluation of parotid masses, including diagnostic pitfalls and mimics.

HNEE-5 THE AIR UP THERE: A JOURNEY THROUGH AIR IN UNEXPECTED PLACES OF THE HEAD AND NECK

Antonio De La Cruz, MD (*Presenter*)
Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Juan Gonzalez, MD (*Abstract Co-Author*)
Maximiliano Carrera (*Abstract Co-Author*)
Neian Contreras Alvarado (*Abstract Co-Author*)
Jose A. Lara, MD (*Abstract Co-Author*)

TEACHING POINTS

Provide an anatomical review of head and neck anatomical landmarks.Use a hot air balloon journey analogy to identify abnormal air locations and patterns.Correlate clinical scenarios with specific air-related findings.Reinforce air related pathologies of head and neck using real cases and illustrations to enhance retention and diagnostic precision.

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Objectives III. Air-Related Head and Neck Anatomy IV. Pathologies a. Traumatic: Pneumocephalus, Orbital Emphysema, Subcutaneous Emphysema b. Infectious/Iatrogenic: Cavernous Sinus Air, Pneumorrhachis, pneumoventricle, pneumocephalus c. Pressure-related: Pneumoparotid d. Spontaneous/Unusual: Pneumosinus Dilatans, Orbital Air Tamponade VI. Pathophysiology and Clinical Context VII. Memorable analogies VIII. Conclusion Abstract:Air is vital for life, but when found outside normal compartments in the head and neck, it may indicate pathology. This exhibit uses a hot air balloon journey to explore ectopic air in regions like the ventricles, cranial vault, parotid spaces, and neck. Pathologies are categorized as traumatic, infectious/iatrogenic, pressure-related, spontaneous, or interventional. CT and MRI cases highlight imaging patterns, complications, and relevance, enhancing diagnostic accuracy through a visual, memorable approach.

HNEE-6 LIGHTS, CAMERA, INFECTION! STARRING THE MAJOR INFECTIOUS EMERGENCIES OF THE HEAD AND NECK

Marcela Mazzetto Cavalcante, MD (*Presenter*)
Cristian Lima Duarte, MD (*Abstract Co-Author*)
Anna C. Silva (*Abstract Co-Author*)
Yolanda Maroto Teixeira, MD (*Abstract Co-Author*)
Lilian Oliveira, MD (*Abstract Co-Author*)
Vitor Dias, MD (*Abstract Co-Author*)
Patricia Oliveira-Szejnfeld, MD (*Abstract Co-Author*)
Roberto Bastos, MD (*Abstract Co-Author*)

TEACHING POINTS

1) Identify the main infectious emergencies of the head and neck and acknowledge their frequent occurrence in clinical practice due to multiple etiologies. 2) Describe fascial planes and spaces of the neck and other relevant head and neck anatomic landmarks. 3) Recognize the critical role of CT and MRI in the diagnostic process, particularly in detecting characteristic imaging patterns. 4) Understand that prompt identification facilitates tailored monitoring and intervention strategies. 5) Endeavor to make the study of these pathologies accessible and less intimidating for radiologists.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Imaging modalities 3. Head and neck anatomy 4. Disease processes categorized by anatomic region: 4.1 Orbits 4.2 Mastoids 4.3 Face 4.4 Neck Summary 5. Take Home Messages

HNEE-7 THE PAROTID SPECTRUM: A COMPREHENSIVE TUMOR ODYSSEY

Dario Nascimento Ferreira Alves, MD (*Presenter*)
Isabela D. Alves, MD (*Abstract Co-Author*)
Maria Vitoria Ludwig, MD (*Abstract Co-Author*)
Luiz R. Uchoa, MD (*Abstract Co-Author*)
Vinicius T. Goncalves, MD (*Abstract Co-Author*)
Jorge T. Takahashi, MD (*Abstract Co-Author*)
Ula Passos, MD (*Abstract Co-Author*)
Eloisa M. Gebrim, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Parotid Anatomy 2. Benign Parotid 3. TumorsMalignant 4. Parotid Tumors 5. Metastases and Unusual Tumors 6. Tumor Mimics 7. Permeability Curves 8. Postoperative Findings 9. Diagnostic Approach of Parotid Tumors

TABLE OF CONTENTS/OUTLINE

1. Introduction 1.1 Overview of Parotid Gland Tumors 1.2 Clinical and Radiological Relevance 1.3 Objectives of the Review 2. Anatomy of the Parotid Gland 3. Parotid Gland Tumors 3.1 Benign Tumors 3.1.1 Pleomorphic Adenoma: Epidemiology, Imaging Features, and Management 3.1.2 Warthin's Tumor: Characteristics and Association with Smoking 3.1.3 Other Benign Lesions (e.g., Hemangiomas, Lipomas) 3.2 Malignant Tumors 3.2.1 Mucoepidermoid Carcinoma: Prevalence and Imaging Findings 3.2.2 Adenoid Cystic Carcinoma and Other Primary Malignancies 3.2.3 Clinical Indicators of Malignancy (Pain, Facial Nerve Palsy) 3.3 Metastatic Tumors 3.3.1 Common Sources (Squamous Cell Carcinoma, Melanoma) 3.3.2 Imaging Differentiation from Primary Tumors 3.4 Unusual Tumors 3.4.1 Lymphomas and Rare Histologies 3.4.2 Carcinoma Ex-Pleomorphic Adenoma 3.4.3 Diagnostic Challenges 4. Permeability Curve Patterns 5. Postoperative Findings 5.1 Expected Imaging Findings After Parotidectomy 5.2 Complications 5.3 Surveillance for Tumor Recurrence 5.4 Role of Imaging in Detecting Recurrence vs. Benign Changes 6. Management and Prognosis 6.1 Surgical Approaches 7. Conclusion 7.1 Summary of Key Points 7.2 Future Directions in Parotid Tumor Imaging and Management 8. References

HNEE-8 SEGMENT-SPECIFIC OPTIMIZED MRI PROTOCOLS FOR CRANIAL NERVES IN NEUROOPHTHALMOLOGY WITH ILLUSTRATIVE CASES

Yebin Kim, MD (*Presenter*)
GO WOON PARK (*Abstract Co-Author*)
Eunhee Kim, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit presents segment-specific MRI protocols optimized for visualizing cranial nerves (CN) 2, 3, 4, and 6 in neuroophthalmology. For high-resolution imaging, 3D sequences are preferred over 2D, and coronal planes are generally superior to axial/sagittal planes in orbit and cavernous sinus. Each anatomical segment requires specific MRI sequences: Brainstem Sub-3mm thin-section RESOLVE DWI reduces susceptibility artifacts while visualizing acute pathologies Cisternal segment 3D proton density imaging enhances nerve-vessel differentiation; small FOV 3D Trufi best visualizes the diminutive CN4 Cavernous segment 3D CE coronal T1 VIBE provides superior visualization of CNs traversing the cavernous sinus compared to 3D CE T1 MPRAGE Orbital Apex 3D CE T1 SPACE with Dixon method provides superior black blood imaging for detecting pathologic lesions Intraorbital segment 3D DESS images visualize peripheral branches of CN3, CN4, and CN6 to extraocular muscles Optic Nerve 2mm thin-section coronal T2WI with fat suppression enables detection of optic nerve atrophy, nerve sheath dilatation, and clear differentiation from surrounding structures The exhibit includes representative clinical cases demonstrating the diagnostic value of each protocol.

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Segmental approach for CN 2, 3, 4, and 6 Brainstem Segment: Thin-section RESOLVE DWI Cisternal Segment: 3D PDWI vs 3D T2 SPACE; Small FOV 3D Trufi for CN4 Cavernous Segment: 3D CE T1 VIBE vs 3D CE T1 MPRAGE Orbital Apex: 3D CE T1 SPACE with Dixon method benefits Intraorbital Segment: 3D DESS for peripheral CN branches Optic Nerve: Thin-section coronal T2WI vs T2 FLAIR Protocol selection algorithm and future directions

HNEE-9 DECODING THE PAROTID PUZZLE: IMAGING INSIGHTS INTO SALIVARY GLAND DISEASE

Claudia Viescas Huerta, MD (*Presenter*)
Isabel Fonseca Buelga, MD (*Abstract Co-Author*)
Diego Alejandro Garcia Paredes, MD (*Abstract Co-Author*)
Sergio Sintes (*Abstract Co-Author*)
Elisa Antolinos Macho, MD (*Abstract Co-Author*)
Juan V. Quintana Perez, MD (*Abstract Co-Author*)
Beatriz Alba Perez, MD (*Abstract Co-Author*)
Abel Gonzalez Huete, MD (*Abstract Co-Author*)

TEACHING POINTS

1.To review the anatomy of the parotid space, its boundaries and content. 2.To review the anatomy of the facial nerve. 3.To explain the benign non tumoral pathology of the parotid gland with illustrative cases. 4.To discuss the optimal approach to manage a lesion in the parotid space. 5.To review the main benign and malignant tumors of the parotid gland with their imaging findings.

TABLE OF CONTENTS/OUTLINE

1.Anatomy: parotid space and facial nerve. 2.Benign non tumoral parotid gland pathology: congenital anomalies, inflammatory and autoimmune diseases. 3.First approach to tumoral pathology: localization of the lesion, number, extension and imaging characteristics. 4.Benign tumors: pleomorphic adenoma, Warthin tumor, oncocytoma and hemangiomas. 5.Malignant tumors: lymphoma, epithelial tumors and metastasis. 6.Perineural spread. 7.Summary.

HNEE-10 SALIVARY SECRETS UNVEILED: A RADIOLOGIST'S GUIDE TO COMMON DISORDERS OF THE MAJOR SALIVARY GLANDS

Hatice Aydin, MD (*Presenter*)
Gozde Ozer IV, MD (*Abstract Co-Author*)
Ekim Gumeler, MD (*Abstract Co-Author*)
Elif Bulut (*Abstract Co-Author*)

TEACHING POINTS

The major salivary glands—parotid, submandibular, and sublingual—are subject to a diverse range of disorders that can pose diagnostic challenges due to overlapping clinical and imaging features. This presentation aims; 1. To provide a detailed review of the radiological anatomy and pathology of the major salivary glands, emphasize radiological features through illustrative cases. 2. To highlight key imaging characteristics of common salivary gland pathologies and present an evidence-based imaging approach to their diagnosis. The role of various imaging modalities—including ultrasound, computed tomography, and magnetic resonance imaging—is discussed in detail.

TABLE OF CONTENTS/OUTLINE

Introduction Overview of basic anatomy and common anatomical variants (e.g., accessory parotid gland, facial process, congenital agenesis) Imaging modalities and differential diagnosis Role of US, CT, and MRI Suggested imaging workflow and differential diagnosis algorithm Benign neoplastic lesions Epithelial: Pleomorphic adenoma, Warthin tumor, oncocytoma Non-epithelial: Lipoma, infantile hemangioma, vascular malformations Malignant neoplastic lesions Mucoepidermoid carcinoma Adenoid cystic carcinoma Acinic cell carcinoma Lymphoma Metastatic disease to the salivary glands Lesions mimicking neoplasia Intraparotid lymph nodes Branchial cleft cysts Ranula Inflammatory disorders Infectious sialadenitis Obstructive sialadenitis/sialolithiasis Juvenile idiopathic recurrent parotitis Systemic diseases affecting the salivary glands Sjögren's disease IgG4-related disease Benign lymphoepithelial lesions (HIV-associated)

HNEE-11 LUMPS AND BUMPS IN THE CERVICOTHORACIC TRANSITION: A RADIOLOGICAL APPROACH TO CYSTIC LESIONS

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Roberta Linhares, MD (*Abstract Co-Author*)
Felipe Siqueira (*Abstract Co-Author*)
Thiago A. Miranda, MD (*Abstract Co-Author*)
Eduardo Kaiser Ururahy Nunes Fonseca, MD (*Abstract Co-Author*)
Daniel V. Sumi, MD (*Abstract Co-Author*)
Carolina R. Soares, MD (*Abstract Co-Author*)
Regina L. Elia Gomes, PhD, MD (*Abstract Co-Author*)

TEACHING POINTS

-Understand the embryological and anatomical origins of cystic lesions in the cervicothoracic region and their clinical implications. -Recognize key imaging features of common cystic lesions including thyroglossal duct cysts, branchial cleft cysts, and lymphatic malformations. -Discuss critical diagnostic challenges, pitfalls, and differential diagnoses of cystic versus cystic-appearing masses. -Correlate findings across ultrasound, CT, and MRI to improve lesion characterization.

TABLE OF CONTENTS/OUTLINE

Introduction -Overview of the diagnostic complexity of cystic lesions at the cervicothoracic junction. -Importance of precise lesion characterization to guide management. Classification and Diagnostic Approach -Thyroglossal Duct Cyst: Midline/paramedian lesions from persistent thyroglossal duct. -Branchial Cleft Cyst: Lateral neck lesions due to embryological remnants. -Thymic and Parathyroid Cysts: Developmental anomalies presenting in lower neck. -Thyroid Cysts: Benign or degenerative changes in neoplasms. -Neurogenic Cysts: Associated with nerve sheath tumors or sympathetic ganglia. -Lymphatic Malformations (Cystic Hygroma): Frequently extending into the thoracic cavity. -Lymphoceles/Fistulas. -Abscesses and Suppurative Lymphadenitis: Infectious processes mimicking cystic masses. -Metastatic Disease: Particularly from papillary thyroid carcinoma or HPV-related oropharyngeal SCC. Imaging Modalities and Diagnostic Tools -Advantages and limitations of US, CT, and MRI in the evaluation of cervicothoracic cystic lesions. -Role of cross-sectional imaging in identifying anatomical relationships and internal lesion characteristics.

HNEE-12 ANATOMY OF SILENCE: A RADIOLOGIST'S PRIMER ON INNER EAR MALFORMATIONS

Hugo Tames, MD (*Presenter*)
Carlos Toyama (*Abstract Co-Author*)
Regina L. Elia Gomes, PhD, MD (*Abstract Co-Author*)
Eloisa M. Gebrim, MD (*Abstract Co-Author*)

TEACHING POINTS

Review the Anatomy and Embryology of the Inner Ear Understand the key stages of inner ear development and recognize normal anatomy as a foundation for identifying congenital malformations. Provide a Practical Classification Guide for Inner Ear Malformations Learn a structured, imaging-based approach to classify inner ear anomalies using CT and MRI, including cochlear aplasia, common cavity, and incomplete partition types. Discuss the Imaging Implications for Clinical Management and Treatment Planning Recognize how accurate identification of malformations impacts surgical candidacy, particularly for cochlear implantation, and guides prognostic expectations.

TABLE OF CONTENTS/OUTLINE

- Introduction- Brief review of inner ear embryology and anatomy- Classification of inner ear malformations: Complete Labyrinthine Aplasia. Rudimentary Otocyst. Cochlear aplasia. Common Cavity.Cochlear Hypoplasia. Incomplete partition type 1. Incomplete partition type 2. Incomplete partition type 3. Enlarged Vestibular Aqueduct. Cochlear Aperture Anomalies. - Implications of imaging findings for treatment and prognostic expectations. - A step-by-step guide to the accurate classification of inner ear malformations. - Take home messages

HNEE-13 SKULL BASE OSTEOMYELITIS: WHEN THE RAMPART PUTS THE BRAIN AT RISK

Elena Luque, MD (*Presenter*)
Ester Carballo, MD (*Abstract Co-Author*)
Tomas Ganado (*Abstract Co-Author*)
Pablo Garcia Perez (*Abstract Co-Author*)
Salome Merino, MD (*Abstract Co-Author*)

TEACHING POINTS

To review skull base osteomyelitis (SBO): epidemiology, potential origins and mechanisms of spread. To delve into SBO imaging findings, complications and main differential diagnosis.

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General review. SBO is an infrequent but potentially lethal complication of malignant external otitis, which leads to bone and soft tissue destruction. Atypical presentations from non-otogenic origins can also appear. The most common pathogen is P. aeruginosa, followed by S. aureus. Other rare pathogens, such as Nocardia , A. chlamydospora or T. canis might be found. In immunosuppressed patients, fungal organisms must be considered. Symptoms are nonspecific and include otalgia, otorrhea, headache, cranial nerves palsy, etc. Imaging findings CT is usually the initial imaging modality, essential for assessing bone lesions (erosion, demineralization). Evaluation of petrous portion of temporal bone is mandatory. In typical SBO, the external auditory canal and temporal bone are usually the epicenter of the disease, while atypical SBO more commonly involves the central skull base, particularly the sphenoid bone. MRI highlights soft tissue and bone marrow infiltration. Key findings include effacement of fat planes and soft tissue mass with T1-hypo/isointensity, T2-hyperintensity and contrast enhancement. When bone marrow is involved, typical findings include T1-hypointensity and STIR hyperintensity. Findings may mimic malignancy, including nasopharyngeal carcinoma, endolymphatic sac tumor, metastasis, etc. Complications: Progression of SBO can result in both extracranial and intracranial complications, including cranial nerves palsy, sinus vein thrombosis, abscesses, etc.

HNEE-14 BEYOND NODULES: WHAT THE RADIOLOGIST NEEDS TO KNOW ABOUT THE THYROID GLAND

Maria Zulfiqar, MD, MBBS (*Presenter*)
Anup S. Shetty, MD (*Abstract Co-Author*)
Katharina Feister, MD (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Nirvikar Dahiya, MD (*Abstract Co-Author*)
William D. Middleton, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Illustrate various pathologic conditions involving the thyroid gland other than typical thyroid nodules with emphasis on diffuse thyroid disease. 2. Delineate multimodality imaging with focus on ultrasound.

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• Congenital: Thyroid agenesis/hemiagenesis; Sublingual thyroid; Intrathyroidal ectopic thymus. • Trauma: Thyroid rupture; Intrathyroidal hematoma; pseudoaneurysm • Thyroiditis: -Acute suppurative thyroiditis -Subacute granulomatous thyroiditis (de Quervain) -palpation thyroiditis/multifocal granulomatous folliculitis -Autoimmune thyroiditis: *Chronic lymphocytic thyroiditis (Hashimoto) *Diffuse toxic goiter/Grave's disease *Fibrosing variant Hashimoto *Painless/silent thyroiditis *Post-partum thyroiditis -Riedel thyroiditis/IgG4 • Drug induced thyroiditis: Amiodarone; Immunotherapy; Lithium • Other diffuse disease: Amyloidosis; lipomatosis • Atypical and rare thyroid nodules and masses: *Cystic: Epidermal inclusion cyst; branchial cleft cyst*B enign neoplasms: Adenolipoma; intrathyroid parathyroid adenoma *Malignant neoplasms: Lymphoma; metastasis; anaplastic thyroid cancer; Langerhans cell histiocytosis.

HNEE-15 HIGH-RESOLUTION TRANSORAL ULTRASONOGRAPHY: TECHNIQUE, NORMAL ANATOMY, AND PATHOLOGY

Sophie K. Wilkinson, MBChB, FRCR (*Presenter*)
Martin Garset-Zamani (*Abstract Co-Author*)
Timothy J. Beale, MBBS (*Abstract Co-Author*)
Gitta Madani, MBBS (*Abstract Co-Author*)
Tobias Todsen (*Abstract Co-Author*)

TEACHING POINTS

1 Transoral ultrasound (US) provides high-resolution imaging of the oropharynx using small high-frequency probes in direct contact with the mucosa. In contrast to transcervical US, this technique can improve detection of smaller head and neck cancers that are otherwise clinically occult. 2 Palatine tonsils are striated with deep crypts. Key anatomical landmarks in the tonsillar fossa include the superior constrictor muscle, medial pterygoid muscle, and internal carotid artery. Other parapharyngeal structures that can be identified include retropharyngeal lymph nodes, internal and external carotids, internal jugular vein, stylopharyngeal-, styloglossal-, and stylohyoid muscles, digastric muscle, and deep lobe of the parotid gland. 3 The lingual tonsil is striated with more ovoid, shallower crypts. Key landmarks include the lateral hyoglossus muscle, the hyoid bone and lingual artery. 4 Carcinomas or lymphomas appear solid with hypervascular and chaotic doppler patterns. Benign lesions such as cysts or abscesses can be differentiated due to their avascular centers. Distinction between pathology superficial to- or profound to the constrictor muscle is critical for accurate diagnosis and treatment.

TABLE OF CONTENTS/OUTLINE

1. Introduction and clinical relevance of transoral US 2. Transoral US landmarks (tonsil) 3. Transoral US landmarks (base of tongue) 4. Imaging of oropharyngeal pathologies (carcinoma, lymphoma, abscesses) 5. Transoral US-guided biopsy techniques

HNEE-16 JAWS 2025 - IMAGING AND PATHOLOGY OF MANDIBULAR MASS LESIONS

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Prateek Hongal (*Abstract Co-Author*)
Richard D. White, MBChB, FRCR (*Abstract Co-Author*)
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Thiru A. Sudarshan, DMRD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

• Odontogenic lesions are related to the teeth or above the inferior alveolar canal. • Non odontogenic lesions are not related to teeth and are usually below the inferior alveolar canal. • Differentiation of the mandibular lesion into radio-opaque and radiolucent lesions help in narrowing the differential diagnosis. • Lesions are characterized based on density, loculations, margin, content, relation, effect on teeth, adjacent bone and soft tissue component. • Resorption and destruction of tooth and soft tissue components are often seen in neoplastic lesions rather than benign lesions. • Essential reporting elements, including lesion size, margins, cortical status, relation to the inferior alveolar nerve, tooth involvement, and signs of aggressiveness.

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1. Embryological development and odontogenesis2. Anatomy of the mandible and tooth3. Imaging modalities 4. WHO Classification5. Multi-modality imaging and differentiating features of mandibular lesions (with pathological correlation where available), including: I. Benign:a) Hemangioma of the mandibleb) Dentigerous cystc) Odontogenic keratocystd) Radicular cyst e) Bilateral OKC - Gorlin-Goltz syndrome f) Complex odontoma.g) Ameloblastoma h) Cementing fibromas i) Calcifying odontogenic tumor (Pindborg tumor) j) Fibro-cemento-osseous lesionsk) Cemento-osseous fibrous dysplasial) Non-ossifying fibroma m) Periostitis n) Osteomyelitis o) Sclerosing osteomyelitis p) Osteoradionecrosis q) Medication-related osteonecrosis of the jaw r) Idiopathic osteosclerosis of the mandible II. Malignant:a) Myeloma b) Squamous cell carcinoma of the mandible c) Lymphoma d) Undifferentiated carcinoma e) Chondrosarcoma

HNEE-17 LOST IN THE LABYRINTH? UNRAVELING INNER EAR DISEASES

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Murilo Vega, MD (*Abstract Co-Author*)
Regina L. Elia Gomes, PhD, MD (*Abstract Co-Author*)
Eloisa M. Gebrim, MD (*Abstract Co-Author*)

TEACHING POINTS

- Learning normal inner ear anatomy and it’s imaging appearance - Understanding clinical, epidemiological and physiopathological characteristics of inner ear diseases, as well as knowing it’s appearance on imaging studies and common differentials

TABLE OF CONTENTS/OUTLINE

INTRODUCTION - Overview of temporal bone anatomy, focused on sectional imaging of the inner ear, osseous and membranous labyrinths, and it’s subdivisions - Common differential diagnoses of the osseous or membranous labyrinths OTIC CAPSULE ABNORMALITIES - Discussion and illustrative cases of otic capsule abnormality differentials, with special consideration to otosclerosis, osteogenesis imperfecta, otosyphilis and Paget’s disease - Imaging differential of the different conditions with illustrative cases THIRD WINDOW SYNDROMES - Concepts and clinical presentation - Discussion of underlying conditions (e.g. semicircular canal dehiscence, enlarged vestibular aqueduct) and imaging characteristics through illustrative cases LABYRINTHITIS AND POST-INFLAMMATORY CHANGES - Overview of inflammatory responses in the inner ear - Showcase imaging of acute labyrinthitis and the evolution to labyrinthitis ossificans INTRALABYRINTHINE FLUID CHANGES - Discussion of fluid changes within the labyrinth, focusing on endolymphatic hydrops and related pathology, also touching upon intralabyrinthine hemorrhage - Detail relevant technical considerations to imaging endolymphatic hydrops INTRALABYRINTHINE SCHWANNOMAS AND OTHER LESIONS - Different imaging appearance of intralabyrinthine schwannomas illustrated through cases - Approach to identifying and characterizing other mass-like lesions in and around the labyrinth

HNEE-18 IMAGING OF CRANIAL NERVES: ANATOMY, FUNCTION AND PATHOLOGY

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Ibone Saralegui Prieto (*Abstract Co-Author*)
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TEACHING POINTS

There are 12 paired cranial nerves that control motor and sensitive functions of the head and neck. Cranial nerve dysfunctions are a common reason for patient consultation and their detection represents a challenge both for clinicians and radiologists. Cranial nerve disorders have a wide range of etiologies, ranging from traumatic, infectious, inflammatory, vascular, neurodegenerative to neoplastic causes. Clinical examination is often not enough to pinpoint the underlying cause, so imaging techniques (mainly magnetic resonance imaging and computed tomography) are often indicated when cranial nerve pathology is suspected. The anatomy and function of cranial nerves is complex and its knowledge is of utmost importance for the radiologist in order to detect pathology. The purpose of this exhibit is to review cranial nerve anatomy and function, display the range of imaging modalities and their use in depicting cranial nerve pathology and make a case-based review of common and uncommon cranial nerve disorders.

TABLE OF CONTENTS/OUTLINE

1- Introduction 2- Imaging modalities: MRI (sequences for intracranial, cisternal segments and extracranial segments) and CT 3- Cranial nerve anatomy and function: Several original illustrations depicting cranial nerve anatomy and function 4- Case based review of a wide variety of pathology affecting cranial nerves 5- Take home points

HNEE-19 ADVANCED NECK ULTRASOUND IN POST-THYROIDECTOMY SURVEILLANCE: PEARLS AND PITFALLS WITH USE OF HIGH-FREQUENCY TRANSDUCERS

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Pyetra Oliveira, MD (*Abstract Co-Author*)
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Luciana Cerri, MD, PhD (*Abstract Co-Author*)
Giovanni G. Cerri, PhD (*Abstract Co-Author*)
Davi D. Romao, MD (*Abstract Co-Author*)
Regiany Alessandra Garcia Jureidini, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

Imaging is an integral part of postoperative surveillance of patients with thyroid cancer, which primarily relies on serial serum thyroglobulin measurements combined with US. Recent technological progress has elevated high-frequency ultrasonography (HFUS) into a highly valuable diagnostic tool for enhancing the diagnostic precision of the US in anatomically complex regions, such as the neck. In post-thyroidectomy follow-up, HFUS enables precise visualization of the thyroid bed, lymph node compartments, and adjacent soft tissues, making it essential for detecting locoregional recurrence, residual disease, or metastatic lymph nodes.

TABLE OF CONTENTS/OUTLINE

1. Introduction: an overview of diagnosis, staging and treatment of thyroid cancer 2. Clinical surveillance after thyroid cancer: a) How to interpret the main biochemical markers levels for monitoring recurrence/disease b) Imaging surveillance: the role of US, RAI imaging, CT, MRI and PET/CT after thyroidectomy 3. Imaging surveillance: a case-based review with radiological-pathological correlations 4. Imaging pearls and pitfalls: a) Normal and abnormal HFUS findings: how to avoid diagnostic errors and misinterpretation b) Early and late complications after thyroidectomy. c) A road map to common sites of disease recurrence and metastasis 5. Challenging and emerging applications a) Elastography and contrast-enhanced US b) Ultra-high frequency US c) Radiomics and artificial intelligence 6. Summary and take-home messages Slide 1: expected findings Slide 2: parathyroid Slide 3: neuromas Slide 4: nodal metastasis Slide 5: recurrence

HNEE-20 ISOLATED LYTIC SKULL LESION: WHEN SHOULD LANGERHANS CELL HISTIOCYTOSIS BE CONSIDERED?

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Marcos V. Camargo, MD (*Abstract Co-Author*)
Regina L. Elia Gomes, PhD, MD (*Abstract Co-Author*)
Thiago A. Miranda, MD (*Abstract Co-Author*)
Breno A. Matos, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the principles and physiopathology of the Langerhans Cell Histiocytosis (LCH), particularly the isolated lytic skull lesion presentation. To recognize the imaging features of the isolated bony LCH in the skull, and to review the differential diagnosis, highlighting the key diagnostic features. To demonstrate a practical approach in the evaluation of an isolated lytic lesion in the skull. To highlight the role of the radiologist in differentiating an isolated lytic skull lesion, and when to consider LCH.

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Introduction, Physiopathology and Clinical Presentation Key imaging features, with teaching cases Differential Diagnoses Practical Approach Take Home Messages References

HNEE-21 FROM RESONANCE TO RELEVANCE: ADVANCED MRI IN HEAD AND NECK NODULES

Carlos Jorge da Silva, PhD, MD (*Presenter*)
Murilo Vega, MD (*Abstract Co-Author*)
Isadora Campos De Matos (*Abstract Co-Author*)
Elder Henrique, MD (*Abstract Co-Author*)

TEACHING POINTS

Review the use of DWI and semiquantitative analysis of T1 permeability curves as ancillary techniques for evaluating head and neck nodules. Demonstrate the application of these ancillary techniques in multiparametric assessment for tumor cellularity/aggressiveness, microvascular architecture, and treatment response.

TABLE OF CONTENTS/OUTLINE

Introduction Overview of head and neck tumor epidemiology in the United States, highlighting key prognostic factors such as delayed diagnosis and recurrence detection challenges. Emphasis on imaging biomarkers' role in enabling early and accurate diagnosis using new MR ancillary techniques. Techniques and Applications Diffusion-weighted imaging (DWI) Semiquantitative analysis of T1 permeability curves Detailed Content We present conventional MR sequences alongside ancillary DWI and T1 permeability to enhance predictive accuracy in tumor histology, cellularity/aggressiveness, microvascular architecture, and treatment response, illustrated by: Pleomorphic adenoma Warthin tumor Parotid gland acinic cell carcinoma Parotid gland solitary fibrous tumor Orbital MALT lymphoma (pre- and post-treatment) Squamous cell carcinoma of the nasopharynx (pre- and post-treatment) Take-home Messages DWI and semiquantitative analysis of T1 permeability are crucial non-invasive tools for tumor characterization. They provide insights into cellular density and microvascular architecture, enhancing diagnostic accuracy for early assessment of tumor aggressiveness, treatment response, and prognostic stratification. Their integration into routine imaging protocols represents a precision imaging improvement and supports personalized oncologic care.

HNEE-22 THE ROLE OF NUCLEAR MEDICINE IN HEAD AND NECK RADIOLOGY: DIAGNOSTIC AND FUNCTIONAL PERSPECTIVES

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Luiz R. Uchoa, MD (*Abstract Co-Author*)
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Vinicius T. Goncalves, MD (*Abstract Co-Author*)
Matheus Waitman, MD (*Abstract Co-Author*)
Carolina Mautoni, MD (*Abstract Co-Author*)
Jorge T. Takahashi, MD (*Abstract Co-Author*)

TEACHING POINTS

Nuclear medicine plays a pivotal role in head and neck radiology, providing both diagnostic and functional insights. Radiotracer-based imaging enhances tumor detection, staging, and therapy planning. Theranostic approaches enable targeted treatment of conditions such as neuroendocrine tumors and paragangliomas. Recognizing non-oncologic uses and common pitfalls improves diagnostic accuracy.

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Oncologic Applications I - HNSCC : Role of 18 F-FDG PET-CT in staging, recurrence assessment, and surgical decision-making; Oncologic Applications II - Neuroendocrine Tumors : 68Ga-DOTATOC and 18F-FDG PET-CT aid in evaluating MTC and paragangliomas. In MTC, calcitonin favors DOTATOC, while CEA favors FDG. Paragangliomas show high uptake on DOTATOC/DOTATATE, supporting diagnosis and 177Lu-DOTATATE therapy; Oncologic Applications III - Theranostics : Radioiodine therapy targets thyroid remnants and metastases. 68Ga-DOTATATE PET detects meningioma recurrence and subcentimeter lesions, aiding radiotherapy and surgery. 177Lu-DOTATATE PRRT benefits refractory meningiomas with somatostatin receptor expression; Oncologic Applications IV - Future Directions : Emerging roles of PSMA PET-CT in the evaluation of adenoid cystic carcinoma; Non-Oncologic Applications : Functional imaging in chronic infections and inflammatory diseases; Pitfalls : Physiological uptake patterns and artifacts that may mimic disease, emphasizing the importance of anatomical correlation.

HNEE-23 DIAGNOSTIC ERRORS IN HEAD AND NECK IMAGING: LEARNING FROM ERRORS AND BIASES

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Osamu Sakai, MD, PhD (*Abstract Co-Author*)
Tsuyoshi Tajima, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Diagnostic errors can be classified into three types: missed diagnosis (failure to detect an existing abnormality), misdiagnosis (incorrect interpretation of an identified finding), and delayed diagnosis (correct diagnosis made too late). The head and neck region is particularly susceptible to diagnostic errors due to its complex anatomy and various pathologies. Accurate diagnosis in this area is crucial, as errors can lead to significant clinical consequences, including delayed treatment or inappropriate management. This exhibit presents a variety of diagnostic error cases in head and neck imaging, categorizes each case by error type, and discusses diagnostic pitfalls as well as strategies for error reduction. The teaching points are: To understand the classification and causes of diagnostic errors To recognize common error patterns and the role of human factors in improving diagnostic accuracy To review illustrative cases of diagnostic errors in head and neck imaging with emphasis on error types, pitfalls, and preventive strategies

TABLE OF CONTENTS/OUTLINE

Classification of diagnostic errors in radiology Perceptual errors in head and neck imaging Cognitive biases in head and neck imaging Technical errors in head and neck imaging Case-based review: examples of missed diagnosis, misdiagnosis, and delayed diagnosis with analysis of error types and teaching points Strategies to reduce errors Current role and limitations of AI in reducing human error in head and neck imaging

HNEE-24 MUCORMYCOSIS: WHEN THE AIR TURNS DEADLY

Carolina Souza, MD (*Presenter*)
Maria Beatriz Pereira Ferreira (*Abstract Co-Author*)
Thais Silva (*Abstract Co-Author*)
Fernanda Nery, MD (*Abstract Co-Author*)
Henzo Ota, MD (*Abstract Co-Author*)
Mariana Rossi Corregliano, MD (*Abstract Co-Author*)
Renato Sartori (*Abstract Co-Author*)

TEACHING POINTS

• Mucormycosis is a highly invasive and rapidly progressive fungal infection, most common in immunocompromised patients, especially those with uncontrolled diabetes. • The rhino-orbito-cerebral form can quickly spread to the orbit and central nervous system via angioinvasion, frequently leading to severe complications such as orbital apex syndrome or cavernous sinus thrombosis, with potential involvement of multiple cranial nerves. • Imaging plays a central role in early diagnosis. Key imaging findings include the “black turbinate sign” on MRI and sinus hyperdensities on CT. • Early recognition and multidisciplinary management are crucial to reduce the high morbidity and mortality associated with this condition.

TABLE OF CONTENTS/OUTLINE

1. Introduction Epidemiology, Risk Factors, Clinical Presentation, Pathophysiology, Histopathology 2. Clinical case Clinical case of a patient with mucormycosis, presenting with exuberant clinical manifestations and involvement of multiple cranial nerves. Anatomy review. Nasopharyngoscopy. 3. Imaging Findings Main CT findings, pattern of involvement in the MRI, early signs, orbital involvementIntracranial extension. 4. Evolution Series of CT images showing the progression of the disease. 5. Complications Orbital apex syndrome; Cavernous sinus thrombosis; Central nervous system invasion; Bone erosion.

HNEE-25 "KEEP AN EYE IN YOUR WATER CYCLE”, ASSESSMENT OF DISEASES OF THE LACRIMAL SYSTEM

Max Yunior Orsi Salazar, MD (*Presenter*)
Alan Iuno R. Araujo (*Abstract Co-Author*)
Ademar Jose d. Paes Junior (*Abstract Co-Author*)
Soraia A. Souza, MD, MS (*Abstract Co-Author*)
Marcio Ricardo T. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Anatomy: Lacrimal gland. Nasolacrimal drainage system and relationships to orbital and sinonasal structures.2. Imaging Modalities: CT (bone evaluation), MRI (soft-tissue contrast), and dacryocystography (contrast-enhanced dynamic assessment).3. Pathological Spectrum: inflammatory (dacryocystitis), chronic (dacryolithiasis), post-traumatic (ductal stenosis), and neoplastic (adenoid cystic carcinoma, lymphoma).4. Key Findings: CT evaluation of calcifications/bone erosions and osseous lacrimal pathway stenosis; MRI evaluation of lesion signal characteristics; dacryocystography for obstructive sites.

TABLE OF CONTENTS/OUTLINE

1. Anatomy of the Lacrimal Drainage System• Anatomical landmarks.2. Imaging Techniques• X-ray/CT/MRI protocols, dacryocystography (contrast administration, dynamic imaging).3. Inflammatory Pathologies• Acute dacryocystitis (soft tissue swelling, dacryocystitis, abscess formation).4. Chronic Benign Pathologies• Dacryolithiasis (contrast pooling), nasolacrimal duct obstruction (focal stenosis), dacryocystocele.5. Post-Traumatic Lesions• Canalicular laceration, bony nasolacrimal duct fractures.6. Neoplasms• Benign (pleomorphic adenoma) vs. malignant (adenoid cystic carcinoma, lymphoma).

HNEE-26 A SUPER-HEAR-O IMAGING GUIDE TO POSTOPERATIVE COMPLICATIONS IN COCHLEAR IMPLANTS

Kristina Ramirez Garcia, MD (*Presenter*)
Eben Cerrillos (*Abstract Co-Author*)
Almudena Perez-Lara, MD, PhD (*Abstract Co-Author*)
Shivaprakash B. Hiremath, MBBS, FRCR (*Abstract Co-Author*)
Griselda T. Romero Sanchez, MD (*Abstract Co-Author*)

TEACHING POINTS

1 Describe aspects of cochlear implants and post-surgical imaging recommendations 2 Discuss various complications associated with the surgical placement of cochlear implant electrode arrays 3 Illustrate Imaging findings of cochlear implants with complications and implications for further management

TABLE OF CONTENTS/OUTLINE

1 Inner Ear Anatomy Overview 2 Cochlear Implantation Surgery Structure Implant Types 3 Imaging of Cochlear Implants Imaging Techniques Imaging Software Assessment Tools Adequate Positioning of Cochlear Implants 4 Cochlear Implants Complications 4a Device Failure 4b Intraoperative Complications 4c Postoperative

Complications Incomplete electrode insertion Kinking Tip fold over Scalar traslocation Electrode migration CSF leaks Flap infection, subcutaneous hematoma or seroma Other infectious, meningitis, mastoiditis, abscess

HNEE-27 ALL ABOUT THE LARYNX: COMMON AND EVEN RARE CASES!

Marcio Ricardo T. Garcia, MD (*Presenter*)
Roberta C. Andrade, MD (*Abstract Co-Author*)
Raphael M. Reali, MD (*Abstract Co-Author*)
Rodrigo J. Araya Rojas, MD (*Abstract Co-Author*)
Suresh K. Mukherji, MD, MBA (*Abstract Co-Author*)
Soraia A. Souza, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

Detail laryngeal anatomy; explain the correct assessment of laryngeal imaging; review the main causes of laryngeal disorders; detail tumor-related causes; detail inflammatory causes; detail other less common causes: vocal fold paralysis, autoimmune diseases, foreign bodies, and surgical complications

TABLE OF CONTENTS/OUTLINE

Introduction Larynx Anatomy; laryngeal Imaging Assessment. Tumors Benign Lesions: papillomatosis, neurofibromas, enchondromas; Malignant Lesions: squamous cell carcinoma, chondrosarcoma, synovial sarcoma. Inflammatory Conditions: Reflux laryngitis, epiglottitis, laryngotracheobronchitis, Reinke's edema, chondroradionecrosis, paracoccidioidomycosis, histoplasmosis, tuberculosis; leishmaniasis. Vascular Abnormalities Vascular malformations (non-neoplastic); vascular tumors (neoplastic), pyogenic granuloma, hemangioma. Other Conditions Vocal cord paralysis, autoimmune diseases, foreign body aspiration, vallecular cyst, laryngoceles, vocal cord polyps, nodules, and granulomas, laryngomalacia, trauma / fracture, amyloidosis, surgical complications, thyroplasty for gender reassignment.

HNEE-28 PETROUS APEX: PEARLS AND PITFALLS

Barbara Sonvenso Ambrosio, MD (*Presenter*)
Natalia Yoshida, MD (*Abstract Co-Author*)
Marcos Marins, MD (*Abstract Co-Author*)
Emily Gazzoli (*Abstract Co-Author*)
Ian Caldas (*Abstract Co-Author*)
Barbara P. Pfluck, MD (*Abstract Co-Author*)

TEACHING POINTS

- Recognize the anatomy.- Provide a practical guide for radiological assessment through imaging patterns.Review main anatomical pathologies of the petrous apex.

TABLE OF CONTENTS/OUTLINE

The radiologist plays a crucial role in the proper evaluation of the petrous apex, contributing to appropriate patient management. First, we will review anatomy and anatomical variations for correct interpretation and to identify 'pitfalls' that mimic pathologies. We will describe imaging aspects on both MRI and CT of the main lesions, analyzing growth patterns, infiltrative effects, margins, and contrast enhancement, in addition to a detailed analysis of other specific findings, such as the lesion's signal on MRI sequences which help determine its tissue composition. CT will assess bone involvement and intralesional calcifications. We will bring images and short texts where we will present anatomical variations such as: asymmetric pneumatization, effusion (trapped fluid), vascular and neural channels, and arachnoid granulation. Examples of some pathologies that will be discussed are cholesterol granuloma, petrous apicitis, cholesteatoma, cephalocele, chordoma, and metastasis. Finally, we will assemble a flowchart for a facilitated and comprehensible approach to the findings and pathologies presented.

HNEE-29 HARD TO EXPLAIN SOFT FINDINGS: A RADIOLOGICAL REVIEW OF PALATAL LESIONS

Lucas P. Caldas, MD (*Presenter*)
Augusto S. Serpa, MD (*Abstract Co-Author*)
Murilo Vega, MD (*Abstract Co-Author*)
Mariana Rossi Corregliano, MD (*Abstract Co-Author*)
Rodrigo W. Murakoshi, MD (*Abstract Co-Author*)
Regina L. Elia Gomes, PhD, MD (*Abstract Co-Author*)
Eloisa M. Gebrim, MD (*Abstract Co-Author*)

TEACHING POINTS

This study aims to review the key anatomic aspects and structures of the palate and its components, making a correlation with the types of lesions that might affect this structure, focusing on the main imaging characteristics, especially on CT and MRI, correlating it with anatomical and pathological implications. The purpose of this exhibition is to: Review the anatomical structure of the hard and soft palate, and how to differentiate the various types of lesions (benign, malignant, inflammatory/infectious and miscellaneous) that can affect this region; Discuss imaging clues that may suggest aggressive nature of the lesion, which might need further investigation or biopsy, or benign imaging findings that might not need intervention; Highlight potential complications or patterns of extension to adjacent structures, including the nasal cavity, maxillary sinus, and oropharynx;

TABLE OF CONTENTS/OUTLINE

Overview of the hard and soft palate anatomy, with schematic illustrations and emphasis on clinical relevance for lesion assessment; Classification and imaging features of the most common lesions affecting the palate: benign, malignant, inflammatory/infectious and miscellaneous; Case-based review with examples of CT and MRI subtle findings, correlating them with histopathological findings.

HNEE-30 IMAGING THE GREAT PRETENDERS: PSEUDOTUMORAL LESIONS OF THE ORAL CAVITY AND OROPHARYNX

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Luiz R. Uchoa, MD (*Abstract Co-Author*)
Vinicius T. Goncalves, MD (*Abstract Co-Author*)
Jorge T. Takahashi, MD (*Abstract Co-Author*)
Ula Passos, MD (*Abstract Co-Author*)
Regina L. Elia Gomes, PhD, MD (*Abstract Co-Author*)
Eloisa M. Gebrim, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the imaging anatomy of the tongue and oral cavity; Recognize common pseudotumoral lesions that may mimic malignancy; Differentiate granulomatous, infectious/inflammatory, and cystic entities; Identify key imaging features that help in avoiding misdiagnosis; Emphasize the importance of considering congenital lesions in pediatric patients; Support a structured approach to lesion characterization and differential diagnosis

TABLE OF CONTENTS/OUTLINE

Clinical Challenge: Distinguishing Tumors from Mimics | Relevance of Imaging in Initial Assessment | Imaging Anatomy of the Tongue and Oral Cavity | Pseudotumoral Lesions by Etiology - Granulomatous Lesions (Paracoccidioidomycosis, Tuberculosis and Sarcoidosis) - Infectious and Inflammatory Lesions (Actinomycosis, Odontogenic Abscesses, Mucositis and Necrotizing Infections, Syphilitic Involvement of the Oropharynx, Myiasis of the Oropharynx)- Cystic and Congenital Lesions (Enteric Duplication Cysts, Dermoid and Epidermoid Cysts, Ranulas and Mucoceles, Hamartomas) | Imaging Patterns and Diagnostic Tips | Case-Based Approach

HNEE-31 ONODI'S CELL: THE IMPORTANCE OF THIS ANATOMIC VARIATION FOR PLANNING SURGERY AND TO AVOID COMPLICATIONS RELATED TO OPTIC NERVES AND INTERNAL CAROTID ARTERIES

Rainer G. Haetinger, MD, PhD (*Presenter*)
Silvia M. Mello (*Abstract Co-Author*)
Paula Cristina Amaral, MD (*Abstract Co-Author*)
Nizam Almeida, MD (*Abstract Co-Author*)

TEACHING POINTS

Detailed imaging assessment in Onodi's cell is essential for a correct surgical approach and reduction of the risk of complications. The radiologist must always be careful to describe this anatomical variation in order to guide surgeons and predict possible complications associated with diseases that may affect Onodi's cells. There are many shapes and sizes of this variation and Radiologists have to be familiar with them and describe all the relations in reports. There is risk of optic nerve damage, Internal carotid artery injury with severe bleeding, CSF fistula due to a breach in the base of the skull.

TABLE OF CONTENTS/OUTLINE

In 1907 Prof. A. Ónodi, from Budapest, Hungary, published a study about the optic nerve and its relation to the paranasal sinuses. In honor of him, the sphenoethmoidal cell is called Onodi's cell, which corresponds to an ethmoidal cell in contact to the optic canal/nerve. Usually the optic canal is related to the sphenoid sinus. In the author's collection many variants and shapes were found, which will be demonstrated in this presentation. In addition to the optic canal, the Onodi's cell may also establish relationship to the internal carotid artery and the cavernous sinus. For this reason, the knowledge about is very important to radiologists and surgeons. In the Opinion of the authors, due to its importance, should be described in any report of the paranasal sinuses and/or skull base. In the sense of highlight the importance of this anatomical variation, many examples of concomitant diseases and some complications are shown in this poster.

HNEE-32 UNDERSTANDING NECK DISSECTION: BRIDGING RADIOLOGY AND SURGERY

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Murilo B. Cintra (*Abstract Co-Author*)
Bruno B. Nobrega SR, MD (*Abstract Co-Author*)
Soraia A. Souza, MD, MS (*Abstract Co-Author*)
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Marcio Ricardo T. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

br /> • Review the anatomy of cervical lymph node levels critical for surgical planning and radiological interpretation.• Illustrate the types of neck dissections (radical, modified radical, and selective) with their anatomical and clinical implications.• Correlate postoperative imaging findings with the type of neck dissection performed, emphasizing key signs of preserved or sacrificed structures.

TABLE OF CONTENTS/OUTLINE

1. Anatomy of Cervical Lymph Node Levels o Detailed anatomical landmarks and drainage pathways. 2. Types of Neck Dissection and Surgical Indications o Radical Neck Dissection (RND) o Modified Radical Neck Dissection (MRND Types I-III) o Selective Neck Dissection (SND, including SOHD, LND, CND) 3. Postoperative Imaging Correlation o CT findings illustrating fat pad loss, gland preservation, and muscular atrophy. 4. Clinical and Surgical Relevance o How imaging findings guide clinical decision-making, recurrence surveillance, and complication recognition. 5. Summary and Teaching Images o Key illustrated examples with annotated CT images correlating surgical techniques and postoperative anatomy

HNEE-33 NI-RADS: A PRACTICAL GUIDE FOR IMPLEMENTATION IN RADIOLOGY SERVICES

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Thiago A. Miranda, MD (*Abstract Co-Author*)
Daniel V. Sumi, MD (*Abstract Co-Author*)
Suheyla P. Ribeiro, MD (*Abstract Co-Author*)
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Regina L. Elia Gomes, PhD, MD (*Abstract Co-Author*)
Carolina R. Soares, MD (*Abstract Co-Author*)

TEACHING POINTS

The ACR NI-RADS system represents an advancement in standardizing radiological reports for patient surveillance in head and neck cancer, and consists of categories that stratify tumor recurrence risk. Our objective is to provide a step-by-step approach for implementing its use, facilitating its adoption in clinical practice. Successful implementation requires: multidisciplinary team formation, protocol standardization, report template development, and training. Training models such as Entrustable Professional Activities (EPAs) can be very useful. Challenges include interobserver variability in borderline categories and adaptation to different institutional resources. Decision flowcharts have proven effective in overcoming these challenges and promoting greater concordance among observers.

TABLE OF CONTENTS/OUTLINE

ACR NI-RADS introduction and overview Implementing a new report model: a challenge on its own! - How was it done for other RADS? - NI-RADS: From literature to daily practice How to implement NI-RADS: step-by-step - Planning - Preparation - Training - Implementation - Monitoring and continuous improvement Team training: using EPAs for NI-RADS supervised implementation at institutional level Continuous improvement: - Peer learning meetings - Multidisciplinary team involvement: feedback from Tumor Board meetings - PDSA strategy: Plan-Do-Study-Act

HNEE-34 DON'T WASTE YOUR TIME - I AM NOT A LESION: PSEUDOLESIONS AND PITFALLS IN HEAD AND NECK IMAGE

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Diogo C. Medeiros, MD (*Abstract Co-Author*)
Anna P. Riello, MD, MSc (*Abstract Co-Author*)
Soraia A. Souza, MD, MS (*Abstract Co-Author*)
Marcio Ricardo T. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

Emphasize the importance of recognizing pseudolesions and imaging pitfalls in the head and neck (H&N) region that can mislead radiologists, resulting in misdiagnosis and unnecessary interventions. Present a variety of pseudolesions and pitfalls, aiming to help radiologists avoid errors and optimize time. Familiarize radiologists with unusual findings and specific anatomical variants of the H&N by turning them into a practical visual reference.

TABLE OF CONTENTS/OUTLINE

Introduction Case-based review by region or structure in the follow order: A. Orbit: Pseudoproptostis on myopia, Microphthalmia, Lacrimal, gland and fat orbital prolapses, Orbital varix B. Muscles: Masseter hypertrophic, Hypertrophic of the anterior belly of digastric, Same distal insertion of anterior belly of digastric C. Vessels: Dominant internal jugular vein due to vascular malformation drainage, Retropharyngeal carotid arteries, Thoracic duct (neck pathway) D. Glands: Lingual thyroid, Accessory parotid gland, Submandibular gland agenesis, Liposubstitution of salivary glands, Cervical extension of thymus, Spontaneous air dilation of the parotid duct E. Larynx and Esophagus: Proximal esophageal varices, Cricoid ridge ossification F. Mastoid: Cochlear cleft, Dehiscent high jugular bulb to tympanic cavity G. Bones: Mandibular and palatine torus, Mandibular and maxillary exostoses, Meningoceles and cephaloceles, Mandibular condyle hyperplasia H. Developed variations: Foramen of Huschke, Arrested pneumatization I. Anatomic findings: Cerebellar floccules in the cerebellopontine cistern, Septal appendix J. Foreign bodies: Gum, candies, saliva, and cosmetic filler materials Conclusion and take-home messages

HNEE-35 BEYOND B MODE PRACTICAL APPLICATION OF CEUS IN THYROID NODULE EVALUATION AND HISTOPATHOLOGIC CORRELATION FOR RADIOLOGY RESIDENTS

Sofia Renee Acuna Barrera, MD, MD (*Presenter*)
Veronica Espinosa Cruz, MD (*Abstract Co-Author*)
Alejandro Garcia Pena, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the complementary use of CEUS for the evaluation of thyroid nodules Recognize the patterns of benignity and malignancy according to the vascularization of thyroid nodules characterized by CEUS Identify which are the hemodynamic characteristics and recognize the imaging findings to differentiate a benign nodule from a malignant one Know and provide basic concepts of the quantitative parameters of post-processing of thyroid nodules enhanced by CEUS through the Time intensity Curves and their interpretation

TABLE OF CONTENTS/OUTLINE

Introduction Incidence of thyroid nodules and why complement a thyroid nodule with CEUS. How is CEUS applied to the patient. What to evaluate in a thyroid nodule through CEUSNodule Vascularization Brief vascular anatomy of the thyroid in benign or malignant nodule. Homogeneous: description, imaging findings compared with grayscale and histopathologic correlation based on clinical cases. Heterogeneous: description, imaging findings compared with grayscale and histopathologic correlation based on clinical casesHemodynamic Characteristics Assessment of blood flow and contrast distribution. Centrifugal: description, imaging findings compared with grayscale and histopathologic correlation based on clinical cases Centripetal: description, imaging findings compared with grayscale and histopathologic correlation based on clinical cases Scattered: description, imaging findings compared with grayscale and histopathologic correlation based on clinical casesEnhancement Time Quantitative Evaluation and what its parameters are Time intensity Curves and contrast behavior

HNEE-36 DIAGNOSIS OF EXTRAOCULAR MUSCLE (EOM) PATHOLOGIES: AN IMAGING GUIDE - CAUSES, KEY IMAGING FINDINGS, AND PITFALLS

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Munevver Duran (*Abstract Co-Author*)
Andres F. Mejia Leon, MD (*Abstract Co-Author*)
Santiago Aristizabal (*Abstract Co-Author*)
Juan Ricardo, MD (*Abstract Co-Author*)
David E. Timaran Montenegro, MD (*Abstract Co-Author*)
Laura Acosta, MD (*Abstract Co-Author*)
Eliana E. Bonfante, MD (*Abstract Co-Author*)

TEACHING POINTS

CT and MRI are essential for evaluating extraocular muscle (EOM) pathologies. Thyroid eye disease (TED) is a leading cause of EOM that presents with enlargement while sparing the tendinous insertions. Infectious, neoplastic, traumatic, vascular, metabolic, and inflammatory conditions present with distinct imaging characteristics.

TABLE OF CONTENTS/OUTLINE

Objectives • Classify EOM pathologies, including infectious, neoplastic, traumatic, vascular, and metabolic causes. • Develop a visual guide to help radiologists distinguish between different EOM pathologies. • Introduce an interactive tool to help identify common imaging pitfalls. Introduction • Differentiating EOM pathologies is critical, as treatments vary. • Imaging helps assess muscle involvement, adjacent structures, and diagnostic features. EOM Pathologies • Infectious Bacterial/fungal orbital cellulitis. • Neoplastic Orbital lymphoma, rhabdomyosarcoma, metastases. • Traumatic/Vascular EOM thickening, hemorrhage, or edema (e.g., carotid-cavernous fistula, dural AV fistula, ophthalmic vein thrombosis, orbital cavernous malformation). • Metabolic/Neuromuscular Thyroid-associated orbitopathy, myasthenia gravis, mitochondrial disease, muscular dystrophies • Inflammatory IgG4-related disease, sarcoidosis. Pitfalls • Measuring size without assessing pattern/symmetry. • Misreading normal variants. • Artifacts mimicking disease. • Lack of clinical correlation. • Missing neoplastic infiltration. Conclusions • While TED is most common, other EOMEs must be considered. • Systematic evaluation of muscle pattern, symmetry, and clinical data improves diagnosis.

HNEE-37 APPROACH TO LYTIC LESIONS OF THE SKULL BASE: PATTERNS, DIFFERENTIALS AND PITFALLS

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Amit Janu, MBBS, MD (*Abstract Co-Author*)
Nilesh Sable (*Abstract Co-Author*)
Munita Bal, MBBS (*Abstract Co-Author*)
Nitin S. Shetty, MBBS, MD (*Abstract Co-Author*)
SUYASH KULKARNI (*Abstract Co-Author*)
Deepa Nair (*Abstract Co-Author*)

TEACHING POINTS

1. Explore the differential diagnosis of lytic lesions involving the skull base. 2. Understand key anatomical compartments of the skull base and how lesion location influences differential 3. Interpret imaging characteristics on CT and MRI that help narrow differential diagnosis- such as lesion margins, enhancement, matrix, and bone remodeling or destruction. 4. Recognize characteristic imaging findings of specific entities such as chordoma, chondrosarcoma, lymphoma, multiple myeloma, Ewing's sarcoma, Rhabdomyosarcoma, epithelial malignancies with secondary bone involvement and certain benign conditions like fibrous dysplasia and giant cell tumor.

TABLE OF CONTENTS/OUTLINE

1. Atlas of common differential diagnosis of lytic lesions of the skull base. 2. Overview and anatomy: Brief anatomy of the skull base relevant to various lytic lesions. 3. Imaging patterns and key differentials of various skull base lytic lesions on multimodality imaging. 4. Case-based diagnostic algorithm: Case vignette with key imaging findings, pearls and pitfalls 5. Summary, takeaway points and suggested workup.

HNEE-38 CHASING CANCER COMEBACKS: NI-RADS INSIGHTS INTO ORAL CAVITY SQUAMOUS CELL CARCINOMA ON PET-CT AND MRI

Jitin Goyal, MBBS (*Presenter*)

TEACHING POINTS

Surgery, with or without chemoradiation, is the primary treatment for head and neck cancers (HNC). However, distinguishing recurrence from post-treatment changes is challenging due to surgical alterations and radiation-induced fibrosis. Imaging plays a key role in detecting recurrence early, enabling salvage treatments. In oral cavity

cancers, reconstructive surgery and post-treatment trismus complicate clinical examination. Post-contrast imaging can show enhancement from both recurrent disease and post-treatment scarring. Additionally, artifacts on diffusion-weighted imaging (DWI) complicate interpretation. The Neck Imaging Reporting and Data System (NI-RADS) was developed to standardize post-treatment surveillance, initially for contrast-enhanced CT and PET, but newer studies highlight the role of MRI, especially DWI and T2-weighted imaging, in improving diagnostic accuracy. NI-RADS categorizes post-treatment findings into four levels: NI-RADS 1 (no recurrence), NI-RADS 2 (low suspicion), NI-RADS 3 (high suspicion), and NI-RADS 4 (definite recurrence). This framework aids in clinical management, though interobserver variability requires further study to solidify its clinical utility.

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Clinical cases with pictorial depiction of recurrence on MR with conventional T2WI, diffusion and 18 FDG PET-CT in post surgical cases of head and neck cancers.

HNEE-39 HEAD AND NECK MANIFESTATIONS OF AMYLOIDOSIS

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Sara Rosalino, MD (*Abstract Co-Author*)
Alvaro Peixoto De Morais (*Abstract Co-Author*)
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Fernanda B. Assuncao, MD (*Abstract Co-Author*)

TEACHING POINTS

Review the main concepts of amyloidosis. Highlight head and neck involvement and its radiological findings. Improve the diagnostic approach by correlating multimodality imaging and clinical findings

TABLE OF CONTENTS/OUTLINE

Amyloidosis is a group of rare disorders (with an incidence of 5-10 cases per million people per year) characterized by the extracellular deposition of insoluble, misfolded proteins, often forming ß-sheet rich fibrils, in various organs, leading to cellular and organ dysfunction. This disease can be categorized into localized and systemic forms of amyloidosis, and subdivided by protein subtype.Although involvement of this topography represents a small fraction of amyloidosis cases in general, it is estimated that up to 20% of patients with the disease present manifestations in this region, frequently associated with the AL (immunoglobulin light chain) subtype.The larynx is the most affected site, followed by the tongue, nasopharynx, palatine tonsils, orbits, salivary glands and, more rarely, the paranasal sinuses. Some types of amyloidosis, such as AL (light chain), can mimic neoplastic lesions both clinically and radiologically. Although it is a rare entity, head and neck amyloidosis presents well-defined clinical and radiological characteristics. Therefore, imaging plays an essential role in assessing the extent and morphological pattern of the disease, aiding in surgical planning and monitoring recurrences, in addition to differentiating it from neoplasms, inflammatory processes, as well as infectious diseases such as tracheobronchial tuberculosis.

HNEE-40 BRACHIAL PLEXUS BEYOND TRAUMA: A CLINICAL AND RADIOLOGICAL PRACTICAL GUIDE

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Yasmin Fernandes De Aquino, MD (*Abstract Co-Author*)
Odilo M. Queiroz, MD (*Abstract Co-Author*)
Marina Nori Hilario, MD (*Abstract Co-Author*)
Marnya Wellysa Leite Tavares, MD (*Abstract Co-Author*)
Carolinny Cruvinel Maia, MD (*Abstract Co-Author*)
Alex Fernandes (*Abstract Co-Author*)
Rainer G. Haetinger, MD, PhD (*Abstract Co-Author*)
Fernanda B. Assuncao, MD (*Abstract Co-Author*)
Alex Baeta (*Abstract Co-Author*)
Silvia M. Mello (*Abstract Co-Author*)

TEACHING POINTS

To present a practical review of the main etiologies, clinical features, and diagnostic strategies of non-traumatic lesions of the brachial plexus, providing tools to facilitate radiological assessment and therapeutic management, emphasizing the importance of a multidisciplinary approach.

TABLE OF CONTENTS/OUTLINE

Non-traumatic lesions of the brachial plexus are frequently underdiagnosed due to their variable and complex clinical presentation. They may result from inflammatory, infectious, immune-mediated, metabolic, hereditary, neoplastic conditions, or radiotherapy-related causes. Their identification depends on the analysis of clinical history, physical examination, and complementary exams, including magnetic resonance imaging (MRI), and represents a challenge for radiologists, as imaging findings may appear similar, especially in non-neoplastic etiologies. Selected cases included primary and secondary neoplastic lesions of the brachial plexus, such as schwannomas, neurofibromas, plexiform neurofibroma, lymphoma, metastases; extrinsic compressions by tumors and secondary infiltration from thoracic neoplasms (Pancoast); inflammatory/infectious causes: Sarcoidosis, Parsonage Turner, COVID, Dengue; immune-mediated conditions such as Chronic Inflammatory Demyelinating Polyneuropathy (CIDP), Lewis Sumner, and Guillain-Barré; radiotherapy-induced plexopathies; other causes like porphyria and paraneoplastic syndrome. In neoplastic pathologies, tumoral infiltration of brachial plexus structures was also observed. A practical approach to non-traumatic lesions of the brachial plexus requires knowledge of their various etiologies and diagnostic nuances.

HNEE-41 DON'T LOSE FACE: IMAGING THE INTRICACIES OF FACIAL NERVE DISORDERS

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Augusto S. Serpa, MD (*Abstract Co-Author*)
Regina L. Elia Gomes, PhD, MD (*Abstract Co-Author*)
Eloisa M. Gebrim, MD (*Abstract Co-Author*)
Carlos Toyama (*Abstract Co-Author*)
Hugo Tames, MD (*Abstract Co-Author*)

TEACHING POINTS

Imaging is crucial for evaluating atypical, progressive, or refractory peripheral facial paralysis. Detailed anatomical knowledge of the facial nerve and careful application of imaging techniques are essential for accurate diagnosis and appropriate management. This exhibit presents a practical imaging approach to peripheral facial paralysis, emphasizing common and uncommon causes, and outlining key CT and MRI findings to guide clinical decision-making. Recognize imaging features of common and uncommon facial nerve pathologies, including idiopathic, infectious, neoplastic, traumatic, and congenital/syndromic etiologies. Bell’s palsy: thickening and non-nodular enhancement. Herpes zoster oticus/ Ramsay-Hunt syndrome: edema and enhancement of the intracanalicular portion of VII and VIII, cochlea and vestibule, and vesicular lesions on the pavilion and external auditory canal. Otologic infections/inflammations: chronic otomastoiditis cholesteatomatous. Syndromic: Moebius, Van Buchem Disease. Traumatic lesions: temporal bone fractures, spurs, asymmetrical geniculate ganglion. Tumors (schwannoma, venous malformation, metastases): infiltrative vs expansive, and focal nodular enhancement.

TABLE OF CONTENTS/OUTLINE

1. Introduction. 2. Imaging findings by etiology and tips for differential diagnosis.3. Pearls and Pitfalls: Post-contrast enhancement patterns; Importance of contralateral comparison; Search distant lesions (parotid, pons, skin); 4. Take-home message.

HNEE-42 TEMPORAL BONE SURGERIES AND THEIR COMPLICATIONS: WHAT THE RADIOLOGIST DOESN'T WANT TO FIND

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GRAZIELE AMBROSIO (*Abstract Co-Author*)
Barbara Sonvenso Ambrosio, MD (*Abstract Co-Author*)
Marcos Marins, MD (*Abstract Co-Author*)

TEACHING POINTS

Postoperative imaging of temporal bone is challenging and requires knowledge of anatomy and surgical techniques to correctly evaluate therapeutic success and for early detection of postoperative complications and recurrences. Accurate imaging characterization of postsurgical complications (e.g., infections, collections, cerebrospinal fluid (CSF) fistulas, neurovascular structure injuries, problems with prostheses or implants) is vital to guide appropriate clinical management and/or reinterventions. This guide reviews the main otologic surgeries (mastoidectomies, tympanoplasties with prostheses, ossicular reconstruction, cochlear implants and approaches to the cerebellopontine angle) and their possible complications imaging aspects in order to properly identify which one needs conservative treatment or new surgical intervention. Correlation with relevant computed tomography (CT) and intraoperative images was also made.

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Illustration and didactic review of relevant aspects of the anatomy of the temporal bone for an adequate assessment of the imaging features of the main surgical procedures. The role of imaging in predicting major and minor complications on postoperative temporal bone imaging. Key aspects to help the accurate interpretation of usual postoperative patterns and it's prompt differentiation from unexpected outcomes and complications.

HNEE-43 DEEP DIVE INTO THE JAW: CT AND MRI FEATURES OF ODONTOGENIC KERATOCYSTS AND THEIR MIMICKERS

Leonardo Bandeira de Andrade, MD (*Presenter*)
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Rodrigo W. Murakoshi, MD (*Abstract Co-Author*)
Bruno C. Olivetti, MD (*Abstract Co-Author*)
Regina L. Elia Gomes, PhD, MD (*Abstract Co-Author*)
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Ula Passos, MD (*Abstract Co-Author*)
Eloisa M. Gebrim, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize the typical imaging features of odontogenic keratocysts (OKC). Differentiate odontogenic keratocysts (OKCs) from other odontogenic cystic lesions, as well as from non-odontogenic entities based on imaging characteristics. Understand the clinical, epidemiological, and pathophysiological aspects of odontogenic keratocysts (OKCs), including their imaging features, typical treatment approaches, and post-treatment imaging findings.

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INTRODUCTION: Brief overview of OKC definition, epidemiology, histology and symptoms IMAGING: Multiple illustrative cases demonstrating the imaging features of OKCs on panoramic radiography, computed tomography (CT), and magnetic resonance imaging (MRI), including neurography sequence, with a particular emphasis on MRI. GORLIN GOLTZ SYNDROME: Definition and most commonly clinical presentation and imaging findings. DIFFERENTIAL DIAGNOSIS: Imaging findings and illustrative cases of ameloblastomas, dentigerous cysts, radicular cysts, odontogenic abscesses, mucoceles, and lymphomas, with emphasis on the imaging characteristics that help distinguish them from odontogenic keratocysts (OKCs). TREATMENT: Most commonly treatment modalities, including enucleation and marsupialisation. FOLLOW UP: Normal postoperative imaging appearances, features suggestive of recurrence or residual lesion, and imaging findings that may indicate malignant transformation.

HNEE-44 EYE SEE WHAT YOU DID THERE - THE ROLE OF IMAGING IN STRABISMUS

Felipe Correa Brito, MD (*Presenter*)
Otavio Yamamoto, MD (*Abstract Co-Author*)
Jacqueline Juhasz (*Abstract Co-Author*)
Paola Yoshimatsu Izelli, MD (*Abstract Co-Author*)
Gabriela Fernanda Riboli Favaro (*Abstract Co-Author*)
Wankler Dias Canhadas Junior (*Abstract Co-Author*)
Raifran Neto, MD (*Abstract Co-Author*)
Sara Rosalino, MD (*Abstract Co-Author*)
Henrique B. Zuppani, MD (*Abstract Co-Author*)
Thiago Luiz P. Scoppetta, MD (*Abstract Co-Author*)
Fernanda B. Assuncao, MD (*Abstract Co-Author*)

TEACHING POINTS

Examine the normal anatomy and physiology related to ocular motility; Explore the primary causes and secondary causes, as also, the risk factors associated with strabismus; Analyze the key radiographic findings of strabismus identified through computed tomography and magnetic resonance imaging; Discuss the role of the radiologist in the diagnosis and therapeutic monitoring of patients with strabismus.

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Essential orbital anatomy and physiology; Definition of strabismus and its epidemiology; Systematic structural assessment that the radiologist must perform; Analysis of the different causes of strabismus associated with the main imaging findings; Congenital: Orbital syndromes, malformations, neural hypoplasia. Acquired: Trauma, inflammatory diseases, neuropathies, orbital tumors, myopathies. Neurological: Ischemic, compressive or inflammatory lesions of the cranial nerves (III, IV, VI). Muscles: Heaving eyes syndrome (esotropia in high myopia), Sagging eye syndrome, Grave´s diseases, Idiopathic inflammatory Others: Post-traumatic muscle entrapment or restriction by orbital masses, lymphomas, metastases The role of the radiologist in diagnosis and therapeutic monitoring of patients with strabismus. Summary Strabismus can have multiple causes, and imaging is essential to guide diagnosis and management; Knowledge of the anatomy and patterns of muscle and neural involvement allows for better interpretation of radiological findings; Radiologists play an essential role in the pre- and post-surgical evaluation of strabismus;

HNEE-45 IMAGING EVALUATION OF HYPOGLOSSAL PALSIES: AN ANATOMICAL AND ETIOLOGICAL APPROACH

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Lazaro F. Amaral, MD (*Abstract Co-Author*)
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Marina Nori Hilario, MD (*Abstract Co-Author*)
Marcos Sakano (*Abstract Co-Author*)
Camila Almeida, MD (*Abstract Co-Author*)
Guilherme L. Gaiotto, MD (*Abstract Co-Author*)
Vinicius Martins, MD (*Abstract Co-Author*)

TEACHING POINTS

Hypoglossal nerve palsy (cranial XII) can significantly impair tongue movement, resulting in deviations, fasciculations, or muscle atrophy. Imaging assessment of anatomical structures along the nerve pathway is crucial to identify pathological changes and determine underlying causes, guiding diagnosis and clinical management.

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The hypoglossal nerve originates in the hypoglossal nucleus, located in the dorsal portion of the medulla oblongata. Its fibers emerge from the skull through the hypoglossal canal. After leaving the canal, the nerve descends laterally, positioning itself between the internal carotid arteries and the internal jugular vein, in the parapharyngeal space. It then crosses the lingual arteries and is distributed to innervate all the muscles of the tongue, except the palatoglossus muscle, which is innervated by the vagus nerve via the pharyngeal plexus.Detailed knowledge of this trajectory is essential for correlating clinical and radiological findings, allowing the identification of lesions.Magnetic resonance imaging is the modality of choice for evaluating the hypoglossal nerve trajectory. MR angiography can be used to evaluate arterial dissections or vascular compressions. Computed tomography of the skull is complementary, especially to identify fractures, bone erosions or calcifications.The main causes of hypoglossal nerve palsy can be categorized according to the affected segment and the nature of the injury. Inspection between clinical and imaging results is essential to determine the level of the injury and guide therapeutic conduct, which can range from observation to surgical interventions.

HNEE-46 OPTIC NEUROPATHIES ON MRI AND CT: A PRACTICAL GUIDE FOR EVERY RADIOLOGIST

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Bruno V. Fahel, MD (*Abstract Co-Author*)
Paulo H. Fujita (*Abstract Co-Author*)
Mariluze Sardinha (*Abstract Co-Author*)
Paulo Mariz Filho, MD (*Abstract Co-Author*)

TEACHING POINTS

- Present a practical, image-based approach to optic neuropathies, highlighting essential radiologic patterns. - Reinforce the anatomical segmentation of the optic nerve and its relevance for diagnostic reasoning. - Illustrate key CT and MRI findings across major etiologic categories of optic nerve involvement. - Enable radiologists to build efficient, confident differential diagnoses in common and atypical presentations.

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- Anatomical overview Segmental division of the optic nerve (intraocular, intraorbital, intracanalicular, intracranial) as the basis for interpretation. - Inflammatory, autoimmune and demyelinating lesions Includes optic neuritis and neuromyelitis optica, differentiated by topography, enhancement pattern, and clinical context. - Gliomatous infiltration Classic findings in NF1-associated optic pathway gliomas and perineural gliomatosis. - Congenital anomalies Recognition of optic nerve coloboma and its distinct “egg-shaped” excavation pattern. - Meningeal lesions Typical concentric perineural enhancement in meningioma, including the “tram-track sign” as a diagnostic clue. - Extrinsic compressive and infiltrative processes: Orbital disorders such as thyroid-associated orbitopathy, melanoma, and perineural tumor spread with secondary optic nerve involvement.

HNEE-48 BEYOND THE MUCOSA: IMAGING SPECTRUM OF PARANASAL SINUS COMPLICATIONS AND AGGRESSIVE INFECTIONS

Oreanna Quintero, MD (*Presenter*)
Andres F. Caliz Cabrales, MD (*Abstract Co-Author*)
Sara Gomez Milanes, MD (*Abstract Co-Author*)
Julian M. Gandur, MD (*Abstract Co-Author*)
Jesus Eduardo Barreto Fernandez (*Abstract Co-Author*)
Luz A. Unigarro, MD (*Abstract Co-Author*)
Alejandro Blanco Rojas, MD (*Abstract Co-Author*)
Carolina Tramontini (*Abstract Co-Author*)

TEACHING POINTS

Sinusitis: Beyond mucosa, consider orbital, osseous, intracranial, aggressive infections (high morbidity/mortality).Imaging (CT/MRI) key for early dx, extent, therapy guidance.Uncomplicated: Mucosal thickening, air-fluid, opacification, OMC obstruction. Chronic: Persistent thickening, polyps, bone remodeling.Orbital: Pre/postseptal cellulitis, subperiosteal/orbital abscess (proptosis, chemosis, fat stranding, rim-enhancing collections - MRI best).Osseous: Osteomyelitis (Pott's Puffy Tumor), mucocele (bone erosion/expansion).Aggressive Fungal (IFS): Rapid, T2 hypointense, bone erosion, vascular/orbital/intracranial invasion.Intracranial Spread: Epidural/subdural abscess, empyema, meningitis, cerebritis, brain abscess, sinus thrombosis (rim-enhancing, DWI restriction, venous defects - MRI+DWI).Red Flags: Bone erosion, T2 hypointense, intracranial/dural enhancement, proptosis, venous thrombosis, pneumocephalus.Early recognition of red flags crucial for timely management.

TABLE OF CONTENTS/OUTLINE

I. Intro: Beyond Simple Sinusitis II. Uncomplicated Sinusitis A. Acute Patterns B. Chronic Patterns III. Local Spread: Orbital A. Pre/Postseptal Cellulitis B. Subperiosteal Abscess C. Orbital Abscess IV. Local Spread: Osseous A. Osteomyelitis (Pott's) B. Mucocele/Pyocele V. Critical Crossings: Intracranial & Aggressive A. Acute Invasive Fungal Sinusitis B. Intracranial Spread VI. Conclusion: Beyond Sinus Cavity A. Summary B. Imaging Red Flags C. Take-Home Message

HNEE-49 IMAGING EVALUATION FOR POST-OPERATIVE COCHLEAR IMPLANTS

Krishnakumari A. Modi, MBBS (*Presenter*)
Otavio Augusto Ferreira Dalla Pria, MD (*Abstract Co-Author*)
Gul Moonis, MD (*Abstract Co-Author*)
Amy F. Juliano, MD (*Abstract Co-Author*)
Nitesh Shekhrajka, MD,MBBS (*Abstract Co-Author*)

TEACHING POINTS

Cochlear implants (CI) surgery an effective treatment in children and adults with severe to profound hearing loss. Imaging plays a crucial role in preoperative and postoperative evaluation of CI. Imaging is used to confirm the desired positioning and insertion depth of the electrode array, which affects sound coding strategies and hearing outcomes as well as detects immediate and late post operative complications.

TABLE OF CONTENTS/OUTLINE

• Overview of CI components. • Review various types of electrodes. • Describe normal postoperative imaging findings. • Identify unfavorable positioning of the electrodes and immediate and late complications. • CI and MRI safety

HNEE-50 IMAGING EVALUATION OF CONGENITAL NON-SYNDROMIC INNER EAR MALFORMATIONS

Krishnakumari A. Modi, MBBS (*Presenter*)
Otavio Augusto Ferreira Dalla Pria, MD (*Abstract Co-Author*)
Gul Moonis, MD (*Abstract Co-Author*)
Amy F. Juliano, MD (*Abstract Co-Author*)
Nitesh Shekhrajka, MD,MBBS (*Abstract Co-Author*)

TEACHING POINTS

Hearing loss in children can significantly impact speech and language development, influencing their academic performance and socio-economic well-being. Imaging studies reveal inner ear malformations in up to one-third of children with sensorineural hearing loss, which may either be isolated or syndromic. A thorough understanding of inner ear embryology, anatomy, and characteristic imaging features is essential for early diagnosis, appropriate intervention, and prevention of complications. In this exhibit, we aim to provide a concise overview of embryologic development of the inner ear, relevant anatomical structures, imaging modalities, and the latest classification of isolated (non-syndromic) inner ear malformations, illustrated with representative graphics and imaging cases.

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• Review inner ear embryology with simple graphic representations. • Imaging anatomy of key inner ear structures on CT and MRI. • Review the latest classification of non-syndromic inner ear malformations. • Case based review of inner ear malformations with imaging examples and graphic representations.

HNEE-51 DON'T LOSE YOUR HEAD: A RADIOLOGISTS' GUIDE TO POSTSURGICAL IMAGING OF ADVANCED HEAD AND NECK TUMORS

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Geovana L. Franco, MD (*Abstract Co-Author*)
Felipe Welter Langer, MD (*Abstract Co-Author*)
Lucas P. Caldas, MD (*Abstract Co-Author*)
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Eloisa M. Gebrim, MD (*Abstract Co-Author*)
Samya S. Alves, MD (*Abstract Co-Author*)
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Rebeca O. Francelino, MD (*Abstract Co-Author*)
Raquel A. Moreno, MD (*Abstract Co-Author*)

TEACHING POINTS

- Management of advanced head and neck malignancies requires a multidisciplinary approach, tailored to tumor location, stage, histopathology, and patient-specific factors. - Surgical resection, often combined with radiation therapy, plays a central role but frequently results in complex posttreatment changes and altered anatomy that complicate imaging interpretation. - This educational session provides a comprehensive review of posttreatment imaging in head and neck cancer patients, emphasizing recognition of expected postoperative findings, major complications, and imaging clues for tumor recurrence.

TABLE OF CONTENTS/OUTLINE

1) Common Surgical and Reconstructive Techniques - Impact on local anatomy and key imaging considerations. 2) Expected Posttreatment Imaging Findings- Normal early and delayed postoperative appearances. 3) Identifying tumor recurrence - Imaging strategies to differentiate recurrent disease from benign postoperative alterations. 4) Major Postoperative Complications - Recognition of common complications including: osteoradionecrosis and osteomyelitis, abscess formation and fluid collections, flap failure (e.g., pedicle thrombosis) and chylous fistula. 5) Conclusion and Future Directions - evolving imaging techniques and emerging robotic techniques.

HNEE-53 UPDATES ON THE 9TH AJCC/UICC NASOPHARYNGEAL CANCER TNM STAGING AND THE ROLE OF MULTIMODALITY IMAGING

Anna Theresa Dantes (*Presenter*)
Takashi Hiyama, MD, PhD (*Abstract Co-Author*)
Hirofumi Kuno, MD, PhD (*Abstract Co-Author*)
Tatsushi Kobayashi, MD (*Abstract Co-Author*)
Ron C. Pilotin, MD (*Abstract Co-Author*)

TEACHING POINTS

The American Joint Committee on Cancer (AJCC) and the Union for International Cancer Control (UICC) published the 9 th version of Nasopharyngeal Cancer TNM Staging Classification in January 2025. This new edition establishes a paradigm shift from primarily clinical-based criteria to incorporation of radiologic parameters, highlighting the role of imaging in nasopharyngeal cancer (NPC) staging. In the T category, emphasis is now given to unequivocal radiologic evidence of cranial nerve involvement as a T4 criterion. The N category now includes imaging-detected advanced extra-nodal extension as a parameter for upstaging to N3. Furthermore, the M category is now subdivided into M1a and M1b according to the number of metastatic lesions and organs involved. The objectives of this presentation are: 1) to review the updates in the 9 th version of the AJCC and UICC TNM staging for NPC, comparing it with the 8 th edition; 2) to discuss the role of multimodality imaging in the proper staging of NPC patients; and, 3) to explore possible challenges in applying these new criteria in practice.

TABLE OF CONTENTS/OUTLINE

1. 9 th version of NPC TNM staging classification vis-a-vis the 8 th edition 2. Case discussion a. T Category b. N Category c. M Category 3. Potential challenges in applying the new criteria in radiology practice 4. Summary and conclusion

HNEE-54 PHOTON-COUNTING CT-DACRYOCYSTOGRAPHY: A SINGLE-CENTER CASE SERIES AND LITERATURE REVIEW

Renske Gahrmann, MD, PhD (*Presenter*)
Aaike S. van Den Berg, MD (*Abstract Co-Author*)
Marcel L. Dijkshoorn (*Abstract Co-Author*)
Sophie E. Veldhuijzen van Zanten, MD (*Abstract Co-Author*)
Anke W. van der Eerden, MD (*Abstract Co-Author*)

TEACHING POINTS

Photon-Counting CT dacryocystography (PCCT-DCG) provides superior anatomical detail with excellent spatial resolution and soft-tissue contrast, outperforming CBCT and MDCT for nasolacrimal drainage system (NLDS) evaluation. A dynamic scanning protocol incorporating timed acquisitions and patient maneuvers enhances diagnostic yield. Clinical utility spans trauma, infection, dacryocystocele, and post-dacryocystorhinostomy (DCR) evaluation. Early adoption of PCCT-DCG in the diagnostic pathways may reduce reliance on more invasive tests and improve diagnostic efficiency.

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Introduction covering epiphora basics, NLDS obstruction etiologies, and current imaging modalities. Technical advantages of PCCT-DCG, including superior bone and soft-tissue imaging, artifact reduction, reconstruction techniques, and optimized radiation dose efficiency compared to CBCT, MDCT, fluoroscopy, and dacryoscintigraphy. Protocol details: non-contrast CT, eyedrop contrast administration, and dynamic scanning. Case series summary highlighting patient characteristics and representative findings. Discussion of diagnostic value and clinical implications in diagnostically challenging cases, where conventional outpatient examinations such as irrigation tests, fail to provide definitive answers.

HNEE-55 NAVIGATING THE NECK: A GUIDE TO CAROTID BODY PARAGANGLIOMAS FOR RESIDENTS

Willington Zapata Salazar, MD (*Presenter*)

TEACHING POINTS

Recognize the anatomy, origin, and characteristic imaging features of carotid paragangliomas, including their vascular behavior, key diagnostic signs, and relevance for surgical risk stratification. Describe a structured, multimodality imaging approach, Doppler ultrasound, CT, MRI, and PET when indicated and apply the Shamblin classification to support accurate diagnosis and presurgical planning.

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Carotid paragangliomas and their clinical importance. Location and nearby anatomical structures. Imaging approach using Doppler, CT, MRI, and PET CT protocol and key features for surgical planning. Shamblin classification for tumor description. Structured interpretation approach for radiology residents.

HNEE-56 CRACKING THE CASE: TEMPORAL BONE TRAUMA REVIEW FOR THE ON-CALL RADIOLOGIST

Brian Nguyen, MD (*Presenter*)
Hunter R. Carlock, MD (*Abstract Co-Author*)
Quinn Magiera, MD (*Abstract Co-Author*)
Mitchel Pham, MD (*Abstract Co-Author*)
Anthony Portanova, MD (*Abstract Co-Author*)

TEACHING POINTS

This project aims to deliver a focused yet comprehensive review of temporal bone trauma imaging, emphasizing key reporting considerations in the on-call setting. Topics of discussion will include mechanisms of injury, fracture patterns, and a comparison of classic versus modern classification systems. A case-based review will highlight the imaging appearance of important complications such as ossicular disruption, CSF leak, and facial nerve paralysis. A brief overview of normal temporal bone anatomy will be provided, limited to what is essential for identifying fracture morphology, complications, and commonly misinterpreted “pseudofractures” caused by normal fissures, sutures, and canaliculi. The presentation will also include a practical reporting checklist to support a structured search pattern at the workstation.

TABLE OF CONTENTS/OUTLINE

Introduction to Temporal Bone Trauma - Epidemiology and clinical relevance Review of Normal Anatomy - Key anatomical landmarks on CT with illustrations - Normal "pseudofractures" (sutures, fissures, canaliculi etc.) Fracture Classifications - Traditional classification: longitudinal vs. transverse vs. mixed - Modern classification: otic capsule-sparing vs. otic capsule-violating Case-Based Review - e.g. ossicular chain injury, CSF leak, facial nerve injury, vascular injury On-call Reporting Checklist - Practical tool for workstation use, search pattern augmentation Summary and Take-Home Points - High-yield recap

HNEE-57 A REAL PAIN IN THE NECK: CASE-BASED REVIEW OF HEAD AND NECK CANCER NODAL STAGING WITH IMAGING-BASED EVALUATION OF EXTRANODAL EXTENSION

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Jumanah M. Ardawi, MBBS (*Abstract Co-Author*)
Carlos I. Torres, MD (*Abstract Co-Author*)
Eugene Yu, MD (*Abstract Co-Author*)
Colin S. Poon, MD, PhD (*Abstract Co-Author*)
Jeffrey Chankowsky, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

Targeted review of anatomy pertinent to nodal staging in head and neck cancer. Overview of existing classification systems for grading likelihood of imaging detected extranodal extension (iENE). Present a case-based review and practical approach to nodal staging and detection/grading of iENE

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Extranodal extension of tumor is an important predictor of negative prognosis in head and neck cancer. Although assessment of pathology-detected ENE (pENE) is well established, detection and grading of iENE is unclear with lack of consensus. As such, it has not been integrated into any staging systems nor is it used to inform clinical management to date. Recent efforts have been made to establish a clear grading system and use of a standardized lexicon for report generation during radiological assessment of iENE, which will improve future research in validating imaging-based assessment and permit imaging to play a greater role in guiding treatment decisions, monitoring disease course and response to treatment. The objective of this exhibit is to provide a practical approach to nodal staging in head and neck cancer and detection and grading of iENE through cased-based review. The exhibit will start with a targeted review of relevant anatomical landmarks that are important to identify during head and neck cancer nodal staging. Subsequently, we will provide an overview of nodal staging systems and present an image-based grading system of iENE derived from a multi-national consensus group, with an emphasis on discussion surrounding accuracy/performance in available validation studies. Finally, we will present a practical approach to nodal staging and grading the degree of iENE through case-based review.

HNEE-58 FROM SIGNAL TO SIGHT: USING MRI TO UNCOVER THE OPTIC NERVE

Pavan Kottamasu, MD, MBA (*Presenter*)
Hunter R. Carlock, MD (*Abstract Co-Author*)
Jeevak Almast, MD (*Abstract Co-Author*)
Steven P. Meyers, MD, PhD (*Abstract Co-Author*)
Shehanaz K. Ellika, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

(1) Review the anatomy of the optic nerve (ON) and discuss MR imaging sequences that adequately assess the ON (2) Discuss the clinical role of MR imaging in diagnosis and management of ON pathology (3) Present common ON pathologies and describe their associated MR imaging findings (4) Identify common imaging pitfalls that occur when evaluating the ON

TABLE OF CONTENTS/OUTLINE

(I.) Defining the segments of the optic nerve (ON) on imaging (II.) MR imaging sequences to include when evaluating the ON (III.) Common ON/nerve sheath pathologies (IIIa.) Congenital/hereditary ON pathologies (IIIb.) Demyelinating disorders (IIIc.) Inflammation of the ON (IIId.) ON neoplasms (IIIe.) Ischemic optic neuropathy (IIIf.) Other ON pathologies (IV.) Common imaging pitfalls when evaluating the ON

HNEE-59 ILLUSTRATING PARATHYROID GLAND PATHOLOGY IN PRIMARY, SECONDARY, AND TERTIARY HYPERPARATHYROIDISM: A PICTORIAL REVIEW

Sofia Ventura-Diaz, MD (*Presenter*)
Andrea Chen (*Abstract Co-Author*)
Ipshita Kak (*Abstract Co-Author*)
James Young (*Abstract Co-Author*)
Ryan P. Rebello, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the physiology and normal anatomy of the parathyroid glands, and the imaging appearance of the different causes of primary (PHPT), secondary (SHPT) and tertiary hyperparathyroidism (THPT).

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Hyperparathyroidism is a cause of substantial morbidity and health care costs. Whilst the diagnosis of hyperparathyroidism is made biochemically, it is important to recognize the most common imaging findings of the PHPT, SHPT and THPT for adequate preoperative localization, as it can potentially be cured surgically. Hyperparathyroidism can result from an intrinsic abnormality (PHPT or THPT) or from extrinsic stimulation secondary to imbalance in the calcium homoeostasis that stimulates production of PTH (SHPT). PHPT represents the most common cause of hypercalcemia and the third most common endocrine disorder. The most common cause of PHPT results from a single parathyroid adenoma (85-90%), hyperplasia (6%), double parathyroid adenoma (4%), and parathyroid carcinoma (<1%). Parathyroid cysts are extremely rare (<0.5%) and the majority (80%) are non-functioning. SHPT arises when increased secretion of PTH is a response to lowered ionized calcium as a result of kidney, liver, or bowel disease. It can be either caused by Vitamin D deficiency, a relatively common cause in the elderly, or as the result of chronic kidney disease (CKD). It is characterized by 4 gland hyperplasia. THPT is a state of autonomous secretion of PTH as a result of longstanding CKD and SHPT. Like SHPT, it is most commonly associated with 4 gland hyperplasia. The most commonly performed imaging modalities for preoperative localization are US, nuclear medicine imaging, and multiphasic CT.

HNEE-60 CT AND MRI IMAGING CHARACTERISTICS OF EYELID LESIONS

Masaya Kawaguchi (*Presenter*)
Hiroki Kato (*Abstract Co-Author*)
Shingo Omata, MD (*Abstract Co-Author*)
Masayuki Matsuo, MD (*Abstract Co-Author*)

TEACHING POINTS

The eyelid covers the eyeball and is divided into an upper and lower eyelid that opens and closes to protect the eyeball. The eyelid is composed of skin, appendages, muscle, fat, and fibrous connective tissue, and a variety of lesions can occur. The majority of eyelid tumors (85%) are benign tumor and malignant tumors are leratively rare. However, CT and MRI scans are rarely performed for benign tumors because of the small size of these lesions. Eyelid imaging is used mainly to investigate malignancy, inflammation, and systemic autoimmune disease. Benign tumors of the eyelid include epidermoid cysts, dermoid cysts, pilomatricomas, chalazion, hordeolum, and hemangiomas. Malignant tumors include basal cell carcinoma, squamous cell carcinoma, malignant melanoma, Merkel cell carcinoma, signet-ring cell/histiocytoid carcinoma, and sebaceous carcinoma. Non-neoplastic lesions include cellulitis, IgG4-related disease, and Erdheim-Chester's disease. There have been no reviews on the imaging findings of eyelid lesions. This article aimed to describe imaging findings of eyelid lesions.

TABLE OF CONTENTS/OUTLINE

Introduction. Anatomy. Skin and subcutaneous tissue, Orbicularis oculi, Tarsal plates, Levator apparatus, Conjunctiva. Benign tumor. Epidermoid cysts, Dermoid cysts, Pilomatricomas, Chalazion, Hordeolum, and Hemangiomas. Malignant tumor. Basal cell carcinoma, Squamous cell carcinoma, Malignant melanoma, Signet-ring cell/histiocytoid carcinoma, Sebaceous carcinoma, and Metastasis. Non-neoplastic lesion. Cellulitis, IgG4-related disease, and Erdheim-Chester's disease. Summary.

HNEE-61 DON'T GET LOST, USE THE LANDMARKS: A COMPREHENSIVE GUIDE TO NECK ULTRASOUND AND LYMPH NODES

Alejandra Cardona Del Valle, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Ana Ayala (*Abstract Co-Author*)
Zofia Marrero (*Abstract Co-Author*)
Andrea M. Ruiz Mojica, MD (*Abstract Co-Author*)
Wilma Rodriguez-Mojica, MD (*Abstract Co-Author*)

TEACHING POINTS

Provide an anatomical review of cervical lymph node levels.Explain key landmarks and anatomical relationships necessary for adequate identification.Use a hiking analogy to simplify learning, comparing cervical lymph node levels to different points on a hiking trail for visualization and easier recall.Review appropriate transducer positioning.

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Objectives III. Anatomy Review IV. Cervical Lymph Nodes Levels: Sonographic Features, hiking analogy and imaging techniques VII. Base Camp VI. Forested Trail III. Waterfall IV. Rest Stop Vb. Boulder Field Va. Climbing Zone IIb. Ridge Trail IIa. Summit Plateau Ib. Nearing the Mountain Range Ia. The Peak VII. Conclusion Cervical lymph node levels are essential for evaluating nodal involvement in malignancies, infections, and other pathological conditions. Nevertheless, accurate identification can be challenging. This exhibit reviews cervical lymph node anatomy, highlighting key landmarks and relationships for precise localization. Using a creative "hiking analogy," it guides radiologists from the "base camp" to the "peak" for easier recall. Real images of lymph node levels and transducer positioning are included to connect anatomical knowledge with ultrasound technique.

HNEE-62 ULTRASOUND IN ACTIVE SURVEILLANCE OF PAPILLARY THYROID MICROCARCINOMA: A PRACTICAL GUIDE FOR RADIOLOGISTS

Ji Ye Lee, MD, PhD (*Presenter*)

TEACHING POINTS

Active surveillance (AS) is an emerging and increasingly accepted management strategy for patients with low-risk papillary thyroid microcarcinoma (PTMC), aiming to reduce overtreatment while maintaining excellent prognosis.As AS gains clinical attention across disciplines, radiologists should be familiar with the criteria, imaging protocols, and follow-up strategies essential for proper patient selection and monitoring.Standardized, high-quality ultrasound (US) plays a pivotal role in detecting imaging features that support or contraindicate AS, including subtle signs of gross extrathyroidal extension (ETE), lymph node metastasis (LNM), and tumor progression.

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1. Indications for Active Surveillance (AS) and Immediate Surgery 1) Criteria for selecting AS vs. immediate surgery based on tumor size, cytology, and imaging features2) Role of patient preference and imaging findings without biopsy 2. Imaging Tools for pre-AS Evaluation 1) Recommendations for baseline US in ETE and LNM assessment 2) Are neck CT and chest CT necessary before AS? 3. How to assess ETE and LNM on US 1) Imaging signs suggesting high risk of gross ETE (e.g., strap muscle, trachea, recurrent laryngeal nerve invasion)2) FNA and thyroglobulin washout for suspicious LNM3) Imaging assessment of appropriateness for AS 4. Standardized US Technique During AS 1) Consistent measurement methods using identical imaging planes2) Importance of image reproducibility in longitudinal follow-up 5. Evaluation of Tumor Progression 1) Criteria for defining tumor size enlargement2) New imaging features suggesting ETE or LNM 6. Recommended Imaging Interval during AS 7. Indications for Surgical Conversion

HNEE-63 MENIERE'S DISEASE: GUIDE TO INTERPRETATION AND REPORTING

Rishi D. Patel, MD (*Presenter*)
Miriam Redleaf, MD (*Abstract Co-Author*)
Burce Ozgen Mocan, MD (*Abstract Co-Author*)

TEACHING POINTS

Menière’s disease (MD) is an inner ear disorder traditionally diagnosed clinically, but advances in MRI have made MRI an increasingly valuable tool in evaluating patients with suspected MD. MR imaging can assess endolymphatic hydrops (EH), characterized by distention of the endolymphatic spaces within the cochlea and vestibule. This exhibit will review the anatomy of the inner ear as it is presented on 3D FLAIR post-gadolinium images. We will present imaging findings of MD using illustrative case examples while proposing a multisequence, multiplanar search pattern to systematically approach the inner ear to optimize diagnostic accuracy. The grading systems

that have been developed will also be reviewed and illustrated. Finally, a basic schematic will be provided to report imaging findings to communicate the degree and extent of disease.

TABLE OF CONTENTS/OUTLINE

1. Introduction to Menière Disease and the role of the radiologist. 2. Imaging findings of normal inner ear structures, endolymph, and perilymph on delayed post-contrast FLAIR & REAL IR sequences. 3. Identifying abnormalities and using endolymphatic hydrops grading system. 4. Diagnostic search pattern. 5. Important considerations in reporting.

HNEE-64 SCALP SECRETS - UNCOVERING SUPERFICIAL LESIONS WITH IMAGING

Carolina A. Almeida, MD (*Presenter*)
Maria Carolina Zafra Paez (*Abstract Co-Author*)
Bruna Duque-Estrada (*Abstract Co-Author*)
Flavia M. Costa, MD, PhD (*Abstract Co-Author*)
Clarissa C. Moraes Do Carmo, MD (*Abstract Co-Author*)

TEACHING POINTS

1. High-frequency ultrasound is a powerful, accessible tool for evaluating superficial scalp lesions, providing key information on lesion location, echotexture, and vascularity.2. Recognizing sonographic patterns helps differentiate common benign entities (e.g., trichilemmal cyst, lipoma, pilomatricoma) from potentially malignant lesions (e.g., squamous cell carcinoma).3. Knowledge of the layered anatomy of the scalp is essential for accurate interpretation and for guiding further workup or intervention, especially in ambiguous or atypical presentations.

TABLE OF CONTENTS/OUTLINE

Introduction Overview of scalp lesion evaluation with emphasis on dermatologic ultrasonography, CT and MRI. Anatomy Review Imaging appearance of the scalp layers and relevance for lesion localization. Case-Based Imaging Gallery Pilar (trichilemmal) cyst Pilomatricoma Lipoma Osteoma Nevus sebaceous of Jadassohn Squamous cell carcinoma Subgaleal hematoma Pattern-Based Diagnostic Approach Algorithm for narrowing the differential diagnosis based on lesion location, echogenicity, presence of calcifications, and Doppler flow. Take-Home Messages Practical pearls to enhance diagnostic confidence and guide management decisions.

HNEE-65 SPOTLIGHT ON SARCOMAS: UNRAVELING HEAD AND NECK TUMORS

Tamara Hernandes Ricci, MD (*Presenter*)
Carlos Alberto F. Coelho Neto, MD (*Abstract Co-Author*)
Murilo B. Cintra (*Abstract Co-Author*)
Gustavo S. Boasquevisque, MBBS (*Abstract Co-Author*)
Soraia A. Souza, MD, MS (*Abstract Co-Author*)
Marcos D. Pinheiro II, MD (*Abstract Co-Author*)
Marcio Ricardo T. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

• Review the main types of sarcomas that can occur in this region.• Characterize the key imaging features of each type to aid in differentiation.• Guide radiologists in recognizing the primary types of sarcomas, as well as providing important details about tumor extent and histological grade for a comprehensive assessment.

TABLE OF CONTENTS/OUTLINE

• Introduction highlighting the general aspects of sarcoma, WHO classification and types of sarcomas. • Overview the main images characteristics of sarcomas, providing clues about tumor grade, composition, extent, and involvement of adjacent structures. • Describe and show images of the principal types of sarcomas: osteosarcomas (including osteoblastic subtype), liposaromas, fibrosarcomas, liposarcoma, chondrosarcoma, undifferentiated pleomorphic sarcoma/malignant fibrous histiocytoma, rhabdomyosarcoma (including embrionary subtype), leiomyosarcoma, angiosarcoma, carcinosarcoma, alveolar soft part sarcoma, synovial sarcoma and ewing sarcoma. • Conclusion.

HNEE-66 IMAGING FINDINGS IN OVAL AND ROUND OTIC WINDOWS, WITH AN INSIGHT ON THIRD WINDOW ANOMALIES

Diego Alejandro Garcia Paredes, MD (*Presenter*)
Juan Gredilla (*Abstract Co-Author*)
Juan V. Quintana Perez, MD (*Abstract Co-Author*)
Beatriz Alba Perez, MD (*Abstract Co-Author*)
Montserrat Medina Diaz, PhD (*Abstract Co-Author*)
Juan S. Martinez San Millan, MD, PhD (*Abstract Co-Author*)
Isabel Fonseca Buelga, MD (*Abstract Co-Author*)
Claudia Viescas Huerta, MD (*Abstract Co-Author*)
Sergio Sintes (*Abstract Co-Author*)

TEACHING POINTS

1. Review of the normal oval and round windows and their roles in sound transmission. 2. Review of the first line imaging modality used for the evaluation of normal and abnormal windows and the different reconstructions used to better visualize these alterations. 3. Discuss the imaging findings of some of the different pathologies affecting the different windows with a special mention about those 'mimickers' that can affect all the different windows. 4. Brief description of what is considered a third window abnormality and classic symptoms manifested by these. 5. Explain pathological air and bone conduction.

TABLE OF CONTENTS/OUTLINE

1. Teaching points. 2. Introduction. - Anatomy of the normal middle and inner ear. - Normal sound transmission. 3. Imaging modality and reconstructions used. 4. Pathologies and imaging findings. - Oval and round windows: Otoesclerosis/otospongiosis, Atresia, Hypoplasia, Obliteration. - Third window: Clinical manifestations and physiological explanation, Natural (Tullio´s phenomenon), Adquired (Otic capsule destruction). - Mimickers. 5. Conclusions 6. Bibliography

HNEE-67 HORNER SYNDROME - NO SWEAT APPROACH TO LESION LOCALIZATION

Alok A. Bhatt, MD (*Presenter*)

TEACHING POINTS

1. Oculosympathetic pathway starts in the hypothalamus and ends in the eye, providing sympathetic innervation to sweat glands of the face and body, dilator muscles of eyes, and retractor muscles of eyelids. 2. Any pathology along the course of the oculosympathetic pathway can cause Horner Syndrome (anhidrosis, myosis, and ptosis). 3. Additional symptoms may occur depending on the location of lesion. 4. Acute unilateral face/neck/head pain with Horner Syndrome needs evaluation with CTA head and neck to evaluate for dissection.

TABLE OF CONTENTS/OUTLINE

Objectives 1. Review the clinical symptoms of Horner syndrome as it relates to the anatomy of the oculosympathetic pathway. 2. Review the various pathologies that can cause Horner Syndrome. 3. Discuss appropriate imaging modalities and protocol depending on the clinical symptoms of Horner Syndrome. Summary: Horner Syndrome is an oculosympathetic paresis, consisting of anhidrosis, miosis, and ptosis. The oculosympathetic pathway begins in the hypothalamus and ends in the eye. It provides sympathetic innervation to sweat glands of the face and body, dilator muscles of eyes, and retractor muscles of eyelids. There are 3 sets of neurons (first order, second

order, and third order) and 2 relay centers (ciliospinal center of Budge-Waller and superior cervical ganglion). Any pathology along the course of the oculosympathetic pathway can cause symptoms of Horner Syndrome. Additional symptoms may occur depending on the location of lesion. This exhibit reviews the various lesions that can occur along the oculosympathetic pathway with illustrations and image rich examples.

HNEE-68 DIAGNOSTIC QUALITY OF 3D T1 FSE MR IMAGING COMPARED TO CONVENTIONAL 2D T1 FSE IN ASSESSMENT OF HEAD AND NECK SQUAMOUS CELL CARCINOMA

Momin Muzaffar, MD (*Presenter*)
Erica Hallman, MD (*Abstract Co-Author*)
Jonathan Wang, MD (*Abstract Co-Author*)
Olga Pasternak Wise, MD, MS (*Abstract Co-Author*)
Heather Whitney, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Historical difficulties of employing 3D isotropic imaging in the neck can be overcome with recent advances in MR technology coupled with deep learning (DL) algorithms. 2. The most common artifacts encountered with 3D FSE T1w imaging include motion and compressed sensing (CS) artifacts. 3. 3D FSE T1w imaging affords improved contrast to noise ratio and comparable in-plane resolution with the added advantage of isotropic acquisition allowing multiplanar reformats although fat suppression in the infrahyoid neck on post contrast images is inferior to 2D Dixon techniques. 4. 3D FSE T1w imaging is advantageous in evaluating head and neck squamous cell carcinoma and nodal disease.

TABLE OF CONTENTS/OUTLINE

1. Overview of 3D FSE acquisition versus 2D FSE acquisition a. Harnessing CS and DL algorithms for accelerating image acquisition b. Advantages of 3D FSE sequences compared to 3D GRE sequences in the neck c. Common artifacts: Motion, CS artifacts, non-laminar vascular flow artifact, susceptibility artifact, aliasing, heterogenous fat suppression 2. Normal anatomy with 3D FSE T1w imaging vs 2D T1w imaging a. Suprahyoid deep spaces including parapharyngeal space, pterygopalatine fossa, masticator space, carotid space, and retropharyngeal space b. Skull base foramina and cranial nerves c. Nasopharynx, oropharynx, hypopharynx d. Larynx and hypopharynx e. Neck vessels on black blood sequences 3. Head and neck squamous cell carcinoma (SCCa) with 3D FSE T1w imaging vs 2D T1w imaging including cavity and oropharyngeal SCCa; laryngeal SCCa including detection of cartilaginous invasion and extralarygneal tumor; perineural tumor spread; and nodal disease with extranodal extension.

HNEE-69 COCHLEAR IMPLANTS: POSTOPERATIVE EVALUATION AND CASE-BASED REVIEW OF MALPOSITIONS

Nicholas W. Kemper, MD (*Presenter*)
Yi Zhang, DO (*Abstract Co-Author*)
Kevin Jacob (*Abstract Co-Author*)
Jerry Lin (*Abstract Co-Author*)
Peter Roland (*Abstract Co-Author*)
Suresh K. Mukherji, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

1. This multi-institutional exhibit will provide a detailed case-based review of Intra-cochlear and Extra-cochlear malpositions for decreased cochlear implant performance, including companion cases and clinical presentations. 2. Introduce imaging for anatomy-based fitting of cochlear implants. 3. Recognize normal insertion of cochlear implants and important intra-operative considerations. 4. After viewing this exhibit, radiologists will have practical tools for developing a differential of anatomical post-implant complications

TABLE OF CONTENTS/OUTLINE

1. Main components of cochlear implant, 2. Types of cochlear implant insertions, 3. Considerations for anatomic-based fitting:, 3a. Tonotopic organization, 3b. Electrode length to cochlear duct length, 3c. Angular insertion depth, 3d. Perimodiolar vs. Lateral wall electrodes, 4. Indications for post-operative imaging, 5. Normal post-op imaging of cochlear implant insertion, 6. Intra-cochlear complications (case-based):, 6a. Underinsertion, 6b. Overinsertion, 6c. Tip foldover, 6d. CI scalar translocation into the scala vestibuli, 6e. Electrode basal buckling, 7. Extra-cochlear complications and malpositionings (case-based):, 7a. Middle ear, 7b. Vestibular placement, 7c. Cochlear aqueduct, 7d. Carotid canal, 7e. IAC and posterior fossa, 7f. Facial nerve contacts

HNEE-70 TI-RADS GUIDELINES; HOW USEFUL ARE THEY IN REAL-WORLD PRACTICE?

Betul Uzunoglu, MD (*Presenter*)
Tolga Orhan, MD (*Abstract Co-Author*)
Aysegul Gormez, MD (*Abstract Co-Author*)
O. Melih Topcuoglu, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review the imaging criteria of the currently available TI-RADS guidelines using case examples.2. To discuss the advantages and disadvantages of each TI-RADS guideline in the detection of malignant thyroid nodules with regard to unnecessary biopsies. 3. To describe the algorithmic approach of each guideline to avoid unnecessary biopsies using representative cases. 4. To describe the algorithmic approach of each guideline to avoid missing malignant thyroid nodules in representative cases.

TABLE OF CONTENTS/OUTLINE

1. Overview of all currently available TI-RADS guidelines. 2. Details of sonographic evaluation in determining TI-RADS scores. 3. Highlighting the reasons for increased malignancy miss rates in each guideline 4. Highlighting the reasons for increased unnecessary biopsy rates 5. Algorithmic approach to the following questions: a. Which is better: not to miss any malignancy of any size, or not to cause additional health burden with unnecessary biopsies? b. Is it possible to use a combination of criteria from different guidelines in routine practice? c. Is it practical to define a term "suspicion of clinically insignificant thyroid malignancy" in thyroid imaging? 6. Conclusion

HNEE-71 UNMASKING PAROTID PATHOLOGIES: IMAGING INSIGHTS AND DIAGNOSTIC STRATEGIES

Ahmed E. Abdelmonem, MBBCh (*Presenter*)
Suryansh Bajaj, MD (*Abstract Co-Author*)

TEACHING POINTS

Pediatric parotid lesions represent a diverse group of pathologies with overlapping imaging features, often misattributed to adult populations. Systematic categorization by pathologic type—infectious/inflammatory, congenital/developmental, autoimmune, adenopathy, and neoplastic—improves diagnostic accuracy. Certain lesions demonstrate characteristic imaging findings: phleboliths in hemangiomas, fluid-fluid levels in venolymphatic malformations, and multifocal punctate sialectasis in juvenile recurrent parotitis. MR sialography and high-resolution ultrasound play a critical role in evaluating pediatric parotid pathology. Awareness of age-specific entities and their imaging appearance ensures timely diagnosis and appropriate clinical management.

TABLE OF CONTENTS/OUTLINE

Introduction Overview of pediatric parotid anatomy and diagnostic challenges Epidemiologic considerations in pediatric vs. adult populations Imaging Techniques Role of ultrasound, MR sialography, and conventional sialography Pathologic Classification Inflammatory/Infectious Lesions Congenital/Developmental Lesions Autoimmune Disease (e.g., Sjögren’s syndrome) Lymphadenopathy and Reactive Nodes Mesenchymal Neoplasms (e.g., neurofibroma, rhabdomyosarcoma) Benign and Malignant

Parenchymal Neoplasms Imaging Pearls and Pitfalls Key distinguishing features of select lesions Mimics and overlapping appearances Summary Diagnostic approach and key take-home points

HNEE-72 UNLOCKING THE VOICE: A DYNAMIC CT PERSPECTIVE

Pradipta Debnath, MD (*Presenter*)
Aaron Friedman (*Abstract Co-Author*)
Anisha Noble (*Abstract Co-Author*)
Robert J. Fleck JR, MD (*Abstract Co-Author*)

TEACHING POINTS

Discuss need, benefits and limitations of dynamic voice CT (DVCT) in pre-surgical evaluation of voice pathologies Outline the implementation of DVCT technique and post-processing Review of common findings on DVCT

TABLE OF CONTENTS/OUTLINE

Background: Discuss the background of dysphonia and voice pathology Demonstrate the limitations of clinical evaluation with nasopharyngolaryngoscopy and how DVCT helps voice surgeons develop a plan for treatment Review of current literature on the use of DVCT to guide surgical treatment Using a case-based approach highlight benefits and limitations of DVCT in our patients and how to evaluate and interpret these images to provide the information the surgeon needs to plan treatment Summary: Take home points

HNEE-73 RADIOLOGIC FEATURES OF EAR DISEASES ON TEMPORAL BONE CT WITH CLINICAL CORRELATION

Yuka Takahashi (*Presenter*)
Fumiyo Higaki (*Abstract Co-Author*)
Akiko Sugaya (*Abstract Co-Author*)
Takahiro Kitayama, MD, PhD (*Abstract Co-Author*)
Yusuke Morimitsu (*Abstract Co-Author*)
Tomohiro Inoue (*Abstract Co-Author*)
Noriaki Akagi, RT (*Abstract Co-Author*)
Yudai Asano (*Abstract Co-Author*)
Katsuhide Kojima (*Abstract Co-Author*)
Yusuke Matsui, MD, PhD (*Abstract Co-Author*)
Takao Hiraki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The temporal bone contains complex anatomical structures that play critical roles in hearing and balance. Accurate interpretation of temporal bone CT is essential for diagnosing a wide range of otologic conditions. This educational exhibit aims to provide a comprehensive review of the anatomy of the temporal bone, followed by a systematic overview of common and important diseases including external auditory canal carcinoma, cholesteatomatous otitis media, otitis media with effusion, ossicular chain discontinuity, otosclerosis, middle and inner ear malformations, and schwannoma, among others. Through representative CT images, we illustrate the characteristic radiologic features of each condition and highlight key points for differentiation. In addition, clinical correlations are presented to emphasize the relevance of imaging findings to patient symptoms and management. This exhibit is intended to contribute to improved diagnostic accuracy in the evaluation of ear disorders.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Anatomy of the temporal bone 3. Classification of ear diseases 4. Detailed discussion of each disease - including a review of the imaging characteristics of each disease and its differential diagnoses. For cases that underwent surgery, imaging findings are compared with intraoperative observations. 5. Summary

HNEE-74 IMAGING OF TRIGEMINAL NEURALGIA AT 7T

Gabriel M. Swenson, MD (*Presenter*)
Nicholas A. Koontz, MD (*Abstract Co-Author*)
Alicia Chen, MD (*Abstract Co-Author*)
Ichiro Ikuta, MD, MMedSc (*Abstract Co-Author*)
Yuxiang Zhou, PHD (*Abstract Co-Author*)
Justin Cramer, MD (*Abstract Co-Author*)

TEACHING POINTS

7T MRI provides superior trigeminal nerve imaging to standard 1.5T or 3T due to higher spatial resolution and decreased noise. 7T trigeminal imaging is intracranial-only due to coil limitations, which regardless covers the most common imaging indications.

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Trigeminal neuralgia most commonly results from neurovascular compression at the nerve root entry zone (REZ). 7 Tesla (7T) MRI shows promise for improved imaging of this entity due to decreased image noise, higher spatial resolution, and higher tissue contrast resolution. We describe our development of a 7T trigeminal protocol, with side-by-side examples with 3T to highlight the benefit. Traditional trigeminal nerve protocols image the nerve from its nuclei through the face. Only head and knee coils are FDA approved for 7T, and the face cannot be completely imaged due to image artifact. Increased susceptibility at 7T also impairs imaging within the skull base. We designed a 7T imaging protocol focusing on the REZ and cisternal segments. The protocol was developed on the 7T MRI from Siemens (Terra.X), utilizing a new parallel transmit head coil to reduce susceptibility, a conventional limitation of 7T imaging. Most essential is the small field of view T2 SPACE 3D, performed at half the slice thickness and the same in-plane resolution as 3T. By keeping the same resolution, image noise is greatly decreased. Whole brain sagittal 3D FLAIR and 2D DWI complete evaluation of the posterior fossa. We are currently trialing two different post-contrast T1 sequences: whole brain MPRAGE and SPACE.

HNEE-75 US-11: AN 11 POINT TECHNIQUE FOR ULTRASOUND OF THE PEDIATRIC NECK

Anu Kamalasanan, FRCR, MBBS (*Presenter*)
Manoj Mohan, FRCR, MBBS (*Abstract Co-Author*)
Ananth K. Shenoy, MRCP, FRCR (*Abstract Co-Author*)
Richard D. White, MBChB, FRCR (*Abstract Co-Author*)
Thiru A. Sudarshan, DMRD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

1) Systematic imaging of the neck is ideal for exact localization of pathology and clinical communication.2) A detailed knowledge of sonographic landmarks is vital to avoid missing pathologies, as children may be uncooperative or unable to achieve the usual scanning position. Sternocleidomastoid muscle separates anterior and posterior triangles of the neck. Anterior bellies of digastric and omohyoid muscles, mylohyoid muscle, carotid bifurcation, hyoid and angle of the mandible are crucial landmarks. 3) Tonsils and peritonsillar abscess can be visualized in the submandibular plane. 4) Thyroglossal duct cyst indents the midline preepiglottic fat space extending cranially posterior to the hyoid. 5) Developmental branchial cleft abnormalities are along a line from pre auricular region to sternal notch. 6) Vocal cords can be assessed dynamically with ultrasound. 7) Suppurative nodal disease is common in children. Distinction between nodal tuberculosis, acute infection and malignancy is from clinical history, examination, lab findings and tissue microbiology/pathology. 8)Clinical syndromes can present with complex neck findings.

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Imaging of the neck is complex due to the volume and variety of tissue contained in a small space. With this poster we aim to simplify neck imaging by introducing systematic neck ultrasound technique in 11 stations. We aim to demonstrate correlative surface anatomy and sonographic landmarks defining the 11 stations. Pictorial review of normal sonographic appearance with correlative clinical and cross sectional anatomy. Common pathology of the paediatric neck on Ultrasound with cross section correlation, where available, will be provided.

HNEE-76 'A TIGHT SQUEEZE': A PICTORIAL REVIEW OF THORACIC OUTLET SYNDROME

Pranit Sukumar (*Presenter*)
Janani Asogan Vaishnavi, MD, FRCR (*Abstract Co-Author*)
Janani Baradwaj, MD, FRCR (*Abstract Co-Author*)
Anu Kamalasanan, FRCR, MBBS (*Abstract Co-Author*)
Richard D. White, MBChB, FRCR (*Abstract Co-Author*)
Thiru A. Sudarshan, DMRD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Thoracic outlet syndrome refers to a group of clinical syndromes caused by congenital or acquired compression of the subclavian vessels and/or brachial plexus as they exit the superior thoracic aperture. The thoracic outlet can be divided into three compartments as the interscalene triangle, the costoclavicular space and the retropectoralis minor space. History taking and physical examination provide information regarding the structures affected. Imaging work up consists of radiograph of the cervical spine, dynamic doppler ultrasonography, dynamic CT angiography and MRI with postural manoeuvres (with arms in neutral position and in hyperabduction). Dynamic imaging is useful in assessing vascular compression. MRI allows visualisation of the brachial plexus and nervous compromise. Criteria used for neurological compression include, effacement of surrounding fat and/or contact with bony or fibrous structures. A range of imaging modalities can be utilised in the evaluation of thoracic outlet syndrome, however none of the investigations have 100% sensitivity and specificity.

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1. Define thoracic outlet syndrome including various clinical presentations. 2. Radiological anatomy of the thoracic outlet, as defined by three compartments/tunnels. 3. Explain various causes of thoracic outlet syndrome. 4. Role of imaging in the evaluation of thoracic outlet syndrome including dynamic imaging with postural manoeuvres. 5. Provide a pictorial review of thoracic outlet syndrome of various aetiologies encountered in our centre.

Abstract Archives of the RSNA, 2025

INEE

Imaging Informatics Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

INEE-1 CARDIA: CLOUD-BASED AI-ENHANCED PLATFORM FOR COLLABORATIVE RADIOLOGY EDUCATION AND CASE ARCHIVING

A Ankush, MBBS, MD (*Presenter*)
Janardhana Ponnatapura, MD (*Abstract Co-Author*)

TEACHING POINTS

- Demonstrate the implementation of CARDIA (Cardiothoracic AI-enhanced Radiology Data & Imaging Archive): A secure, cloud-based platform for collaborative radiology education, leveraging Google Workspace (Sheets, Drive, Apps Script) for data storage, management, and visualization. - Highlight scholarly database grounded AI integration to enrich submitted case data with scholarly insights. - Promote a reproducible model for academic institutions to build their own teaching repositories.

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I. Educational Gap in Radiology Training Lack of centralized, AI-enhanced teaching archives setup. II. System Overview CARDIA architecture and GCloud integration. Complete CRUD (Create, Read, Update, Delete) application for case archive management. Cloud-native, low-barrier tech stack. III. Case Submission Workflow User sign-in restricted to pre-authorized users via secure Google OAuth. Atomic updates via the GSheets API ensure real-time collaboration with conflict-free edits. Automatic unique GDrive folder for case-images. IV. AI-Powered Insights Integrated scholarly grounded search LLMs to enhance the depth and accuracy of educational content. V. Case Retrieval and Visualization Image previews within a filterable list, searchable by tags using logical operators (e.g., 'CT' AND 'MRI'). VI. Impact & Scalability Applications in residency/fellowship programs. Structured data collection for research. Facilitates multi-institutional collaboration for educational databases.

INEE-2 AUTONOMOUS AI AGENTS: RADIOLOGY'S NEXT FRONTIER

Parsa Rouzrokh (*Presenter*)
Pouria Rouzrokh, MD, MPH (*Abstract Co-Author*)
Bradley J. Erickson, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Artificial intelligence is advancing from narrow, single-task models toward more autonomous AI agents that can reason, use tools, and adapt independently. In diagnostic radiology, such agents promise to manage complex, multi-faceted cases that overwhelm traditional AI models. This presentation introduces autonomous AI agents as a natural next step in AI's evolution and shows how multiple agents working together—a multi-agent system—can collaboratively address intricate workflow challenges. We will examine why these agents are needed, how they can be built, and what benefits they offer in real-world radiology scenarios. Aimed at expanding general radiologists' knowledge of agentic systems, the session equips attendees with core concepts and practical examples of these AI assistants, laying the groundwork for assessing their potential roles in routine practice.

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1- Problem Statement: Why Agents?: Sets the stage by outlining rising imaging complexity and the need for smarter AI assistance; 2- Autonomous AI Agents Defines an agent, and highlights key components; 3- Building an Agent Outlines the basic steps to combine the raw components into a functioning assistant, illustrated with no-code examples. 4- Agent vs Model A brief comparison of these approaches focused on common radiology tasks. 5- Multi-Agent Systems: Describes coordinated teams of agents sharing roles and context on the same case. 6- Agentic AI in Radiology Workflows Explores the potential applications of single- and multi-agent systems throughout the radiology workflows. 7- Limitations & Safety Examines the principal constraints, risks, and oversight requirements when deploying agentic AI in radiology.

INEE-3 AI AGENTS IN RADIOLOGY: THE NEXT EVOLUTION IN INTELLIGENT WORKFLOWS

Bardia Khosravi, MD, MPH (*Presenter*)
Pouria Rouzrokh, MD, MPH (*Abstract Co-Author*)
Shahriar Faghani, MD (*Abstract Co-Author*)
Mana Moassefi, MD, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Differentiate between basic LLMs (chatbots), augmented LLMs, and full AI agents to understand their distinct capabilities and applications 2. Identify how AI agents can address specific radiology workflow pain points through automation, flexible processing, and integration with existing systems 3. Evaluate the challenges and limitations of AI agent implementation in clinical radiology practice, including security considerations and appropriate levels of autonomy

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1. Understanding the AI Agent Spectrum in Radiology a) From chatbots to autonomous agents: key differences and capabilities b) How agents differ from traditional radiology AI algorithms c) The evolution of intelligence: basic LLMs ? augmented LLMs ? agents ? multi-agent systems 2. AI Agent Architecture and Implementation a) Core components of AI agents: planning, execution, feedback loops, and memory b) Tool use in radiology context: connecting to PACS, RIS, EHR and clinical databases c) Multi-agent workflows: hierarchical, collaborative, and sequential arrangements 3. Clinical Applications of AI Agents in Radiology a) Workflow optimization: triage, prioritization, and resource allocation b) Image analysis: coordinating specialized AI models and standardizing outputs c) Report generation: contextualizing findings with clinical data d) Quality improvement: monitoring protocol adherence and outcomes 4. Challenges and Considerationsa) Security, privacy, and HIPAA compliance in agent implementations b) Determining appropriate levels of agent autonomy in clinical settings c) Regulatory considerations and documentation requirements 5. Future Directions and Conclusion

INEE-4 DIGITAL TWINS IN NEURO-ONCOLOGY: CURRENT LANDSCAPE AND FUTURE DIRECTIONS

Angelica Kurtz, BA (*Presenter*)
Moinak Bhattacharya (*Abstract Co-Author*)
Gagandeep Singh, MD, MBA (*Abstract Co-Author*)
Annie Singh (*Abstract Co-Author*)
Prateek Prasanna, PhD (*Abstract Co-Author*)
Angela Lignelli-Dipple, MD (*Abstract Co-Author*)

TEACHING POINTS

Define digital twins and their applications in medicine Describe the data required to create an effective digital twin model Discuss previous work in digital twins in neurology and neuroradiology Identify the gaps in digital twin research in neuro-oncology Explain future radiologic uses in neuro-oncology

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1. Defining digital twins Digital twins are virtual replicas of physical systems that can be updated with real-time characteristics of the physical system. The virtual digital twin can then be used to predict responses of the physical system to certain events or stimuli. Digital twins were originally used as replicas of industrial and mechanical systems for improving performance, predicting maintenance requirements, etc. 2. Digital twins in medicine Similar to their applications in industry, digital twins in medicine are virtual models calibrated to an individual patient and updated with new patient data over time, with the goal of predicting a patient's individual treatment response before treatment is even administered 3. Required data Mechanistic modeling versus machine learning/AI In oncology, required data includes characteristics of the tumor itself and its surrounding environment 4. Existing research 5. Digital twins in neuro-oncology There is a distinct paucity of research in neuro-oncology Our lab created a model that was able to successfully predict lung cancer treatment response. While this model itself is not a digital twin, we hope to use it as the basis for a digital twin model for brain tumor treatment response The future of digital twins in neuro-oncology includes predicting patient response to chemotherapy regimens, radiation, and surgical resection

INEE-5 TALK TECH TO ME: AI IN RADIOLOGY FOR THE UNINITIATED

Trupti Devaraja, MBBS, MD (*Presenter*)
Harshithaa Varatharajan (*Abstract Co-Author*)
Sujith R. Swamy, MBBS (*Abstract Co-Author*)
Shreelatha Aladangady (*Abstract Co-Author*)
Malathi S. Bhat, MBBS (*Abstract Co-Author*)

TEACHING POINTS

With the rapid integration of artificial intelligence (AI) into radiology, a significant gap has emerged between the technological sophistication of AI tools and the practical understanding required for their effective use in clinical practice. This educational exhibit aims to bridge that gap by demystifying key principles of AI, machine learning (ML), and deep learning (DL), highlighting their real-world applications in radiology, and fostering a deeper understanding of their strengths, limitations, and collaborative potential.

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The Case for AI in Radiology: Establishing the clinical and operational need for artificial intelligence today. Foundations of Artificial Intelligence: Clarifying core concepts and terminology in a radiologist-friendly manner. Current Applications of AI in Radiology: Highlighting real-world use across diagnosis, segmentation, radiomics, and workflow enhancement. Limitations and Ethical Considerations: Addressing the challenges, risks, and responsibilities of AI integration in clinical practice. Radiologist-AI Collaboration: Emphasizing complementary strengths and the importance of human oversight. Future Directions in AI for Radiology: Exploring emerging innovations, ongoing research, and the evolving role of AI in imaging.

INEE-6 ZERO-SHOT ENTITY RECOGNITION EXPLAINED: A GUIDE TO BERT-BASED NLP FOR RADIOLOGY REPORTS

Mladen Zecevic (*Presenter*)
Shannon Morrissey (*Abstract Co-Author*)
Andrew March (*Abstract Co-Author*)
Janet M. Busey, MS (*Abstract Co-Author*)

TEACHING POINTS

Named Entity Recognition (NER) is a technique that automatically finds and categorizes key terms (like anatomy, diagnoses, or treatments) in a text. Tokenization breaks text into smaller units (tokens), typically dictionary-based words or subwords. Computers understand numbers, not words, so word embeddings convert each token into a list of numbers that captures its meaning or context. BERT functions like a "reader" that comprehends context holistically, while GPT operates as a "writer" that builds content sequentially based on previous tokens. Model pretraining builds a strong language foundation, fine-tuning sharpens the model for the specific task of radiology NER, and zero-shot learning allows it to recognize new entity types without additional training. GLiNER is a model that can identify new types of entities in radiology reports without prior training, turning free text into structured, labeled data.

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Introduction Tokenizer: Breaking Text into Smaller Pieces Word Embeddings: Turning Tokens into Numbers Transformers: The Engines Behind Modern NLP Transformers: BERT vs. GPT BERT: Training vs. Fine-Tuning vs. Zero-Shot GLiNER: BERT Goes Zero-Shot for NER

INEE-7 BEYOND THE NOISE: AICE'S ROLE IN RESCUING LOW-DOSE CT - A PIXEL-BY-PIXEL JOURNEY: CASE SHOWDOWN: CONVENTIONAL VS. AICE-RECONSTRUCTED IMAGES IN CHALLENGING SCENARIOS

CE WANG (*Presenter*)
Tongyin Zhang (*Abstract Co-Author*)

TEACHING POINTS

AiCE Fundamentals : Uses deep CNNs trained on high/low-dose CT pairs to suppress noise while preserving anatomy. IR Limitations : Over-smoothing, residual noise, loss of low-contrast details. AiCE Superiority : Addresses photon starvation, metal artifacts, detects subtle lesions (subcentimeter nodules, tumor invasion, IBD activity). Validation : Confirmed via NPS, MTF (>0.8 at 0.5 cycles/mm), SSIM (>0.92). Dose Optimization : =50% dose reduction in neurology, abdomen, thorax.

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1.Low-Dose CT Challenges & AiCE Innovations 2. AiCE vs. IR: Clinical Performance Obesity : 60% noise reduction improves hepatic metastasis margins. Metal Artifacts : Streak suppression clarifies pancreatic tumor vascular invasion. Low-Contrast Lesions : 45% noise reduction in brain CT enhances stroke diagnosis; 50% CNR boost in CTE clarifies IBD inflammation. Thoracic Imaging : 35% higher MTF sharpens ground-glass nodules and fibrosis. 3. Validation & Clinical Implementation Metrics : 50-70% noise reduction (NPS), MTF >0.8 (pancreatic imaging), SSIM >0.92. Radiologist Preference : 90% endorse AiCE for IBD activity and lung nodules. Protocols : 40-50% dose reduction in stroke, pancreatic cancer, and CTE imaging. Future : Liver metastasis tracking, trauma protocols, pediatric applications (Crohn's, cystic fibrosis). 4. Future Directions Oncology : Track liver metastasis response. Trauma : Low-dose polytrauma protocols. IBD : Optimize mucosal healing assessment. Pediatrics : Dose-sensitive protocols for frequent imaging. 5. Conclusion AiCE redefines LDCT by balancing dose reduction and diagnostic precision. Adopt AI-driven reconstruction for safer, high-quality imaging in complex cases.

INEE-8 CREATING CUSTOM APPLICATIONS BASED ON 3D SLICER

Beatriz Paniagua, PhD (*Presenter*)
Jean-Christophe Fillion-Robin, MSc (*Abstract Co-Author*)
Samantha Horvath (*Abstract Co-Author*)

TEACHING POINTS

3D Slicer is a widely used open-source software platform for visualization and analysis of medical images. Known for its flexibility, Slicer supports over 200 community-developed extensions enabling advanced workflows for biomedical research, including DICOM handling, AI-based analysis, and segmentation. However, its broad capabilities can pose a steep learning curve for new users or teams with focused goals. To address this, Kitware developed the SlicerCustomAppTemplate—a lightweight framework that wraps the core of 3D Slicer. This template allows developers to build custom applications with streamlined interfaces and targeted features, incorporating specific branding, specialized modules, and tailored workflows suited for particular research or clinical domains. This educational exhibit introduces Slicer's modular architecture, demonstrates how the SlicerCustomAppTemplate supports efficient custom app development, and includes a hands-on session where attendees will build their own simplified Slicer-based tool. This approach empowers research groups, startups, and organizations to create and share customized Slicer versions, optimized for specific use cases without the burden of unrelated features. By the end of the session, participants will: Understand Slicer's modular design Learn how to start with the SlicerCustomAppTemplate Use custom apps to streamline research workflows Help translate research into minimum viable products

TABLE OF CONTENTS/OUTLINE

Introduction to 3D Slicer Modular Architecture Deep Dive SlicerCustomAppTemplate Overview Custom Application Development Workflow SlicerCustomAppTemplate case study: SlicerSALT Hands-On Exercise

INEE-9 LET THE ALGORITHM DRAW: UNDERSTANDING GANS, DIFFUSION, AND GPT IN RADIOLOGY

Yaara Artsi (*Presenter*)
Eyal Klang, MD (*Abstract Co-Author*)
Eli Konen, MD, MD (*Abstract Co-Author*)
Vera Sorin, MD (*Abstract Co-Author*)

TEACHING POINTS

Teaching Points: • Understand how generative models—GANs, Stable Diffusion, and GPT-powered systems—operate in radiologic imaging. • Identify practical uses: rare-pathology simulation, data augmentation, segmentation aid, and privacy-preserving synthetic look-alikes. • Recognize fidelity metrics, regulatory limits, and ethical pitfalls of synthetic images.

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Outline: I. Introduction: Why Let the Algorithm Draw? • Visual challenge: Real vs. AI-generated image • Timeline of generative AI in radiology (GAN ? Stable Diffusion ? GPT) II. GANs - Adversarial learning and image realism III. Stable Diffusion - Denoising in compressed feature space IV. GPT-Based Systems - Prompt-to-image generation with clinical language V. Applications in Radiology Practice • Rare pathology simulation and case diversification • Few-shot segmentation and data augmentation • Anonymized synthetic look-alikes for privacy VI. Considerations for Use • Fidelity metrics (FID, SSIM, Turing tests) • Regulatory landscape and FDA guidance • Limitations, risks, and bias mitigation VII. Future Directions and Clinical Integration • Prompt-to-PACS workflows • Open-source tools and education • Responsible adoption and ethical AI use in imaging

INEE-10 EVALUATING THE RETURN ON INVESTMENT FOR AI ALGORITHMS IN THE RADIOLOGY PRACTICE: THE IMPORTANCE OF ESTABLISHING KEY PERFORMANCE INDICATORS

Michele A. Powell, RT, ARRT (*Presenter*)
Holly Meyer, RT, MS (*Abstract Co-Author*)
Cole Cook (*Abstract Co-Author*)
Emily Sheedy, BS, MBA (*Abstract Co-Author*)
Amanda Mensing (*Abstract Co-Author*)
Matthew Edwards (*Abstract Co-Author*)
Gian Marco Conte, MD, PhD (*Abstract Co-Author*)
Daniel J. Blezek, PhD (*Abstract Co-Author*)
Andrew Missert, PhD (*Abstract Co-Author*)
Jeremy D. Collins, MD (*Abstract Co-Author*)
Panagiotis Korfiatis, PhD (*Abstract Co-Author*)
Timothy L. Kline, PhD (*Abstract Co-Author*)
Eric E. Williamson, MD (*Abstract Co-Author*)

TEACHING POINTS

-Process and methods for assessing the Return on Investment (ROI) for AI Algorithms -Key metrics to establish value of product -Advantages and lessons learned associated with gathering Objective and Key Results (OKRs) and Key Performance Indicators (KPIs)

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Purpose: 1. Describe a framework that assists in determining the overall value of internally developed Artificial Intelligence (AI) algorithms integrated into a radiology practice. 2. Propose how this framework can provide insights into the value proposition for developing algorithms internally vs. purchasing commercial products. Process -Algorithm ROI Evaluation Process -Algorithm Readiness Evaluation -Post-Production Monitoring -Annual Reviews -Gathering OKRs ROI -Clinical Improvements -Patient Care Outcomes -Finance -Academic and Data Contributions KPI Metrics -Operational Efficiency -Algorithm Performance -Revenue and Growth Lessons Learned -Algorithm ROI Evaluation Process Planning -Stakeholder Engagement -Change Management -Ongoing Evaluation Conclusion Evaluating the ROI of AI algorithms in radiology involves implementing structured processes and methods. Key metrics gathered at multiple points throughout the process allow for insights and advantages of these products. This comprehensive approach will enable radiology practices to make more informed decisions, optimize clinical workflows, and better serve the needs of the patient.

INEE-12 REINVENTING LAXATIVE-FREE CT COLONOGRAPHY: GENERATIVE AI MEETS PHOTON-COUNTING CT

Hiroyuki Yoshida, PhD (*Presenter*)
Janne J. Nappi, PhD (*Abstract Co-Author*)
Rie Tachibana, PhD (*Abstract Co-Author*)
Toru Hironaka (*Abstract Co-Author*)
Dufan Wu, PhD (*Abstract Co-Author*)
Rajiv Gupta, PhD, MD (*Abstract Co-Author*)
Katsuyuki Taguchi, PhD (*Abstract Co-Author*)
Masaki Okamoto, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

(1) Explain the emerging role of laxative-free CT colonography in colorectal cancer (CRC) screening. (2) Explain the role of photon-counting CT in addressing the challenges of laxative-free CT colonography. (3) Explain the role of generative artificial intelligence (Gen AI) in unlocking the potential of laxative-free photon-counting CT colonography as a CRC screening test.

TABLE OF CONTENTS/OUTLINE

1. Introduction: the importance of CRC screening; the emerging role of laxative-free CT colonography. 2. Photon-counting CT: how it addresses the remaining challenges of the laxative-free CT colonography technique. 3. Gen AI: enables an effective computer-assisted laxative-free photon-counting CT colonography examination: virtual bowel cleansing; automated detection of polyps; risk assessment; putting it all together. 4. What we know and don't know: outcomes from clinical laxative-free CT colonography trials; photon-counting CT colonography: preliminary results.

INEE-13 GENERATIVE ADVERSARIAL NETWORKS IN RADIOLOGY: FROM NEURAL DUELS TO CLINICAL TOOLS

Pranav Ajmera, MD (*Presenter*)
Parv Mehta (*Abstract Co-Author*)
Ashish R. Khandelwal, MD (*Abstract Co-Author*)

TEACHING POINTS

• Radiologists must grasp the fundamentals of Generative Adversarial Networks (GANs) to critically engage with emerging AI tools in imaging. • GANs are enabling a new era of radiologic innovation—from generating synthetic data to reconstructing low-dose images with near-diagnostic fidelity. • Beyond technical novelty, GANs are solving real-world clinical problems, such as limited data availability and modality-specific imaging gaps. • Understanding GAN pitfalls (e.g., hallucinations, mode collapse) and metrics (FID, SSIM, Dice) ensures meaningful interpretation of AI results. • Ethical literacy is essential as GANs evolve—radiologists must advocate for transparency, fairness, and validation in generative AI deployment. • Educating trainees in GAN concepts equips them to practice in an AI-integrated clinical future.

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1. GAN Fundamentals for Radiologists Generator-discriminator dynamics GANs vs. traditional AI models 2. Architectural Landscape DC-GAN, CycleGAN, SR-GAN, Conditional GAN, WGAN Task-specific models and their imaging relevance 3. Performance Evaluation Demystified Key metrics: FID, IS, SSIM, PSNR, Dice Score Limitations of current benchmarks 4. Clinical Integration Across Subspecialties Synthetic data generation and augmentation Image reconstruction and low-dose enhancement Modality conversion (e.g., MR-to-CT, PET-to-MR) Tumor segmentation and abnormality detection Disease progression simulation 5. Ethical & Practical Considerations Hallucinations, data consent, algorithmic bias Importance of transparent and validated deployment 6. Conclusion: The Future Radiologist's Toolkit Why familiarity with GANs is now essential

INEE-14 REVIVING GI-FLUOROSCOPY: AI-DRIVEN ARCHIVE

Mei Carter (*Presenter*)
Ethan Vyhmeister (*Abstract Co-Author*)
Amanda Aguilera, MD (*Abstract Co-Author*)

TEACHING POINTS

GI fluoroscopy, once a cornerstone of radiology training, has declined with the rise of cross-sectional imaging and retirement of experienced radiologists, yet remains essential for evaluating diverse GI pathology. To address the educational gap, we developed an AI-powered, web-based teaching tool that curates and annotates over 1,000 legacy GI fluoroscopy cases, many paired with CT, and supplements them with Radiopaedia images. The platform bridges residents' CT knowledge to fluoroscopic findings via a searchable case archive, Socratic-style AI feedback, and GPT-4 tutoring. It uses microlearning, active recall, and real-time case interaction. Users search by symptom or diagnosis, compare modalities, and engage with structured prompts. A tiered curriculum enables skill progression, while a faculty validation dashboard ensures quality, accuracy, and iterative AI refinement. This is a modern, scalable solution that revitalizes GI fluoro education.

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Introduction: GI fluoro is essential but underrepresented. Educational Tool: AI-powered platform with 1,000+ legacy cases and Radiopaedia. Learning Bridge: CT-fluoro pairing supports interpretation. Design: Microlearning, recall, AI Socratic feedback. Curriculum: Tiered by difficulty; faculty oversight. Impact: Builds diagnostic confidence and bridges training gaps.

INEE-15 REALITY CHECK: FDA-APPROVED AI PRODUCTS IN MSK IMAGING AND WHAT THEY REALLY DELIVER

Pranav Ajmera, MD (*Presenter*)
Girish Gandikota, MD (*Abstract Co-Author*)
Rajesh Botchu, MBBS (*Abstract Co-Author*)

TEACHING POINTS

• FDA-approved AI tools are emerging across musculoskeletal (MSK) imaging, supporting tasks like fracture detection, bone age estimation, and joint disease classification. • Radiologists must understand the scope and regulatory status of these tools to evaluate their relevance and limitations. • These solutions enhance diagnostic consistency, speed, and workflow efficiency—particularly in trauma and pediatric settings. • Awareness of FDA pathways, intended use claims, and validation gaps is essential for responsible adoption. • Ethical use requires oversight of algorithm bias, generalizability, and data transparency.

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Introduction Rationale for evaluating FDA-approved AI in MSK imaging Impact on clinical workflow, diagnosis, and standardization Understanding FDA Clearance 510(k) vs. De Novo vs. PMA pathways AI-specific regulatory developments Categorization of FDA-Cleared AI Tools in MSK Radiology Fracture detection (e.g., wrist, hip, spine, ribs) Bone age estimation (pediatric growth assessment) Joint assessment (e.g., knee OA grading) Post-op assessment (implant positioning, fusion analysis) Technical Overview of Common Algorithms Deep learning models (CNNs, object detection frameworks) Device integration (PACS plug-ins, cloud-based systems) Clinical Use Cases and Limitations Case examples of impact in trauma and emergency imaging Barriers: validation gaps, interpretability, legal liability Ethical and Operational Considerations Algorithm bias, data privacy, the role of radiologists in oversight Conclusion and Future Directions Responsible adoption, regulatory vigilance, collaborative validation

INEE-16 MODELING UNCERTAINTY IN AI-DRIVEN RADIOLOGY REPORT ANALYSIS VIA A DUAL SCORING FRAMEWORK

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Akash R. Pattnaik (*Abstract Co-Author*)
Kalina Slavkova (*Abstract Co-Author*)
Jean-Benoit Delbrouck (*Abstract Co-Author*)
John M. Paulett, MS (*Abstract Co-Author*)
Woojin Kim, MD (*Abstract Co-Author*)
Bradley J. Erickson, MD, PhD (*Abstract Co-Author*)
Khan M. Siddiqui, MD (*Abstract Co-Author*)
Adam E. Flanders, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the difference between source-level (radiologist) and model-level (LLM) uncertainty in radiology report interpretation. Learn how the Radiologist Confidence Score (RCS) and Language Model Confidence Score (LMCS) separately quantify and categorize these uncertainties. Explore how categorizing uncertainty by source improves explainability, triage, calibration, and QA workflows. Review practical applications of dual confidence scoring for more interpretable AI systems in radiology. Discover how fine-grained subcategories like contradiction or diagnostic specificity support richer insight and downstream decision-making.

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Introduction Role of uncertainty in radiology language and AI interpretation RCS and LMCS Overview Independent scoring of report clarity and model certainty Uncertainty Categories Taxonomy of RCS (image quality, diagnostic specificity) and LMCS (contradiction, ambiguity, etc.) Applications QA, explainability, model calibration, and radiologist feedback Integration with Existing Frameworks Alignment with existing report analysis frameworks, potential for structured error analysis Conclusion The RCS /LMCS framework offers a practical and conceptually grounded approach to uncertainty modeling in radiology AI. By distinguishing between radiologist- and model-driven uncertainty, it enables systems that not only extract findings but also communicate when and why they may be uncertain. This supports more explainable, auditable, and trustworthy report analysis in AI workflows.

INEE-17 CTRL + ALT + SECURE: CYBERSECURITY IN RADIOLOGY

Vidya Sankar Viswanathan, MBBS (*Presenter*)
Joshua Volin, MD (*Abstract Co-Author*)
Peter A. Harri, MD (*Abstract Co-Author*)
Nabile M. Safdar, MD, MPH (*Abstract Co-Author*)
Elias Kikano, MD (*Abstract Co-Author*)

TEACHING POINTS

Cyberattacks in radiology can delay diagnoses, disrupt procedures, and impact clinical care, making cybersecurity essential to patient safety. Radiologists play a hands-on role in securing their clinical ecosystem, from reporting threats to shaping AI tool usage, not just IT. Actions like avoiding credential sharing, recognizing phishing attempts, and securing workstations prevent major breaches. A culture of shared responsibility, strong leadership, and routine cybersecurity education empowers all levels to respond effectively The rise of AI in radiology introduces unique cybersecurity risks- vetting tools, safeguarding data, and ensuring ethical use now require active oversight.

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Growing Cyberattack Landscape in Radiology Overview of rising healthcare cyberattacks Anatomy of a real-world ransomware attack Why Radiology is Especially Vulnerable High-value PHI, fully digital workflows (PACS, RIS, EHR, Cloud) 24/7 operational requirements with little downtime Patient Care at Risk Delayed diagnoses, canceled procedures, disrupted care Financial consequences for systems, practices, and patients Governance in Action Key national, state, and institutional policies Governance structure in academic vs private practice Practices to Prevent Breaches Multi-factor authentication, encrypted storage, secure image sharing Credential sharing, phishing scams, and workstation security Handling anonymized data and HIPAA gray zones in research Cyberproofing the AI Workflow Security risks of AI integration AI tool deployment governance Radiologists' role in secure, ethical AI adoption

INEE-18 RETHINKING DIFFUSION FOR MEDICAL IMAGING

Yuki Ikuno (*Presenter*)
Atsushi Teramoto, PhD (*Abstract Co-Author*)
Hiroshi Fujita, PhD (*Abstract Co-Author*)

TEACHING POINTS

Recent diffusion models have advanced medical imaging, aiding diagnosis and privacy. Yet, their complexity and large parameter counts present major challenges for efficient use and accessibility: Enormous computational resource requirements Training on large-scale medical images (e.g., MRI, CT) requires substantial computing power, time, and energy. Constraints on individual research activities High hardware requirements restrict clinicians and domain experts from conducting independent, field-driven research. Model expansion and increased training difficulty High-resolution or conditional generation tasks demand larger models, leading to unstable and repeated training cycles. Data scarcity and task dependence Tasks like rare disease analysis or report-based synthesis need well-annotated paired data, which is hard to collect. We believe these issues pose significant barriers for researchers in medical imaging. To address them, we introduce two diffusion-based approaches. Latent Diffusion Model (LDM) A resource-efficient approach that performs the diffusion process in a learned latent space rather than in pixel space, reducing computational costs and enabling individual research. Retrieval-Augmented Diffusion Model (RDM): A semi-parametric design that retrieves semantically similar examples from external databases to enhance generalization, adaptability, and control without additional training.

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1. Current Challenges in Diffusion-Based Generative Models. 2. Cost-Efficient Training with the Latent Diffusion Model (LDM). 3. Zero-Shot Generative Modeling via the Retrieval-Augmented Diffusion Model (RDM)

INEE-19 TRANSFORMING PATIENT CARE: RADIOLOGIST-DRIVEN CONSULTATIONS WITH OPPORTUNISTIC CT SCREENING

Karthika Devi D S, MBBS (*Presenter*)
Adnan Ahmad (*Abstract Co-Author*)
Samriddhi Sivakumar (*Abstract Co-Author*)
Domenico Mastrodicasa, MD (*Abstract Co-Author*)
Sarabjeet Singh, MD, MBA (*Abstract Co-Author*)
Dania Daye, MD,PhD (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)
Dushyant Sahani, MD (*Abstract Co-Author*)

TEACHING POINTS

? In modern health care, opportunistic CT screening offers a unique approach for radiologists to enhance patient care by extracting and analyzing CT data. ? This educational exhibit explores the potential of collaborative consultations driven by radiologists, using CT scans to predict health risks, including chronic conditions. ? This exhibit aims to provide a perspective on adopting innovative strategies that can improve patient care and drive the future of healthcare.

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1. Value of CT data extraction - targeted investigation and management: ? The value of opportunistic screening - Routine imaging is used to identify incidental findings that may have significant health implications. ? Describe body composition analysis tools currently available. 2. AI-enabled patient data extraction: ? Post-scanning AI: Data extraction & quantification (body composition analysis, organ volumetry, other biomarkers) to assess disease severity and overall risk assessment. ? Integrated diagnostic capabilities (Imaging + EHR+ lab + genomics) - Novel combined diagnostic tools with superior analytics for disease and outcome prediction. 3. Radiologist-driven patient consultation: ? AI-enabled predictive capability of these integrated data enables radiologists for collaborative patient consultation - drives shared decision-making, increases radiologist's visibility & impact of radiology in patient management. ? These consultations can guide lifestyle modifications, facilitate early detection of diseases, and prompt timely interventions, ultimately improving health outcomes and reducing health care costs.

INEE-20 DIFFUSION WITHOUT INFUSION: A REVIEW OF DIFFUSION MODELS FOR SYNTHETIC CONTRAST-ENHANCED IMAGING

Neel Mistry, MD (*Presenter*)
Pouya Shiri (*Abstract Co-Author*)
Xin Yi, PhD (*Abstract Co-Author*)
Scott J. Adams, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Describe generative artificial intelligence (AI) methods for synthetic contrast-enhanced imaging to reduce reliance on iodinated and gadolinium-based contrast agents for CT and MRI 2. Describe the principles of diffusion models and their relevance to medical image synthesis 3. Compare diffusion models with other architectures for

synthetic contrast-enhanced image generation 4. Identify challenges and limitations related to synthetic contrast-enhanced imaging 5.Discuss future directions to enable deployment of synthetic contrast-enhanced imaging in clinical practice.

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Clinical Motivation Risks and drawbacks of iodinated and gadolinium-based contrast agents and unmet clinical needs Overview Generative artificial intelligence (AI) methods for synthetic contrast-enhanced imaging, with a focus on diffusion models Diffusion Models: Key models including DDPM, DDIM, Latent Diffusion, Consistency, and Bridge Diffusion Example Diffusion Model : SC-BBDM as a structure preserving model Comparison of Methods: compare diffusion models to other generative AI methods for synthetic contrast-enhanced image generation Evaluation Methods Quantitative metrics (e.g., PSNR, FID, SSIM), segmentation overlap, and clinical review Limitations anatomical inconsistency, memory constraints, and diagnostic uncertainty Future Directions few-shot learning, biomarker generation, and clinical task alignment Conclusion Summary of current progress and paths to clinical deployment.

INEE-21 REGULATION AND ETHICS IN ENSEMBLE AI: BALANCING INNOVATION AND RESPONSIBILITY

Sarang Ingole, MBBS (*Presenter*)
Easwar Lakshmi Narayanan, MD (*Abstract Co-Author*)
Amit Kumar (*Abstract Co-Author*)
Vidur Mahajan, MBA, MBBS (*Abstract Co-Author*)
Devanshi Thakkar (*Abstract Co-Author*)

TEACHING POINTS

• Ensemble AI integrates multiple model outputs to improve diagnostic accuracy but raises unique regulatory and ethical challenges. • Regulatory frameworks (FDA SaMD, PCCPs, EU AI Act) are evolving to address lifecycle oversight, adaptivity, and ensemble risks. • Ethical concerns include bias amplification, compounded opacity, and unclear accountability for errors. • Best practices include ensemble-specific validation, explainability tools (SHAP, LIME), human-in-the-loop oversight, and real-world monitoring. • Radiologists need skills to assess ensemble AI limitations and ensure responsible, fair deployment.

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Introduction to Ensemble AI Definition, rationale, and types Clinical value in enhancing robustness Global Regulatory Landscape FDA: SaMD guidance, GMLP, PCCPs EU: AI Act classification, MDR integration Ethical Considerations Unique to Ensembles Algorithmic bias propagation across component models Compounded opacity and explainability challenges Responsibility in distributed model decisions Data governance and consent across diverse training sets Best Practices for Deployment Ensemble-specific validation, model interaction tracking Transparency via SHAP, LIME applied to ensemble outputs Defined clinician oversight roles and update governance Case Study Chest radiograph ensemble AI deployment Real-world performance, limitations, and future outlook Conclusion and Future Directions Need for interdisciplinary oversight and evolving standards Radiologist's expanding role in ethical AI adoption and governance

INEE-22 ONTOLOGIES FOR IMPROVING AI MODEL AND DATASET DISCOVERABILITY

Abhinav Suri, BA, MPH (*Presenter*)
Charles E. Kahn JR, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is to give viewers an introduction to the world of ontologies and how they can be used to encode information. We will discuss ontologies further in the context of artificial intelligence (AI). Specifically, we aim to show how AI models, datasets, and projects can be described using ontologies and how doing so promotes Findable, Accessible, Interoperable, and Reusable (FAIR) principles (which viewers will also be introduced to). We will also cover the basics of current attempts in AI research to satisfy FAIR principles by discussing "model cards", but also highlight how they come up short when describing medical projects. Lastly, we will touch on existing initiatives in the medical AI research field to encode metadata about projects. Specifically, we will focus on three attempts to do so: the Radiology Ontology for AI Datasets, Models, and Projects (ROADMAP), the Coalition for Health AI (CHAI) Model Card, and the FDA Model Card. We will highlight the use cases, benefits, and shortcomings of each.

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1. Introduction to basics of AI and terminologies (specifically what are models, datasets, and projects); 2. Introduction to the definition of an ontology; 3. Creation of a toy ontology to introduce the idea of relationships within intologies; 4. Brief overview of extant ontologies in medicine such as RadLex; 5. Introduction to FAIR principles; 6. Introduction to model cards and shortcomings in medical AI work; 7. Overview of ROADMAP ontology, CHAI model card, and FDA model cards; 8. Comparisons of use cases for all medical AI model cards

INEE-23 ARTIFICIAL INTELLIGENCE LITERACY: WHAT DOES THE RADIOLOGIST SHOULD KNOW?

Maxime Bouthillier, MD (*Presenter*)
An Ni Wu, MD (*Abstract Co-Author*)
Jan Valosek (*Abstract Co-Author*)
Julien Cohen-Adad (*Abstract Co-Author*)
Laurent Letourneau-Guillon, MD, MSc (*Abstract Co-Author*)

TEACHING POINTS

Artificial intelligence (AI) is increasingly integrated into routine radiology practice and will likely expand further. However, for radiologists without a technical background, the terminology used by AI developers and manufacturers can be challenging to interpret. A clear understanding of common AI-related semantics helps radiologists grasp the scope of AI tools or research and think critically about their quality and relevance. As the field rapidly evolves, fundamentals from model development to clinical deployment remain key to evaluating tool quality. While in-depth knowledge of model architecture may not be essential, familiarity with standard data science performance metrics, sometimes named differently than in medical sciences, is crucial. AI models, whether from deep or machine learning, are often challenging to interpret: visual tools have thus been developed to reveal which features influence model predictions. The same applies to assessing internal and external validity. While some AI advances are now routinely used, imaging analysis remains the central challenge where federated learning may offer a promising solution to privacy and data-sharing limitations. This exhibit summarizes key concepts every radiologist should know to support the safe, responsible and effective integration of AI in clinical workflows.

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Effective Integration of Artificial Intelligence: Must-Know Concepts for Radiologists. From Development to Deployment: AI Task-Specific Considerations. Relevant Performance Metrics for AI-based Model Evaluation. Common Visualization Tools for AI-based Model Results. AI in Radiology: 2025 Challenges & Opportunities — Where Are We Headed?

INEE-24 EVALUATION METHODS AND METRICS FOR AUTOMATED RADIOLOGY REPORT GENERATION

Samantha Leech, MD (*Presenter*)
Neel Mistry, MD (*Abstract Co-Author*)
Ashani Shah (*Abstract Co-Author*)
Scott J. Adams, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Describe the key dimensions and challenges of evaluating radiology reports generated by large language models and other generative AI systems. • Compare traditional NLP metrics and specialized radiology evaluation tools for assessing lexical similarity, factual accuracy, and clinical utility. • Describe radiologist-in-the-loop

evaluation strategies and real-world monitoring tools for validating generative AI outputs. • Describe current benchmarks, datasets, and emerging frameworks that support robust assessment of AI-generated radiology reports.

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1. Introduction • Current status of AI for automated radiology report generation • Key dimensions for evaluating AI-generated radiology reports 2. Categories of Evaluation Metrics • Lexical and semantic similarity metrics • Label- and concept-based metrics • Error-specific analysis • LLM-based evaluation and clinical judgment scoring 3. Radiologist-in-the-Loop Evaluation Strategies• Human ratings and error annotation • Discrepancy scoring and adjudication• Edit-based metrics in real-world deployment 4. Datasets and Benchmarking Resources • Public and institutional datasets • Evaluation benchmarks and leaderboards 5. Deployment Metrics and Continuous Monitoring 6. Limitations, Risks, and Best Practices

INEE-25 BUILDING DIGITAL TWINS FOR MEDICAL APPLICATIONS: A REVIEW OF MODELING APPROACHES AND TECHNIQUES

Zhihua Qi, PhD (*Presenter*)

TEACHING POINTS

To understand the principles behind the three commonly used modeling approaches in building digital twins To recognize the strengths and the drawback of the modeling approaches To review tools and resources available for modelling digital twins in various clinical applications

TABLE OF CONTENTS/OUTLINE

1. The history and the current state of digital twins 2. The roles of digital twin in medicine 3. General framework for the development and the application of digital twins in medical applications 4. Main types of modelling approaches a. Monte Carlo method i. Basic concepts and methods ii. Tools and resources iii. Example solutions and applications b. Partial differential equations i. Basic concepts and methods ii. Tools and resources iii. Example solutions and applications c. Deep neural network i. Basic concepts and methods ii. Tools and resources iii. Example solutions and applications 5. Other emerging approaches and techniques 6. Outlook of digital twins in the era of big data and medical AI 7. Summary

INEE-26 SIMPLE TIPS FOR WORK FLOW EFFICIENCY IN AN EVER ADVANCING MODERN WORLD

Ryan Walsh, MBBCh, BSc (*Presenter*)

TEACHING POINTS

In today's fast-paced healthcare environment, radiology professionals must optimise digital workflows to meet rising demands for speed and accuracy. This educational exhibit focuses on practical, actionable tips for improving workflow efficiency using PACS systems, the example being Sectra PACS. Learn to harness keyboard and mouse shortcuts for rapid image measurement and navigation, implement smart display protocols for consistent and automated image layouts, and utilise dictaphone and headset shortcuts to streamline reporting. Special attention is given to advanced tools such as general image fusion, particularly for multiple sclerosis 3D FLAIR follow-up scans, enabling seamless comparison of current and prior studies. Real-world examples demonstrate how these strategies can be easily adopted to reduce repetitive tasks, enhance productivity, and improve diagnostic quality. By mastering these simple yet powerful techniques, radiology teams can fully leverage PACS systems to thrive in an ever-advancing modern world.

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Introduction: The Need for Workflow Efficiency; Keyboard Shortcuts; Smart Display Protocols and Automated Layouts; Mouse Shortcuts and Customisation; Dictaphone and Headset Integration; Advanced Fusion Tools for MS 3D FLAIR; Real-World Applications and Case Studies; Conclusion: Maximising Sectra PACS in Modern Radiology

INEE-27 BUILT BY RADIOLOGISTS, FOR RADIOLOGY: DEVELOPING AN IN-HOUSE GENERATIVE AI SOLUTION -TOOLS, APPLICATIONS, AND CHALLENGES

Naga Sai Rasagna Mareddy, MBBS (*Presenter*)
Kimia Kamrani (*Abstract Co-Author*)
Ahmed Benghatnsh, MD (*Abstract Co-Author*)
Ramandeep Singh, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1.Recognize how generative AI can assist in reducing fatigue and improving efficiency by automating time-consuming elements of the radiology workflow, such as prior report summarization and impression drafting.2.Understand the limitations of commercial AI platforms, particularly in multimodal performance, cost, and alignment with radiology-specific tasks. 3.Explore the potential of open-source foundation models and custom in-house tools tailored to radiology, allowing for flexibility in integration and fine-tuning for local practice needs. 4.Review real-world applications of generative AI across imaging and reporting, with emphasis on clinical relevance, reliability, and workflow compatibility. 5.Identify key implementation challenges, including data privacy, regulatory uncertainty, inconsistent model output quality, and limited explainability in high-stakes imaging tasks. 6.Emphasize the role of radiologists in guiding the development, validation, and safe use of generative AI tools to ensure clinical accuracy and patient safety.

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1.Rationale: Why radiology needs custom in-house gen AI tools. 2. AI Landscape: Infrastructure, model types, and platform trends.3. Tool Comparison: Commercial vs. open-source generative AI systems. 4.Imaging Use Cases: Vision-language models in image interpretation. 5.Text Use Cases: Report summarization and language model applications. 6.Challenges: Hallucination, PHI handling, integration, and regulation.7.Next Steps: Building radiologist-aligned, institutionally controlled gen AI tools.

INEE-29 THE AI REPORT CARD: A RADIOLOGIST'S CHECKLIST FOR SAFE, FAIR, AND EFFECTIVE AI

Harshithaa Varatharajan (*Presenter*)
Trupti Devaraja, MBBS, MD (*Abstract Co-Author*)
Shreelatha Aladangady (*Abstract Co-Author*)
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TEACHING POINTS

This exhibit provides radiologists with a practical framework to evaluate AI tools before clinical adoption. It simplifies key metrics (e.g., sensitivity, specificity, AUC-ROC), highlights the importance of diverse training data, and addresses issues like explainability, subgroup performance, and automation bias. By breaking down regulatory nuances, workflow fit, and long-term monitoring, it empowers clinicians to assess AI for safety, fairness, and real-world usability.

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Metrics That Matter - Decode sensitivity, specificity, AUROC, PPV, NPV, and F1 score. Understand relevance for different tasks and common pitfalls like missing confidence intervals. Generalizability - Assess whether the model works on your population. Identify gaps by age, sex, scanner, comorbidities. Black Box Breakdown - Who labeled the data? What was excluded? Understand how data quality shapes outcomes. Bias Detection - Spot selection, measurement, and systemic bias. Subgroup analysis reveals hidden clinical risks. Regulatory ? Ready - FDA/CE clearance doesn't guarantee performance. Know what's covered and what's not. Workflow Fit - Evaluate PACS/RIS integration, UX, and reporting efficiency. Model Drift - Monitor how model performance changes post-deployment. Ask about versioning and retraining. AI Evaluation Toolkit - 1-pager with key vendor questions, metrics cheat sheet, and integration checklist. QR Corner - Link to downloadable tools, mock vendor form, and trust survey.

INEE-30 FROM ANNOTATION TO APPLICATION: DEVELOPING AI SEGMENTATION MODELS FOR RECTOSIGMOID ENDOMETRIOSIS IN PELVIC MRI

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TEACHING POINTS

Deep endometriosis is a severe, often underdiagnosed condition that commonly affects the rectosigmoid region. Magnetic Resonance Imaging (MRI) offers high diagnostic value for deep endometriosis but requires expert interpretation. AI segmentation models, especially those based on deep learning, can aid radiologists by improving lesion detection, standardizing reporting, and reducing interpretation time. Building clinically useful models requires high-quality annotated datasets, appropriate model architecture, and robust validation. Radiologists are essential stakeholders in the development, evaluation, and integration of AI tools into clinical workflows. Understanding the technical and operational challenges of AI implementation is crucial for safe and effective adoption.

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Introduction and Clinical Relevance Clinical implications of accurate detection and staging MRI Features of Rectosigmoid Endometriosis Imaging protocol and key sequences Typical signal characteristics and differential diagnoses Common pitfalls and variability in interpretation AI in Pelvic MRI: Why and How Overview of AI techniques for medical image segmentation Role of AI in supporting radiology and multidisciplinary care Step-by-Step: Developing a Segmentation Model Data and annotation strategies Evaluation metrics Potential Benefits Improved detection and quantification of lesions Reduction in interobserver variability Assistance in surgical planning and interdisciplinary communication Challenges in Development and Clinical Integration Future Perspectives Summary and Final Considerations

INEE-31 FROM NOVICE TO EXPERT: PARALLELING AN AI TOOL WITH A RADIOLOGY RESIDENT

Syed Muhammad Awais Bukhari, MD (*Presenter*)
Sreyes Venkatesh (*Abstract Co-Author*)
Wilson Liou (*Abstract Co-Author*)
Annie Singh (*Abstract Co-Author*)
Komal M. Awan, MD (*Abstract Co-Author*)
Charit R. Tippareddy, MD (*Abstract Co-Author*)
Amit Gupta, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Understand the developmental journey of an AI tool and how it parallels the training path of a radiology resident. 2. Define artificial intelligence, machine learning, and deep learning within the context of medical imaging. 3. Explore various machine learning paradigms including supervised, semi-supervised, and reinforcement learning. 4. Appreciate the clinical applications and regulatory milestones of DL tools alongside real-world radiology training benchmarks. 5. Envision the future of radiology with emerging concepts such as multimodal AI and the virtual resident.

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Introduction: A Parallel Journey Overview of the exhibit concept: AI development vs. resident training. Rationale for using this analogy Training Phase AI Tool: Labeled dataset supervised by expert radiologists; supervised learning via CNNs. Radiology Resident: Guided education under faculty; exposure to curated cases and didactics. Testing Phase AI Tool: Internal testing on unseen data Radiology Resident: In-training evaluations and supervised reads on new cases. Validation and Authorization Phase AI Tool: External validation using institutional datasets; FDA approval. Radiology Resident: ABR Core and Certifying Exams; full licensure. Deployment Phase AI Tool: Integration into clinical practice with institutional oversight. Radiology Resident: Transition to clinical independence Monitoring Phase AI Tool: Continuous performance assessment (e.g., accuracy, sensitivity). Radiology Resident: QA processes, CME, and ongoing professional development. Deep Learning Models in Radiology AI Learning Methods Future Directions Multimodal AI integration Concept of the "Virtual Resident"

INEE-32 SPATIAL COMPUTING AND EXTENDED REALITY GUIDANCE IN HEPATOBILIARY-PANCREATIC INTERVENTIONAL RADIOLOGY AND SURGERY: MACHINE LEARNING-DRIVEN ORGAN TRACKING FOR PROCEDURAL EDUCATION

Maki Sugimoto, MD, PhD (*Presenter*)

TEACHING POINTS

The integration of spatial computing and extended reality (XR) technologies, machine learning-based organ modeling, and real-time object tracking-provides innovative educational benefits specifically for hepatobiliary-pancreatic (HBP) interventional radiology (IVR) and surgery.In percutaneous HBP IVR such as TACE, RFA, liver biopsy, PTCD, and EUS-BD, XR enables immersive 3D visualization and dynamic overlays of patient-specific anatomy and procedural plans, enhancing spatial understanding and procedural safety. For laparoscopic and robotic HBP surgery, XR guidance supports intraoperative navigation through real-time anatomical overlays and instrument tracking, improving accuracy and decision-making in complex procedures. Machine learning-driven tracking enables precise localization of organs and tools, reducing errors and facilitating hands-on, simulation-based training without patient risk. XR platforms promote efficient, sustainable educational workflows by minimizing reliance on physical models and external monitors.

TABLE OF CONTENTS/OUTLINE

Introduction to Spatial Computing and XR in HBP IR and Surgery - Overview of XR and spatial computing; educational impact for HBP IR and surgery Machine Learning-Based Organ Modeling and Tracking - Data acquisition, 3D modeling, and real-time tracking in HBP procedures XR Guidance in Percutaneous HBP Interventions - Application in TACE, RFA, liver biopsy, PTCD, and EUS-BDXR in Laparoscopic and Robotic HBP Surgery - Real-time anatomical overlays and intraoperative navigation Educational Benefits and Workflow Optimization - Simulation-based training, knowledge retention, and sustainability

INEE-33 NATIONAL CANCER INSTITUTE IMAGING DATA COMMONS: DATA + TOOLS + COMPUTE TO POWER YOIR AI EXPLORATIONS

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TEACHING POINTS

NCI Imaging Data Commons (IDC) is a cloud-based repository of publicly available cancer imaging data co-located with analysis and exploration tools. IDC, part of the NCI Cancer Research Data Commons (CRDC), provides access to a large, comprehensive, and expanding collection of cancer research imaging data. IDC uses a

combination of commercially available (Google Cloud Platform (GCP), Amazon Web Services (AWS)) and open source components. The IDC portal (https://imaging.datacommons.cancer.gov) and SQL interface enable exploration and visualization of data and cohort building. As of Spring 2025, IDC hosts over 85 TB of freely available radiology and digital pathology image data harmonized using the DICOM standard, and available in both GCP and AWS. IDC enables both efficient cloud-based data processing and simple data download for on-premise analysis. We will present the scope and status of IDC (new datasets, new portal and visualization features), accompanying tools (python data access interface, query, dashboards, integration with AI models from MHub.AI and 3D Slicer), demonstrations of utility of cloud-based computation (cloud-based notebooks, scalable workflows, JetStream2 demonstration), use cases (including scientific studies utilizing IDC) and plans for future development, along with live interactive demonstrations.

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Overview of CRDC and IDC; Data curation; Portal; Viewer; Organization of data; Integration of tools; Documentation and user support resources; Hands-on demonstrations of python interface, notebooks, 3D Slicer and MHub.AI integration; Large scale computing using CRDC Cloud Resources; Status update and plans for future development.

INEE-34 INTELLIGENT CT PROTOCOL ADVISOR: HOW CAN WE ENSURE SAFETY, EFFICIENCY, AND EQUITY IN CT IMAGING?

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Joao Cortez, MD (*Abstract Co-Author*)
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Izaely R. Prates, MD (*Abstract Co-Author*)
Marcio V. Sawamura, MD, PhD (*Abstract Co-Author*)
Shri Krishna Jayanthi, MD (*Abstract Co-Author*)

TEACHING POINTS

To introduce an intelligent, automated CT protocol advisor that standardizes protocol selection based on clinical history. To demonstrate how the tool enhances workflow efficiency, promotes equitable imaging access, and reduces radiation exposure and protocol variability. To present the clinical logic and development process, emphasizing its application in diverse practice settings with limited resources or specialized staff.

TABLE OF CONTENTS/OUTLINE

Introduction : Background on challenges in protocol standardization and its impact on safety, efficiency, and equity. Development : Literature review and guideline-based protocol mapping; creation of a keyword recognition system using Python. Clinical History Input : Integration of information from referrals and pre-scan interviews to drive protocol recommendations. Workflow Integration : Use cases across a wide range of clinical indications illustrating improved decision-making and workflow without RIS/PACS dependence. Results : Retrospective validation of the tool in multiple anatomic regions and clinical contexts, assessing accuracy, consistency, and adherence to guidelines. Discussion : Benefits in under-resourced settings, pediatric imaging, and standardization of complex protocol requirements, including dynamic maneuvers. Conclusion : Intelligent tools can empower consistent, safe, and efficient imaging pathways independent of infrastructure.

INEE-35 AI FOR RADIOLOGY EDUCATION: VALIDATED QUESTION GENERATION, ADAPTIVE LEARNING, AND GAMIFIED ENGAGEMENT

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Young-Tak Kim, PhD (*Abstract Co-Author*)
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Michael H. Lev, MD (*Abstract Co-Author*)
Jeanne B. Ackman, MD (*Abstract Co-Author*)
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Rory L. Cochran, MD,PhD (*Abstract Co-Author*)
Shaunagh McDermott, MBBCh (*Abstract Co-Author*)
Michael S. Gee, MD, PhD (*Abstract Co-Author*)
Synho Do, PhD, MS (*Abstract Co-Author*)

TEACHING POINTS

•Introduce a proof-of-conect AI-augmented platform designed to deliver personalized learning through automatically generated diagnostic questions. •Describe the hybrid quality assurance framework that combines user feedback and statistical analysis of response patterns to identify flawed items for expert review, ensuring scalable content validation. •Explain how the platform delivers personalized learning experiences by adapting question difficulty in real time based on learner performance. •Highlight how the system supports continuous learner engagement through progression feedback and gamified elements.

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1.AI for Educational Content Generation: Define the role of AI in radiology education as a tool for generating validated, personalized learning content rather than supporting clinical decision-making. Introduce an AI-augmented platform that delivers clinically relevant and quality-assured diagnostic questions aligned with educational goals. 2.Quality Assurance Mechanism: Describe the hybrid quality assurance system that combines structured user feedback with statistical response analysis. Explain how flagged questions are escalated for expert review to validate and refine clinical quality. 3.Personalized Learning via Adaptive Difficulty Adjustment: Explain the real-time adaptive difficulty mechanism that dynamically adjusts question levels based on user performance. Illustrate how this supports personalized learning trajectories and cognitive engagement. 4.Learner Engagement and motivation: Demonstrate how gamification elements are integrated to enhance learner motivation, engagement, and structured progression.

INEE-36 SEGMENTATION OF MEDICAL IMAGES USING DEEP LEARNING AND FOUNDATION MODELS

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Sachi Ishizuka (*Abstract Co-Author*)
Hideaki Tamori (*Abstract Co-Author*)
MASATO NAKAYA (*Abstract Co-Author*)
Hikaru Sasaki (*Abstract Co-Author*)
Tsunehiro Otsuka (*Abstract Co-Author*)
Satoshi Kasai, PhD (*Abstract Co-Author*)

TEACHING POINTS

We will present our research on applying Deep Learning and Generative AI (Foundation Models) to multiple medical images to characterize various segmentation models. The purpose of this exhibit is to: - Recognize various types of segmentation models - Understand the benefit of medical image segmentation by use of Deep Learning and Foundation models - Learn about characteristics of Foundation Models (Segment Anything Model: SAM and MedSAM) and accuracy improvement methods (Low-Rank Adaptation: LoRA) - Review the characteristics and clinical usefulness of applying various segmentation models to a variety of medical images.

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1) Introduction and comparison of current segmentation model types 2) Transition of segmentation model 3) Deep Learning (U-Net) 4) Foundation Model (SAM) 5) Foundation Model (MedSAM) 6) Introduction of accuracy improvement methods (LoRA) besides fine-tuning 7) Our research: applying various segmentation models to Mammogram (Breast: Breast tissue) and MRI (Brain: Glioma), comparing the results, and identifying the characteristics of each model - Materials and Methods - The results of the Dice score and output images - Discussion of each model (Review the characteristics and clinical usefulness) 8) Clinical usefulness of medical image segmentation by use of Deep Learning and Foundation models 9) Summary

INEE-37 ARTIFICIAL INTELLIGENCE (AI)-ASSISTED CHEST X-RAY DIAGNOSTIC SYSTEM FOR THE ENTIRE TUBERCULOSIS (TB) CARE IN THAILAND

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Antoine Choppin, MS (*Abstract Co-Author*)
Lalita Kaewwilai (*Abstract Co-Author*)
Orawan Kaewboonchoo (*Abstract Co-Author*)

TEACHING POINTS

1) To learn current status of tuberculosis (TB) in Southeast Asia including Thailand, 2) To review artificial intelligence (AI)-assisted chest x-ray (CXR) system for detection and differential diagnosis of TB, 3) To discuss AI-assisted CXR system for comparison/follow-up function of TB during treatment, 4) To discuss AI-assisted mobile CXR bus TB screening, 5) To discuss future AI-assisted CXR system in Thailand

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1) Status of TB in Southeast Asia including Thailand, 2) WHO guideline for TB, 3) Problems of TB care in Thailand, 4) AI software for TB, 5) AI-assisted CXR for detection and differential diagnosis of TB, 6) AI-assisted CXR for comparison/follow-up function of TB, 7) Status and problems of mobile CXR bus TB screening in the communities in Bangkok, 8) Application for AI-assisted mobile CXR bus TB screening, 9) Limitations of AI-assisted CXR diagnosis system for TB, and 10) Future AI-assisted TB CXR diagnosis system including predictive AI

INEE-38 DEVELOPING AI FOR PEDIATRIC RADIOLOGY: AUTOMATED LEG LENGTH MEASUREMENT USE CASE

Andrew Johnston, MD, MBA (*Presenter*)
Lina Cheuy (*Abstract Co-Author*)
Arogya Koirala, BS, MS (*Abstract Co-Author*)
Hye Sun Na (*Abstract Co-Author*)
Akshay Chaudhari, PhD (*Abstract Co-Author*)
David B. Larson, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

[1] Development of pediatric algorithms has lagged progress seen in adult AI. In many use cases of image-based AI, tools used for adults cannot be applied to children because pediatric anatomy is different than adult anatomy. [2] Expertise in the task to be automated enables curation of high-quality datasets. [3] Anatomic landmark localization is a robust approach for image-based algorithm development. [4] Successful AI deployment requires building consensus and deep involvement from experts in radiology, process improvement, and AI.

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[1] Needs Assessment - Clinical need, amenability to automation, leg length example. [2] Model Training - Understanding the task to be automated, pediatric anatomy and landmark selection, creating labeling instructions. [3] Development strategy - Clinical experts, AI experts, and process experts. [4] Development process - Data labeling, training the algorithm, developing UI for product use, developing monitoring platform. [5] Implementation considerations - Development, building in reliability, post-deployment monitoring

INEE-39 POST-DEPLOYMENT MONITORING OF RADIOLOGY AI: A PRACTICAL GUIDE

Cole Cook (*Presenter*)
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Panagiotis Korfiatis, PhD (*Abstract Co-Author*)
Gian Marco Conte, MD, PhD (*Abstract Co-Author*)
Andrew Missert, PhD (*Abstract Co-Author*)
Daniel J. Blezek, PhD (*Abstract Co-Author*)
Christoph Wald, MD, MBA (*Abstract Co-Author*)
Tim Leiner, MD, PhD (*Abstract Co-Author*)
Timothy L. Kline, PhD (*Abstract Co-Author*)
Jeremy D. Collins, MD (*Abstract Co-Author*)

TEACHING POINTS

- AI performance may drift after deployment. Drift may be abrupt or gradual as imaging protocols, hardware, or demographics change.- Systematic surveillance of input features, operational parameters, and task-specific metrics enables early detection of performance degradation.- Statistical process-control dashboards enable the identification of significant deviations from historical baselines.- A human-in-the-loop workflow of AI-radiologist disagreements can drive continuous quality improvement.

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1. Introduction (a) Rapid AI adoption, regulations, and the necessity of post-deployment validation and monitoring. 2. Data vs concept shift; abrupt vs gradual drift with examples. 3. What to monitor (a) Input data (b) Operational parameters (c) Task-specific performance metrics (d) User engagement (e) Workflow and patient impact 4. Monitoring pipeline - statistical process-control dashboards; periodic checkpoints vs sliding-window updates, including examples. 5. Ground truth- generation at scale - LLM assisted labeling of -free text- reports; expert image correction capture as part of the workflow, including examples. 6. Human-in-the-loop feedback and alerting for AI-human disagreements, with examples. 7. Practical implementationa. Step-by-step examples from practiceb. Challenges and lessons learned. 8. Current and future efforts/directions - Reference labs for AI evaluation, ACR & other society initiatives, and regulatory perspectives.

INEE-40 MHUB.AI - SIMPLE AND REPRODUCIBLE AI FOR MEDICAL IMAGING

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Dennis Bontempi, MSc (*Abstract Co-Author*)
Suraj Pai, BEng (*Abstract Co-Author*)
Andriy Fedorov, PhD (*Abstract Co-Author*)
Curtis Lisle (*Abstract Co-Author*)
Hugo Aerts, PhD (*Abstract Co-Author*)

TEACHING POINTS

Machine learning shows promise in medical imaging but struggles with clinical adoption due to a lack of accessible and well documented models. Existing models often require significant effort to implement, creating an "implementation gap" between research and practice. Variations in datasets, technologies, and input formats hinder direct model comparisons. We developed MHub, a one-command framework for running ML models in medical imaging. MHub models are containerized with Docker, including inference code, dependencies, and model weights. It supports zero-configuration execution on DICOM data through native integration for medical imaging formats. Each model adheres to a structured template with Dockerfiles, MHub modules, workflows, and metadata. The platform includes our model collection, the MHub framework, online documentation, and a self-service contribution system. MHub offers tools for data organization and conversion, making it framework-agnostic and compatible with DICOM workflows. MHub has deployed over 30 models across modalities like CT, MR, PT, and SM, operating directly on DICOM data and producing harmonized outputs for easy comparison. Sample input and output data accompany each model. MHub provides a simple, reproducible, DICOM-compatible solution. The user-friendly design and standardization promote wider adoption of ML models in medical imaging.

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Overview of the MHub.ai platform and model repository. Deployment template und Framework; Documentation and tutorials; Hands-on demo of model execution, notebooks; 3D Slicer and IDC integration; Use case scenarios; Contributor guidance: How to make your model simple and reproducible through MHub.ai.

INEE-41 PROGRESSIVE DISEASE RESPONSE: CHALLENGES AND INSIGHTS ACROSS IMAGING TREATMENT RESPONSE CRITERIA GUIDELINES

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Mark A. Anderson, MD (*Abstract Co-Author*)
Gordon J. Harris, PhD (*Abstract Co-Author*)
Annick D. Van den Abbeele, MD (*Abstract Co-Author*)

TEACHING POINTS

• Provide a comprehensive review of the progressive disease (PD) designation across imaging-based treatment response criteria • Highlight key challenges in assessing progressive disease using response assessment criteria guidelines • Elaborate on the complexities involved in evaluating progressive disease in non-measurable lesions • Navigate unique challenges in the context of immunotherapy and immune-related response patterns • Illustrate case-based examples that demonstrate the variability in PD designations and the integration of both imaging and clinical findings, with an emphasis on adjudication gaps and decision-making ambiguity

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• Overview of progressive disease guidelines in response assessment criteria, including solid tumors, hematological malignancies, prostate cancer, and beyond • Similarities and key differences of progressive disease definitions across response criteria • Challenges in subjective assessment of progressive disease in non-measurable disease • Encounters of progressive disease assessment following immunotherapeutic agents including pseudoprogression, delayed responses, and hyperprogression • Case-based scenarios highlighting the nuances and limitations of progressive disease assessment • Summary and future directions • References

INEE-42 NO VALID MULTICENTER STUDY WITHOUT ACCOUNTING FOR CENTER EFFECTS

Leeha Ryu, MS (*Presenter*)
Kyunghwa Han, PhD (*Abstract Co-Author*)
Jin Hur, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Recognize the importance of accounting for center effects in multicenter studies to ensure valid and unbiased results. 2. Review commonly used statistical methods applicable to multicenter data across various outcome types. 3. Understand the practical implications of using different methods through real-world application and literature examples.

TABLE OF CONTENTS/OUTLINE

1. Introduction to Multicenter Data: - Characteristics of multicenter studies - Factors contributing to between-center heterogeneity 2. Overview of Statistical Methods: - Introduction to different analytical approaches applicable to multicenter data - Brief overview of methods used depending on outcome type 3. Literature Overview: - Usage patterns of statistical methods applied in published multicenter studies - Representative examples of appropriate model use 4. Applied Analysis Using Real Data: - Comparison of results across different statistical methods 5. Conclusion and Practical Takeaways

INEE-43 AI-ASSISTED ANEURYSM DETECTION AND ANALYSIS: RECENT ADVANCES

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Juheon Hwang (*Abstract Co-Author*)
Jaesik Min (*Abstract Co-Author*)
Deok H. Lee, MD (*Abstract Co-Author*)
Yunsun Song, MD, PhD (*Abstract Co-Author*)
Yoojin Nam, MD (*Abstract Co-Author*)
Seon Moon Hwang (*Abstract Co-Author*)
Joon Ho Choi (*Abstract Co-Author*)
Boseong Kwon (*Abstract Co-Author*)

TEACHING POINTS

Artificial intelligence for intracranial aneurysm detection has rapidly evolved from 2D to 3D approaches, addressing the growing neuroimaging workload that contributes to clinically significant missed detection rates. However, there still exists a notable performance gap between regulatory approval studies and real-world implementation, for example, far reduced sensitivity often observed in clinical settings. This discrepancy occurs when the pixel/voxel-based AI models that are trained on specific imaging protocols perform inconsistently across different clinical environments. Our geometry-based approaches offer robustness to this problem by capturing the spatial relationships of vessels through point cloud representations, differentiating spherical aneurysm expansions from cylindrical normal vessels using normal vector analysis. This transformation-based approach maintains its performance across different hospitals, modalities, and protocols. It enables comprehensive analysis beyond simple detection toward registration, longitudinal comparison, quantitative measurement, and ultimately rupture risk prediction.

TABLE OF CONTENTS/OUTLINE

1. Clinical Implementation Challenges - Limitations of pixel/voxel-based AI models in clinical settings 2. Introduction of EVG-NET: Entire Vasculature with 3D Geometry-guided NETwork 3. Experimental Validation 4. Future Directions and Summary

INEE-44 UNDERSTANDING AI HALLUCINATIONS IN GENERATIVE MEDICAL IMAGING: MECHANISMS, MANIFESTATIONS, AND MITIGATION STRATEGIES

Annie Singh (*Presenter*)
Fatima Qureshy, MBBS (*Abstract Co-Author*)
Moinak Bhattacharya (*Abstract Co-Author*)
Angela Lignelli-Dipple, MD (*Abstract Co-Author*)
Prateek Prasanna, PhD (*Abstract Co-Author*)
Gagandeep Singh, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

-Understand the role of generative AI in image generation and interpretation. -Distinguish hallucinations from distorted information, disinformation, and misinformation. -Identify key causes and types of hallucinations. -Review image examples demonstrating hallucination. -Discuss strategies to mitigate hallucinations through data-level, model-level, and system-level safeguards.

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1. Introduction Background of Generative AI and LLMs in radiology and trends in AI driven image generation. Understanding the risks that AI hallucinations pose to patient safety, diagnostic accuracy, and clinical trust. 2. Anatomy of AI Hallucination: Defining hallucinations and distinguishing them from other forms of information distortion. This section explores key mechanisms behind hallucinations, including data bias and noise, overfitting, model limitations (e.g., source-reference divergence), and lack of contextual understanding. Hallucinations are classified into three types: (i) Anatomical, (ii) Pathological, and (iii) Modality-inconsistent 3. Illustrative case studies Demonstrative examples of AI generated hallucinations with input prompt, output generated, and observed discrepancies. 4. Workflow Strategies; Safeguard against AI Hallucinations: Discusses mitigation strategies across three levels, (i) Data level methods (data curation and annotation), (ii) Model level methods (prompt tuning, hallucination maps, image masking), and (iii) System level methods (human-AI feedback loop and model cross validation) 5. Conclusion: Summarizing key concepts and emphasizing on awareness, interpretive caution, and the need for radiologist involvement in AI validation.

INEE-45 UNLOCKING HIDDEN CT BIOMARKERS: AI-PREDICTED BIOLOGICAL LUNG AGE AND MULTI-DISEASE CORRELATIONS

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Sriya Kappagantu (*Abstract Co-Author*)
Audrey Burnett (*Abstract Co-Author*)
Xiaowen Yin (*Abstract Co-Author*)
Tician Schnitzler, MD, MSc (*Abstract Co-Author*)
Yasuhito Mitsuyama (*Abstract Co-Author*)
Daiju Ueda, MD, PhD (*Abstract Co-Author*)
Jae Ho Sohn, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

Chest CT scans contain hidden biomarkers of biological lung aging beyond their diagnostic role. CT-based AI prediction of lung age offers a quantitative biomarker of biological lung aging, with significant correlations to multiple chronic diseases. The Lung Aging Index , defined as the discrepancy between AI-predicted lung age and chronological age, correlates with diseases such as asthma, COPD, emphysema, and hypertension. Therefore, the purpose of this exhibit is to highlight the clinical value of the Lung Aging Index by reviewing CT images with high and low index values that reveal key features of accelerated or decelerated lung aging.

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#1 Title #2 Table of contents #3 Background: Concept of biological vs. chronological age and emerging role of biological age as a health indicator #4 Patient selection and demographics: Description of datasets - NLST, [Hospital 1] (US), [Hospital 2] (Asia) #5 Study Workflow and Model Pipeline: Data preprocessing, model architecture, ensemble prediction, Lung Aging Index calculation, disease correlation analysis #6 Comparison of AI-Predicted Biological Lung Age vs Chronological Age: Scatter plots and summary statistics across datasets #7 Disease Associations: Logistic regression analysis correlating Lung Aging Index with asthma, COPD, emphysema, and hypertension #8 Representative CT Images #8-1 CT Features of Lungs with High Lung Aging Index #8-2 CT Features of Lungs with Low Lung Aging Index #9 Clinical Implications: Application of Lung Aging Index for early disease detection, population-level risk stratification, and preventive screening #10 Take-home Messages #11 References

INEE-46 ADVANCED 3D IMAGING FOR SURGICAL GUIDANCE IN SOLID ORGAN TUMORS: A MULTIDISCIPLINARY APPROACH

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Daniel Nunes (*Abstract Co-Author*)
Paulo Falcao, MD (*Abstract Co-Author*)
Thiago De Sousa (*Abstract Co-Author*)
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Elizabeth Maria Neves Silva Souza (*Abstract Co-Author*)
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Romulo Varella, MD, MSc (*Abstract Co-Author*)

TEACHING POINTS

- Advanced 3D imaging enhances spatial understanding of solid organ tumors and supports personalized surgical planning. - 3D reconstructions and printed models help reduce operative time, blood loss, and interobserver variability. - Integration between radiology, surgery, and biomedical engineering is critical for a successful workflow. - Radiologists play a central role in model development and interdisciplinary surgical guidance. - 3D modeling serves as an effective educational tool for trainees and surgical simulation.

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Introduction: The challenge of complex solid tumors - The rise of personalized, minimally invasive surgery. - Limitations for surgeons for spatial and relational anatomical analysis of 2D imaging. 3D Imaging Workflow in Surgical Planning - Steps from image acquisition to segmentation, modeling, and 3D printing.- Software and PACS integration for clinical applications. Clinical Applications Across Solid OrgansLiver: Segmental 3D planning for Y90 radioembolization. - Pancreas: Post-chemotherapy planning with printed model validation.- Lung: Vascular/airway mapping and printing for central tumors.- Kidney: Margin-based planning for nephron-sparing surgery.- Uterus: Leiomyoma mapping for fertility-focused myomectomy.- Diaphragm: Complex hiatal hernia planning. Interdisciplinary Care and Radiology Leadership - Radiologists as coordinators of 3D workflow and tumor board discussions. Medical Education and Surgical Simulation - Resident training, anatomical teaching, and rehearsal of complex procedures. Conclusion - 3D imaging as a transformative toolEnhances safety, precision, and integration in oncologic surgical care

INEE-47 ADDING CLINICAL CONTEXT USING A VISUALIZATION TOOL FOR CO-REGISTERED PATIENT VISIBLE LIGHT IMAGES AND RADIOGRAPHS

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Nabile M. Safdar, MD, MPH (*Abstract Co-Author*)
Pamela T. Bhatti, PhD (*Abstract Co-Author*)

TEACHING POINTS

Point-of-care patient visible light (VL) imaging can provide missing visual context in radiology. A VL imaging system was deployed at a large academic hospital and an application created to co-register and efficiently visualize co-registered VL images with the corresponding radiographs. This application features a user interface to select a study and visualize radiographs overlayed on VL images. Opacity of the overlayed radiograph is controlled using a software slider bar in the application. The ease of transitioning back and forth between VL images and radiographs will allow interpreting radiologists to efficiently compare image content in both modalities. This will prove valuable in locating features in common but also provide a view beyond the collimation of the radiograph acquisition, providing a “mini physical exam.” This educational exhibit will highlight multiple use cases of VL images, elucidated by videos of the application allowing simultaneous viewing of these images overlayed with radiographs.

TABLE OF CONTENTS/OUTLINE

Explanation of benefits of point-of-care patient visible-light (VL) images in radiography Overview of VL system Use cases highlighting the benefits of co-registered VL images and radiographs and an application to efficiently view them Diabetic foot ulcer and osteomyelitis Soft Tissue conditions Cellulitis Subcutaneous emphysema

Ruling out free air using patient positioning Checking for presence of lines and tubes absent in radiographs Masses not seen in radiographs but visualized on the photographs

INEE-48 BEYOND EXPLAINABILITY: MECHANISTIC INTERPRETABILITY FOR UNDERSTANDING RADIOLOGY FOUNDATION MODELS FROM WITHIN

Bardia Khosravi, MD, MPH (*Presenter*)
Amirali Khosravi, MD (*Abstract Co-Author*)
Frank Li, PhD (*Abstract Co-Author*)
Hari Trivedi, MD (*Abstract Co-Author*)
Bradley J. Erickson, MD, PhD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)

TEACHING POINTS

1. Differentiate between AI explainability (what the model did) and interpretability (how the model works), understanding their complementary roles in trustworthy radiology AI 2. Identify polysemanticity challenges in neural networks where single neurons respond to multiple unrelated concepts, complicating interpretation 3. Apply mechanistic interpretability techniques like activation patching and sparse autoencoders to dissect how radiology AI models process images and make diagnostic decisions

TABLE OF CONTENTS/OUTLINE

1. Introduction to Interpretability and Explainability in Radiology AI: (a) The black box problem and its clinical implications (b) Explainability: Post-hoc attribution methods (saliency maps, attention maps, SHAP) (c) Interpretability: Understanding the internal mechanisms 2. Challenges in Neural Network Interpretation: (a) Polysemanticity: When neurons encode multiple unrelated concepts (b) Superposition: How networks represent more features than neurons (c) Case study: Hidden biases in chest X-ray classification 3. Mechanistic Interpretability Techniques: (a) Sparse autoencoders: Disentangling features for clearer interpretation (b) Activation patching: Causal interventions in model decision-making 4. Clinical Applications and Implications: (a) Understanding racial disparities in image classification models (b) Detecting and mitigating bias through mechanistic insights (c) Using interpretability to improve clinical safety and trustworthiness 5. Future Directions: (a) Automated circuit discovery for scalable interpretability (b) Implications for regulatory frameworks and clinical implementation 6. Conclusion

INEE-49 SMARTER AI TRAINING, FEWER LABELS: THE ACTIVE LEARNING PERSPECTIVE FOR RADIOLOGISTS USING GRAND SAMPLING

Sahika Yayli, MD (*Presenter*)
Bradley J. Erickson, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Radiologists and data scientists can achieve high-performing models with fewer annotations by using active learning, saving labeling time and cost. • Active learning enables selective sampling of the most informative data to improve model efficiency. • GraNd (Gradient Norm) is a simple, interpretable, and model-agnostic strategy for sample selection. • Even with simple datasets like MNIST, GraNd demonstrates the value of data prioritization.

TABLE OF CONTENTS/OUTLINE

1. Introduction: The Annotation Bottleneck in RadiologyRadiology AI models require large labeled datasets, but expert annotations are costly and time-consuming. 2. What Is Active Learning?: Active learning is a machine learning paradigm that aims to reduce the number of labeled samples needed by selecting only the most informative examples for annotation. It does so by estimating the model's uncertainty and focusing labeling efforts where the model learns the most. We introduce this concept through intuitive examples and connect it to real-world clinical relevance. 3. GraNd Sampling: Gradient Norm-Based SelectionEntropy and gradient norm-based method to identify impactful training samples. 4. Proof-of-Concept Experiment Using MNIST: MNIST used to simulate radiology data labeling. Models trained with: Small seed set Randomly added samples GraNd-selected samples Full dataset Active learning achieved similar performance to full labeling with fewer samples. 5. Clinical Implication : Active learning strategies like GraNd help radiologists and data scientists prioritize which data to label first, enabling efficient AI training in scenarios where annotations are costly or limited.

INEE-50 BENCHMARK TESTING FOR SAFER RADIOLOGY VISION-LANGUAGE AI ON ERROR DETECTION AND CORRECTION IN CT REPORTS

Sunggu Kyung, PhD (*Presenter*)
Jinyoung Seo (*Abstract Co-Author*)
Hyungbin Park (*Abstract Co-Author*)
Jimin Sung (*Abstract Co-Author*)
Jihyun Kim (*Abstract Co-Author*)
Dongyeong Kim, MD (*Abstract Co-Author*)
Wooyoung Jo (*Abstract Co-Author*)
Yoojin Nam, MD (*Abstract Co-Author*)
Sangah Park (*Abstract Co-Author*)
Taehee Kwon (*Abstract Co-Author*)
Sang Min Lee, MD, PhD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

TEACHING POINTS

• The importance of benchmarking in radiology AI for evaluating safer and more effective AI systems in clinical settings. • Categorize six common error types in CT reports and analyze clinical impact. • Discuss advances in medical large multimodal language models (MLLMs) and their clinical applicability, focusing on the technical features and CT interpretation capabilities. • Analyze the limitations of existing medical visual question answering (VQA) benchmarks (e.g., simple visual focus, limited clinical relevance) and emphasize the need for precise, clinically relevant evaluation schemes. • Highlight error detection and correction as key indicators for evaluating medical AI models and propose a new benchmark design. • Analyze performance of 3D medical MLLMs across error classification, detection, and correction to identify model characteristics and clinical selection criteria

TABLE OF CONTENTS/OUTLINE

1. Introduction The importance of benchmark tests in radiology vision-language AI Errors in CT reports: prevalence and clinical impact 2. Advances in MLLMs Overview of MLLMs in medicine Key 3D MLLM models: RadFM, M3D, CT-CHAT Comparative analysis: technical features & CT interpretation 3. Limitations of Existing Medical VQA Benchmarks 2D benchmarks: VQA-RAD, PMC-VQA, OmniMedVQA 3D benchmarks: RP3D-VQA, M3D-VQA Methodological issues: simple visual focus, limited reasoning, low clinical relevance 4. Designing a New Benchmark for Error Detection and Correction Error types: Omission, Insertion, Orientation, Size, Unit, Typo Evaluation: classification, detection, correction 5. Results and Analysis Task-wise performance metrics Model strengths and weaknesses Selection criteria for clinical use

Abstract Archives of the RSNA, 2025

IREE

Interventional Radiology Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

IREE-1 PERCUTANEOUS CT GUIDED BONE TUMOR BIOPSY: BASIC PRINCIPLES AND APPROACHES- A CASE-BASED REVIEW

Alexandra Panyukova, MD (*Presenter*)
Mishal Shahab, MBBS (*Abstract Co-Author*)
Sukrita Menon, MD (*Abstract Co-Author*)
Antonio Santana Veliz, MD (*Abstract Co-Author*)
Katsuhiro Kobayashi, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. CT guidance remains the primary method for bone tumor biopsy. 2. The shortest route is not always the best: careful trajectory planning minimizes damage to vital structures and compartments. 3. Meticulous planning is essential, especially for suspected sarcomas — biopsy track contamination can significantly impact limb-salvage surgery outcomes. 4. Close communication with orthopedic oncologists is critical when sarcoma is suspected to ensure optimal surgical outcomes. 5. Procedural complications such as non-diagnostic sampling, bleeding, joint violation, nerve injury, and tumor seeding can be minimized through careful planning and technique.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. General Biopsy Principles 3. Special Considerations for Primary Bone Tumors 4. Site-Specific Biopsy Approaches 4.1 Upper extremity: 4.1.1 Humerus (Proximal to Distal) 4.1.2 Forearm (Radius and Ulna) 4.2 Lower extremity:4.2.1 Pelvis 4.2.2 Femur (Proximal, Shaft, Distal) 4.2.3 Tibia and Fibula 5. Complications and Pitfalls 6. Take Home Points 7. References

IREE-2 EVOLVING GLOBAL TRENDS IN LOCOREGIONAL TREATMENT FOR HEPATOCELLULAR CARCINOMA

Mahmoud Odeh, MD (*Presenter*)
Diana Dinh, MD, MPH (*Abstract Co-Author*)
Jeffrey L. Weinstein, MD (*Abstract Co-Author*)
Muneeb Ahmed, MD (*Abstract Co-Author*)
Ammar Sarwar, MD (*Abstract Co-Author*)

TEACHING POINTS

• Globally, the incidence of hepatocellular carcinoma (HCC) has been slowly increasing over the past two decades until it reached 6.15 in 2021 • The highest incidence and mortality rates are observed in East Asia, which account for over half of global cases • In China, TACE is the most commonly used LRT, utilized in 37% of patients in 2013, with a gradual increase in the use of radiotherapy • In Japan, the use of TACE and ablation declined between 1996 and 2017 (from 35% to 27% and 31% to 19%, respectively), in favor of surgical resection. Despite this shift, TACE remains the most frequently used LRT. TARE is not yet approved for clinical use • In South Korea, the overall use of LRTs has slightly declined in favor of increased resection. Among transarterial therapies, TACE remains dominant but has been decreasing following the introduction of TARE from 88% in 2008 to 79% in 2022, while TARE accounts for 7.7% of transarterial therapies use in 2022. • In the United States, the use of TACE reached a peak in 2010 and has since been declining, while TARE use has been increasing rapidly since 2012, becoming the most common LRT offered to HCC patients awaiting liver transplantation in 2023.

TABLE OF CONTENTS/OUTLINE

1. Overview of the global incidence and mortality of HCC 2. HCC trends outside the United States (Europe, China, Japan, South Korea)a. Incidence and mortality rates of HCC outside the United States compared to within the U.S. b. Trends in the use of locoregional therapies (LRTs) for HCC outside the United States compared to the U.S. over the past two decades c. Shifts within LRT modalities: trends in the use of ablation, transarterial chemoembolization (TACE), and transarterial radioembolization (TARE) both outside and within the United States

IREE-3 TARGETING BONE METASTASES: THE POWER OF MICROWAVE ABLATION - INSIGHTS FROM A SINGLE-CENTER EXPERIENCE WITH PRACTICAL TIPS & TRICKS FOR THE INTERVENTIONAL RADIOLOGIST

Helena Puigderrajols Vehils, MD (*Presenter*)
Igor Radalov, MD (*Abstract Co-Author*)
Claudio Pusceddu, MD (*Abstract Co-Author*)
Alberto Solano Lopez (*Abstract Co-Author*)
Jose Maria Maiques Llacer, MD (*Abstract Co-Author*)
SALVATORE MARSICO (*Abstract Co-Author*)

TEACHING POINTS

1. Practical review of the principles and equipment of microwave ablation based therapies. 2. Outline appropriate patient selection criteria, indications, contraindications and possible integration with other therapies. 3. Describe procedural planning, including CT-guided techniques, and lesion access strategies based on location. 4. Illustrate key pre- and post-ablation imaging findings and their correlation with clinical outcomes, emphasizing the role of MWA in pain palliation and local tumor control. 5. Identify potential complications and strategies for their avoidance and management.

TABLE OF CONTENTS/OUTLINE

1. Overview of bone metastases and current treatment strategies. 2. Rationale for thermal ablation, with a particular focus on MWA, and comparative analysis of MWA relative to other ablation techniques. 3. MWA technique: equipment, energy parameters, and ablation dynamics. 4. Indications and patient selection: 4.1.Pain palliation in refractory cases 4.2.Oligometastatic disease 4.3.Integration with radiotherapy and systemic treatments 4.4.Combination with cementoplasty for stabilization of bone structures (in selected cases with high risk of pathological fractures). 5. Absolute and relative contraindications. 6. Procedural approaches: 6.1.CT-guided planning 6.2.Lesion access by location 6.3.Pre-procedural biopsy 6.4.Adjunctive techniques 7. Review of the most common complications and strategies for their avoidance and management 8. Multiple combined case examples from our institution, including technical tips & tricks 9. Summarize & key points 10. Conclusion

IREE-4 A MODERN APPROACH TO HEMODIALYSIS ACCESS: ENDOVASCULAR ARTERIOVENOUS FISTULA CREATION THROUGH CLINICAL CASES

Manex Lasa, MD (*Presenter*)
Virginia Diaz (*Abstract Co-Author*)
Inigo Deba Ayarza, MD (*Abstract Co-Author*)
Carlos Jimenez Zapater (*Abstract Co-Author*)
Borja Pena (*Abstract Co-Author*)
Nicolas Perez, MD (*Abstract Co-Author*)
Mikel Merino Aboitiz, MD (*Abstract Co-Author*)
Ainhoa Urrutia Ortiz De Salazar, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the indications and patient selection criteria for endovascular arteriovenous fistula (endoAVF) creation in hemodialysis candidates.Review the step-by-step technique and essential imaging guidance for successful endoAVF creation. Recognize potential complications and strategies to manage them intra- and post-procedurally.

TABLE OF CONTENTS/OUTLINE

Introduction: Overview of dialysis access options and the role of endoAVF creation. Patient Selection: Clinical and radiological inclusion criteria. Case Planning: Arm vessel mapping using Doppler ultrasound. Technique: Step-by-step procedure with imaging guidance. Case-Based Review: Illustrative examples highlighting key technical points and variations. Complications and Management: Identification and handling of intra- and post-procedural issues; ultrasound evaluation and follow-up of fistula maturity. Conclusion: Practical insights and take-home messages.

IREE-5 MINIMALLY INVASIVE MANAGEMENT OF INTRA-ABDOMINAL LYMPHATIC PATHOLOGIES - THE "MILIEU INTERIEUR" DEMYSTIFIED

Venkata Subbaih Arunachalam, MD (*Presenter*)
Saebeom Hur, MD (*Abstract Co-Author*)

TEACHING POINTS

1) To illustrate the anatomy and physiology of hepatic, mesenteric, and retroperitoneal lymphatic system 2) To describe the pathophysiological basis of clinical manifestations of pathologies of the intra-abdominal lymphatic system 3) To systematically categorize the acquired intra-abdominal pathologies of the lymphatic system and postulate an algorithmic approach for evaluation and interventional management of chylous ascites 4) To describe the salient imaging features and interventional management of protein-losing enteropathy, Chyluria and lymphatic decompression for interventional management of Refractory ascites in patients with CLD

TABLE OF CONTENTS/OUTLINE

1) Introduction 2) Anatomy & Physiology of hepatic, mesenteric, and retroperitoneal lymphatic system 3) Pathophysiological basis of clinical manifestations - Chylous ascites, Ascites, Protein-losing enteropathy, Chyluria, Scrotal and Lower limb edema 4) Classification of intra-abdominal lymphatic pathologies - Congenital vs Acquired, Disorders of production, transit (reflux), and drainage. 5) Etiologies of chylous ascites - Congenital, Inflammatory, Neoplasm, Trauma 6) Role of imaging in the management of chylous ascites8) Endovascular approaches to manage chylous ascites - Hepatic Lymphatic deprivation, Mesenteric lymphatic deprivation, Thoracic duct angioplasty and stenting, Retroperitoneal lymphatic embolization, Endolymphatic BORALE 7) Imaging and Interventional management of protein-losing enteropathy, hepatic lymphorrhoea & Chyluria 8) Rationale of lymphatic decompression in the management of Refractory ascites 9) Complications of lymphatic interventions 10) Conclusion

IREE-6 NUMB AND NUMBER: A GUIDE TO MASTERING SEDATION, ANALGESIA, AND LOCAL ANESTHESIA

Tanya W. Moseley, MD, PhD (*Presenter*)
Mary S. Guirguis, MD (*Abstract Co-Author*)
Ronald Arthur Rauch (*Abstract Co-Author*)
Gaiane M. Rauch, MD, PhD (*Abstract Co-Author*)
Beatriz E. Adrada, MD (*Abstract Co-Author*)

TEACHING POINTS

Pain management during radiological procedures is essential for patient comfort, cooperation, and procedural success. This comprehensive guide addresses analgesia, local anesthesia, and sedation techniques in radiology, emphasizing patient safety and procedure efficacy. TEACHING POINTS Patient assessment and risk stratification prior to analgesia and sedation Pharmacology of common analgesic agents and local anesthetics Sedation techniques and monitoring requirements Procedure-specific pain management protocols

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TABLE OF CONTENTS Introduction and Background Patient Assessment and Preparation Pharmacology of Analgesic Agents Local Anesthesia Techniques Pharmacology of Sedative Agents Monitoring and Safety Considerations Special Populations Complications and Management

IREE-7 TUMOR ACIDITY-REGULATING LIPIODOL PICKERING EMULSIONS STABILIZED BY IRON NANOPARTICLES ENABLES ENHANCED TRANSARTERIAL EMBOLIZATION THERAPY VIA SYNERGISTICALLY INDUCING FERROPTOSIS AND ACTIVATING ANTITUMOR IMMUNITY

Yang Weihao (*Presenter*)

TEACHING POINTS

1,The long-term therapeutic outcome of TACE is significantly limited by unfavorable pharmacokinetic behaviors of the loaded drug and intraarterial embolization aggravated tumor immunosuppression. 2,In this study, iron nanoparticles (FeNPs) with pH-dependent Fention catalytic ability was synthesized and utilized as particular surfactants to stabilize Lipiodol Pickering emulsion (LPE) for tumor localized delivery of cariporide in responding to the extracellular tumor acidity.3,As an inhibitor of sodium-hydrogen exchanger in plasma membrane, cariporide markedly enhanced the ferroptosis inducing ability of FeNPs via down-regulating intracellular pH, while suppressed extracellular tumor acidosis through reducing proton efflux. 4,The obtained cariporide-loaded FeNPs-stabilized LPE, abbreviated as CFe-LPE, initiated potent antitumor immunity by inducing immunogenic cell death and reversing the immunosuppressive TME through amelioration of tumor acidity. 5, CFe-LPE mediated TAE treatment exhibited significantly improved therapeutic efficacy against orthotopic N1S1 HCC in rats compared to conventional TACE treatment with the lipiodolized doxorubin emulsion.

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1)Preparation and characterization of CFe-LPE2)CFe-LPE induces self-enhancing ferroptosis of cancer cells3)In vivo therapeutic efficacy of CFe-LPE on subcutaneous H22 tumors4)RNA-Sequencing5)Immune activation effect of CFe-LPE in vivo6)In vivo TACE treatment with CFe-LPE in an orthotopic N1S1 rat tumor model.

IREE-8 BEYOND PEDIATRICS: UNVEILING THE TRUE INTRAHEPATIC PORTAL SYSTEM IN CONGENITAL PORTOSYSTEMIC SHUNTS—RECLAIMING THE ROLE OF INTERVENTIONAL RADIOLOGY

Masashi Tamura, MD, PhD (*Presenter*)
Seishi Nakatsuka, MD (*Abstract Co-Author*)
Takahiro Hosokawa (*Abstract Co-Author*)
JITSURO TSUKADA (*Abstract Co-Author*)
Hiroki Yoshikawa (*Abstract Co-Author*)
YUJI FURUKAWA (*Abstract Co-Author*)
Ryo Ogawa, MD (*Abstract Co-Author*)
Yosuke Yamamoto, MD (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. C ongenital portosystemic shunt (CPSS) may remain undetected in childhood and be first diagnosed in young adults with complications, highlighting their relevance even for non-pediatric radiologists. 2. Angiography with balloon occlusion (BO) reveals true intrahepatic portal system (IHPS) status in congenital portosystemic shunt (CPSS), often underestimated by conventional imaging. 3. IHPS classification (Mild/Moderate/Severe) under BO and concurrent measurement of mean portal vein pressure (mPVP) provide crucial guidance for shunt management. 4. Radiologists shold recognize CPSS-portopulmonary hypertension (PoPH) association , a leading mortality cause. 5. Interventional radiologists are key to CPSS management through angiographic evaluation, treatment planning, and percutaneous closure procedures.

TABLE OF CONTENTS/OUTLINE

1. Overview of CPSS : definition, embryology, and presentation beyond pediatrics. 2. CPSS Classification Intrahepatic, extrahepatic, persistent ductus venosus; Abernethy types . 3. IHPS assessment : Conventional imaging limitations . 4. Balloon Occlusion Test : Technique, IHPS classification, mPVP correlation. 5. Management Algorithm : Decision-making based on shunt type, complications, IHPS, mPVP. 6. CPSS-related Complications : hepatic, neurological and pulmonary disorders. 7. PoPH in CPSS : Significance, diagnosis, radiologist's role. 8. Shunt Closure Outcomes : Clinical impact in pediatric and young adult patients. 9. Case Examples : Diagnostic workup and intervention illustrations. 10. Conclusion : Reclaiming interventional radiology’s role in the evolving care of CPSS

IREE-9 STANDARDIZING THE VX2 RABBIT MODEL FOR LIVER CANCER RESEARCH IN INTERVENTIONAL RADIOLOGY: A COMPREHENSIVE HOW-TO-GUIDE TO METHODOLOGY AND APPLICATIONS

Salma A. Abosabie (*Presenter*)
Sara Abosabie (*Abstract Co-Author*)
Yubei He (*Abstract Co-Author*)
Han Xu, MSc (*Abstract Co-Author*)
Justus Ramtke (*Abstract Co-Author*)
Friederike Hesse (*Abstract Co-Author*)
Julius Chapiro, MD, PhD (*Abstract Co-Author*)
Veronica E. Prieto Ventura, MD (*Abstract Co-Author*)
Hanna Javan, MD (*Abstract Co-Author*)
Ben Sadeghi, MD (*Abstract Co-Author*)
Nadine Abi-Jaoudeh, MD (*Abstract Co-Author*)
Lynn J. Savic, MD (*Abstract Co-Author*)

TEACHING POINTS

1. The VX2 liver tumor model in New Zealand White rabbits is widely used in translational research for interventional oncology, particularly due to its size, rapid and reproducible growth, hypervascularity, and imaging features that resemble hepatocellular carcinoma. 2. The model involves intramuscular implantation of tumor fragments in donor rabbits, followed by hepatic implantation of fragments from the donor tumor into recipient rabbits. 3. Both VX2 cell suspensions or solid tumor fragments can be used, each with its advantages and limitations. 4. The animal size allows for the use of standard clinical equipment for transarterial and ablation therapies, and radiologic imaging can be performed with human-size CT or MR scanners. 5. While the model is highly reproducible, it is essential to adhere to standard operating procedures for complex interventions, accurate and consistent anesthesia and analgesia protocols, and thorough postoperative monitoring to ensure procedural success and animal welfare.

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1. Introduction to VX2 rabbit liver model and its applications in IO research.. 2. Two-step tumor induction protocol including tumor inoculation in donor rabbits, and laparotomy and hepatic implantation of recipient rabbits. 3. Comparison of VX2 cell suspensions and tumor fragments, including preparation methods, advantages, and limitations. 4. Macroscopic and microscopic histopathological features of VX2 tumors and their imaging features. 5. Perioperative protocols of anesthesia and analgesia. 6. Guidelines for postoperative care and surgical complication management. 7. SOP for transarterial access and embolization and microwave ablation of VX2 liver tumors.

IREE-10 SEALING THE LEAK : FROM DIAGNOSIS TO EPIDURAL BLOOD PATCH

Jyoti Narayan, MBBS (*Presenter*)
Tanvi Gowadia, MBBS (*Abstract Co-Author*)
Shrinivas B. Desai, MD (*Abstract Co-Author*)

TEACHING POINTS

Clinical vigilance supplemented by Imaging transforms radiology into a powerful diagnostic tool in Spontanous Intracranial Hypotension (SIH). CT myelography is preferred for confirming and locating CSF leaks. Identifying resistance factors like plica dorsalis, arachnoid webs, and CSF-venous fistulas aids in treatment planning. Accurate localization supports targeted repair is preferred. When leak location is unknown, blind EBP still offers significant relief and imaging improvement. Dynamic CT myelography is especially effective. Radiologists must recognize misleading signs like the “C1-C2 sign,” which may falsely suggest craniocervical leaks. Treatment must be personalized—ranging from blood patches and fibrin glue to surgery—based on leak type and site.

TABLE OF CONTENTS/OUTLINE

Introduction Overview of intracranial hypotension, including diagnostic tools like dynamic CT myelogram and EBP. Discusses MR myelogram, types, and causes of CSF leaks. Methods CT Myelogram Dynamic CT with contrast under fluoroscopy to locate CSF leaks. Emphasis on technique to avoid complications. Dynamic vs. conventional Needle/contrast choice Positioning, scanning, diagnostic tips Epidural Blood Patch (EBP) Blind EBP under CT/fluoroscopy. Indications, types, and approach Technical details Mechanism, positioning, care, failure reasons Cases & Discussion Highlights success of dynamic CT myelogram and EBP in SIH, with strong outcomes using blind patch technique. Conclusion Combined approach offers high effectiveness, low complication rates. Teaching Points Covers pitfalls and best practices.

IREE-11 MISSION POSSIBLE: A RADIOLOGIST’S GUIDE TO NAVIGATING THE RIGHT ADRENAL VEIN WITH CONFIDENCE

Mehreet Kaur Chahal (*Presenter*)
Ram Kishore R. Gurajala, MBBS, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Review adrenal venous anatomy and identify key fluoroscopic landmarks to facilitate precise and efficient right adrenal vein localization. Emphasize the importance of pre-procedural CT (Computed Tomography) in evaluating adrenal vascular anatomy and predicting potential obstacles. Provide a structured, stepwise approach to AVS (Adrenal Vein Sampling) . Address challenges in adrenal vein cannulation, focusing on technical difficulties, anatomical variations, and catheter selection. Discuss complications, pitfalls, and false-negative prevention through case-based learning.

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Introduction :-Role of AVS in diagnosis of primary aldosteronism and guiding unilateral Vs Bilateral adrenalectomy decisions. Understanding the anatomical location of the right adrenal vein. Pre-Procedural Planning: Cross-sectional imaging for vascular anatomy and anatomic variants. Assessment of mass lesions, if any. ACTH Stimulation including preparation and importance. Challenges in Right adrenal Vein cannulation -Smaller Size of the vein. Difficulties in recognizing the typical vascular pattern. Confusion with other adjacent vessels - renal, hepatic, retroperitoneal and thus difficult fluoroscopic identification. Stepwise Algorithm for troubleshooting AVS : Flowchart Confirmation of Success : Imaging and Biochemical Analysis -How results determine success; Lateralization Index

IREE-12 HANDS UP, THIS IS A ROBBERY! SPLENIC STEAL SYNDROME IN LIVER TRANSPLANT: DIAGNOSIS AND INTERVENTIONAL MANAGEMENT

Daniel Campillo Amoros (*Presenter*)
Carolina Nieto Garcia (*Abstract Co-Author*)
Ines Bonnin, MD (*Abstract Co-Author*)
Sandra L. Barrero Varon, MD (*Abstract Co-Author*)
Raul Garcia (*Abstract Co-Author*)

TEACHING POINTS

1. Understanding the physiopathology of splenic steal syndrome (SSS), a vascular complication in liver transplant recipients, where excessive splenic artery flow compromises hepatic arterial perfusion. 2. Identify key diagnostic features and imaging findings. 3. Review interventional radiology techniques, focusing on embolization of the splenic artery to restore hepatic arterial flow and graft viability.

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1. Physiopathology of SSS in liver transplant patients. 2. Clinical and analytical presentation of SSS. 3. Diagnosis of splenic steal syndrome: a. US/US-Doppler: decreased hepatic artery flow and increased splenic artery velocity. b. Computer Tomography: prominent splenic artery, early splenic hyperenhancement and hepatic artery caliber decrease. c. Digital Subtraction Angiography (DSA): Gold Standard. Confirmatory tool showing dominant splenic flow. 4. Interventional Radiology treatment: Embolization. Techniques, materials used and expected outcomes.

IREE-13 TREATMENT APPROACH FOR A PORTAL CAVERNOMA WITH BILIARY OBSTRUCTION

Ammar Jawad (*Presenter*)
Pratiik Kaushik (*Abstract Co-Author*)
Devi Preetham Veeramgari (*Abstract Co-Author*)
Calvin Nguyen (*Abstract Co-Author*)
Christopher W. Bailey, DO (*Abstract Co-Author*)

TEACHING POINTS

1. To understand the clinical presentation and complications that arise from portal cavernomas and discuss various approaches for their treatment.2. Illustrate the role of multidisciplinary consultation in the management of portal cavernomas.3. Provide trainees with a primer on associated portal cavernoma radiological findings.

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Background: introduce readers to cavernous transformations of the portal vein and common treatment approaches. Pathophysiology: describe the hepatobiliary mechanisms and etiologies behind portal cavernomas, as well as their various clinical presentations and complications. Case example/imaging: review clinical findings and radiological associations corresponding with a portal cavernoma case. Treatment approaches: in depth discussion of the progression from historically used management strategies (medical therapy, endoscopic/surgical operations) to minimally invasive image-guided interventions performed by interventional radiologists with the aid of a clinical decision making flowchart. Summary: Cavernous transformations of the portal vein (CTPV), known as portal cavernomas, are a sequela of chronic portal vein thrombosis (PVT) and may result in varices and splenomegaly due to biliary obstruction and portal hypertension. These malformations present correlative radiological and clinical findings. Treatment wise, this condition was historically treated endoscopically and/or surgically; however, minimally invasive image-guided therapies performed by interventional radiologists are now becoming increasingly employed. Step-wise multidisciplinary management aids clinical decision making and understanding.

IREE-14 IMMERSIVE EDUCATION FOR INTERVENTIONAL RADIOLOGY USING SPATIAL COMPUTING AND EXTENDED REALITY: STRATEGIES FOR ENHANCING SPATIAL UNDERSTANDING

Maki Sugimoto, MD, PhD (*Presenter*)
Takuya Sueyoshi (*Abstract Co-Author*)

TEACHING POINTS

2D IVR Imaging Limits 2D (CT, MRI) image reliance in IVR hinders 3D anatomy/instrument understanding, a key learning barrier. XR for Spatial Insight XR (VR/MR) offers spatial organ visualization, improving 3D anatomical understanding over planar images & boosting education. App 1: Cerebral Coiling XR spatial vascular models aid pre-op coil shaping simulation for aneurysms, enhancing device selection & procedural learning. App 2: TAVI Planning XR simulation for TAVI allows spatial valve-coronary assessment, aiding pre-op planning & reducing complication risks (e.g., PCI). App 3: RFA Guidance XR spatial indicators (virtual paths, "Green Zones") for RFA clarify needle trajectory/angle, promoting safer, effective procedural training. App 4: Hybrid OR Navigation XR with landmarks (clips) for 3D registration improves orientation/understanding in complex hybrid OR procedures (e.g., cholangiography).

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Intro Traditional IVR education challenges & XR paradigm shift. XR Fundamentals Spatial visualization benefits & immersive learning. XR Apps in IVR Cerebral Coiling: 3D simulation. TAVI: Pre-op planning. RFA: Safer puncture training. Hybrid OR: Better navigation/spatial sense. XR Education Implementation Integration & practicalities. Conclusion Future potential & impact of XR in IVR education.

IREE-15 LYMPHANGIOGRAPHY IN INTERVENTIONAL RADIOLOGY: CUTTING-EDGE TECHNIQUES FOR AN OLD-SCHOOL PROCEDURE

Pedro Vicenzo Deo Malaquini, MD (*Presenter*)
Daniel Cabrera, MD (*Abstract Co-Author*)
Fernanda Prazeres (*Abstract Co-Author*)
Soraia Damiao, MD (*Abstract Co-Author*)
Enji Y. Mallmann I (*Abstract Co-Author*)
Caio Cesar G. Amorim, MD (*Abstract Co-Author*)
Aline Cavalcante (*Abstract Co-Author*)
Charles E. Zurstrassen, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

Lymphatic interventions are increasingly relevant for managing postoperative lymphatic complications, such as refractory chylous leaks and lymphatic fistulas. Knowledge of lymphatic anatomy and access techniques—especially intranodal and thoracic duct embolization—is essential for procedural success. Image-guided lymphangiography remains a key diagnostic and therapeutic tool in interventional radiology.

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Introduction to Lymphatic Interventions & General Anatomy of the Lymphatic System. Lymphangiography Techniques and Access Routes, including Intranodal Lymphangiography, Transabdominal and Transvenous Thoracic Duct Access, Peripheral and Direct Puncture Techniques. Main lymphatic pathologies, Key lymphatic intervention and example of Lymphatic fistula identified on lymphangiography in a patient who underwent a robotic prostatectomy - followed by embolization of the right inguinal lymph node. Thoracic Duct Embolization after Lobectomy and Mediastinal lymphadenectomy. Thoracic Duct Embolization by retrograde catheterization.

IREE-16 BEYOND CLOSURE: RETHINKING PULMONARY ARTERIOVENOUS MALFORMATIONS, ENDOVASCULAR THERAPY, AND PERSISTENCE MANAGEMENT

Sai Swarupa R. Vulasala, MD (*Presenter*)
Naga Sai Rasagna Mareddy, MBBS (*Abstract Co-Author*)
Lourdhu Pragna Onteddu (*Abstract Co-Author*)
Aryan Sharma (*Abstract Co-Author*)
Sanjeeva P. Kalva, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Describe the type of PAVMs and review their imaging features2. Outline the patterns of persistent PAVM despite successful embolization.3. Detail the management of the persistent PAVM depending on the pattern of persistence. Pulmonary arteriovenous malformations (PAVM) are the fistulous connections between feeding pulmonary arteries and draining pulmonary veins without intervening capillary bed. They are commonly associated with hereditary hemorrhagic telangiectasia (HHT) syndrome and are discovered incidentally on a screening transthoracic contrast-enhanced echocardiogram. Further confirmation can be obtained with computed tomographic angiography or magnetic resonance angiography. Endovascular embolization of the feeding vesels can be performed to exclude the PAVM from the pulmonary circulation. Coils and plugs are the two most employed embolization agents in the current clinical practice. Despite successful embolization, the persistence of PAVM is not uncommon. Follow up imaging demonstrates filling of venous sac or draining vein through recanalization of the feeding artery, accessory feeding pulmonary artery, systemic arteries, or retrograde pulmonary venous filling. This presentation will focus on these patterns of persistence and their management.

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1. Types of PAVM2. Incidence and syndrome association3. Clinical presentation4. Imaging appearance of different types of PAVM5. Indications for intervention6. Currently employed endovascular therapies7. Types of PAVM persistence8. Various factors associated with persistence9. Management of the persistent PAVM

IREE-17 URETEROARTERIAL FISTULAS: INSTITUTIONAL EXPERIENCE IN DIAGNOSIS AND TREATMENT OF A RARE BUT INCREASINGLY COMMON HIGH MORBIDITY CONDITION

Danielle Cadoret, MD, BSc (*Presenter*)
Mohannad S. Behairy, MD (*Abstract Co-Author*)
Younes Jahangiri, MD (*Abstract Co-Author*)
Aaron Leach, MD, BA (*Abstract Co-Author*)
Chirag Patel, MD (*Abstract Co-Author*)
James J. Morrison, MD (*Abstract Co-Author*)
Bryan R. Mustert, MD (*Abstract Co-Author*)

TEACHING POINTS

• Review the pathogenesis, clinical presentation, risk factors and diagnosis of ureteroarterial fistulas (UAFs). • Compare endovascular and surgical treatment; understand the leading role of IR in practice. The following teaching points will be demonstrated using real institutional cases from 2018-2024: • Assess patient and situational needs for optimal peri-procedural care. • Describe technical aspects of endovascular repair. • Understand common and catastrophic complications of endovascular repair. • Understand clinical followup required for UAF and what to look for. • Know the specialties involved in multidisciplinary care of UAF, what to rely on them for, and Radiology (IR and DR)'s role.

TABLE OF CONTENTS/OUTLINE

1. Introduction to ureteroarterial fistulas (UAFs). 2. Pitfalls in Diagnosis: how to not miss a UAF. 3. UAF Treatment Options and Radiology's Role. 4. Real life cases: spot the UAF. 5. Case series demonstration on endovascular repair technique. 6. Peri, procedural and post-procedural complications with case series examples. 7. Know your plan: short and long-term followup post-procedure. 8. Know your friends: players involved in the multidisciplinary care of UAFs

IREE-18 IMAGE-GUIDED PERCUTANEOUS SHARP RECANALIZATION OF CENTRAL VENOUS OCCLUSION: TECHNIQUE AND PEARLS

Alex Stevens, DO (*Presenter*)
Zac Ohs (*Abstract Co-Author*)
Mario Dervishi, MD (*Abstract Co-Author*)
Nami R. Azar, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

Central venous occlusions (CVOs) are increasingly prevalent due to chronic catheter use, dialysis access, and malignancy. When conventional wire and catheter techniques fail, cross-sectional guided sharp recanalization provides a viable salvage technique. Knowledge of the technique, tools, and imaging features is essential for radiologists involved in diagnosis, management, and post-procedural evaluation. General radiologists should be familiar with patient selection, procedural steps, potential complications, and interpretation of follow-up imaging.

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Central venous occlusions (CVOs), particularly involving the thoracic central veins, are increasingly encountered in patients with chronic indwelling catheters, dialysis access, or malignancy. When conventional wire and catheter techniques fail, a cross-sectional guided sharp recanalization offers a viable and alternative option to restore venous patency and preserve critical vascular access. This educational exhibit reviews the fundamentals of sharp recanalization, with an emphasis on the cross-sectional technique, required tools, and key imaging features. Practical tips for general radiologists are provided to enhance understanding of this high-stakes technique, including recognizing candidates for referral, interpreting post-procedure imaging, and anticipating complications.

IREE-19 Y-90 OUTSIDE HCC AND MCRC: REVIEW OF Y-90 TREATMENT IN HEPATIC METASTATIC DISEASE

Steven Meng, MD (*Presenter*)
Sang Bum Lee (*Abstract Co-Author*)
June Kim (*Abstract Co-Author*)
Jamaal Benjamin, MD, PhD (*Abstract Co-Author*)
Moaz Choudhary, MD (*Abstract Co-Author*)
Seung Kwon Kim, MD (*Abstract Co-Author*)

TEACHING POINTS

1) Overview of current indications for Y-90 and treatment types. 2) Review of literature for uses in various cancers with hepatic metastases. 3) Explore case examples of Y-90 treatment in hepatic metastases.

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1) Current indications for Y-90 microspheres. 2) Treatment strategies based on tumor burden, clinical status, patient factors. 3) Overview literature for uses of Y-90 in various hepatic metastatic disease, exploring tumor response, safety profile, and overall survival. 4) Case example of breast cancer, renal cell carcinoma, and uveal melanoma with hepatic metastases. Additional cases may be added. References: 1) Feretis M, Solodkyy A. Yttrium-90 radioembolization for unresectable hepatic metastases of breast cancer: A systematic review. World J Gastrointest Oncol. 2020;12(2):228-236. 2) Alexander ES, Petre EN, Zhao K, et al. Yttrium-90 transarterial radioembolization of primary lung cancer metastases to the liver. J Vasc Interv Radiol. 2024;35(2):214-225.e2. 3) Kis B, Shah J, Choi J, et al. Transarterial yttrium-90 radioembolization treatment of patients with liver-dominant metastatic renal cell carcinoma. J Vasc Interv Radiol. 2017;28(2):254-259. 4) Bibok A, Kis B, Frakes J, et al. Yttrium-90 radioembolization for liver-dominant metastatic prostate cancer: a case series. J Vasc Interv Radiol. 2022;33(9):1061-1065. 5) Puleo L, Agate L, Bargellini I, et al. Yttrium-90 transarterial radioembolization for liver metastases from medullary thyroid cancer. Eur Thyroid J. 2022;11(6):e220130. 6) Jia Z, Jiang G, Zhu C, Wang K, Li S, Qin X. A systematic review of yttrium-90 radioembolization for unresectable liver metastases of melanoma. Eur J Radiol. 2017;92:111-115.

IREE-20 HOW TO PERFORM PERCUTANEOUS CHOLECYSTOLITHOTOMY: A REVIEW OF PROCEDURAL INDICATIONS, TOOLS AND STEPS, AND POST-PROCEDURE MANAGEMENT

Sang Bum Lee (*Presenter*)
Steven Meng, MD (*Abstract Co-Author*)
June Kim (*Abstract Co-Author*)
Akram Sadeghi, MD (*Abstract Co-Author*)
Seung Kwon Kim, MD (*Abstract Co-Author*)

TEACHING POINTS

1) Overview procedural tools and steps commonly used in percutaneous cholecystolithotomy for calculous cholecystitis. 2) Review indications for percutaneous cholecystolithotomy based on size and number of stones. 3) Review management algorithms for percutaneous cholecystolithotomy. 4) Discuss outcomes for percutaneous cholecystolithotomy in current literature.

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1) Discussion of current indications and contraindications for percutaneous cholecystolithotomy. 2) Overview cholecystolithotomy tools including Spyglass, electrohydraulic lithotripsy, laser, and stone basket. 3) Overview procedural steps, including discussion of size- and number-based approach. 4) Discuss management algorithm, including considerations and timing for re-intervention or tube removal. 5) Review case example of cholecystolithotomy. 6) Review current literature on outcomes of cholecystolithotomy. References: 1) Kim SK, Mani NB, Darcy MD, Picus DD. Percutaneous cholecystolithotomy using cholecystoscopy. Tech Vasc Interv Radiol. 2019;22(3):139-148. 2) Stirrat J, Patel NR, Stella SF, Mafeld S, Ho CS, Shlomovitz E. Safety and efficacy of percutaneous gallstone extraction in high-risk patients: an alternative to cholecystectomy or long-term drainage? J Am Coll Surg. 2021;232(2):195-201. 3) Binh NT, Ly NTL, Hien PN, Linh LT, Lenh BV, Duc NM. Percutaneous transhepatic cholecystolithotomy by holmium laser for non-high-risk patients with symptomatic gallbladder stones. Med Arch. 2022;76(1):29-33.

IREE-21 OPTIMIZING BILIARY DRAINAGE: A TECHNICAL AND IMAGING REVIEW OF ARTICULATED PLASTIC STENT USE FOR STRICTURE MANAGEMENT

Mary Foster (*Presenter*)
Jesus Beltran-Perez, MD (*Abstract Co-Author*)
Jorge E. Lopera, MD (*Abstract Co-Author*)

TEACHING POINTS

Articulated plastic biliary stents (APBS) provide a valuable alternative for percutaneous transhepatic drainage (PTBD) of complex hilar strictures. Obstruction at the hilum is challenging due to complexity of ductal anatomy, often requiring two or more PTBD.APBS provide an advantage of achieving drainage of two or more biliary ducts using a single percutaneous access.APBS allows achieving a very large internal diameter at area of stenosis while using smaller drain externally, improving patient comfort and limiting complications.APBS may result in decreased complications associated with blockage of smaller bile ducts by large bore catheters.

TABLE OF CONTENTS/OUTLINE

Intro to APBS. Indications for APBS. Possible stent configurations (T-, Y-, and double barrel configurations) and the common applications for each. Stepwise technique and materials needed to fabricate articulated plastic biliary stents. Patient Case 1: Deployment of APBS for left-sided biliary duct. Patient Case 2: Deployment of APBS for right-sided biliary duct. Patient Case 3: Challenging stent exchange. Complications of APBS.

IREE-22 ENTERIC ACCESS: PRACTICAL GUIDE FOR THE INTERVENTIONAL RADIOLOGIST

Kenneth N. Huynh, DO (*Presenter*)

TEACHING POINTS

1. Review the relevant gastrointestinal anatomy, indications/contraindications, and equipment used for percutaneous enteric access. 2. Present different techniques to percutaneous enteric access, including push-/pull-type gastrostomy, gastrojejunostomy, direct jejunostomy, and transesophageal gastrostomy. 3. Review technical considerations, post-procedural care, and complications related to percutaneous enteric access.

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Optimal nutrition is essential to the recovery and quality of life in patients whose oropharyngeal or gastrointestinal anatomy, or function, precludes safe oral intake. The prevalence of dysphagia from stroke and neurodegenerative disease, head-and-neck or upper-GI malignancies, severe gastroparesis, and post-surgical or radiation changes is rising, increasing the demand for durable access for enteral nutrition. Image-guided percutaneous techniques can circumvent the limitations of endoscopic or surgical approaches, accommodate hostile abdomens, and allow precise placement in altered anatomy. Familiarity with different enteric access options—gastrostomy, gastrojejunostomy, jejunostomy, and trans-esophageal gastrostomy—allows interventional radiologists to directly impact patient outcomes. This educational exhibit will (1) review relevant GI anatomy and indications for enteric access, (2) present different techniques for enteric access and considerations for successful placement and exchange, and (3) discuss post-procedural care such as routine tube maintenance, troubleshooting (peristomal leakage, buried bumper, clogging), and complications such as hemorrhage, aspiration, and gastric or duodenal obstruction.

IREE-23 TIPS FOR EVOH EMBOLIZATION: EVOH IN THE PORTOVENOUS SYSTEM

Alexander Weinstein, BS (*Presenter*)
Amin Golamy-Sadig (*Abstract Co-Author*)
John A. Walker, MD, PhD (*Abstract Co-Author*)
Jorge E. Lopera, MD (*Abstract Co-Author*)
Carlos B. Ortiz, MD (*Abstract Co-Author*)

TEACHING POINTS

Review imaging and technical aspects of ethylene-vinyl alcohol copolymer (EVOH) (LAVA and Onyx) embolization for the treatment of bleeding varices. Recognize cases where EVOH embolization can effectively embolize varices. Understand the importance of catheter positioning to avoid potential complications when using EVOH in the

portovenous system. Technical review of different access techniques for embolization in the portovenous system.

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Introduction to EVOH embolization embolic properties, prior literature, preparation, and current use of LAVA and Onyx. Review variceal anatomy and access required for embolization gastroesophageal, coronary, splenic, gastric, splenorenal shunts, and paraumbilical veins. Technical steps to prepare for safe EVOH embolization EVOH concentration selection, proper mixing, catheter stability, and secure microcatheter position for safe embolization. Review important imaging considerations while performing EVOH embolization for proper visualization increasing fluoroscopy dose, collimation, magnification, adequate mixing of EVOH, and use of roadmaps in dense EVOH. Various cases to demonstrate teaching points, procedural steps, and imaging considerations TIPS creation with embolization, transhepatic access, percutaneous varix access, and femoral/jugular access for splenorenal shunts. Outcomes, Limitations, and Complications. Conclusion: EVOH embolization can serve as a quick and effective method for embolization of varices in the portovenous system. There are important technical and procedural considerations for application of this novel technique in the treatment of variceal bleeding.

IREE-24 MECHANICAL THROMBECTOMY FOR PE: TOOLS AND LESSONS FROM COMPLICATIONS

Matteo Conte, MD (*Presenter*)
Anne Sailer, MD (*Abstract Co-Author*)
Hamid R. Mojibian, MD (*Abstract Co-Author*)
Joshua Cornman-Homonoff, MD (*Abstract Co-Author*)

TEACHING POINTS

Mechanical thrombectomy for PE is a fast-evolving technique that delivers rapid hemodynamic improvement. As devices expand the scope of treatment, understanding their specific roles and associated risks becomes critical. This case-based exhibit follows the procedural sequence, highlighting tool selection and complication management.

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(1) Tools. Mechanical thrombectomy requires selecting devices based on clot burden, location, and anatomy. Teaching points cover pros and cons of widely used tools, each designed for specific pulmonary embolism niches. (2) Access Site. Initial femoral or jugular venous access carries risks like arterial puncture, pseudoaneurysm, and retroperitoneal hematoma. Sheath insertion may dislodge iliofemoral DVT or cause vessel injury. Teaching points address recognition, prevention, and management. (3) Crossing the Heart. Passing wires and catheters through the right atrium and ventricle can cause arrhythmias, valvular trauma, or pericardial effusion. Teaching points highlight wire selection, crossing technique, and fluoroscopic or hemodynamic cues for early injury detection. (4) When the Tool Becomes the Threat. Device-related pulmonary artery complications include vessel perforation (from direct injury or aggressive aspiration) and embolic dislodgement (from incomplete aspiration or clot adhesion). Teaching points focus on recognizing, managing, and preventing such events. (5) Bleeding. Post-procedural bleeding may result from access site issues, anticoagulation mismatch, or unrecognized injuries—leading to hemoptysis, pleural effusions, or instability. Teaching points emphasize targeted imaging, and timely intervention.

IREE-25 BRIDGING VISUAL AND RADIOLOGIC GUIDANCE: THE ROLE OF ENDOSCOPES IN INTERVENTIONAL RADIOLOGY

Mehdi Siddiqui, MD (*Presenter*)
Fei Ye (*Abstract Co-Author*)
Novin Nekoui, BA (*Abstract Co-Author*)
John A. Walker, MD, PhD (*Abstract Co-Author*)
Samy Al-Bayati, MD (*Abstract Co-Author*)
Jorge E. Lopera, MD (*Abstract Co-Author*)

TEACHING POINTS

Minimally invasive techniques such as endoscope-guided interventions can be utilized in the management of a wide variety of complex conditions. By combining radiologic imaging with high-resolution endoscopic visualization, these techniques can enhance diagnostic accuracy and targeted therapy. Here, we present a series of cases highlighting the versatility of endoscope-guided interventions in the management of gastrointestinal and urologic conditions.

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Endoscopic guidance can be crutial in geniturinary interventions for obtaining access to the ureter from the bladder, removal of ureteral stents that are in difficult positions or cannot be easilty retracted Using endoscopes in the hepatobiliary cases can help both in diagnosis and treatment of biliary disease In settings of necrotizing pancreatitis, endoscopes can be used to evaluate for necrotic debris that are otherwise not able to be appreciated using flouroscopy aloneIn cases where imaging is equivacal, endoscopes can be a great tool for better ellucidate a diagnosis

IREE-26 COMPLEX IVC FILTER RETRIEVAL

Zachary Fitzgerald, BS (*Presenter*)
Madison Mills, BS (*Abstract Co-Author*)
Peyton Hopkins (*Abstract Co-Author*)
Dan F. Laney IV, MD (*Abstract Co-Author*)
Alexandra H. Fairchild, MD (*Abstract Co-Author*)
Bahri Ustunsoz, MD (*Abstract Co-Author*)
Hector Ferral, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand key anatomic and technical factors that complicate inferior vena cava (IVC) filter retrieval. Review retrieval techniques and tools tailored to complex scenarios. Have a clearly defined backup strategy and recognize the 'point of no return' to safely manage challenging filter retrievals.

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Overview of Complex IVC Filter Retrieval: Common complicating factors: Filter migration, Filter Tilt, IVC Invasion Fractured or damaged filters Dwelling length and presence of clot Median dwell time is 196 days for successful removal vs 375 days for failed removal Filter Classification: Identifying open vs closed cell filters Closed cell filters often require more advanced techniques for removal and certain filters are more prone to fracture Advanced Retrieval Techniques: Techniques will be demonstrated through case examples & 9;& 9;Hangman technique Loop Snare With Single Access / Realignment Technique Tilted Filter-Straightening Single Access / Stiff Wire-Displacement Technique Wire Loop-and-Forceps / A modified version of the Sling Technique Rigid Bronchoscopy Forceps, Thermal, Etc / Dissection Technique& 9;& 9; Filters that can be removed from the femoral approach Procedural Planning and post-operative management: & 9;& 9;Always have a back up plan& 9;& 9; Knowing your point of "No return" Follow suspected complications closely with imaging

IREE-27 PROJECTION-BASED APPROACH TO PULMONARY ANGIOGRAPHY: NAVIGATING EACH SEGMENT

Matteo Conte, MD (*Presenter*)
Anne Sailer, MD (*Abstract Co-Author*)
Joshua Cornman-Homonoff, MD (*Abstract Co-Author*)
Hamid R. Mojibian, MD (*Abstract Co-Author*)

TEACHING POINTS

Cutting edge pulmonary interventions have increased the need for precise pulmonary angiography over time. However, fluoroscopic interpretation is often limited by misleading 2D projections that compromise navigation and accuracy. Mastering oblique views and real-time recognition of vascular landmarks enhances catheter control,

segmental access, and procedural success. By combining multiplanar reconstructions (MPR) with live angiography, interventionalists can anticipate anatomical variation, troubleshoot deceiving views, and avoid critical errors during high-risk procedures.

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(1) Mastering Projectional Imaging in Pulmonary Angiography. Proper use of oblique views resolves ambiguous fluoroscopic appearances. This section introduces "deceiving views" and demonstrates troubleshooting through C-arm rotation and image alignment. Practical examples show how to visualize hidden vessels and distinguish overlapping structures. (2) Segmental Navigation and Superselection: A Systematic Approach. A step-by-step method for consistent pulmonary segment selection is presented. Each segment is reviewed using a multimodal workflow: axial CTA, preferred-projection CTA, 3D reconstruction, and angiographic correlation. This sequence connects static imaging to live navigation using anatomical reasoning. (3) Case-Integrated Learning. Clinical cases illustrate segmental access, projection planning, and superselection across diverse pathologies (e.g., AVMs, PE, aneurysms). Selected examples highlight how missteps in planning lead to delays or suboptimal views, reinforcing the value of structured angiographic technique.

IREE-28 HOW CAN IR CONTRIBUTE TO THE MANAGEMENT OF VASCULAR COMPLICATIONS POST PANCREATICODUODENECTOMY?

Hiroaki Kato, MD, PhD (*Presenter*)
Masashi Fujimori, MD, PhD (*Abstract Co-Author*)
Yuki Yamaoka (*Abstract Co-Author*)
Ryosuke Shima, MD (*Abstract Co-Author*)
Yuki Omori (*Abstract Co-Author*)
Hikari Fukui (*Abstract Co-Author*)
Takanori Kokawa, MD (*Abstract Co-Author*)
Naritaka Matsushita, MD (*Abstract Co-Author*)
Takashi Yamanaka, MD (*Abstract Co-Author*)
Hajime Sakuma, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Vascular complication is one of the fatal complications after pancreaticoduodenectomy and surgical repair is challenging. This educational exhibit will outline the vascular complications post pancreaticoduodenectomy and discuss how IR can treat and save the patients with the vascular complications after pancreaticoduodenectomy. -To review the anatomy of abdominal organs and vessels post pancreaticoduodenectomy -To identify common vascular complications post pancreaticoduodenectomy -To discuss minimally invasive treatment options to manage vascular complications post pancreaticoduodenectomy

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1. Anatomy of Abdominal Organs and Vessels post Pancreaticoduodenectomy a) Location of Reconstructed Abdominal Organs b) Anatomy of Arteries and Portal Vein c) Vessels Potentially Work as Collateral Vessels for Critical Organs 2. Arterial Complications Post Pancreaticoduodenectomy a) Symptoms b) Location of Involved Arteries c) Computed Tomography Images of Arterial Complications 3. Endovascular Treatment for Arterial Complications a) Coiling b) Stent Graft Placement c) Endovascular Treatment with Drainage for Bile/Pancreatic juice leakage 4. Venous Complications Post Pancreaticoduodenectomy a) Symptoms b) Extrahepatic Portal Venous Stenosis/Occlusion c) Computed Tomography Images of Venous Complications 5. Endovascular Treatment for Venous Complications a) Stenting i. Percutaneous Transhepatic Approach ii. Under Laparotomy b) Thromectomy c) Anticoagulant or Antiplatelet Therapy after Stenting

IREE-29 HEMOPTYSIS IN LUNG CANCER: AN OVERVIEW OF ENDOVASCULAR MANAGEMENT

Antoine Khalil, MD, PhD (*Presenter*)
Waqaas Mohammad (*Abstract Co-Author*)
Ahmed Tibaoui (*Abstract Co-Author*)
Salma Attia (*Abstract Co-Author*)
Khaled Kadri (*Abstract Co-Author*)
Valerie Gounant (*Abstract Co-Author*)

TEACHING POINTS

The knowledge of the pathophysiology and natural history of bronchial cancer provides insight into the mechanisms of hemoptysis More than identification of the BA network, the CT-angio, by showing signs in favor of an erosion of the pulmonary artery, i.e. necrosis and visualization of a false aneurysm of the PA, is the cornerstone examination in the pre-therapeutic workup Indications of endovascular treatment are guided by the rate (>200mL/24-48h), the tolerance, the presence of CT-angio signs of PA erosion, and in preventive situation in case of necrotizing large cancer before chemotherapy Covered stent is the treatment of choice of proximal PA injuries however, coils or liquid are used for distal PA The recurrencies of hemoptysis after treatment could be in relation with a different mechanism, ectopic systemic artery or progression of the disease

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Introduction Lung tumor vascularization Physiopathology of hemoptysis in patients with lung cancer Role of CT-angiography in the pre endovascular treatment workup Indication of endovascular embolization Active hemoptysis: rate/24-48h; tolerance of hemoptysis Preventive treatment: lung cancer necrosis A- Systemic artery embolization: Technique (bronchial artery embolization "BAE" and systemic non bronchial artery embolization) Results of Systemic Artery Embolisation How to deal with recurrences or failures? B- Pulmonary artery management: Technique (Pulmonary artery occlusion "PAO" and Pulmonary artery stenting "PAS") Results of Pulmonary artery management How to deal with recurrences or failures? Clinical Cases Conclusion

IREE-30 WHAT TO DO WHEN "URINE" TROUBLE: GENITOURINARY CATHETER COMPLICATIONS AND THEIR MANAGEMENT

Caleb Walker, DO (*Presenter*)
Kamil Bahit, MD (*Abstract Co-Author*)
Lap-Heng Keung, MD (*Abstract Co-Author*)
Jaimin D. Shah, MD (*Abstract Co-Author*)

TEACHING POINTS

1: Genitourinary catheters are common devices to treat a number of genitourinary disorders. Because of their wide-spread use, familiarity with the types of catheters, their complications and typical presentations, as well as their management, is important to understand for both the diagnostic radiologist and interventional radiologist alike. 2: Imaging evaluation may involve a range of modalities, including ultrasound, CT, MRI, and Nuclear Medicine. Fluroroscopy is a mainstay in diagnosing and managing complications. 3: Common catheter complications may arise from catheter itself, such as malfunction, obstruction, dislodgement and malposition. Other issues may arise outside of the catheter, such as pain along the catheter track, hematuria, or infection. Additional catheter complications include injury to the collecting system which may result in urine leaks, injury to the renal vasculature resulting in pseudoaneurym or arteriovenous fistula formation, or injury to adjacent organs during placement. 4: Complications are typically managed via catheter exchange, upsizing, repositioning, or converting to alternative diversion methods.

TABLE OF CONTENTS/OUTLINE

Introduction. Types of Catheters. Indications and Contraindications for Placement. Procedure Care and Chronic Catheter Management Evaluation of Potential Complications Imaging Complications and Management Catheter Malfunction and Obstruction Malposition and Dislodgement Hemorrhage Infection Pain, Discomfort, and Urinary Symptoms Pseudoaneurysm Formation Urine LeakAdjacent Organ Injury, Fistula Formation and Pneumothorax Five Cases Illustrating Complications and Management Citations

IREE-32 TRICUSPID VALVE VEGETECTOMY USING TRANSESOPHAGEAL OR INTRACARDIAC ECHOCARDIOGRAPHY GUIDED LARGE BORE MECHANICAL ASPIRATION: AN INSTITUTIONAL EXPERIENCE UTILIZING A NOVEL TECHNIQUE AND THE EVOLVING ROLE OF IR IN THE MULTIDISCIPLINARY CARE OF PATIENTS WITH RIGHT SIDED INFECTIVE ENDOCARDITIS

Behairy, MD (*Presenter*)
Zachary T. Vandeveer, MD (*Abstract Co-Author*)
Dylan Goldsmith, MD (*Abstract Co-Author*)
Christopher D. Swenson, MD (*Abstract Co-Author*)
Jarrod MacFarlane, DO (*Abstract Co-Author*)
James J. Morrison, MD (*Abstract Co-Author*)

TEACHING POINTS

Infective endocarditis, particularly drug use associated right-sided infective endocarditis, is a condition with high rates of morbidity and mortality requiring complex multidisciplinary care For high-risk surgical patients with tricuspid valve (TV) vegetations, large-bore mechanical aspiration offers a viable, minimally invasive treatment alternative. Institutional experience demonstrates the feasibility, safety, and clinical success of echocardiography-guided endovascular tricuspid valve vegetation debulking in selected patients with right-sided IE.

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Overview of Infective Endocarditis - Epidemiology, pathophysiology, and clinical presentation of right-sided IE - Risk factors and complications. Unique challenges with drug use associated IE Therapeutic Approaches - Medical and surgical management of TV vegetations - Percutaneous vegetectomy: vacuum-assisted and mechanical aspiration techniques. Indications, considerations and outcomes Institutional Experience and Case Series - Technical insights using the Inari FlowTriever system - Periprocedural considerations in patient selection - Outcomes and lessons learned from 8 patients, including special scenarios such as pregnancy, prosthetic valves and intracardiac devices Conclusions - Evolving role of interventional radiology in multidisciplinary care - The need for more robust studies evaluating short- and long-term outcomes of percutaneous vegetectomy.

IREE-33 TARGETED, MINIMALLY INVASIVE, EFFECTIVE: PROSTATIC ARTERY EMBOLIZATION FOR BENIGN PROSTATIC HYPERPLASIA

Serhat Akis, MD (*Presenter*)
Melike Z. Akis, MD (*Abstract Co-Author*)
Raif Can Yarol, MD (*Abstract Co-Author*)
Afonso Q. Fonseca, MD (*Abstract Co-Author*)
Tiago Bilhim, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand benign prostatic hyperplasia (BPH) as a common cause of bladder outlet obstruction in aging men, presenting with storage (nocturia, urgency, frequency) and voiding (hesitancy, weak stream, incomplete emptying) symptoms that require careful differentiation from other urologic conditions. Prostatic artery embolization (PAE) is a minimally invasive option for moderate to severe BPH-related symptoms with a growing role in current guidelines. Learn comprehensive pre-procedural assessment for PAE, including uroflowmetry, symptom scoring (IPSS and QoL), prostate volume, erectile function evaluation, PSA, and CT angiography for vascular mapping. Recognize the technical demands, including accurate artery identification within complex pelvic anatomy, and the role of cone-beam CT and advanced embolization techniques. PAE is a safe with fewer complications than surgery most of which resolve on their own.

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Introduction Overview of BPH pathophysiology, symptomatology, conventional treatments, and the emerging role of PAE as a minimally invasive alternative. PAE Candidacy: Patient selection criteria based on symptom severity, anatomical suitability, and surgical risk profile. Pre-procedural Evaluation Clinical, functional, and imaging assessments required for appropriate PAE planning. Techniques Detailed overview of PAE steps, vascular anatomy, image guidance, and advanced methods to enhance embolization safety and efficacy. Complications Common post-PAE adverse events, their management, and strategies to prevent non-target embolization. Comparison Clinical outcomes, complication rates, and advantages of PAE versus surgery.

IREE-34 3D DIFFERENTIABLE GAUSSIAN-BASED STRATEGY FOR CRYOABLATION PLANNING IN LIVER TUMORS

Xiaoyu Huang (*Presenter*)

TEACHING POINTS

1. A novel preoperative planning algorithm using 3D differentiable-Gaussians was developed to optimize hepatic tumor cryoablation strategies.2. The algorithm differentiates between tumors =5 cm and >5 cm, offering complete ablation plans for smaller tumors and combined complete/debulking plans for larger ones.

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Purpose: This study proposes a preoperative planning algorithm for hepatic tumor cryoablation based on 3D differentiable-Gaussian-based planning strategy. The algorithm aims to provide complete or debulking ablation plans for different tumors. The safety was evaluated. Materials and Methods: A total of 47 tumors were included. Tumors with diameters =5 cm were planned for complete ablation, while those >5 cm were approached using a combined complete and debulking strategy. The algorithm automatically optimized puncture paths and generated multiple feasible plans. Clinicians rated the top five plans and selected the optimal one. The safety of these selected plans were assessed. Results: The median physician score for the selected plans was 1.50 (IQR: 1.00-1.50). For tumors <3 cm, the algorithm achieved a 100% complete ablation rate. For tumors 3-5 cm, complete coverage and complete ablation rates were 94.44% and 72.22%, respectively. For tumors >5 cm, complete coverage and complete ablation rates were 23.81% and 14.29%, respectively. Conclusion: A novel 3D differentiable-Gaussian-based planning strategy was proposed for hepatic tumor cryoablation. The algorithm-generated plans demonstrated favorable safety upon clinical evaluation.

IREE-35 IRREVERSIBLE ELECTROPORATION OF LIVER TUMORS NEAR CRITICAL STRUCTURES: A PRECISION IMAGE-GUIDED TECHNIQUE

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Gaby E. Gabriel, MD (*Abstract Co-Author*)

TEACHING POINTS

Irreversible electroporation (IRE) is a non-thermal ablation technique particularly suited for liver tumors located near critical structures such as bile ducts, portal veins, and hepatic arteries. Unlike thermal methods, IRE minimizes collateral damage, making it ideal for anatomically challenging locations. Successful outcomes depend on meticulous pre-procedural imaging assessment, precise electrode placement, and ECG-gating to deliver energy safely and effectively. Familiarity with unique post-IRE imaging appearances is essential for accurately evaluating treatment response and differentiating expected changes from residual or recurrent tumors.

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1. IRE mechanism and advantages over thermal ablation for challenging liver tumor locations 2. Patient selection and pre-procedural imaging assessment (Identifying tumors near vital structures using CT/MRI) 3. Technical approach: electrode configuration, parameters, and ECG-synchronization 4. Post-procedure imaging and follow-up protocols 5. Case demonstrations: Step-by-step review of complex case(s) with pre- and post-ablation imaging 6. Outcomes and complication avoidance strategies

IREE-36 CLEARLY VISUALIZING WHAT IS CHALLENGING TO SEE: THE TRANSFORMATIVE POTENTIAL OF ARTIFICIAL INTELLIGENCE-BASED SEGMENTATION IN IMAGE-GUIDED LIVER TUMOR THERAPIES

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Kristy K. Brock, PhD (*Abstract Co-Author*)
Bruno C. Odisio, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Liver and tumor contouring (segmentation) is essential in many aspects of image-guided liver tumor therapies within radiation, surgical, and interventional oncology. Liver tumor segmentation is particularly challenging due to tumor heterogeneity. 2. Segmentation tasks have historically entailed slice-by-slice manual contouring tumors on a medical image; a time-consuming and repetitive task for clinicians that is prone to inter-observer variation in results. 3. Artificial intelligence (AI)-based segmentation can streamline this process, enhancing both patient care and clinical workflow across specialties. Given this anticipated impact, clinicians should gain a foundational understanding of AI-based segmentation tools (models). 4. Developing AI-based segmentation models for liver tumors requires many high-quality labeled images for training, validation, and testing. 5. Before use in patient care, model performance must be assessed with quantitative, qualitative, and patient outcomes-based metrics. Continuous human oversight is required to assess for model failure. Nevertheless, this development process is worthwhile, as these models can offer high-quality, consistent outputs that enhance precision and reproducibility in image-guided therapies.

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1. Exploring the World of Therapeutic Possibilities with Liver Segmentation 2. If it's not Measured, it's Just Maybe: Leveraging Segmentation to Overcome Limitations in Visual Ablative Margin Assessment 3. Know How Much You Grow: Preparing the Liver for Surgery with Portal Vein Embolization 4. The Basics of AI-Based Segmentation Model Development 5. Using Multi-Faceted Approaches to Evaluate Model Performance

IREE-37 DIRECT TO THE POINT: DIPS FOR PORTAL HYPERTENSION COMPLICATIONS IN CANCER PATIENTS: AN ALTERNATIVE APPROACH TO CONVENTIONAL INTERVENTIONS

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TEACHING POINTS

Portal hypertension is a common complication in cancer patients, defined by an increased pressure gradient between the portal and systemic veins. Associated complications include variceal bleeding, refractory ascites, and hepatic hydrothorax. Transjugular Intrahepatic Portosystemic Shunt (TIPS) has historically been employed to manage these complications. However, conventional TIPS can be technically challenging or unfeasible in cancer patients due to anatomical variance, tumor invasion, or hepatic vein thrombosis. Direct Intrahepatic Portosystemic Shunt (DIPS), which uses ultrasound and fluoroscopic guidance to access the portal vein directly from the inferior vena cava, has emerged as an alternative in these complex scenarios. This educational exhibit shows the role of DIPS in cancer, where conventional methods are not an option.1. Recognize clinical scenarios in oncology where conventional TIPS is not feasible, and DIPS becomes the preferred approach. 2. Understand essential imaging protocols, including ultrasound and intravascular ultrasound (IVUS), for planning and performing DIPS procedures. 3. Implement a structured algorithm for screening, timely identification, and management decisions for portal hypertension in cancer patients that would require appropriate intervention (TIPS vs. DIPS) based on individual anatomical and clinical factors.

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1. Introduction to DIPS: Rationale and Clinical Indications in Cancer Patients 2. Clinical Decision-Making : Identifying Candidates for DIPS vs. TIPS 3. Essential Imaging and Procedural Protocols: Ultrasound and IVUS-Guided Technique 4. Clinical Impact: Evidence from Institutional Experience

IREE-38 COMMAND AND CONTROL: NAVIGATING LIVER ABLATION WITH ARTIFICIAL INTELLIGENCE AT YOUR SIDE

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Iwan Paolucci, PhD (*Abstract Co-Author*)
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TEACHING POINTS

Thermal ablation software supports the full procedural workflow, from procedure planning to case-end margin assessment; thereby enhancing consistency, reproducibility, and treatment precision. Accurate preprocedural planning and probe placement verification are critical for effective ablation. Software-based tools offer 3D visualization and spatial feedback that help clinicians select optimal trajectories and probe positions. Software-based assessment during CT-guided thermal ablation of liver tumors significantly improves the minimal ablative margin (MAM) compared to visual inspection, as demonstrated in the COVER-ALL randomized clinical trial, supporting its potential integration as a standard component of liver ablation workflows. The minimal ablative margin (MAM) is a key predictor of local tumor progression after liver ablation. Several software platforms have been developed to quantify the MAM using (artificial intelligence) AI-enhanced auto-segmentation and image registration techniques. Minimal ablative margin computation requires pre- and post-ablation images to be spatially aligned, which is achieved through image-to-image registration. Because liver deformation is common during ablation, deformable image registration—particularly biomechanical or AI-based—offers improved accuracy and anatomical plausibility over rigid techniques.

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A New Player Enters the Game: Software-based methods in Liver Ablation Planning, Targeting, and Confirming: One Software, Many Moves Planning and Targeting — Getting It Right from the Start Precision Wins: From Visual Guesswork to Quantified Coverage Summary of Evidence on 3D Software for MAM Assessment

IREE-39 PERSONALIZED YTTRIUM-90 DOSIMETRY: A PRACTICAL FRAMEWORK FOR INTENT-BASED RADIOEMBOLIZATION

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TEACHING POINTS

1. Define personalized dosimetry and key recommendations. 2. Present a stepwise approach to Yttrium-90 (Y-90) transarterial radioembolization (TARE) based on clinical factors and treatment goals. 3. Review imaging findings and clinical scenarios with pictorial examples.

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Background : TARE using Y-90 glass or resin microspheres is a standard treatment for primary liver malignancies (hepatocellular carcinoma and cholangiocarcinoma) and metastatic disease, (colorectal cancer and neuroendocrine tumors). Emerging evidence supports that personalized dosimetry improves outcomes and reduces toxicity. Recent expert guidelines emphasize the role of incorporating personalized dosimetry into treatment planning. Introduction to Personalized Y-90 Dosimetry 1. Brief history of dosimetry development in Y-90 TARE. 2. Definitions and methods for activity prescription. 3. Comparison of glass vs. resin microspheres. 4. Patient eligibility criteria, including Child-Pugh Score and ALBI grade. Treatment Intent 1. Curative a) Radiation segmentectomy. b) Radiation lobectomy. 2. Palliative a) Multifocal unilobar disease. b) Multifocal bilobar disease. c) Macrovascular invasion. Pretreatment Planning and Technique 1. Importance of multidisciplinary team evaluation prior to TARE. 2. Dosimetry thresholds tailored to microsphere type and tumor biology. 3. Technical considerations: a) Mapping angiography. b) Importance of beam CT for accurate targeting and dosimetry. c) Lung shunt fraction: planar imaging and SPECT/CT. d) Tumor-to-normal liver ratio. e) Tools for multicompartment dosimetry. Treatment Verification and Post-TARE Imaging Protocols

IREE-40 MANAGEMENT OF COMPLICATIONS POST LUNG RADIOFREQUENCY ABLATION- HOW TO FIND AND HOW TO TREAT

Yuki Yamaoka (*Presenter*)
Masashi Fujimori, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Radiofrequency ablation (RFA) has been used as a local treatment for primary and metastatic lung tumors. The complication rate has been reported up to 50%. Though most of these complications were pneumothorax, fatal complications were also reported. Pulmonary artery aneurysm, bronchopleural fistula, and air embolism are such rare but potentially fatal complications after lung RFA. This educational exhibit will outline the complications post lung RFA and discuss how to find such fatal complications and manage the patients. -To review the preprocedural preparation, treatment procedure, and post-treatment follow-up of lung RFA -To outline the complications post lung RFA -To discuss treatment options to manage complications post lung RFA, including rare but potentially fatal complications.

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1. Treatment Flow of Lung RFA a) Preprocedural Preparation b) Treatment Procedure c) Post-treatment Follow-up 2. Complications post Lung RFA a) Definition of Major/Minor Complications b) Mortality Rate post Lung RFA c) Minor Complications d) Major Complications 3. Treatment for Frequently Reported Complications post Lung RFA a) Pneumothorax b) Bleeding c) Pleuritis 4. Treatment for Rare but Potentially Fatal Complications a) Pulmonary Artery Aneurysm i) Symptoms ii) Image findings iii) Treatment b) Air Embolism i) Symptoms ii) Image findings iii) Treatment

IREE-41 STATE OF THE FIELD: INTERVENTIONAL RADIOLOGY & SPACE

Orhun Davarci (*Presenter*)
Roberto R. Galuppo Monticelli, MD (*Abstract Co-Author*)

TEACHING POINTS

With NASA having plans to send a manned mission to Mars in 2030s, a significant question have arisen within the aerospace medicine and the medical community at large as to how to provide urgent and emergent medical care to the astronauts on long term missions. It has been proposed that rising field of interventional radiology (IR) would be best suited for role of being the onboard physician to address the cases that can’t be managed remotely by medical expertise on earth. However, there are still many factors to be considered with IR as well. As the field rapidly expands and increases its breadth & depth of the performed procedures, limitations caused by the spaceflight must be carefully considered. These include increased difficulty of moving objects with higher mass, and proper management of fluids due to IR catheterization to avoid contamination within the spacecraft. 1- To review recent IR related advancements with respect to space exploration.2- To investigate the qualities of IR needed for effective and versatile medical care in space.3- To understand the potential and bright future as well as limitations of IR applications in space.

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1- Latest developments using image guided interventions in space, advantages & limitations.2- Assessment of space-flights that would benefit from possessing IR onboard the most.3- Space medicine considerations for IR physicians and procedures.4- Interventional procedures of US-only procedures vs X-ray only procedures in IR.5- Differences in engineering requirements between basic surgical care vs basic IR procedural care systems.6- Take home points

IREE-42 VEINS TO THE RESCUE: TRANSCATHETER ARTERIALIZATION OF DEEP VEINS FOR NO-OPTION CHRONIC LIMB-THREATENING ISCHEMIA

Kausthubh Hegde, MBBS (*Presenter*)

TEACHING POINTS

1. Understand the concept and clinical need for deep venous arterialization (DVA) in patients with no-option chronic limb-threatening ischemia (CLTI). 2. Review procedural steps and devices available for DVA - including both dedicated systems (LimFlow) and off-the-shelf/commercially available tools. 3. Compare short and long-term clinical outcomes, including amputation-free survival, limb salvage, wound healing, and cost-effectiveness. 4. Highlight the evolving evidence base and potential future directions, including health economics and broader device availability.

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1. Introduction to Peripheral Artery Disease and CLTI • Definition & burden of disease• Limitations of below-the-knee revascularization options 2. Pathophysiologic Rationale for DVA • ‘Desert foot’ physiology • Mechanism: Using venous channels to bypass arterial occlusions • Historical background • How DVA targets small artery disease 3. Techniques and Tools• Dedicated System: LimFlow device • Commercial/Off-the-shelf devices • Technical steps: AV fistula creation, valvulotomy, stent deployment• Imaging and procedural guidance pearls4. Clinical Outcomes• PROMISE I & II, ALPS study: Feasibility and efficacy with LimFlow Device•DEPARTURE study: Efficacy with non-dedicated tools• Safety, patency, and reintervention rates• Comparative effectiveness, cost effectiveness, and health system impact: TADV vs natural history (CLariTI Registry)• Implications for reducing amputation rates and healthcare burden5. Future Directions• Expanding device access and refining patient selection • Role of interventional radiologists in scaling access, ongoing trials, and next-gen device innovations

IREE-43 A GUIDE TO EMBOLIC AGENTS IN INTERVENTIONAL RADIOLOGY

Rooshi Parikh, BS (*Presenter*)
Stephen P. Reis, MD,MBA (*Abstract Co-Author*)

TEACHING POINTS

1) To understand temporary vs. permanent embolic agents. 2) To classify embolic agents: coils, particles, liquid embolics. 3) To review the mechanisms by which different embolic agents achieve vessel occlusion. 4) To identify appropriate clinical scenarios for the use of specific embolic agents.

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1) Introduction to Embolic Agents: Differentiate between temporary and permanent agents, as well as coils, particles, and liquid embolics. 2) Coils: Mechanism of Action: induce thrombosis by creating a mechanical block within the vessel. Clinical Applications: used for larger, accessible vessels in bleeding and tumor embolization. Advantages and Limitations: well-established with a predictable occlusion profile, less effective for small or complex vessels due to their inability to provide dense occlusion in all cases. 3) Particulate Embolic Agents: Mechanism of Action: range from 50 to 1500 microns in size, occlude vessels by physically blocking the lumen.

Clinical Applications: Commonly used in UFEs, tumor embolization, and certain GI bleeds. Advantages and Limitations: effective for moderately sized vessels but may be associated with a higher risk of non-target embolization and ischemic complications. 4) Liquid Embolic Agents: Mechanism of Action: ability to flow through the vasculature, providing precise occlusion of small, tortuous vessels. Clinical Applications: small vessels, tumors, and AVMs. Advantages and Limitations: high precision and minimal distal migration, potential complications of non-target embolization and difficulty in control during deployment. 5) Summary of embolic agents' properties, including ideal applications, strengths, and potential drawbacks.

IREE-45 FEASIBILITY ANALYSIS OF ULTRASOUND-GUIDED PERCUTANEOUS THERMAL ABLATION FOR LIVER METASTASES BASED ON A SCORING SYSTEM

Xiaoning Yue (*Presenter*)
Xiang Zhou (*Abstract Co-Author*)

TEACHING POINTS

Purpose To analyze the differences in conspicuity and feasibility between contrast-enhanced ultrasound (CEUS) and conventional ultrasound (US) for guiding percutaneous radiofrequency ablation of liver metastases (LM). Materials and Methods: This retrospective study included patients who underwent ultrasound-guided radiofrequency ablation for LM between June 2022 and January 2024. The number of LMs, size, depth, and location were recorded. We used a 5-point scale to evaluate the conspicuity of target lesions on US and CEUS and compared score differences between the two. Feasibility of target lesions was assessed based on lesion conspicuity and the safety of the ablation path. Results A total of 68 LM patients with 203 lesions were included. CEUS significantly outperformed US in target lesion conspicuity (mean scores: 4.6 vs. 2.9, $p < 0.05$). For US, lesion size and depth affected conspicuity; for CEUS, depth and location were key factors. Tumor size was an independent risk factor for US-guided ablation feasibility, while tumor depth was an independent risk factor for CEUS-guided ablation. For tumors =3cm in size and<4cm in depth, CEUS-guided ablation feasibility was significantly higher than US-guided ablation (29.1% vs. 79.8%, $p < 0.05$; 32.0% vs. 82.8%, $p < 0.05$, respectively). Conclusion CEUS-guided percutaneous radiofrequency ablation demonstrates superior conspicuity and feasibility for LM compared to US. CEUS has notable advantages in identifying small and shallow LMs. However, for larger or deeper lesions, detection rates and feasibility of LM are comparable between US and CEUS.

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Purpose Materials and Methods: .Results Conclusion

IREE-46 NEW HORIZONS FOR BRONCHIAL ARTERY EMBOLIZATION: THE EXPANDING ROLE OF LOCOREGIONAL THERAPIES IN LUNG CANCER

Gavin Wu, BA (*Presenter*)
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Jason C. Hoffmann, MD (*Abstract Co-Author*)
Mina S. Makary, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Understand the potential role of locoregional therapies, including TACE, TARE, and combination approaches, in the management of advanced lung cancer. 2. Review evidence on efficacy and outcomes of these minimally invasive treatments, including tumor response rates, symptom relief, and survival benefits. 3. Recognize emerging data supporting combination therapies and identify areas where further clinical research is needed to optimize patient selection and treatment protocols.

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Background Advanced-stage lung cancer carries a poor prognosis, with limited curative options. Locoregional therapies such as TACE and TARE are emerging as potential adjuncts to systemic treatment. Procedure Details and Outcomes Studies demonstrate that DEB-TACE achieves ORRs of up to 50% and median OS up to 16.5 months with minimal complications. TARE shows potential but remains investigational. Combination therapies (e.g., TACE + iodine-125 seeds or TAE + RFA) show improved response rates and survival over monotherapy. Conclusion Locoregional therapies may offer improved local control, symptom relief, and survival in select patients with advanced lung cancer. Continued research is needed to define their optimal use in clinical practice.

IREE-47 THE APPLICATIONS OF SPECTRAL CT IN INTERVENTIONAL RADIOLOGY: INNOVATIONS IN DIAGNOSIS AND INTRAOPERATIVE GUIDANCE

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Moaz Choudhary, MD (*Abstract Co-Author*)
Patrick D. Sutphin, MD, PhD (*Abstract Co-Author*)
Sanjeeva P. Kalva, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

Spectral CT offers enhanced pre-operative planning, intraoperative precision, and post-procedural assessment in interventional radiology. Spectral CT reduces artifacts, improves contrast, and allows functional imaging such as perfusion and temperature mapping. This modality assists in detecting post-procedural complications including endoleaks, hemorrhage, and tumor recurrence with higher accuracy than conventional CT. Future innovations including AI analysis and integration into IR suites holds great promise in advancing medical imaging.

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Background Spectral CT imaging overview Pre-operative Planning Tissue and lesion characterization Vascular mapping and perfusion Intraoperative Use Needle guidance and ablation mapping Functional and artifact-reduced imaging Post-procedural Applications Tumor response (e.g., post-TACE) Endoleak and hemorrhage detection Vessel recanalization Institutional examples of utility of Spectral CT Future Directions of Spectral CT Artificial intelligence algorithms that interface with spectral CT images to improve interpretation of imaging data Integration of Spectral CT into IR suite

IREE-48 INTRA-ARTERIAL TREATMENT FOR HEPATOCELLULAR CARCINOMAS : HOW TO MANAGE SHUNTING FROM THE ARTERY

Dohoon Kim, MD (*Presenter*)
Hyo-Cheol Kim, MD (*Abstract Co-Author*)

TEACHING POINTS

Intra-arterial therapy including chemoembolization and radioembolization is a workhorse for the treatment of patients with hepatocellular carcinomas. Occasionally, the operators encounter shunts from the artery (arterioportal, arteriovenous, and arteriopulmonary shunts) that prevent effective treatment. The causes of these shunts include tumor invasion to the vessels, previous percutaneous procedures, chronic inflammation, and congenital acquisition. Unless the shunt is properly occluded, embolic material can pass through the shunt and cause non-target embolization or serious complications. The purpose of this exhibit is : (1) To review radiologic appearance of arterioportal, arteriovenous, and arteriopulmonary shunts. (2) To learn how to manage these shunts with proper embolic materials. (3) To list the possible complications and their management.

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1) List of shunts Arterioportal shunt (hepatic artery - portal vein), Arteriovenous shunt (hepatic artery - hepatic vein), Arteriopulmonary shunt (hepatic artery - pulmonary artery/vein), 2) Imaging findings on CT/MR and angiography according to the cause (tumorous vs non-tumorous condition) 3) Embolization strategy and materials for shunts 4) Complications related with non-target embolization and their management

IREE-49 HIGH-INTENSITY FOCUSED ULTRASOUND IN VARICOSE VEIN THERAPY

Motaz A. Daraghma, MD (*Presenter*)
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Hunaid Rana, BS (*Abstract Co-Author*)

TEACHING POINTS

*High-Intensity Focused Ultrasound (HIFU) is an emerging non-invasive technique for treating varicose veins, offering an alternative to traditional therapies such as endovenous laser treatment (EVLT) and sclerotherapy. *HIFU enables precise, extracorporeal ablation of incompetent venous structures without requiring anesthesia, incisions, or catheterization *Understanding the mechanism, clinical applications, and benefits of HIFU can improve its adoption in vascular and interventional radiology practices.

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Introduction to Varicose Veins and Current Treatment Challenges Epidemiology and impact of varicose veins. Overview of standard treatment options and their limitations. Mechanism of High-Intensity Focused Ultrasound (HIFU) Principles of HIFU and targeted thermal ablation. How HIFU differs from histotripsy , a technique used in interventional oncology. Clinical Applications and Emerging Research SonoVein trials and their implications. Case studies demonstrating the effectiveness of HIFU in vein therapy. Comparison with Conventional Therapies Success rates and procedural benefits. Patient recovery time, risk factors, and potential complications. Future Directions and Impact on Radiology Practice Expanding the use of HIFU beyond vascular treatments. Considerations for radiologists and interventional specialists adopting this technology.

IREE-50 PERCUTANEOUS INTERVENTIONS FOR BENIGN BILIARY STRICTURES

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Junaid Raja, MD (*Abstract Co-Author*)
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Aliaksei Salei, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review the etiology, classification, and clinical presentation of benign biliary strictures in adults. 2. Describe the imaging modalities and diagnostic procedures used to evaluate strictures. 3. Highlight percutaneous minimally invasive techniques available for management, including evolving therapies.

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Background: Benign biliary strictures account for up to 30% of biliary obstructions. Early diagnosis and effective management are essential to prevent complications such as cholangitis and liver failure. Technological advances in imaging and interventional techniques have expanded the role of percutaneous approaches, especially when endoscopic options fail. Etiology and Classification: 1. Causes: iatrogenic (post-surgical), infectious, inflammatory, ischemic, autoimmune. 2. Anastomotic vs non-anastomotic strictures. 3. Classification systems based on location and surgical relevance. Clinical Presentation and Diagnostic Modalities: 1. Symptoms and laboratory findings. 2. Noninvasive imaging: ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), and magnetic resonance cholangiopancreatography (MRCP). 3. Invasive diagnostic options: endoscopic retrograde cholangiopancreatography (ERCP), percutaneous transhepatic cholangiography (PTC), and percutaneous cholangioscopy. Percutaneous Management: 1. Benign biliary protocol. 2. Percutaneous balloon cholangioplasty. 3. Percutaneous biliary stenting. a) Types of stents. b) Options of stent removal. Role of Cholangioscopy Adjunct and Emerging Techniques: 1. Sharp recanalization and rendezvous procedures. 2. Endobiliary radiofrequency ablation. 3. Evolving tools.

IREE-51 MICROWAVE THERMAL ABLATION IN BREAST CANCER: TRICKS AND TIPS FROM OUR EXPERIENCE IN 29 CASES WITHOUT COMPLICATIONS

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Maria J. Ciudad, MD (*Abstract Co-Author*)
Beatriz Lannegrand Menendez (*Abstract Co-Author*)
Carlota Garcia Baron (*Abstract Co-Author*)
Laura Escudero, MD (*Abstract Co-Author*)
Nancy Sanchez Rubio, MD (*Abstract Co-Author*)
Noelia Arevalo (*Abstract Co-Author*)

TEACHING POINTS

To describe the performance of the microwave ablation in breast cancer treatment through our experience step by step To illustrate with our cases some useful tips to performance microwave ablation minimizing complications

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Ultrasound-guided microwave thermal ablation is a promising technique for treating early breast cancer. It uses high temperatures to achieve coagulative necrosis of the tumor, offering advantages such as reduced use of general anesthesia, fewer complications, shorter recovery times, and better aesthetic results. In our breast unit, this technique is proposed as a palliative treatment for patients unfit for surgery, particularly elderly and frail patients who benefit from a minimally invasive approach. We will present our experience, including the criteria for patient selection by the multidisciplinary team and some useful tips and tricks we have learned to perform the technique without complications. Although other authors recommend performing microwave ablations with general anesthesia, we have conducted all procedures using only local anesthesia, which was well tolerated by patients. In our experience, which includes 29 cases in 27 patients, the procedure is fast and safe and it was performed without complications and with a high degree of patient satisfaction.

IREE-52 BEYOND THE BASICS: ADVANCED PLUG-ASSISTED RETROGRADE TRANSVENOUS OBLITERATION (PARTO) TECHNIQUES FOR GASTRIC VARICEAL EMBOLIZATION

Yasmin Aly, MBBCh (*Presenter*)
Husameddin El Khudari, MBChB (*Abstract Co-Author*)

TEACHING POINTS

Discuss the anatomy of gastric varices (GV) and gastrorenal shunts (GRS). Review the standard PARTO Technique. Describe three novel, refined PARTO techniques, including: Fogarty-Assisted Plug-Assisted Retrograde Transvenous Obliteration (F-PARTO), Balloon and Plug-Assisted Retrograde Transvenous Obliteration (BPARTO), and Web-Straddled Plug-Assisted Retrograde Transvenous Obliteration (S-PARTO).

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Outline Introduction Gastric variceal hemorrhage is one of the leading causes of mortality among patients with liver cirrhosis. PARTO, is an effective treatment of GV with GRS. We aim to review the standard PARTO technique and its limitations, and explore novel modifications designed to overcome these limitations. PARTO Techniques Standard PARTO: For shunts up to 16mm. After positioning of the vascular plug above the venous web at the GRS- left renal vein junction, the sclerosant mixture is injected through the catheter. F-PARTO: For smaller shunts (= 7mm). A Fogarty catheter is advanced into the GRS, and its balloon is inflated allowing sclerosant injection before plug placement in the standard fashion. B-PARTO: For shunts up to 16mm. A balloon guide catheter occludes flow, enabling controlled sclerosant injection before plug deployment. S-PARTO: For larger shunts (= 16 mm). The proximal nitinol mesh of the 22mm Amplatzer II plug is positioned below the venous web, ensuring secure placement of plug. Conclusion These specialized PARTO techniques allow customized treatment for effective obliteration of GV.

IREE-53 CLINICAL GUIDELINES IN TRAUMA: PICTORIAL REVIEW

Devang Srivastava (*Presenter*)
Adam P. Jacobs, MD (*Abstract Co-Author*)
Stephen R. Brown, MD (*Abstract Co-Author*)
Andrew J. Gunn, MD (*Abstract Co-Author*)
Aliaksei Salei, MD (*Abstract Co-Author*)

TEACHING POINTS

• Discuss AAST, EAST, WSES, SIR guidelines for trauma management as well as other pertinent guidelines. • Illustrate approaches to trauma imaging and current guideline recommendations for detection of vascular injury and active bleeding. • Provide case-based review of organ specific guidelines for splenic, hepatic, renal and pelvic trauma.

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1 Introduction ? Epidemiology of trauma ? Expanding role of IR in trauma care 2 Guideline Overview ? Key society guidelines for trauma imaging and management 3 Organ-Specific Algorithms with Clinical and Imaging Scenarios: Splenic Trauma ? Implications of 2018 AAST scaling update ? Management considerations based on clinical presentation, other organ damage, grade of injury and presence of vascular injury ? Distal vs. proximal splenic artery embolization ? Impact on immune function Hepatic Trauma ? Implications of liver vascular anatomy on management ? Management considerations based on clinical presentation, other organ damage, and presence of vascular injury Renal Trauma ? Rationale for increased use of nonoperative management in renal injury ? Management based on clinical presentation, other organ damage, presence of vascular injury, and injury to collecting system ? Management of traumatic renal artery dissection or occlusion ? Embolization techniques in guidelines Pelvic Trauma ? Means of hemostasis in pelvic trauma (embolization, preperitoneal packing, REBOA) ? Overview of clinical and imaging scenarios ? Embolization techniques in guidelines Summary and Key Takeaways

IREE-54 SAFE AND CONTROLLED NBCA EMBOLIZATION USING A NOVEL LOW-ADHESION MICROCATHETER: A FIVE-CASE SERIES

Motoki Nakai, MD, PhD (*Presenter*)
Toru Saguchi, MD (*Abstract Co-Author*)
Takafumi Yamada (*Abstract Co-Author*)
Masanori Ishida (*Abstract Co-Author*)
Kazuhiro Saito, MD (*Abstract Co-Author*)

TEACHING POINTS

•N-butyl 2-cyanoacrylate (NBCA) rapidly polymerizes upon contact with blood, enabling emergent hemostasis but posing risks of catheter adherence to the vessel wall, necessitating prompt catheter removal. •NSX® is a novel microcatheter featuring a 3-cm PTFE tip with low adhesion to NBCA, allowing safe catheter removal even after delayed withdrawal. •NSX® enables slow, controlled injection of NBCA, achieving accurate embolization without rushed catheter removal.

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Introduction •NBCA is effective for emergency embolization but requires immediate catheter removal due to strong adhesiveness, risking incomplete treatment. •This limits injection control, and delayed removal increases the risk of catheter entrapment or vascular injury. •To overcome these challenges, the NSX® microcatheter was developed with a PTFE tip that reduces adhesion to NBCA. •This exhibit highlights five representative cases demonstrating the clinical utility of NSX® in emergent settings. Case Series (5 patients) Five representative cases were treated with NSX® for: 1. postoperative bleeding, 2. gastrointestinal bleeding, 3. intraperitoneal bleeding, 4. postpartum hemorrhage, and 5. trauma. In all cases, NBCA was injected and the catheter withdrawn >1 minute after injection, with no significant adhesion or complications. Conclusion •NSX® allows safe, controlled NBCA injection in various emergent bleeding scenarios without the need for hurried withdrawal, ensuring accurate embolization. •The average time from injection to removal was 96 seconds. •A minor limitation is slightly reduced distal trackability compared to conventional microcatheters due to the PTFE tip’s stiffness.

IREE-55 APPROACH TO THE COMPLEX BILIARY TRACT USING ARTICULATED CATHETERS: A MINIMALLY INVASIVE STRATEGY

Denny Marcela P. Achicanoy I, MEd (*Presenter*)
Daniel F. Mendez Lopez I, MEd (*Abstract Co-Author*)
Diana F. Achicanoy, MD (*Abstract Co-Author*)
Ana M. Roman an Marquez, MD (*Abstract Co-Author*)
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TEACHING POINTS

The placement of percutaneous transhepatic biliary drainage (PTBD) as a treatment for biliary stenosis has gained greater relevance due to the decrease in morbidity and mortality rates, associated complications, and costs compared to invasive surgical procedures. For this reason, new techniques have been developed that surpass the advantages of PTBDs, such as Articulated Plastic Biliary Catheters (APBC). APBCs consist of one or more shorter secondary intraluminal biliary drainage catheters associated with a primary internal-external biliary drainage system facilitating drainage mainly in hilar stenosis of more than one bile duct through a single percutaneous access. The indications for APBC are specifically three: complex benign or malignant hilar stenosis requiring bilateral PTBC, benign distal biliary stenosis, and benign biliary-enteric anastomotic stenosis involving the hepatic ducts. CBPA placement can be performed in three ways: Y, T, and Tandem techniques. The first two are mainly used for hilar stenosis and the last for distal stenosis. Complications in APBC and PTBD are similar, including catheter obstruction with or without cholangitis, pericatheter biliary leak, catheter migration, among others. However, the presence of multiple PTBD increases their incidence, and larger PTBDs cause obstruction of small bile ducts, predisposing to the formation of liver abscesses. We will conduct an objective and current review of articulating plastic biliary catheters and describe several clinical cases of malignant biliary strictures that were successfully treated with APBC.

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Introduction, definition, indications, technique, clinical cases, complications

IREE-56 MASTERING VASCULAR PLUGS: FROM BASIC TO ADVANCED TECHNIQUES AND STRATEGIC USE FOR EFFICIENT AND SUSTAINABLE EMBOLIZATION

Shintaro Senda, MD (*Presenter*)
Hideki Yashiro (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Vascular plugs offer numerous advantages in embolotherapy, including excellent device control, stable occlusion, low recanalization risk, and minimal imaging artifact. These features contribute to efficient procedures, reduced radiation exposure, and decreased use of embolic materials, which align with the goals of an effective and environmentally conscious practice. However, standard deployment may be inadequate in complex vascular anatomies or high-flow conditions, where mechanical instability or insufficient thrombosis can pose significant challenges. To address these, a variety of refined techniques have emerged in clinical practice. Focusing on the most widely used plugs, Amplatzer Vascular Plugs (AVPs), this exhibit provides a comprehensive overview of a wide range of techniques, spanning from basic to advanced approaches, to promote strategic and effective plug use.

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(1) Introduction : Clinical utility of AVPs and their contribution to Green Radiology, along with current limitations of standard use. (2) Technique-Based Strategies and Classification : A. Deployment Stabilization : Compressing Deployment Technique, Pull-through Wire Technique, Plug Anchoring Technique B. Thrombus Formation

Enhancement : Gelfoam-Assisted Technique, Internal Coil Packing Technique, Modified Internal Coil Packing Techniques (Direct Puncture, Coil Prefilling, Preloading Catheter) C. Alternative Access and Special Situations : Candy-Plug Technique, Aortic Pseudoaneurysm Occluding Technique *Each technique will be illustrated using clinical examples, technical tips, and common pitfalls derived from real-world experience.

IREE-57 WEDGED INJECTION OF NBCA UNDER OCCLUSION WITH MICROBALLOON CATHETER: YOUR ULTIMATE TECHNIQUE FOR CHALLENGING SITUATIONS

Maki Hirao, MD (*Presenter*)
Hideki Ishimaru, MD, PhD (*Abstract Co-Author*)
Satomi Yoshimi (*Abstract Co-Author*)
Shuto Miyamura (*Abstract Co-Author*)
Oka Taiga (*Abstract Co-Author*)
Takamasa Nishimura (*Abstract Co-Author*)
Chika Somagawa, MD (*Abstract Co-Author*)
Tomoki Nakano, MD (*Abstract Co-Author*)
Ryo Toya, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The use of a microballoon catheter for wedged injection of NBCA is highly effective for embolizing a large volume of blood vessels into a mold shape. This technique allows both antegrade and retrograde injections. It is also useful when a standard microcatheter cannot be inserted into the target vessel; however, in such cases, it is necessary to obstruct the normal perfusion area using coils. Although more expensive than conventional microcatheters, the microballoon catheter enables "wedged injection" by blocking blood flow with a balloon, which also prevents NBCA from flowing back towards the catheter. When a single injection is expected to provide sufficient therapeutic results, the use of a microballoon catheter is recommended.

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1) Features of NBCA 2) What are the benefits of wedged injection of NBCA? 3) Properties of microballoons (made from polyurethane and silicone) and the potential for catheter adhesion 4) Contrasting wedged injection using a microballoon with injection under flow arrest using a balloon guiding catheter 5) Balloon occluded antegrade injection versus retrograde injection 6) Various scenarios where microballoons prove beneficial (including arteriovenous malformation, arteriovenous fistula, varix, hemorrhage, and pseudoaneurysm, among others) 7) Adjunctive technique 8) Pitfall

IREE-58 PRECISION UNDER PRESSURE: A MULTI-FACETED APPROACH TO ACCESS ANY TARGET IN THE ABDOMEN

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Laurel Chen, MEng (*Abstract Co-Author*)
Stephanie A. Vincent-Sheldon, MD (*Abstract Co-Author*)
Brian J. Di Giacinto, DO (*Abstract Co-Author*)

TEACHING POINTS

It is possible to access almost any abdominal mass or fluid collection for diagnostic or therapeutic purposes with the correct combinations of preprocedural patient optimization and percutaneous techniques. A simple direct route is often the key to success. However, many providers are reticent to displace or traverse other organs due to overestimation of the risks involved. We provide our systematic institutional approach to complex patients and case-based reviews of underutilized percutaneous techniques to simplify accessing deep abdominal targets. All these approaches are safe and supported by literature or our institutional experience. Our educational exhibit specifically addresses risk to benefit ratio assessment, patient optimization, approach selection (e.g., trans-pleural, transpulmonary, transcaval, passage through hollow viscera), window optimization (re-positioning, bladder volume adjustment, enema, etc.), and access techniques (e.g., curved needle, blunt dissection, needle lever). For radiologists and radiology trainees, this exhibit provides real-world techniques backed by institutional examples that reinforce how deep abdominal targets can be safely accessed. We hope these techniques can equip proceduralists and trainees alike with the skills to access intraabdominal pathology.

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1) Title 2) Teaching points and learning objectives 3) Specific access techniques: Choosing an approach 4) Technique A: Guide needle/catheter lever 5) Technique B: Window optimization via bladder distention 6) Technique C: Curved needle 7) Technique D: Hydrodissection 8) Key Takeaways 9) References

IREE-59 TIPS AND TRICKS FOR KIDS: REVIEW OF ENDOVASCULAR PORTAL INTERVENTIONS, INDICATIONS, AND COMPLICATIONS IN PEDIATRIC PATIENTS

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Devanshi Bhangle (*Abstract Co-Author*)
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Reza Imani-Shikhabadi, MD, MS (*Abstract Co-Author*)
Nicholas Voutsinas, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is to: Review normal and abnormal anatomy pertinent to the portal venous system. Discuss the options for portal interventions and indications. Emphasize differences between adult and pediatric patients in pre-, intra-, and post-procedural management of portal interventions.

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Portal system anatomy Normal anatomy Variant anatomy Congenital portosystemic shunt (Abernethy malformation) Patent ductus venosus Gastrorenal shunt Spontaneous splenorenal shunt Post-liver transplant Post-Meso-Rex shunt Options for endovascular interventions Obtaining access (transhepatic, transsplenic) Transjugular intrahepatic portosystemic shunt (TIPS) Portal vein recanalization (angioplasty, thrombectomy, stent) Variceal sclerotherapy Balloon-assisted antegrade/retrograde transvenous obliteration Congenital portosystemic shunt embolization Surgical portosystemic shunt angioplasty Portal vein embolization Portal system pathologies indicating endovascular intervention The core pathogenic mechanisms Portal hypertension (prehepatic, intrahepatic, and posthepatic) Shunting Portal vein thrombosis and stenosis Gastric varices Extrahepatic portal vein obstruction Liver disease and cirrhosis Surgical complications (post-liver transplant, post-Meso-Rex shunt) Congenital portosystemic shunts (Abernethy malformations) Cavernous transformation of the portal vein Complications of endovascular interventions Bleeds Biliary fistula Thrombosis Restenosis Hepatic encephalopathy Pulmonary edema Special consideration for pediatric patients Stents Catheter size Micropuncture kit Ring set changes

IREE-60 PUSHING THE BOUNDARIES: ALL THE WAY THROUGH THE URETER

Onur Ege Tari, MD (*Presenter*)
Emre Unal, MD (*Abstract Co-Author*)

Aycan Uysal, MD (*Abstract Co-Author*)
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TEACHING POINTS

Ureteral stenosis or leak encountered in native or transplant kidneys, can be managed percutaneously with several ways including double J, tandem or metallic stents. Obtaining ureteral access is a challenge, but an interventional radiology (IR) team is capable of achieving ureteral access either antegrade (through percutaneous nephrostomy) or retrograde (via urethra to ureter) manner. Particularly in women, retrograde ureteral access via urethral orifice can be obtained with imaging guidance and without cystoscopy. Therefore, ureteral magnetic compression anastomosis (MCA) procedure involving two magnets placed to cranial and caudal part of an occlusion, can be done in an IR unit since both antegrade and retrograde accesses are achieved with imaging guided methods. MCA can be done with a high technical success rate without cystoscopy and/or surgery in native and post-surgical ureteric occlusions, allowing patients with total ureteric occlusion to be catheter-free. At last an imaging-guided ureteroneocystostomy involving three basic steps, (1) percutaneous puncture of bladder, (2) needle course through the lumen of bladder, and (3) final puncture of caudal segment of the obstructed ureter, can be performed in an IR unit.

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1. An overview of ureteral stenosis and leaks 2. Methods for imaging guided ureteral accesses a. Antegrade b. Retrograde c. Direct Puncture 3. Management of ureteral stenosis and leak in various scenarios (native-transplant kidneys and ileal conduits) a. Double J stent placement b. Tandem stent placement c. Balloon dilatation d. Metallic stent placement e. Rendezvous technique 4. Total occlusion a. Magnetic compression anastomosis b. Direct ureteral puncture

IREE-61 HISTOTRIPSY OF HEPATIC LESIONS: EARLY LESSONS FOR POST TREATMENT DIAGNOSTIC STUDIES

Anna S. McKenney, MD,PhD (*Presenter*)
Qian Yu, MD (*Abstract Co-Author*)
Andrew Navarro, MD (*Abstract Co-Author*)
Osmanuddin S. Ahmed, MD (*Abstract Co-Author*)
Christos S. Georgiades, MD, PhD (*Abstract Co-Author*)
Mikhail Silk, MD (*Abstract Co-Author*)
Mishal Mendiratta-Lala, MD (*Abstract Co-Author*)
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TEACHING POINTS

Histotripsy of the liver has gained momentum for locoregional treatment, and its post-treatment findings differ from classic thermal ablation findings. Histotripsy treatment-zone findings on immediate imaging include hypoattenuation and hypoenhancement, but some treatment zones may show minimal change from hepatic parenchyma. On short- and long-term followup, hyperenhancement of margins should be interpreted with caution. Secondary signs of tissue destruction, including presence of blood products or diffusion restriction should be considered. Post treatment findings likely depend on the nature of the primary tumor. Post-histotripsy findings for hypoenhancing tumors such as metastatic colorectal lesions will differ from hyperenhancing lesions such as HCC. Acute findings and adverse events may be identified in the immediate postprocedure period. Many are asymptomatic and self-limiting, but some require treatment.

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Histotripsy Technology and procedure: Potential benefits Drawbacks Adverse Events Patient selection / tumor board discussion major points Post-histotripsy Imaging Immediate postprocedure Ablation zone characteristics Identification of acute findings Short Term Findings that can be misleading including persistent peripheral enhancement Findings that may provide collateral information including hemorrhagic products and diffusion restriction Long term interpretation Contextualizing the originally ablated tumor In the setting of additional locoregional treatment

IREE-62 THYROID ARTERY EMBOLIZATION FOR BENIGN GOITER: ANATOMY, EVALUATION, AND TREATMENT TECHNIQUES

John Caniglia, MD (*Presenter*)
Josh Verhagen (*Abstract Co-Author*)
Matthew M. Niemeyer, MD (*Abstract Co-Author*)
Sean K. Golden, MD (*Abstract Co-Author*)

TEACHING POINTS

Thyroid artery embolization (TAE) is an emerging endovascular treatment for benign thyroid disease, including multinodular goiter and Graves'. Typical patients are poor surgical candidates due to substernal goiter or comorbidities. TAE is favored over thermal ablation in patients with large or substernal nodules. Pre-procedure work-up includes CTA neck to assess goiter location and arterial supply, as well thyroid function tests. TAE is performed on an outpatient basis via femoral or radial access. The thyroid gland is supplied by the bilateral inferior and superior thyroid arteries, which are branches of the thyrocervical trunk and external carotid artery, respectively. During TAE, two or three of the thyroid arteries are embolized to stasis using particles to induce ischemia of the gland, improving mass effect and/or hyperthyroidism. Non-target embolization, vessel dissection, or atheroembolism can result in stroke, a rare complication of the procedure occurring in less than 1% of patients. Intra-procedure CTA or cone-beam CT can be performed to reduce risk of non-target embolization. Understanding of common anatomic variants of the thyrocervical trunk and thyroidea ima is critical for technical success. Post-procedure, subclinical hyperthyroidism is common and can be managed conservatively. Thyroid storm, hypothyroidism, and hypoparathyroidism are uncommon but should be screened for using thyroid and parathyroid labs. Post-procedure imaging can be obtained with ultrasound or CT to quantify goiter reduction.

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1. History of TAE 2. Indications 3. Pre-procedure work-up 4. Vascular anatomy and variants 5. Procedural steps 6. Complications 7. Post-procedure follow-up

IREE-63 PORTAL HYPERTENSION WITH ECTOPIC VARICES: CAUSES, COMPLICATIONS, AND MANAGEMENT

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Kenneth S. Zurcher, MD (*Abstract Co-Author*)
Douglas S. Lewis, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Portal hypertension can result from prehepatic, hepatic, and posthepatic etiologies. 2. Ectopic varices are an uncommon, but clinically significant complication of portal hypertension, and can occur anywhere along the GI tract. 3. Management of ectopic varices requires a collaborative and interdisciplinary approach, with diagnostic and interventional radiologists playing a central role in both diagnosis and treatment. 4. Interventional treatment of ectopic varices is highly individualized, often including a combination of TIPS decompression, variceal embolization, and/or portal vein recanalization and may require alternate access such as transhepatic, transplenic, or direct stick approaches.

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1. Briefly review causes, epidemiology, and complications of portal hypertension. 2. Review ectopic varix etiology, anatomic locations, complications, and prognosis. 3. Provide an overview of various interventional treatment options and approaches for ectopic varices. 4. Review a small case series of lower GI ectopic varices managed with a variety of the above interventional approaches and techniques.

IREE-65 COMMON ENDOVASCULAR AND PERCUTANEOUS IMPLANTABLE DEVICES: WHAT THE DIAGNOSTIC RADIOLOGIST NEEDS TO KNOW

Aida Haddad, MD (*Presenter*)
Juliet M. Alla, MD (*Abstract Co-Author*)
Fregenet Gichamo, MD (*Abstract Co-Author*)
Surbhi B. Trivedi, MD (*Abstract Co-Author*)
Christine E. Boone, MD,PhD (*Abstract Co-Author*)
Christopher J. Friend, MD,MBA (*Abstract Co-Author*)

TEACHING POINTS

Review the indications for use of common endovascular and percutaneous implantable devices. Delineate endovascular devices, such as inferior vena cava (IVC) filters, embolics, and vascular repair devices. Identify complications related to endovascular devices and their appropriate follow-up. Outline percutaneous devices, such as general drains, biliary drains, gastrointestinal tract tubes, and genitourinary tract tubes, as well as their respective complications and appropriate diagnosis. Provide multimodal imaging examples distinguishing indications, features, complications, and potential diagnostic pitfalls of endovascular and percutaneous devices.

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Endovascular Devices Common examples of IVC filters and their potential complications. Characteristic examples of embolic agents, such as liquid embolics, glue, coils, and plugs, as well as their associated imaging artifacts. Common endovascular aneurysm repairs, including specific examples of general procedural steps, types of stent-graft devices, and short- & long-term complications (specifically, endoleaks). Drains Characteristic examples and a stepwise approach to assessing pre- and immediate post-intervention imaging, including examples of standardized approaches to identify complications, such as malpositioned or kinked drains. Biliary stricture interventional approach and the appearance of devices implemented in these treatment approaches placed by IR versus gastroenterology, and their complications. Evaluation and management after placement of a percutaneous nephrostomy tube, percutaneous nephroureteral tube, nephroureteral stent, or retrograde ureteral stent.

IREE-66 ABLATIVE RADIOEMBOLIZATION FOR LIVER TUMOR : WHEN AND HOW

Hyo-Cheol Kim, MD (*Presenter*)

TEACHING POINTS

Radioembolization has become a workhorse for the treatment of patients with unresectable hepatocellular carcinoma and metastatic liver cancers. Unlike traditional radioembolization, ablative radioembolization aims to deliver a significantly higher radiation dose, often exceeding 200 Gy, to achieve tumor ablation. This can result in complete tumor necrosis, making it a potentially curative option for selected patients, especially those who are not candidates for surgery. It is particularly effective for small- to medium-sized tumors and can serve as a bridge to liver transplantation or surgical resection. Despite its advantages, the procedure carries risks such as radiation-induced liver disease, and non-target embolization. Careful patient selection, accurate dosimetry planning, and multidisciplinary management are essential to minimize complications and maximize therapeutic outcomes. The purpose of this exhibit is : (1) To review definition and outcome of ablative radioembolization. (2) To learn how to prescribe the target tumor dose. (3) To list the technical tips and tricks of ablative radioembolization depending on tumor size and location.

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1) Definition of radioembolization 2) Literature review regarding outcomes of ablative radioembolization 3) Single compartment dosimetry 4) Partition model dosimetry 5) Voxel-based dosimetry 6) Radiation segmentectomy in small tumor 7) Radiation major hepatectomy in large tumor 8) Superselective multiple injection in small future liver remnant 9) Flow diversion in central tumor

IREE-67 A JOINT VENTURE: EMBOLIZATION FOR CHRONIC JOINT DISEASE BEYOND THE KNEE

Harrison Blume (*Presenter*)
Gray R. Lyons, MD, PhD (*Abstract Co-Author*)
Clifford R. Weiss, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Explore novel applications of transarterial embolization for management of joint disease beyond the knee, including osteoarthritis, tendinopathies and adhesive capsulitis. 2. Identify clinical and imaging indications of transarterial embolization for patients with chronic joint pain. 3. Review technical considerations, highlighting target vessels for embolization, vascular access, catheter selection and choice of embolic materials. 4. Assess gaps in current literature, emphasizing innovation and long-term clinical follow-up of safety and efficacy.

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1. Introduction: review of chronic joint pathologies amenable to embolization 2. Overview of general management strategies: current medical and surgical options 3. Rationale for embolization: incorporating existing literature for understanding pathophysiology 4. Indications for embolization: patient selection, key imaging findings and clinical evaluation of joint disease 5. Review of normal joint arterial anatomy with branches targeted for embolization 6. Embolization techniques for chronic joint disease a. Locations for vascular access: radial, ulnar, femoral access b. Considerations for catheter selection c. Choice of embolic materials: resorbable or permanent 7. Adverse events and contraindications, noting non-target embolization and joint ischemia 8. Future research directions: prospective studies, improving procedural materials, and broadening the scope of joint disease treated with embolization

IREE-68 THE ESTABLISHMENT AND VALIDATION OF A MODEL FOR PREDICTING OVERALL SURVIVAL IN PATIENTS WITH UNRESECTABLE HEPATOCELLULAR CARCINOMA UNDERGOING TRANSARTERIAL CHEMOEMBOLIZATION

Tianbo Fan (*Presenter*)
Qi Wang (*Abstract Co-Author*)

TEACHING POINTS

To develop a new model to predict overall survival (OS) of patients with unresectable HCC after TACE.

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I. Purpose A. Study objective: develop a nomogram to predict overall survival (OS) after TACE in unresectable HCC II. Methods A. Patient Selection 1. Inclusion criteria (unresectable HCC, TACE between Jan 2015-Dec 2019) 2. Training vs. validation cohorts (random assignment) B. Variable Assessment 1. Clinical and laboratory parameters 2. Radiologic response after first TACE C. Statistical Analysis 1. Cox proportional hazards model (identification of independent prognostic factors) 2. Model performance: a. Concordance index (C-index) b. Calibration plots c. Time-dependent ROC AUC d. Decision curve analysis (DCA) III. Results A. Cohort Characteristics and Median OS (11.2 months) B. Independent Prognostic Factors • Radiologic response • Tumor number • Vein invasion • Extrahepatic metastasis • AFP level • ALBI grade • PLR C. Nomogram Performance 1. C-index: 0.775 (training), 0.796 (validation) 2. Calibration: strong observed vs. predicted agreement 3. AUC: superior to conventional staging systems 4. DCA: demonstrated clinical net benefit D. Risk Stratification • Comparison of OS across low-, intermediate-, and high-risk groups ($P < 0.001$) IV. Conclusion A. Summary: TACE-specific nomogram enables precise OS prediction in unresectable HCC B. Clinical Implication: tool for individualized patient counseling and management V. Keywords unresectable hepatocellular carcinoma; transarterial chemoembolization; nomogram; prediction model

IREE-69 TRANSARTERIAL EMBOLIZATION OF TYPE II ENDOLEAKS USING A NOVEL QUINTET-COAXIAL CATHETER SYSTEM: OVERCOMING CHALLENGING ACCESS ROUTES

Toru Saguchi, MD, PhD (*Presenter*)
Motoki Nakai, MD, PhD (*Abstract Co-Author*)
Takafumi Yamada (*Abstract Co-Author*)
Masanori Ishida (*Abstract Co-Author*)
Kazuhiro Saito, MD (*Abstract Co-Author*)

TEACHING POINTS

• Introduce a novel quintet-coaxial catheter system for embolization of type II endoleaks associated with internal iliac artery (IIA) branches. • Demonstrate the technical feasibility of navigating tortuous lumbar and iliolumbar routes into the aneurysm sac using this system. • Highlight the procedural advantages of enhanced microcatheter support and precision in embolic delivery.

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Type II endoleaks (ELs) from IIA branches can persist despite standard management. Effective transarterial embolization (TAE) requires stable access to the aneurysm sac via tortuous and narrow collateral routes. Device Description The quintet-coaxial system consists of five coaxially aligned catheters: 1. 5-F flexible guiding sheath 2. 5-F guiding catheter 3. 3.4-F large-bore distal access catheter 4. 2.7-F high-flow microcatheter 5. 1.9-F microcatheter Technique TAE was performed in five patients (mean age: 81.8 years) with persistent type II EL post-EVAR. The catheter system was introduced via the ipsilateral femoral artery and advanced through lumbar and iliolumbar arteries into the aneurysm sac. Embolization was achieved using a 20% NBCA-Lipiodol mixture, followed by coil embolization of inflow arteries. Results All procedures were successful without complications. The large-bore access catheter provided robust support, enabling precise microcatheter navigation. Mean procedure time was 166 minutes; mean fluoroscopy time was 71 minutes. Six-month CT follow-up showed sac shrinkage or stability in all cases. Conclusion The quintet-coaxial catheter system facilitates safe and effective TAE for IIA-related type II ELs, especially via challenging vascular routes.

IREE-70 OPTIMISATION OF ULTRASOUND FOR INTERVENTIONAL RADIOLOGISTS: A CASE-BASED COMPREHENSIVE REVIEW

Nanda Venkatanarasimha, FRCR, FRANZCR (*Presenter*)

TEACHING POINTS

1.Interventional Radiologists should be familiar with the numerous features commonly available on ultrasound (US) machines including advanced technical features that can play a valuable role in ultrasound guided interventions.2.Optimisation of US can improve detection of target tissue, minimise artefacts, reduce procedural times &increase application of this technology across a variety procedures. 3.Thorough understanding of basics &nuances of the functionality of US machine will translate into greater operator confidence, safer &successful procedure.

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1.Required equipment- Mandatory: Multiple linear &curvilinear probes of varying frequency, greyscale with harmonic imaging &spatial compounding, color, power &spectral Doppler. Desirable, not mandatory: Bedside table &adjustable stool, dual screen capability, advanced techniques (e.g. Fusion, contrast-enhanced ultrasound, techniques to enhance acoustic window, microvascular imaging, B-flow).2.Using a side-by-side illustration we will present a case based discussion of ultrasound equipment parameters that can maximise image quality to improve practical applications during interventions - frequency, gain, depth, dynamic range, compound &harmonic imaging etc.3.Provide functional information illustrating correct optimisation of ultrasound images to increase the likelihood of performing ultrasound guided interventions confidently, safely &effectively. 4.Review relevant pitfalls/artefacts &provide tips to minimise these to improve diagnostic & therapeutic outcomes.5.Discuss general considerations - ergonomics, ambient lighting, infection prevention including lessons from pandemic.

IREE-71 VARIANT HEPATIC ARTERY ANATOMY: IMPLICATIONS FOR LIVER-DIRECTED THERAPY

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Reza Imani-Shikhabadi, MD, MS (*Abstract Co-Author*)
Nicholas Voutsinas, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is 1) to review normal and variant hepatic artery anatomy and 2) to discuss the clinical implications of variant arterial anatomy for liver-directed therapy, with a focus on Transarterial Chemoembolization (TACE) and Transarterial Radioembolization (TARE).

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1. Normal Mesenteric and Hepatic Arterial Anatomy a. Celiac Trunk b. Superior Mesenteric Artery c. Hepatic Arteries and their branches 2. Variant Hepatic Arterial Anatomy a. Replaced vs Accessory b. Michels' Classification (Types I-X) c. Extrahepatic Tumoral Arterial Supply i. Phrenic ii. Gastroduodenal iii.Gastric 3. Overview of Arterial-Based Liver-Directed Therapy a. TACE b. TARE c. Bland Embolization 4. Implications of Variant Anatomy on Liver-Directed Therapy a. Mechanisms of Failure i. Vascular injury ii. Catheter misplacement iii. Variant downstream anatomy despite correct catheter placement iv. Accessory tumor supply b. Off-Target Effects i. Delivery of embolic to extrahepatic organs ii. Ischemia of extrahepatic organs c. Decreased Treatment Efficacy i. Chemotherapy or radiation bypasses tumor ii. Accessory tumor supply results in residual viable tumor d. Additional Procedures i. Repeat Embolization ii. Adjunct Liver Directed Therapy (Microwave of Residual Disease) iii. Protective Arterial Embolization 5. Pre-procedural Imaging a. Technetium-99m-labeled macroaggregated albumin (MAA) mapping i. Hepatopulmonary Shunt b. CT & MR Angiography c. 3D Reconstruction

IREE-72 BLEOMYCIN ELECTROSCLEROTHERAPY (BEST) FOR VASCULAR ANOMALIES - A PRIMER FOR INTERVENTIONAL RADIOLOGISTS

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Moritz Wildgruber, MD, PhD (*Abstract Co-Author*)
Roberto Luigi Cazzato, MD (*Abstract Co-Author*)
Premal A. Patel, MBBS, FRCR (*Abstract Co-Author*)
Kishore Minhas, FRCR,MBChB (*Abstract Co-Author*)
Martin Krauss (*Abstract Co-Author*)
Alessandro Zanasi (*Abstract Co-Author*)
Afshin Gangi, MD, PhD (*Abstract Co-Author*)
Walter A. Wohlgemuth, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Using the principle of reversible electroporation, bleomycin electrosclerotherapy (BEST) is an emerging image-guided treatment for patients with vascular anomalies, particularly effective in cases which are refractory to conventional sclerosants or surgical resection. 2. The large molecular size of bleomycin limit its ability to cross cell membranes and exert its effect of disrupting DNA inside the cytosol. The application of short, intense electric pulses potentiates the effect of bleomycin sclerotherapy through 1) "reversible electroporation", i.e. transient increase in cell membrane permeability, which increases the intracellular bioavailability of bleomycin; and 2) "vascular lock effect", i.e. temporary vasoconstriction of dysplastic vasculature, to increase the retention of bleomycin. 3. BEST has a role in treatment of slow flow vascular malformations with considerable stromal component, such as microcystic lymphatic malformations (LM) and extensive venous malformations (VM), and

arteriovenous malformations (AVM) with challenging angioarchitecture for embolization. 4. Successful BEST treatment requires careful case selection, pre-procedural planning, bleomycin instillation, electrode placement and post-procedural care. Common complications include cutaneous hyperpigmentation, post-procedural swelling and pain. Nerve palsy and vasospasm are rare. Preventive strategies include limitation of adhesive use, placement of electrode away from nerves and post-BEST analgesic plan.

TABLE OF CONTENTS/OUTLINE

1. Mechanism of BEST; 2. Equipment and planning; 3. Peri-procedural optimization; 4. Cases to illustrate the role of BEST ; 5. Complications and preventive strategies

IREE-73 RADIOLOGIC ASSESSMENT AFTER RADIOEMBOLIZATION: EXPECTED CHANGES AND COMPLICATIONS

Nai-Wen Chang, MD (*Presenter*)
Yin Chen Y. Tsai, MD (*Abstract Co-Author*)
Chien An Liu, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize normal post-TARE findings : Common tumor changes include thin rim enhancement, internal hemorrhage; liver parenchyma may show edema, fibrosis, capsular retraction or compensatory hypertrophy at contralateral lobe. Be aware of post-TARE complications : These include rare but significant events such as radiation pneumonitis, radioembolization-induced liver disease (REILD), complication related to non-target embolization, and lymphopenia, etc. Use enhancement-based criteria for tumor response assessment : EASL, modified RECIST, and LI-RADS TRA focus on viable tumor enhancement, providing more accurate post-TARE evaluation than size-based criteria alone.

TABLE OF CONTENTS/OUTLINE

Outline1. The tumor (1) Common early and late findings (2) Complete necrosis, or not (3) Evaluating tools- EASL, modified RECIST, LI-RADS2. The liver (treated and untreated)- common early and late findings, radioembolization induced liver disease (REILD)3. The lung - radiation induced lung disease4. The non-target organs - gastroduodenal, falciform ligament and cystic arteries5. Post embolization syndrome

IREE-74 ULTRASOUND-GUIDED THORACIC PROCEDURES: INDICATIONS, TECHNIQUES AND COMPLICATIONS REVIEW

Silvia Revuelta Gomez, MD (*Presenter*)
Alejandra Somoano Marfull (*Abstract Co-Author*)
Aranzazu Sanchez Gabin, MD (*Abstract Co-Author*)
Rodrigo Sutil, MD (*Abstract Co-Author*)
Ana Berasategui Criado, MD (*Abstract Co-Author*)
Victor Fernandez Lobo (*Abstract Co-Author*)

TEACHING POINTS

1. To review the basic concepts of ultrasound-guided thoracic interventions.2. To describe the advantages and limitations of ultrasound as a procedural guidance tool.3. To discuss the main indications and complications associated with pleural and pulmonary interventional procedures.

TABLE OF CONTENTS/OUTLINE

1. INTRODUCTION. Thoracic interventional procedures represent a rapidly expanding field, with numerous thoracic pathologies requiring image-guided interventions for both diagnostic and therapeutic purposes.Radiologists must therefore be familiar with each procedure's indications, complications, and technical aspects. 2. GENERAL CONSIDERATIONS. 2.1. Thoracic ultrasound. 2.2. Interventionism 3. PLEURAL INTERVENTIONS: indications, technique and complications 3.1. Thoracocentesis. 3.2. Pleural drainage. 3.3. Pleural biopsy 4. PULMONARY INTERVENTIONS: indications, technique and complications. 4.1. Pulmonary biopsy. 4.2. Drainage of pulmonary abscesses. 5. CONCLUSIONS. Due to its accessibility, low cost, and safety profile, ultrasound is an excellent tool for guiding various thoracic interventional procedures:- At the pleural level, ultrasound represents the ideal technique for performing thoracentesis, pleural drainage, and pleural biopsies, with a very low complication rate.- In the lung , the role of ultrasound is more limited, as only lesions in contact with the parietal pleura are accessible using this technique.6. BIBLIOGRAPHY.

IREE-75 POSTPARTUM HEMORRHAGE EMBOLIZATION ESSENTIALS: COMMON AND UNCOMMON BLEEDING SOURCES, PELVIC COLLATERALS, AND FERTILITY OUTCOMES

Sakiko Kageyama, MD (*Presenter*)
Kei Takase, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

-Postpartum hemorrhage (PPH) includes both uterine atony-related bleeding from the endometrial cavity and traumatic bleeding from the cervix, vaginal wall, or perineum. -Depending on the hemorrhage site, bleeding may arise not only from uterine arteries but also from extra-uterine branches . Awareness of these sources is vital for selecting access and achieving effective embolization. -This exhibit reviews bleeding sources by location, including normal anatomy, variants, collateral pathways, and relevant anastomoses. -Understanding potential complications and reproductive outcomes is essential for optimal care.

TABLE OF CONTENTS/OUTLINE

1) Introduction: Overview of postpartum hemorrhage (PPH) subtypes, including uterine atony and traumatic bleeding, and the importance of anatomical understanding in interventional planning. 2)Pelvic Vascular Anatomy and Collateral Circulation Comprehensive review of pelvic arteries involved in PPH, including the uterine artery, cervicovaginal artery, vaginal artery, round ligament artery, ovarian artery, internal and external pudendal arteries, and superior, medium and inferior rectal arteries. Includes normal anatomy, common variants, collateral pathways, and clinically significant anastomoses. 3)Case-Based Presentation of Hemorrhage Patterns: Imaging and angiographic examples categorized by bleeding type and location, including uterine atony, vaginal hematoma, perineal hematoma, and other complex scenarios. 4)Complications and Reproductive Outcomes: Summary of potential ischemic complications following embolization and current evidence regarding fertility preservation and reproductive outcomes.

IREE-76 RADIOLOGY'S ROLE IN MANAGEMENT OF METASTATIC NEUROENDOCRINE TUMOR: CURRENT GUIDELINES AND RECOMMENDATIONS

Marie Killerby, MPH (*Presenter*)
Jeffrey Bodner, MD (*Abstract Co-Author*)
Nicholas Schreiter, MD (*Abstract Co-Author*)
Austin Glenn (*Abstract Co-Author*)
Stuart L. Polk, MD (*Abstract Co-Author*)
Omar Abdalla, BS (*Abstract Co-Author*)
Allen Luna, BEng (*Abstract Co-Author*)
Lily Gao, BA (*Abstract Co-Author*)
Devanshi Bhangle (*Abstract Co-Author*)
Matthew Anguiano (*Abstract Co-Author*)
Anish Kammila (*Abstract Co-Author*)
Atlee Witt (*Abstract Co-Author*)
Heather A. Cole, MD (*Abstract Co-Author*)
Andrew J. Marsala II, MD (*Abstract Co-Author*)
Reza Imani-Shikhabadi, MD, MS (*Abstract Co-Author*)
Nicholas Voutsinas, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this presentation is: 1) Review the role of interventional radiology and nuclear medicine in the treatment of metastatic neuroendocrine tumors. 2) Review recommendations as to when radiologic interventions are optimally applied, based on guidelines and recommendations from appropriate organizations

TABLE OF CONTENTS/OUTLINE

1) Introduction a. Neuroendocrine Tumor (NET) types, progression, mortality b. Treatment options for metastatic NET: i. Systemic therapy ii. Liver directed therapy. 2) Relevant society guidance and recommendations a. National Comprehensive Cancer Network (NCCN) b. The North American Neuroendocrine Tumor Society (NANETS) c. European Neuroendocrine Tumor Society (ENETS) d. Society for Interventional Radiology (SIR) e. Society of Nuclear Medicine and Molecular Imaging (SNMMI). 3) Interventional radiology and nuclear medicine management options a. Peptide Receptor Radionuclide Therapy (PRRT): i. Patient selection ii. Treatment Protocol b. Intra-arterial Embolization: i. Patient selection ii. Choice of transarterial embolization (TAE) vs. transarterial chemoembolization (TACE) vs. transarterial radioembolization (TARE) iii. Procedural Technique c. Percutaneous Therapy: i. Patient selection ii. Procedural Technique 1. Microwave Ablation 2. Cryoablation 3. Radiofrequency Ablation 4. Irreversible Electroporation 5. Histotripsy. 4) Medical Management of side effects post treatment a. Dependent on subtype of tumor, but often involving somatostatin analogs.

IREE-77 PROPTOSIS? EYE'M ON IT: A PARACAVERNOUS DAVF MIMICKING INDIRECT CCF - A DIAGNOSTIC AND THERAPEUTIC ODYSSEY

Devahuti Shalley, MD (*Presenter*)
Vivek Murumkar (*Abstract Co-Author*)
Priscilla Joshi, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

Para-cavernous dural arteriovenous fistulas are rare lesions that mimic indirect carotid-cavernous fistulas (CCFs) in clinical presentation and imaging. Key differences in venous drainage and shunt location influence management. When conventional transvenous access (eg- the inferior petrosal sinus (IPS), facial vein) is not feasible, multidisciplinary approach by direct superior ophthalmic vein (SOV) access provides a safe alternative.

TABLE OF CONTENTS/OUTLINE

Clinical Presentation: A 56 year old hypertensive female presented with right eye proptosis, redness, watering, lid swelling and ptosis. Exam showed non-pulsatile, non-reducible, tender proptosis with chemosis, corneal opacities, conjunctival congestion and restricted eye movements. Imaging Findings: MRI: T1 DIXON: Right eye proptosis, enlarged SOV, swollen extraocular muscles, retrobulbar fat stranding. T2WI: Tortuous flow voids in right cavernous region. DSA & Endovascular Management DSA showed a Barrow type D indirect CCF with feeders from ICA & ECA. The right IPS was hypoplastic; embolization attempts via right superior petrosal sinus & left IPS failed. An anatomic variant of the right SOV lacked communication with the angular/ facial vein. Diagnosis revised to paracavernous fistula . Treatment & Outcome Direct SOV access with oculoplastic surgeon assistance enabled embolization. SOV was exposed and punctured using 21G Gelco cannula with Y-connector and hemostatic valve. 0.4 ml Onyx injected into fistulous sac via microcatheter, achieving complete occlusion. Post-procedure, congestion, chemosis and proptosis reduced significantly. Extraocular movements and visual acuity improved from 6/36 (pinhole) to 6/12 (p).

Abstract Archives of the RSNA, 2025

MKEE

Musculoskeletal Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

MKEE-1 COMPLICATIONS AFTER SPINE SURGERY: UPDATED IMAGING CONCEPTS AND A STRUCTURED CLASSIFICATION APPROACH

Joao P. Ferreira, MD (*Presenter*)
Vitor T. Paula, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Provide a didactic classification and systematization of postoperative complications following spinal surgeries. 2. Categorize complications according to etiology (iatrogenic or not), time of onset (immediate, early, late), related to the instrumentation hardware, and anatomical location (bone, soft tissues, disc, dural sac, spinal cord, nerve roots). 3. Present a comprehensive list of complications, including direct iatrogenic events (such as wrong site injection and gossypiboma), hematoma, hardware malpositioning, fistula, infection, disc herniation recurrence, incomplete disc resection, periradicular fibrosis, adjacent segment disease, pseudarthrosis, hardware loosening or fracture, nerve root injury, radiculitis, arachnoiditis, myelopathy and pseudomeningocele. 4. Describe the imaging findings of each complication and recommend the most appropriate imaging modalities for evaluating each of them.

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1. Review of applied and practical spinal anatomy. 2. Overview of common spinal surgical techniques and their indications. 3. Didactic systematization and listing of postoperative complications. 4. Management strategies for each complication. 5. Future perspectives and emerging techniques (such as endoscopic spine surgery). 6. Final didactic flowchart summarizing all complications and their classifications.

MKEE-2 MAKE THE JUICE WORTH THE SQUEEZE: TIPS AND TACTICS FOR SUCCESSFUL ARTHROCENTESIS

Jeremiah R. Long, MD (*Presenter*)
Alecio F. Lombardi, MD (*Abstract Co-Author*)
Logan Haug, MD (*Abstract Co-Author*)
David M. Melville, MD (*Abstract Co-Author*)
Jonathan A. Flug, MD, MBA (*Abstract Co-Author*)
Rupert O. Stanborough, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Common Procedure : Arthrocentesis is a frequently performed diagnostic procedure in many radiology settings.2. Widely Performed by Radiologists : Trainees, general radiologists and those with subspecialty musculoskeletal (MSK) training routinely perform arthrocentesis.3. Multiple Imaging Modalities Fluoroscopy, ultrasound, and computed tomography (CT) are all utilized for image-guided arthrocentesis.4. Factors Influencing Success : The technical success of arthrocentesis, defined as obtaining fluid, depends on multiple factors, including operator experience.5. Importance of Knowledge : Understanding site-specific and modality-specific tips and tactics can significantly enhance the technical success rate of arthrocentesis in different settings.

TABLE OF CONTENTS/OUTLINE

This educational exhibit will review the procedure of arthrocentesis with attention to consistent procedural steps, image guidance modality selection, native versus prosthetic joints and tips and tactics to help increase aspiration yields. The following outline will be utilized:• Indications for joint aspiration• Preprocedural imaging• Patient preparation• Needle selection• Specimen handling• Image guidance modality selection including pros and cons• Native joint versus prosthetic joint• General arthrocentesis tips and tactics to help improve technical success rate• Anatomic site-specific recommendations to help improve technical success rate

MKEE-3 TWIST AND TORQUE: UNRAVELING THE DISTAL BICEPS BRACHII TENDON

Lorena Brandao, MD (*Presenter*)
Gustavo O. Watanabe, MD (*Abstract Co-Author*)
Leticia dos Reis Morimoto, MD (*Abstract Co-Author*)
Luiz Ribas (*Abstract Co-Author*)
Pedro H. Arruda, MD (*Abstract Co-Author*)
Isabela A. Da Cruz, MD (*Abstract Co-Author*)
Julio B. Guimaraes, MD, PhD (*Abstract Co-Author*)
Marcelo A. Nico, MD (*Abstract Co-Author*)
Alipio Ormond Filho, MD (*Abstract Co-Author*)

TEACHING POINTS

Distal biceps brachii tendon (DBBT) ruptures have nearly doubled in the last decade, driven by an aging, active male population and better imaging. Ruptures occur when a 90° flexed, supinated elbow is forcefully extended, with hypovascularity, smoking, and steroids increasing risk. Nontraumatic issues include bursitis, tendinopathy, and chronic rupture; tenosynovitis doesn’t occur in this sheathless tendon. The DBBT’s long head enhances supination, while its short head flexes the elbow at 90°. The tendon twists 90° as it inserts, using the radial tuberosity’s apex as a cam to maximize torque. The lacertus fibrosus aponeurosis stabilizes the tendon and a teardrop-shaped bicipitoradial bursa cushions both heads during rotation. X-rays and CT detect bone injuries and postoperative changes but can’t show the tendon. MRI with the FABS view (84% sensitivity, 86% specificity) is the gold standard despite cost and limited availability. US is more accessible but requires multiple windows and dynamic maneuvers. Surgery restores strength through single or double-incision techniques with fixation options from suture buttons to interference screws but is contraindicated in patients with poor soft tissue or major comorbidities. Although complications such as rerupture, infection, heterotopic ossification, and nerve injury are uncommon, radiologists must recognize normal postoperative imaging appearances by timing and clinical context to distinguish true complications.

TABLE OF CONTENTS/OUTLINE

Anatomy Biomechanics Image evaluation CR and CT MRI (FABS) Ultrasound techniques Acute tear Degenerative lesion Miscellany Surgical Techniques Normal postoperative findings and complications of surgical repair

MKEE-4 NO STRESS WITH STRESS FRACTURES: A CASE-BASED GUIDE TO ACCURATE DIAGNOSIS

Erica D. Cruz, MD (*Presenter*)
Arthur H. Godeiro, MD (*Abstract Co-Author*)
Danielle B. Rumi, MD (*Abstract Co-Author*)
Diego A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

Stress fractures result from the repeated and excessive application of force on the bone and are classified into two types: fatigue fractures and insufficiency fractures. Fatigue fractures occur when a healthy bone is subjected to repetitive stress that exceeds its capacity for remodeling. They are more common in young athletes, particularly females, and typically affect the lower limbs. In contrast, insufficiency fractures develop when routine activities cause injury to bones that are already weakened, most often seen in elderly individuals with preexisting bone diseases. X-ray is the most commonly used initial imaging method due to its wide availability; however, other techniques such as computed tomography (CT), bone scintigraphy, and magnetic resonance imaging (MRI) play a crucial role in the diagnosis and prognosis of stress fractures.

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Review and analysis of stress fracture cases from both personal and institutional archives, aiming to define fundamental concepts and correlate them with imaging findings, with an emphasis on magnetic resonance imaging. The cases are organized according to a previously established classification. Topics are structured to facilitate understanding and support further study.

MKEE-5 DECIPHERING HIP PROSTHESIS: A RADIOLOGIC GUIDE FOR BETTER EVALUATION AND DESCRIPTION

Erica D. Cruz, MD (*Presenter*)
Mateus Oliveira Gloria, MD (*Abstract Co-Author*)
Jose Lucas S. Galvao I, MD (*Abstract Co-Author*)
Danielle B. Rumi, MD (*Abstract Co-Author*)
Diego A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

The analysis of hip orthopedic materials through imaging studies presents a challenge for radiologists, requiring specialized knowledge due to its critical role in postoperative evaluation and in identifying potential complications associated with these devices. Plain radiography is typically the initial imaging modality of choice, as it is widely available, cost-effective, and provides a general overview of implant positioning, bone condition, and joint alignment. However, advanced imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI) are often recommended for a more detailed assessment of the prosthesis-bone interface, surrounding soft tissues, and possible pathological changes. The integrated use of these imaging modalities enables a more comprehensive and accurate evaluation, contributing to the proper interpretation of hip orthopedic devices.

TABLE OF CONTENTS/OUTLINE

Analysis of hip prosthesis cases from both personal and institutional archives, reviewing aspects such as anatomical landmarks, prosthetic components, techniques, measurements and angles, complications, and special cases. Additionally, correlations between different imaging modalities are performed.

MKEE-6 NO UNION, NO GLORY: IMAGING THE DOWNFALL OF AN UNHEALED SCAPHOID

Giulia Caroline Paes Scopel, MD (*Presenter*)
Rodrigo Zancanaro, MD (*Abstract Co-Author*)
Daniel C. Oliveira, MD (*Abstract Co-Author*)
Tereza Souto, MD (*Abstract Co-Author*)
Mariana Faria Amaral, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is to provide an educational overview of scaphoid non-union.A) To recognize key imaging findings across radiography, CT, and MRI for accurate diagnosis and differentiation from anatomical variants.B) To identify critical complications such as avascular necrosis (AVN) and patterns of carpal instability, including the progression to scapholunate advanced collapse (SLAC) wrist. This exhibit aims to improve diagnostic accuracy and confidence among radiologists in formation and musculoskeletal imaging specialists in evaluating scaphoid non-union and its complications.

TABLE OF CONTENTS/OUTLINE

Introduction: Overview of scaphoid anatomy and vascular supply, emphasizing the retrograde intraosseous blood supply to the proximal pole and its implications for non-union. Discussion of scaphoid fracture patterns and mechanisms of injury, with a focus on fractures prone to non-union. Definition of scaphoid non-union and its clinical consequences. Imaging Techniques: Radiography. Computed Tomography (CT). Magnetic Resonance Imaging (MRI). Interpreting Imaging Findings (case based review): Avascular Necrosis (AVN). Carpal instability patterns. Scapholunate advanced collapse (SLAC) wrist. Conclusion: Summary of Key Imaging Features. Importance of Accurate Diagnosis and Imaging-Guided Management.

MKEE-7 FIRST CARPOMETACARPAL OSTEOARTHRITIS: BIOMECHANICS, IMAGING, AND OPERATIVE TREATMENT

Jayesh Gupta, MD (*Presenter*)
Conner Beyersdorf, MD (*Abstract Co-Author*)
Brandon Ritchie, DO (*Abstract Co-Author*)
Vijaya K. Kosaraju, MD (*Abstract Co-Author*)
Navid Faraji, MD (*Abstract Co-Author*)

TEACHING POINTS

The carpometacarpal (CMC) joint is a complex joint of two perpendicular, saddle-shaped bones stabilized by ligaments. This unique anatomy enables the thumb's wide range of motion, including various forms of adduction, abduction, opposition, and retropulsion. The CMC joint is the second most common site of hand arthritis and the most frequently operated joint in the upper extremity. Arthritis here can significantly impair function and quality of life. While nonsurgical treatments may be tried, surgery is often required, with multiple techniques available. This educational exhibit aims to: 1) Review CMC joint anatomy, 2) Outline the Eaton-Littler classification, and 3) Present surgical treatment options with postoperative imaging.

TABLE OF CONTENTS/OUTLINE

CARPOMETACARPAL ANATOMY• Understanding the biomechanics of the joint and the stabilizing ligaments involved • EPIDEMIOLOGY/RISK FACTORS • IMAGING • Reviewing Eaton-Littler classification and identifying pertinent negative findings • Using MRI for further evaluation • TREATMENT • Surgical options available such as volar ligament reconstruction, tendon interposition, arthroplasty • Identifying patients who have received surgical treatment for CMC arthritis and associated postoperative complications

MKEE-8 DEMYSTIFYING THE DRUJ: POSTOPERATIVE IMAGING OF THE DISTAL RADIOULNAR JOINT

Parker Brown, MD (*Presenter*)
Lana Elcic, MD (*Abstract Co-Author*)
Logan Haug, MD (*Abstract Co-Author*)
Anisha Shetty, MD (*Abstract Co-Author*)
Jeremiah R. Long, MD (*Abstract Co-Author*)
Aaron J. Wyse, MD (*Abstract Co-Author*)
Jonathan A. Flug, MD, MBA (*Abstract Co-Author*)
David M. Melville, MD (*Abstract Co-Author*)

TEACHING POINTS

Present the anatomic complexity of the distal radioulnar joint (DRUJ) and how its complex structure is essential for forearm rotation and upper extremity weight bearing. Introduce common pathologies involving the DRUJ, specifically highlighting the impact on osseous anatomy by focusing on osteoarthritis and post-traumatic instability. Present cases of various DRUJ pathology with emphasis on the spectrum of interventions employed to treat DRUJ injuries while demonstrating the post-operative appearances. When applicable, spotlight post-operative complications associated with these interventions, such as: Recurrent or persistent subluxation/widening of the DRUJ at the sigmoid notch after ligamentous reconstruction, loosening or infection, Aptis arthroplasty component failure.

TABLE OF CONTENTS/OUTLINE

Introduction : Anatomic and functional overview of the DRUJ, Imaging techniques for DRUJ evaluations, Common DRUJ pathologies and their imaging appearances. Surgical Interventions for DRUJ Pathology : Adams-Berger ligamentous reconstruction, Sauve-Kapandgi, Darrach, Wrist arthrodesis and bone graft with pronator quadratus stabilization, Bowers procedure, Matched distal ulnar resection, Extensor retinaculum for DRUJ instability, Aptis arthroplasty, Hemiresection with pronator quadratus interposition and volar stabilization. Postoperative Complications Conclusion : Summary of key points, highlighting common pathology and most frequent surgical interventions.

MKEE-9 IMAGING OF DESMOID FIBROMATOSIS: A COMPREHENSIVE REVIEW

Shuji Nagata, MD (*Presenter*)
Hiroshi Nishimura, MD (*Abstract Co-Author*)
Miyuki Sawano (*Abstract Co-Author*)
Yuki Shouji (*Abstract Co-Author*)
Seiji Kurata, MD (*Abstract Co-Author*)
Yusuke Uchiyama, MD (*Abstract Co-Author*)
Shuichi Tanoue, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

To illustrate the clinical and radiologic features of desmoid fibromatosis (DF) in extra-abdominal, intra-abdominal, and abdominal wall sites. To compare MRI findings with pathological features of DF in various phases (e.g., growth phase, plateau phase, and regression phase). To highlight characteristic MRI findings of DF (e.g., band sign, fascial tail sign, flame sign, Yin-yang sign, and staghorn sign). To discuss MRI findings for predicting tumor growth in DF (e.g., Black fiber sign and T2 ratio). To describe soft tissue tumors that may mimic DF on MRI (e.g., schwannoma, SFT, leiomyosarcoma).

TABLE OF CONTENTS/OUTLINE

Desmoid fibromatosis (DF) is a rare, deep-seated myofibroblastic tumor characterized by infiltrative growth and a high rate of local recurrence. Its variable imaging features and clinical behavior often make diagnosis challenging. MRI is the imaging modality of choice, and a systematic approach is essential to distinguish DF from malignant soft-tissue tumors. Radiologists should recognize key imaging signs and patterns to accurately suggest the diagnosis. In addition, we discuss MRI findings for predicting tumor growth in DF, including the black fiber sign and T2 ratio.

MKEE-10 FROM TACKLE TO TINGLING: A RADIOLOGIC APPROACH TO SPORTS-RELATED PERIPHERAL NERVE INJURIES

Maria Lua Gulde (*Presenter*)
Paulo Victor P. Helito, MD (*Abstract Co-Author*)
Renata V. Leao, MD (*Abstract Co-Author*)
Renata T. Fernandes, MD (*Abstract Co-Author*)
Eduardo L. Bizetto, MD (*Abstract Co-Author*)
Raul O. Martins, MD (*Abstract Co-Author*)
Marcelo Bordalo, MD (*Abstract Co-Author*)
Elisabet Hagert (*Abstract Co-Author*)

TEACHING POINTS

Sports-related peripheral nerve injuries are an important source of pain and often present a diagnostic challenge, as symptoms frequently overlap with those of other conditions. These injuries may result from acute trauma but more commonly arise from chronic repetitive stress. Radiologists play a key role in diagnosing neuropathies, either by being the first to identify an unsuspected injury or by confirming and staging a suspected pathology. This exhibit aims to promote awareness of peripheral nerve injuries in athletes by outlining a practical imaging-based diagnostic approach. We present a comprehensive review of peripheral nerve pathologies associated with sports, focusing on examination protocols, anatomy, imaging findings, and relationship with sport modalities. Emphasis is given to high-resolution ultrasonography (US) and MR-neurography (MRN). This exhibit integrates imaging findings with patient history and, when applicable, surgical correlation. It addresses both compressive and post-traumatic neuropathies, involving abdominal wall, upper and lower limb nerves.

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1. General overview of sports-related peripheral nerve injuries. 2. Mechanisms of nerve injury and the association with sport-specific movements. 3. Imaging protocols and assessment of the peripheral nerves using 3D MRN and high-resolution US. 4. Case-based review from our institutional database with sport-specific examples. 5. Correlation with imaging findings, clinical implications, surgical planning, and intraoperative findings.

MKEE-11 IMAGING FINDINGS AND TREATMENTS FOR OF MUSCULOSKELETAL VASCULAR ANOMALIES: WHAT RADIOLOGIST SHOULD KNOW

Miyuki Sawano (*Presenter*)
Shuji Nagata, MD (*Abstract Co-Author*)
Shohei Mizushima (*Abstract Co-Author*)
Tomoko Kugiyama (*Abstract Co-Author*)
Asako Kuhara (*Abstract Co-Author*)
Yusuke Uchiyama, MD (*Abstract Co-Author*)
Masamichi Koganemaru (*Abstract Co-Author*)
Shuichi Tanoue, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. To review the spectrum of vascular anomalies (VAs) and relevant syndromes. 2. To present the characteristics and roles of each imaging modality. 3. To illustrate the imaging appearances of various musculoskeletal VAs related to treatment.

TABLE OF CONTENTS/OUTLINE

The musculoskeletal system is one of most common sites involved by VAs. The VAs are basically categorized based on the classification established by International Society for the Study of Vascular Anomalies (ISSVA) . For the safe and effective treatments, accurate imaging diagnosis is essential, in addition, the correct understanding of angioarchitecture and hemodynamics of the lesion may help making appropriate treatment strategy. 1). Classification and terminology of VAs according to the ISSVA 2). Characteristics and clinical applications of imaging modalities: US, CT, MRI, Angiography 3). Clinical manifestations and imaging features of VAs: Infantile hemangioma, Congenital hemangioma, Tufted angioma, Kaposiform hemangioendothelioma, Kaposi sarcoma, Angiosarcoma 4). Clinical features and treatment strategies based on the angiographic classification of vascular malformations: Arteriovenous malformation, Venous malformation, Lymphatic malformation, Capillary malformation 5). Clinical manifestations and imaging findings of vascular malformations associated with other anomalies: Klippel-Trenaunay syndrome, Parks Weber syndrome 6). Clinical manifestations and imaging findings of unclassified VAs: Fibro adipose vascular anomaly (FAVA)

MKEE-12 PEARLS AND PITFALLS OF TOTAL KNEE ARTHROPLASTIES

Yujie Qiao, MD (*Presenter*)
Josephina A. Vossen, PhD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit will review surgical indications of total knee arthroplasties, normal and abnormal postoperative imaging appearance, and the most common short and long-term complications. Increased knowledge and improved detection of complications can prevent delays in treatment that could result in long-term disability.

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Review the indications and contraindications of total knee arthroplasties. Describe and illustrate the expected imaging appearance of total knee arthroplasties. Teach the difference between unconstrained (posterior-cruciate retaining, posterior-cruciate substituting), constrained (nonhinged, hinged) and fixed versus mobile bearing. Describe short and long-term complications and their imaging appearance, including prothesis malalignment, prosthesis loosening, periprosthetic fractures, polyethylene liner dislodgement, extensor mechanism rupture and infection.

MKEE-13 IMAGING CARPAL LIGAMENT INSTABILITY AND INJURIES: CLINICAL INSIGHTS THROUGH CASE-BASED LEARNING

Ligia C. Germek, MD (*Presenter*)
Danielle B. Rumi, MD (*Abstract Co-Author*)
Camila Tabosa, MD (*Abstract Co-Author*)
Rafael Omena, MD (*Abstract Co-Author*)
Roberto Froeder Oliveira, MD (*Abstract Co-Author*)
Diego A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

Carpal ligament instability is a complex diagnostic challenge requiring detailed anatomical knowledge and clinical-radiological correlation. Understanding instability patterns (CID, CIND, adaptive, complex) is essential for accurate interpretation and management. A multimodality imaging approach improves detection and characterization of ligamentous injuries.

TABLE OF CONTENTS/OUTLINE

We begin with a review of the functional anatomy of carpal ligaments, categorized as intrinsic and extrinsic, emphasizing their three-dimensional arrangement and their fundamental role in both dynamic and static carpal stability. We then explore the classification of carpal instabilities, focusing on the main patterns: dissociative (CID), non-dissociative (CIND), adaptive, and complex types. This framework is key for interpreting imaging findings and guiding management.A range of imaging modalities—including radiographs, CT, and MRI—are discussed with emphasis on their strengths and limitations in evaluating ligamentous injuries. Real clinical cases are used to illustrate different instability patterns, highlighting clinical-radiological correlation and key diagnostic features. Schematic illustrations are incorporated to clarify key concepts, particularly in angular assessment and progression of injury patterns.

MKEE-14 OSTEOID OSTEOMA. A RADIOLOGICAL REVIEW

Marta Granados Baltuille, MD (*Presenter*)
Xiaqun Xuzhu (*Abstract Co-Author*)

TEACHING POINTS

The aim of this article is to present the main radiological findings of one of the most common bone tumors, the osteoid osteoma. This is the third most common bone tumor, after enchondroma and non-ossifying fibroma. Typically, it occurs in males between 10 and 35 years old and clinically manifests as nocturnal pain that relieves with salicylates. This tumor consists of a nidus, or the tumor itself, which appears as a cortical lytic lesion in the diaphysis of the long bones such as the femur and tibia, accompanied by sclerosis and surrounding corticoperiosteal thickening. Less common locations include the carpal and tarsal bones, the spine, the upper limbs, or even intra-articular sites in up to 10-13% of cases, presenting as joint effusion and synovitis, for which MRI is the imaging modality of choice. The gold standard imaging technique is Computed Tomography (CT), which demonstrates a highly specific sign called "the vascular groove sign" in up to 80% of cases. Furthermore, CT guides treatment, which consists of radiofrequency ablation of the nidus, with success rates of 94-95%. However, it is a lesion that requires a high degree of suspicion to diagnose, as it can present in multiple forms depending on the degree of calcification of the nidus, as well as a wide range of differential diagnoses, such as Brodie's abscess, osteoblastomas, stress fractures, or septic arthritis, among others.

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The article presents the following outline: Introduction Epidemiology Classification and Locations Diagnostic imaging techniques and main radiological findings Treatment Differential Diagnosis Conclusions

MKEE-15 THE SILENT INFECTION: MRI CLUES TO TUBERCULAR SACROILIITIS

Sapna Katyal, MD (*Presenter*)
Sapna Singh (*Abstract Co-Author*)
Anjali Prakash, DMRD (*Abstract Co-Author*)

TEACHING POINTS

Imaging features of tubercular sacroiliitis and differentiating features of tubercular sacroiliitis from seronegative spondyloarthropathy.

TABLE OF CONTENTS/OUTLINE

Tuberculosis is a major cause of musculoskeletal infection particularly in immunocompromised patients most commonly involving the spine. Tubercular sacroiliitis however, is an uncommon infection which may present insidiously, making early MRI-based diagnosis essential for appropriate management. The exhibit will illustrate the MRI features of tubercular sacroiliitis structured under specific imaging parameters including bone and cartilage changes in the form of bone marrow edema, intraosseous abscesses and erosions; joint and synovial changes in the form of synovitis, enthesitis, capsulitis, sclerosis; juxta-articular soft tissue changes including perimuscular edema, presacral abscesses, sinus tract formation and neurovascular bundle involvement. Key imaging differences from seronegative spondyloarthropathy (SpA) will also be highlighted. Imaging findings favoring tubercular sacroiliitis include bone marrow edema with sacral predominance and asymmetric distribution, deep erosions with sacral dominance, intraosseous and presacral abscesses, muscle edema, sinus tract formation and neurovascular involvement whereas features favoring seronegative spondyloarthropathy include iliac-dominant, symmetrical bone marrow edema, typically smaller (<1 cm) and iliac-predominant erosions, inflammation confined to the joint without muscular or neurovascular involvement.

MKEE-16 COMPREHENSIVE IMAGING REVIEW OF ELBOW TRAUMA: ANATOMY AND KEY INJURIES

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Livia Reis, MD (*Abstract Co-Author*)
Danielle B. Rumi, MD (*Abstract Co-Author*)
Diego A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

Elbow trauma demands a thorough understanding of the joint's complex anatomy and the mechanisms underlying common injury patterns. Accurate assessment relies on a structured approach to imaging interpretation, supported by knowledge of anatomical landmarks and normal variants. Multimodality imaging—including radiography, CT, and MRI—plays a central role in detecting both osseous and soft tissue injuries. Early recognition of subtle findings is essential to avoid misdiagnosis and guide appropriate clinical management. This exhibit aims to enhance diagnostic accuracy and reporting clarity through focused anatomical review and case-based learning.

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The exhibit begins with an overview of the clinical relevance of elbow trauma and the imaging modalities employed in its evaluation. It then transitions into a detailed review of elbow anatomy, highlighting osseous structures, musculature, and ligamentous complexes. Key anatomical variants are briefly discussed to support accurate interpretation. Common traumatic injuries are presented next, including fractures of the distal humerus, radial head, coronoid process, and olecranon, along with typical patterns of elbow dislocation. A case-based section reinforces key learning points and illustrates complex injuries, concluding with diagnostic strategies and their clinical implications.

MKEE-17 POSTERIOR MENISCAL MYSTERIES-IMAGING KEYS TO UNLOCKING RAMP TEAR DIAGNOSIS

Pranav K. Udupi, MD,MBBS (*Presenter*)
Amit K. Sahu, MBBS, MD (*Abstract Co-Author*)
VIKASH K. GUPTA, MD (*Abstract Co-Author*)
Anuradha Sural, MD (*Abstract Co-Author*)
Bharat Aggarwal, MD (*Abstract Co-Author*)
Anjali Sharma (*Abstract Co-Author*)
Vikas Gupta (*Abstract Co-Author*)

TEACHING POINTS

Recognize the spectrum of Ramp lesions (posterior medial meniscal tears) using the Grief classification system, demonstrated through case examples and custom illustrations.Understand clinical significance: RAMP tears frequently accompany ACL injuries (10-40%) and may contribute to anterolateral rotatory instability when overlooked, potentially compromising ACL reconstruction outcomes. Recognize clinical implications: Identification and repair of RAMP tears leads to improved knee stability, better functional outcomes, and reduced ACL graft stress. Missed RAMP lesions remain a significant cause of persistent instability following ACL reconstruction.

TABLE OF CONTENTS/OUTLINE

Definition of RAMP tear and its classification by Grief et all. Includes custom made illustration of types.Case example of type 1 RAMP tear.Case example of type 2 RAMP tear.Case example of type 3A and 3B RAMP tears.Example of type 4A RAMP tear and custom illustration of type 4B tear.Illustration of Type 5 tear and clinical significance with differential diagnosis.

MKEE-18 THE SILENT SIGNALS-THE SOFT TISSUE FINDINGS THAT SPEAKS VOLUMES

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Amit K. Sahu, MBBS, MD (*Abstract Co-Author*)
VIKASH K. GUPTA, MD (*Abstract Co-Author*)
Anuradha Sural, MD (*Abstract Co-Author*)
Bharat Aggarwal, MD (*Abstract Co-Author*)
Akshay Tiwari (*Abstract Co-Author*)

TEACHING POINTS

Recognize characteristic imaging patterns of Pellegrini-Stieda lesion, representing post-traumatic ossification of the medial collateral ligament, which appears as linear calcification along the medial femoral condyle. Identify calcific tendinitis and myositis ossificans with case example Appreciate the arcuate sign as a reliable indicator of posterolateral corner injury, representing avulsion of the arcuate ligament complex - a finding often overlooked but critical for surgical planning. Distinguish phleboliths in vascular malformations from other calcifications based on their characteristic lamellated appearance and association with soft tissue masses showing diagnostic vascular features. Interpret periosteal reaction patterns (solid, lamellated, sunburst, Codman triangle) as valuable clues to underlying pathology, from benign processes to aggressive malignancies. Recognize distinctive matrix patterns in bone tumors that guide differential diagnosis, including chondroid, osteoid, and fibrous matrices.

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Case example of Pelligrini Steida lesion and Arcuate sign.Case of calcific tendinitis and Vascular malformation.Slide about Myositis ossificans with examples and CT correlation.Slide about different periosteal reaction.Different types of matrix of bone lesions with example for chondroid matrix.

MKEE-19 APPLICATIONS OF DIGITAL TOMOSYNTHESIS IN THE MUSCULOSKELETAL SYSTEM

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Mor Armoni (*Abstract Co-Author*)
Yotam Kimmel (*Abstract Co-Author*)
Guy Yoskovitz (*Abstract Co-Author*)
Yael S. Schiffenbauer, PhD (*Abstract Co-Author*)
Ophir Robenpour (*Abstract Co-Author*)
Sigal Tal, MD, DMD (*Abstract Co-Author*)
Yiftah Beer, MD (*Abstract Co-Author*)

TEACHING POINTS

Digital tomosynthesis (DTS) is a well-established imaging technique that has become the gold standard in breast mammography. In recent years its benefits in musculoskeletal (MSK) imaging have gained recognition, and along with the growing availability at lower costs resulted in a rapid increase in its utilization. Although this is a radiographic technique, reading a DTS study is different than reading a conventional radiograph, and requires just a short learning curve. The purpose of this exhibit is to enhance the readers knowledge and confidence on the technology, and explore a range of clinical cases and applications. Key benefits of DTS in MSK include: 1. Enhanced visualization of overlapping bones and articular surfaces; 2. Improved sensitivity of radiographically occult fracture diagnosis; 3. Better anatomical localization of both normal bony structures and abnormal findings; 4. Elimination of radiographic pseudo findings such as pseudo fractures caused by overlapping structures; 5. Provision of sufficient diagnostic information for surgical planning, with significantly lower radiation, cost, and reading time compared to CT; 6. Reduced dependency of image quality on optimal patient positioning; 7. Significantly improved imaging of the bones and joints in patients with casts, splints and bracing; 8. Improved imaging in the presence of metal.

TABLE OF CONTENTS/OUTLINE

1) Purpose of the Educational Session. 2) Background on DTS. 3) Radiation considerations. 4) How to read a DTS study. 5) Enhance the readers knowledge and confidence in DTS. 6) Applications and Clinical cases. 7) Take home messages

MKEE-21 PREOPERATIVE IMAGING OF ACUTE KNEE DISLOCATION: WHAT THE SURGEON WANTS TO KNOW

Dyan V. Flores, MD (*Presenter*)

TEACHING POINTS

Acute knee dislocation (AKD) refers to complete disruption of the integrity of the tibiofemoral articulation. It is a potentially limb-threatening injury with long-term dysfunction and even amputation. Though an overall rare condition with a reported incidence of less than 0.5%, actual incidence is likely underestimated due to spontaneous reduction or missed diagnosis in the setting of polytrauma. In some instances, the radiologist may even be the first physician to suggest the diagnosis of a traumatic knee dislocation. Given its significant morbidity, the radiologist plays a crucial role in accurate depiction of the extent of injury for appropriate preoperative planning. The objectives of this educational exhibit are: -To review definitions and classifications in AKD -To discuss imaging considerations and associated injuries -To outline imaging findings that the surgeon wants to know before operative management

TABLE OF CONTENTS/OUTLINE

Definitions •Dislocation •Subluxation •Multiligament knee injury Classifications •Kennedy •Schenck Imaging Considerations Associated Injuries •Posterolateral corner •Popliteal artery •Common peroneal nerve •Dislocations in the rest of the knee What The Surgeon Wants to Know 1.Findings that affect treatment decision-making (operative versus conservative) •Location of ligament tears •Presence of osseous avulsion •Peroneal nerve injury 2.Findings that may affect timing of surgery •Which ligaments are injured (staged approach) •Popliteal artery injury •Meniscus tear •Chondral damage 3.Findings that may affect the surgical technique •Reconstruction versus repair •Status of the iliotibial band

MKEE-22 BONE VOYAGE: SCANNING THROUGH OSTEOPOROSIS WITH DXA

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Raul N. Pigatto, MD, MBA (*Abstract Co-Author*)
Paulo Ferreira, MD (*Abstract Co-Author*)
Andre S. Kamogari Nakamura, MD (*Abstract Co-Author*)
Ricardo Caracante, MD (*Abstract Co-Author*)
Joao Pedro d. Costa, MD (*Abstract Co-Author*)
Renato Fujiki, MD (*Abstract Co-Author*)
Paulo R. Moreira, MD (*Abstract Co-Author*)
Henrique A. Lino, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)

TEACHING POINTS

Osteoporosis is a progressive, silent disease that increases fracture risk and demands early and accurate diagnosis. DXA (dual-energy X-ray absorptiometry) is the gold standard for assessing bone mineral density. Quantitative criteria as T-score and Z-score are essential but can be influenced by qualitative factors. Artifacts such as patient positioning, vertebral fractures, vascular calcifications, and degenerative changes can alter DXA interpretation.The physician plays a critical role in interpreting DXA results, similar to a flight commander who adjusts the coordinates according to the conditions.

TABLE OF CONTENTS/OUTLINE

Introduction - epidemiology and impact of osteoporosis and importance of early diagnosis;Imaging Method - DXA - technical principles and quantitative assessment and T-score interpretation;Qualitative factors influencing DXA - commom artifacts and anatomical variations,- degenerative changes, fractures,- calcifications,- positioning errors and their consequencesThe physician’s role: avoiding misdiagnosis through qualitative evaluation).

MKEE-23 CRACKING THE SIDE STRAIN PEARLS: RADIOLOGIC INSIGHTS INTO A RARE ELITE ATHLETIC INJURY

Omar Ashour, MD, MRCS (*Presenter*)
Kieran Pandey (*Abstract Co-Author*)
Aditya R. Daftary, MBBS (*Abstract Co-Author*)
Leanne K. Singh, MBBS, FRCR (*Abstract Co-Author*)
Prof. Janani Pillai, MBBS,FRCR (*Abstract Co-Author*)

TEACHING POINTS

Side strain is an uncommon tear of the lateral abdominal wall muscle commonly seen in cricketers, presenting as acute lateral trunk pain. MRI is the gold standard, accurately delineating and grading the extent of injury, predicting recovery time, and aiding safe return-to-play decisions.These injuries can get missed without appropriate imaging, which can delay recovery or increase the risk of recurrence. Radiologists play a pivotal role in diagnosis but also in guiding management, recovery and influencing long-term outcomes. Given the limited literature and low awareness, a radiology led multidisciplinary approach is essential for recognising and managing this underdiagnosed sports injury, improving outcomes.

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What is side strain and why it matters in elite-level cricket? Mechanism of Injury: Rotational biomechanics and anatomical vulnerability of the internal oblique. Clinical Features: Epidemiology, presentation (acute lateral trunk pain on non-dominant side), and clinical assessment. Imaging: MRI findings (oedema, partial tears, avulsion); ultrasound’s adjunct role in dynamic assessment and guided interventions; excluding other diagnoses. Management: Conservative treatment (rest, analgesia, physiotherapy) as mainstay; role of corticosteroid or PRP injections; rarely surgery. Return-to-Play: Criteria for safe return, typical recovery timeline and re-injury prevention. Radiology-Led Teaching Value: call for awareness, imaging protocols and multidisciplinary approach to make time sensitive decisions. Conclusion: Gaps in literature and radiologist’s crucial role to confirm diagnosis, management, and outcomes for this rare injury.

MKEE-24 WHOLE-BODY MAGNETIC RESONANCE IMAGING FOR NEUROMUSCULAR DISORDERS: APPLICATIONS, NEW PERSPECTIVES AND CASE-BY-CASE REVIEW

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Amr Kalander, MD (*Abstract Co-Author*)
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Livia Vasconcelos, MD (*Abstract Co-Author*)
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Andre S. Kamogari Nakamura, MD (*Abstract Co-Author*)
Renan Oliveira De Carvalho Caminha (*Abstract Co-Author*)
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Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)
Vitor T. Paula, MD (*Abstract Co-Author*)

TEACHING POINTS

Whole-body magnetic resonance imaging (WB-MRI) is well established in medical practice in oncologic screening and staging. There are new perspectives for musculoskeletal evaluation, especially for inflammatory arthropathies and myopathies. Despite being rare, neuromuscular disorders (NMD) can benefit from the radiologic evaluation of specific patterns of muscular fatty atrophy (MFA). The purpose of this exhibition is to: - Review the role of WB-MRI in musculoskeletal evaluation, focusing on NMD. - Review the specific patterns of MFA related to NMD and highlight when this diagnosis should be suspected. - Discuss the new perspectives for WB-MRI in this scenario. - Describe the technique of image acquisition within a resumed protocol.

TABLE OF CONTENTS/OUTLINE

Introduction Physical and clinical aspects of WB-MRI Currently available WB-MRI options Epidemiology, physiopathology and clinical aspects of NMD in general. Perspectives in WB-MRI for NMD evaluation Review the importance of the patterns of MFA and why this protocol could be helpful in NMD assessment New perspective and protocol suggestion for NMD evaluation with examples. Case-by-case discussion and review Specific patterns of MFA and its correlation with NMD: desminopathy, collagen-VI related dystrophies, metabolic dystrophies, mitochondrial myopathies and others. Differential diagnosis: myositis, fasciitis and other conditions. Conclusions & "take-home messages"

MKEE-25 FOLLOW THE FAT AND YOU WILL FIND THE ANSWER: MRI PATTERN RECOGNITION OF GENETIC MYOPATHIES

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Maria Fernanda Galleguillos, MD (*Abstract Co-Author*)
Axel I. Aranguiz Aranda, MD (*Abstract Co-Author*)
Diana G. Lopez Alvarez, MD (*Abstract Co-Author*)
Jorge A. Bevilacqua (*Abstract Co-Author*)
Jorge Diaz, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Genetic myopathies are caused by mutations in genes involved in muscle structure or function and are characterized by selective muscle involvement.2. MRI is the imaging gold standard for the assessment of myopathies. Standard protocols include T1w and STIR: T1w allows assessment of muscle fatty replacement, while STIR identifies edema.3. Fatty replacement patterns help to differentiate genetic myopathies and support genetic testing.4. Key imaging features include selective muscle involvement (e.g. tongue in Pompe), sparing (e.g. sartorius in dysferlinopathy), asymmetry (e.g. facioscapulohumeral dystrophy), cephalocaudal gradients (e.g. sarcoglycanopathies), and specific signs (e.g. peripheral involvement with central sparing in COL6A).5. MRI reports should quantify fatty replacement for each muscle group, highlighting affected and spared muscles. Conclusions should indicate whether the findings are consistent with a myopathy, support a genetic etiology, and, if possible, suggest a specific diagnosis.

TABLE OF CONTENTS/OUTLINE

1. Introduction: pathophysiology and genetics.2. MRI protocols: recommended sequences.3. Myopathy imaging findings: fatty replacement and edema.4. Diagnostic approach: systematic analysis and diagnostic algorithms5. Disease-specific patterns: a) Dystrophic: Limb-girdle muscular dystrophies, dystrophinopathies, and others. b) Non-dystrophic: Congenital myopathies and channelopathies. c) Metabolic: Pompe and mitochondriopathies.6. How to report: a recommended template.7. Conclusions.

MKEE-26 BEYOND THE USUAL SUSPECTS: UNCOVERING CHOPART SPRAINS ON MRI

Grace Wang, MD, MPH (*Presenter*)
Mickael Tordjman, MD, MS (*Abstract Co-Author*)
Kevin Pham, MD (*Abstract Co-Author*)
Bronte Balon, MD (*Abstract Co-Author*)
Mingqian Huang, MD (*Abstract Co-Author*)

TEACHING POINTS

1) Identify normal anatomy of the Chopart (midtarsal) joint complex on MRI, including the calcaneocuboid and talonavicular ligaments 2) Use case-based imaging review to demonstrate MRI features of mid-ankle (Chopart) sprains, which are often under recognized in routine ankle trauma workups 3) Recognize classic injury mechanisms and associated bone contusion patterns that suggest midtarsal ligament injury 4) Distinguish pitfalls 5) Highlight the clinical consequences of missed Chopart sprains 6) Emphasize the role of MRI in guiding and discuss when further orthopedic evaluation is warranted

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Introduction: a) Epidemiology of midtarsal injuries in ankle trauma b) Clinical presentation in ED and outpatient settings Anatomy and biomechanics of injuries: a) Normal anatomy of the talocalcaneonavicular and calcaneocuboid joints b) Mechanisms of Chopart injury Case-Based Review of Chopart Sprains: a) For example, classic acute inversion-type sprain, chronic sequalae of remote midtarsal sprain, and complex combined ligamentous injury Pitfalls and Variants: a) Differentiating true ligament injury from normal thickening or chronic scarring b) Accessory ossicles vs. avulsion fragments c) Commonly missed bone marrow edema patterns in Chopart injuries Surgical and Clinical Correlation: a) Overview of conservative vs. surgical management b) Role of imaging in guiding orthopedic referral c) Outcomes of untreated Chopart instability

MKEE-27 PAINFUL SKIN TUMORS UNDER THE PROBE: HIGH-FREQUENCY ULTRASOUND AS A KEY DIAGNOSTIC TOOL

Sofia Skaf (*Presenter*)
Damaris V. Goncalves, MD (*Abstract Co-Author*)
Claudia B. Camara, MD (*Abstract Co-Author*)
Fernanda A. Cavallieri, MD (*Abstract Co-Author*)
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Caroline Skaf, MD (*Abstract Co-Author*)

TEACHING POINTS

High-frequency ultrasonography (HFUS) has become a key diagnostic tool for dermatologists and plastic surgeons due to its availability, safety, and cost-effectiveness. It also offers higher spatial resolution than earlier imaging modalities like magnetic resonance imaging (MRI). As demand for specialized sonographic evaluation grows, radiologists must recognize dermatologic lesions and their imaging features. Although asymptomatic skin lesions are often underestimated—delaying cancer diagnoses—patients tend to seek faster evaluation when lesions are palpable, painful, or cause dysesthesia. These arise from various etiologies grouped under the acronym ENGLAND (eccrine spiradenoma, neuroma, glomus tumor, leiomyoma, angiolipoma, neurilemmoma, and dermatofibroma). Expanded acronyms like LEND AN EGG also include endometrioma and granular cell tumor. However, many other conditions, such as foreign bodies, may similarly present with pain and cutaneous alterations. This educational exhibit highlights their key clinical and sonographic features, particularly on HFUS, and aims to serve as a practical guide for radiologists in differentiating these entities and improving diagnostic report quality.

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1) Introduction: overview of painful skin lesions and presentation of the acronym LEND AN EGG. 2) HFUS: technical aspects of imaging of skin lesions with high-frequency probes and low-scale Color and Power Doppler imaging. 3) Demonstration of each painful skin lesion and its imaging aspect: Leiomyoma, Eccrine spiradenoma, Neuroma, Dermatofibroma, Angiolipoma, Neurilemmoma (Schwannoma), Endometrioma, Glomus tumor, Granular cell tumor, Miscellanea. 4) Conclusion

MKEE-28 STRAIGHT TALK ON A TWISTED SPINE: NAVIGATING SCOLIOSIS IMAGING

(*Presenter*)
Lucas K. Miyahara, MD (*Abstract Co-Author*)
Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is: 1. To review scoliosis definition, etiology and classification. 2. To discuss when to use imaging techniques such as CT and MRI to evaluate patients with scoliosis. 3. To analyze multimodality imaging associated findings in patients with scoliosis. 4. To assess the ability to predict postoperative correction. 5. Scoliosis surgical treatment.

TABLE OF CONTENTS/OUTLINE

1. Scoliosis definition. 2. Scoliosis etiology and biomechanics. 3. Imaging evaluation: Role of radiography, computed tomography, and magnetic resonance imaging. 4. Cobb angle. 5. Lenke Scoliosis Classification. 6. Spinal flexibility assessment in preoperative scoliosis. 7. Imaging findings associated regarding each scoliosis etiology. 8. Indications, main techniques, imaging findings, and complications in scoliosis surgery treatment.

MKEE-29 HIGH-FREQUENCY ULTRASOUND IN THE EVALUATION OF NON-TRAUMATIC PERIPHERAL NEUROPATHIES: PEARLS AND PITFALLS

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Renata F. Batista Pereira, MD (*Abstract Co-Author*)
Cesar Gabriel Rocha Da Costa Paloschi, MD (*Abstract Co-Author*)
Debora Mayumi Takamune, MD (*Abstract Co-Author*)
Roddie Moraes Neto, MD (*Abstract Co-Author*)
Alex Dias, MD (*Abstract Co-Author*)
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Gabriela R. Camerin, MD (*Abstract Co-Author*)
Regiany Alessandra Garcia Jureidini, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

High-frequency ultrasound (HFUS) is a valuable modality for evaluating non-traumatic peripheral neuropathies, including compressive and inflammatory etiologies. HFUS provides real-time, high-resolution imaging of nerve morphology and pathology. It is faster, more accessible, and more cost-effective than MRI, with the added advantage of bedside use and suitability for serial monitoring and image-guided interventions. In compressive neuropathies, HFUS allows accurate localization of entrapment sites, visualization of nerve compression, displacement, and associated lesions. In inflammatory neuropathies, HFUS identifies hallmark features of nerve involvement, aiding the diagnosis of disorders like CIDP, Lewis-Sumner syndrome, and multifocal motor neuropathy.

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1. Introduction- Peripheral neuropathies: types and classification- Role of imaging in diagnosis and management2. HFUS in nerve imaging: an overview- Technical Considerations- Comparison with MRI and other modalities3. Compression neuropathies- Common Sites of Entrapment (e.g., carpal tunnel, ulnar groove)- Dynamic Assessment Techniques- HFUS-Guided Interventions4. Inflammatory neuropathies- Key sonographic findings- Role in monitoring disease progression and treatment response5. Other non-traumatic neuropathies: metabolic, post-infectious, autoimmune and inflammatory causes6. Pitfalls and Diagnostic Challenges7. Future Directions and Emerging Technologies8. Summary and take-home messages

MKEE-30 LIKE THE BACK OF YOUR HAND: A PRACTICAL GUIDE TO ULTRASONOGRAPHIC EVALUATION OF THE HAND AND WRIST

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Janaina Moreira (*Abstract Co-Author*)
Arthur H. Godeiro, MD (*Abstract Co-Author*)
Ana Gomes, MD (*Abstract Co-Author*)
Marcos Antonio Tebet Filho (*Abstract Co-Author*)
Danilo Amaral, MD (*Abstract Co-Author*)
Caio P. Martinel, MD (*Abstract Co-Author*)
Jose Lucas S. Galvao I, MD (*Abstract Co-Author*)

TEACHING POINTS

Ultrasound is an essential tool for evaluating the musculoskeletal structures of the hand and wrist, offering high resolution and real-time dynamic assessment. It provides detailed visualization of tendons, ligaments, muscles, joints, nerves, and superficial vascular structures. The most common findings include tenosynovitis, tendinopathies, tendon tears, synovial cysts, inflammatory and degenerative changes, nerve compressions such as carpal tunnel syndrome, soft tissue masses, and foreign bodies. Additionally, ultrasound is useful for guiding interventional procedures such as injections and aspirations, contributing to early diagnosis and therapeutic monitoring of various conditions.

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This work begins by highlighting the benefits of ultrasound in evaluating the hand and wrist, followed by a brief anatomical review. It then discusses examination techniques, including patient positioning and dynamic maneuvers. The main detectable pathologies are presented, such as tendon inflammation, tears, cysts, joint changes, nerve compressions, and traumatic injuries. The role of ultrasound in guiding therapeutic procedures is also addressed. The content concludes with clinical applications and case examples that demonstrate its relevance in medical practice.

MKEE-31 HIT THE TARGET: A PRACTICAL GUIDE TO PET/CT-GUIDED BIOPSY

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Caio Nunes, MD (*Abstract Co-Author*)
Guilherme Swerts Pereira (*Abstract Co-Author*)
Pedro Mecate Prada, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Rodrigo Gobbo (*Abstract Co-Author*)
Vitor T. Paula, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)
Eduardo N. Kihara, MD (*Abstract Co-Author*)

TEACHING POINTS

- Demonstrate the role of PET/CT imaging in guiding biopsies of metabolically active bone lesions, particularly in oncology patients. - Provide a step-by-step practical guide for performing PET/CT-guided bone biopsies with high diagnostic accuracy and safety. - Highlight the advantages of PET/CT-guided biopsies compared to conventional CT-guided techniques.

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Clinical Context and Clinical Indications: - Overview of clinical scenarios where PET/CT-guided bone biopsy is valuable Imaging Integration and Lesion Selection - PET/CT combines metabolic and anatomic imaging to localize lesions with high FDG or PSMA uptake (SUV), enabling accurate selection of biopsy targets. Step-by-Step

Technique 1. Image Acquisition: Initial PET/CT scan identifies the metabolically active lesion. 2. Biopsy Planning: Lesions are selected based on highest radiotracer uptake and anatomical accessibility. 3. Patient and Equipment Positioning: Patient is positioned to optimize access to the lesion, and biopsy materials are prepared. 4. Confirmation of needle positioning: A second PET/CT scan ensures accurate needle placement at the metabolic hotspot. 5. Tissue Sampling: Multiple core samples are collected to improve diagnostic yield. 6. Histopathological Analysis: Results guide final diagnosis and influence treatment planning. Diagnostic Yield and Safety - PET/CT-guided biopsies show higher diagnostic accuracy and lower complication rates than conventional CT-guided techniques. Case Illustrations - Selected clinical cases demonstrate the technique's effectiveness and impact on patient management

MKEE-32 BEHIND THE CURTAIN: DANCE-RELATED PATELLOFEMORAL INJURIES ON MRI

Bronte Balon, MD (*Presenter*)
Kevin Pham, MD (*Abstract Co-Author*)
Grace Wang, MD, MPH (*Abstract Co-Author*)
Mickael Tordjman, MD, MS (*Abstract Co-Author*)
Adriano Cuadros (*Abstract Co-Author*)
Mingqian Huang, MD (*Abstract Co-Author*)

TEACHING POINTS

1) Describe the unique biomechanical demands of dance on the patellofemoral joint and extensor mechanism 2) Case-based introduction of the injuries and their presentation patterns 3) Highlight patellar anatomy and key MRI measurements crucial for accurate assessment of these injuries 4) Discuss the clinical implications of early diagnosis, including prevention of chronic dysfunction and impact on athletic performance

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Introduction: Overview of common dance movements and associated biomechanics Imaging of the Knee in Dancers: a) Anatomy Review b) Important measurements (TT-TG distance, patellar tilt angle) Case-Based Review of Patellofemoral Injuries in dancers: a) Chondromalacia Patellae b) Patellar Osteochondral Injury c) Patellar Maltracking and Instability Case-Based Review of Patellar Tendon Injuries in dancers: a) Patellar Tendinopathy ("Jumper's Knee") b) Partial Patellar Tendon Tears c) Sinding-Larsen-Johansson Syndrome Clinical Impact: a) Importance of early diagnosis in preventing chronic disability b) Conservative vs. surgical management implications based on imaging Summary: a) Early-stage patellofemoral and tendon pathologies are common but often under- recognized in dancers b) The critical role MRI plays in diagnosing these changes

MKEE-33 QUANTITATIVE MR FINGERPRINT IN SARCOPENIA. MORE THAN THE RADIOLOGIST'S EYE MEETS

Alfonso Iglesias, MD, PhD (*Presenter*)
Ana Blanco Bugueiro (*Abstract Co-Author*)
Mercedes Arias Gonzalez, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

To know the applications of texture analysis in medical image analysis and their challenging problems in image processing due to the fact that textures have a huge variability To illustrate the MRI data preparation: preprocessing and region of interest for the extraction of textures features whose aim to characterize muscle tissue structure To know the different texture descriptors such as Gray-Level Co-occurrence Matrix (GLCM), Gray-Level Run Length Matrix (GLRLM), Discrete Wavelet Transform (DWT), and Fractal Dimension (FD) that allows to extract texture findings from T2-weighted-images that help in identifying texture patterns associated with sarcopenia. To evaluate how these metrics capture complexity, homogeneity, and variability in muscle structures, providing quantitative biomarkers relevant to detect sarcopenia.

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Review key concepts and the strengths and weaknesses of texture analysis in medical image analysis Application of different texture analysis methods on T2-weighted-images to characterize healthy muscle and to be able to differentiate it from sarcopenic muscle To explain how these methods support the development of automated, objective systems for diagnostic imaging, offering helpful tools to assist in the identification of sarcopenia

MKEE-34 HIGH-FREQUENCY ULTRASOUND IN MUSCULOSKELETAL RADIOLOGY: MAIN INDICATIONS AND CASE REVIEW

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TEACHING POINTS

Learn how to perform high-frequency ultrasound and understand its specific technical features; Understand the clinical applications of high-frequency ultrasound in the musculoskeletal system; Structure the diagnostic approach to common pathologies and differential diagnoses involving skin, nails, cutaneous appendages, and the musculoskeletal system

TABLE OF CONTENTS/OUTLINE

Introduction: Overview of high-frequency ultrasound; Technical guide on how to perform it and key considerations; Anatomy and ultrasound anatomy of the skin, subcutaneous tissue, and appendages; Applications in the musculoskeletal system and related pathologies; High-Frequency Ultrasound - Musculoskeletal System: Case-Based Review: Cutaneous tumors; Nail lesions; Cutaneous appendage lesions Inflammatory and infectious conditions; Vascular lesions;Nerve injuries; Soft tissue injuries; Summary; Take-Home Messages

MKEE-35 ULTRASOUND-GUIDED BARBOTAGE IN THE TREATMENT OF CALCIFIC ROTATOR CUFF TENDINOPATHY: TECHNIQUE, CHALLENGES AND PRACTICAL INSIGHTS

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Alberto Bazzocchi, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the indication and create a practical flow-chart with the steps for ultrasound guided barbotage in rotator cuff calcific tendinopathy. To analyze diagnostic and technical challenges and strategies for complication prevention and management.

TABLE OF CONTENTS/OUTLINE

When conservative treatment of calcific tendinopathy of the rotator cuff fails, ultrasound-guided barbotage (UGB) offers a minimally invasive and effective alternative. Understanding deposit morphology and location on ultrasound is essential for procedural planning, as it guides needle placement, technique selection, and directly influences barbotage success. UGB requires adequate equipment selection, patient positioning, sterile preparation and administration of local and bursal anaesthesia. Both single and two-needle approaches have specific advantages depending on the calcification's characteristics. Repeated cycles of lavage are used to fragment and evacuate the calcium. Completion of UBG is based on analysis of fragmentation and changes in morphology. A bursal infiltration with a corticosteroid is typically done

post-barbotage, followed by passive or active mobilization of the shoulder. Partially successful procedures or large deposits must be recognized and considered for follow-up procedures. Technical challenges like needle placement, along with potential complications, require precise technique to ensure safe and effective outcomes.

MKEE-36 ACQUISITION OF A MUSCULOSKELETAL MRI: FROM PHYSICS TO PRACTICAL TROUBLESHOOTING - A COMPREHENSIVE GUIDE

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Gabriel Da Silva Eli, MD (*Abstract Co-Author*)
Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)
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TEACHING POINTS

Magnetic Resonance Imaging (MRI) is the modality of choice for several musculoskeletal conditions as it is a safe, reliable and reproductive method. Its image acquisition, however, may pose a significant challenge due to patients' diverse body habitus, comorbidities, hardware, among many others. The purpose of this exhibit is to: - Provide MRI physics concepts useful for understanding imaging acquisition. - Review main MRI artifacts and how to overcome them. - Provide insights in unexpected situations: additional findings, large or restless patients. - Discuss imaging parameters and optimization in specific situations: tumors, whole-body protocols.

TABLE OF CONTENTS/OUTLINE

1. Introductiona. Applied MRI physics reviewb. "Hands on" of the MRI interface and acquisitionc. Primary MRI adjustments (average, TR, TE, concatenation, FOV etc.) 2. MRI artifacts a. Physics behind MRI artifacts b. How to avoid and solve MRI artifacts3. Specific situations:a. Slice programming in the setting of an unexpected findingb. Uncooperative patients c. Metal artifactsd. Signal and resolution balancing 4. Conclusions & "take-home messages"

MKEE-37 SPORT MUSCLE INJURIES OF THE TRICEPS SURAE: WHAT, HOW, WHY AND WHERE

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Micaela A. Rabino, MBBS (*Abstract Co-Author*)
Maria F. Neville, MEd (*Abstract Co-Author*)
Javier Michienzi (*Abstract Co-Author*)
Pablo A. Eivers (*Abstract Co-Author*)
Augusto Napoli, MD (*Abstract Co-Author*)

TEACHING POINTS

To understand the anatomy, function, and biodynamic aspects of triceps surae muscle complex. To recognize the spectrum of tearing of these muscles, myotendinous junctions and tendons during sports practice analyzing their mechanism of injury. To evaluate the imaging methods in the different gastrocnemius, soleus and plantaris lesions and describe the precise location and characteristics. To describe ultrasound and magnetic resonance signs of these tears, emphasizing the prognostic criteria for recovery, return to play, and re-injury.

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The posterior muscles of the leg are arranged in two compartments, one superficial and the other deep. The superficial muscle group, or triceps surae, includes medial and lateral gastrocnemius, soleus and the plantaris which are inserted distally into the calcaneus. Its primary function is plantar flexion of the foot, with a secondary role in knee flexion. This muscle complex plays a crucial role in propulsion during walking and sprinting.Triceps surae muscle complex injuries generally affect the medial gastrocnemius and soleus muscles, and the most common injury mechanism is during the sprint or high-speed running with knee extension and foot dorsiflexion. The injuries of gastrocnemius, soleus and plantaris were included in the category of calf injuries.Ultrasound is commonly employed as an initial imaging technique. To assess deeper anatomical structures MR imaging is the diagnostic gold standard.The evolution of injuries and the return to play can be estimated depending on its extent and location.Additionally, we will include some injuries of the deep muscle group.

MKEE-38 MUSCULOSKELETAL IMAGING IN DIABETIC FOOT COMPLICATIONS: A PRACTICAL APPROACH

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Alberto Bazzocchi, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the role of the different imaging techniques on assessing diabetic foot complications. To provide a logical algorithm for diagnosis of the different possible complications, based on the capabilities of the different techniques

TABLE OF CONTENTS/OUTLINE

Foot complications are a leading cause of non-traumatic amputations. The global prevalence has been calculated to be approximately 6.3%. The delayed diagnosis of complications poses an additional risk for patients and may lead to amputations. Early and accurate diagnosis in high-risk patients is crucial to prevent progression and preserve the limb. Radiographs are a first line tool for detecting fractures, osteolysis and joint destruction, but lack sensitivity for early-stage changes. Ultrasound allows assessment of soft tissue infections and aids in performing targeted interventions. MRI is the gold standard for detecting early osteomyelitis and distinguishing infection from non- infectious Charcot neuroarthropathy. CT lacks sensitivity for the assessment of early infectious or neuroarthropathic changes, but may be useful in the assessment of progression and with surgical planning. Nuclear imaging aids in the challenging differentiation of early osteomyelitis from Charcot arthropathy by detecting increased bone metabolism.

MKEE-39 IMAGING EVALUATION OF PERIPHERAL NERVE INJURIES IN CHILDREN

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Renata V. Leao, MD (*Abstract Co-Author*)

TEACHING POINTS

1) The evolution of high-frequency ultrasound transducers and the development of specific magnetic resonance imaging sequences have made it feasible to visualize peripheral nerves and diagnose abnormalities in radiological studies. 2) The assessment of peripheral nerves in the pediatric population must consider age-related differences, anatomical particularities, and technical challenges, in order to guide the choice of imaging modality and ensure accurate interpretation of the findings. 3) Our purpose is to illustrate, based on real cases from our institution, the main imaging findings to look for in the evaluation of nerves in children, focusing on traumatic, inflammatory, and tumor-related conditions. 4) Understanding the mechanism of neuropathy, as well as the extent and location of the injury, can aid in selecting an appropriate treatment strategy—whether surgical or conservative—and in predicting the child's recovery potential.

TABLE OF CONTENTS/OUTLINE

1) Introduction to the imaging assessment of peripheral nerves. 2) Particularities of the pediatric age group. 2) Advantages, limitations and applications of each imaging method. 4) Normal appearance of peripheral nerves vs. general abnormal findings. 5) Case-based review of nerve injury mechanisms. 5.1) Traumatic injuries. 5.2) Inflammatory neuropathies. 5.3) Peripheral nerve tumors. 5.4) Postoperative injuries. 6) Challenges, pearls and pitfalls in interpreting peripheral nerve images. 7) Take-home messages.

MKEE-40 SURFACE ECHOES: SONOGRAPHY OF SUPERFICIAL NON-NEOPLASTIC LESIONS

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TEACHING POINTS

Non-neoplastic superficial palpable abnormalities encompass a wide range of pathologies that present as apparent masses, often causing significant distress for patients. Sonography is an excellent, and frequently first-line, modality for evaluating these abnormalities. Effective use of ultrasound can expedite diagnosis, alleviate patient anxiety, and reduce the need for unnecessary imaging studies, specialist consultations, and procedures.We will discuss how factors such as patient demographics, lesion location, and chronicity can be combined with imaging findings to develop an appropriate differential diagnosis for a given palpable abnormality. The sonographic features of common superficial non-neoplastic entities, including vascular and lymphatic malformations as well as cystic lesions, will be reviewed. Additionally, we will explore superficial pseudo-masses, including but not limited to hematomas, fat necrosis, scar endometriomas, abscesses, and bursal disease. Common pitfalls and mimics to be aware of in the diagnostic process will also be highlighted. Finally, we will provide an overview of relevant treatments and management strategies for these conditions.

TABLE OF CONTENTS/OUTLINE

• Introduction • Objectives • Review of relevant presentations and the pathophysiology of various nonneoplastic entities • Key sonographic features and examples • Additional diagnostic considerations, review of common pitfalls, and mimics of nonneoplastic entities • Review of treatment/management • Summary and conclusions • References

MKEE-41 LESSER EVIL: IMAGING AND DISEASES OF THE LESSER TOES

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TEACHING POINTS

Forefoot pain arises from various conditions. While numerous articles have detailed the anatomy and imaging of hallux abnormalities, there is scarcity of literature on lesser toe disorders despite their considerable morbidity. The lesser toes enhance the weight-bearing surface area and support a significant portion of body weight during walking, making them susceptible to greater stresses and unique disorders. The lesser toe plantar plate features a single fibrocartilaginous capsular thickening, which can lead to attritional deficiency. The second and third metatarsals are typically longer and more slender, bearing the most force during push-off, increasing their risk for stress fractures and Freiberg's infraction. The narrower intermetatarsal spaces between the second and fourth toes may compress and irritate the plantar digital nerves, resulting in Morton's neuroma. This educational exhibit will concentrate on forefoot pain associated with lesser toe disorders emphasizing relevant anatomy mechanisms and imaging findings

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PLANTAR PLATE TEAR •Single fibrocartilaginous capsular thickening predisposes to attritional deficiency •MTPJ synovitis may cause plantar plate degeneration over time and MTPJ instability STRESS FRACTURE The longer, thinner MT2 and MT3 bear greatest impact in push off IMPINGEMENT Morton's neuroma Narrower 2nd-4th intermetatarsal spaces predispose to nerve irritation Adventitial bursitis Foot is supported at the heel, MT1 and MT5 (tripod) increasing risk for bursitis HAMMERTOE, MALLET, CLAWTOE Longer, thinner 2nd toe predisposes to compression FREIBERG'S INFRACTION Longer, thinner 2nd toe predisposes to altered joint biomechanics

MKEE-42 UPDATE ON CHRONIC LATERAL ANKLE INSTABILITY - WHAT RADIOLOGISTS NEED TO LOOK FOR AND HOW TO REPORT IT

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Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

Ankle sprains are among the most common musculoskeletal injuries, particularly in athletic populations. A substantial proportion of these injuries progress to Chronic Lateral Ankle Instability (CLAI), which is characterized by the presence of residual symptoms and repeated ankle sprains, sensations of instability, and mechanical laxity persisting after an initial significant lateral ankle sprain. Given the clinical overlap and subjective nature of symptoms, radiologists play a crucial role in the accurate diagnosis of CLAI. The purposes of this exhibit are: Make a multimodality-based didactic review of the main topics of the Chronic Lateral Ankle Instability with multiple imaging methods. Make a practice guide with schematic fluxogram explaining the decision make. Propose a didactic categorization of these topics by radiology method: x-ray with and without stress ultrasound tomography resonance arthroscopy Illustrate those conditions based on cases from our radiology group.

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ANATOMY OF LATERAL ANKLE LIGAMENTS Anterior talofibular ligament (ATFL) Calcaneofibular ligament (CFL) Posterior talofibular ligament (PTFL) THE ROLE OF THE IMAGING METHODS plain radiographs stress radiographs ultrasound computed tomography nuclear resonance arthroscopy RADIOLOGY REPORTS IN ANTEROLATERAL ANKLE INSTABILITY Evaluate the Lateral Ligament Complex Look for Indirect Signs of Instability Assess Associated Structures Comment on Alignment and Biomechanics Clinical Relevance POSTOPERATIVE Surgical techniques Postoperative phases and findings Main complications FUTURE PERSPECTIVES Artificial Intelligence New imaging techniques Surgical innovations

MKEE-43 TINY TROUBLES: IMAGING CHALLENGES IN NEONATAL AND SMALL CHILDREN BONE AND SOFT TISSUE TUMORS

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Vitor T. Paula, MD (*Abstract Co-Author*)

TEACHING POINTS

- Recognize the clinical relevance of early detection and accurate diagnosis of common and uncommon bone and soft tissue tumors in neonates and small children. - Emphasize the role of ultrasound as a first-line imaging tool, complemented by CT and MRI for comprehensive evaluation and surgical planning. - Review a wide spectrum of tumor types and their differential diagnoses, distinguishing benign from malignant entities. - Present illustrative cases to demonstrate diagnostic challenges, typical imaging features, and treatment strategies.

TABLE OF CONTENTS/OUTLINE

1. Introduction - Overview of epidemiology, anatomy, and clinical impact 2. Imaging Modalities Ultrasound: Initial assessment tool. CT/MRI: Define lesion extent, guide biopsy, surgical planning. 3. Types of Tumors and Conditions - Case Based Review Bone/Soft Tissue Tumors: Rhabdomyosarcoma Infantile fibrosarcoma Rhabdoid tumor Lipoblastoma / Lipoma Fibrous tumors Vascular Lesions: Infantile and congenital hemangiomas Klippel-Trénaunay syndrome Lymphoproliferative/Histiocytic Disorders: Langerhans cell histiocytosis Lymphoma Other Conditions: Congenital torticollis Neuroblastoma Teratoma Skeletal dysplasias Dysraphism Bone malformations Chronic recurrent osteomyelitis Metabolic bone disorders Hematoma Cystic lesions 4. Differential Diagnoses: Key imaging features to distinguish malignant from benign and pseudotumoral entities. 5. Treatment and Follow-Up: Imaging role in staging, planning, and monitoring. 6. Diagnostic Flowchart: Structured algorithm to support accurate reporting.

MKEE-44 CRACKING THE CODE: IMAGING PATTERNS OF OSTEOID OSTEOMA ACROSS MRI

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Sergio F. Junior SR, MD (*Abstract Co-Author*)
Flavia P. Lopes, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. To understand the pathophysiology and clinical presentation of osteoid osteoma. 2. To identify characteristic conventional and advanced MRI features of osteoid osteoma. 3. To recognize potential pitfalls and mimicries in MRI interpretation. 4. To improve diagnostic confidence and accuracy in identifying osteoid osteoma using MRI systematic aprroach.

TABLE OF CONTENTS/OUTLINE

Introduction: OO is a benign osteogenic tumor affecting children and young adults, characterized by a small radiolucent nidus surrounded by reactive bone sclerosis. While CT is traditionally considered the gold standard for diagnosis, MRI is increasingly used for its superior soft tissue contrast, ability to detect marrow and soft tissue edema, and lack of ionizing radiation. However, MRI findings can sometimes be nonspecific or misleading, making a thorough understanding of MRI features critical for accurate diagnosis. Objective: To review the etiopathogenesis ,conventional and advanced MRI characteristics in detecting the nidus of OO with a systematic approach, that will be proposed to differentiate from inflammatory, infectious, traumatic, and tumoral lesions. An understanding of the applicability and limitations of MRI tecniques is necessary to make accurate diagnosis and potentially the right treatment for our patients.TABLE OF CONTENTS AND OUTLINE 1) The value of each conventional and advanced MRI techniques(DIXON T1 (inand out phase) , DCEperfusion and, DWI) in diagnosis. 2) Case discussion to demonstrate the ultility in differentiate OO from : · Lymphoma · Inflamatory diseases · Infection (Brodie abscess) · CRMO · Stress Fractures

MKEE-45 BEYOND THE SHEATH: DIAGNOSTIC CHALLENGES AND PITFALLS IN PERIPHERAL NERVE TUMORS

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TEACHING POINTS

Clinical and epidemiological approach to peripheral nerve sheath tumors, with emphasis on less common and diagnostically challenging subtypes. Most commonly affected nerves and associated functional implications. Role of magnetic resonance imaging and ultrasound in the diagnosis and characterization of these lesions. Imaging criteria to differentiate benign from malignant tumors, including red flags for malignant transformation. Typical and differential imaging features of less common tumors such as intraneural perineuriomas, lipofibromatous hamartoma and malignant tumors such as malignant peripheral nerve sheet tumor and malignant triton tumor, in addition to schwannomas and neurofibromas. Recognition of secondary expansive lesions affecting peripheral nerves (cystic nerve lesions, perineurial spread of malignancy and inflammatory pseudotumors) Recognition of common pitfalls that may mimic nerve sheath tumors: radiation-induced neuropathy, post-traumatic neuromas, and inflammatory neuropathies. Illustrative cases with key diagnostic insights.

TABLE OF CONTENTS/OUTLINE

Overview of peripheral nerve sheath tumors: origin, epidemiology, and clinical relevance. Role and imaging protocol of MRI and ultrasound in the assessment of these lesions. Imaging differences between benign and malignant tumors. Less common and diagnostically challenging tumors, as intraneural perineurioma and malignant triton tumor. Pitfalls and how to identify them. Illustrative case discussions highlighting diagnostic challenges, key learning points, pitfalls and secondary expansive lesions affecting peripheral nerve.

MKEE-46 ANTERIOR CRUCIATE LIGAMENT INJURIES AND REPAIR: ADVANCES IN IMAGING AND INTERPRETATION

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TEACHING POINTS

This case-based review provides an in-depth exploration of the anatomy and biomechanics of anterior cruciate ligament (ACL) injuries, encompassing, injury types, surgical indications, surgical techniques and expected imaging findings, postoperative complications, prognosis, and future advancements, with a focus on magnetic resonance imaging (MRI).

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AnatomyTypical MRI appearance Biomechanics Main mechanisms of injury Injuries: MRI appearance of partial lesion, degeneration, complete lesion.Associated injuries such as Segond fracture, ramp lesion, posteromedial corner injury of the knee, meniscocapsular separation, O'Donoghue unhappy triad (anterior cruciate ligament tear, medial collateral ligament injury and medial meniscal tear (lateral compartment bone bruise) Management Conservative and surgical treatment criteria;When to re-address lesions in cases that have already undergone surgeryNew surgical techniques: Internal Brace or Ligament Augmentation and BEAR - Bridge-Enhanced ACL Repair Postoperative Findings Imaging features of conventional reconstruction, different graft options, ligament suturing, double-bundle reconstruction, and single-bundle reconstruction.Expected postoperative imaging results.Identification of complications through MRI as tunnel enlargement/malpositioning, friction, arthrofibrosis, tunnel cysts, infection, loosening of material and re-rupture Teaching Flowchart: A schematic flowchart will be prepared to guide the report

MKEE-47 POSTOPERATIVE IMAGING OF LUMBAR SPINE ENDOSCOPIC DECOMPRESSION SURGERY - WHAT THE RADIOLOGIST NEEDS TO KNOW

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Marcello H. Nogueira-Barbosa, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Chronic low back pain, defined as pain persisting for more than three months, is a leading musculoskeletal complaint.• Endoscopic lumbar decompression is a minimally invasive technique using endoscopic and microscopic tools via small incisions, reducing complications while ensuring effective neural decompression.• MRI is the modality of choice in low back pain context, particularly for suspected radiculopathy or disc herniation, playing a key role in both preoperative planning and postoperative evaluation.• Postoperative complications are uncommon and include hematoma, seroma, infection and recurrent herniation.• Hematomas are most frequent (up to 86%) but rarely symptomatic. Symptomatic cases may present with pain, paresthesia and dysuria.• Granulation tissue and epidural fibrosis are common and must be distinguished from recurrent herniation, often requiring contrast-enhanced MRI.• Interlaminar and transforaminal are the main surgical routes, selected based on preoperative imaging and herniation type.• Postoperative findings are often subtle, demanding careful image interpretation and clinical correlation.

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• Overview of lumbar spine anatomy on MRI, with focus on findings relevant to surgical planning.• Comparison between open and endoscopic spine surgery, including different endoscopic approaches - key imaging features, advantages, disadvantages and criteria guiding surgical choice.• Postoperative MRI and CT findings, including expected appearance and complications, illustrated with clinical cases.• Future directions, the role of AI and a practical flowchart to support radiologists in interpreting endoscopic spine surgery imaging.

MKEE-48 HIGH-FREQUENCY ULTRASOUND IN SKIN CANCER - A COMPREHENSIVE IMAGING APPROACH

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TEACHING POINTS

High-frequency ultrasound (HFUS) is a valuable, noninvasive imaging tool for evaluating non-melanoma skin cancers, especially basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) . HFUS enables precise measurement of tumor thickness and delineation of tumor margins , aiding in surgical planning and risk stratification. Sonographic patterns differ between BCC and SCC, allowing imaging-based differentiation and potentially influencing clinical management. HFUS can be used to detect recurrence , assess treatment response , and guide biopsies in complex or ambiguous lesions. Combining HFUS with clinical and dermoscopic evaluation enhances diagnostic accuracy in dermatologic oncology.

TABLE OF CONTENTS/OUTLINE

Introduction to High-Frequency Ultrasound (HFUS) in Dermatology Overview of HFUS technology and resolution Advantages over conventional ultrasound in skin imaging Clinical relevance in cutaneous oncology Ultrasound Technique and Protocols Transducer selection (15-70 MHz) Patient positioning and scanning planes Use of gel standoff pads and minimal pressure Role of color and power Doppler Sonographic Appearance of Basal Cell Carcinoma (BCC) Typical HFUS features: hypoechoic, well-defined, intradermal/subdermal Patterns by histologic subtype (nodular, infiltrative, superficial) Preoperative depth and margin assessment Sonographic Appearance of Squamous Cell Carcinoma (SCC) HFUS features: heterogeneous, irregular margins, deep infiltration Doppler findings and vascular flow patterns Detection of aggressive behavior Comparative Sonographic Features: BCC vs SCC Morphologic and vascular differences Practical tips for differentiation Case-based examples with images

MKEE-49 KEY SPINE MEASUREMENTS: A RADIOGRAPHIC GUIDELINE

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TEACHING POINTS

Spine radiographs, in frontal and lateral views, offer valuable quantitative data beyond visual analysis. These images enable key measurements essential for diagnosis, therapeutic planning, and postoperative follow-up in spinal disorders. Sagittal balance evaluation relies on the relationship between spinal curvatures and pelvic parameters. Pelvic incidence defines the ideal spinal curves for global alignment, while pelvic tilt, sacral slope, and SVA complete the assessment. In coronal deformities, key parameters are Cobb angle, vertebral rotation, apex position, and compensatory clavicle/pelvic obliquity. Clavicle and pelvic obliquity indicate compensatory adjustments. Morphological evaluations, including vertebral body and intervertebral disc heights, pedicle dimensions, and foraminal widths, aid in structural assessment.

Dynamic radiographs improve instability detection. Flexion-extension views better identify segmental instability, while lateral bending radiographs distinguish structural from non-structural scoliosis. This guide consolidates essential radiographic parameters for objective, biomechanically grounded spine evaluation.

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1Frontal View Scoliosis definition, Key measures; Dynamic evaluation (bending) ; Post-treatment follow-up 2Lateral View Spinopelvic curvatures, Pelvic parameters, Sagittal balance measurements; Cervicothoracic balance key parameters; Scheuermann Disease evaluation; Dynamic Evaluation for Segmental Instability (Flexion/extension); Structural findings (Foraminal stenosis, Disc space narrowing, Vertebral body height loss); Post-treatment follow-up.

MKEE-50 ULTRASOUND-GUIDED PERINEURAL AND INTRAMUSCULAR INJECTIONS FOR NEURALGIAS OF THE HEAD, NECK, AND UPPER CHEST

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Joseph C. Giaconi, MD (*Abstract Co-Author*)
George R. Matcuk JR, MD (*Abstract Co-Author*)

TEACHING POINTS

Perineural and intramuscular injections in the head, neck, and upper chest can be performed under real-time ultrasound guidance for diagnostic and therapeutic purposes. These injections can be used to evaluate and/or treat pain related to occipital neuralgia, prior trauma or surgery, or neurogenic thoracic outlet syndrome. This exhibit will review the sonoanatomy of certain nerves and muscles from the head to the upper chest and topographic anatomy correlation with MRI and provide a guide for specific perineural and muscle injections.

TABLE OF CONTENTS/OUTLINE

1. Introduction and indications for perineural and intramuscular injections - diagnose and confirm specific neuropathy prior to surgery, relieve nerve pain 2. Procedure preparation- ultrasound transducers, needle size, amount of anesthetic or steroid/anesthetic mixture 3. Anatomy, techniques, and imaging examples of certain perineural and muscle injections, including the greater occipital nerve, lesser occipital nerve, greater auricular nerve, interscalene brachial plexus, and the anterior and middle scalene muscles and pectoralis minor muscle for neurogenic thoracic outlet syndrome. 4. Risks and side effects

MKEE-51 BEYOND BONES AND MUSCLES: THE RADIOLOGIST'S GUIDE TO MUSCULOSKELETAL LYMPHNODES

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TEACHING POINTS

Understand the imaging appearance of normal, reactive, and involved musculoskeletal lymph nodes. Recognize histopathologic correlations and immunohistochemical profiles in lymph node assessment. Identify diagnostic challenges and pitfalls in nodal interpretation during musculoskeletal imaging.

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Musculoskeletal lymph nodes, although clinically significant, are frequently overlooked in routine imaging. This pictorial review highlights pertinent nodal stations—including axillary, inguinal, external iliac, and popliteal chains—and explores their relevance in inflammatory, infectious, and neoplastic conditions. Morphologic criteria such as size, cortical thickness, and hilum preservation, alongside advanced imaging techniques like DWI, assist in distinguishing benign from malignant nodes. Two histologically confirmed cases are presented: one demonstrating complete nodal replacement by metastatic rhabdomyosarcoma with positive myogenic markers (Desmin, Myogenin, MyoD1, CD56), and another showing a reactive lymphoid pattern with interfollicular expansion and eosinophils, supported by preserved B and T-cell profiles, high germinal Ki-67 index, and absence of CD30 expression. Understanding lymph node behavior in musculoskeletal imaging not only aids in diagnosis but also enhances staging accuracy and patient management, especially in oncology and inflammatory diseases.

MKEE-52 IMAGING IN JUVENILE IDIOPATHIC ARTHRITIS: HOW RECENT ADVANCES ARE REDEFINING CLINICAL CARE

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Leticia dos Reis Morimoto, MD (*Abstract Co-Author*)
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Stefanie Basilio Medeiros, MD (*Abstract Co-Author*)
Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Highlight the latest advancements in imaging modalities for JIA diagnosis and monitoring. Demonstrate how these techniques enable early detection of inflammation and structural damage. Emphasize the role of standardized imaging protocols in improving diagnostic accuracy and patient outcomes.

TABLE OF CONTENTS/OUTLINE

Introduction: Definition, classification, and diagnostic challenges of JIA. Role of Imaging: Importance of imaging for early detection, differential diagnosis, and disease monitoring. Conventional Radiography: Structural assessment and limitations. Musculoskeletal Ultrasound: Accessibility, utility in joint evaluation, and standardized scoring. Magnetic Resonance Imaging: High sensitivity, evolving criteria, and international standardization efforts. Criteria for disease remission and how imaging exams can assist Treatment Future Perspectives: Standardization needs, protocol improvements, and integration of artificial intelligence.

MKEE-53 FROM TRADITIONAL TO MODERN MENISCAL REPAIR: IMAGING CHALLENGES AND INSIGHTS

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Lavinia Dias, MD (*Abstract Co-Author*)
Vitor T. Paula, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the main and new surgical techniques used in meniscal treatment, including partial meniscectomy, meniscal repair and meniscal replacement; To present expected imaging findings and diagnostic pitfalls in the postoperative meniscus; To demonstrate the role of multimodal imaging — especially MR and MR arthrography —

in the differentiation between postoperative changes and recurrent meniscal tears; To illustrate common postoperative scenarios with imaging examples and highlight the importance of clinical correlation

TABLE OF CONTENTS/OUTLINE

1 - Meniscal anatomy and physiology relevant to surgery and healing Anatomical zones (red vs. white zone) and vascularity; Structural function of the meniscus and its implications in surgery; Healing potential and cellular differences by meniscal region; 2 - Surgical techniques and postoperative expectations (indications, surgical approach, and expected postoperative findings) Partial meniscectomy; Meniscal repair: repairable tear patterns, fixation techniques including meniscal suture and meniscal root repair; Meniscal transplantation; 3 - Imaging strategies in the postoperative evaluation Role of conventional MR imaging and its limitations; MR arthrography and CT arthrography: clinical utility in specific contexts, and advantages in detecting recurrent tear; 4 - Most common postoperative imaging findings and diagnostic challenges 5 - Practical Tips for Radiology Reporting and How to Communicate Relevant Findings 6 - Future Perspectives and Innovations 7 - Decision-Making Flowchart for Radiologists: visual algorithm to guide image interpretation;

MKEE-54 METATARSALGIA OF THE LESSER RAYS:A MULTICAUSAL APPROACH TO FOREFOOT PAIN

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Lucas N. Silva, MD (*Abstract Co-Author*)
Thiago A. Rizzetto, MD (*Abstract Co-Author*)
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Marcelo A. Nico, MD (*Abstract Co-Author*)
Alipio Ormond Filho, MD (*Abstract Co-Author*)

TEACHING POINTS

Metatarsalgia refers to pain in the metatarsal region, a frequent complaint affecting about 10% of the population and up to 85% of foot pain in middle-aged women. Its causes are diverse and often clinically indistinct, making imaging essential for accurate diagnosis. The forefoot can be divided into the first ray and the lesser rays—the latter being the focus of this review. Foot biomechanics play a key role in load distribution and gait stability. Alterations can lead to second ray syndrome with plantar plate rupture, Morton's neuroma, stress fractures, and Freiberg's infraction. Non-mechanical causes must also be considered, including plantar vein thrombosis, rheumatoid arthritis, gout, osteoarthritis, infections, and tumors. A multimodal imaging approach enhances diagnostic accuracy. Radiographs and CT are helpful for detecting osseous abnormalities, such as stress and subchondral fractures. MRI and ultrasound provide superior soft tissue assessment, crucial for evaluating plantar plate injuries and Morton's neuroma. Treatment ranges from conservative management—rest, orthotics—to surgery in cases of persistent pain or joint instability. This study discusses the biomechanical, structural and systemic causes of metatarsalgia, the role of imaging in diagnosis, and therapeutic outcomes.

TABLE OF CONTENTS/OUTLINE

Anatomy. Normal e altered biomechanics. Assessment of imaging methods: X-ray, Ultrasound, CT, MRI. Differential diagnosis of metatarsalgias: Mechanical causes and Non mechanical causes. Post-surgical treatment.

MKEE-55 STICK, SEAL, HEAL: IMAGING CHARACTERISTICS AND THE EVOLVING LANDSCAPE OF CHONDRAL REPAIR TECHNIQUES

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Vitor T. Paula, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Frederico C. Miranda, MD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is: 1. To review the anatomy, microstructure of articular cartilage and the imaging characteristics of chondral defects.2. To discuss the treatment of chondral lesions using various surgical techniques with particular emphasis on the use of autologous matrix-induced chondrogenesis and their imaging features.3. To demonstrate the role of imaging in postoperative evaluation, illustrated with cases showing expected postoperative findings and the most common complications.

TABLE OF CONTENTS/OUTLINE

1 - Anatomy of the chondral surfaces, including imaging characteristics of normal cartilage.2 - Imaging characteristics of the most common chondral defects.3 - Treatment of chondral lesions using multiple surgical techniques, with an overview of indications, advantages, and limitations, illustrated with clinical cases: Debridement and Chondroplasty (Shaving / Lavage);Microfracture; Drilling; Osteochondral autograft transplantation (OATS / Mosaicplasty);Osteochondral allograft transplantation; Autologous Chondrocyte Implantation (ACI / MACI); 4 - Focused discussion on the treatment of chondral lesions using autologous matrix-induced chondrogenesis and its imaging features.5 - A practical guide for radiologists to identify postoperative MRI features of chondral repair, differentiate normal healing patterns from complications, and deliver accurate reports.6 - Use of advanced T2 mapping sequences and the MOCART score in postoperative evaluation.7 - Future perspectives, emerging techniques, and trends in chondral repair.

MKEE-56 FIBROUS AND (SOMETIMES) FURIOUS: MULTI-MODALITY REVIEW FOR DIAGNOSING, MANAGING, AND TREATMENT RELATED IMAGING CHANGES OF DESMOID TUMORS

Brandon Ritchie, DO (*Presenter*)
Kennedy Sparling (*Abstract Co-Author*)
Navid Faraji, MD (*Abstract Co-Author*)

TEACHING POINTS

• Identify subtypes and pathologic behavior of desmoid fibromatosis • Review a spectrum of indolent to more aggressive imaging features of desmoid tumors across multiple modalities • Outline current management strategies while describing how imaging can be used to assess treatment response and disease recurrence

TABLE OF CONTENTS/OUTLINE

Background & Classification: Overview of extra-abdominal, abdominal wall, and intra-abdominal subtypes. Pathophysiology Sporadic vs. FAP-associated; ß-catenin and APC gene involvement. Clinical Features: Locally aggressive with no metastatic potential; high recurrence risk. Imaging Evaluation MRI (preferred): T2 signal intensity reflects tumor activity; fascial tail, band, and whorled signs CT/US: Variable attenuation/echogenicity; useful for intra-abdominal lesions. Management: Active surveillance for stable tumors Surgery, radiotherapy for select cases Systemic therapy (NSAIDs, anti-estrogens, TKIs, chemo) Interventional approaches (e.g., cryoablation) Monitoring: MRI T2 signal, changes in lesion density, and lesion size help assess treatment response

MKEE-57 CHARTING THE CARTILAGE COURSE: A RADIOLOGIST'S GUIDE TO CHONDRAL BONE LESIONS

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Thaina d. Rodrigues, MD (*Abstract Co-Author*)
Italo Ueno SR, MD (*Abstract Co-Author*)
Vitor Verlangieri Carmo Machado, MD (*Abstract Co-Author*)
Taisa M. Guarilha, MD (*Abstract Co-Author*)
Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)

Artur Da Rocha Correa Fernandes, MD, PhD (*Abstract Co-Author*)
Julio B. Guimaraes, MD, PhD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the imaging spectrum of chondral bone tumors, from benign to malignant. Recognize key radiologic features that help distinguish ACT from high-grade chondrosarcomas. Integrate imaging findings with clinical context and histopathology to support diagnosis and management.

TABLE OF CONTENTS/OUTLINE

Chondral bone tumors represent a diverse group of osseous lesions sharing a chondroid matrix and exhibiting variable biological behavior. These lesions range from benign enchondromas to aggressive, therapy-resistant high-grade chondrosarcomas. Imaging features such as flocculent or comma-shaped mineralization, endosteal scalloping, cortical destruction, and periosteal reaction assist in diagnosis and risk stratification. Special attention is given to atypical cartilaginous tumors (ACTs), classified as low-grade chondrosarcomas with locally aggressive behavior. The main diagnostic challenge lies in distinguishing ACTs from high-grade chondrosarcomas, which are resistant to chemotherapy and radiotherapy. Case-based examples are presented, including pathological fractures associated with ACT and misclassified lesions evolving into higher-grade tumors. Osteochondromas and multiple hereditary exostoses are also reviewed, with attention to cartilage cap thickness and syndromic patterns. Differential diagnosis must account for lesion location, multiplicity, and patient age, incorporating mimics such as metastasis, plasmacytoma, fibrous dysplasia, and bone infarction. A structured diagnostic approach is key for radiologic evaluation and guiding management.

MKEE-58 'DISPUTED' THORACIC OUTLET SYNDROME (DTOS): BEYOND BONE- RETHINKING MUSCULAR AND SOFT TISSUE IMPINGEMENT

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Jose Carlos Garcia (*Abstract Co-Author*)
Eduardo L. Bizetto, MD (*Abstract Co-Author*)
Renata V. Leao, MD (*Abstract Co-Author*)
Renata F. Batista Pereira, MD (*Abstract Co-Author*)
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TEACHING POINTS

Disputed Thoracic Outlet Syndrome (DTOS) might represent up to 99% of neurogenic TOS cases, yet it's often missed because standard MRI and electromyography typically show normal results. We believe DTOS isn't truly "disputed," but rather frequently overlooked due to subtle muscular compressions and mild, variable symptoms. Bilateral dynamic positional MRI (2D/3D sequences) can catch these hidden compressions and subtle asymmetries missed by routine exams. In our patient series, we found impingements caused by muscles such as the scalenes, pectoralis minor, anterior serratus, and subclavius, as well as fibrous bands, anomalous nerve trajectories, and muscle variants. Spotting these subtle anatomical details greatly improves diagnosis and allows precise, minimally invasive endoscopic treatments. It's time to rethink DTOS!

TABLE OF CONTENTS/OUTLINE

* Introduction * Key MRI Signs of Compression * DTOS: Emerging Evidence (4 Cases): 1. Subclavius 2. Middle Scalene 3. Anterior Serratus 4. Pectoralis Minor * Beyond Bone (Anatomical Variants): Muscular and Soft-Tissue Impingement (4 Cases): 5. Scalenus Minimus 6. Subclavius Posticus 7. Anomalous Nerve Trajectories 8. Fibrous Band

MKEE-59 NOT EVERY HOT SPOT IS BONE INFECTION: UNMASKING MIMICKERS THROUGH MULTIMODAL IMAGING

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Alipio Ormond Filho, MD (*Abstract Co-Author*)

TEACHING POINTS

Bone lesions that simulate infection represent a recurrent challenge in radiology, often leading to misdiagnosis, unnecessary antibiotic use, and delays in identifying the actual underlying cause. The clinical and imaging overlap between infectious and non-infectious bone lesions necessitates a careful and structured approach. Among non-infectious inflammatory mimics, chronic nonbacterial osteitis (CNO/CRMO) and SAPHO syndrome are key conditions, especially in children and young adults. Complex regional pain syndrome (CRPS) may also resemble osteomyelitis. Some neoplastic entities and benign lesions can exhibit cortical disruption, periosteal reaction, or surrounding edema features commonly associated with infection. Other vascular and mechanical causes of bone changes add to the diagnostic complexity. This review discusses multimodal imaging findings related to bone infection and non-infectious bone changes, highlighting key features useful for discriminating these non-infectious entities. Incorporating these clues into radiologic assessment can improve diagnostic accuracy and guide appropriate management.

TABLE OF CONTENTS/OUTLINE

1. Introduction - Mimickers of Osteomyelitis. 2. Non-infectious Inflammatory Conditions 3. Neoplastic (benign and malignant) 4. Vascular and Hematologic Lesions 5. Developmental and Mechanical Conditions 6. Imaging Approach & Differential Clues

MKEE-60 IMAGING FINDINGS OF DERMATOFIBROSARCOMA PROTUBERANS: A CASE-BASED EDUCATIONAL EXHIBIT

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Renata V. Leao, MD (*Abstract Co-Author*)
Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)
Giovanni G. Cerri, PhD (*Abstract Co-Author*)
Natally Horvat, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Dermatofibrosarcoma protuberans (DFSP) is a rare soft tissue tumor, a dermal sarcoma known for its locally aggressive nature, that presents a diagnostic challenge due to its variable clinical and histological features. Accurate imaging plays a crucial role in the diagnosis and management of DFSP, by characterizing lesions, assessing tumor extent, and guiding treatment planning. This educational exhibit will delve into the nuances of DFSP and aims to explore the imaging findings of DFSP using various modalities, highlighting key features that aid in accurate diagnosis and management, through a series of case-based discussions, with: 1. Overview of Dermatofibrosarcoma Protuberans 2. Imaging Modalities for DFSP Evaluation 3. Typical Imaging Features of DFSP 4. Differential Diagnosis and Pitfalls 5. Role of Imaging in Treatment Planning 6. Follow-up Imaging and Surveillance

TABLE OF CONTENTS/OUTLINE

I. Introduction to Dermatofibrosarcoma Protuberans II. Imaging Modalities in DFSP Evaluation III. Case Studies IV. Differential Diagnosis and Imaging Pitfalls V. Treatment Planning and Imaging Guidance VI. Follow-up Strategies and Surveillance Imaging This exhibit aims to equip radiologists, oncologists, and other healthcare professionals with the knowledge and skills necessary to accurately interpret imaging findings of DFSP, ultimately improving patient outcomes through timely diagnosis and appropriate management.

MKEE-61 CROSSROADS OF RECOVERY: POSTOPERATIVE INSIGHTS OF ANTERIOR CRUCIATE LIGAMENT

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Felipe Batista Rodrigues, MD (*Abstract Co-Author*)
Camila Tabosa, MD (*Abstract Co-Author*)
Ligia C. Germek, MD (*Abstract Co-Author*)
Roberto Froeder Oliveira, MD (*Abstract Co-Author*)
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Diego A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

• Review key aspects of postoperative evaluation of ACL reconstruction, focusing on graft positioning and integrity. • Highlight the role of imaging modalities in assessing surgical outcomes. • Recognize common complications. • Distinguish expected postoperative changes from pathological findings.

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Postoperative imaging assessment of anterior cruciate ligament (ACL) reconstruction is essential to confirm graft positioning and integrity, monitor healing-related changes, and identify complications. X-ray and CT help evaluate tunnel positioning, fixation devices, and bone structures, with CT also detecting early tunnel widening. MRI is the most sensitive modality for assessing graft signal and integrity, typically showing low signal on T1 and T2 sequences, and evaluating intra-articular structures. Common complications include motion limitation (e.g., impingement, arthrofibrosis, ganglion cysts), graft laxity or rupture, infection, fixation failure, and tunnel enlargement. Clear distinction between expected postoperative findings and complications is crucial for appropriate patient management and timely intervention to avoid surgical failure and long-term dysfunction.

MKEE-62 SAGITTAL BALANCE AND JOINT INTERACTIONS: FROM SPINE TO HIP AND BEYOND

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Vitor Verlangieri Carmo Machado, MD (*Abstract Co-Author*)
Leticia dos Reis Morimoto, MD (*Abstract Co-Author*)
Artur Da Rocha Correa Fernandes, MD, PhD (*Abstract Co-Author*)
Julio B. Guimaraes, MD, PhD (*Abstract Co-Author*)
Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

Present the key parameters of spinopelvic alignment (PI, PT, SS, LL, PI-LL mismatch) and their functional significance. Emphasize how alterations in spinopelvic alignment affect postural compensation, surgical outcomes, and joint overload. Highlight the value of standing and sitting radiographs to evaluate functional pelvic mobility before surgery. Show how imaging supports surgical planning in both spine fusion and hip arthroplasty to prevent complications like impingement, dislocation, or sagittal decompensation.

TABLE OF CONTENTS/OUTLINE

Introduction: Spinopelvic balance as a central axis of musculoskeletal alignment — not just a spinal concern.Understanding the Parameters: Defining and correlating pelvic incidence, tilt, sacral slope, lumbar lordosis, and PI-LL mismatch.Postural Compensation and Alignment: How the body adapts through pelvic retroversion, hip flexion, and knee positioning.Imaging Approach: The role of lateral standing and seated radiographs in evaluating functional spinopelvic dynamics.Surgical Planning Integration: Using imaging to guide decision-making in spine fusion and hip arthroplasty, especially in rigid or decompensated patients.Clinical Consequences: How poor alignment affects implant positioning, risk of dislocation, joint degeneration, and patient-reported outcomes.Interdisciplinary Insight: The importance of shared understanding between radiologists, spine surgeons, and hip surgeons to ensure optimal results.

MKEE-63 "BONE TO BE WILD": A RADIOLOGIC JOURNEY THROUGH SCLEROSING DYSPLASIAS

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Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)
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Adham A. Castro, MD (*Abstract Co-Author*)
Jose Flavio De Oliveira Neto (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is: A. Define sclerosing bone dysplasias, highlighting their relevance findings in radiologic practice and differing from mimics conditions; B. Present the objectives of the pictorial essay, such as reviewing the main imaging patterns and differential diagnoses; C. To simplify how to look the findings and become in a imaging diagnostic.

TABLE OF CONTENTS/OUTLINE

1. Classification and diagnostic challenges; 2. Radiographic, CT, MRI findings of each sclerotic dysplasias and sclerotic conditions that mimic dysplasias, including: 2a. pyknodisostosis 2b. osteopetrosis 2c. osteopoikilosis 2d. osteophatia striata 2e. hyperostosis corticalis generalisata (van buchem disease) 2f. progressive diaphyseal dysplasia (ribbing disease) 2g. overlap syndromes 2h. melorheostosis 2i. intramedullary sclerosis 2j. progressive diaphyseal dysplasia (camurati-engelmann disease) 2k. mielofibrosis 2l. DISH 2m. metastases 2n. paget disease 2o. sicke-cell disease 2p. erdheim-chester disease 2q. tuberous sclerosis 2r. chronic osteomyelitis; 3. Educational diagnostic algorithm designed to refine diagnostic reasoning and facilitate radiologists' understanding of the differential diagnoses of sclerosing bone dysplasias.

MKEE-64 STEP BY STEP: A RADIOLOGIC AND SURGICAL WALKTHROUGH OF FEET DEFORMITIES

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Artur Da Rocha Correa Fernandes, MD, PhD (*Abstract Co-Author*)
Julio B. Guimaraes, MD, PhD (*Abstract Co-Author*)
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Italo Ueno SR, MD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is: A. Divide foot deformities by anatomical division (forefoot, midfoot and hindfoot), define which are the most common, their findings, what is important to report about; B. Reviewing the main imaging patterns and differential diagnoses; C. To simplify how to look the findings and become in a imaging

diagnostic; D. Provide images and surgical techniques used in the treatments of the cases presented.

TABLE OF CONTENTS/OUTLINE

1. Definition, classification, and diagnostic challenges about feet deformities; 2. Radiographic, CT, MRI findings of each feet deformities, including: 2a. hallux valgus, 2b. hammer toe, 2c. claw toe, 2d. mallet toe, 2e. pes cavus, 2f. midfoot collapse, 2g. lisfranc injuryx, 2h. charcot foot, 2i. pes planus, 2j. tarsal coalition, 2k. achilles insertional deformities, 2l. deformities due to inflammatory artrhropaties; 3. Ortopaedics surgical imaging; 4. Educational diagnostic algorithm designed to refine diagnostic reasoning and facilitate radiologists' understanding of the differential diagnoses of feet deformities; 5. Future perspectives, such as new diagnostic methods and application of artificial intelligence.

MKEE-65 CHONDRAL AND OSTEOCHONDRAL LESIONS IN CHILDREN: MAPPING THE CHALLENGES IN THE IMMATURE SKELETON

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Alipio Ormond Filho, MD (*Abstract Co-Author*)
Marcelo A. Nico, MD (*Abstract Co-Author*)

TEACHING POINTS

The immature skeleton, still undergoing growth and ossification, exhibits distinct biomechanical and histological characteristics that influence the type and pattern of injuries sustained during childhood. With the increasing involvement of children in sports activities—often at competitive intensities—there has been a notable rise in osteochondral injuries resulting from both acute trauma and repetitive microtrauma. These stressors place considerable mechanical demand on the developing osteochondral unit, particularly in skeletally immature joints. Early and accurate recognition of such injuries is essential not only to prevent progression to secondary osteoarthritis but also to avoid misinterpreting normal variants of physiological ossification as pathological alterations. A precise diagnosis that guides the appropriate selection of treatment, combined with thorough post-treatment monitoring via imaging studies, is essential for achieving a favorable outcome. This study aims to describe the development of the osteochondral unit in children, identify the main etiological factors involved in pediatric osteochondral injuries, highlight their distinctions from adult skeletal injuries, and outline strategies for post-treatment evaluation using advanced imaging techniques.

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Developmental process of the osteochondral unit. Imaging evaluation of osteochondral lesions.Patterns of osteochondral injury in children. Differences between osteochondral lesions in pediatric and adult populations. What to report in the pre- and post-treatment imaging assessment. Post-surgical evaluation of osteochondral lesions.

MKEE-66 UPDATED BEST PRACTICES FOR IMAGING AND REPORTING OF LOWER LIMB INJURIES IN YOUNG ATHLETES

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Adham A. Castro, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)
Frederico C. Miranda, MD (*Abstract Co-Author*)
Vitor T. Paula, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review the pediatric anatomy applied to musculoskeletal imaging exams with the particularities of children's development. 2. To highlight the importance of a structured approach and evaluation of the lower limb injuries in young athletes. 3. To discuss and to illustrate the different mechanisms and presentations of the main lower limb injuries in childhood across different imaging modalities. 4. Discuss key points to address in the report in cases of sports injuries. 5. Discuss the spectrum of changes involving sports injuries in young athletes: Apophysitis and avulsion fractures Physeal injuriesOsteochondral injuries Overuse injuries / stress fractures Muscle and tendon injuries Impingement syndromes Instability Ligament injuries Accessory bones and coalition Other findings and pitfalls

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Introduction: Common pediatric MSK injuries in the emergency room are related to sports activities. Epidemiology and distribution of fractures and soft-tissue lesions in pediatric athletic group More frequent findings before and after the growth spurt Emerging perspectives in the diagnosis of pediatric sports-related disorders. Imaging: Multimodality imaging techniques: radiography (XR), magnetic resonance imaging (MR), ultrasound (US) and computerized tomography (CT) Imaging evaluation: Bone evaluation of pediatric sports injuries, including the apophyses and growth plates Importance of imaging in diagnosis of sports injuries in childhood Structured reporting templates highlighting the essential findings for each pediatric hip disorder. Treatment: Correlate the medical and sports history with the accurate imaging diagnosis and treatment.

MKEE-67 WHAT IS THAT? A RADIOLOGIST'S GUIDE TO LESS COMMON ORTHOPEDIC PROCEDURES AND DEVICES

Mary E. Buchanan, MD (*Presenter*)
Jade A. Anderson, MD (*Abstract Co-Author*)
Bethany Ho, MD (*Abstract Co-Author*)
Rolando Gerena, MD (*Abstract Co-Author*)
Nicole C. Sztuk, DO, MS (*Abstract Co-Author*)
Lily Gibson (*Abstract Co-Author*)

TEACHING POINTS

Many radiologists are familiar with the expected post-operative appearances of common orthopedic surgeries and interventions. The number of orthopedic surgeries in the United States has steadily increased in recent years and new technologies are increasingly employed. This exhibit aims to elucidate the expected appearance of several newer and less ubiquitous orthopedic procedures to increase familiarity among radiologists.

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MISHA knee system, SpineJack Osseointegration prosthesis, Antibiotic spacers, Meniscal transplant, Corpectomy cages, Silicone joint prosthesis, Thumb CMC suspensionplasty, Osteochondral Allograft Transplantation (OATS), Latarjet procedure, MAGEC rods, Four corner wrist fusion, Proximal row corpectomy, Scheker prosthesis, Knee rotationplasty, Ulnar nerve transposition , Latissimus dorsi tendon transfer for subscapularis repair, IcoTec carbon fiber fusion rods, Subacromial balloon spacer, TOPS device

MKEE-68 NOT JUST A FRACTURE - A PERIOSTEAL PLOT TWIST

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Adham A. Castro, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)

Frederico C. Miranda, MD (*Abstract Co-Author*)
Vitor T. Paula, MD (*Abstract Co-Author*)

TEACHING POINTS

Review fracture complications unique to the pediatric population, where growth plate involvement requires special attention. Emphasize the importance of follow-up imaging in suspected growth plate injuries to avoid long-term sequelae. Recognize periosteal interposition in the physis as a rare but critical complication that can lead to growth disturbances. Understand how to apply the Salter-Harris classification system for precise diagnosis and communication. Guide treatment planning and surgical decision-making based on imaging findings and classification.

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Introduction Pediatric fractures: why they are different The clinical relevance of periosteal interposition Case-Based Review Illustrative cases from our institution highlighting periosteal entrapment Clinical presentation and radiologic findings Imaging Evaluation Comparative role of radiographs, ultrasound, CT, and MRI Advantages of each modality for detecting soft tissue and physeal involvement Fracture Classification Detailed application of Salter-Harris types I-V Correlation with prognosis and complications Management and Treatment Conservative versus surgical approaches How imaging findings influence treatment strategy and follow-up

MKEE-70 FROM CLIVUS TO SACRUM: IMAGING OF CHORDOMAS

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Jose Siju, MBBS (*Abstract Co-Author*)
SUYASH KULKARNI (*Abstract Co-Author*)
Manish Pruthi, MD (*Abstract Co-Author*)
Siddhartha Laskar, MD (*Abstract Co-Author*)
Nehal Khanna (*Abstract Co-Author*)

TEACHING POINTS

1. Review the embryologic origin and typical anatomical distribution of chordomas along the axial skeleton, emphasizing common locations including the clivus, mobile spine, and sacrococcygeal region.2. Describe the characteristic CT and MRI imaging features of chordomas, highlighting their appearance on different sequences and the role of each modality in diagnosis and surgical planning.3. Differentiate chordomas from imaging mimics such as chondrosarcoma, metastases, and other spinal and skull base lesions, using location, signal characteristics, and enhancement patterns.4. Discuss current management strategies for chordomas, including the roles of surgery, external beam radiation therapy (EBRT), and proton beam therapy, with attention to indications, challenges, and long-term outcomes.

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1. Introduction, definition, incidence, and clinical relevance of chordomas.2. Anatomical locations and imaging characteristics on CT and MRI.3. Pathological subtypes of Chordoma and basic histological appearance.4. Imaging patterns and key differentials of various tumor mimics on multimodality imaging.5. Challenges in the management of Chordoma and the role of imaging.

MKEE-71 EWING-LIKE, BUT NOT QUITE: IMAGING OF CIC-REARRANGED AND BCOR-ALTERED SARCOMAS

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Nitin S. Shetty, MBBS, MD (*Abstract Co-Author*)
Nehal Khanna (*Abstract Co-Author*)
Manish Pruthi, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Describe the spectrum of undifferentiated round cell tumours, including classic Ewing sarcoma and emerging Ewing-like entities.2. Understand the pathologic and molecular features of CIC-rearranged, BCOR-altered sarcomas and their diagnostic significance.3. Identify imaging features characteristic of Ewing sarcoma and recognise patterns that may raise suspicion for Ewing-like sarcomas.4. Review CIC-rearranged and BCOR-altered sarcomas through a case-based, multimodality imaging approach. 5. Recognise the radiologist’s role in guiding appropriate molecular testing in cases with atypical imaging findings.

TABLE OF CONTENTS/OUTLINE

1. WHO Classification of Undifferentiated Round Cell Sarcomas: Overview of Ewing sarcoma and emerging Ewing-like entities (CIC-rearranged, BCOR-altered, and EWSR1 non-ETS fusion sarcomas). 2. Pathologic Review and Clinical Presentation, including histopathologic features, immunohistochemistry, molecular alterations, and clinical demographics of each subgroup. 3. Multimodality Imaging Features and Diagnostic Clues to distinguish Ewing-like sarcomas from the classic Ewing sarcoma. 4. Case-Based Review of CIC and BCOR-Altered Sarcomas, integrating radiological and pathological findings.

MKEE-72 BEYOND THE BEAR ESSENTIALS: UPDATES TO HARDWARE AND NEW OPERATIVE TECHNIQUES IN THE KNEE

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Sepideh Abdi, MD (*Abstract Co-Author*)
Seth Sherman (*Abstract Co-Author*)
Geoff Abrams (*Abstract Co-Author*)
Robert D. Boutin, MD (*Abstract Co-Author*)
Kathryn J. Stevens, MBBS, FRCR (*Abstract Co-Author*)

TEACHING POINTS

• 1. Post-operative imaging in the knee is challenging due to the complexity and variety of surgical techniques and hardware, as well as hardware-related artifacts that may further degrade image quality and obscure surrounding tissues. • 2. Metal artifact reduction techniques are essential for minimizing image distortion from metallic implants, improving visualization of the surrounding bone and soft tissues, and for identifying potential complications such as infection, loosening, or hardware failure. • 3. New and evolving surgical techniques and orthopedic hardware in the knee pose potential diagnostic challenges for radiologists who are unfamiliar with their imaging appearances. • 4. Understanding the imaging characteristics of these new surgical techniques and hardware enables radiologists to differentiate between normal postoperative changes from hardware complications, enhancing diagnostic accuracy.

TABLE OF CONTENTS/OUTLINE

• Introduction • Diagnostic challenges of hardware imaging • Metal artifact reduction o Techniques: 1.5T where possible, FSE, increase bandwidth, increase matrix, STIR or IDEAL for uniform fat suppression o Sequences: Multi-Acquisition Variable-Resonance Image Combination (MAVRIC), Multi-Acquisition with Variable Resonance Image Combination SeLective (MAVRIC SL), Slice-Encoding for Metal Artifact Correction (SEMAC), and Orthopedic Meal Artifact Reduction (O-MAR). • Case-based review including: o Medial Implantable Shock Absorber (MISHA) o Bridge-Enhanced Anterior Crucial Ligament Restoration (BEAR) Implant o Lateral Extra-articular Tenodesis o BioBrace Implant o Matrix-induced autologous chondrocyte implantation (MACI) • Discussion/conclusion

MKEE-73 IMAGING FINDINGS OF DESMOID TUMORS UNDERGOING MEDICAL AND ABLATION THERAPIES AND THEIR COMPLICATIONS: A CASE-BASED REVIEW

Gary Yu, PhD (*Presenter*)
Benjamin E. Northrup, MD (*Abstract Co-Author*)
Mariam A. Malik, MD (*Abstract Co-Author*)
Kelby B. Napier, MD, PhD (*Abstract Co-Author*)
Resten Imaoka, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand imaging characteristics of extra-abdominal desmoid tumors and the differential diagnosis of similar soft tissue masses Recognize changes in imaging characteristics associated with post-treatment changes of desmoid tumors and imaging features concerning for disease recurrence

TABLE OF CONTENTS/OUTLINE

- Overview of imaging characteristics of desmoid tumors - Brief imaging-based differential diagnosis for desmoid tumor - Case-based review of desmoid tumors undergoing various types of treatment and corresponding post-treatment imaging findings o Wide local excision with resulting scar formation o Cryoablation o Medical management with new therapeutic agents (sorafenib, niregacestat) o Identifying disease recurrence in patients who have undergone multiple types of treatment o Combinations of therapies o Complications of desmoid tumors after treatment

MKEE-74 AXIAL COMPRESSION OF THE LUMBAR SPINE: HOW TO PERFORM, INDICATE AND INTERPRET

Danilo Amaral, MD (*Presenter*)
Livia Reis, MD (*Abstract Co-Author*)
Luana Paschoal, MD (*Abstract Co-Author*)
Lazaro F. Amaral, MD (*Abstract Co-Author*)

TEACHING POINTS

Lumbar spine imaging performed in the supine position may underestimate the severity of spinal canal narrowing, as this posture alleviates symptoms and removes the gravitational load present in standing. Axial loading simulates upright physiology, providing a more accurate depiction of dynamic changes. This exhibit illustrates the value of axial loading in CT and MRI, highlighting its role in detecting critical findings such as dural sac compression and symptomatic stenosis. Understanding the appropriate indications, technical execution, and imaging interpretation under load enhances diagnostic accuracy and clinical decision-making in patients with suspected lumbar canal stenosis.

TABLE OF CONTENTS/OUTLINE

The exhibit begins by explaining how lumbar canal dimensions vary with posture, emphasizing the limitations of conventional supine imaging. Axial loading is introduced as a method to replicate the effects of weight-bearing during imaging. The technique involves applying a supine axial load equivalent to 50% of body weight using a calibrated compression device with an acoustic alert for patient movement. Key findings include reduction in dural sac cross-sectional area (with thresholds for relative and absolute stenosis), focal deformities, and symptom reproduction. The case-based review highlights typical appearances and pitfalls, concluding with practical criteria for when to request dynamic lumbar spine imaging under load.

MKEE-75 TOTAL ELBOW ARTHROPLASTY: WHAT RADIOLOGISTS SHOULD KNOW

Youngjune Kim, MD (*Presenter*)
Yusuhn Kang, MD, PhD (*Abstract Co-Author*)
Choong Guen Chee, MD (*Abstract Co-Author*)

TEACHING POINTS

1) To understand the anatomy of the elbow and the indications for total elbow arthroplasty 2) To learn about the common types and components of prostheses used in total elbow arthroplasty 3) To review the common complications that can occur after total elbow arthroplasty

TABLE OF CONTENTS/OUTLINE

1. Anatomy and physiologic movement of elbow 2. Indications for total elbow arthroplasty 3. Representative procedure during total elbow arthroplasty 4. Common types and components of total elbow arthroplasty - Linked total elbow arthroplasty - Unlinked total elbow arthroplasty 5. Complications after total elbow arthroplasty - Infection - Bushing wear and osteolysis - C-ring failure - Periprosthetic fracture

MKEE-76 CORTICAL IS CRITICAL: WHAT DOES A BENIGN BONE LESION LOOK LIKE?

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Camila Tabosa, MD (*Abstract Co-Author*)
Rafael Omena, MD (*Abstract Co-Author*)
Danielle B. Rumi, MD (*Abstract Co-Author*)
Diego A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

Benign bone lesions typically present as well-defined, non-aggressive findings on imaging, often with preserved bone architecture, absence of periosteal reaction, and no associated soft tissue mass. These features reflect their indolent biological behavior and allow confident differentiation from more aggressive or malignant processes. Radiographs serve as the initial diagnostic tool, but advanced modalities such as CT and MRI offer complementary detail when lesion extent, matrix characteristics, or surrounding structures require further evaluation. MRI, in particular, helps assess marrow involvement and soft tissue response, enhancing diagnostic certainty. Recognizing imaging patterns consistent with benignity helps avoid unnecessary procedures, reduces patient anxiety, and contributes to more efficient and accurate care pathways. Radiologists play a critical role in this process, providing diagnostic clarity through pattern recognition and clinical correlation.

TABLE OF CONTENTS/OUTLINE

This educational display presents a schematic overview of the imaging characteristics commonly seen in benign bone lesions, emphasizing their typical features on MRI. It includes illustrative cases that highlight key patterns such as margin definition, internal signal characteristics, and absence of aggressive findings. The goal is to reinforce recognition of benign imaging features through visual correlation and case-based learning.

MKEE-77 IMAGING OF POST-ABLATION MUSCULOSKELETAL NEOPLASMS

Grant Yoneoka, MD (*Presenter*)
Maria Ly (*Abstract Co-Author*)

Benjamin E. Northrup, MD (*Abstract Co-Author*)
Kelby B. Napier, MD, PhD (*Abstract Co-Author*)
Mariam A. Malik, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is to:*Review various ablation techniques and the pre-ablation assessment.*Review the expected post-ablation appearance in various musculoskeletal neoplasms using multimodal imaging techniques.*Provide examples of recurrent disease following ablation and review ablation-related complications.

TABLE OF CONTENTS/OUTLINE

*Introduction and epidemiology*Overview of common and emerging ablation techniques*Preprocedural assessment, pre-procedural imaging, and technical considerations*Post-ablation appearance of benign tumors*Post-ablation appearance of malignant tumors*Post-ablation augmentation techniques*Recurrent disease and ablation-related complications*Conclusion

MKEE-78 IMAGING-GUIDED STRATIFICATION OF HYPERVASCULAR SOFT TISSUE TUMORS: A DIAGNOSTIC FRAMEWORK BEYOND FLOW VOIDS

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Masaya Kawaguchi (*Abstract Co-Author*)
Masashi Asano, MD (*Abstract Co-Author*)
Yuki Arita, MD, PhD (*Abstract Co-Author*)
Masayuki Matsuo, MD (*Abstract Co-Author*)

TEACHING POINTS

Due to overlapping imaging features, hypervascular soft tissue tumors pose diagnostic challenges. We present a structured, three-step imaging-based framework to support pre-biopsy assessment.Hypervascular soft tissue tumors can be effectively stratified by evaluating flow void prominence, T2 signal characteristics, and enhancement patterns. Recognizing early-diagnosable entities aids confident image-based triage before histologic confirmation. Step 1: Early recognition of six tumors with specific traits: - Hibernoma (fat-rich) - Alveolar soft part sarcoma (numerous intra/peritumoral vessels) - Glomus tumor (subungual, painful, enhancing) - Epithelioid hemangioendothelioma (ill-defined, brush-like margins) - Kaposiform hemangioendothelioma and Kaposi sarcoma (cutaneous, HIV-related). These often suggest a confident presumptive diagnosis prior to biopsy. Step 2: Ten others—Perivascular epithelioid cell tumor, solitary fibrous tumor, infantile fibrosarcoma, angiosarcoma, paraganglioma, myopericytoma, infantile hemangioma, synovial sarcoma, leiomyosarcoma, and angioleiomyoma—are categorized by flow void prominence: prominent, limited, or absent. Step 3: Final refinement integrates T2 signal, enhancement, and clinical features (e.g., age, pain, depth) to narrow the differential diagnosis.

TABLE OF CONTENTS/OUTLINE

Background: Diagnostic complexity in hypervascular tumors Step 1 - Early Diagnosable Tumors (n=6): Specific imaging traits Step 2 - Flow Void-Based Classification (n=10): Prominent, limited, absent Step 3 - Refinement by T2 signal, enhancement, and clinical features Educational Value: Structured visual approach before pathology

MKEE-79 MRI OF CARTILAGE: A PRACTICAL GUIDE FOR RADIOLOGY RESIDENTS

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Roberto Froeder Oliveira, MD (*Abstract Co-Author*)
Rafael Omena, MD (*Abstract Co-Author*)
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Diego A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

Cartilage injuries are common and clinically significant, especially in young and active patients. MRI plays a crucial role in diagnosis but often presents subtle findings that may be overlooked by residents. A practical and image-rich approach can enhance confidence and accuracy in cartilage evaluation.

TABLE OF CONTENTS/OUTLINE

This exhibit aims to provide a practical and didactic review of articular cartilage assessment using MRI, specifically targeted at radiology residents. It begins with a discussion of the basic anatomy and biomechanics of hyaline cartilage, followed by the main imaging patterns of cartilage injury and their clinical implications, including pain, subchondral bone marrow edema, and synovial reaction. Real case examples from our institution are extensively used to illustrate the full spectrum of cartilage involvement—from subtle superficial defects to deep lesions with subchondral exposure—focusing on visual recognition of common imaging findings. Additionally, the key points that should be included in the radiological report are addressed, with emphasis on clarity, clinical relevance, and impact on orthopedic decision-making. By integrating theoretical background, imaging features, and practical application, this presentation seeks to strengthen the resident's foundation and confidence in evaluating articular cartilage.

MKEE-80 FIGHT CALCIUM WITH WATER: EVERYTHING YOU NEED TO KNOW ABOUTULTRASOUND-GUIDED PERCUTANEOUS IRRIGATION OF CALCIFIC TENDINOPATHY (US-PICT) OF THE SHOULDER:

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Andrea De Grandis, MD (*Abstract Co-Author*)
Carlo D'Alessandro, MD (*Abstract Co-Author*)
Giulia Beggiato, MD (*Abstract Co-Author*)
Giacomo Negro, MD (*Abstract Co-Author*)
Giovanni Sussan, MD (*Abstract Co-Author*)
Francesco Fusco, MD (*Abstract Co-Author*)
Emilio Quaia, MD (*Abstract Co-Author*)
Filippo Crimi, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Rotator cuff calcific tendinopathy (RCCT) is a common condition, mainly affecting the supraspinatus tendon, that can cause pain and a certain degree of disability. There are different treatment for this condition. Ultrasound-guided percutaneous irrigation (US-PICT) is a safe, effective, and minimally invasive treatment for RCCT. US-PICT represents a valuable alternative to more invasive therapies, with rapid symptom relief and minimal recovery time. This procedure can be performed with various techniques with different advantages. Proper technique, especially using the double-needle approach and closed-circuit irrigation, enhances efficacy and safety. Radiologists should be familiar with procedural nuances to ensure optimal results.

TABLE OF CONTENTS/OUTLINE

RCCT: physiopathology Imaging findings and classifications US-PICT indications and contraindications Single- vs. double-needle technique: pros and cons Procedural steps, tips and tricks Role of post-procedural steroid injection in the subacromial-subdeltoid bursa Additional post-treatment care: cryotherapy and oral analgesics Outcomes: clinical efficacy, safety profile, and complication rate

MKEE-81 LATERAL ANKLE INSTABILITY: A COMPREHENSIVE REVIEW AND NEW CONCEPTS

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Leticia dos Reis Morimoto, MD (*Abstract Co-Author*)
Gustavo O. Watanabe, MD (*Abstract Co-Author*)
Lucas N. Silva, MD (*Abstract Co-Author*)
Mauro Cesar Mattos E Dinato (*Abstract Co-Author*)
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Alipio Ormond Filho, MD (*Abstract Co-Author*)

TEACHING POINTS

Lateral ankle sprain is the most common orthopedic injury in emergency care, leading to significant functional impairment and socioeconomic impact. Although most sprains resolve with conservative management, their high incidence and clinical-economic impact demand a detailed diagnostic evaluation, to prevent chronic pain, instability, and secondary sequelae. In this review, we evaluate standard and advanced imaging modalities for lateral ankle instability, highlighting their strengths and limitations in acute and chronic settings, and demonstrating how these techniques impact clinical management and surgical planning. We also highlight emerging insights into ATFL microinstability—isolated tears of the intra-articular superior fascicle—which often elude conventional assessment and may underlie persistent symptoms. Finally, we discuss current surgical indications, main anatomic repair techniques (most notably Broström-type reconstructions), and their possible complications, providing a review on what the radiologist should report in a post-operative scenario.

TABLE OF CONTENTS/OUTLINE

Introduction & Biomechanics of Injury Classical Imaging Evaluation: • Radiography: Conventional and Stress Radiographs • Ultrasound • Computed Tomography • Magnetic Resonance Imaging New Concepts in Anatomy & Microinstability: • Detailed ATFL Anatomy: Superior vs. Inferior Fascicle • Imaging Features of Microinstability Associated Lesions Clinical Management, Surgical Techniques & Postoperative Imaging: • Conservative Treatment • Surgical Indications & Candidate Selection • Anatomic Repair Techniques (Broström-Gould, Retinacular Augmentation) • Postoperative Imaging

MKEE-82 COMMON WRIST AND HAND SURGERIES - A MULTIMODALITY GUIDE OF NORMAL FINDINGS AND COMPLICATIONS

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Gabriela R. Camerin, MD (*Abstract Co-Author*)
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Marcos Felippe D. Correa, MD (*Abstract Co-Author*)
Renata V. Leao, MD (*Abstract Co-Author*)

TEACHING POINTS

• Review common lesions of tendons and ligaments of the wrist and fingers (traumatic, degenerative), such as gamekeeper thumb and Stener lesion, scapholunate ligament injury, extensor and flexor tendon injuries. • Summarize usual techniques for surgical repair of tendons and ligaments in hand surgery and their imaging findings on radiographs, CT, ultrasound and MRI. • Highlight complications in tendon repair: recurrent rupture, hardware failure, fibrosis, tenosynovitis, infection, neuroma. • Review scapholunate ligament repair complications: loss of graft integrity, residual instability, hardware failure, SLAC wrist, fibrosis. • Review Stener lesion repair complications: hardware failure, recurrent rupture, laxity and fibrosis/ ossification. • Discuss less frequent ligament lesions, their repair surgeries and complications.

TABLE OF CONTENTS/OUTLINE

• Introduction and epidemiology of hand and wrist ligament and tendon lesions and their mechanism. • Review of surgical repair techniques and imaging findings, as well as protocols and technical aspects of post operative evaluation. • Imaging findings and complications: o Tendon repair (flexors and extensors). o Scapholunate ligament repair. o Stener lesion repair. o Other ligaments lesions and repair. • Challenging cases and take-home points

MKEE-83 VASCULAR TUMORS AND PSEUDOTUMORS OF THE MUSCULOSKELETAL SYSTEM

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Juliana Lie Taya (*Abstract Co-Author*)
Bruno C. Carneiro (*Abstract Co-Author*)
Marcio A. Ishida, MD (*Abstract Co-Author*)
Adriano Silveira Moreira Novaes, MD (*Abstract Co-Author*)
Bruno B. Cardoso, MD (*Abstract Co-Author*)
Luiz T. Nehme, MD (*Abstract Co-Author*)

TEACHING POINTS

Review vascular tumors/pseudotumors of the musculoskeletal system, emphasizing radiological findings and diagnostic approaches using multimodality imaging.

TABLE OF CONTENTS/OUTLINE

Vascular tumors/pseudotumors range from benign (hemangiomas, malformations) to aggressive (angiosarcomas). MRI, CT, and Doppler US are key for assessing vascularization and behavior, aiding differentiation and management. Review epidemiology, clinical features, and imaging characteristics of musculoskeletal vascular lesions for educational purposes.Hemangiomas, the most common benign vascular tumors, typically exhibit hyperintensity on T2-weighted MRI and homogeneous contrast enhancement, often with venous flow on Doppler and signs of spontaneous involution. In contrast, hemangioendotheliomas can display varying aggressiveness, presenting as infiltrative lesions with heterogeneous enhancement and perilesional edema. Angiosarcomas, the most malignant, appear as poorly defined masses with necrosis and may mimic hematomas or inflammatory processes.Vascular malformations, though non-neoplastic, can mimic tumors. Venous malformations show T2 hyperintensity, phleboliths on CT, and lack arterial flow. Lymphatic malformations are cystic and may contain fluid-fluid levels, while arteriovenous malformations demonstrate high-flow vessels, early arterial enhancement, and shunting. Syndromic associations, such as Klippel-Trenaunay syndrome, combine vascular anomalies with soft tissue and bone overgrowth.Accurate imaging interpretation is crucial for diagnosis and management, avoiding unnecessary interventions and optimizing care.

MKEE-84 IMAGE-GUIDED EPIDURAL BLOOD PATCH - TECHNIQUE, TIPS AND BEST PRACTICES

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Vitor T. Paula, MD (*Abstract Co-Author*)
DURVAL BARROS SANTOS, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)

TEACHING POINTS

Indications and contraindications; Prep an patch material; Procedure: patching;Patch types by indication; Post-patch restrictions and complication.

TABLE OF CONTENTS/OUTLINE

INTRODUCTION · Review what the procedure is, its indications and contraindications .· How to prepare the material and the patient for the procedure. PATCHING GUIDED BY CT · Step by step. PATCH TYPES BY INDICATION · Unseen leaks and chronic orthostatic headaches; · Post dural puncture headache;· Indwelling devices; · Surgical durotomy; · Ventral dural tear and sleev leak; · Cerebral fluid venous fistula. POST-PROCEDURE MANAGEMENT · What the patient should and shouldn't do and what complications the doctor needs be aware of.

MKEE-85 MRI ARTHROGRAPHY AND SHOULDER MICROINSTABILITY: WHAT THE RADIOLOGIST NEEDS TO KNOW

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Leonardo Kazunori Tsuji, MD (*Abstract Co-Author*)
Lucas K. Miyahara, MD (*Abstract Co-Author*)
Vitor N. Sato, MD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)
Artur Da Rocha Correa Fernandes, MD, PhD (*Abstract Co-Author*)
Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Present an overview of the anatomy of the shoulder, with stability factors and the association with the concept of shoulder microinstability and its predisposing factors. Discuss the applicability of magnetic resonance arthrography, with its sensitivity to subtle structures among other advantages, which allow for early and accurate identification of abnormalities. To illustrate the main findings in magnetic resonance arthrography in shoulder microinstability, as well as normal findings that mimic labral lesions.

TABLE OF CONTENTS/OUTLINE

Introduction and overview of shoulder anatomy, presenting stability factors (static and dynamic) and relationship with the causal factors of shoulder microinstability. Presentation of magnetic resonance imaging, both conventional and arthrography as a tool for evaluating injuries, presenting advantages and drawbacks common to both and the arthrography related. Identifying the main safety concerns involving magnetic resonance imaging and arthrography. Technique and parameters of the shoulder MRI (conventional and arthrography) protocol, including additional positioning. Main findings in magnetic resonance arthrography in labral, ligamentous and rotator cuff injuries, anterior and posterior impingements in shoulder microinstability. Warning and illustrations with examples of some pitfalls that should not be confused with injuries.

MKEE-86 DIGIT CLUES RADIOLOGIC INSIGHTS INTO COMMON FINGER DEFORMITIES

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Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is to: Provide a structured, imaging-based overview of the most frequent congenital and acquired finger deformities. Highlight key imaging findings that support diagnosis, classification, and surgical planning. Emphasize the importance of radiologic evaluation in sports-related finger injuries. Reinforce the role of multimodality imaging in differentiating deformities and guiding clinical management.

TABLE OF CONTENTS/OUTLINE

Introduction: Overview and clinical impact of finger deformities. Congenital Deformities: Polydactyly: Classification, imaging patterns, and surgical relevance. Syndactyly: Soft tissue vs. osseous fusion and preoperative imaging role. Acquired Deformities: Rheumatoid Arthritis-related changes: Ulnar deviation, swan-neck, and boutonnière deformities. Dupuytren's Contracture: Fascial thickening and flexion deformity on imaging. Sports-Related Finger Deformities: Mallet Finger, Jersey Finger, Skier’s Thumb: Mechanisms, imaging features, and clinical implications. Imaging Modalities: Contributions of radiography, ultrasound, and MRI to diagnosis and management. Conclusions: Importance of radiologic expertise in recognizing patterns and supporting therapeutic decisions.

MKEE-87 ARTHROGRYPOSIS AND IT'S POSTOPERATIVE FINDINGS: WHAT THE RADIOLOGIST SHOULD KNOW

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Gabriel Pianowski Pajanoti, MD (*Abstract Co-Author*)
Raifran Neto, MD (*Abstract Co-Author*)
Bruno C. Carneiro (*Abstract Co-Author*)
Marcio A. Ishida, MD (*Abstract Co-Author*)
Adriano Silveira Moreira Novaes, MD (*Abstract Co-Author*)
Bruno B. Cardoso, MD (*Abstract Co-Author*)
Luiz T. Nehme, MD (*Abstract Co-Author*)

TEACHING POINTS

- Explain the importance of radiological imaging at Arthrogryposis evaluation.- Demonstrate the efficacy of x ray and ultrasound analising the different muscles and joints affected.- Describe different surgical treatment and radiological results in between the patients with Artrhogryposis.

TABLE OF CONTENTS/OUTLINE

1. Brief overview of Arthrogryposis (definition, clínical manifestations and epidemiology).2. Why imaging is important in patients with Arthrogryposis.3. Explain the usage of multimodality imaging (ultrasound and x-ray) in patients with Arthrogryposis.5. Discuss briefly the different possible manifestations and each surgical treatment.4. Provide image-rich examples and descriptions of different manifestations and its post operative findings with Arthrogryposis who underwent radiological imaging.5. Point out the importance of radiological imagins in patients with Arthrogryposis.6. Conclusion and Take Home Message.

MKEE-88 OFF TRACK: A VISUAL REVIEW OF PATELLOFEMORAL JOINT INSTABILITY

Brandon Ritchie, DO (*Presenter*)
Kennedy Sparling (*Abstract Co-Author*)
Navid Faraji, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Recognize subtypes and risk factors of patellofemoral joint instability. 2. Understand clinical presentation and underlying pathophysiology. 3. Discuss both conservative and surgical treatment options. 4. Review key multimodality imaging findings for diagnosis, assessment, and post-surgical changes.

TABLE OF CONTENTS/OUTLINE

Background Spectrum includes subluxation, dislocation, and chronic instability. Subtypes Lateral (most common), medial, and multidirectional instability. Etiology/Risk Factors : Trochlear dysplasia, patella alta, malalignment, prior trauma, connective tissue disorders . Clinical Features : Instability, pain, mechanical symptoms; risk of chondral injury and early OA. Evaluation Imaging : Radiographs for initial eval; MRI is gold standard. Key Findings : Trochlear dysplasia: Sulcus angle, facet asymmetry Patellar height: Insall-Salvati, Caton-Deschamps indices Lateralization: Congruence angle, TT-TG distance Patellar tilt: Lateral PF angle, Fulkerson angle. Management Non-Surgical: PT, bracing, NSAIDs Surgical: MPFL reconstruction, tibial tubercle osteotomy, trochleoplasty Post-op Imaging: MRI/CT for assessment.

MKEE-89 LOW-ENERGY TRAUMA BUT HIGH IMPACT: A REVIEW OF THE ANATOMY, PATHOLOGY, AND IMAGING OF SUBTLE LISFRANC INJURIES

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Bryan Chan, MD (*Abstract Co-Author*)
Geoffrey Phillips (*Abstract Co-Author*)
Pamela J. Walsh, MD (*Abstract Co-Author*)
Mobeen Farooq, MD (*Abstract Co-Author*)

TEACHING POINTS

Subtle Lisfranc injuries occur with low-energy trauma and result in instability at the midfoot/Lisfranc joint complex · Lisfranc injuries can be classified as transverse or longitudinal and simple or complex based on which ligaments are involved and if there is extension into additional joints · Subtle Lisfranc injuries continue to be underdiagnosed, secondary to their atypical imaging features and due to the lack of familiarity with variant Lisfranc injury patterns · A missed or delayed diagnosis can lead to increased patient morbidity and a decline in quality of life · Weightbearing films and/or CT/MRI are often necessary to arrive at the correct diagnosis and identify other accompanying osseous and soft tissue injuries · Certain patient characteristics (i.e. young age, athlete) can be used to raise index of suspicion for a subtle Lisfranc injury

TABLE OF CONTENTS/OUTLINE

Brief introduction to the Lisfranc joint/midfoot· Review the osseous and ligamentous anatomy of the Lisfranc joint · Discuss the direct (high-energy) and indirect (low-energy) mechanisms of Lisfranc injury, with emphasis on the indirect mechanism · Illustrate some of the patterns of subtle Lisfranc injuries caused by low-energy trauma (transverse, longitudinal etc.) · Describe the role of different imaging modalities (Radiographs, CT and MRI) in evaluation of subtle Lisfranc injuries · Use case examples to review imaging findings in subtle Lisfranc injuries · Highlight clinical features useful in raising index of suspicion for a subtle Lisfranc injury

MKEE-90 RADIOLOGICAL ASPECTS OF MARFAN SYNDROME

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Luiz T. Nehme, MD (*Abstract Co-Author*)

TEACHING POINTS

- Explain the importance of radiological imaging at Marfan syndrome patients- Demonstrate the efficacy of x ray, ultrasound, MRI and CT analising Marfan syndrome patients - Describe different manifestations and radiological results in between the patients with Marfan syndrome

TABLE OF CONTENTS/OUTLINE

1. Brief overview of Marfan syndrome (definition, clínical manifestations and epidemiology)2. Why imaging is important in patients with Marfan syndrome3. Explain the usage of multimodality imaging (x ray, ultrasound, MRI and CT) in patients with Marfan syndrome4. Provide image-rich examples and descriptions of different manifestations with Marfan syndrome who underwent radiological imaging 5. Point out the importance of radiological imagins in patients with Marfan syndrome 6. Conclusion and Take Home Message

MKEE-91 HOW ABOUT A LITTLE HAND? POSTOPERATIVE FINDINGS OF THE HAND AND WRIST

Andre Y. Aihara, MD, PhD (*Presenter*)
Filipe Costa Toledo, MD (*Abstract Co-Author*)
Lucas K. Miyahara, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is: 1. Provide a comprehensive radiologic overview of the most common surgical procedures involving the hand and wrist. 2. Highlight the radiologic features associated with common complications. 3. Familiarize radiologists and trainees with the normal imaging appearances of various surgical interventions, including osteosynthesis, arthroplasty, arthrodesis, and tenorrhaphy.

TABLE OF CONTENTS/OUTLINE

1. Introduction: objectives of postoperative imaging, a brief review of the main indications for hand and wrist surgery with illustrations of selected surgical procedures, and an overview of imaging modalities (X-ray, CT, MRI).2. Osteosynthesis: Indications, techniques, expected imaging findings, and potential complications. 3. Triangular fibrocartilage complex repair: review and illustrative case. 4. Trapeziectomy vs. total thumb arthroplasty: indications, differences, and illustrative case. 5. Four-Corner Arthrodesis: difference between SLAC and SNAC. 6. Tenorrhaphy: review and illustrative case. 7. Osteotomy: review and illustrative case. 8. Conclusion. 9. Bibliographical references.

MKEE-92 BRACE FOR THE IMPACT: THE TIP OF THE ICEBERG AND THE DEEP IMPACT OF EXOPHYTIC TUMORS - A VISUAL GUIDE TO PROGNOSIS ACROSS VARIOUS HISTOLOGIES

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TEACHING POINTS

Superficial soft tissue tumors are defined as lesions originating within or above the muscular fascia. The term exophytic describes their outward growth from the surface of origin, distorting skin contours. These tumors have distinct characteristics, including a significant psychological impact on patients. While most exophytic tumors are benign, excluding malignancy is critical, particularly in lesions exceeding 5 cm in diameter, located at a deep level, or demonstrating rapid growth.Superficial lesions are typically detected earlier than deep-seated ones. However, relying solely on size for superficial tumors risks underdiagnosis or delayed diagnosis, as it may overlook key prognostic features such as fascial contact/invasion. Additional imaging findings like fascial edema, cutaneous contact/thickening, and tumor necrosis also hold diagnostic and prognostic significance.This presentation will illustrate, through clinical cases of an oncological reference center, how exophytic masses of diverse histologies share similar imaging appearances. Additionally, it will serve as a visual guide to the most relevant prognostic factors and essential radiological reporting points.

TABLE OF CONTENTS/OUTLINE

A. Definition and ClassificationB. Role of Imaging and Rationale for MRIC. Recommended MRI protocolsD. Essential Elements of the Standardized Report and Classification Proposals such as ST-RADSE. Differentiating Benign and Malignant Lesions on MRIF. The Different Histologies of Common Exophytic Superficial Tumors and Their MimickersG. Key Prognostic and Diagnostic Factors for the ReportH. Common Pitfalls in the Imaging Diagnosis of Exophytic Tumors

MKEE-93 NO ARCH ENEMY: NEW INSIGHTS INTO PROGRESSIVE COLLAPSING FOOT DEFORMITY (PCFD) USING MULTIMODAL IMAGING

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TEACHING POINTS

Progressive Collapsing Foot Deformity (PCFD) is a complex 3D deformity with significant clinical impact, resulting from the sequential failure of static and dynamic stabilizers of the medial longitudinal arch. Accurate diagnosis and staging are essential for optimal management, requiring a multimodal imaging approach.This paper analyzes radiography, magnetic resonance imaging and weight-bearing computed tomography (WBCBCT) in the evaluation of PCFD discussing the advantages and disadvantages of each method.

TABLE OF CONTENTS/OUTLINE

Understand the progressive failure sequence of both static and dynamic stabilizers in the medial longitudinal arch that leads to PCFD development.Recognize essential radiographic measurements for PCFD assessment while being aware of their limitations in evaluating dynamic deformities.Appreciate conventional CT's complementary role in detecting associated conditions such as arthropathy and tarsal coalitions.Grasp the critical importance of WB-CBCT as the gold standard for 3D PCFD assessment.Identify characteristic MRI findings of soft tissue pathology. Understand the current consensus classification system for PCFD and how imaging findings guide surgical decision-making. Learn postoperative imaging evaluation protocols for assessing alignment correction and detecting potential complications like undercorrection or recurrence.Explore our proposed imaging algorithm that strategically integrates radiography, MRI, CT, and WB-CBCT based on deformity severity.Examine future artificial intelligence applications that can help in the analysis of images related to PCFD

MKEE-94 POST-OP SPINE: DON'T MISS THESE IMAGING SIGNS

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Breno Trindade (*Abstract Co-Author*)

TEACHING POINTS

- Spinal surgeries have become increasingly common and can be divided into decompressive procedures, stabilization-fusion procedures and various others.- The different surgical materials used and their surgical approaches should be known by radiologists.- It is essential to differentiate expected postoperative changes from complications.- Early and late postoperative spine complications recogntition and imaging (related to the procedure itself and materials used, infectious, non infectious).- By knowing expected changes, radiologists can provide more assertive reports which can play a crucial role for postoperative complication management by the referring physician.

TABLE OF CONTENTS/OUTLINE

- Review of the main spinal surgeries and materials used.- Expected postoperative changes.- Didactic division of the main postoperative complications of the spine.- Imaging of postoperative complications.- Imaging recognition of postoperative complications typical findings.

MKEE-95 MR NEUROGRAPHY: STEP-BY-STEP APPROACH TO INTERPRETATION - A PRIMER FOR RADIOLOGISTS

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Thiago Jose Pinheiro Lopes, MD (*Abstract Co-Author*)
Maria Vitoria Ludwig, MD (*Abstract Co-Author*)
Enzo Calheiros, MD (*Abstract Co-Author*)
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Raul O. Martins, MD (*Abstract Co-Author*)
Renata V. Leao, MD (*Abstract Co-Author*)
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Renata F. Batista Pereira, MD (*Abstract Co-Author*)

TEACHING POINTS

• Understand MR neurography protocols and optimal sequence selection (e.g., STIR-SPAIR, high-resolutionT2 FS)• Recognize imaging patterns of neuropathies and muscle denervation• Apply a systematic approach to interpretation for improved diagnostic confidence

TABLE OF CONTENTS/OUTLINE

Introduction:• Definition, indications, and advantages of MR neurography• Technical considerations and protocol highlightsNerve Evaluation• Assess nerve caliber and asymmetry• Evaluate signal alterations and contrast enhancement• Confirm continuity and identify neuromas or transections• Analyze fascicular architecture for signs of fibrosis, infiltration, or edema• Observe morphological changes and assess surrounding fat planesMuscle Evaluation• Identify denervation edema on fluid-sensitive sequences• Detect fatty infiltration on T1-weighted images for chronic changesSummaryTake-Home Messages

MKEE-96 IMAGING THE SOLE: A COMPREHENSIVE SONOGRAPHIC EVALUATION OF THE PLANTAR FAT PAD

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Aranzazu Sanchez Gabin, MD (*Abstract Co-Author*)
Rodrigo Sutil, MD (*Abstract Co-Author*)
Celia Cantolla, MD (*Abstract Co-Author*)
Elena A. Gallardo, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

To review the unique histological and anatomical features of the plantar fat pad. To identify the sonoanatomy of the subcalcaneal and submetatarsal regions. To recognize a broad spectrum of mechanical and non-mechanical fat pad pathologies. To apply an anatomic and etiologic classification to improve diagnostic accuracy.

TABLE OF CONTENTS/OUTLINE

The plantar fat pad is a specialized structure critical for shock absorption and load distribution. Its complex multilobular architecture and regional differentiation make ultrasound an ideal tool for high-resolution, dynamic evaluation. Histologic and Anatomical Overview : We discuss the structural differences between the subcalcaneal and submetatarsal fat pads, including septal organization, and biomechanical function. Normal Sonoanatomy : Ultrasound appearance of plantar fat compartments, with emphasis on echotexture and compressibility. Pathologies by Etiology and Location : Mechanical Causes: • Cutaneous: Hyperkeratosis, and corns (helomas). • Subcutaneous: Adventitial bursitis and fat pad contusion syndrome. Non-Mechanical Causes : • Cutaneous: Papillomas. • Dermo-hypodermic: Plantar vein thrombosis, epidermal inclusion cyst, piezogenic papules. • Subcutaneous: Foreign bodies, abscesses, subcutaneous rheumatoid nodules, lipomas. • Deep-structure-related: Morton’s neuroma, plantar fibromatosis. This poster presents a comprehensive ultrasonographic approach to plantar fat pad pathology using an anatomically and etiologically driven framework with illustrative cases from our institution.

MKEE-97 FREEZE, BURN OR BUZZ: BONE TUMOR ABLATION IN DAILY RADIOLOGIC PRACTICE

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TEACHING POINTS

Ablation of bone tumors has become more accessible and is now the first line of treatment for many common and uncommon lesions found in our daily practice. There are some considerations that involve the decision of ablating a bone tumor: refractory pain, associated pathological fracture, length of the lesion. Ablation can be performed by several techniques: radiofrequency ablation, cryoablation and microwave ablation are the more commonly used methods and the choice of therapy relies on availability, location and tumor specific characteristics. While performing the ablation itself, care must be taken regarding near noble structures, such as nerves and vascular structures. Isolating the target structure by performing hydro and pneumodissection is a common strategy.

TABLE OF CONTENTS/OUTLINE

Review of the most common imaging characteristics of bone tumors that are submitted to ablation. Demonstrate the material used in different types of ablations at our institution. Explain the technique used in different types of ablations, focusing on radiofrequency ablation, cryoablation and microwave ablation. Post-procedure imaging and patient follow up.

MKEE-98 ULTRASOUND IMAGING OF NAIL PATHOLOGIES: ESSENTIALS FOR RADIOLOGISTS

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Maria J. Veloza Vega, MD (*Abstract Co-Author*)
Laura Olarte Bermudez (*Abstract Co-Author*)
Ana M. Rendon-Garavito (*Abstract Co-Author*)
Oscar Rivero SR, MD (*Abstract Co-Author*)
Javier A. Romero, MD, MSc (*Abstract Co-Author*)

TEACHING POINTS

Recognize and understand different pathologies and noxas, such as onychodystrophy, leukonychia, onychomycosis and subungual glomus tumor, among others can affect the nail and surrounding structures, and how this alteration of the anatomy can present in ultrasound imaging, from real life cases with various presentations of the same disease. Learn the key elements to document in an ultrasound report, including reservation of the trilaminar nail structure, thickness of the nail bed, vascularization of the nail folds, and integrity of the surrounding bone structures, taking into account clinical findings, for an accurate diagnosis. Develop a comprehensive review of the normal anatomy and ultrasound presentation of the nail plate, nail bed, matrix, and surrounding structures, as well as the nail growth, allowing for correct identification and differentiation of normal and abnormal findings.

TABLE OF CONTENTS/OUTLINE

1. Normal Anatomy and Ultrasound Findings 2. Infectious Nail Disorders: Onychomycosis, Paronychia, Onychocryptosis3. Nail dystrophies: Onychodystrophy, Onycholysis, Leukonychia, Onychomadesis, Onychorrhexis, Melanonychia4. Cysts: Synovial Cyst Myxoid-mucoid cyst 5. Tumors and Cancers: Koenen's Tumor, Glomus Tumor,Subungual Exostosis, Bowen's Disease6. Others:Psoriasis 7. Correct Radiological Report and Key points

MKEE-99 BONE CLUES: A RADIOLOGIST’S DETECTIVE GUIDE TO LONG BONE OSTEOSYNTHESIS

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Andreza Melloni, MD (*Abstract Co-Author*)
Jose Alvaro Nascimento Paixao, MD (*Abstract Co-Author*)
Camila N. Oliveira (*Abstract Co-Author*)
Atilio Teixeira, MD (*Abstract Co-Author*)
Alexandre Bialowas, MD (*Abstract Co-Author*)
Taise T. da Silva (*Abstract Co-Author*)

TEACHING POINTS

Many long bone fractures require surgical treatment using various fixation devices, including Kirschner wires, intramedullary nails, plates, and screws. It is the radiologist's responsibility to assess the progression of fracture healing, identify the types of osteosynthesis materials, and detect potential complications. This work presents and illustrates both normal and pathological healing processes, including hypertrophic callus formation, non-union (pseudoarthrosis), and both acute and chronic osteomyelitis. Additionally, it addresses hardware-related complications such as loosening and fracture of fixation devices.

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Bone Clues: Radiologic Evaluation of Long Bone Osteosynthesis Introduction Radiologists must assess bone healing and fixation integrity after surgery. Step 1: Fixation Type: Identify hardware: Kirschner wires, nails, plates, screws. Step 2: Hardware Evaluation: Check for loosening, deviation, fracture. Compare with baseline images. Step 3: Healing: Assess callus, alignment, signs of malunion or non-union. Step 4: Infection: Look for osteomyelitis or soft tissue abscess. Conclusion: A structured, stepwise approach improves diagnosis and patient outcomes.

MKEE-100 DDH AND ITS COMPLICATIONS: FROM NEWBORN SCREENING TO ADULT PRESENTATION AND MANAGEMENT

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Farhad Pishgar, MD, MPH (*Abstract Co-Author*)
Sara Haseli, MD (*Abstract Co-Author*)
Hyun Su Kim, MD, PhD (*Abstract Co-Author*)
Ezekiel Maloney, MD (*Abstract Co-Author*)
Maryam Yousefiasl, MPH (*Abstract Co-Author*)
Bahar Mansoori, MD (*Abstract Co-Author*)
Pramod Kamalapathy, MD (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)

TEACHING POINTS

Ultrasound, particularly Graf’s method for measuring the a-angle, is essential for detecting DDH in newborns, offering a non-invasive, reliable, and widely accessible imaging technique. As the child ages, radiography becomes crucial for assessing acetabular index and femoral head displacement, aiding in accurate classification and treatment planning of DDH. MRI and CT are pivotal for post-treatment evaluation, assessing femoral head positioning after reduction, and detecting complications such as avascular necrosis or joint over-coverage.

TABLE OF CONTENTS/OUTLINE

• Introduction to DDH, Screeningo DDH spectrumo Barlow and Ortolani maneuvers, limitationso Risk factorso Flowchart of screening• Anatomyo Hip joint anatomy on US and X-rayo US timing, screening protocols• Ultrasoundo Graf US, landmarks, and a-angleo Normal findings: a = 60°o Mild dysplasia: a 50-59°, management by ageo Dislocated hips: a < 43°, labral elevation• Radiographso Switch from US to radiography.o Describes Hilgenreiner’s, Perkin’s, Shenton’s lineso Acetabular index• Radiographic Classificationo Subtle acetabular shallownesso High-riding femoral headO Grades I-IVo Uses H-point• Treatment and Follow-Upo Treatment planning and decisionso MRI§ Used post-reduction to confirm hip positioning§ Soft tissue visualization, femoral head vascularity§ Concentric reduction in spica cast on MRIo CT and Arthrography§ CT inication§ Used during reduction to assess obstacles§ Arthrogram• Complicationso Potential long-term and treatment-related issueso AVNo Persistent acetabular shallowness despite treatmento Later OA• Case Studieso Symmetric dislocationso Early treated and resolved DDH• Conclusion

MKEE-101 PREOPERATIVE TO POSTOPERATIVE IMAGING FEATURES OF PEDIATRIC FOOT DEFORMITIES. HOW RADIOGRAPHS MATTER!!

Jainam A. Doshi, MBBS, MD (*Presenter*)
Pushpa Bhari Thippeswamy, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

• Reporting checklist for assessing pediatric foot deformities on radiograph that warrant surgical intervention.• Systematic method for evaluating postoperative radiographs in patients with pediatric foot deformity. • Flow chart to address deformities in report to aid clinicians in management.

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Pediatric foot deformities affect the quality of life for both child and parent. Prevalence varies from 1/1,000 live births for clubfoot to 1 /10,000 for congenital vertical talus. These deformities are primarily diagnosed clinically but preoperative imaging helps assess bone development and alignment. Various lines and angles help to assess the degree of deformity and guide management strategy. Pediatric foot deformities are treated either by conservative or surgical approach. Conservative approach includes serial manipulation and casting, special orthosis, & physiotherapy. The resistant cases may require surgical management, which includes soft tissue release, tendon transfers, osteotomies and arthrodesis. In certain deformities like congenital vertical talus and neglected clubfoot, surgery is the only option for management. Radiographs are the most common modality used for post-operative assessment in pediatric foot deformities. Radiographs play critical role in evaluation of success of surgical correction, implant placement, implant-related complications and detecting recurrence. Hence, radiologists should be aware of postoperative imaging features of routine surgical interventions. This educational exhibit focuses on the common pediatric foot deformities, surgical strategies and postoperative radiographic appearance.

MKEE-102 NEURAL SHEATH TUMORS: A PICTORIAL REVIEW

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Bruno C. Carneiro (*Abstract Co-Author*)
Rafael B. Jorge, MD (*Abstract Co-Author*)
Luiz T. Nehme, MD (*Abstract Co-Author*)

TEACHING POINTS

Review the main subtypes of neural sheath tumors and their imaging characteristics. Identify findings that suggest malignancy, such as undefined margins, necrosis, hemorrhage, and invasion of adjacent structures. Understand the importance of observation with neurofibromatosis type 1 (NF1) as a risk factor for malignant transformation. Differentiate benign from malignant tumors based on imaging patterns, contributing to early diagnosis and appropriate management. Appreciate the role of imaging in diagnostic suspicion, even when it is not possible to define with certainty benignity or malignancy without biopsy.

TABLE OF CONTENTS/OUTLINE

Introduction Definition and origin of neural sheath tumors Clinical relevance and association with NF1 Retrospective institutional analysis with histological confirmation Imaging modalities used: MRI, CT and radiography Classification and Subtypes Schwannoma (typical and atypical) Neurofibroma (localized, diffuse, plexiform) Malignant neural sheath tumors Perineurioma and rare variants Imaging findings: T1, T2 signal, enhancement pattern, necrosis, hemorrhage Features suggesting malignancy Correlation with symptoms and location Differential Diagnosis Soft tissue sarcomas Myogenic tumors and pseudotumoral lesions Discussion of Cases Illustrative examples with images Clinical and anatomopathological Conclusion

MKEE-103 ACHILLES TENDON: STATE OF THE ART IN TENDON INJURIES AND POSTOPERATIVE FINDINGS

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Vitor T. Paula, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review the anatomy of the achilles tendon and the pathophysiology and types of injuries 2. To correlate the type of injury with imaging findings, focusing in ultrasound and MRI 3. To review the main surgical treatments and their corresponding findings in radiographs, ultrasound and MRI

TABLE OF CONTENTS/OUTLINE

1. Anatomy and pathophysiology of the achilles tendon 2. Correlate the injury mechanism with the type of injury found 3. Main achilles tendon injuries 3.1 Tendinosis 3.2 Achilles tendon tears 3.3 Paratendinitis 3.4 Insertional tendinopathy 3.5 Haglund's deformity 3.6 Bursitis 3.7 Systemic disease 4. Treatments and corresponding imaging findings 4.1 Conservative - Functional bracing/casing in resting equinus 4.2 Non-conservative - Reinsertion repair (open) : single row and double row techniques - Mid-tendon repair: minimally invasive (achillion) and open (Kessler; Bunell; Krackow); complementary autologous tendon reinforcement or halo grafting 5. Pos-operated achilles injuries 5.1 Re-rupture 5.2 Infection

MKEE-104 LABRAL TEARS UNVEILED: MRI CLUES AND ARTHROSCOPIC CONFIRMATION

Ira Agrawal (*Presenter*)
Amit K. Sahu, MBBS, MD (*Abstract Co-Author*)
Bharat Aggarwal, MD (*Abstract Co-Author*)
Vikas Gupta (*Abstract Co-Author*)
Akram Jawed (*Abstract Co-Author*)
Vikas Kumar Shukla (*Abstract Co-Author*)

TEACHING POINTS

Identify normal MRI anatomy of the glenoid labrum across anterior, posterior, and superior regions. 1. Describe MRI features of common labral tears (SLAP, Bankart, posterior). 2. Correlate MRI findings with arthroscopy for accurate diagnosis. 3. Differentiate true tears from variants (sublabral recess, foramen, Buford complex). 4. Discuss diagnostic pitfalls and MRI limitations. 5. Review clinical relevance for treatment decisions.

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Anterior Labral Tears: Bankart: Anteroinferior avulsion; unstable. ALPSA: Medialized labrum; chronic injury. Perthes: Detached labrum with intact periosteum. GLAD: Superficial tear + cartilage damage; stable. HAGL: IGHL avulsion from humerus; not a labral tear. Superior Labral Tears (SLAP): Ten types based on location and biceps involvement. Posterior Labral Tears: Reverse Bankart: Posteroinferior avulsion. Posterior Peel: Lifted labrum, intact periosteum. Kim Lesion: Incomplete tear; subtle. Posterior HAGL: IGHL avulsion from humerus. Posterior SLAP Extension: SLAP tear extending posteriorly. Labral Tear Mimickers: Sublabral Recess: Normal variant at 12-1 o'clock. Sublabral Foramen: Gap at anteroinferior labrum. Buford Complex: Absent anteroinferior labrum + thick MGHL. Magic Angle: Signal artifact on short TE. Partial Volume Averaging: Pseudotear from thick slices or oblique plane.

MKEE-105 ORTHOPEDIC PHOTODYNAMIC FIXATION

Kyle Robbins (*Presenter*)
Kelby B. Napier, MD, PhD (*Abstract Co-Author*)
Mariam A. Malik, MD (*Abstract Co-Author*)
Benjamin E. Northrup, MD (*Abstract Co-Author*)

TEACHING POINTS

Introduce the technology of photodynamic fixation for prophylactic and fracture fixation Understand the surgical approaches and operative technique of photodynamic fixation Recognize the normal imaging findings after photodynamic fixation Identify potential complications including extraosseous fixation and periprosthetic fracture

TABLE OF CONTENTS/OUTLINE

Outline Introduction Indications including prophylactic fixation as well as benign and pathologic fixation Surgical approach and technique Case based review of expected imaging findings and complications Normal postoperative appearance of fixation at different site Potential complications including extraosseous extension and periprosthetic fracture Outcomes after fixation

MKEE-106 ULTRASHORT TIME TO ECHO (UTE) SEQUENCES IN IMAGING OF THE CORTICAL BONE - CAN THE "INVISIBLE" BE FINALLY "VISIBLE" ON MRI: AN INITIAL EXPERIENCE

Rakhee Kumar Paruchuri, FRCR, MBBS (*Presenter*)

TEACHING POINTS

• Ultrashort Echo Time (UTE) MRI is a newer sequence available on 3T machines. It utilizes ultrashort TE to capture signal on tissues with short T2 / T2* values. • This makes "invisible" structures such as cortical bone, tendons, ligaments & menisci "visible". • High contrast morphological imaging of the cortical bone results in images that have similar contrast to CT images. • The images can be "inverted" to give an appearance similar to CT images or radiographs. • This MR technique can potentially reduce radiation exposure with CT. It also aids in avoiding multiple investigations to assess cortical abnormalities and replacing the traditional use of CT to assess the cortical bone.

TABLE OF CONTENTS/OUTLINE

1. Physiology of normal bone and its appearance on conventional MRI sequences. 2. Key features of UTE sequences, understanding the physics behind this sequence, technical specifications and utilization. 3. Benefits of UTE sequences. 4. Illustrative examples demonstrating the use of UTE sequences in depicting cortical abnormalities. 5. Understanding its limitations. 6. Future role of UTE.

MKEE-107 EMERGING ROLE OF ZERO ECHO TIME (ZTE) MRI IN EVALUATING BENIGN AGGRESSIVE BONE NEOPLASMS

Amit Janu, MBBS, MD (*Presenter*)
Pranjal Rai, MBBS (*Abstract Co-Author*)
SUYASH KULKARNI (*Abstract Co-Author*)
Nitin S. Shetty, MBBS, MD (*Abstract Co-Author*)
Kunal B. Gala, MBBS, MD (*Abstract Co-Author*)
Amit J. Choudhari, FRCR,MBBS (*Abstract Co-Author*)
Vivek Dhomane, MBBS (*Abstract Co-Author*)

TEACHING POINTS

? Understand the technical principles of ZTE MRI and its advantages in bone imaging. ? Explore the role of ZTE in evaluation of matrix mineralisation, margins and periosteal reaction in evolution of benign aggressive bone neoplasm. ? Recognize ZTE imaging patterns to know how the radiograph and CT findings like sclerosis, different matrix, lytic changes appear on ZTE sequence. ? Compare ZTE with conventional radiography and MRI in benign aggressive bone neoplasms.

TABLE OF CONTENTS/OUTLINE

1. Introduction ? Overview of benign aggressive bone tumors ? Current imaging Techniques ? Principle of ZTE MRI 2. Benign aggressive bone tumor- Chondroblastoma 3. Benign aggressive bone tumor- Giant cell tumor 4. Benign aggressive bone tumor- Osteoid Osteoma and others 5. Conclusion ? Summary and clinical impact6. Overall review: Benign aggressive bone neoplasms often present with overlapping features that challenge conventional imaging modalities. While the zone of transition and periosteal reaction are better assessed on radiograph, CT offers excellent cortical detail and matrix mineralization, its ionizing radiation burden remains a concern, particularly in young and adolescent patients. Zero Echo Time (ZTE) MRI, enables direct cortical bone visualization with minimal susceptibility artifacts, can act as an emerging promising alternative with emphasis on 3D accessibility of bone tumors over plane radiographs. ZTE offers CT-like contrast for bone while retaining the soft tissue resolution inherent to MRI, facilitating comprehensive lesion evaluation in a single modality. Through case-based examples we demonstrate how ZTE improves diagnostic confidence and management of these tumors.

MKEE-108 MAGNETIC RESONANCE IMAGING RESPONSE EVALUATION AFTER NEOADJUVANT TREATMENT IN SOFT TISSUE SARCOMAS: WHERE DO WE STAND?

Jose A. Narvaez, MD (*Presenter*)

TEACHING POINTS

1. To review the current role of neoadjuvant treatment in soft tissue sarcomas (STS). 2. To recognize that MR Imaging depict various changes induced by neoadjuvant therapies in the treatment of STS, but these changes are poorly correlated with histology and clinical outcomes.3. To recognize the usefulness of Choi's criteria, together with information from functional magnetic resonance imaging (DWI AND DCE-MRI), to improve the efficacy of response criteria such as RECIST 1.1 in identifying good responders based on tumor cell necrosis and viability after neoadjuvant treatment.

TABLE OF CONTENTS/OUTLINE

A. Review the current role of Neoadjuvant Therapy in soft-tissue (ST) sarcomas, emphasizing the more common indications. B. MR imaging protocols for assessment response to Neoadjuvant Theraphy in ST sarcomas. Conventional pulse sequences, Diffusion (b values, ADC, IVIM), Dynamic Contrast-enhanced images. C. Spectrum of Pathologic Changes in ST sarcomas after Neoadjuvant Therapy. Necrosis, Granulation Tissue, Fibrotic Tissue, Viable Tumor, Peripheral changes and Pseudocapsule. D. MR imaging/Pathologic correlation of changes after Neoadjuvant Therapy in ST sarcomas. Histologic subtypes with specific imaging/pathologic changes (Synovial Sarcoma, Myxoid Liposarcoma). Changes in conventional MR pulse sequences, Difussion, Dynamic Contrast-enhanced images. E. Imaging response criteria: RECIST 1.1, Choi Criteria, usefulness of functional MRI. F. Prognostic value of good response to neoadjuvant therapy in ST sarcomas.

MKEE-109 NARRATIVE NEEDLEWORK: DOCUMENTING THE ORAL TRADITION OF MUSCULOSKELETAL INTERVENTION TRAINING TO MAXIMIZE PROCEDURAL SUCCESS

Brian Y. Chan, MD (*Presenter*)

TEACHING POINTS

1. Create an enduring resource containing procedural knowledge that has been acquired largely via oral tradition.2. Suggest guidelines for maximizing patient comfort and opportunity for technical success.3. Provide tips for troubleshooting commonly encountered procedural pitfalls.

TABLE OF CONTENTS/OUTLINE

1. Before the procedure- Allergies- Managing barriers to moderate sedation- Consent- Room setup- Equipment selection- Planning the approach- Patient positioning- Role of intraprocedural pathology consultation2. During the procedure- Pain management- Navigating around sensitive structures- How to sample difficult lesions- Removing the sample3. After the procedure- Specimen handling and transport media- Dealing with complications4. Modality-specific considerations- FL- US- CT

MKEE-110 WHAT LASTS OF THEM: FUNGAL INFECTION IN MUSCULOSKELETAL IMAGING

Vitor Nascimento, MD (*Presenter*)
Lucas Nogueira, MD (*Abstract Co-Author*)
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TEACHING POINTS

Fungal infections have multiple forms of musculoskeletal presentation and are often a neglected differential diagnosis. MRI is the most sensitive modality for early detection, while CT provides detail on cortical destruction and calcifications. Recognition of imaging patterns and correlation with clinical risk factors is critical for suggesting a fungal etiology and guiding biopsy or treatment.

TABLE OF CONTENTS/OUTLINE

Introduction: Overview of fungal musculoskeletal infections and its diagnostic challenges. Objectives: To describe imaging features of fungal infections, highlight key pathogens, and discuss diagnostic strategies. Methods: Illustrative case-based review using MRI, CT, and plain radiographs from confirmed fungal infections. Discussion: Review of dissemination pathways (hematogenous, direct inoculation, contiguous spread), typical imaging findings, and pathogen-specific clues. Conclusion: Fungal infections should be considered in indolent, atypical musculoskeletal presentations. High clinical suspicion and targeted imaging play a central role in early diagnosis and improved outcomes.

MKEE-111 PSORIATIC ARTHRITIS FROM A TO Z: A GUIDE TO RADIOLGY

Hugo Franco, MD (*Presenter*)
Damaris V. Goncalves, MD (*Abstract Co-Author*)
Pedro H. Arruda, MD (*Abstract Co-Author*)
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TEACHING POINTS

Psoriatic arthritis (PsA) is a systemic inflammatory disease that affects peripheral and axial joints, tendons, ligaments, and their insertions, present in around 30% of patients with the cutaneous disease and in up to 90% of the patients with nail psoriatic changes. Although the diagnosis of psoriasis is eminently clinical, imaging exams play a fundamental role in assessment of PsA, as well as for monitoring disease progression and response to treatment. X-rays have traditionally been used to document structural joint damage, such as bone erosions, joint space narrowing, bone proliferation, and typical deformities (e.g. "pencil-in-cup"), having a greater role in the chronic phase. Ultrasound (US) and magnetic resonance imaging (MRI) are particularly useful in detecting inflammatory changes in the soft tissues, such as synovitis and enthesitis. US, for example, can identify specific abnormalities of PsA, such as perientheseal microvascular flow detected by Power Doppler and has good sensitivity for detection of bone erosions. MRI provides a detailed view of inflammatory and structural changes, such as bone marrow edema and synovitis, being useful for both

peripheral and axial disease. The appropriate use of various imaging modalities and accurate interpretation of the findings add significant value to the diagnostic and treatment of patients with PsA, contributing to prevention of joint destruction and reduction of disease burden.

TABLE OF CONTENTS/OUTLINE

1. Introduction: psoriasis and PsA 2. The Enthesis Organ Concept 3. Epidemiology & Clinical Features of PsA 4. Multimodality imaging 5. Key Findings in PsA 6. Differential Diagnosis 7. Conclusion

MKEE-112 ENTHESIS IN HEALTH AND DISEASE: A PRIMER FOR RADIOLOGISTS

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TEACHING POINTS

Entheses are structures that attach tendons, ligaments, capsules, or fasciae to bones. They may exist in the form of fibrous or fibrocartilaginous entheses, the latter further subdivided into classic, functional, and articular types. Entheses consist of various types of cartilage and synovial tissue, collectively referred to as the "synovioentheseal complex" (SEC). The SEC can be affected by many rheumatic diseases, foremost among them psoriatic arthritis, the most common subtype of peripheral spondyloarthritis, as well as traumatic or overuse injuries like Osgood-Schlatter disease and metabolic conditions such as X-linked hypophosphatemia. This educational exhibit aims to provide essential information about the structure of various forms of healthy entheses and the spectrum of diseases and conditions that can lead to their inflammation or disruption.

TABLE OF CONTENTS/OUTLINE

1. Enthesis in health: synovioentheseal complex and enthesis subtypes 2. Imaging modalities for enthesitis and/or enthesopathies 3. Case examples of enthesis in disease including Arthritis (a) Psoriatic arthritis, reactive arthritis, inflammatory bowel disease-related arthritis(b) Rheumatoid arthritis(c) Ankylosing spondylitis(d) Juvenile idiopatic arthritis (enthesitis-related arthritis)(e) Diffuse idiopathic skeletal hyperostosis (DISH)(a) Crystal arthropathy (gout arthritis)(f) Systemic lupus erythematosus(g) Synovitis, acne, pustulosis, hyperostosis, osteitis syndrome (SAPHO)(h) Chronic non-bacterial osteomyelitis (CNO) Metabolic Diseases (b) X-linked hypophosphatemia Trauma-Overuse Related (a) Osgood-Schlatter disease(b) Haglund deformity(c) Pulley injury4. Summary 5. Conclusion

MKEE-113 STAYING AFLOAT IN MUSCULOSKELETAL TRAUMA: AN OVERVIEW OF CONDITIONS WITH FAT FLOATING ON BLOOD

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TEACHING POINTS

Fat-blood interface, whereby fat and blood come into direct contact and less dense fat floats within more dense serum and hematocrit, has unique imaging characteristics that point to specific pathophysiological patterns of musculoskeletal system. Lipohemarthrosis is a pathognomonic feature of intra-articular fractures, which result in a mixture of marrow fat and blood with synovial fluid within joint space. When gas is also introduced, as with certain surgeries, gunshots or other forms of trauma, pneumolipohemarthrosis occurs. Lipohematomas can be seen adjacent to fractures, whereby the hematoma is composed of marrow blood mixed with fat. Bursal or tendon sheath lipohematomas may also occur. Morel-Lavallée (ML) lesions are seen in subcutaneous fat tissue (usually deeper to superficial fascia) over a bony promontory when a shear injury disrupts vessels, into which floating globules from the surrounding fat or ruptured lymphatics may be introduced. Foci of coalesced extracellular fat within marrow may be seen in bone contusions and fractures, as well as in osteomyelitis.

TABLE OF CONTENTS/OUTLINE

Radiographic shades of grey and how they pertain to fat floating on or in serum/blood on radiographs or CT. Pathophysiology of fat floating within a blood-filled cavity. Case examples of lipohemarthrosis, pneumolipohemarthrosis, bursal lipohematoma, floating fat within tendon sheaths, ML lesions, and coalesced extracellular fat globules within marrow in bone contusions, fractures and, as a differential consideration, osteomyelitis. How "saline-solution load test? may result in an erroneous diagnosis of pneumolipohemarthrosis in a "challenged joint?, if chart review is not duly performed by radiologist.

MKEE-114 ASSESSMENT OF T2-WEIGHTED MRI-DERIVED SYNTHETIC CT FOR THE DETECTION OF SUSPECTED LUMBAR FACET ARTHRITIS: A COMPARATIVE ANALYSIS WITH CONVENTIONAL CT

Gan Cao (*Presenter*)
Jun Xia (*Abstract Co-Author*)
Shanghuang Xie (*Abstract Co-Author*)
Jiandong Guo (*Abstract Co-Author*)
Keliang Ye (*Abstract Co-Author*)

TEACHING POINTS

1.Deep learning-based sCT using Pix2Pix GAN with ResNet-9 transforms T2-weighted MRI into CT-equivalent images, enabling radiation-free bone evaluation. 2.sCT shows strong correlation with conventional CT (axial/sagittal SSIM: 0.889/0.858; PSNR: 24.56/23.75dB; MAE: 0.031/0.038; DSC: 0.935/0.876). 3.For lumbar facet pathology, sCT outperforms T2-weighted MRI in detecting bone erosions (sensitivity: 57.9%vs.5.3%; specificity: 98.8%vs.84.6%), osteosclerosis and joint alterations. 4.Bland-Altman analysis confirms high agreement between sCT and CT across 15 spinal parameters with excellent inter/intra-reader reliability (ICC: 0.839-0.983/0.953-0.995). 5.Integrating sCT into MRI protocols provides "one-stop" spinal assessment, potentially eliminating need for additional CT while maintaining diagnostic confidence. 6.Limitations include reduced performance with severe degeneration, metal artifacts, or anatomical variants, requiring further technical refinement.

TABLE OF CONTENTS/OUTLINE

I. IntroductionA. Lumbar facet arthropathy significanceB. Imaging limitations: CT vs. MRIC. Need for MRI-derived synthetic CT II. Technical FrameworkA. Pix2Pix-GAN architecture with ResNet-9B. Custom loss functionsC. Dataset and validation approach III. Image AnalysisA. Modality comparison (CT/sCT/T2WI)B. Normal vs. pathological facet jointsC. Multi-planar reconstruction accuracy IV. Validation ResultsA. Quality metrics (SSIM, PSNR, MAE, DSC)B. Bland-Altman analysis of key measurementsC. Diagnostic performance for facet pathologies V. Clinical ImpactA. Radiation reduction benefitsB. Diagnostic workflow enhancementC. Limitations and future directions

MKEE-115 UPDATE ON IMAGING OF ROTATOR CUFF TEARS: WHAT WE KNOW SO FAR AND WHAT LIES AHEAD

Dyan V. Flores, MD (*Presenter*)

TEACHING POINTS

Rotator cuff (RC) tears affect 20%-50% of individuals aged 60 years or older. The RC repair is the second most common orthopedic soft tissue repair procedure and more than 250 000 repairs are performed annually in the United States alone. Imaging plays a crucial role in diagnosing and evaluating rotator cuff tears. Multiple modalities are used, each with its own strengths and applications. Rapid advances in imaging, along with updates on anatomy and arthroscopy have provided opportunities for improved treatment strategies, based on a better understanding of the various patterns of RC tears. In this educational exhibit, we review the latest on

rotator cuff tears specifically imaging modalities, radiologic reporting and interpretation, and treatment. We also highlight controversies, gaps in literature, burning questions and future directions.

TABLE OF CONTENTS/OUTLINE

1. IMAGING MODALITIES What We Know So Far •Common US pitfalls •Common MRI pitfalls What Lies Ahead •3D MRI •Novel sequences 2. RADIOLOGIC INTERPRETATION AND REPORTING What We Know So Far •Lack of MRI grading system •ISAKOS classification •Non-ISAKOS tears: Thinning, Delamination, MTJ tear •Hard to diagnose areas: subscapularis, rotator interval •Measurements: tendon retraction and muscle atrophy What Lies Ahead •AI-driven measurements 3. POSTOPERATIVE IMAGING What We Know So Far •When to use US, MRI or MRA •Appearances of conventional repairs What Lies Ahead •Biologic and structural augmentation •Tendon transfers •Superior capsular reconstruction

MKEE-117 LEPROSY REVISITED: AN IMAGING REVIEW OF MUSCULOSKELETAL ABNORMALITIES

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Marcello H. Nogueira-Barbosa, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is to: Highlight the characteristics of neural and musculoskeletal imaging findings associated with leprosy. Demonstrate the role of ultrasonography and magnetic resonance imaging (MRI) in the early detection, diagnosis and disease monitoring, as well as management of leprosy-related complications. Emphasize the importance of global diagnostic awareness and the radiologist’s role in improving outcomes through timely imaging evaluation.

TABLE OF CONTENTS/OUTLINE

Introduction: Definition of leprosy, clinical relevance and current diagnostic challenges. Public Health: Increasing relevance in developed countries due to global migration and delayed recognition of atypical cases in non-endemic settings. Role of Imaging: Importance of imaging in early detection, differential diagnosis and disease monitoring. Ultrasonography: Accessibility, utility in nerve evaluation and neural complications, standardized measurement. MRI: Use for joint evaluation and its importance for differential diagnosis. Future Perspectives: Imaging protocols standardization, investigation of potential role of MR neurography/tractography and ultrasound elastography in leprosy neuropathy.

MKEE-118 EPONYMOUS FRACTURES: REFLECTING ON THE HISTORY, MECHANISM, AND RADIOLOGICAL FEATURES

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Mahmoud Omar, MD (*Abstract Co-Author*)
Vijaya K. Kosaraju, MD (*Abstract Co-Author*)
Navid Faraji, MD (*Abstract Co-Author*)

TEACHING POINTS

Many common musculoskeletal eponyms are named after 18th and 19th century physicians whose original descriptions laid the foundation for modern fracture classification. Eponymous fractures demonstrate characteristic imaging findings based on mechanistic patterns. Knowledge of eponymous fractures facilitates active review of imaging and recognition of secondary findings.

TABLE OF CONTENTS/OUTLINE

Background: Accuracy of eponym use in clinical practice. Advantages and limitations of eponym usage. Eponymous Fractures: Le Fort, Jefferson, Hangman, and Chance (craniofacial and spinal). Bankart and Hill-Sachs (shoulder). Colles, Galeazzi, Monteggia, Gamekeeper's, Bennett, Rolando, and Boxer (upper extremity). Lisfranc, Segond, Schatzker Classification, Maisonneuve, Pilon, Tillaux, Chopart, and Jones (lower extremity).

MKEE-119 THE BIG NERVE PROBLEM: IMAGING OF SCIATIC NERVE PATHOLOGIES FROM COMMON TO RARE !!

Aruna R. Patil, MD, FRCR (*Presenter*)
Rajesh V. Helavar, MBBS,MD (*Abstract Co-Author*)
Kartik Revanappa (*Abstract Co-Author*)

TEACHING POINTS

Sciatic nerve as it spans a long course can be affected by focal or diffuse pathologies at various levels. Many disease processes spread along the nerve and present with confusing clinical picture. Awareness of the typical and atypical imaging features of common and1. rare abnormalities is vital for any practicing radiologist. This exhibit will focus on :1.Radiological anatomy of Sciatic nerve - USG, CT, MRI 2. Approach on localisation of sciatic nerve pathologies 3. Multiple focal and diffuse abnormalities of the nerve with pertinent imaging features

TABLE OF CONTENTS/OUTLINE

The exhibit will cover: 1. The anatomy of the sciatic nerve (illustration) and radiological anatomy 2. Variant anatomy and landmarks 3.Motor supply of the nerve and denervation patterns 4. Focal lesions: Benign: Schwannoma, neurofibroma, intraneural ganglion cyst, intraneural lipoma . Malignant: neurofibrosarcoma, in NF-1, lymphoma, chloroma 5.Diffuse: Guillian Barre, chronic idiopathic inflammatory polyneuropathy, Charcot Marie Tooth disease, Hansens disease, neuritis secondary to compression (Ischiofemoral impingement, bed sores , persistent sciatic artery), radiation plexitis / neuritis, vasculitis related neuritis, malignant extension 6. Trauma - neuropraxia due to complete transection , posterior hip dislocation 7. Extrinsic compression - by tumors, osteochondroma, labral cysts 8.Secondary involvement - by vascular malformation, endometriosis, tumors, abscess (perianal fistula) , fibromatosis 9. Sciatic nerve interventions - image guided injections - tips to avoid iatrogenic injury 10.Advances - MR neurography and DTI

MKEE-120 THE FAT LABYRINTH: NAVIGATING PITFALLS IN FAT-CONTAINING SOFT TISSUE TUMORS

Takahiro Kitayama, MD, PhD (*Presenter*)
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Yudai Asano (*Abstract Co-Author*)
Fumiyo Higaki (*Abstract Co-Author*)
Katsuhide Kojima (*Abstract Co-Author*)
Yoshiyuki Ayada (*Abstract Co-Author*)
Hidetaka Yamamoto (*Abstract Co-Author*)
Takao Hiraki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Fat is a distinctive imaging feature and plays a crucial role in the differential diagnosis of soft tissue tumors. However, adipocytic tumors span a broad spectrum from benign to malignant, and radiologists often encounter benign lipoma subtypes that may be challenging to differentiate from liposarcomas, as well as liposarcomas that closely mimic benign lesions. Additionally, various neoplastic and non-neoplastic fat-containing masses can act as mimickers of adipocytic tumors, occasionally leading to diagnostic uncertainty among radiologists. The purpose of this exhibit is to: 1. Explore the spectrum of adipocytic tumors based on the latest WHO Classification of Soft

Tissue Tumors, with a focus on their imaging characteristics. 2. Highlight key mimickers, emphasizing pitfalls, diagnostic challenges, and differential considerations. 3. Present a structured diagnostic framework that integrates imaging features, clinical information and anatomical distribution to aid in the differentiation of fat-containing soft tissue tumors.

TABLE OF CONTENTS/OUTLINE

1. Introduction2. Case-based review of adipocytic tumors following the WHO Classification of Soft Tissue Tumors, 5th Edition, covering both benign and malignant subtypes, with a focus on imaging characteristics and diagnostic challenges.3. Overview of neoplastic and non-neoplastic fat-containing masses that mimic adipocytic tumors, emphasizing key imaging pitfalls and differential considerations.4. A structured diagnostic flowchart integrating imaging features, clinical information and anatomical distribution to guide the differentiation of fat-containing soft tissue tumors.5. Summary

MKEE-121 NON-EXTREMITY MUSCLE INJURIES: A FRONT-TO-BACK OVERVIEW

Ethan Porter, BA (*Presenter*)
Muhayman Sadiq, MBBS (*Abstract Co-Author*)
Manickam Kumaravel, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Identify all non-extremity muscles and provide examples of commonly imaged and injured muscles in this group. Highlight MRI techniques most useful for diagnosing non-extremity muscle injuries, associated injuries, and complications. Detail MRI techniques for detecting edema and hematoma in non-extremity muscle injuries. Compare T2-weighted and T1-weighted imaging findings. Outline grading methods for strains and tears in non-extremity muscles, with MRI examples of each. Discuss intraoperative and postoperative appearances of these muscles, including common postoperative complications.

TABLE OF CONTENTS/OUTLINE

Introduction Diagnosis of non-extremity muscle injury. MRI findings: qualitative and quantitative. Relevant muscles and MRI injury examples. MRI Techniques MRI techniques for edema qualification. Strengths of different MRI techniques. T1 vs. T2 contrasts, with side-by-side MRI examples. Measurement and distinction of fluid areas, edema, and hematoma on MRI. Grading Comparing grading patterns for different muscles with respective imaging. Criteria for surgical vs medical management of tears. Management Pre-op, intra-op, and post-op imaging with illustration. Postoperative complications imaging appearance. Conclusion Suggest a report template with key information to include. Key imaging pitfalls and techniques to avoid them. Key takeaways. References

MKEE-122 FROM SPINE TO SYNOVIUM: A COMPREHENSIVE REVIEW OF SKELETAL TB FOR THE LEARNING RADIOLOGIST

Janardhana Ponnatapura, MD (*Presenter*)
Praveen Shastry (*Abstract Co-Author*)

TEACHING POINTS

Musculoskeletal TB is a diagnostic challenge due to its protean manifestations and overlap with other pathologies. Musculoskeletal TB represents 10-15% of extrapulmonary TB. Spine, hip, and knee are the most commonly affected sites. MRI is the most sensitive modality for early detection, assessment of disease extent, and treatment response. Recognizing characteristic imaging patterns (e.g., paradiscal involvement, Phemister's triad, cold abscesses, spina ventosa) is critical to early and accurate diagnosis.

TABLE OF CONTENTS/OUTLINE

Overview of musculoskeletal tuberculosis• Pathophysiology and routes of skeletal TB spread• Classification of spinal TB patterns Paradiscal Anterior subligamentous Central Posterior element involvement • Extraspinal manifestations of TB Tuberculous arthritis and Phemister's triad Tuberculous osteomyelitis TB dactylitis (Spina ventosa) Tenosynovitis and myositis • Characteristic imaging features on radiographs, CT, and MRI• Key differentiating features from mimics Pyogenic infections Metastatic disease Inflammatory arthritis • Role of imaging in diagnosis, biopsy planning, and monitoring response• Radiologic signs of active vs. healing disease• Diagnostic tips and red flags for early recognition• Educational value for trainees: case-based quiz and pattern-recognition pearls

MKEE-123 IDENTIFYING COMMON BLIND SPOTS IN SPINE MRI: WHAT SETS RADIOLOGISTS APART FROM OTHER CLINICIANS

Hyun Su Kim, MD, PhD (*Presenter*)
Peyman Mirghaderi, MD, MPH (*Abstract Co-Author*)
Arash Azhideh, MD, MPH (*Abstract Co-Author*)
Sara Haseli, MD (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)

TEACHING POINTS

• Spine MRI routinely captures a broader anatomical landscape than the immediate clinical target. • Clinically significant pathologies may lurk in overlooked regions, escaping detection without a vigilant review. • Radiologists possess the unique expertise to identify subtle but actionable findings invisible to most clinicians. • A comprehensive, anatomy-wide approach elevates diagnostic precision and directly impacts patient outcomes. • Cultivating awareness of blind spots and implementing structured search patterns amplifies the radiologist's diagnostic value

TABLE OF CONTENTS/OUTLINE

Introduction - Expanding the radiologist's role beyond focused interpretation - Risks of missing high-impact findings in non-targeted areas Why Blind Spots Matter - Incidental findings with major clinical consequences - Missed diagnoses, delayed treatment, and avoidable morbidity Anatomical Regions Often Overlooked - Craniocervical junction - Thoracic cavity and pulmonary apex - Retroperitoneum and psoas compartment - Pelvis and extraspinal soft tissues Illustrative Case Examples - Aneurysms, deep-seated tumors (sellar, retroperitoneal, muscular, costovertebral), abscesses, insufficiency fractures, osteonecrosis - Multimodality correlation (CT, PET-CT, enhanced MRI) for definitive diagnosis Recommendations for Practice - Structured interpretive strategies to minimize oversight - Imaging or biopsy recommendations when suspicion arises Conclusion - What sets radiologists apart is their vigilance—making the invisible, visible.

MKEE-124 SEEING BETWEEN THE LINES: MR AND CT ARTHROGRAMS MADE CLEAR FOR RADIOLOGISTS

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Vitor T. Paula, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)

TEACHING POINTS

Compare the technical execution, clinical indications, and diagnostic advantages of MR and CT arthrography in musculoskeletal imaging. Provide guidance on appropriate modality selection based on clinical scenarios. Review intra-articular injection techniques, including fluoroscopy- and ultrasound-guided approaches. Identify key imaging findings for accurate diagnosis. Discuss potential complications associated with arthrography. Emphasize strategies to enhance diagnostic confidence and improve patient care.

TABLE OF CONTENTS/OUTLINE

Introduction Overview of arthrography in musculoskeletal radiology Clinical value and growing role of MR and CT arthrograms Technical Considerations Intra-articular injection techniques Fluoroscopy-guided Ultrasound-guided Contrast agents and protocols Modality Comparison MR Arthrography: strengths, limitations, and clinical

applications CT Arthrography: strengths, limitations, and clinical applications Choosing the right modality Common Complications Infection Adverse contrast reactions Neurovascular injury Joint-Specific Applications Shoulder Elbow Wrist Hip Knee Ankle Conclusion Importance of technical proficiency and anatomical knowledge Role of arthrography in improving diagnostic accuracy and patient outcomes

MKEE-125 PEARLS AND PITFALLS IN TFCC IMAGING: FACT VERSUS ARTIFACT

Dyan V. Flores, MD (*Presenter*)

TEACHING POINTS

The triangular fibrocartilage complex (TFCC) is a complex arrangement of delicate structures that plays a crucial role in wrist stability. Its radiologic appraisal can be challenging due the small size of its components, subtle imaging characteristics, variable imaging criteria for injury to each component, and lack of imaging-surgical correlation in existing literature. This educational exhibit aims to present the latest information regarding the imaging characteristics of each component, highlight common pitfalls in imaging assessment, and provide practical strategies to address these pitfalls.

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CENTRAL DISC Fact : • Palmer type IA lesion appears as a thin perforation in the central disc Artifact : •The disc can appear thin on wrist rotation mimicking a perforation DISTAL RADIOULNAR LIGAMENTS (DRULs) Fact : •The ligamentum subcruentum (LS) is a vascular fissure that represents the deep/foveal layer of the DRULs •The DRULs attach to the ulnar fovea and styloid Artifact : •The bright signal of the LS can be confused for a tear on MRI •Supinated positioning of the wrist can distort the appearance of the ulnar insertions of the DRULs, limiting evaluation ULNOMENISCAL HOMOLOGUE (UMH) Fact : •The UMH is a synovium-like structure that lies just ulnar to the prestyloid recess Artifact: •The appearance of the UMH is highly variable and often affected by the imaging parameters and the position of the wrist at the time of scanning ULNAR COLLATERAL LIGAMENT (UCL) Fact: •The UCL arises from the ulnar aspect of the ulnar styloid and merges with fibers of the rest of the TFCC Artifact: •The normal UCL can appear injured on radiocarpal compartment arthrography

MKEE-126 CRIMPS, PULLEYS, AND BOWSTRINGS: ULTRASOUND AND MAGNETIC RESONANCE IMAGING EVALUATION OF FLEXOR PULLEY INJURIES FROM ROCK CLIMBING

David Lee, MD (*Presenter*)
Steven R. Kussman, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Finger pulley injury is well-known and dreaded among rock climbers, developing from persistent overuse and heavy loading of the finger flexors, the flexor digitorum, in a crimp position. 2. Finger pulley is a localized thickening of the synovial tendon sheath, which stabilizes the flexor digitorum by maintaining its close distance to the phalanx, and allows for efficient force transfer in finger flexion. 3. A2 and A4 pulleys, located volar to the proximal and middle phalanges, respectively, are most commonly injured, which leads to 'bowstringing' of the flexor tendon away from the phalanx. 4. Ultrasound and magnetic resonance imaging enable efficient and effective evaluation of bowstringing based on increased tendon-phalanx distance, which correlates with the severity of pulley injury, ranging across the spectrum of sprain, partial rupture, complete rupture, and complete ruptures of multiple pulleys. 5. Imaging-guided evaluation of pulley injury guides management, with varied timelines of conservative medical management through immobilization, rehabilitation, versus surgical management.

TABLE OF CONTENTS/OUTLINE

1) Anatomy of the finger pulley system. 2) Biomechanics of pulley injury in rock climbing. 3) Ultrasound evaluation of the severity of pulley injury, with tendon-phalanx distance as a measure of 'bowstringing' of the flexor digitorum away from the phalanx. 4) Additional ultrasound signs of finger flexor overuse: tenosynovitis and synovial cyst. 5) Clinical grading for management and rehabilitation: sprain, partial rupture, complete rupture, and multiple pulley complete ruptures. 6) Advanced evaluations using MRI.

MKEE-127 DECT POST PROCESSING IN SPINAL HERNIATION AND DEGENERATION

Levent A. Solim, MD (*Presenter*)
Scherwin Mahmoudi, MD (*Abstract Co-Author*)
Vitali Koch, MD (*Abstract Co-Author*)
Christian Booz, MD (*Abstract Co-Author*)
Simon Bernatz, MD (*Abstract Co-Author*)
Thomas J. Vogl, MD, PhD (*Abstract Co-Author*)
Ibrahim Yel, MD (*Abstract Co-Author*)

TEACHING POINTS

Dual-Energy CT (DECT) enables advanced material differentiation by acquiring datasets at two different energy levels, allowing post-processing techniques such as Virtual Non-Calcium (VNCa) imaging and Collagen Mapping to highlight specific tissue changes beyond what conventional CT can offer. VNCa imaging suppresses the calcium signal from vertebral bodies and endplates, improving visualization, which serves as a non-invasive marker of degenerative spinal disease and disc herniation. Collagen mapping, a relatively novel DECT application, enhances the depiction of the intervertebral disc structure, allowing improved evaluation of annular tears, disc degeneration, and facet joint changes by quantifying collagen content and distribution. The application of VNCa and collagen mapping in thoracic and lumbar spine demonstrates promising added value in diagnosing spinal pathologies, contributing to a more nuanced assessment of spine disorders using CT.

TABLE OF CONTENTS/OUTLINE

1. Intervertebral herniation 2. Vertebral degeneration 3. DECT post-processing 4. Virtual noncalcium reconstruction (VNCa) 5. Collagen mapping

MKEE-128 PREGNANCY-RELATED MUSCULOSKELETAL DISORDERS AND TUMORS

Peyman Mirghaderi, MD, MPH (*Presenter*)
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Kevin Oommen, MD (*Abstract Co-Author*)
Hyun Su Kim, MD, PhD (*Abstract Co-Author*)
Arash Azhideh, MD, MPH (*Abstract Co-Author*)
Nastaran Hosseini (*Abstract Co-Author*)
Bahar Mansoori, MD (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)

TEACHING POINTS

• Classify Musculoskeletal (MSK) disorders by pregnancy stage: prenatal, peripartum, postpartum • Recognize pregnancy-specific MSK pathology and exacerbations of preexisting disease • Understand the impact of pregnancy on tumor growth/presentation • Identify a safe/effective imaging approach across trimesters

TABLE OF CONTENTS/OUTLINE

A wide range of MSK disorders in pregnancy are often underdiagnosed due to overlapping symptoms and imaging hesitancy. Pregnancy-related MSK pathology can be generally categorized as pregnancy-induced, pregnancy-exacerbated, childbirth-induced, or neoplastic (benign and malignant). We review multimodality imaging, safety, and clinical pearls using real cases to develop a practical framework for navigating MSK disorders in pregnancy. Table of Contents • Pregnancy Induced o Pelvic Girdle Syndrome o Osteoporosis o Stress Fractures o Hip Subchondral Bone Disease o Disk Herniation o Sciatica o Carpal Tunnel Syndrome o Meralgia Paresthetica • Exacerbated preexisting conditions o Vascular malformation o Deep MSK Fibromatosis o Rheumatoid Arthritis, etc. • Childbirth-related / Postpartum o Lumbosacral Plexopathy o Pubic Symphysis Disorder o Sacrococcygeal Dislocation o Coccygodynia o Septic Arthritis o De Quervain tenosynovitis (Baby Wrist) o Osteitis Condensans

Ilii o Joint pain/remodeling/hypermobility/instability o Ligamentous Laxity o Diastasis Recti o Varicose Veins o Pes Planus • Benign/malignant tumors o Giant Cell Tumor o Hemangioma o Desmoid Tumor o Aggressive Angiomyxoma o Metastases (primarily breast cancer) o Angiosarcoma • Imaging modality use and safety Case-based imaging algorithms

MKEE-129 STRUCTURED REPORTING OF PROXIMAL HUMERUS FRACTURES: A CHECKBOX-BASED TOOL FOR CONSISTENCY AND SURGICAL COMMUNICATION

Ignacio Cavaller, MD (*Presenter*)
Cristina Casado Perez, MD (*Abstract Co-Author*)
Andres Abellan Albert, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the different classification systems used for proximal humerus fractures. To explain the key factors to assess in shoulder CT imaging for accurate diagnosis and treatment planning. To detail Hertel's criteria for predicting avascular necrosis. To optimize the synthesis of these critical data points through a structured tool for systematic evaluation. To demonstrate how checkbox-based templates can be translated into clear, concise, and standardized written radiology reports.

TABLE OF CONTENTS/OUTLINE

Epidemiology and fracture patterns. Neer’s classification and special fracture configurations. Hertel’s criteria for vascular risk stratification. Introduction and walkthrough of the structured reporting form, showing different images to illustrate each item. Nine clinical cases from our institution, illustrated through both the form and the corresponding structured report.

MKEE-130 BEYOND THE BIG TOE: ATYPICAL PRESENTATIONS OF GOUT IN MUSCULOSKELETAL IMAGING

John Cerne, MD, BS (*Presenter*)
Vanessa M. Zayas-Colon, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Tophi generally enhance and have low T2 signal, but look for juxta-articular location and associated bone erosion, to increase specificity. 2. The earliest sign of gout is joint effusion. 3. Dual-energy CT can help to clarify urate crystal presence. 4. Certain characteristics of erosions support a diagnosis of gout. These include: (a) sparing the joint space (until late in the disease) and (b) juxta-articular location 5. Focal nodular synovitis in gout is a manifestation of chronic urate deposition and can mimic synovial tumors.

TABLE OF CONTENTS/OUTLINE

Introduction [a] Brief overview of gout as a common crystalline arthropathy [b] Emphasis on classic presentation vs under-recognized atypical manifestations, on MRI [c] Avoiding misdiagnosis Pathophysiology [a] Urate crystal deposition [b] Mechanisms: i. Tophus formation ii. Erosions iii. Inflammation Atypical Gout [a] Tophi, not at the big toe [b] Enthesopathy [c] Bursitis [d] Erosions, not at the big toe [e] Focal nodular synovitis Clinical Pearls for Radiologists [a] Teaching points for recognizing unusual patterns [b] Importance of correlating imaging with clinical and laboratory data [c] Reporting language to suggest gout when features are ambiguous Case Gallery from our institution (8 examples) Conclusion [a] Recap the importance of recognizing gout beyond its typical presentation [b] Emphasize the radiologist’s role in guiding correct diagnosis and management [c] Suggest follow-up actions: biopsy avoidance, DECT confirmation, and collaboration with rheumatology

MKEE-131 THE EXPANDING ROLE OF VIRTUAL NON-CALCIUM IMAGING IN AN AGING SOCIETY: BEYOND FRACTURE DETECTION

Hirotaka Nakashima, MSc, RT (*Presenter*)

TEACHING POINTS

1. VNCa imaging has been demonstrated to enhance the detection of subtle fractures in osteoporotic bone.2. This technology facilitates the estimation of bone density and the analysis of marrow fat.3. The vendor-neutral implementation of these systems has been shown to facilitate widespread clinical adoption.4. It has been demonstrated that VNCa may contribute to the prevention of fractures and support healthy aging.

TABLE OF CONTENTS/OUTLINE

This exhibit introduces the concept of Virtual Non-Calcium (VNCa) imaging, a derivative of Dual-Energy CT (DECT), emphasizing its multifaceted role in an aging population. A total of 178 cases were analyzed for the purpose of detecting fractures, 228 patients were examined for correlation with bone mineral density, and 563 patients were analyzed for age-related intramedullary fat composition.Case studies will illustrate the efficacy of VNCa in visualizing subtle fractures, estimating bone fragility through marrow density, and detecting fatty marrow conversion associated with aging. These findings are particularly salient in the context of Japan, a nation that has become a paradigm of a super-aged society. VNCa has the potential to serve as a valuable instrument in the early detection of fragility signs and the prevention of fractures in elderly populations. The educational value of the images is maximized through the use of annotated images, correlation charts, and visual comparisons with conventional CT.

MKEE-132 IMAGING-BASED CLASSIFICATION AND CHARACTERIZATION OF SPINAL DYSRAPHISM: INSIGHTS FROM A TERTIARY CARE EXPERIENCE

Gurubharath Ilangovan, MD (*Presenter*)
Anand N. Parimalai, MD (*Abstract Co-Author*)
Amarnath Chellathurai, MD, FRCR (*Abstract Co-Author*)
Murali K. Logudoss, MBBS, MD (*Abstract Co-Author*)
Rahul Thangavel (*Abstract Co-Author*)

TEACHING POINTS

1. Spinal dysraphism requires detailed imaging for accurate diagnosis. 2. MRI is best for soft tissue and neural evaluation; CT excels in bony detail. 3. Open types present early with severe deficits; closed types present later with variable signs. 4. Multimodal imaging and clinical correlation are essential for diagnosis, planning, and prognosis.

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Spinal dysraphism comprises congenital neural tube defects arising between the 2nd-6th gestational weeks, often linked with vertebral segmentation anomalies. MRI is optimal for evaluating neural and soft tissue structures, while CT is valuable for assessing vertebral anatomy. This study assessed imaging's role in detecting and characterizing spinal dysraphism in 24 clinically suspected patients over one year using MRI (1.5T Siemens Magnetom Essenza) and CT (128-slice Siemens Somatom Scope). Closed dysraphism was more prevalent (67%) and more common in females (58%). Open types, mainly myelomeningocele, were often diagnosed prenatally and had severe neurological deficits. Closed types, like diastematomyelia, often presented later with signs such as hypertrichosis and variable symptoms. MRI was superior for neural tissue assessment; CT excelled in identifying vertebral anomalies. A multimodal approach improved diagnostic accuracy, classification, and clinical management.

MKEE-133 STRATEGIES TO EXTEND QUANTITATIVE INFORMATION FROM LOW-DOSE CHEST CT EXAMINATION

Xinyu Li (*Presenter*)

TEACHING POINTS

1. To point out relevant additional quantitative Information from low-dose chest CT that may interest people. 2. To propose a no-dose-increase way to obtain these Information from low-dose chest CT by using quantitative CT (QCT) software 3. To demonstrate the advantages of extending quantitative information from low-dose chest CT

TABLE OF CONTENTS/OUTLINE

1. Additional quantitative Information in low-dose CT • Bone mineral density (BMD) • The fat content of Liver and muscle • The area of total soft tissue, visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) 2. Strategies to obtain these quantitative Information using QCT without dose increase • Perform standard low-dose chest CT commonly covers the first and second lumbar vertebra and a part of upper liver • Calculate BMD of the first and second lumbar vertebra using QCT software • The fat content of liver, area of total soft tissue, VAT and SAT could be measured with QCT software, and the image slice containing main portal vein is recommended • The fat content of muscle could be measured depended on clinical needs 3. The advantages of extending quantitative information using low-dose CT • Extend application value of low-dose chest CT screening, provide comprehensive assessment for patient health in one-stop CT • Additional parameters are quantitative instead of qualitative • No additional scan required

MKEE-134 PERI-PROSTHETIC OSTEOMYELITIS: IMPROVING RECOGNITION OF A CHALLENGING ENTITY ON MRI

Alan Campbell, MBBCHIR (*Presenter*)
Danielle Forster (*Abstract Co-Author*)
Rikin Hargunani, FRCR, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Periprosthetic osteomyelitis (PPO) poses a diagnostic challenge on imaging as traditional approaches of diagnosis are limited in the presence of a prosthetic joint. 2. When present, cloacae and collections are very useful in diagnosis. 3. Metal artefact reduction is vital: In biopsy proven PPO, the surrounding marrow tends to return decreased signal intensity on T1w imaging and increased signal intensity on fluid-sensitive (particularly STIR) imaging and thus optimisation is key to detect subtle changes. 4. Periostitis or surrounding soft tissue oedema are not sufficiently specific in isolation for osteomyelitis in the presence of a prosthetic joint. 5. When present in combination, bone marrow oedema, periostitis and soft tissue oedema, together with raised inflammatory markers, are useful in positively predicting PPO and guiding decisions to proceed to more extensive bone sampling.

TABLE OF CONTENTS/OUTLINE

This educational exhibit will: -Describe PPO - background, epidemiology and clinical presentation -Demonstrate typical, uncommon and challenging appearances primarily on MRI: --Signal characteristics --Biopsy proven cases, supported by examples --Morphologically useful features including cloacae, collections and periostitis --Limitations, including artefact, which can be challenging --Pearls and pitfalls to avoid in improving accurate detection of cases -Discuss correlating data and their utility: --Microbial culture results from aspiration, needle biopsy, open sampling --Inflammatory markers and use in challenging cases The reader will refresh their understanding of MRI features of PPO and build confidence in combining data in deciding when to proceed to sampling and/or surgery.

MKEE-136 OSSEOINTEGRATION: A MULTIMODALITY IMAGING UPDATE FOR THE RADIOLOGIST

Muhayman Sadiq, MBBS (*Presenter*)
Saagar Patel, MD (*Abstract Co-Author*)
Manickam Kumaravel, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

This exhibit aims to: 1. Describe what Osseointegration is and its unique benefits. 2. Outline the movement biomechanics with socket-based prosthetic and Osseointegrated limbs. 3. Discuss different Osseointegration techniques and their benefits. 4. Explain the role of radiographs, CT, MRI, ultrasound, and nuclear medicine scans in evaluating Osseointegrated limbs. 5. Overview of the considerations/measurements used in preoperative planning and postoperative monitoring. 6. Review the normal intraoperative and postoperative findings. 7. Identify the imaging findings of postoperative failure and different postoperative complications. 8. Discuss potential pitfalls when evaluating Osseointegration and how to avoid them.

TABLE OF CONTENTS/OUTLINE

1. Introduction. a. Outline Osseointegration and its benefits. b. Biomechanics of socket-based prosthetics and Osseointegrated limbs. c. Indications and contraindications to Osseointegration and their imaging appearance. 2. Osseointegration. a. Types of Osseointegration and their pros/cons. b. Stages of the procedure, including preoperative planning and measurement. c. Surgical technique with intraoperative illustration and imaging. d. Steps to optimize imaging. 3. Postoperative imaging. a. Normal appearance on radiographs, CT, and MRI. b. Postoperative complications and their imaging appearance. c. Early signs of hardware failure. d. Potential pitfalls and techniques to avoid them. 4. Conclusions. a. Suggest a report template with key information to include. b. Key takeaways. 5. References.

MKEE-137 RADIOLOGIC ASSESSMENT OF KNEE ARTHROPLASTY: A STRUCTURED REPORTING APPROACH FROM PREOPERATIVE PLANNING TO POSTOPERATIVE SURVEILLANCE

Javier Azpeitia Arman, MD (*Presenter*)
Rosa M. Lorente-Ramos, MD, PhD (*Abstract Co-Author*)
Paz Azpeitia Hernandez (*Abstract Co-Author*)
Javier Azpeitia-Hernandez, MD (*Abstract Co-Author*)
Teresa Lago Munoz, MD (*Abstract Co-Author*)
Antonio-David Murillo Vizuete (*Abstract Co-Author*)
Maria Juan Porter, MD (*Abstract Co-Author*)

TEACHING POINTS

-To review the different types of knee prostheses. -To analyse normal and abnormal postoperative imaging findings and signs of complications -To review the role of imaging techniques (plain radiograph, CT, MR, US, scintigraphy) in pre- and postoperative evaluation of the knee. -To illustrate image analysis and interpretation of knee replacement studies, emphasizing useful parameters that should be described in radiological reports.

TABLE OF CONTENTS/OUTLINE

We review the image of knee replacement, highlighting variables that should be included in radiological reports, and correlating images with clinical considerations and functional outcomes. We present: 1. A review of types of replacement. 2. Surgery. Aims. 3. Imaging. Plain radiographs, CT, US, and scintigraphy. 4. Image analysis and interpretation. - Parameters that should be evaluated: alignment of femoral and tibial components, position (flexion/extension), rotation, patellar assessment, joint line height. -Imaging complications: Aseptic loosening, infections, instability, disassembly, dislocation, subluxation, periprosthetic fractures, mechanical failure of prosthetic components, and ectopic bone formation 5. Proposed report for knee replacements in the pre- and postoperative settings.

MKEE-138 OSTEOID OSTEOMA: THE NIGHT OWL OF BONE TUMOURS

Hasaam Uldin, BSC,MBChB (*Presenter*)
Ali Shah, FRCR, MBBS (*Abstract Co-Author*)
Shashank Chapala, MD,MBBS (*Abstract Co-Author*)
Devpriyo Pal, MD,FRCR,MBBS (*Abstract Co-Author*)
Sameer B. Raniga, MD, FRCR (*Abstract Co-Author*)
Rajesh Botchu, MBBS (*Abstract Co-Author*)

TEACHING POINTS

• To describe essential imaging features of untreated osteoid osteomas (OO) • To raise awareness of the atypical features of OO • To enable differentiation between OO and imaging mimics • To discuss treatment approaches and follow-up of OO

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CONTENTS : • Meet the Menace: Introduction to OO • Know Your Tools: Multimodality Imaging of OO • When It's Not Textbook: Atypical Presentations • Masquerades and Mimics: What Else Could It Be? • Pictorial Parade: Typical and Atypical Cases • Treated but Hurting? Post-Treatment Imaging • Pearls and Pitfalls: Read Between the Lesions • Final Diagnosis: Take-Home Messages OUTLINE : Osteoid osteoma is common, representing approximately 10% of benign bone neoplasms and encountered by virtually all radiologists over a career. Radiographs and CT classically show dense, fusiform, sclerotic bone around a lone central nidus. MRI typically shows accompanying marked edema. However, atypical features can muddle the diagnosis. Multicentric (two nidi in a single lesion), multifocal (two or more nidi in the same bone), synchronous (multiple lesions in different bones at one time), and metachronous (lesions separated in time) OO can occur. Rare etiologies such as iatrogenesis also cause diagnostic uncertainty. Diagnostic mimics include other tumors, infection, and trauma. Similarly, an OO alongside pre-existing pathology needs a sound understanding of both conditions for confident diagnosis. We discuss clinical and imaging features of typical and atypical lesions through unique cases. Methods to differentiate atypical OO from salient mimics are covered. Difficulties in managing these lesions and strategies for optimal treatment and followup are also reviewed.

MKEE-139 GOING VIRAL: THE MUSCULOSKELETAL MANIFESTATIONS YOU SHOULD'T MISS

Aline Serfaty Sr, MD, PhD (*Presenter*)
Dyan V. Flores, MD (*Abstract Co-Author*)
Tatiane C. Rodrigues, MD (*Abstract Co-Author*)

TEACHING POINTS

Viral infections can leave behind distinctive, yet often overlooked, musculoskeletal (MSK) manifestations. These include inflammatory arthropathies, myositis, neuritis, and bone marrow involvement, which may mimic autoimmune, neoplastic, or bacterial diseases. Imaging—particularly MRI—plays a critical role in detecting these viral footprints, aiding in early diagnosis, appropriate management, and the avoidance of unnecessary interventions.

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• Overview and Clinical Spectrum Define the scope of MSK involvement in viral infections. Highlight the potential for underdiagnosis due to overlap with autoimmune and septic conditions. Include epidemiologic insights on common viral agents such as Parvovirus B19, Chikungunya, Dengue, HIV, Herpes Zoster, and SARS-CoV-2. • Mechanisms of Injury Describe the main pathways of MSK involvement, including direct viral invasion, immune-mediated injury, and post-viral inflammatory responses. Imaging Modalities Discuss the roles of radimaging in evaluating viral MSK disease, with emphasis on MRI. • Case-Based Imaging Patterns Case-based imaging patterns of viral musculoskeletal involvement. • Red Flags and Mimics Discuss diagnostic pitfalls and key features that help differentiate viral etiologies from autoimmune and bacterial conditions. Include imaging clues favoring viral origin. • Conclusion and Clinical Impact Reinforce the value of imaging in the diagnostic workup of suspected viral MSK disease, particularly in the setting of an outbreak or in high-risk individuals. Highlight the importance of pattern recognition and clinical correlation for timely and accurate diagnosis.

MKEE-140 LIPOSARCOMA UPDATE—RADIOLOGIC-PATHOLOGIC CORRELATION BASED ON THE WHO 2020 CLASSIFICATION (5TH EDITION) SUBTYPES, PRACTICAL DIAGNOSTIC APPROACH, AND DIFFERENTIAL CONSIDERATIONS—

Koichiro Mori, MD (*Presenter*)
Ryo Kurokawa, MD, PhD (*Abstract Co-Author*)
Mariko Kurokawa, PhD, MD (*Abstract Co-Author*)
Shu Suzuki, MD (*Abstract Co-Author*)
Yasunobu Takaki (*Abstract Co-Author*)

TEACHING POINTS

Comprehend the diverse clinical and imaging features of liposarcoma subtypes according to WHO 2020 Classification (5th edition) Recognize both typical and atypical imaging features of liposarcomas, and understand the characteristic findings that help differentiate them from benign lipomatous tumors that may mimic liposarcoma Recognize the role of molecular markers such as MDM2 and CDK4 in radiological interpretation and diagnosis Provide site-specific differential diagnostic approaches for various anatomical locations Present a diagnostic flowchart for MRI evaluation of fat-containing soft tissue masses useful for everyday clinical practice

TABLE OF CONTENTS/OUTLINE

Introduction Epidemiology and clinical significance of liposarcoma Overview of WHO 2020 Classification (5th edition) updates Radiological-Pathological Correlation by Subtype Atypical lipomatous tumor/Well-differentiated liposarcoma Dedifferentiated liposarcoma Myxoid liposarcoma Pleomorphic liposarcoma Myxoid pleomorphic liposarcoma (new entity) Role of Molecular Markers in Radiological Diagnosis Integration of molecular information into imaging interpretation Site-Specific Features and Differential Diagnosis Extremity liposarcomas Retroperitoneal liposarcomas Other anatomical locations Post-Treatment Imaging Local recurrence patterns Dedifferentiation: imaging characteristics Metastatic disease assessment Practical Approach: MRI Diagnostic Flowchart Systematic evaluation of fat-containing soft tissue masses Decision points and diagnostic criteria Imaging pearls and pitfalls Conclusion

MKEE-141 TOTAL TALUS REPLACEMENTS: AN EDUCATIONAL OVERVIEW

Muhayman Sadiq, MBBS (*Presenter*)
Tiffany A. Kumala (*Abstract Co-Author*)
Saagar Patel, MD (*Abstract Co-Author*)
Manickam Kumaravel, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

This exhibit aims to: 1. Outline what a total talus replacement is and it's indications. 2. Understand the anatomy and biomechanics of the talus and associated ligaments. 3. Overview the role of radiographs, CT, MRI, and ultrasound in evaluating total talus replacements. 4. Identify key imaging findings in pathologies necessitating total talus replacement. 5. Learn about various types of replacements and prosthetics used in clinical practice. 6. Understand the pre-operative planning and measurements for total talus replacement (including AI-generated automated measurements). 7. Discuss intraoperative and postoperative imaging findings in non-complicated cases. 8. Recognize common postoperative complications and their imaging findings.

TABLE OF CONTENTS/OUTLINE

1. Introduction. a. Talus and hindfoot anatomy and biomechanics. b. Indications for total talar replacement (pathologies of the talus) and their imaging appearance. 2. Total Talus Replacement procedure. a. Types of prostheses. b. Preoperative planning and measurements. c. Surgical techniques with intraoperative illustrations and imaging. d. Associated benefits and risks. 3. Post-operative imaging. a. Radiographs: views, technique, standard image acquisition, and parameters that should be evaluated. b. CT: technique, parameters which should be evaluated. c. Imaging appearance of normal post-operative findings and associated complications (with illustrations). 4. Conclusions. a. Suggest a report template highlighting key information for an orthopedic surgeon. b. Key takeaways 5. References.

MKEE-142 ULTRASOUND-GUIDED SPINAL AND SACROILIAC MUSCULOSKELETAL PROCEDURES: KEY CONCEPTS AND PRACTICAL GUIDE FOR RADIOLOGISTS

Matilde Goncalves, MD (*Presenter*)
Roberts Naglis (*Abstract Co-Author*)
Sebastiano Inturri (*Abstract Co-Author*)
Domenico Romeo (*Abstract Co-Author*)

Miguel O. Castro, MD (*Abstract Co-Author*)
Maria Pilar Aparisi Gomez, FRANZCR,MBChB (*Abstract Co-Author*)
Alberto Bazzocchi, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the sonographic anatomy of the spine and sacroiliac (SI) joints. To review the technical aspects and applications of various spine and SI joint ultrasound-guided procedures.

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Neck and lowback pain represent illnesses with a substantial burden. Facet joints and SI joint pathology contribute significantly to back pain. Spinal and SI injections are effective for both diagnostic and therapeutic purposes, aiding in surgical planning and as a supplement to conservative management. Ultrasound-guided interventions are increasingly utilized due to their lack of ionizing radiation, portability, reliability, and cost-effectiveness compared to fluoroscopy and computed tomography. The success rates for ultrasound-guided spinal and SI joint injections have been reported to be comparable to fluoroscopic guidance, with significant reduction in pain. However, degenerative spine changes and anatomical conditions can pose challenges to spine ultrasound-guided procedures. This educational exhibit will review the indications and illustrate step-by-step the technique for cervical and lumbar facet injections, spinal nerve blocks and SI joint injections.

MKEE-143 PERSONALIZED VERTEBRAL FRACTURE RISK PREDICTION: A TEACHING EXHIBIT ON THE APPLICATION OF GENDER- AND AGE-SPECIFIC BMD ANALYSIS USING QUANTITATIVE CT

Wei Duan (*Presenter*)

TEACHING POINTS

1.To explain the interaction effects between gender, age, and bone mineral density (BMD) on vertebral fragility fracture risk. 2.To illustrate the development and clinical utility of an individualized fracture risk prediction model using quantitative CT (QCT) measurements. 3.To demonstrate how ROC analysis, calibration, and nomogram visualization can enhance personalized risk stratification and early preventive intervention.

TABLE OF CONTENTS/OUTLINE

1) Introduction to Vertebral Fragility Fractures (a) Epidemiology and clinical significance (b) Importance of early individualized risk prediction 2) Methodology Overview (a) Role of Quantitative CT (QCT) in assessing volumetric BMD. (b) Constructing predictive models using logistic regression with interaction terms (BMD × Gender, BMD × Age Group). (c) Development of a scoring system and nomogram for clinical application. 3) Model Performance and Visualization Techniques (a) ROC curve analysis demonstrating excellent discrimination (AUC = 0.921). (b) Calibration curve analysis indicating good predictive consistency. (c) Decision curve analysis (DCA) evaluating clinical net benefit. 4) Risk Stratification and Clinical Translation (a) Stratifying patients into low, intermediate, and high fracture risk groups based on prediction scores (b) Application of a nomogram for individualized clinical decision-making. 5) Clinical Implications and Future Directions (a) Improving early identification of high-risk populations for vertebral fractures. (b) Integrating BMD, gender, and age factors into personalized osteoporosis management strategies. (c) Potential for multi-center validation and AI integration to enhance predictive performance.

MKEE-144 ULTRASONOGRAPHIC FINDINGS IN MYCOBACTERIAL INFECTIONS AFTER AESTHETIC PROCEDURES: IMPORTANCE OF EARLY RECOGNITION

Cibelle Melo, MD (*Presenter*)
Luara Boson, MD (*Abstract Co-Author*)
Estevao Vargas (*Abstract Co-Author*)
Evelyn Rubin (*Abstract Co-Author*)

TEACHING POINTS

The rising incidence of non-tuberculous mycobacterial, particularly rapidly growing mycobacteria, infections following aesthetic and other invasive procedures represents a growing public health concern. In Brazil alone, nearly 3,000 cases were reported between 1998 and 2022, with a notable predominance in women undergoing cosmetic interventions. Due to their indolent clinical course, these infections are frequently underdiagnosed or misdiagnosed, often after unsuccessful empirical antibiotic treatments. This diagnostic delay can compromise therapeutic efficacy, extend treatment duration, and result in poor aesthetic outcomes. This educational exhibit, based on illustrative clinical cases, emphasizes the role of high-frequency ultrasound in the early recognition of cutaneous mycobacterial infections. It highlights the typical clinical and sonographic features of these infections and the critical role of ultrasound-guided sampling for microbiological confirmation.

TABLE OF CONTENTS/OUTLINE

1. Overview of cutaneous mycobacterial infections following aesthetic procedures. 2. Clinical manifestations and diagnostic challenges. 3. Ultrasonographic findings: a. Small abscesses with dense internal content b. Hypoechoic, irregular, and heterogeneous soft-tissue areas c. Increased perilesional vascularity on Doppler d. Fistulous tracts 4. Role of ultrasound in guiding sample collection for microbiological culture. 5. Conclusion and take-home messages.

MKEE-145 DEEP LEARNING-BASED EARLY DETECTION OF LUMBAR SPONDYLOLYSIS IN X-RAY IMAGES WITH SELF-SUPERVISED PRETRAINING

Sho Maruyama, PhD (*Presenter*)
Haruyuki Watanabe, PhD (*Abstract Co-Author*)

TEACHING POINTS

This presentation explores the applicability of deep learning-based diagnostic support systems in the orthopedic field for young athletes and underscores the importance of future research based on the following educational points. Lumbar spondylolysis is a common cause of low back pain in young athletes, and early diagnosis is essential to prevent long-term disability. X-ray imaging is recommended for initial assessment, but it has limited sensitivity for early-stage cases. A detection system for lumbar spondylolysis focusing on X-ray images demonstrates promising classification performance for early detection. Deep learning models with self-supervised pretraining improve model generalizability in limited-data scenarios. Visualization of classification rationale using Grad-CAM not only helps interpret model behavior but also suggests the potential utility of attention to non-defect regions for risk assessment.

TABLE OF CONTENTS/OUTLINE

1 Introduction - Overview of lumbar spondylolysis - Limitations of current imaging diagnosis - Motivation for computer-aided diagnosis for X-ray image. 2 Materials and Methods - Self-supervised pretraining strategy - Overview of deep learning model architecture - Application of ResNet as a comparison benchmark - Dataset description - Evaluation metrics. 3 Results - Assessment of model performances across imaging direction (AP vs. lateral) - Grad-CAM analysis. 4 Discussion - Impact of X-ray imaging direction - Effectiveness of self-supervised pretraining - Applicability to risk assessment beyond lesion localization - Potential and limitations for screening young athletes - Future directions. 5 Summary of key findings

MKEE-146 NOOKS & CRANNIES: A SONOGRAPHIC GUIDE TO JOINT RECESSES AND THEIR SYNOVIAL COMMUNICATIONS

Lisa Billone, BSc (*Presenter*)
Andrew J. Grainger, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Ultrasound is a first-line tool for detecting joint effusions and intra-articular pathology, but lesser-known recesses and synovial communications may be overlooked, leading to missed or misinterpreted findings. 2. The sonoanatomy of normal joint recesses and their physiologic communications with bursae and tendon sheaths will be demonstrated, supported by MRI correlation. 3. Case-based examples, featuring images and cine clips, will demonstrate how joint recess anatomy and synovial

connections impact the detection of pathology on ultrasound. 4. Optimal patient positioning and dynamic scanning techniques will be reviewed to improve sensitivity and avoid common diagnostic pitfalls. 5. Clinically relevant recesses for US-guided injection and aspiration will be highlighted.

TABLE OF CONTENTS/OUTLINE

A. Introduction B. Anatomy, sonographic technique and case examples of the: a) Shoulder girdle: glenohumeral joint recesses; biceps tendon sheath; subacromial-subdeltoid bursa; acromioclavicular & sternoclavicular joint recesses b) Elbow: coronoid, olecranon & annular recesses; bicipitoradial bursa c) Wrist: distal radioulnar, radiocarpal & midcarpal joint recesses d) Hand: carpometacarpal & interphalangeal joint recesses e) Hip: femoroacetabular joint recesses; iliopsoas & obturator externus bursae f) Knee: anterior, parameniscal & posterior joint recesses; semimembranosus-medial gastrocnemius bursa; popliteus tendon sheath; proximal tibiofibular joint recess g) Ankle: tibiotalar & subtalar joint recesses; flexor hallucis longus tendon sheath h) Foot: midtarsal, tarsometatarsal, metatarsophalangeal & interphalangeal joint recesses C. Take Home Points

MKEE-147 HOLY COW! THAT CALF HURTS - LET'S SCAN IT

Madeline Stever, MD (*Presenter*)
Daniel Kowal, MD (*Abstract Co-Author*)

TEACHING POINTS

• Ultrasound plays a pivotal role in the evaluation of calf pain from musculoskeletal etiologies. • Standardized ultrasound scanning protocols are essential for ensuring a comprehensive and systematic musculoskeletal evaluation. Standardization enhances diagnostic accuracy, facilitates reproducibility, and minimizes the risk of overlooking subtle but clinically significant findings. • Ultrasound allows for dynamic evaluation of muscles, tendons, and peritendinous structures. This dynamic imaging is unique to ultrasound and may be used to aid in the diagnostic evaluation for calf pain. • The portability, cost-effectiveness, and accessibility of ultrasound makes it especially valuable in sports medicine, emergency, and outpatient clinical settings.

TABLE OF CONTENTS/OUTLINE

• Introduction • Learning objectives • Scanning techniques and relevant ultrasound anatomy evaluating calf pain • Imaging cases & causes of pain - Mechanism of injury, imaging findings, differential diagnoses/imaging pitfalls o Muscle & tendons: gastrocnemius tear, Achilles tendon injury (acute vs. chronic tendinosis, partial vs. full thickness tear), Achilles paratenonitis, plantaris tendon injury (normal vs. abnormal) o Soft tissues: shin muscle hernia, bursitis o Masses: lipomas, hematomas, shin sarcomas, lower calf/ankle nerve sheath tumors o Vascular: soleal vein thrombosis • Summary • References

MKEE-148 SOUND APPROACH TO ACHING TENDONS: A GUIDE TO US-GUIDED TREATMENTS OF TENDON DISEASE

Sultan M. Alamro, MBBS (*Presenter*)
Dyan V. Flores, MD (*Abstract Co-Author*)

TEACHING POINTS

Tendinopathy is a broad term used to describe a wide spectrum of pathologies in and around tendons. Tenosynovitis refers to inflammation of the synovial membrane surrounding a tendon. It may be seen with or without tendinosis/tendinitis. Tendinosis refers to disorganized collagen architecture due to a primarily degenerative, noninflammatory process, and can occur after aging or overuse. Conversely, tendinitis is inflammation of the tendon after acute overload from excessive or sudden tensile force. Several US-guided percutaneous tendon treatments are now available and continue to develop rapidly. The objectives for treating each tendon disease may vary. For example, the goal for tendinosis is to stimulate collagen repair, in contrast to the goal for tendinitis, which is to reduce inflammation. Some treatments to reduce inflammation in tendinitis and tenosynovitis, such as corticosteroid therapy, are counterintuitive in tendinosis. In this educational exhibit, we will emphasize US techniques, controversies and current evidence in the three most common treatments: peritendinous injection, calcific tendinopathy barbotage and tenotomy.

TABLE OF CONTENTS/OUTLINE

1. Peritendinous injection • Technique • Common tendons: De Quervain's, long head of the biceps • Burning questions: - Indications - Interval and number of session 2. Barbotage • Technique • Common tendons: rotator cuff, gluteus • Burning questions: - Does the size of the calcification change treatment effectivity? 3. Tenotomy/Fenestration • Mechanical - Dry needling only • Chemical - PRP, stem cell, hyaluronate • Common tendons: common extensor, common flexor • Burning questions: - Effectivity of various substances in chemical fenestration

MKEE-149 KEEP YOUR HANDS WHERE WE CAN SCAN THEM: USING ULTRASOUND TO EVALUATE MASSES AND PSEUDOMASSES OF THE WRIST AND HAND

Madeline Stever, MD (*Presenter*)
Daniel Kowal, MD (*Abstract Co-Author*)

TEACHING POINTS

• Ultrasound effectively characterizes common wrist and hand masses allowing for differentiation between solid and cystic lesions, vascular vs. avascular structures, and inflammatory vs. neoplastic processes. • Color Doppler and microvascular flow imaging adds valuable information by evaluating the vascularity of a lesion, which can aid in differentiating between benign and potentially malignant or inflammatory masses. • Dynamic ultrasound assessment provides a unique advantage, allowing evaluation of mass mobility, compressibility, and interaction with surrounding tendons, joints, and neurovascular structures. • The accessibility, cost-effectiveness, and portability of ultrasound make it especially useful in outpatient clinics, hand surgery practices, sports medicine, and emergency settings, where quick and accurate assessment is essential.

TABLE OF CONTENTS/OUTLINE

• Introduction • Learning objectives • Imaging cases & causes of pain - Pathophysiology, imaging findings, differentials/imaging pitfalls o Masses: ganglion cyst, giant cell tumor, fibromatosis, epidermal inclusion cyst, intramuscular myxoma, lipomas o Pseudomasses: tenosynovitis (inflammatory vs. infectious), intersection syndrome, de Quervains tenosynovitis, accessory muscles, vascular malformations • Summary • References

MKEE-150 MUSCULOSKELETAL REPORTING AND DATA SYSTEM (MSK-RADS): EXPANDING APPLICATIONS, SCOPE, AND CLASSIFICATION FRAMEWORKS

Hyeyun Lee, MD (*Presenter*)
Chankue Park, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Review the different musculoskeletal reporting and data system (RADS) • Illustrate the imaging finding of bone tumor, soft tissue tumor, infection and neuropathy with exemplary application of RADS • Identify the different scope and intended use of RADS

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Reporting and data systems (RADS) standardize radiologic terminology, reduce interpretive variability, and enhance clinical management and interdisciplinary communication. In musculoskeletal imaging, however, each RADS differs in modality, target population, evidence base, and required expertise. It is important for radiologists to know the characteristics to appropriately use RADS according to different scenarios. In this exhibit, we will review 8 different RADS; five RADS for bone tumor assessment(• American College of Radiology Bone-RADS • Radiological Evaluation Score for Bone Tumor • CT and MR Bone-RADS by Society of Skeletal Radiology • Osseous Tumor-RADS • Solitary bone tumor imaging-RADS Bone tumor), Soft tissue tumor(ST)-RADS, musculoskeletal infection(MSKI)-RADS, and neuropathy score(NS)-RADS with examplery cases and applications.1.1. RADS related to bone tumor assessment: • Lipoma • Enchondroma • Giant cell tumor • Osteosarcoma • Metastasis, 1.2 ST-RADS: •Fibroma •Peripheral nerve sheath tumor •Myxoma •Sarcoma, 1.3MSKI-RADS •Abscess •Necrotizing fasciitis •Possible osteomyelitis

•Osteomyelitis •Septic arthritis, 1.4 NS-RADS •Injury •Neoplasm •Entrapment •Diffuse neuropathy •Post-intervention 2. Characteristics •Structure •Modality • Intended use •Target population •Use of clinical information •Number of lesions Finally, we will explore the strengths and weaknesses to identify optimal use.

MKEE-151 DIFFERENTIALS FOR STERNOCLAVICULAR JOINT SWELLING

Sakib Kazi, MD (*Presenter*)
Dyan V. Flores, MD (*Abstract Co-Author*)

TEACHING POINTS

The sternoclavicular (SC) joint, the osseous articulation between the axial and appendicular skeleton, is an essential component of the shoulder girdle. It allows limited motion but plays a vital role in shoulder movement including clavicular elevation and depression; protraction and retraction; and rotation. Given the potential for significant morbidity and functional impairment associated with various SC joint disorders, accurate radiologic assessment using a systematic approach is necessary for appropriate diagnosis and management. A vast majority of SC joint disorders present with swelling and are most commonly due to traumatic, typical atraumatic, and atypical atraumatic causes. This exhibit aims to enhance radiologist awareness of the diverse pathologies that affect the SC joint. The objectives of this educational exhibit are: • To review the normal anatomy and variants of the SC joint • To discuss pearls and pitfalls in the various imaging modalities for evaluating the SC joint • To discuss the role of various imaging techniques (radiography, CT, MRI, ultrasound) in the evaluation of SC joint pathology • To outline the differentials for swelling of the SC joint based on three common etiologies: traumatic, atraumatic - typical, and atraumatic - atypical

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ANATOMY AND VARIANTS 1. Osseous components 2. Ligaments and musculature IMAGING 1. Radiography • Serendipity view • Hobbs view 2. CT 3. MRI 4. Ultrasound DIFFERENTIALS FOR SWELLING 1. Traumatic 2. Atraumatic - Typical • Degenerative • Inflammatory • Infectious 3. Atraumatic - Atypical • SAPHO • Friedrich's • Tietze's syndrome • Condensing osteitis • Neoplasms

MKEE-152 IMAGING INTERPRETATION OF MORPHEA: PEARLS AND PITFALLS

Parham Pezeshk, MD (*Presenter*)
Majid Chalian, MD (*Abstract Co-Author*)
Oganes Ashikyan, MD (*Abstract Co-Author*)
Alireza Eajazi, MD (*Abstract Co-Author*)

TEACHING POINTS

- Determining the activity and extent of soft tissue involvement in localized scleroderma (morphea) can be clinically challenging. - Deep soft tissue involvement in morphea may lead to irreversible sequelae, including functional and cosmetic impairment. Therefore, an accurate assessment of the extent of soft tissue involvement is crucial. - MRI has shown promise in providing detailed information for clinicians; however, optimal interpretation remains a challenge due to a lack of standardized key elements to report.

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- Briefly review the pathophysiology of morphea. - Discuss the clinical grading system used by dermatologists, the Localized Scleroderma Assessment Tool (LoSCAT), for evaluating morphea. - Review an optimized MRI protocol for imaging morphea. - Establish a structured MRI reporting approach incorporating key elements from LoSCAT, including skin thickness, involvement of the fascia, subcutaneous fat, muscle, and joints, as well as perfusion and enhancement. - Present case studies with key MRI findings and interpretations.

MKEE-153 WRIST MRI UNLOCKED: A SYSTEMATIC APPROACH TO ULNAR, RADIAL, AND DORSAL PAIN SYNDROMES

Akhileshwar R. Ginnaram, MBBS (*Presenter*)
Suryansh Bajaj, MD (*Abstract Co-Author*)

TEACHING POINTS

MRI is the gold standard for evaluating complex wrist pain due to its ability to visualize soft tissues, ligaments, cartilage, and bone marrow. A clinically relevant, region-based classification of wrist pain—ulnar, radial, dorsal (interosseous ligament), and miscellaneous—enhances diagnostic precision and management. Ulnar-sided wrist pain is the most frequent and diagnostically challenging subtype, with high-resolution MRI essential for evaluating TFCC injuries, ECU tendon disorders, ulnocarpal impaction, and other mimics. Understanding the imaging-pathologic correlation of wrist biomechanics and injury patterns is key to recognizing subtle but clinically significant lesions.

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Introduction Clinical importance of MRI in wrist pain evaluation Biomechanical context for pathology Wrist Pain Classification Framework Anatomical approach: Ulnar, Radial, Dorsal, Miscellaneous Ulnar-Sided Wrist Pain TFCC Anatomy and Palmer Classification MRI patterns of traumatic vs. degenerative lesions Ulnotriquetral ligament pathology Ulnar impaction syndromes (ulnolunate, styloid, hamato-lunate) ECU tendon disorders Ulnar-sided fractures (hook of hamate, triquetral) Pisotriquetral osteoarthritis Radial-Sided Wrist Pain Scaphoid and trapezial fractures Triscaphe arthritis De Quervain's and distal intersection syndrome EPL and FCR tendon tears Dorsal Wrist Pain Interosseous ligament injuries (scapholunate, lunotriquetral) MRI features of instability and SLAC progression Miscellaneous Conditions Radioulnar abutment syndrome Madelung deformity Conclusion Emphasis on structured MRI interpretation aligned with clinical findings

MKEE-154 IMAGING EVALUATION OF MENISCAL TRANSPLANTATION FROM INDICATION TO INTEGRATION

Shrey Derasari (*Presenter*)
Muhayman Sadiq, MBBS (*Abstract Co-Author*)
Saagar Patel, MD (*Abstract Co-Author*)
Manickam Kumaravel, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

This exhibit aims to: 1. Evaluate the role of the menisci through anatomical position, vascular supply, and biomechanical load distribution. 2. Discuss indications for transplantation, including symptomatic meniscal deficiency, post-meniscectomy syndrome, and concomitant ligamentous/chondral pathology. 3. Review clinical and imaging preoperative evaluation criteria and necessary measurements to assess cartilage, axis alignment, and meniscal extrusion. 4. Overview of various surgical fixation methods and postoperative MRI appearances. 5. Discuss patient-reported functional outcome measures and longitudinal MRI monitoring. 6. Identify imaging findings of early & late-stage postoperative complications of transplantation.

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1. Introduction. a. Overview of meniscal anatomy and vascular supply. b. Biomechanics of menisci and related load distribution schematics. 2. Meniscal Transplantation. a. Indications of meniscal transplantation. b. Initial injury, post-meniscectomy, and concurrent knee pathology imaging. c. Preoperative assessment and key imaging measurements for surgical planning. d. Surgical techniques illustrations and postoperative imaging 3. Postoperative Evaluation. a. Normal MRI postoperative appearance. b. Functional outcome monitoring with imaging and clinical tools. c. Postoperative complications imaging, including graft extrusion and failure, with subsequent cartilage and joint degeneration. 4. Conclusions a. Key takeaways b. Key imaging pitfalls and how to avoid them. 5. References.

MKEE-155 WHEN FAT SPEAKS: INTERPRETING FAT WITHIN BONE LESIONS

Ali Shah, FRCR, MBBS (*Presenter*)
Sonal Saran, MBBS (*Abstract Co-Author*)

Sai Niharika Gavvala, MD, MBBS (*Abstract Co-Author*)
Devpriyo Pal, MD,FRCR,MBBS (*Abstract Co-Author*)
Sameer B. Raniga, MD, FRCR (*Abstract Co-Author*)
Rajesh Botchu, MBBS (*Abstract Co-Author*)

TEACHING POINTS

To learn how to recognize classic and atypical fat-containing bone lesions. To learn how to differentiate benign from malignant marrow lesions using macroscopic and microscopic fat. To learn the principles and diagnostic value of Chemical Shift Imaging (CSI) in bone lesion evaluation. To learn practical imaging tips for lesion characterization in oncologic and non-oncologic patients. To learn when fat is a reassuring finding and when it warrants further work-up.

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TABLE OF CONTENTS Fat Fables : Classic lesions with macroscopic fat - lipomas, haemangiomas, infarcts Imaging Tools : Detecting fat on radiographs, CT, MRI Shift Focus - CSI : Physics, technique and interpretation utilising 20% signal drop out rule Curveballs Ahead : Atypical cases and how to avoid VOMIT 1 Rare Cases : Unusual fat-rich tumours and fat-mimicking lesions, and collision lesions Clinical Pearls : Tips to distinguish benign from malignant; guidance for radiologists reporting in high-risk populations OUTLINE Bone lesions can pose diagnostic challenges and uncertainty, especially in patients at risk for metastases or marrow-based malignancies. Recognising fat within bone lesions can help differentiate benign from malignant marrow lesions using macroscopic and microscopic fat. We demonstrate typical and atypical fat-containing bone lesions, describing imaging pearls using radiographs, CT, MRI, and chemical shift imaging (CSI), emphasizing when fat indicates benignity and when further work-up is warranted. Imaging pitfalls with aggressive haemangiomas and collision lesions are also reviewed. 1. Victim of modern imaging techniques

MKEE-156 ULNAR WRIST PAIN - THE DARK SIDE OF THE WRIST

Andreas Kunz, MD (*Presenter*)
Jan P. Grunz, MD (*Abstract Co-Author*)

TEACHING POINTS

Ulnar wrist pain describes a complex clinical situation with a variety of underlying causes, the differential diagnosis of which requires a detailed understanding of anatomy, biomechanics and pathophysiology. While radiological assessment plays a decisive role in ulnar wrist pain, close cooperation with hand surgeons is key for optimal patient care. Cross-sectional imaging techniques with high spatial resolution can be supplemented by dynamic procedures such as ultrasound and fluoroscopy. Injuries to the ulnocarpal complex (TFCC) represent the most common cause of instability in the distal radioulnar joint. Multicompartmental injection of contrast medium followed by CT or MR arthrography is the imaging reference standard for TFCC lesions.

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1. Anatomy of the ulnar wrist a) Biomechanical propertiesb. Vascularization 2. Imaging a) MRI with and without intravenous contrast enhancement b) CT and MR arthrography c) Dynamic imaging with fluoroscopy and ultrasound 3. Pathologies a) TFCC injuries b) Distal radioulnar joint instability c) Extensor carpi ulnaris tendon pathologies d) Impaction syndromes e) Radioulnar impingement f) Lunotriquetral instability g) Pisotriquetral pathologies h) TILT syndrome 4. Therapy a) Surgery versus conservative treatment b) Overview of surgical procedures 5. Discussion

MKEE-157 PERCUTANEOUS TREATMENT OF ANEURYSMAL BONE CYSTS: INTRALESIONAL CALCITONINE AND CORTICOID INJECTION

Laura Tello Arnas (*Presenter*)
Mar Tapia Vine (*Abstract Co-Author*)
Jorge Guisandez (*Abstract Co-Author*)
Remedios De Frutos (*Abstract Co-Author*)
Jorge Rey Porras (*Abstract Co-Author*)
Pablo Lama (*Abstract Co-Author*)
Angel Romero Guzman (*Abstract Co-Author*)

TEACHING POINTS

The main objectives are to describe the percutaneous treatment of aneurysmal bone cysts using radiological guidance, focusing on intralesional injection of calcitonin and corticosteroids in selected cases, and to show imaging findings during follow-up.

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Aneurysmal Bone Cysts (ABC) are non-malignant bone lesions composed of blood-filled channels, primarily affecting children and adolescents. While traditional treatments include surgery and curettage, these can be incomplete and lead to recurrence. Promising alternatives, particularly in high-risk patients or difficult locations, are percutaneous treatments, alone or in combination, with a primary focus on intralesional injection of calcitonin and corticosteroid. This minimally invasive technique is performed under general anesthesia, using CT guidance to locate the cyst. The patient is positioned to facilitate easy access, and a coaxial needle is inserted. The procedure involves breaking the thin internal partitions, aspirating contents, and injecting methylprednisolone and calcitonin. Methylprednisolone has anti-inflammatory effects; calcitonin promotes new bone formation. In our hospital, this procedure has been performed in five patients, two with prior embolization—one received three injections, the others two. Iodinated contrast may be used to ensure no vascular communication. This method reduces lesion volume and induces ossification with no significant complications. Follow-up CT is recommended at three months; repeat procedures may be needed at six months. Overall, it is a safe, effective alternative to surgery.

MKEE-158 COMPREHENSIVE ASSESSMENT OF BONE METASTASES USING DUAL-ENERGY CT: FROM DETECTION TO TREATMENT RESPONSE

Hirotaka Nakashima, MSc, RT (*Presenter*)

TEACHING POINTS

1. Dual-energy computed tomography (DECT) improves the detection, characterization, and assessment of treatment efficacy of bone metastases.2. Virtual Non-Calcium (VNCa) imaging improves sensitivity for detecting early bone marrow invasion by highlighting fat loss and tumor replacement.3. Iodine maps in bone allow evaluation of tumor perfusion and vascular changes before and after treatment.4. DECT is a non-invasive, rapid and quantitative tool for longitudinal monitoring and may reduce reliance on biopsy and MRI.5. Correlation with MRI or PET/CT may further improve diagnostic accuracy and clinical decision making.

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This educational exhibit presents a comprehensive approach to the evaluation of bone metastases using DECT. First, the clinical importance of accurate assessment of bone lesions in oncology patients will be outlined and the basic principles of DECT will be presented, including imaging techniques such as material degradation, VNCa, and iodine mapping in bone. It will then explore how DECT improves early detection of metastatic lesions by visualizing subtle bone marrow changes not seen with conventional CT, and how quantification of fat loss and contrast enhancement patterns can help differentiate malignant from benign lesions. In addition, how DECT facilitates objective monitoring of treatment response through changes in iodine uptake and bone densitometry indices is supported by illustrative clinical cases comparing pre- and post-treatment findings. Finally, we highlight the clinical value of integrating DECT into routine practice and its potential role as a noninvasive, reproducible tool for personalized cancer treatment.

MKEE-159 THE MANY FACES OF PES ANSERINE BURSITIS

Nagore Siles, MD (*Presenter*)
James Teh, MD (*Abstract Co-Author*)
Huw Walters, MA,MBBCHIR (*Abstract Co-Author*)

TEACHING POINTS

1. To describe the anatomy of the pes anserine bursa.2. To introduce the concept of the enthesis organ, using the pes anserine as an example of a "functional enthesis organ". 3. To illustrate the imaging manifestations of the pes anserine bursitis, emphasizing concurrent pathologic conditions.

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1. Anatomy of the pes anserine bursa. 2. The enthesis organ: beyond the focal insertion. 3. Radiological features of various causes of pes anserine bursitis: a) Overuse. b) Chronic enthesopathy. c) Inflammatory arthritis. d) Infection. e) Synovial chondromatosis. f) Tenosynovial giant cell tumour (TSGCT), aka pigmented villonodular synovitis (PVNS). g) Osteochondroma associated.

MKEE-160 UNCOMMON BUT CRITICAL: RADIOLOGIC RECOGNITION AND CLINICAL IMPLICATIONS OF SKELETAL MUSCLE AND SUBCUTANEOUS FAT METASTASES

Hyun Su Kim, MD, PhD (*Presenter*)
Arash Azhideh, MD, MPH (*Abstract Co-Author*)
Peyman Mirghaderi, MD, MPH (*Abstract Co-Author*)
Sara Haseli, MD (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)

TEACHING POINTS

• Soft tissue metastases (STM) are rare but meaningful indicators of aggressive disease and possible therapeutic targets. • CT and US show characteristic but nonspecific findings; awareness of patterns is key. • Radiologists should consider STM in new soft tissue lesions in cancer patients. • Biopsy should be recommended when STM is suspected based on imaging and clinical context. • Greater recognition of STM may improve outcomes and support future treatment strategies.

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1. Purpose: STM to skeletal muscle and subcutaneous fat are rare but clinically important. As cancer survival improves and use of PET-CT, CT, and whole-body MRI expands, STM are increasingly recognized. This exhibit highlights key imaging features, diagnostic challenges, and the radiologists' role. 2. Overview • Often accompanied by other metastases; however, isolated STM do exist. • Lung cancer - most common primary source 3. Imaging Findings • CT: Central low attenuation with rim enhancement or homogeneous enhancement • US: Hypoechoic with well-defined margins and vascularity • PET-CT: Strong FDG uptake • MRI: Ill or well-defined lesions with peritumoral edema, non-enhancing T2 hyperintensity 4. Mimickers: Epidermoid cysts, abscesses, fibromatosis, endometriosis 5. Clinical and Imaging Considerations • CT : more commonly used, may miss subtle lesions. • PET-CT: greater sensitivity but comes with limitations (radiation, access). • Imaging alone is rarely definitive—image-guided biopsy is essential. 6. Impact • Recognition of STM can support early diagnoses and guide locoregional treatments. • Familiarity may lead to accurate diagnosis and contribute to future research and treatment protocols.

MKEE-161 NONINVASIVE ASSESSMENT OF INTRAMUSCULAR PHOSPHATE METABOLISM USING ^{31}P-MR SPECTROSCOPY ON CLINICAL MRI SYSTEMS: PRINCIPLES, PROTOCOLS, AND CLINICAL APPLICATIONS

Koji Takumi, MD, PhD (*Presenter*)
Hiroaki Nagano, MD, PhD (*Abstract Co-Author*)
Ryota Nakanosono, MD (*Abstract Co-Author*)
Tsubasa Nakano (*Abstract Co-Author*)
Fumitaka Ejima (*Abstract Co-Author*)
Masanori Nakajo, MD (*Abstract Co-Author*)
Kiyohisa Kamimura, MD, PhD (*Abstract Co-Author*)
Takashi Yoshiura, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Multi-nuclear MRI is gaining attention as a powerful tool for noninvasive metabolic assessment. Intramuscular phosphate metabolism reflects mitochondrial function and plays a key role in physiological adaptation, aging, and diseases like diabetes and heart failure. 31 P-MRS allows noninvasive, in vivo quantification of high-energy phosphate metabolites (PCr, Pi, ATP) and intracellular pH. Once mainly a research tool, clinical implementation of 31 P-MRS is now feasible. This exhibit introduces the principles and clinical utility of 31 P-MRS for evaluating intramuscular metabolism and mitochondrial function. The purposes of this exhibit are: 1) To explain the principles of 31 P-MRS and phosphate metabolite quantification, 2) To outline clinical MRI protocols for 31 P-MRS, 3) To demonstrate applications through skeletal and cardiac muscle cases, emphasizing post-exercise PCr recovery and pH monitoring

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1) Overview of intramuscular phosphate metabolism and clinical significance: Energy metabolism, roles of PCr, Pi, ATP, and pH, 2) Principles of 31 P-MRS and clinical implementation: Basics of acquisition and spectral analysis; protocol optimization, 3) Clinical and research applications: PCr recovery as an oxidative biomarker; pH changes in aging, heart failure, and diabetes, 4) Take-home messages: 31 P-MRS as a clinical metabolic biomarker; future integration with multiparametric MRI

MKEE-162 PAINFUL KNEE ARTHROPLASTY: A RADIOLOGIST'S SURVIVAL GUIDE FOR RESIDENTS

Zoe G. Winston, MBBS, FRCR (*Presenter*)
Michelle W. Ooi, MBBS, FRCR (*Abstract Co-Author*)

TEACHING POINTS

1. Understand the complementary roles of various imaging modalities in the assessment of a painful knee arthroplasty.2. Review the spectrum of common causes of prosthetic knee failure, including aseptic loosening, subsidence, dislocation, periprosthetic fractures, arthrofibrosis, and tendon ruptures.3. Illustrate key complications through multimodality case examples, highlighting characteristic imaging findings.

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Total knee arthroplasty (TKA) is a common procedure for managing advanced osteoarthritis, with excellent outcomes in most cases. However, persistent or recurrent post-operative pain can present a significant diagnostic challenge due to the wide range of potential complications. This pictorial review highlights key imaging findings in common causes of knee arthroplasty failure, with an emphasis on a multimodality approach. Cases will demonstrate pathologies including prosthesis component dislocation and subsidence, aseptic loosening, septic loosening (periprosthetic joint infection), periprosthetic fracture, arthrofibrosis, extensor mechanism injury and instability. Radiographs, CT, and MRI will be used to illustrate the diagnostic value of each modality. The review is designed to support radiology trainees in recognising important post-operative complications and to aid in clinical decision-making through accurate image interpretation.

MKEE-163 REVOLUTIONIZING DIAGNOSIS: SCREENING OPPORTUNITIES TRANSFORMING PIXELS TO PROGNOSIS

Robert D. Boutin, MD (*Presenter*)
Eddy Zandee van Rilland, MD (*Abstract Co-Author*)
Andrew Johnston, MD, MBA (*Abstract Co-Author*)
Jennifer A. Padwal, MD, MS (*Abstract Co-Author*)
Akshay Chaudhari, PhD (*Abstract Co-Author*)
Leon Lenchik, MD (*Abstract Co-Author*)

TEACHING POINTS

[1] Muscular, skeletal, and fatty tissues are seen on all musculoskeletal imaging exams; each of these tissues contains modifiable biomarkers that can be used to gauge biological health/aging. [2] Sarcopenia, osteoporosis, and adiposity can be treated; disease screening is important because each condition is an independent risk factor for poor clinical outcome. [3] Routine imaging exams provide an opportunity for screening of underdiagnosed and undercoded diseases, including osteosarcopenia, sarcopenic obesity, and other related conditions.

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[I] DEFINITIONS & PATHOGENIC LINKS: Sarcopenia; Osteoporosis; Adiposity [II] PATIENT IMPACT & UNMET DIAGNOSTIC NEED: Sarcopenia; Osteoporosis; Adiposity [III] IMAGING: TECHNICAL CONSIDERATIONS & CORRECTIONS: Radiography; CT; MRI; Sonography [IV] IMAGING APPROPRIATENESS & CLINICAL IMPLEMENTATION: Reporting; Clinical Practice Guidelines; Coding; Billing [V] AI & Multimodal Foundation Models: What's Ready; What's Coming

MKEE-164 FROM DIAGNOSIS TO FOLLOW-UP: IMAGING AND MANAGEMENT OF LOCALIZED AND DIFFUSE TENOSYNOVIAL GIANT CELL TUMORS

Raul N. Pigatto, MD, MBA (*Presenter*)
Vitor T. Paula, MD (*Abstract Co-Author*)
Pedro Henrique R. Silva, MD (*Abstract Co-Author*)
Ricardo Caracante, MD (*Abstract Co-Author*)
Renato Fujiki, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)

TEACHING POINTS

Illustrate the TGCT multimodality signature : nodular extremity masses (L-TGCT) versus extensive large-joint synovial proliferation (D-TGCT) - with exemplar XR, CT, US and MRI cases. Recognize the MRI fingerprint : low-to-intermediate T1/T2 signal with blooming on GRE/SWI/T2*. Distinguish TGCT from mimickers : using blooming, calcifications, post-contrast behavior and a side-by-side comparison table chart. Apply an evidence-based management & follow-up flow-chart : marginal excision followed by less stringent MRI control for L-TGCT. Partial synovectomy, total synovectomy ± radiotherapy and CSF1R inhibition for D-TGCT, with more stringent MRI follow-up. Equip readers with a structured checklist to ensure all key findings are reported.

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Epidemiology Classification: L-TGCT vs D-TGCT Imaging workflow & hallmarks Differentials & mimickers Treatment roadmap Follow-up flow-chart & recurrence detection Structured checklist

MKEE-165 MELANOMA IN MOTION - MUSCULOSKELETAL METASTASES UNVEILED

Flavia M. Costa, MD, PhD (*Presenter*)
Carolina A. Almeida, MD (*Abstract Co-Author*)
Clarissa C. Moraes Do Carmo, MD (*Abstract Co-Author*)
Flavia P. Lopes, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

To evaluate the performance of conventional and advanced MRI techniques in the diagnosis and to differentiate them from other soft tissue tumors. Illustrate many cases of MSK metastasis of melanoma demonstrating their dissemination, leading to compression and invasion of adjacent structures. To be aware of the conditions and the mechanisms by which false positive and negative results (hematomas, ossificans myositis and thrombosis). Make a pictorial essay of the main differential diagnosis. An understanding of the applicability and limitations of MRI tecniques is necessary to making accurate diagnosis and potentially the right treatment for our patients.

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1) The value of each conventional and advanced MRI techniques(DIXON T1, T2*, SWI, DCEperfusion and TIC, DWI) in diagnosis and follow-up.2) Case discussion to demonstrate the ultility in differentiate this tumors from : Sarcomas Lymphoma Hematoma Tenosynovial Giant Cell Tumor Hemosiderotic neurogenic tumor Desmoid Chondral tumors 3) Common pittfalls

MKEE-166 COMPREHENSIVE IMAGING ATLAS OF NEUROMUSCULAR DISEASES: DIAGNOSTIC PATTERNS AND EDUCATIONAL INSIGHTS

Hiroki Miyazaki, MD (*Presenter*)
Hiroki Mukai (*Abstract Co-Author*)
Hajime Yokota, MD (*Abstract Co-Author*)
Jun Hashiba (*Abstract Co-Author*)
Takashi Uno (*Abstract Co-Author*)

TEACHING POINTS

•Advances in genetic testing and identification of disease-specific autoantibodies have reduced the reliance on muscle biopsy, making non-invasive imaging with CT and MRI increasingly essential in the diagnosis and management of neuromuscular diseases. •Some neuromuscular diseases, such as facioscapulohumeral muscular dystrophy (FSHD), cannot be diagnosed by exome sequencing and often show only nonspecific muscle pathology, highlighting the importance of radiologists in recognizing disease-specific imaging patterns. •Muscle imaging supports diagnosis by evaluating key features such as atrophy, fatty replacement, edema, asymmetry, distribution, and extramuscular findings. •This exhibit presents a structured, pattern-based imaging approach to representative neuromuscular diseases, providing radiologists with practical diagnostic tools and a systematic understanding of disease classification for immediate clinical application.

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•Background and Significance of Imaging in Neuromuscular Diseases •CT and MRI Evaluation of Neuromuscular Diseases •Pattern-Based Imaging Approach •Disease-Specific Imaging Approach A. Acquired Myopathies • Inflammatory myopathies: - PM/DM - IMNM - IBM - Muscular sarcoidosis B. Inherited Myopathies • Muscular dystrophies: - Dystrophinopathies - Myotonic dystrophy - LGMD - FSHD - OPMD/OPDM • Distal myopathy C. Neurogenic Diseases • Motor neuron diseases: - ALS - SMA - SBMA • Peripheral neuropathies: - Charcot-Marie-Tooth disease •Diagnostic Pearls and Pitfalls •Summary and Diagnostic Algorithm • Imaging-based diagnostic flowchart

MKEE-167 MR NEUROGRAPHY PLAYBOOK: ESSENTIAL IMAGING SIGNS FOR THE DIAGNOSIS OF PERIPHERAL NERVE PATHOLOGY

Ali S. Tejani, MD (*Presenter*)
Amelie M. Lutz, MD (*Abstract Co-Author*)
Mahesh Prakash, MD, MBBS (*Abstract Co-Author*)
Avneesh Chhabra, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

1. Review role of MR Neurography (MRN) for diagnosing peripheral nerve pathology 2. Discuss optimal MRN protocol 3. Provide a visual review of typical diagnostic signs for common etiologies of peripheral nerve pathology

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1. Introduction a. Clinical paradigms for peripheral nerve evaluation b. Role for MR neurography (MRN) c. Optimal MRN protocol for peripheral nerve evaluationd. Neuropathy Score Reporting Data System (NS-RADS) for consistent and reproducible reporting of findings 2. Imaging signs a. Nerve tumors/tumor-like lesions i. Spaghetti - lipomatosis of nerve ii. Target- peripheral nerve sheath tumors iii. Honeycomb - perineuroma, idiopathic hypertrophic mononeuropathy, CIDP and hereditary motor and sensory neuropathy iv. Garland - intraneural ganglion cyst v. Bag of worms - plexiform neurofibroma/schwannoma vi. Dripping hose - neurolymphoma, perineural spread of malignacy or non-malignant disease like infection or active inflammation b. Nerve injury i. Gudgeon (fresh water fish) - neuroma in continuity ii. Yarn and string - terminal neuroma iii. Loner - brachial plexus avulsion injury iv. White out - post-radiation fatty change, intraneural hemorrhage from injury, endometriosis, or sarcoma v. Black out - scarring from severe injury or regional ablation, ischemic neuropathy from severe compression, graft degeneration c. Nerve entrapment/inflammation i. Mount Fuji - neurogenic thoracic outlet syndrome ii. Meandering - nerve inflammation like brachial neuritis iii. Zig-zag - multifocal post-traumatic or iatrogenic scarring iv. Hourglass - nerve root torsion or severe constriction v. Triple B sign - severe constriction at entrapment

MKEE-168 DIAGNOSIS AND TREATMENT OF TRAUMATIC PERONAL TENDON DISORDERS

Raquel Prada, PhD (*Presenter*)
Juan Manuel Gomez Canedo (*Abstract Co-Author*)
Maria Costas, MD (*Abstract Co-Author*)
Montserrat Novoa Ferro, MD (*Abstract Co-Author*)
Selma d. Estepar, BMBS (*Abstract Co-Author*)

TEACHING POINTS

Understand pathogenesis of traumatic peroneal tendons injuries. Describe the US and MR finding of peroneal tendinopahy, peroneal instability and peroneal tendón tears and predisposing anatomical variants .Explain the different therapeutic approaches and illustrate surgical procedures .

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Although traumatic injuries to peroneal tendons are uncommon, they are a common cause of chronic lateral ankle pain and may lead to ankle instability.There are three traumatic disorders; peroneal tendinopathy, peroneal subluxation, and peroneal tendon tears. The most common associated pathologies are also described: lateral collateral ligament sprain, osteochondral injury to talar dome, and calcaneal and peroneal fractures. Initial diagnosis is difficult and often underdiagnosed. Imaging techniques, primarily ultrasound and MRI, play an important role in diagnosis. For peroneal tendons instabiliy Eckert and Davis/Oden classification is used and for tendon tears Sobel classification is used. The first treatment option is conservative maneuvers. The next therapeutic approach for peroneal instability is open or endoscopic repair of superior peroneal retinaculum, with or without endoscopic or open fibular groove deepening. For tendinopthy the surgical options include debridement and synovectomy and for tendon tears, debridement and tubularization, resection and tenodesis. The most common postoperative complications are tendon retears and tenosynovitis. US and MRI findings as well as predisposing anatomical variants are illustrated. The different surgical procedures and posoperative complications are also described.

MKEE-169 IMAGING OF MUSCLE INJURY COMPLICATIONS

Stefano Fusco, MD (*Presenter*)
Fernando Idoate, MD (*Abstract Co-Author*)
Alexeys Perez, MD (*Abstract Co-Author*)
Luis Cerezal, MD (*Abstract Co-Author*)
Eva Llopis, MD (*Abstract Co-Author*)

TEACHING POINTS

Muscle injuries are a major concern in sports medicine, and imaging plays a key role not only in diagnosis but also in follow-up, aiding in the detection of potential complications. Normal healing may result in restitutio ad integrum or scar formation, whereas abnormal healing can lead to excessive fibrosis, potentially impairing function and increasing the risk of reinjury, one of the most challenging complications. Nerve involvement can occur in acute muscle strains due to stretch injury, with nerve thickening, edema, and loss of the fascicular pattern. Acute nerve disruption may also occur, especially in hamstring avulsions, often involving small motor sciatic branches, with MRI usually showing only indirect signs. Chronically, nerve injury may result from entrapment within scar tissue or from disruption. MRI signs are muscle edema and, if unresolved, fatty atrophy. Other complications include calcifications, which can occur during the healing process, and myositis ossificans, consisting of heterotopic bone formation, typically following hematomas after direct trauma. Rarely, residual fascial defects may cause herniation of muscle belly, best assessed by dynamic US. Deep vein thrombosis is another potential complication, detectable on US and MRI. It mainly occurs in calf injuries, particularly involving intramuscular veins. Awareness of these complications is essential, as they significantly impact prognosis and return-to-play.

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1.Excessive scarring and reinjury; 2.Nerve injury - 2a.Acute (stretching / disruption) - 2b.Chronic (secondary to fibrosis or disruption); 3. Calcifications & myositis ossificans; 4.Muscle hernia; 5.Deep vein thrombosis

MKEE-170 PLAY-D'OHN'T BE FOOLED: IDENTIFYING DISPLACED MENISCAL TEARS AND THEIR MIMICKERS

Natalia Eugene, MD (*Presenter*)
Sanjum Singh, MD (*Abstract Co-Author*)
David Cornwell (*Abstract Co-Author*)
Matthew Rae (*Abstract Co-Author*)
Tetyana A. Gorbachova, MD (*Abstract Co-Author*)

TEACHING POINTS

• Review the current classification of meniscal tears and typical locations of displaced meniscal tears. • Utilize original 3D printed and Play-Doh models as well as clinical MRI images to illustrate meniscal anatomy and tear configurations. • Highlight anatomic findings, variants and artifacts that may mimic displaced meniscal tears. • Emphasize the importance of accurate tear characterization for both radiologists and orthopedic surgeons in guiding management.

TABLE OF CONTENTS/OUTLINE

1. Current classification of meniscal tears with emphasis on displaced tears. 2. MRI signs of displaced meniscal tears and their pitfalls (e.g., comma or boomerang sign, meniscus in the notch, double PCL) 3. Common Locations for displaced meniscal fragments a. Medial Meniscus b. Lateral Meniscus c. Search patterns and diagnostic pitfalls d. Treatment implication depending on tear morphology and fragment location 4. Mimickers of displaced meniscal tears a. Transverse meniscal ligament b. Meniscofemoral and meniscotibial ligaments c. Oblique meniscomeniscal ligaments d. Anteromedial capsulofemoral band e. Semimembranosus tendon f. Popliteus tendon g. Popliteomeniscal fascicles h. Discoid meniscus 5. MRI Artifacts that may mimic tears (e.g., vacuum phenomenon) 6. Treatment Strategies a. Treatment options (e.g., meniscectomy, arthroscopic repair—including different techniques based on location—and meniscal allograft transplantation) b. Indications for urgent Intervention (fragment location and salvageability) c. Prognostic factors d. Special treatment considerations (pediatric vs adult patients)

MKEE-171 NERVE-WRACKING: HIGH-RESOLUTION ULTRASOUND OF TRAUMATIC PERIPHERAL NERVE INJURIES

Tania A. Toma, MBChB (*Presenter*)
Melissa Berwick, mbbs (*Abstract Co-Author*)
Dyan V. Flores, MD (*Abstract Co-Author*)
Linda Probyn, MD (*Abstract Co-Author*)
Angela Atinga, MBBChir, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

Traumatic peripheral nerve injury (TPNI) can result in profound sensory and motor deficits as well as chronic neuropathic pain, impacting on function and quality of life. High-resolution sonography (US) offers excellent sensitivity and spatial resolution with dynamic capabilities and is a valuable adjunct to nerve conduction studies (NCS), electromyography (EMG) and magnetic resonance imaging (MRI), in diagnosis, prognosis and treatment selection. It is especially beneficial in the setting of severe trauma where longer acquisition times of MRI with marked edema and hemorrhage may limit overall image quality. The teaching objectives are as follows: 1. Review the normal anatomy and US appearances of peripheral nerves 2. Discuss different types of TPNIs and review current grading classification systems 3. Demonstrate cases of TPNIs emphasizing their US appearances and extraneural findings, and how this relates to prognosis and implications for treatment

TABLE OF CONTENTS/OUTLINE

1. Normal peripheral nerve anatomy and US appearances 2. Imaging considerations (including timing of imaging) 3. Mechanisms and types of nerve trauma 4. Seddon and Sunderland Classification system for TPNI 5. US scanning techniques including pearls and pitfalls 6. TPNI cases emphasizing US appearances and extraneural findings 7. Prognostication and treatment implications

MKEE-172 HIDDEN STRENGTH: OPPORTUNISTIC BONE HEALTH ASSESSMENT IN ROUTINE IMAGING

Margrit E. Muller, MD (*Presenter*)
Lucas Da Silva Costa, MD (*Abstract Co-Author*)
Lara Quiche, MD (*Abstract Co-Author*)
Vitor T. Paula, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Akemi Osawa, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)

TEACHING POINTS

- To explain the concept and clinical relevance of opportunistic bone health assessment in medical imaging. - To explain the concept and importance of Dual-energy X-ray Absorptiometry (DXA) in assessing bone health. - To review the main imaging modalities that allow bone mineral density (BMD) estimation beyond Dual-energy X-ray absorptiometry (DXA). - To highlight emerging techniques and technologies, including AI algorithms. - To illustrate with clinical cases where opportunistic screening made a significant difference in patient outcomes. - To encourage radiologists to integrate bone assessment into routine imaging to support early diagnosis and prevention of osteoporosis-related fractures.

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- Definition and value of opportunistic bone health assessment. - DXA as the gold standard: strengths and limitations. - Alternative imaging modalities: CT, radiography, ultrasound, and MRI. - Advances in quantitative imaging: quantitative CT (QCT), AI-based tools, quantitative ultrasound (QUS), and ultrashort echo magnetic resonance imaging (UTE MRI). - Case examples illustrating potential impact on patient care.

MKEE-173 PELVIC BONE TUMORS : A COMPREHENSIVE IMAGING AND INTERVENTIONAL GUIDE FOR THE RADIOLOGIST

Felipe A. Sulla Lupinacci, MD (*Presenter*)
Flavia F. Araujo, MD (*Abstract Co-Author*)
VINICIUS R. BRAMBILLA, MD (*Abstract Co-Author*)
Marco Gonzalez (*Abstract Co-Author*)
Pedro H. Arruda, MD (*Abstract Co-Author*)
Isabela A. Da Cruz, MD (*Abstract Co-Author*)
Julio B. Guimaraes, MD, PhD (*Abstract Co-Author*)
Alipio Ormond Filho, MD (*Abstract Co-Author*)
Marcelo A. Nico, MD (*Abstract Co-Author*)

TEACHING POINTS

Pelvic bone tumors represent a diagnostic and therapeutic challenge given the complex anatomy and the broad pathological spectrum—ranging from benign to malignant, primary to metastatic lesions. The limitations of physical examination due to deep location and proximity to vital pelvic structures underscore the indispensable role of imaging. Radiography is frequently suboptimal owing to overlapping anatomy and thin cortical bone in regions such as the iliac wing. MRI is the modality of choice for evaluating marrow infiltration, soft-tissue extension, and peritumoral edema, although reconversion or persistence of hematopoietic marrow may mimic pathology. The sacroiliac joint, with limited cartilage coverage and frequent tumor invasion, and the hip joint, commonly affected by degenerative changes, require meticulous assessment. Interventional radiology is integral to management, with CT-guided biopsy, thermal ablation, and cementoplasty offering minimally invasive options. High-resolution CT enables precise localization relative to critical neurovascular landmarks, including iliac vessels, femoral/sciatic nerves, and the sacral plexus. This review discusses imaging hallmarks, introduces a structured diagnostic algorithm, and outlines image-guided interventions tailored to lesion type and location.

TABLE OF CONTENTS/OUTLINE

Introduction Multimodality Evaluation Classification of Pelvic Bone Tumors 3.1 Benign 3.2 Malignant 3.3 Metastatic Imaging-Based Diagnostic Algorithm Interventional Radiology Considerations 5.1 Different approaches 5.2 Structures to avoid 5.3 Possible complications

Abstract Archives of the RSNA, 2025

MSEE

Multisystem Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

MSEE-1 SEEING WHAT WAS INVISIBLE: SPECTRAL AND UHR IMAGING WITH PHOTON COUNTING DETECTOR CT

Kota Yokoyama, MD, PhD (*Presenter*)
Yusuke Kawasaki, MD (*Abstract Co-Author*)
Hirofumi Yamada (*Abstract Co-Author*)
Tomoki Imokawa, MD (*Abstract Co-Author*)
Jun Oyama (*Abstract Co-Author*)
Akane Ozawa (*Abstract Co-Author*)
Junichi Tsuchiya, MD, PhD (*Abstract Co-Author*)
Ukihide Tateishi, PhD (*Abstract Co-Author*)

TEACHING POINTS

- Photon-counting detector CT (PCD-CT) introduces a paradigm shift in radiology with ultra-high resolution (UHR) and spectral imaging. - PCD-CT enables detailed visualization of small vessels, tissue characterization, and lesion delineation. - It broadens the utility of contrast-enhanced CT across cardiovascular, neurovascular, oncologic, and inflammatory diseases. - Spectral data such as iodine and extracellular volume (ECV) maps support functional assessment comparable to MRI. - PCD-CT advances “Green Radiology” by reducing the need for MRI, lowering radiation dose, and potentially replacing invasive procedures.

TABLE OF CONTENTS/OUTLINE

Introduction - Overview of PCD-CT and comparison with energy-integrating detector CT (EID-CT) - Key innovations: direct photon conversion, spectral binning, noise reduction Ultra-High Resolution Imaging - Non-contrast imaging: temporal bone, trabecular bone, lung - Contrast imaging: in-stent lumen, small vessels, dural defects, pancreaticobiliary ducts Spectral Imaging Applications - Iodine and ECV mapping for myocardial fibrosis - Lesion conspicuity in cancer imaging - Inflammatory disease evaluation - Bone marrow imaging Clinical Impact & Future Directions - Toward replacing MRI and invasive angiography - Dose reduction and sustainability - Practical needs: kernel tuning, software, data management Conclusion - PCD-CT redefines CT by integrating structural and functional imaging.

MSEE-2 KEY FINDINGS: CRACKING OPEN THE SKULL VAULT’S DIAGNOSTIC TREASURE

Andressa C. Kuzma, MD (*Presenter*)
Mariana Carmo, MD (*Abstract Co-Author*)
Rodrigo Zancanaro, MD (*Abstract Co-Author*)
Enzo Fatuch (*Abstract Co-Author*)
Bruno Coghi (*Abstract Co-Author*)
Sebastiao B. de Araujo Neto, MD (*Abstract Co-Author*)
Stenio Burlin, MD (*Abstract Co-Author*)
Luis T. Tibana, MD (*Abstract Co-Author*)
Gustavo D. Gomez, MD (*Abstract Co-Author*)

TEACHING POINTS

A wide spectrum of calvarial lesions and malformations can be identified on imaging, ranging from congenital and developmental anomalies to neoplastic, metabolic, infectious, vascular, and traumatic causes. Understanding their underlying pathophysiology helps radiologists establish a diagnostic approach. In this exhibit we present a didactic review of skull vault abnormalities according to etiology, as a teaching aid with causes ranging from commonest to rare, aiming to both stimulate the young resident as well as review and remember experts of rarer differential diagnoses.

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Congenital causes include inclusion cysts, leptomeningeal cysts, congenital skull depressions, meningoencephaloceles, and syndromic conditions such as Apert syndrome and cleidocranial dysplasia. Other developmental and genetic disorders like fibrous dysplasias and tuberous sclerosis are also explored. Metabolic disorders such as renal osteodystrophy, Paget disease, and hyperparathyroidism are included, along with endocrine causes like acromegaly and also drug-related hyperostosis. Infectious and inflammatory diseases, including osteomyelitis and Langerhans cell histiocytosis, are presented. Neoplastic conditions range from benign (osteoma and meningioma variants) to malignant (metastases, multiple myeloma, and malignant bone tumors). The exhibit addresses hematologic disorders and idiopathic causes such as Gorham disease, but also more common iatrogenic changes including burr holes. Normal variants such as prominent foramina and arachnoid granulations are also considered as potential pitfalls.

MSEE-3 OLD SCHOOL, STILL COOL CONVENTIONAL CONTRAST STUDIES IN ACTION

Pablo Nahuel Montalto, MD (*Presenter*)

TEACHING POINTS

Highlight the continued relevance of conventional contrast studies in modern radiologic practice. Identify clinical scenarios where these studies outperform or complement modern cross-sectional imaging. Demonstrate key imaging findings in gastrointestinal tract, genitourinary, and airway pathologies using real cases. Emphasize the value of dynamic fluoroscopy in visualizing functional abnormalities that static imaging may miss.

TABLE OF CONTENTS/OUTLINE

Introduction: Revisiting conventional contrast imaging Technical overview: Equipment and acquisition principles Gastrointestinal applications: Achalasia, reflux, Zenker's diverticulum Genitourinary cases: Ureterocele, vesicoureteral reflux, urethral strictures Airway relevance: Swallowing studies and tracheoesophageal fistulas Advantages, limitations, and reporting pearls Educational conclusions and take-home messages

MSEE-4

Koji Takumi, MD, PhD (*Presenter*)
Hiroaki Nagano, MD, PhD (*Abstract Co-Author*)

EXTRACELLULAR VOLUME FRACTION ASSESSMENT IN ONCOLOGY USING DUAL-ENERGY AND PHOTON-COUNTING CT: TECHNIQUES, INTERPRETATION, AND CLINICAL APPLICATIONS

Ryota Nakanosono, MD (*Abstract Co-Author*)
Tsubasa Nakano (*Abstract Co-Author*)
Fumitaka Ejima (*Abstract Co-Author*)
Masanori Nakajo, MD (*Abstract Co-Author*)
Kiyohisa Kamimura, MD, PhD (*Abstract Co-Author*)
Takashi Yoshiura, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Extracellular volume fraction (ECV) is a promising imaging biomarker in oncology, with clinical utility across multiple organs. It enables non-invasive evaluation of tumor microenvironment features such as fibrosis and extracellular matrix, which correlate with tumor subtype, aggressiveness, and treatment response. Radiologists should understand the principles, technical aspects, and clinical value of ECV to improve diagnostic accuracy and guide treatment. Advances in dual-energy CT (DECT) and photon-counting CT (PCCT) have simplified and enhanced ECV quantification, especially via iodine-based imaging. The purposes of this exhibit are: 1) To review the principles and methods of ECV quantification using DECT and PCCT. 2) To illustrate the interpretation of ECV maps in various oncologic entities with pathological correlation. 3)To discuss the clinical applications of ECV in tumor characterization, staging, and treatment monitoring, with examples from thoracic and abdominopelvic tumors.

TABLE OF CONTENTS/OUTLINE

1) Overview of ECV Quantification in Oncology; 1: Definition and biological significance of ECV. 2: Technical overview of ECV measurement using DECT and PCCT, 2) Techniques; 1: Acquisition protocols: equilibrium phase imaging and dual-energy/spectral techniques, 2: Mathematical calculation and required inputs (hematocrit, attenuation value or iodine concentration, 3) Clinical Applications; 1: Role of CT-derived ECV in differentiating tumor subtypes as a biomarker for tumor aggressiveness, 2: Case-based interpretation: lung cancer subtypes, mediastinal tumors, liver and pancreatic lesions, gastric cancers, rectal tumors, etc.

MSEE-5 MULTIMODALITY IMAGING OF VASCULAR GRAFT AND ENDOGRAFT INFECTION

Sophie Canham, BSC,MBChB,FRCR (*Presenter*)
Mitesh Naik, FRCR (*Abstract Co-Author*)
Namir Asmar, MBBCHIR (*Abstract Co-Author*)
Elika Kashef, FRCR (*Abstract Co-Author*)
Oliver Lyons (*Abstract Co-Author*)
Tara D. Barwick, FRCR, MSc (*Abstract Co-Author*)

TEACHING POINTS

• To discuss the pathogenesis, clinical presentation and management of vascular graft and endograft infection (VGEI) • To provide an overview of imaging features of VGEI for the general reporting radiologist • To highlight strengths and limitations of imaging modalities used to diagnose VGEI, including ultrasound, CT angiography, white blood cell scintigraphy (WBC) with SPECT/CT and [18 F]FDG PET/CT • To review international guidance on the workup of suspected VGEI

TABLE OF CONTENTS/OUTLINE

Background • Pathogenesis • Presentation - clinical/radiological/laboratory features (including MAGIC [Management of Aortic Graft infection Collaboration] criteria) • Management and follow up Review of imaging features • Ultrasound - perigraft fluid/collections, mural thickening, edema, thrombus • CT angiography - perigraft fluid/gas/soft tissue inflammation/collections • [18 F]FDG PET/CT - visual analysis (level and pattern of tracer uptake with grading) and semi-quantitative analysis (standardized uptake value and target-to-background ratios) • WBC scintigraphy with SPECT/CT - visual analysis (level and pattern of tracer uptake incrementing across two time-points) • Advantages and disadvantages of each modality Review of international imaging guidance Multimodality case examples with interpretive pearls and pitfalls • Typical cases • Unusual presentations and complex scenarios • Complications Summary

MSEE-6 MULTIMODALITY IMAGING OF COSMETIC FILLERS AND BIOSTIMULATORS: PATTERNS, PEARLS AND PITFALLS

Heytor Jose De Oliveira Cabral, MD (*Presenter*)
Marilia A. Tavares, MD (*Abstract Co-Author*)
Israel Missrie, MD (*Abstract Co-Author*)
Alexandre M. Silva, MD (*Abstract Co-Author*)
Luciana C. Zattar, MD (*Abstract Co-Author*)
Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)
Julia Capobianco, MD (*Abstract Co-Author*)

TEACHING POINTS

• The increasing demand for percutaneous aesthetic procedures has led to a growing variety of injectable materials, including non-resorbable synthetic fillers, autologous fat grafts, and resorbable agents.• These substances often exhibit distinct imaging features across modalities. However, patients may be unaware of the specific material used, complicating clinical and radiologic assessment.• Recognizing the imaging characteristics of different fillers is essential to avoid misdiagnosis, false-positive findings, and unnecessary invasive procedures

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• Illustrate, through institutional case examples, the imaging appearances of various fillers and biostimulatory agents—including free silicone, acrylates (PMMA, PAAG), hyaluronic acid, vitamin D, calcium hydroxyapatite, and autologous fat—across multiple imaging modalities.• Review common injection sites and discuss potential local and systemic complications associated with each type of injectable material.• Help radiologists recognize the typical imaging features of these materials to reduce misinterpretation, avoid false-positive diagnoses, and prevent unnecessary interventions.

MSEE-7 HYDATIDOSIS BEYOND THE LIVER: A SYSTEMATIC REVIEW BASED IN A SERIES OF CASES

Isabel Fonseca Buelga, MD (*Presenter*)
Sara Siguenza-Gonzalez, MD (*Abstract Co-Author*)
Claudia Viescas Huerta, MD (*Abstract Co-Author*)
Diego Alejandro Garcia Paredes, MD (*Abstract Co-Author*)
Sergio Sintes (*Abstract Co-Author*)
Antonio Michael-Fernandez, MD (*Abstract Co-Author*)
Raquel Garcia Latorre, MD (*Abstract Co-Author*)
Abel Gonzalez Huete, MD (*Abstract Co-Author*)

TEACHING POINTS

Brief review of the current situation, epidemiology and life cycle of the Echinococcus granulosus. Description of the radiographic findings comparing different imaging modalities (US, CT and MRI). To recall the classification of hydatidic cysts. Review extraabdominal hydatidosis manifestations by using illustrative cases and remarking the differential diagnosis in each location Talk about the possible complications of the disease and their diagnosis.

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1. Introduction. Current Situation and Cycle. 1.1 Epidemiology and distribution of Echinococcus granulosus 1.2 Cycle 2. Imaging Features 2.1 Ultrasound (US) 2.2 Computed Tomography (CT) 2.3 Magnetic Resonance Imaging (MRI). Hepatic Echinococcosis. 3. Classification of hydatidic cysts Ethiopathogenesis. Classification of

Ghaarby. 4. Extrahepatic Hydatidosis. 4.1 Intra-abdominal cysts . 4.2 Extra-abdominal dissemination . 4.3 Illustrating cases. 5. Musculoskeletal hydatidosis 5.1 Imaging findings. 5.2 Differential diagnosis 6. Complications . 6.1 Etiopathogenesis . 6.2 Imaging features .7. Summary

MSEE-8 VISUALIZATION&INTERVENTION:BASICS OF LYMPHATIC SYSTEM RADIOLOGY

Wei Meng, MD (*Presenter*)
Yosuke Yamamoto, MD (*Abstract Co-Author*)
Taiki Nozaki, MD (*Abstract Co-Author*)
Jitsuro Tsukada (*Abstract Co-Author*)
Yuko Tsujioka, MD, PhD (*Abstract Co-Author*)
Yu Iwabuchi (*Abstract Co-Author*)
Shigeyoshi Soga, MD (*Abstract Co-Author*)
Masanori Inoue, MD (*Abstract Co-Author*)
Yoshitake Yamada, MD, PhD (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The purposes of this exhibit are 1)To demonstrate the function, anatomy, and anatomical variations of the lymphatic system. 2)To present various imaging modalities for visualizing the lymphatic system and compare their advantages and disadvantages. 3)To illustrate Interventional Radiology treatment options for lymphatic disorders along with representative imaging findings.

TABLE OF CONTENTS/OUTLINE

1)Introduction 2) The function, anatomy, and anatomical variations of the lymphatic system 3) Visualization of the lymphatic system: modalities including scintigraphy, lymphangiography and MR lymphangiography(Non-contrast MR lymphangiography and Dynamic contrast MR lymphangiography) 4) Interventional Radiologic of lymphatic disorders including Retrograde transvenous thoracic duct embolization and Percutaneous thoracic duct embolization

MSEE-9 HAIRY KIDNEYS AND FIBROTIC SURPRISES: RADIOLOGIC ADVENTURES IN MULTISYSTEM DISEASE

Shayan Saeed (*Presenter*)
Jasmine Zhao, MD (*Abstract Co-Author*)
Syed Ibrahim (*Abstract Co-Author*)
Star Lopez (*Abstract Co-Author*)
Jadyn Lontoc (*Abstract Co-Author*)
River Wolf (*Abstract Co-Author*)
Mohammad Helmy, MD (*Abstract Co-Author*)
James Shi, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Multisystem diseases such as IgG4-related disease, sarcoidosis, amyloidosis, Behçet's disease, and Erdheim-Chester disease present with diverse, often non-specific symptoms that can mimic more common conditions. 2. Radiologic imaging is essential for early identification, with certain diseases exhibiting hallmark signs such as retroperitoneal fibrosis (IgG4-RD) and the "hairy kidney" and coated aorta signs (Erdheim-Chester disease). 3. MRI, CT, and PET/CT facilitate detection of multisystem involvement, often revealing subtle findings before clinical symptoms fully manifest. 4. Early recognition through imaging can guide targeted biopsy, inform differential diagnosis, and enable prompt initiation of appropriate multidisciplinary therapy.

TABLE OF CONTENTS/OUTLINE

1. Learning objectives 2. 5 Must-Know Multisystem diseases: Case-Based Examples 2. i) Clinical Presentation 2. ii) Epidemiology 2. iii) Histopathogenesis 2. iV) Understand Disease-specific Imaging Modalities 2. V) Key Imaging features and Diagnostic challenges 3. Summary and Key Takeaways

MSEE-10 RECOGNIZING IGG4-RELATED DISEASE: IMAGING INSIGHTS INTO A COMPLEX DIAGNOSIS

Vitor Soares, MD (*Presenter*)
Andrey Ribeiro, MD (*Abstract Co-Author*)
Luiza Chimeli-Ormonde, MD (*Abstract Co-Author*)
Mateus Pereira Dos Santos Gomes, MD (*Abstract Co-Author*)
Andre Ferreira, MD (*Abstract Co-Author*)
Felipe C. Ribeiro, MD (*Abstract Co-Author*)
Anna P. Riello, MD, MSc (*Abstract Co-Author*)
Daniella B. Parente, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

IgG4-related disease (IgG4-RD) is a rare, immune-mediated condition with diverse clinical presentations, that can affect virtually any organ. Imaging plays a crucial role in detecting organ involvement and guiding diagnosis.Familiarity with characteristic imaging patterns across multiple organs is essential for radiologists.

TABLE OF CONTENTS/OUTLINE

I. Purpose To review the multisystemic imaging manifestations of IgG4-RD and highlight key radiologic findings that support early and accurate diagnosis. II. Multisystemic Manifestations and Key Imaging Features ? Type 1 Autoimmune Pancreatitis The pancreas is the most frequently involved organ. Image is useful for distinguishing between the acute and chronic phases. ? Retroperitoneal Fibrosis Presents as a soft-tissue mass encasing the abdominal aorta and its branches. It often involves the ureters, potentially leading to hydronephrosis. ? Sclerosing Cholangitis The biliary system is the second most commonly affected site. Imaging typically reveals fibrosis of the intra- and extrahepatic bile ducts, accompanied by upstream biliary dilatation. ? Pulmonary Involvement May present with nodules or masses, ground-glass opacities, and interstitial or peribronchovascular changes. ? Sialadenitis Characterized by typically painless, bilateral glandular swelling. III. Future Perspectives ^{18}F-Fluorodeoxyglucose positron emission computed tomography has shown promise in assessing multiorgan involvement in a single scan. IV. Conclusion Imaging modalities, particularly CT and MRI, play a pivotal role in the diagnosis and follow-up of IgG4-RD. Nuclear medicine techniques may further enhance diagnostic accuracy and disease monitoring soon.

MSEE-11 BONE MARROW PATHOLOGICAL MODIFICATIONS OF HEMATOLOGICAL MALIGNANCIES

Mickael Tordjman, MD, MS (*Presenter*)
Fadila Mihoubi Bouvier (*Abstract Co-Author*)
Seoung-Oh Yang, PhD (*Abstract Co-Author*)
Mohamed Jarraya, MD (*Abstract Co-Author*)
Bachir Taouli, MD (*Abstract Co-Author*)
Ali Guermazi, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Bone marrow (BM) evaluation is central to the diagnosis, staging, and response assessment of hematological malignancies.• Specific imaging and pathological patterns help differentiate between various hematological malignancies such as multiple myeloma, bone lymphoma, leukemia, and myelofibrosis.• Recognizing focal, diffuse, variegated, and patchy BM infiltration patterns is key to the diagnosis, prognosis and guiding appropriate treatment strategies.• Advanced imaging techniques (Dixon,

PET/CT, whole-body MRI, PET/MRI) increasingly complement histopathological analysis in detecting early or residual disease.• Understanding post-therapeutic BM remodeling (e.g., reconversion, fibrosis, necrosis) is crucial for differential diagnosis and accurate longitudinal assessment.

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1. Normal Bone Marrow Architecture. 2. Imaging Techniques of Bone Marrow Evaluation. o MRI signal changes, Dixon characteristics, PET uptake. 3. Pathological Patterns of Marrow Infiltration. o Focal, diffuse, and mixed patterns. o Cell lineage-specific features (e.g., plasma cells, blasts, lymphocytes). 4. Hematological Malignancies Imaging Features Overview. o Multiple Myeloma and Plasmacytoma. o Acute and Chronic Leukemiaso Lymphoma. o Aplastic Anemia. o Myelofibrosis. 5. Therapy-Induced Marrow Changes. o Treatment response patterns. o Complications: fibrosis, necrosis. o Reconversion. 6. Diagnostic Pitfalls and Mimics. o Reactive changes, infections, and marrow reconversion. 7. Integrating Imaging and Histopathology for Diagnosis and Monitoring

MSEE-12 PEDIATRIC VITAMIN DEFICIENCIES AND MALNUTRITION: WHAT THE RADIOLOGIST NEEDS TO KNOW

Dora Chen, MD (*Presenter*)
Asha Sarma, MD (*Abstract Co-Author*)
Yu Luo, MD,PhD (*Abstract Co-Author*)
Elizabeth J. Snyder, MD (*Abstract Co-Author*)
Rekha S. Krishnasarma, MD (*Abstract Co-Author*)

TEACHING POINTS

Consequences of pediatric vitamin deficiencies range from mild to devastating. Deficiencies can have specific imaging findings, and therefore imaging plays an essential role in early and accurate diagnosis. Early diagnosis is important because prompt supplementation can prevent, halt, or even reverse consequences. Causes of vitamin deficiencies in pediatric patients are wide-ranging and include: no Vitamin K administration, prematurity, self-restricted diet/anorexia, metabolic disease, and renal disease. Radiologists should be familiar with the various ways each vitamin deficiency can present and its appearance across modalities.

TABLE OF CONTENTS/OUTLINE

Series of curated cases of pediatric patients who presented with specific deficiencies, organized by vitamin. Each vitamin, in addition to its cases, will have accompanying slides dedicated to explaining the functional role of that vitamin as well slides dedicated to describing the manifestations/disease states that can occur.

MSEE-13 SICKLE CELL DISEASE ON IMAGING: WHAT RADIOLOGISTS SHOULD KNOW

Marcella Brandao, MD, MEd (*Presenter*)
Igor Amorim, MSc (*Abstract Co-Author*)
Daniel Sa Ribeiro (*Abstract Co-Author*)
Paulo H. Fujita (*Abstract Co-Author*)
Dilton Mendonca (*Abstract Co-Author*)
Paulo Mariz Filho, MD (*Abstract Co-Author*)

TEACHING POINTS

To showcase a broad range of real patient cases, highlighting the clinical and radiologic heterogeneity of sickle cell disease. To provide a structured overview of acute and chronic complications, reinforcing the radiologist’s role in diagnosis and management. To emphasize key imaging features and potential diagnostic pitfalls that may influence patient outcomes.

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Sickle cell disease is a multisystem hematologic disorder with diverse and characteristic imaging manifestations. This case-based review is organized by organ systems: Musculoskeletal: H-shaped vertebrae, bone infarcts, osteonecrosis, osteomyelitis, and deep vein thrombosis. Neurological: Stroke, silent infarcts, moyamoya syndrome, posterior reversible encephalopathy syndrome (PRES), and labyrinthine hemorrhage. Cardiopulmonary: Chronic (pulmonary artery dilatation, cardiomegaly, concentric left ventricular hypertrophy, and chronic parenchymal lung changes) and acute (variable CT presentations of acute chest syndrome). Abdominal: Iron overload (hepatic, splenic, and renal iron deposition), hepatobiliary (cholelithiasis, choledocholithiasis, and morphological liver changes), splenic (autosplenectomy, splenic infarcts, and Gamna-Gandy bodies) and renal (bilateral cortical necrosis, renal vein thrombosis and pyelonephritis).

MSEE-14 GENETIC SYNDROMES WITH INCREASED RISK OF GASTROINTESTINAL AND GENITOURINARY CANCERS: ROLE OF IMAGING IN SCREENING

Komal A. Chughtai, MD (*Presenter*)
Amar Shah, MD (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Roman Shrestha, MD (*Abstract Co-Author*)
Kumaresan Sandrasegaran, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review major hereditary cancer syndromes affecting the gastrointestinal (GI) and genitourinary (GU) systems. 2. Understand current imaging-based screening protocols for these high-risk populations 3. Explore emerging research and discuss controversies regarding screening and surveillance in high-risk populations.

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Contents/Outline This exhibit highlights the role of radiologists in screening patients with cancer-predisposing germline mutations affecting GI and GU systems. Discussed symptoms include: • Familial Adenomatous Polyposis • Lynch Syndrome • Peutz-Jeghers • Juvenile Polyposis Syndrome • BRCA1 and BRCA2 • Li-Fraumeni • Multiple Endocrine Neoplasia Types 1 and 2• ATM, PALB2 • PRSS1 • Von Hippel-Lindau• Hereditary Leiomyomatosis Renal Cell Carcinoma• Hereditary Papillary Renal Cell Carcinoma • Birt-Hogg-Dubé • Cowden Syndrome (PTEN Hamartoma Syndrome) Clinical features, associated GI and GU tumors, recommended imaging screening strategies, and representative radiologic cases will be presented for each syndrome highlighting practical imaging pearls. Novel directions in cancer surveillance, including the use of whole-body MRI for radiation-free multi-organ screening and advances in radiomics for early lesion characterization, will be discussed. Additionally, we review areas of controversy regarding oncologic screening and surveillance in certain high-risk populations. Summary Familiarity with syndrome-specific screening protocols, characteristic imaging findings, and emerging tools empowers radiologists to directly impact patient outcomes. Early, tailored imaging can be life-saving for high-risk individuals.

MSEE-15 NEUROENDOCRINE TUMORS: GET IT STRAIGHT

Cecilia Vieira Leite (*Presenter*)
Sandra Baleato Gonzalez, MD, PhD (*Abstract Co-Author*)
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TEACHING POINTS

Neuroendocrine tumors are an heterogeneous group of tumors occurring at various anatomic sites and with a wide range of appearance in imaging studies. They represent around 1% of all malignancies, but with an increasing incidence worldwide.Understanding these tumors, their possible locations, imaging characteristics and how the radiological findings can impact the treatment approach are of key importance for a correct management.

TABLE OF CONTENTS/OUTLINE

- - Get the best out of your resources. Learn how to use different imaging techniques and how each of them can be useful for your diagnosis- - Be aware of where to look for. Describing the most typical locations and presentation forms, but also atypical locations and uncommon situations. - - Measure what matters. Knowing what and why describe tumor size, ADC values, SUV, texture. How they can correlate with prognosis and how they will impact management.- - See beyond. The behavior behind imaging. What the presence of necrosis, cystic degeneration, the vascularity, and what tumor margins can tell you. - - Game changing. Assessing resectability, embolization and theragnostics indications. Which criteria is important when considering surgical approach, vascular information, number of lesions, and how the presence of molecular and nuclear markers can influence treatment decisions.- - Getting the puzzle together. A radiological report with all the critical information your multidisciplinary team needs to know.

MSEE-16 GOT YOU UNDER MY SKIN: ULTRASOUND EVALUATION OF POST-FILLER NODULES

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Matheus Fritzen, MD (*Abstract Co-Author*)
Julia D. Zavariz, MD (*Abstract Co-Author*)
Mateus Esmeraldo, MD (*Abstract Co-Author*)
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TEACHING POINTS

To describe the ultrasound characteristics of different dermal fillers and post-filler nodules To distinguish non-inflammatory from inflammatory post-filler nodules using HFUS. To demonstrate the role of Doppler imaging in identifying active inflammation and vascularity.

TABLE OF CONTENTS/OUTLINE

A. Imaging Technique and Normal Skin Anatomy Use of =15-20 MHz HFUS for layered visualization Protocol for scanning face and subcutaneous compartments Importance of Doppler in evaluating vascularity B. Types of Fillers and Sonographic Patterns Hyaluronic Acid (HA): Pseudocystic anechoic, well-defined, typically avascular Calcium Hydroxyapatite (CaHA): Coalescent hyperechoic foci with acoustic shadowing Poly-L-lactic acid (PLLA): Hyperechoic deposits that become subtle after 15 days PMMA, Silicone, polycaprolactone (PCL), Hydrogel: Varying echogenicity and artifact signatures C. Non-inflammatory Nodules Product Redistribution: maintains the intrinsic sonographic aspects of the filler, but are in a different region than injectedInaccurate Placement: filler deposits are placed in an unintended layer (SMAS, intramuscular) Accumulation: Localized filler pooling D. Inflammatory Nodules and Reactions Granulomatous Inflammation: Abscess: Panniculitis E. Clinical Impact and Management Guidance Diagnostic clarification to avoid biopsy or surgery Ultrasound-guided therapy (e.g., hyaluronidase injection) Monitoring resolution and treatment response

MSEE-17 WHEN BEAUTY SPREADS: ULTRASOUND EVALUATION OF LYMPH NODE ALTERATIONS AFTER COSMETIC PROCEDURES

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TEACHING POINTS

Cosmetic materials such as silicone, PMMA, calcium hydroxyapatite, and tattoo pigment can migrate to lymph nodes and mimic malignant or infectious conditions on ultrasound. High-frequency ultrasound enables identification of echogenic foci, posterior artifacts, and vascular patterns that help distinguish reactive from suspicious nodes. Clinical correlation with prior aesthetic procedures is essential to avoid misdiagnosis and unnecessary biopsy or alarm. Radiologists must recognize the specific sonographic appearances associated with each material to accurately interpret lymph node alterations.

TABLE OF CONTENTS/OUTLINE

Introduction - Overview of lymph node changes after filler injections and cosmetic procedures. Normal Lymph Node Anatomy on Ultrasound - Key criteria and baseline appearance. Sonographic Findings of Migrated Materials a. Silicone: snowstorm artifact b. PMMA: hyperechoic foci with comet-tail artifacts c. Tattoo pigment: punctate foci and mild cortical thickening d. Calcium hydroxyapatite: reactive lymphadenopathy Case Examples - Ultrasound images and histologic correlations. Differentiating Benign from Malignant Patterns - Tips to avoid pitfalls. Conclusion - The importance of aesthetic history and sonographic expertise in lymph node evaluation.

MSEE-18 ONE DISEASE TO RULE THEM ALL? : THE MANY FACES OF IGG4-RELATED DISEASE AND RECENT TRENDS

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Steven S. Chua, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Recognize different presentations of IgG-4 related disease in various body organs. • Understanding how early diagnosis is important to prevent multi-organ failure. • Knowledge about common mimickers of IgG-4 related disease. • Correlating radiological features with serological and histopathological findings. • Recent trends and advancements in disease diagnosis.

TABLE OF CONTENTS/OUTLINE

• Introduction • Epidemiology and Pathophysiology • Diagnostic criteria • Common organ involvement with radiological images: 1. Pancreas 2. Biliary tree 3. Renal 4. Retroperitoneum 5. Lymph nodes 6. Orbits 7. Prostate 8. Hepatic pseudotumor 9. Vasculitis 10. Pulmonary • Pitfalls and atypical presentation. • Management and prognosis of disease. • Recent advances and future perspective • Summary

MSEE-19 IMAGING OF DERMATOLOGIC LESIONS ASSOCIATED WITH SYNDROMIC DISEASES

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TEACHING POINTS

• Recognize characteristic Imaging findings (ultrasound, MRI, DTI-tractography, etc) of skin lesions associated with syndromic diseases.• Understand how imaging differentiate dermatologic lesions in syndromic diseases from other soft-tissue masses, aiding in accurate diagnosis.

TABLE OF CONTENTS/OUTLINE

Cutaneous lesions are critical early biomarkers for over 30% of syndromic disorders, offering radiologists a unique opportunity to diagnosis syndromic disease before severe complications arise. For instance, xanthomas signal familial hyperlipidemia, a precursor to cardiovascular events, while neurofibromas in neurofibromatosis type 1 (NF1) precede malignant peripheral nerve sheath tumors (MPNSTs). Goals include (1) empower radiologists to recognize syndromic skin lesions through modality-specific hallmarks, (2) bridge imaging patterns to genetic disorders (e.g., desmoid tumors in FAP, lymphangiomas in Turner syndrome): Neurofibroma (NF1) Schwannoma (Neurofibromatosis Type 2 [NF2], Schwannomatosis) Desmoid Tumor (Familial Adenomatous Polyposis/Gardner Syndrome) Xanthoma (Familial

Hyperlipidemia) Lymphangioma (Turner/Noonan Syndrome) Angiofibroma (Tuberous Sclerosis Complex [TSC], MEN1) Calcinosis Cutis (CREST Syndrome, Dermatomyositis) Lupus Pernio (Sarcoidosis) Telangiectasia (CREST Syndrome) Erythema Nodosum (Sarcoidosis, Inflammatory Bowel Disease) Basal Cell Carcinoma (Gorlin Syndrome) MPNST (NF1) Angiokeratoma (Fabry Disease) Collagenoma (Multiple Endocrine Neoplasia Type 1 [MEN1]) Ehlers-Danlos Skin Features (Vascular Ehlers-Danlos Syndrome) § Scleroderma Skin Thickening (Systemic Sclerosis)

MSEE-20 FROM MALIGNANCY TO AESTHETICS: A COMPREHENSIVE APPROACH TO SKIN ASSESSMENT WITH ELASTOGRAPHY

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Gabrielle A. Zattar (*Abstract Co-Author*)
Giovanni G. Cerri, PhD (*Abstract Co-Author*)
Jose de Arimateia B. Araujo Filho, MD,PhD (*Abstract Co-Author*)
Natally Horvat, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- Elastography is an advanced ultrasound-based technique that assesses skin elasticity or stiffness, aiding in the evaluation of both pathologic and aesthetic conditions. - In dermatology, elastography provides important data and details, enhancing diagnosis, treatment planning, and monitoring across a range of conditions. - Applications include tumor characterization, fibrosis assessment, scar evaluation, identification and monitoring of filler or collagen biostimulation and it complications or outcomes.

TABLE OF CONTENTS/OUTLINE

1. Introduction to Elastography - Strain vs. Shear Wave Elastography 2. Applications: clinical, US and Elastography characteristics in: 2.1. Anatomic evaluation - Skin and anatomical layers, superficial musculoaponeurotic system, ligaments 2.2. Oncology : - Lesion identification: subtypes and characterization (melanona, basal cell carcinoma, squamous cell carcinoma, dermatofibrosarcoma protuberans, others) - Treatment: pre-operative mapping, margin, invasion, lymph nodes 2.3. Inflammatory Disorders - Scleroderma, psoriasis, hidradenitis suppurativa, lipedema 2.4. Scar and Keloid Assessment - Objective staging and treatment monitoring 2.5. Aesthetic Dermatology - Filler and collagen biostimulators identification, follow-up and complications 3. Advantages and Limitations - Functional, real-time, and non-invasive - Considerations: probe frequency, site variability, learning curve 4. Conclusion

MSEE-21 ISOMERISM EXPOSED: A STEPWISE ATLAS OF HETEROTAXY ANOMALIES

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TEACHING POINTS

Isomerism encompasses a spectrum from situs solitus to complete situs inversus, with situs ambiguous subdivided into right and left heterotaxy. It can be approached using a dual framework: i) Situs spectrum : solitus, total inversus, partial inversus, ambiguous (right/left isomerism); (ii) Organ-system compartments : thoracic, abdominal, extra-visceral. Recognition of atrial isomerism via atrial appendage morphology refines cardiac classification and guides sequential segmental analysis. Multimodality imaging is essential for comprehensive assessment and management planning.

TABLE OF CONTENTS/OUTLINE

Introduction Definition Embryological overview, etiopathological considerations and epidemiology Educational goals Clinical implications and management Role of imaging Spectrum and Classification Situs solitus and situs inversus totalis Partial inversus Situs ambiguous (heterotaxy) Right isomerism (asplenia) Left isomerism (polysplenia) Thoracic Compartment Bronchial isomerism and lung lobation Cardiac anomalies: Atrial isomerism Atrioventricular canal defects Conotruncal defects Vacular anomalies Systemic veins Pulmonary veins Arteries Abdominal Compartment Splenic variants: asplenia, polysplenia spectrum. Gastrointestinal anomalies Other visceral anomalies Extra-Visceral Systems Neurological anomalies Skeletal anomalies Diagnosis and Management Algorithmic framework for diagnosis 7. Take home lessons 8. References

MSEE-22 NEUROENDOCRINE TUMORS IN PLACES YOU WOULD NOT EXPECT

Darcy F. Carabantes Garcia, MD (*Presenter*)

TEACHING POINTS

Neuroendocrine tumor (NET) that arises from the enterochromaffin (or Kulchitsky) cells and can affect virtually any organ system in the body. A possible explanation for this association is the growth factors or mitogens secreted by carcinoid tumors, which may promote phenotypic changes in susceptible cells Several histologic types of malignant tumors can coexist with carcinoid and have been reported in up to 25% of cases. Multifocal or multiple carcinoid tumors can also be seen in the same patient at the time of presentation (described as synchronous) or at a later time (described as metachronous)after prolonged stimulation, inducing The most frequent sites for carcinoids are the gastrointestinal tract (73.7%) and the bronchopulmonary system (25.1%). However, almost any organ of the body can be involvedneoplastic transformation

TABLE OF CONTENTS/OUTLINE

- Know what neuroendocrine tumors are. -Identify the radiological characteristics and components of neuroendocrine tumors. - Exemplify in a didactic way the key points found from a series of cases of our institution

MSEE-23 HIGH FREQUENCY ULTRASOUND AT YOUR FINGERTIPS: A PRACTICAL GUIDE TO FOCAL LESIONS

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Marcelo R. Silva, MD (*Abstract Co-Author*)
Marcos R. Queiroz, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

The purposes of this exhibit are: To emphasize the importance of ultrasound for assessing pathologies of the hand and fingers To provide a visual guide for the diagnosis and differentiation of these lesions. To reduce the need for invasive tests.

TABLE OF CONTENTS/OUTLINE

To review the finger anatomy in ultrasound Illustrated teaching cases from our department showing the main differential diagnoses: Cystic lesions, Solid lesions, Inflammatory lesions, Tumor lesions, Nail apparatus Main lesions illustrated: Synovial cyst, Schwannoma, Foreign body, Myofibroma, Hemangioma, Subungual exostosis, Pyogenic Granuloma

MSEE-24 IMAGING CHAGAS DISEASE: A MULTIMODALITY MULTISYSTEMIC REVIEW FOR RADIOLOGISTS

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TEACHING POINTS

1.To review the pathophysiology of Chagas disease, including the life cycle of Trypanosoma cruzi and its effects on key organ systems. 2. To identify the clinical manifestations of Chagas disease, distinguishing between the acute and chronic phases, with emphasis on cardiovascular, gastrointestinal, and neurological involvement. 3. To analyze the roles of various imaging modalities, including echocardiography, CT, MRI, and scintigraphy, in the diagnosis and monitoring of Chagas disease. 4. To evaluate clinical scenarios where multimodality imaging is essential for accurate diagnosis and effective management of Chagas disease, particularly in endemic regions. 5. To compare Chagas disease with other conditions that present with similar imaging findings, enhancing differential diagnosis skills.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Overview of Chagas disease, its pathophysiology, parasitic life cycle, epidemiology, and clinical significance. 2. Radiological Manifestations: Imaging findings across key systems—cardiovascular, gastrointestinal, neurological, abdominal, and pulmonary. 3. Radiological Differential Diagnosis: Key radiological features distinguishing Chagas disease from other conditions with similar imaging presentations. 4. Take Home Messages: Key points for radiologists in diagnosing and managing Chagas disease, focusing on the multimodality approach and imaging insights.

MSEE-25 UPDATES ON IMAGING FOR SCREENING AND SURVEILLANCE FOR ABDOMINOPELVIC NEUROENDOCRINE NEOPLASMS

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TEACHING POINTS

Neuroendocrine neoplasms (NENs) have shown a significant increase in incidence and prevalence in the recent decades, primarily due to improved cross-sectional imaging, expanded use of endoscopic procedures and advanced genetic analysis. However, detection of the hereditary NENs is still a challenge due to heterogeneity in their presentation, variety of neoplastic locations and associated syndromes. Long term (or may be lifelong) follow-up imaging is needed not only for screening of these hereditary NENs, but also for surveillance of hereditary as well as sporadic NENs. This is because some of the hereditary NENs may even be detected in late adult life and, recurrence or metastatic disease may occur even up to or after 10 years after the curative treatment for prior NENs. Early detection and timed management can significantly reduce morbidity and mortality in these cases, for which comprehensive screening and surveillance programs centered around anatomic and functional imaging are needed in addition to biochemical tests, genetic counseling and testing for at-risk relatives to identify carriers.

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1) Introduction: Hereditary and sporadic NENs 2) National Comprehensive Cancer Network (NCCN) guidelines for: A) Screening of Hereditary NENs a) Hereditary Gastroenteropancreatic (GEP) NENs (e.g. MEN1, NF1, tuberous sclerosis, etc.) b) Hereditary GU NENs (e.g. VHL, MEN2, NF1, pheochromocytoma/paragangliomas, etc.) B) Surveillance guidelines for hereditary and sporadic NENs a) GEP NENs b) GU NENs 3) Role of anatomic and functional Imaging including CT, MRI, PET-CT with different tracers including FDG & somatostatin analog tracers like DOTATATE with illustrations 4) Conclusion

MSEE-26 UNDER PRESSURE: HOW RADIOLOGY REDEFINES THE DIAGNOSTIC AND THERAPEUTIC PATH IN SECONDARY HYPERTENSION

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Teresa Maria Seccia (*Abstract Co-Author*)
Gian Paolo Rossi (*Abstract Co-Author*)
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TEACHING POINTS

Hypertension is one of the principal risk factors for cardiovascular diseases, with a large role in overall death and disability. Secondary hypertension (SH) is due to an identifiable and treatable cause. Hypertension with renovascular origin can be identified with radiological imaging. Also renovascular disorder can be treated with interventional radiology (IR) procedures, that may be life saving in emergency situations like the Pickering syndrome. Primary Aldosteronism (PA) as a cause of SH uses both radiological imaging and IR for diagnostic purposes, and to lead the surgical therapy. Soon radiomic analysis will provide insight into the activity of adrenal

adenomas (AA). IR may also increase its importance in SH treatment thanks to percutaneous ablation as a mean to treat pheochromocytomas and functioning adenomas (FA) as causes of SH.

TABLE OF CONTENTS/OUTLINE

1. Characteristics suggestive of SH and its types 2. Renovascular hypertension (RVH): fibromuscular dysplasia and atherosclerosis as a cause and their physiopathology 3. RVH diagnosis: renal arterial duplex ultrasound technique, anatomical pitfalls and data interpretation; renal arteries CT and MRI study 4. RVH interventional radiology treatment: indication and technical application of renal angioplasty and stenting; emergency management and Pickering syndrome 5. PA: radiology role in diagnosis, CT and MRI characterization of AA, 6. Radiomics and AI: predictive models for subclinical FA 7. IR to lead the correct treatment: adrenal veins sampling objective, preparation and technique 8. Percutaneous ablation of AA and pheochromocytomas with curative intent: indications, risk and prevention of hypertensive crisis, ablation methods

MSEE-27 MULTIMODALITY IMAGING OF MEDIAN ARCUATE LIGAMENT SYNDROME

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TEACHING POINTS

The purpose of this exhibit is to: *Illustrate normal anatomy and pathophysiology of median arcuate ligament syndrome (MALS) using multimodality imaging, including CT, MR, ultrasound, and conventional angiography. *Describe a clinical framework for the diagnostic and therapeutic evaluation of MALS. *Review expected post-operative findings and complications.

TABLE OF CONTENTS/OUTLINE

*Epidemiology and presentation *Anatomy: normal celiac trunk and median arcuate ligament anatomy *Clinical approach to MALS: diagnostic and therapeutic framework for MALS, election considerations between imaging modalities *CT angiography: CTA technique and protocol, normal CTA appearance, and CTA findings of MALS *Ultrasound assessment: ultrasound technique, normal grayscale and Doppler appearance, and contrast-enhanced ultrasound *MR angiography: MRA technique and protocol, normal MRA appearance, and MRA findings of MALS *Conventional angiography *Treatment approaches: median arcuate release, adjunct procedures such as angioplasty, stenting, ganglia block, and celiac bypass *Post-operative imaging and complications *Imaging pitfalls: variant anatomy and mimics

MSEE-28 SKIN DEEP INSIGHTS: HIGH-FREQUENCY ULTRASOUND IN DERMATOLOGIC TUMOR ASSESSMENT

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TEACHING POINTS

Highlight the increasing role of high-frequency dermatologic ultrasound (HFUS) for non-invasive, high-resolution imaging of skin tumors and metastases. Demonstrate how HFUS surpasses computed tomography (CT) and magnetcic resonance imaging (MRI) in detailed visualization of key malignancy features (invasion depth, thickness, irregular margins, microcalcifications, vascularity). Emphasize the correlation between HFUS imaging findings and histopathological results in a case series from a referral center. Illustrate the crucial role of HFUS in diagnosis, clinical management, surgical planning, locoregional evaluation, and follow-up of skin tumors. Present characteristic HFUS features of basal cell carcinoma (BCC), squamous cell carcinoma (SCC), metastasis, Merkel cell carcinoma, and melanoma to aid radiologist identification. Underscore HFUS as a promising method complementing dermatologic diagnosis despite challenges in differentiating benign/malignant and histopathological types.

TABLE OF CONTENTS/OUTLINE

Epidemiology and main features of skin cancer The emerging role of HFUS in evaluating dermatological lesions Skins neoplasms ultrasound correlation with histopathology Representative cases from a dermatologic ultrasound service in a specialized hospital Imaging Findings: characteristics of BCC, SCC, metastasis, Merkel cell carcinoma and melanoma Conclusion and take-home messages

MSEE-29 THE DARK SIDE OF AESTHETIC ENHANCEMENT: A RADIOLOGIST'S GUIDE TO FOREIGN MODELING AGENT REACTIONS

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Hugo A. Cervantes Flores, MD (*Abstract Co-Author*)
Maria F. Ortiz Haro y Nasar, MEd (*Abstract Co-Author*)
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Johnatan Rubalcava Ortega, MD (*Abstract Co-Author*)

TEACHING POINTS

• Illustrate the appearance of a wide range of foreign modeling agents used in cosmetic procedures across imaging modalities (US, CT, PET-CT, MRI). • Present case-based examples of Foreign Modeling Agent Reactions (FMAR) from mild to severe. • Define and visualize iatrogenic allogenosis — foreign-body-induced tissue responses to non-biocompatible materials. • Integrate radiological, surgical, and histopathological correlations to explain FMAR mechanisms. • Highlight key findings and red flags to suspect adverse reactions across imaging modalities (US, CT, PET-CT, MRI).MeMention the main differentials and potential pitfalls of FMAR.

TABLE OF CONTENTS/OUTLINE

Introduction and background Definition of iatrogenic allogenosis and foreign modeling agent reactions (FMAR) Pathophysiology of foreign-body induced tissue responses. Case presentation of reactions from mild to severe including: - Edema - Granulomas - Infection - Fat Necrosis - Systemic siliconosis - Myositis and compartment syndrome Main differentials and potential pitfalls of FMAR Conclusions and Take home points.

MSEE-30 TINY PATIENTS, TANGLED VESSELS: DIAGNOSING PEDIATRIC VASCULITIS

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Yuko Tsujioka, MD, PhD (*Abstract Co-Author*)
Gen Nishimura (*Abstract Co-Author*)
Tatsuo Kono, MD (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Pediatric vasculitis encompasses a diverse group of disorders characterized by inflammation of blood vessels, leading to multi-organ dysfunction. Early diagnosis is essential to initiate therapy and prevent irreversible morbidities. As with viral infection, affected children present with non-specific inflammatory symptoms, such as fever, fatigue, and rash, making clinical diagnosis challenging. Distinct childhood-specific vasculitic phenotypes exist. IgA vasculitis is the most common, while Kawasaki disease ranks second in prevalence. Genetic defects in interferon metabolism cause infantile-onset chilblain vasculitis. Other pediatric vasculitides overlap with adult-onset forms, though prevalence and outcomes differ between these groups. Pediatric-specific diagnostic strategies are essential when evaluating affected children. Radiologists should recognize the broad spectrum of imaging findings across vasculitis subtypes to support multidisciplinary management. This presentation aims to summarize the current imaging perspectives of pediatric vasculitis.

TABLE OF CONTENTS/OUTLINE

Introduction—Large vessel vasculitis (Takayasu arteritis)—Medium sized vessel vasculitis (Kawasaki disease, childhood polyarteritis nodosa, etc.)—Small vessel granulomatous vasculitis (granulomatosis with polyangiitis, eosinophilic granulomatosis with polyangiitis)—Small vessel granulomatous vasculitis (IgA vasculitis, microscopic polyangiitis, etc.)—Others (Behcet disease, Cogan syndrome, vasculitis associated with connective tissue diseases, isolated vasculitis of the CNS, inteferonopathy-related vasculitis)

MSEE-31 BEHÇET'S DISEASE: A REVIEW OF MULTI-SYSTEM IMAGING FINDINGS

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Nicholas G. Matthees, MD (*Abstract Co-Author*)
Kalen Riley, MD, MBA (*Abstract Co-Author*)
David M. Melville, MD (*Abstract Co-Author*)
Cole P. Thompson, MD (*Abstract Co-Author*)
Roman Shrestha, MD (*Abstract Co-Author*)
Sedat G. Kandemirli, MD (*Abstract Co-Author*)
Darpan R Thakare (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)

TEACHING POINTS

Behçet’s Disease (BD) is a variable vessel vasculitis with multisystem clinical presentation. Imaging plays a role in diagnosis, management & surveillance. * BD presents as venous thrombosis and arterial pseudoaneurysms across various systems. Mucocutaneous and vascular systems are most commonly affected while the central nervous system and thorax are the most common sites of imaging findings. Other involved sites include gastrointestinal and musculoskeletal systems. * Management is individualized according to organs involved, severity of leading manifestations, age, and sex. * Imaging predicts prognosis. Increased mortality is associated with vascular and neurologic involvement.

TABLE OF CONTENTS/OUTLINE

Epidemiology * Pathology * Diagnosis * Clinical Features * Role of Radiology * Imaging Manifestations: Mucocutaneous: Oral and genital ulcers, folliculitis, erythema nodosum-like lesions, superficial thrombophlebitis. Ocular: Posterior or panuveitis, retinal vessel occlusion. Cardiovascular: Deep vein thrombosis, arterial narrowing, aneurysm, and occlusion, pericarditis, ruptured sinus of Valsalva, intracardiac thrombosis, periaortic pseudoaneurysm. Pulmonary: Recurrent pneumonia, subpleural alveolar infiltrates, pulmonary infarction, and hemorrhage. Gastrointestinal: Ulcers and complications, postoperative ulcer recurrence, downhill esophageal varices, Budd-Chiari syndrome due to thrombosis, pancreatitis. Mimicker of IBD. Central Nervous System: Parenchymal lesions, venous thrombosis, arterial aneurysm, occlusion, and dissection. Musculoskeletal: Arthritis, enthesopathy, avascular necrosis, myositis. * Prognosis * Treatment.

MSEE-32 MULTISYSTEM IMAGING FINDINGS AND COMPLICATIONS OF GLP-1 RECEPTOR AGONISTS: WHAT RADIOLOGIST SHOULD KNOW

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Negar Firoozeh, MD (*Abstract Co-Author*)
Farhad Pishgar, MD, MPH (*Abstract Co-Author*)
Antonio C. Westphalen, MD, PhD (*Abstract Co-Author*)
Dushyant Sahani, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Understand the expanding use of GLP-1 receptor agonists (e.g., Semaglutide) and their growing relevance in radiology practice.2. Review multisystem imaging findings involving adipose tissue, muscle, liver, bone, gastrointestinal tract, and CNS.3. Recognize imaging features of key complications, including pancreatitis, gastroparesis, and thyroid malignancy risk.4. Identify drug-specific challenges in nuclear medicine, PET imaging, and gastric emptying studies.5. Equip radiologists with tools to interpret and manage imaging variability related to GLP-1 agonist therapies.

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With Semaglutide use rapidly expanding, what should radiologists expect across imaging modalities? This exhibit reviews organ-specific changes, including reduced visceral and subcutaneous fat, improved hepatic steatosis, and evolving data on bone density and muscle composition. Can CT scan, ultrasound, or MRI reliably capture these changes?What are the imaging clues for GLP-1-related complications such as pancreatitis, gastroparesis, bowel obstruction, retinopathy, and thyroid cancer risk? How do we adjust for altered gastric emptying on scintigraphy or increased muscle uptake on FDG PET?We also address practical considerations: How long should GLP-1 agonists be withheld before functional imaging? Are new protocol standards needed? This exhibit empowers radiologists to recognize drug-related patterns, avoid interpretation pitfalls, and adapt practice to this fast-changing therapeutic landscape.

MSEE-33 THE SUBSTANCE! IMAGING COMPLICATIONS OF THE “PERFECT” BODY CREATED BY ANABOLIC ANDROGENIC STEROIDS

Beatriz Oliveira, MD (*Presenter*)
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TEACHING POINTS

- Discuss the raise in abuse of anabolic steroids - Provide an overview of the side effects caused by the use of anabolic androgenic steroids. - Describe the imaging findings of potential complications related to steroid use, organized by body system. - Contribute to raise awareness of complications of anabolic steroids in imaging evaluation.

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INTRODUCTION - Define Anabolic Androgenic Steroids - Recognize the increasing trend of misuse, especially among individuals seeking enhanced athletic and aesthetic performance. - Discuss that the misuse of anabolic androgenic steroids leads to serious complications that affect multiple organs and tissues. OBJECTIVE - Highlight the importance of imaging exams in identifying and assessing complications related to anabolic androgenic steroids use. - Describe imaging findings of these potential complications by organ system ->Cardiovascular and Thoracic: cardiomegaly, myocarditis, asymmetric hypertrophic cardiomyopathy with fibrosis, pulmonary thromboembolism, septic embolism. ->Central Nervous System: venous thrombosis, intraparenchymal hematoma. ->Musculoskeletal: myositis and pyomyositis, fasciitis. ->Gastrointestinal system: hepatic adenoma, peliosis, sinusoidal alterations. CONCLUSION - Contribute to accurate diagnosis and early treatment through proper imaging interpretation. - Reinforce the central role of radiologist in diagnosis of anabolic steroids complications, since in some cases patients may deny the use of any substances at first.

MSEE-34 EXTRAMEDULLARY HEMATOPOIESIS: A COMMON ENTITY WITH VARIABLE IMAGING PRESENTATIONS

Anthony Sposato, MD (*Presenter*)
Ashwin Panda, MD (*Abstract Co-Author*)
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TEACHING POINTS

1. Review the causes of Extramedullary hematopoiesis (EMH), including hematopoiesis deficiencies such as myelofibrosis, anemia, and thalassemia, in the setting of immunosuppressive medication and secondary to hematological malignancies 2. Review the pathophysiology of EMH 3. Review the variable imaging appearance of EMH (radiographs, CT, PET/CT) 4. Present EMH in multiple body parts

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- Definition and causes of EMH - Review the imaging features of EMH in multiple body parts utilizing a case-based approach: 1. Paraspinal EMH suspected on radiograph, characterized on CT scan, and confirmed by biopsy 2. Giant paraspinal EMH causing symptomatic respiratory distress 3. Perirenal EMH seen on PET/CT in a patient with relapsed lymphoma 4. Presacral EMH in the setting of anticancer medication use

MSEE-35 MELANOMA'S GREAT ESCAPE: THE PATHWAYS OF DISSEMINATION

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TEACHING POINTS

-Know the Breslow classification as a prognostic variable. -To understand the pathways of melanoma dissemination. -Know the different forms of presentation of melanoma metastasis in different organs.

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Relevance and main challenges for radiologist in the staging of metastatic melanoma - Illustrated review of local staging of melanoma. - Review the different dissemination pathways of melanoma, including illustrations ofthe three proposed models: the "stepwise step" model, the "simultaneous spread" model and the "differential spread" model. - Overview of inmune escape and metastasis mechanisms in melanoma. - Pictorial review of the main metastatic sites and their organ-specific imaging presentations, through different imaging techniques. Melanoma is one of the most aggressive and lethal skin neoplasms, with a marked tendency to metastasize to multiple organs via both lymphatic and hematogenous routes. Emerging theories on metastatic dissemination, including the concept of immune escape, highlight the need for a refined diagnostic approach. In this context, radiologists play a key role in actively detecting metastases and recognizing organ-specific imaging patterns, which are reviewed in this presentation.

MSEE-36 ONE DELETION, MANY HITS: A RADIOLOGIC ATLAS OF SMARCB1-DEFICIENT TUMOURS ACROSS THE BODY

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Suyash Kulkarni, DDS, DMRD (*Abstract Co-Author*)
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TEACHING POINTS

1. Understand the role of the SMARCB1 gene and the SWI/SNF chromatin remodelling complex as a tumour suppressor. 2. Explore the spectrum of SMARCB1-deficient tumours across multiple organ systems. 3. Appreciate the diversity of histomorphological appearances (carcinoma/sarcomas) of tumours resulting from this shared genetic alteration. 4. Recognise the diverse imaging appearances of these tumours across various sites. 5. Assess the prognostic and therapeutic relevance of identifying SMARCB1 loss in clinical practice.

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1. Genetics: The role of the SWI/SNF chromatin remodelling complex and its SMARCB1 subunit in tumour suppression 2. Spectrum of SMARCB1-Deficient Tumours: Overview of tumours with reduced, mosaic, or absent SMARCB1 expression across organ systems 3. Anatomic Distribution and Imaging Characteristics: A region-wise radiological review of SMARCB1-deficient neoplasms 4. Prognostic and Clinical Implications: The impact of identifying SMARCB1 loss on diagnosis, treatment, and outcomes

MSEE-37 WHAT TO KNOW FOR FEMALE DYNAMIC PELVIC FLOOR MR IMAGING

Man B. Dai, MD (*Presenter*)

TEACHING POINTS

1) Understand normal female pelvic floor anatomy and appearance on MR imaging. 2) Develop a systemic approach for interpreting dynamic pelvic floor MR imaging. 3) Recognize and effectively report female pelvic floor pathologies on dynamic pelvic floor imaging.

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1) Overview of female pelvic floor prolapse - epidemiology, clinical significance, presentation and treatment. Role of MRI. 2) Normal pelvic floor anatomy. 3) Dynamic pelvic floor MRI protocol. 4) Pictorial review of pelvic floor pathologies on dynamic pelvic floor MRI Quantifications of findings: pubococcygeal line (PCL), H-line, M-line, anorectal angle. Anterior compartment pathologies - cystocele, urethral hypermobility. Middle compartment pathologies - uterine/vaginal prolapse. Posterior compartment pathologies - rectocele, rectoanal intussusception with Oxford Grading scale, peritoneocele, enterocele, sigmoidocele. Spastic pelvic floor syndrome. 5) Sample reporting. 6) Summary and take-home points.

MSEE-38 HERE AND THERE... SYNOVIAL SARCOMAS EVERYWHERE!

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TEACHING POINTS

Synovial sarcoma (SS) is a rare type of soft tissue sarcoma accounting for 5-10% of cases. It mainly affects adolescents and young adults (mean age 39 years). They originate in primitive mesenchymal cells and not in the synovial membrane. The etiologic cause of SS is believed to be a chromosomal abnormality that is usually present in more than 90% of cases, known as T(x; 18) (P11.2; q11.2). Histologically, it presents in three types: monophasic (most common), biphasic, and poorly differentiated (worse prognosis). It usually occurs near the joints (frequently in the lower extremities, around the knee). However, it can be located in other regions of the body, although much less frequently, in the intra-abdominal or intra-thoracic cavity, or at the level of the head and neck, which is much rarer. As for imaging studies, magnetic resonance imaging is the technique of choice, as it shows areas of hyperintensity, isointensity, and hypointensity, indicating the mixture of cystic and hemorrhagic areas with a signal intensity three times higher. In some cases, tomography may contribute to the identification of calcifications. However, histological confirmation is necessary for diagnosis and treatment. The five-year survival rate is 75%. For this, locoregional (surgery or radiotherapy) or systemic management are available.

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Intra-thoracic synovial sarcoma.Intra-abdominal synovial sarcoma.Synovial sarcoma in the head and neck.

MSEE-39 PARADIGM SHIFT TOWARD A PATIENT-CENTERED MRI SCREENING STRATEGY FOR GENETIC AND FAMILIAL HIGH-RISK ADULTS

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Katherine M. Krajewski, MD (*Abstract Co-Author*)
Jyothi Priya Jagannathan, MD (*Abstract Co-Author*)
Abdullah S. Al-Yousef, MD (*Abstract Co-Author*)
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TEACHING POINTS

• MRI screening is increasingly used for early cancer detection in individuals with hereditary cancer syndromes, offering a high-sensitivity imaging tool. • Growing shift to gene-based, multi-organ MRI strategies tailored to individual genetic and familial risk. • Radiologists must be familiar with hereditary cancer syndromes, associated gene mutations, and current MRI screening recommendations to interpret risk-adapted imaging protocols.

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1) Introduction to MRI-Based Screening and the Radiologist's Role Increasing incorporation of MRI screening for hereditary cancer syndromes Paradigm shift toward gene-based, multi-organ MRI screening Radiologists' role: integrating genetic/familial risk into personalized protocols 2) Summary of Cancer-Based Screening Strategies Using MRI Importance of radiologist familiarity with MRI screening guidelines MRI screening recommendations now span a range of cancers and associated gene mutations: including breast, ovarian, prostate, pancreatic, hereditary colorectal, and renal cancers, as well as Li-Fraumeni syndrome, neurofibromatosis types 1 and 2, pheochromocytoma/paraganglioma, and multiple endocrine neoplasia types 1 and 2. 3) Clinical Cases MRI representative cases illustrating early cancer detection. Emphasis on the impact of personalized, precision screening in high-risk individuals

MSEE-41 NEXT-GENERATION T-CELL ENGAGING ANTI-CANCER THERAPIES: CAR-T, BISPECIFIC ANTIBODIES, AND T-CELL ENGAGERS: WHAT RADIOLOGISTS SHOULD KNOW?

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Nari Kim (*Abstract Co-Author*)
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Katherine M. Krajewski, MD (*Abstract Co-Author*)

TEACHING POINTS

To provide radiologists with a comprehensive understanding of next-generation T-cell engaging immunotherapies, specifically CAR-T cells, bispecific antibodies (BsAbs), and bispecific T-cell engagers (BiTEs), highlighting their mechanisms, clinical applications, imaging findings, and immune-related adverse events, enabling improved interpretation and multidisciplinary care in cancer imaging.

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1. Overview of T-cell Engaging Therapies - Mechanisms of action of CAR-T, BiTEs, and BsAbs. - Comparison of structural design and immunologic synapse formation. 2. Current Clinical Applications and Agents - FDA-approved agents: Axicabtagene ciloleucel, Blinatumomab, Teclistamab, etc. - Indications in hematologic and solid malignancies. 3. Imaging Patterns of Treatment Response - Usual response pattens including early dramatic response - Atypical response patterns including pseudoprogression and hyperprogression. - Limitations of RECIST and LUGANO and the role of iRECIST and LYRIC. 4. Imaging of Immune-related Toxicities - Cytokine Release Syndrome (CRS), Immune effector Cell-Associated Neurotoxicity Syndrome (ICANS), and opportunistic infections. - Radiologic clues for early identification. 5. What Radiologists should know? - Suggested imaging protocols and timepoints in clinical trials. - Checklist for structured reporting and communication tips in tumor boards.

MSEE-42 "NINJA TUMORS": THE RADIOLOGIST'S CHALLENGE IN DETECTING TUMORS OF UNKNOWN PRIMARY

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Shingo Omata, MD (*Abstract Co-Author*)
Yoshifumi Noda, MD, PhD (*Abstract Co-Author*)
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Tetsuro Kaga, MD, PhD (*Abstract Co-Author*)
Yukiko Takai (*Abstract Co-Author*)
Hiroki Kato (*Abstract Co-Author*)
Masayuki Matsuo, MD (*Abstract Co-Author*)

TEACHING POINTS

- To demonstrate the imaging features of tumors of unknown primary origin, including those with regressed, masked, or ectopic primaries.- To outline a systematic diagnostic approach that integrates imaging findings with clinical and laboratory data.- To emphasize the radiologist's role in localizing and characterizing elusive primaries, impacting patient care.

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1. Concept - Definition and clinical importance of tumors with elusive or undetectable primaries2. Case-Based Imaging Review of "Ninja Tumors" by Pathophysiologic Categories - Regressed/small primaries: burned-out testicular tumor, occult thyroid tumor, occult breast cancer, AFP-producing gastric carcinoma- Lack of tumor markers: small cell prostate carcinoma with low PSA- Extensive metastasis obscuring origin: primary peritoneal carcinoma, low-grade appendiceal mucinous neoplasm- Ectopic origin: papillary carcinoma in ectopic thyroid tissue, cryptorchidism-related seminoma3. Diagnostic and Management Strategy - Recognition of metastatic pathways (lymphatic, hematogenous, transcoelomic)- Integration of tumor markers (AFP, pro-GRP, CA-125, PSA, etc.) with imaging- The impact of identifying the primary tumor on treatment decisions and prognosis4. Conclusion Awareness of these "Ninja Tumors" and recognition of imaging and clinical patterns can guide appropriate diagnostic testing and improve patient outcomes.

MSEE-43 FROM HEAD TO TOE: ROLE OF WHOLE-BODY MRI IN LI-FRAUMENI SYNDROME

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TEACHING POINTS

Li-Fraumeni Syndrome (LFS) is an autosomal dominant hereditary cancer syndrome caused by a mutation in the TP53 tumor suppressor gene and development of multiple neoplasms. Whole-Body MRI (WB-MRI) is a highly sensitive method for screening for surveillance in LFS patients, without ionizing radiation exposure. This study aims to discuss the role of WB-MRI in the surveillance of patients with LFS, including international protocols recommendations, highlighting its importance in the multidisciplinary management of this genetic condition.

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Introduction:LFS is a genetic disorder caused by a mutation in a tumor suppressor gene. Approximately 50% of affected individuals develop at least one LFS-associated cancer before the age of 30.Therefore, the implementation of screening and surveillance strategies is essential to identify and treat potential malignancies at an early stage, improving both survival and quality of life. In this context, imaging takes a central role in the follow-up of these patients, with emphasis on WB-MRI, which offers high sensitivity for detecting suspicious lesions without the use of ionizing radiation. Development:Description and discussion of LFS and its most up-to-date follow-up and surveillance protocols, with a focus on the role of imaging studies—particularly WB-MRI—including illustrative case examples from a tertiary public healthcare institution.

MSEE-44 NON-VASCULAR MALFORMATION DISEASES MIMICKING AND MISDIAGNOSED AS COMMON VASCULAR MALFORMATIONS: A PICTORIAL REVIEW

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Hiroyuki Uetani, PhD (*Abstract Co-Author*)
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TEACHING POINTS

Vascular malformations are relatively common conditions encountered in everyday clinical practice. Common vascular malformations are classified into low-flow (venous and lymphatic) and high-flow (arteriovenous) malformations based on their hemodynamic characteristics. These malformations arise from errors in the process of vascular development and can present with a variety of clinical manifestations. Some tumors and tumor-like lesions can mimic these common vascular malformations clinically and radiologically, increasing the diagnostic challenge and the possibility of misdiagnosis. Accurate differentiation of vascular malformations from those nonvascular malformation lesions is crucial, as the natural history, treatment strategies, and prognosis of each condition are fundamentally different. Misdiagnosis can lead to inappropriate interventions and delayed treatment, which may adversely affect patient outcomes, especially in the case of potentially malignant diseases. In this exhibition, we will review imaging and clinical features of a variety of diseases that can mimic common vascular malformations with illustrative cases and discuss several points to reduce the risk of misdiagnosis.

TABLE OF CONTENTS/OUTLINE

1.General clinical and imaging features of the common vascular malformations2.Diseases mimicking arteriovenous malformation3.Diseases mimicking venous malformation4.Diseases mimicking lymphatic malformation

MSEE-46 FROM THE GARDEN TO THE READING ROOM: SOME NATURAL RADIOLOGY SIGNS

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Pablo A. Cikutovic SR, MD (*Abstract Co-Author*)
Carlos R. Riquelme, MD (*Abstract Co-Author*)
Francisco J. Garrido Cisterna, MD (*Abstract Co-Author*)
Alvaro Huete Garin, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Many radiologic signs are named after fruits, flowers, or plant-like forms due to visual resemblance, aiding in recognition and recall. 2. Understanding the clinical significance of these nature-inspired signs is essential for accurate diagnosis and appropriate patient management

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1. Introduction 2. Learning objectives 3. Radiologic signs: Neuroradiology: palm tree sign Abdomen and pelvis: apple core sign, cloverleaf sign, lotus flower sign, nutcracker syndrome, coffee bean sign, onion skin appearance, staghorn calculi, cauliflower morphology Chest: tree-in-bud pattern, ginkgo leaf sign MSK: bamboo spine, rice bodies Pediatrics: greenstick fracture, fallen lily sign 4. Conclusions

MSEE-47 WHOLE-BODY MRI IN ONCOLOGY: FROM FUNDAMENTALS TO CLINICAL PRACTICE

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Mariana C. Kucharczyk, MD (*Abstract Co-Author*)
Fernando D. Losada Lopez, MD (*Abstract Co-Author*)
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TEACHING POINTS

Understand the expanding role of whole-body MRI (WBMRI) in oncologic imaging, from initial detection and staging to treatment response assessment. Review technical fundamentals and standardized acquisition protocols essential for accurate interpretation. Emphasize the importance of structured reporting systems such as MY-RADS

and MET-RADS in response evaluation. Demonstrate, through real-world case examples, how WBMRI provides both functional and anatomical insights into marrow and extramedullary disease in various solid and hematologic malignancies.

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Introduction "Why Whole-Body MRI?": Overview and limitations of traditional imaging. Whole-Body MRI basics: Key sequences (DWI, Dixon), technical parameters, and acquisition strategies for protocol optimization and workflow efficiency. Clinical applications: Marrow and extramedullary disease detection in various cancers, both solid and hematologic. Interpretation and response assessment criteria: Standardized criteria using MY-RADS and MET-RADS systems. Case-Based review: Imaging examples illustrating typical findings and practical interpretation challenges

MSEE-48 THORACIC DISORDERS WITH MUSCULOSKELETAL SYSTEM INVOLVEMENT

Babina Gosangi, MD, MPH (*Presenter*)

TEACHING POINTS

Numerous medical conditions have multiorgan imaging findings. Here, we review specifically thoracic disorders involving the musculoskeletal system. These correlations are meant to remind the astute clinician that certain thoracic disorders with MSK involvement should trigger a careful evaluation for multisystemic processes.

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1. Introduction. 2. Examples of cases: a. Connective tissue disorders- Rheumatoid arthritis, Raynaud's syndrome, SLE, Dermatomyositis b. Hereditary conditions: Marfan, Ehlers Danlos, sickle cell disease c. Metabolic- Hyperparathyroidism, Renal failure with osteodystrophy and metastatic calcification in the lungs d. Infectious conditions: Tuberculosis, septic embolism e. Neoplastic conditions: lung cancer, melanoma. 3. Conclusion.

MSEE-49 DECODING IGG4-RELATED DISEASE: A MULTISYSTEMIC ABDOMINAL AND PELVIC PERSPECTIVE

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Teresa A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

IgG4-related disease (IgG4-RD) is a chronic immune-mediated condition with multisystemic involvement, characterized by fibroinflammatory infiltration of various organs induced by plasma cells that express (immunoglobulin G subclass 4). Radiologic findings are often characteristic and, when correlated with clinical and histopathologic criteria, can avoid unnecessary interventions. Familiarity with organ-specific patterns and key differential diagnoses is essential for radiologists. In this exhibit we will: - Review the typical findings of the IgG4-related abdomen and pelvis. - Classify them according to their location. - Review the keys for diagnosis and their main differential diagnosis.

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1) Introduction, Clinical and Histopathological findings. 2) Diagnosis and Classification criteria. 3) Role of different modalities. 4) Entities based on location Pancreatic disease Pancreas - Autoimmune Pancreatitis Extrapancreatic disease Bile duct - Sclerosing cholangitis and Gallbladder disease. Kidney and Ureter- Tubulointerstitial nephritis Retroperitoneum - Retroperitoneal fibrosis, lymphoplasmacytic aortitis Mesentery - Sclerosing mesenteritis Prostate - Prostatitis Lymph node - Lymphadenopaty 5) Differential diagnosis Infections Inflammatory Neoplasms 6) Conclusions 7) Summary

MSEE-50 STATE-OF-THE-ART IMAGING BIOMARKERS IN SCREENING OF CARDIOVASCULAR DISEASE

Prabhakar Rajiah, MD, FRCR (*Presenter*)

TEACHING POINTS

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality. Atherosclerosis is a long, progressive, silent process that may manifest first as an acute event. 1. To discuss categories of cardiovascular risk 2. To discuss the goals of screening for CVD in asymptomatic individuals. 3. To review the current clinical strategy for screening CVD. 4. To explore the state-of-the-art imaging tools available for screening CVD.

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A. Introduction B. Strategies for CVD screening C. Risk prediction tool - ASCVD calculator-age, gender, race, smoking blood tests (lipids, glucose), BP - SCORE 2, SCORE 2-OP D. Lab biomarkers- ApoA, ApoB, hs-CRP, BNP, lipoprotein (a) [Lp(a)], cholesterol remnants, LDL particles, etc E. Early tests - Stress ECG, exercise testing F. Imaging tests and biomarkers used for screening CVD- Discussion with case examples i. Coronary artery calcium score ii. Calcium score from routine chest CT, x ray iii. Coronary plaque characterization iv. Plaque quantification- Qualitative, semi-quantitative, quantitative v. Peri-coronary adipose tissue attenuation (PCAT)- vi. Epicardial adipose tissue (EAT) quantification vii. Coronary artery stenosis assessment viii. Radiomics ix. Other calcium- aortic valve, mitral annulus, thoracic aorta, abdominal aorta x. Carotid-intimate media thickness xi. Carotid MRI xii. Aortic arterial stiffness xiii. Aortic MRI xiv. Ankle brachial index xv. Breast arterial calcification xvi. Brain white matter hyperintensities G. Imaging for risk assessment and secondary prevention i. CT-fractional flow reserve ii. Myocardial perfusion iii. Extracellular volume iv. Late iodine enhancement v. Bone mineral density, liver attenuation

MSEE-51 MULTIMODALITY IMAGING OF COMPLICATIONS OF DIABETES MELLITUS

Prabhakar Rajiah, MD, FRCR (*Presenter*)
Kevin R. Kalisz, MD (*Abstract Co-Author*)
Sudhakar K. Venkatesh, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

1. To review the pathophysiology of diabetesmellitus (DM).2. To discuss the complications related to DM. 3. To describe the role of imaging in theevaluation of DM complications. 4. To illustrate the imaging appearances of variouscomplications of DM.

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1. DM- Pathophysiology 2. Role of Imaging- Radiograph, ultrasound,CT, MRI, nuclear medicine, echocardiography3. Discussion and illustration of thefollowing complications of DM with case examples A. Cardiac - Coronary artery disease- CardiomyopathyB. Vascular - Peripheral arterial disease- Medial arterial sclerosisC. Thoracic - InfectionsD. Gastrointestinal - Fatty liver- Emphysematous cholecystitis- Pancreatitis- Pancreatic atrophy- Actue necrotizing esophagus- Pneumatosis cystoides intestinalisE. Genitourinary - Xanthogranulomous pyelonephritis- Emphysematous pyelonephritis/cystis- Renal papillary necrosis- Medullary nephrocalcinosis- Renal papillary necrosis- Renal abscess- Renal disease- Polycystic oveary- Vascular erectile dysfunction- Calcified vas defernsF. Musculoskeletal - Neuroarthropathy- Myopathy- Necrotizing fasciitis- Fournier's gangrene- Amyloid deposits- Spinal epidural abscess- Osteomyelitis- Spondylodiscitis- Muscle denervation- Insulin ballG. Breast - MastopathyH. Neurologic - Stroke- Non-ketotic hyperglycemia hemichorea- Dementia- Malignant otitis externa- Hyperostotosis frontalis interna- Neuropathy

MSEE-52 STATE-OF-THE-ART PHOTON COUNTING CT IN MULTISYSTEM VASCULAR IMAGING

Prabhakar Rajiah, MD, FRCR (*Presenter*)

TEACHING POINTS

To review the benefits of photon-counting detector (PCD) CT in vascular imaging To discuss the parameters to be optimized for PCD-CT in vascular imaging To illustrate the clinical applications of PCD-CT in vascular imaging

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PCD CT TECHNOLOGIES Single source, Dual-source BENEFITS OF PCD-CT -a) Ultra-high spatial resolution b)Multi energy (ME) imaging c)K-edge imaging- multi/novel contrast media d) High vascular signal e) Low electronic noise & artifacts f)Lower radiation & contrast doses TECHNICAL ASPECTS FOR VASCULAR IMAGING a)Scan modes- Ultra-high resolution (UHR), multi-energy, UHR-ME, Flash-ME, gated/ungated b)Kernels- Smooth, Sharp c) Collimation, matrix d) Images - Single energy (T3D), VMI, Material-specific (iodine, Virtual non contrast, virtual non calcium) e) Radiation doses, CARE keV VASCULAR APPLICATIONS OF PCD CT WITH CASE SAMPLES a)UHR - Improved small vessel visualization (Perforator flaps; Artery of Adamkiewicz; arteries of hand, feet, head), calcified plaques, small stents b)High iodine CNR (low-energy VMIs)- Low contrast dose studies, salvage of suboptimal-enhanced studies c) Decreased artifacts - Calcium blooming, beam hardening, metal d)ME calcium separation Improved lumen visualization e)ME bone subtraction - Rapid and accurate f)ME lesion characterization hematoma vs active bleed vs calcification g) Vascular perfusion - Lung, myocardium, extremities h) Multi-contrast,novel contrast media - e.g. iodine and gadolinium i)Advanced material separation - Calcium j) Radiation dose reduction - VNC in multiphasic studies, lower noise profile LIMITATIONS, PITFALLS a) Image storage and transfer issues b)Noise in UHR c) Artificial-looking images

MSEE-53 NOW SCREENING: THE ROLE OF IMAGING IN SURVEILLANCE OF PATIENTS WITH CANCER PREDISPOSITION SYNDROMES

Victoria Chernyak, MD, MS (*Presenter*)
Milana Flusberg, MD (*Abstract Co-Author*)
Mariya Kobi, MD (*Abstract Co-Author*)
Lyndon Luk, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review various cancer predisposition syndromes, including genetic mutations and associated cancers 2. To learn about imaging surveillance recommendations for various cancer predisposition syndromes3. To learn the recommended imaging modalities for various surveillance strategies

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1. Background: a. Objectives of surveillance b. Imaging modalities for cancer surveillance 2. Breast Cancer a. BRCA1/2 mutation, Li Frumeni, PALB2/CHEK2/ATM/CDH1 mutations, Cowden syndrome, Hereditary Diffuse Gastric Cancer, Peutz-Jeghers Syndrome b. Annual breast MRI in addition with annual mammography with tomosynthesis 3. Ovarian cancer a. BRCA1/2 mutation, Lynch syndrome b. Transvaginal ultrasound with serum CA-125 4. Pancreatic Cancer a. Familial pancreatic cancer syndrome, Peutz-Jeghers syndrome, hereditary pancreatitis, Lynch syndrome, BRCA1/BRCA2/PALB2/ATM/ CDKN2A mutations b. MRI/magnetic resonance cholangiopancreatography and endoscopic ultrasound 5. Colorectal cancer a. Lynch syndrome, familial adenomatous polyposis, Peutz-Jeghers syndrome, juvenile polyposis syndrome b. Screening with colonoscopy; the age at initial screening varies by syndrome 6. Thyroid cancer a. Multiple endocrine neoplasia type 2, PTEN hamartoma syndrome, familial adenomatous polyposis type 1 b. Thyroid ultrasound 7. Renal cancer a. Von Hippel-Lindau syndrome, Hereditary Leiomyomatosis and Renal Cell Cancer syndrome, Birt-Hogg-Dubé syndrome, tuberous sclerosis b. Annual CT or MRI 8. Li-Fraumeni Syndrome (TP53 mutation): a. Close to 100% lifetime cancer risk b. Whole-body MRI for annual surveillance

MSEE-55 CUSHING SYNDROME

Benjamin Srivastava (*Presenter*)
James Hwang, MD (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)
Khaled M. Elsayes, MD, PhD (*Abstract Co-Author*)
Rachita Khot, MD (*Abstract Co-Author*)
Ajay Malhotra, MD, MMM (*Abstract Co-Author*)
Shehbaz M. Ansari, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. MRI plays an essential role in the diagnosis of Cushing's disease caused by an ACTH-secreting pituitary adenomas2. Dedicated adrenal imaging with CT or MRI differentiates ACTH-independent Cushing’s syndrome3. Integration of imaging findings of Cushing’s disease and syndrome with clinical and laboratory values helps to avoid misdiagnosis4. Ectopic ACTH Syndrome and adrenal tumors may also result in the development of Cushing’s Syndrome5. Early detection and appropriate management of Cushing's disease are vital to prevent complications and improve patient outcomes.

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1. Pathophysiology of Cushing’s syndrome spectrum- differentiation and clinical/laboratory presentation2. Exogenous causes, associated conditions and role of imaging CT/MR/US:o prolonged use of corticosteroid medications (prednisone, ect) in pts with asthma, lupus, or rheumatoid arthritis.?3. Endogenous causes and role of imaging CT/MR/US: Pituitary Adenomas (Cushing's Disease) Benign tumors of the pituitary gland that secrete excess adrenocorticotropic hormone (ACTH), stimulating cortisol production. Ectopic ACTH Syndrome (Paraneoplastic syndrome) ACTH is produced by tumors located outside the pituitary gland, such as in the lungs or pancreas. Adrenal Tumors Benign (adrenal adenoma and hyperplasia) or malignant tumors of the adrenal glands (Adrenocortical carcinoma) that produce excess cortisol independently 4. Complications: adrenal hyperplasia, osteoporosis/fractures, avascular necrosis, brain atrophy, cardiovascular changes (LV hypertrophy).5. Most common management and treatment options

MSEE-56 SOMETHING DOES NOT BELONG: ABC’S OF FOREIGN BODIES

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Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Gabriel Frattallone, MD (*Abstract Co-Author*)
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Amanda P. Marrero-Gonzalez, MD, BS (*Abstract Co-Author*)

TEACHING POINTS

1. Provide a comprehensive review of frequent and uncommon foreign bodies (FB), emphasizing their key imaging features. 2. Review types of FB by location 3. Understanding the expected attenuation of different materials on imaging modalities 4. Discuss the advantages and limitations of various imaging techniques in detecting FB 5. Use a glossary for visual representation, facilitate study, and recognition of FB.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Objectives 3. Anatomy review 4. Expected attenuation of the different foreign body material in US, CT and X-ray (metal, plastic, wood, glass, bones, etc). 5. Review of foreign bodies by etiology: = Arising from ingestion or introduction through natural orifices - Eye, ear - Gastrointestinal and genitourinary tracts - Airway - Vagina = Iatrogenic / post-surgical = Traumatic = Others: Fistula (peritoneal cavity) 6. Complications 7. Structured radiology report 8. Conclusion Abstract: FBs are common in emergency medicine,often presenting diagnostic and management challenges. The management of FBs involves three key considerations: accurate characterization of the material, detection of complications, and effective documentation. This exhibit simplifies FB evaluation through a creative glossary analogy, reviews imaging techniques, and provides guidance on thorough radiology reporting. It aims to educate medical students, residents, and imaging specialists.

MSEE-57 LOCKED, LOADED, AND READY TO SCAN: TRY NOT TO MISS THESE RADIOLOGY SIGNS

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Claudia M. Muns, MD (*Abstract Co-Author*)
Jorge Machicote, MD, MSc (*Abstract Co-Author*)
Ana Ayala (*Abstract Co-Author*)
Carlos J. Perez, MD (*Abstract Co-Author*)
Jose A. Lara, MD (*Abstract Co-Author*)

TEACHING POINTS

Learn to recognize important radiological findings inspired by weapons and munitions. Use real cases from our institution to apply knowledge to clinical scenarios and improve diagnostic acumen. Participate in a detective-style narrative to investigate radiological signs, for a creative memorable way to remember these signs.

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Objectives III. Anatomy Review IV. Weapon signs and imaging findings Suspect Weapon Clues Crime Scene Case Summary VII. Conclusion This exhibit explores over 15 weapon-themed radiologic signs, which aid diagnosis but may be unfamiliar to modern radiologists. Using a detective-themed approach, it presents visual examples, real clinical cases, and a crime-solving narrative to enhance learning. Participants will analyze "clues" and "crime scenes" (imaging modality and anatomical regions), "weapons" (signs/radiologic findings), and identify "suspects" (pathologies) across different imaging modalities from our institution. By integrating creativity with critical thinking, this exhibit improves pattern recognition and diagnostic confidence.

MSEE-58 SEE YOU LATER, RADIO-GATOR! ZOO OF ANIMAL-INSPIRED RADIOLOGY SIGNS

Alejandra Cardona Del Valle, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
John Melendez Moreno (*Abstract Co-Author*)
Amanda P. Marrero-Gonzalez, MD, BS (*Abstract Co-Author*)

TEACHING POINTS

Discuss the most common radiological signs inspired by animals. Explain the background, etiology, and radiological uses of each of the discussed signs. Describe the signs through example cases and illustrations using various imaging modalities.

TABLE OF CONTENTS/OUTLINE

I. Educational Objectives and Introduction II. Discuss signs with imaging examples of the following animal categories: fish and marine life, mammals, birds, arthropods and reptilesIV. Importance in recognitionV. Conclusion ??In this pictorial review, we will showcase a series of classic animal signs inspired by different animal categories, such as fish and marine life, mammals, birds, arthropods and reptiles. These signs, visible across various imaging modalities, will be illustrated with drawings, a public domain image of the animal that inspired its name, and example cases from our institution. Additionally, a concise explanation of the underlying pathology and pertinent information for the referring physician will be provided. A total of 25 radiological signs will be reviewed, including manta ray, fish vertebra, lobster claw, bear paw, beaver tail, camel hump, staghorn calculus, anteater, pig nose, scotty dog, tigroid pattern, butterfly vertebra, cobra, moth eaten, bag of worms, crocodile pancreas, caterpillar, bird's beak, owl eyes, pooping duck and seagull sign. With these animal based signs, we aim to enhance the recognition and understanding of various pathologies.

MSEE-59 THE MSK EPONYM ALPHABET: LETTERS WITH A FRACTURE

Alejandra Cardona Del Valle, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Christopher Quintana (*Abstract Co-Author*)
Ana Ayala (*Abstract Co-Author*)
Elizabeth Trullenque, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review common musculoskeletal fractures and pathologies, emphasizing clinical features and historical relevance. 2. Use a glossary with visuals to help recognize eponyms commonly seen at our institution. 3. Showcase key imaging findings using X-rays, CT, 3D reconstructions, and artwork to support diagnosis and treatment.

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Objectives III. Glossary of Terms IV. Cases with Anatomy Diagram and Institutional Case V. Pioneer/Author Image VI. History and Clinical Relevance VII. QuizThis exhibit reviews common musculoskeletal fractures and pathologies, focusing on clinical presentation, historical relevance, and key imaging signs. It includes joint and long bone fractures, common classifications, and osteochondrosis. A glossary of musculoskeletal eponyms is provided, with definitions, and brief history. Imaging features are highlighted through X-rays, CT, and 3D reconstructions of real cases from our institution. By combining clinical, historical, and radiologic perspectives, the exhibit aims to improve recognition, diagnosis, and management of musculoskeletal conditions, while providing a visual learning experience for radiologists, residents, and medical students.

MSEE-60 NEEDLE IN THE CASE STACK: APPROACH TO RADIOGRAPHS FOR RETAINED SURGICALLY PLACED FOREIGN BODIES, TIPS & TRICKS FOR BOOSTING RADIOLOGIST CONFIDENCE

Selin Ocal, MD (*Presenter*)
John Eng, MD (*Abstract Co-Author*)

TEACHING POINTS

• Images obtained to rule out unintentionally retained surgically placed foreign bodies (SFBs) are an anxiety-provoking study type for radiologists. • SFBs are a rare occurrence, and specialized exposure to this topic may not be provided in residency and fellowship programs. These factors contribute to a lack of significant experience and confidence when these studies are interpreted. •Given that positive studies for retained SFBs are uncommon, we provide examples of radiographs that depict SFBs of various levels of "difficulty" to demonstrate the wide range of pitfalls that can occur when interpreting these images. • To improve detection of SFBs and boost confidence, we provide a special framework for radiologists to consider utilizing, in addition to their usual radiographic search pattern.

TABLE OF CONTENTS/OUTLINE

• Unintentionally retained surgically placed foreign bodies (SFBs): what they are, how often they occur, and how different institutions utilize radiography to detect them • The evolving role of the radiologist in identifying SFBs—how culpability extends from the operating room to the reading room • Lack of radiology trainee exposure to these unique studies • Is your existing search pattern enough? Tips and tricks to evaluate these images • Spectrum of difficulty with case examples: positive radiographs with SFBs that were detected by the radiologist (considered "routine" or simpler to detect) and some that were missed by the radiologist (considered "difficult" or harder to detect) • General principles and patterns of "difficult" cases that made detection of SFBs in those instances harder, and what we can learn from them

MSEE-61 IMAGING IN HEMOPHAGOCYTIC LYMPHOHISTIOCYTOSIS (HLH)

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Shehbaz M. Ansari, MD, MBBS (*Abstract Co-Author*)
Ananya Panda, MD, MBBS (*Abstract Co-Author*)
Mohamad Kayali, MBBCh (*Abstract Co-Author*)

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Hiba G. Narvel, MBBS (*Abstract Co-Author*)
Chetan Saini, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Hemophagocytic lymphohistiocytosis (HLH) is a rare, life-threatening condition of excessive immune activation with widespread systemic inflammation & multiorgan dysfunction. This exhibit discusses the following teaching points: 1. Identification of imaging patterns that, in the appropriate clinical context, can provide crucial early diagnostic clues to suspect HLH.2. Radiologic findings in HLH are often nonspecific but can provide early diagnostic clues & help assess complications.3. While radiology is not part of the diagnostic criteria, which is mainly based on clinical findings & laboratory analysis, imaging certainly aids in identifying biopsy sites, monitoring treatment response, and ruling out mimics such as sepsis or lymphoma.4. As awareness of HLH increases, radiologists play a vital role in timely recognition & management.

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Epidemiology Types Primary HLH Secondary HLH Etiologies Familial HLH (type 1-5) Association with immunodeficiency syndromes Associated viral etiologies (EBV, CMV, HSV, VZV, HIV) Associated malignancies (T or NK cell lymphoma/leukemia & B-cell lymphoma) Associated rheumatological disease (systemic JIA, SLE) Role of radiology Imaging manifestations CNS (multifocal T2 hyperintensities, enhancing parenchymal lesions, brainstem/cerebellar predominant or non-specific atrophy) Pulmonary (ground glass opacities, consolidation, interstitial infiltrates, pleural effusion, ARDS-like) Gastrointestinal (hepatosplenomegaly, lymphadenopathy, ascites, liver focal hypodensities, gallbladder wall thickening) MSK (Osteonecrosis, metaphyseal lucencies, osteopenia, intramuscular hematoma) Prognostication Treatment response

MSEE-62 ULTRASONOGRAPHIC EVALUATION OF HIDRADENITIS SUPPURATIVA: ALL YOU NEED TO KNOW

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Fatima A. Lezcano Sticchi SR, MD (*Abstract Co-Author*)
Constanza San Miguel, MD (*Abstract Co-Author*)
Micaela Sturnigh, MD (*Abstract Co-Author*)
Joaquin Martinez Pereira, MD (*Abstract Co-Author*)
Jonathan Rosenvasser, MD (*Abstract Co-Author*)

TEACHING POINTS

- To provide an introduction about hidradenitis suppurativa, clinical background, historical aspects, and pathophysiology.- To highlight the importance of an early diagnosis in order to provide an effective treatment.- To learn the main ultrasonographic findings which will allow the initial diagnosis. - To review staging criteria of Hidradenitis Suppurativa and their role in treatment response evaluation. - To enhance the importance of the radiologists role in diagnosis and follow-up of this entity.

TABLE OF CONTENTS/OUTLINE

- Introduction to this underdiagnosed disease.- Normal skin ultrasound and optimal US settings.- Imaging evaluation of Hidradenitis Suppurativa: the importance of ultrasound. * Examination Technique * US Findings: Dermal thickening; Pseunododule/pseudocyst; Fluid collection; Fistulas. - Sonographic Scoring. * Modified sonographic scoring of hidradenitis suppurativa (mSOS-HS). * Activity Scoring (US-HSA)

MSEE-63 FERUMOXYTOL-ENHANCED MRI/MRA OF ABDOMEN, PELVIS, AND PERIPHERAL VASCULATURE

Daniel R. Ludwig, MD (*Presenter*)
Richard Tsai, MD (*Abstract Co-Author*)
Nathan P. Skinner, MD, PhD (*Abstract Co-Author*)
Benjamin S. Strnad, MD (*Abstract Co-Author*)
Anup S. Shetty, MD (*Abstract Co-Author*)

TEACHING POINTS

-Ferumoxytol is an FDA-approved IV iron preparation composed of superparamagnetic iron oxide nanoparticles which is used to treat iron-deficiency anemia. Also a safe and effective off-label MRI contrast agent which may benefit patients with clinical indications for contrast-enhanced MRI/MRA but who have contraindications to gadolinium-based contrast agents (GBCAs) -Due to its long intravascular half-life (~15 hours), steady-state imaging with intense vascular enhancement can be performed up to a day after infusion -Ferumoxytol is taken up by the mononuclear phagocyte system (MPS) 24-72 hours after infusion, accurately differentiating tumor from splenule with delayed imaging -FDA issued a black box warning on ferumoxytol about potential acute hypersensitivity reactions, though the rate of severe allergic reactions is likely similar to GBCAs. Diluted ferumoxytol can be administered safely as either slow infusion or bolus but requires additional clinical monitoring

TABLE OF CONTENTS/OUTLINE

-Background on use of ferumoxytol as off-label imaging agent -Steps needed for institutional approval to use ferumoxytol as an imaging agent -Advantages and disadvantages of ferumoxytol over gadolinium -Discussion and illustration of use cases including applications for bolus injection in scanner and steady-state imaging after slow infusion: MRA of renal and hepatic transplant vasculature; MRA of abdominal aorta and peripheral vasculature (AIF); diagnosis of placenta accreta spectrum pathology; dynamic lesion characterization in a patient unable to receive GBCA; staging or restaging known or suspected malignancy during pregnancy; differentiation of peri-pancreatic splenule from tumor

MSEE-64 PICTORIAL REVIEW OF ABDOMINOPELVIC DISEASES WITH ELEVATED ALPHA-FETOPROTEIN: FROM DIAPHRAGMATIC DOME TO GENITAL AREA

Jian Guan, MD, PhD (*Presenter*)
Shulin Ma (*Abstract Co-Author*)
Guanglei Tang, MBBS (*Abstract Co-Author*)
Rulin Xu (*Abstract Co-Author*)
Yang Peng (*Abstract Co-Author*)

TEACHING POINTS

1. To review the basic knowledge of alpha-fetoprotein (AFP).2. To know normal AFP levels in different age populations and physiological variations. 3. To explore the relationship between various abdominopelvic diseases and AFP elevation. 4. To learn the spectrum of abdominopelvic diseases with elevated AFP in various organs.

TABLE OF CONTENTS/OUTLINE

1. Basic knowledge of alpha-fetoprotein (AFP) (1) Definition and physiological function of AFP;(2) Biosynthesis, production and metabolic pathways of AFP;(3) Normal AFP levels in different age populations and physiological variations 2. Case reviews by organ system: imaging features and clinical relevance(1) Diseases of liver (hepatocellular carcinoma and recurrence, combined hepatocellular and cholangio- carcinoma, hepatoblastoma, acute hepatitis, chronic active hepatitis, cirrhosis, etc) ; (2) Diseases of gallbladder and bile duct (intrahepatic cholangiocarcinoma, hepatoid adenocarcinoma differentiated intrahepatic cholangiocarcinoma, ectopic hepatocellular carcinoma, biliary atresia, etc);(3) Diseases of pancreas (pancreatoblastoma, pancreatic hepatoid carcinoma, neuroendocrine tumor, etc);(4) Diseases of gastrointestinal tract (hepatoid adenocarcinoma);(5) Diseases of kidney (Wilms tumor, eg. teratoid nephroblastoma) and retroperitoneal space (malignant degeneration of retained testicle, immature teratoma, etc);(6) Diseases of reproductive system (Yolk sac tumor, seminoma, immature teratoma, dysgerminoma, mixed germ cell tumor, Sertoli-Leydig cell tumors, etc).3. Summary of abdominopelvic diseases with elevated alpha-fetoprotein.

MSEE-65 AN APPROACH TO MRI FOR CHRONIC PELVIC PAIN

Arjuna Somasundaram, MBBS (*Presenter*)
Tam Tran (*Abstract Co-Author*)

Craig Buchan, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Recognise the radiologist's role in the evaluation of chronic pelvic pain (CPP), a complex multidisciplinary condition. 2. Review the strengths and weaknesses of magnetic resonance imaging (MRI) to identify structural causes of CPP. 3. Review diseases that can cause CPP, their imaging findings and potential diagnostic pitfalls on MRI.

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Chronic pelvic pain (CPP) is a debilitating condition that affects 15 - 25% of women. 1,2 It is defined as non-malignant pain below the level of the umbilicus that is continuous or intermittent for a minimum of six months duration. 4 The aetiology is complex and multifactorial, contributing to an average time to diagnosis of seven years. 3 MRI provides an effective, non-invasive tool for diagnosing structural causes of CPP. This educational exhibit is a review of MRI for chronic pelvic pain. 1. Definition of CPP. 2. Causes of CPP. 3. Systematic approach to diagnosing CPP, with imaging findings and pitfalls. Gynaecological: Endometriosis, Adenomyosis, Pelvic congestion, Fibroids, Ovarian remnant syndrome, Pelvic inflammatory disease Urological: Urethral diverticula, Cystitis, Prostatitis Anorectal & Pelvic Floor: Perianal disease, Hypertrophic myopathy of the internal anal sphincter, Sigmoid/rectal inflammation, Pelvic floor dysfunction Musculoskeletal & Neurological: Hernias, Neuropathy, Pubic symphysis pathology, Rectus abdominis/adductor pathology, Sacroiliitis, Hip pathology Postoperative complications: Surgical material infection, Hernia recurrence, Malpositioned tacks, Perimesh fibrosis, Nerve impingement

MSEE-66 START FROM SCRATCH! IMAGING FINDINGS OF SPOROTRICHOSIS

Matheus Taborda, MD (*Presenter*)
Nathalia Bonmann, MD (*Abstract Co-Author*)
Regielly Cognialli (*Abstract Co-Author*)
Bruna M. Sarolli, MD (*Abstract Co-Author*)
Bernardo C. Teixeira, MD, PhD (*Abstract Co-Author*)
Dante L. Escuissato, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

- To outline the main clinical and epidemiological characteristics of sporotrichosis.- To understand physiopathological and immunological aspects of Sporothrix infection. - To review imaging findings of sporotrichosis in multiple systems, including osteoarticular, central nervous system, and pulmonary sporotrichosis.

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This presentation aims to provide a comprehensive overview of the main features of sporotrichosis, including epidemiology, pathology, radiographic features, prognosis, differential diagnosis, and treatment. Using an organ-based approach, we will explore the classic and uncommon imaging manifestations of sporotrichosis, including lymphocutaneous, osteoarticular, central nervous system, and pulmonary sporotrichosis, as well as miscellaneous findings. The presentation will be subdivided in the following categories: 1. Introduction 2. Epidemiology 3. Physiopathology and Immune Response 4. Lymphocutaneous Form 5. Osteoarticular Form 6. Central Nervous System Sporotrichosis 7. Pulmonary Sporotrichosis 8. Miscelaneous 9. Conclusion

MSEE-67 "NEUROTHORACICS" - THORACIC DISEASES WITH NEURO-RADIOLOGICAL MANIFESTATIONS AND VICE VERSA

Alexandre Semionov, MD, PhD (*Presenter*)

TEACHING POINTS

There exist a number of pathological entities with thoracic and neuro-radiological manifestations. When considered separately, imaging findings could be nonspecific. However integration of radiological findings from both body systems can lead to a specific diagnosis based on imaging alone. As a corollary, certain neuroimaging findings should prompt screening of the thorax and vice versa. The purpose of this exhibit is a review of several pathological entities that can have both chest and neuro-radiological manifestations.

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Each case will be presented as image(s) of thoracic abnormality and image(s) of CNS abnormality. The combination of the thoracic and CNS findings should lead to fairly specific diagnosis. Explanation of the findings and brief review of the pathological entity will be provided. The pathological entities included in the presentation: 1. Tuberous sclerosis 2. Cowden syndrome 3. Langheran's cell histiocytosis 4. TB 5. Sarcoidosis 6. Erdheim-Chester disease 7. Limbic encephalitis 8. AIDS 9. Breast cancer 10. NF1 11. Alcohol abuse 12. Osler-Weber-Rendu 13. IgG4 disease 14. Takayasu's arteritis 15. PRES - preeclampsia 16. Klippel-Feil syndrome 17. Amyloidosis 18. Hyperparathyroidism 19. Septic emboli 20. Granulomatosis with polyangitis.

MSEE-68 ULTRASONOGRAPHIC FINDINGS IN HIDRADENITIS SUPPURATIVA: A GUIDE FOR THE RADIOLOGIST

Cibelle Melo, MD (*Presenter*)
Luara Boson, MD (*Abstract Co-Author*)
Estevao Vargas (*Abstract Co-Author*)
Thiago Lopes (*Abstract Co-Author*)

TEACHING POINTS

Hidradenitis suppurativa (HS) is a chronic, inflammatory skin disorder characterized by recurrent nodules, abscesses, and sinus tracts, predominantly in intertriginous areas such as the axillae and groin. Ultrasound plays a critical role in detecting subclinical anatomical changes and in revealing the often underestimated clinical severity of HS, which is essential for appropriate therapeutic decision-making. The main ultrasonographic features include follicular dilatation, dermal thickening, pseudocysts, fluid collections, sinus tracts, and hair tract remnants. The presence of three or more of these findings has been proposed as a diagnostic criterion for HS. Doppler ultrasound further aids in identifying subclinical fistulous tracts and assessing inflammatory activity. This educational exhibit presents a standardized ultrasound protocol for the evaluation of HS, illustrated through representative clinical cases. The proposed protocol aims to improve diagnostic consistency and enhance patient management by guiding radiologists in the systematic assessment of HS using grayscale and Doppler imaging.

TABLE OF CONTENTS/OUTLINE

1. Overview of hidradenitis suppurativa. 2. Ultrasonographic evaluation protocol and key imaging findings. 3. Educational materials including annotated images and flowcharts derived from a comprehensive literature review. 4. Take-home messages.

MSEE-69 BEYOND THE BONE MARROW: MULTI-MODALITY IMAGING OF EXTRAMEDULLARY DISEASE IN ACUTE MYELOID LEUKEMIA

Shu Suzuki, MD (*Presenter*)
Koichiro Mori, MD (*Abstract Co-Author*)
Yasunobu Takaki (*Abstract Co-Author*)
Mizuka Suzuki, MD (*Abstract Co-Author*)
Noriko Doki (*Abstract Co-Author*)

TEACHING POINTS

•Multimodal imaging approachA comprehensive imaging strategy incorporating CT, MRI, PET/CT and US is essential for the accurate detection and characterization of extramedullary disease (EMD) in acute myeloid leukemia (AML). •Case-based insights into diagnostic challengedsA case-based review highlights the diverse manifestations of EMD in AML, recognizing imaging features to avoid misdiagnosis. •Distinguishing EMD from lymphoma: the significance of ADC valuesAlthough the

imaging findings of EMD are similar to those of lymphoma, the lesion tends toshow lower ADC values, which may be useful for differential diagnosis. incorporating CT, MRI, PET/CT and US is essential for the accurate detection and characterization of extramedullary disease (EMD) in acute myeloid leukemia (AML).

TABLE OF CONTENTS/OUTLINE

•Present classification and epidemiology of AML •General treatment of AML •Case presentation of relatively common sites of extramedullary leukemia; Lymphadenopathy, Hepatomegaly, Splenomegaly •Case presentation of various sites of extramedullary leukemia; Central nervous system, middle ear, lung, bone, skin, gastrointestinal tract, orbit etc. •Comparison of ADC values: extramedullary disease in AML and malignant lymphoma •Diagnostic pitfalls; infection and other malignancy

MSEE-70 IMAGING IN TSUTSUGAMUSHI DISEASE (SCRUB TYPHUS)

Yashant Aswani, MD (*Presenter*)
Galib Mirza Nasirul Islam, MBBS (*Abstract Co-Author*)
Shreyas Reddy Kankara, MBBS, MD (*Abstract Co-Author*)
Nishant Aswani (*Abstract Co-Author*)
Shravan Reddy K, MBBS (*Abstract Co-Author*)
Simmi Kumari, MBBS (*Abstract Co-Author*)

TEACHING POINTS

• Scrub typhus (ST) is a common rickettsial zoonosis endemic to Asia-Pacific region & is transmitted by bite of chigger mites infected with Orientia tsutsugamushi. In the US, it is primarily encountered among travellers • Presents as acute febrile illness with non-specific features. Eschar at site of mite bite & positive serology clinches the diagnosis • Multisystemic involvement is the rule. Underlying pathology is vasculitis & perivasculitis in multiple organs • Imaging features are nonspecific. However, awareness about common features like a combination of gallbladder wall edema, hepatosplenomegaly & reticulonodular lung opacities is crucial to raise suspicion of ST in those at risk & thus prompt specific diagnostic testing. Imaging features are particularly useful in flagging cases of early disease with negative serology or those without the characteristic eschar • ST responds promptly to antirickettsial antibiotics. Delayed institution of antibiotics carries an adverse prognosis; hence early diagnosis is important • Imaging helps with prognostication & early detection of complications like myocarditis & ARDS

TABLE OF CONTENTS/OUTLINE

• Epidemiology • Life cycle of mite • Pathogenesis • Clinical features • Diagnosis o Role of imaging o Imaging manifestations o Pulmonary (reticulonodular opacities, pleural effusion, hilar lymph nodes, ARDS) o Cardiac (reversible cardiomegaly) o CNS (encephalitis & or meningitis, microhemorrhages, PRES, myelitis, ADEM) o Abdomen (gallbladder wall edema, periportal inflammation, hepatosplenomegaly, splenic infarct, lymphadenopathy, hemorrhage, acute renal failure) • Treatment & prognosis • Control measures for mite

MSEE-71 OPPORTUNISTIC CT SCREENING: WHAT, WHY, AND HOW?

Siddhant Dogra, MD (*Presenter*)
Malte Westerhoff (*Abstract Co-Author*)
Soterios Gyftopoulos, MD, MBA (*Abstract Co-Author*)
Ehizokha Ihionkhan, MD (*Abstract Co-Author*)
Miriam A. Bredella, MD, MBA (*Abstract Co-Author*)
Michael P. Recht, MD (*Abstract Co-Author*)
Bari Dane, MD (*Abstract Co-Author*)

TEACHING POINTS

Opportunistic CT screening refers to standardized extraction of imaging biomarkers from routinely acquired CT scans for early risk stratification and proactive intervention. By leveraging imaging data that would otherwise be overlooked, opportunistic screening can deliver measurable patient- and population-outcome benefits without extra radiation, repeat scans, or cost to the patient. AI enables automatic extraction of quantitative data, making opportunistic screening feasible at scale and seamlessly integrable into existing clinical workflows. Common examples of opportunistic screening include assessment of bone mineral density, vascular calcification, body-composition (adiposity, sarcopenia), and hepatic steatosis. Deliberate implementation is key to success, including aligning sensitivity and specificity with institutional priorities, integrating screening into the radiologist workflow, and seamlessly communicating findings to primary-care and specialty referrers

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1) What is opportunistic screening? (Definition, Historical context and growing clinical interest). 2) Value of opportunistic screening (Patient outcomes, Cost-effectiveness). 3) Common opportunistic screening examples (Body composition [sarcopenia, adiposity]), Bone mineral density, Liver steatosis, Vascular calcifications). 4) Workflow (PACS integration, Dissemination and implementation pathways to primary care providers and specialty referrers). 5) Institutional experience (Adoption timeline, QI metrics, Pitfalls and mitigation strategies). 6) Future directions (Improved AI-assisted quantification, Potential quality measures and reimbursement pathways).

MSEE-72 BODY OF EVIDENCE: RADIOLOGIC MANIFESTATIONS OF KAPOSI SARCOMA FROM HEAD TO TOE

Amir Imanzadeh, MD (*Presenter*)
Shayan Saeed (*Abstract Co-Author*)
Anh-Tho Nguyen (*Abstract Co-Author*)
Malak Itani, MD (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)

TEACHING POINTS

Despite a decreasing incidence of Kaposi Sarcoma (KS), geographic and racial disparities in incidence and survival persist. It is therefore imperative for radiologists to remain aware of KS and raise suspicion in the appropriate clinical context. Although imaging findings are nonspecific, radiologists often identify the presence of visceral disease. Imaging facilitates the diagnosis, staging, and follow-up of KS. KS may be complicated by immune reconstitution syndrome (IRS); in cases of pulmonary KS, IRS may be differentiated by more widespread disease in the latter. This exhibit will present the typical and atypical imaging manifestations of KS in multiple organ systems, and showcase imaging findings and patterns that favor KS

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1. Epidemiology2. Pathology3. KS variants 4. Role of imaging 5. Imaging Manifestations: Head and Neck: Mucosal thickening or enhancing masses in the palate, tongue, or pharynx; Hyperenhancing cervical adenopathy. Thoracic: Enhancing peribronchovascular and subpleural pulmonary nodules; Flame shaped interstitial opacities. GI: Hypervascular mural/submucosal lesions; Polypoid lesions. GU: Bladder or urethral masses; External genital lesions. Musculoskeletal: Enhancing intramuscular or subcutaneous nodules; Lytic or mixed osseous lesions 6. Diagnostic Challenges and Solutions: Mimics and differential considerations on imaging Disease progression versus opportunistic co-infection7. Complications and Disease Monitoring The role of imaging in staging, treatment response assessment, and longitudinal disease monitoring KS-associated immune reconstitution syndrome: imaging hallmarks Prognostic factors

MSEE-73 LESS NOISE, MORE INSIGHT: CASE-BASED IMAGING WITH B-FLOW

Vitor Amorim Falcao, MD (*Presenter*)
Nikhil Gupta (*Abstract Co-Author*)
Eunhae Yeo, MD (*Abstract Co-Author*)
Terri A. Williams-Weekes, MD (*Abstract Co-Author*)

TEACHING POINTS

Comprehend the physical principles and imaging mechanism of B-Flow. Identify normal B-Flow appearances in different organs. Recognize the added diagnostic value of B-Flow in detecting vascular and parenchymal pathology through illustrative case examples. Appreciate the complementary role of B-Flow to enhance traditional color and spectral Doppler and the limitations of the technique.

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Introduction to B-Flow Technology • Overview, physics, and clinical rationale Normal B-Flow Studies • Neurosonography (e.g., neonatal brain) • Hepatic Imaging (e.g., liver vasculature) • Renal Imaging (e.g., native and transplant kidneys) Pathologic Applications • Neurologic Pathologies (e.g., thalamic infarct, periventricular leukomalacia) • Renal Pathologies (e.g., proteinaceous cyst, vs solid mass, perfusion of renal transplant) • Hepatic Disorders (e.g., left portal vein thrombus) • Vascular disorders (e.g., internal jugular vein thrombosis) Comparative Imaging: B-Flow vs Color Doppler • Side-by-side image analysis • Strengths and limitations of each modality Limitations and Technical Considerations • Artifacts, motion sensitivity, and operator dependence • When and where B-Flow may be suboptimal Summary and Future Applications • Key takeaways • Potential areas for expansion of clinical and research applications of the technique

MSEE-74 RECOGNIZING HEPATIC AND EXTRAHEPATIC MANIFESTATIONS IN HEREDITARY LIVER DISEASES

Sung-Hua Chiu, MD (*Presenter*)
David Bingham (*Abstract Co-Author*)
Aya Kamaya, MD (*Abstract Co-Author*)
Justin Tse, MD (*Abstract Co-Author*)

TEACHING POINTS

Patients with hereditary liver diseases require frequent imaging to monitor disease and identify complications. This education exhibit will also provide an overview of five more commonly encountered hereditary liver diseases: glycogen storage disease, alpha-1-antitrypsin deficiency, cystic fibrosis, Wilson's disease, and primary hemochromatosis. For example, deficient activity of the glucose 6-phosphatase enzyme in glycogen storage disease results in excess glycogen and fat deposition in the liver. Hepatocellular adenomas are extremely common, most commonly inflammatory and ß-catenin-mutated exon 7/8 subtypes. While the pathophysiology is unclear, the association between GSD I and Moyamoya disease has been reported for decades.

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Genetics, hepatic manifestations, and extrahepatic manifestations of the following disease processes: 1. Glycogen storage disease 2. Alpha-1-antitrypsin deficiency 3. Cystic fibrosis 4. Wilson's disease 5. Primary hemochromatosis

MSEE-75 PHAKOMATOSES IN THE ERA OF MOLECULAR TARGET THERAPIES: REVISITED

Shunsuke Nakamura, MD (*Presenter*)
Yuko Tsujioka, MD, PhD (*Abstract Co-Author*)
Gen Nishimura (*Abstract Co-Author*)
Tatsuo Kono, MD (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Phakomatoses, synonymously termed neurocutaneous disorders, comprise a diverse group of genetic skin disorders with pigmentary or vascular cutaneous lesions and/or skin tumors, complicated by hamartomatous proliferation or vascular malformation in other organs, most commonly in the nervous system. The term "phakomatoses" was proposed by a Dutch ophthalmologist (Jan van der Hoeve) in the early 20th century. The term was initially referred to as lenticular retinal changes in neurofibromatosis (NF1) and tuberous sclerosis (TS), and named after the old Greek word, meaning "lentil". The morphological concept was applied to extraocular lesions in NF1 and TS, and extended to other disorders, e.g., von Hippel-Lindau disease (VHL) and Sturge-Weber syndrome (SWS). Recent molecular investigations have revealed that phakomatoses share the common pathogenic mechanism with cancers, i.e., aberrant signaling in the cell cycle, e.g., RAS/MAPK and PI3K/Akt/mTOR pathways. Therefore, molecular target therapies are currently feasible in phakomatoses. In general, diseases of the same pathway share common clinical and imaging features. Radiologists should be aware of the current status of pathophysiology linked to imaging findings and the therapeutic strategy of phakomatoses. From this perspective, we attempt to review imaging findings in the group of disorders.

TABLE OF CONTENTS/OUTLINE

Introduction - RAS/MAPK pathway-related (NF1, Neurocutaneous melanosis, Parkes-Weber syndrome, CM-AVM, etc.) - PI3K/Akt/mTOR pathway-related (TS, VHL, PI3K-related overgrowth syndromes, etc.)- Other pathways (SWS, hereditary hemorrhagic telangiectasia, PHACE syndrome, Nevoid Basal Cell Carcinoma Syndrome, etc.)

MSEE-76 WHY IS IT DARK ON T2 AND BRIGHT ON CT? A PATHOPHYSIOLOGIC APPROACH TO CROSS-ORGAN PATTERN-BASED DIAGNOSIS

Orito Ikeda (*Presenter*)
Hirotaka Akita (*Abstract Co-Author*)
Yoshitake Yamada, MD, PhD (*Abstract Co-Author*)
Yuko Tsujioka, MD, PhD (*Abstract Co-Author*)
Junya Tsuzaki (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

•Lesions with low signal on T2-weighted MRI and high attenuation on unenhanced CT can be categorized into six pathophysiologic groups based on fundamental tissue characteristics, such as the presence of paramagnetic substances, dense material accumulation, or reduced free water content. •These imaging features result from high atomic number substances attenuating X-rays (CT hyperdensity) and paramagnetic or dense tissues shortening transverse relaxation times (T2 hypointensity). •Recognizing these cross-organ signal patterns enhances diagnostic confidence and refines differential diagnoses by focusing on fundamental tissue characteristics, offering critical clues across diverse clinical scenarios, from acute hemorrhage to chronic fibrosis and malignancy. •Understanding the relationship between physical properties, disease mechanisms, and imaging appearances fosters a more comprehensive, mechanism-based diagnostic approach applicable across organ systems and patient populations.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Background and rationale for focusing on T2 hypointensity and CT hyperattenuation 2. Fibrous, Collagenous, and Muscular Lesions with Dense Stromal Architecture 3. Lesions Characterized by High-Protein, Mucinous, or Colloidous Material (e.g., Thyroid Tissue) 4. Lesions Associated with Melanin or Heavy Metal Deposition 5. Hypercellular Tumors with Dense Cellular Proliferation 6. Lesions Associated with Hemorrhage and Iron Deposition 7. Calcified Lesions Characterized by Prominent Mineralization 8. Conclusion

MSEE-77 CHIMERIC ANTIGEN RECEPTOR (CAR) T-CELL THERAPY. A PRACTICAL GUIDE FOR RADIOLOGISTS

Silvia Revuelta Gomez, MD (*Presenter*)
Alejandra Somoano Marfull (*Abstract Co-Author*)
Aranzazu Sanchez Gabin, MD (*Abstract Co-Author*)
Rodrigo Sutil, MD (*Abstract Co-Author*)
Marta Drake Perez, MD (*Abstract Co-Author*)
Enrique Marco de Lucas (*Abstract Co-Author*)

TEACHING POINTS

1.To review the basic principles of CAR T-cell therapy.2.To describe the clinical and imaging findings of therapy-related toxic effects.

TABLE OF CONTENTS/OUTLINE

1. Introduction. CAR T-cell therapy is a recently approved immunotherapy that has revolutionized the treatment of hematologic malignancies. 2. Principles of CAR T-cell therapy. 2.1. CAR structure. 2.2. Steps in therapy process. 3. Indications. 4. Complications. Because of their nature as a cellular product that amplifies the patient's immune system, CAR T-cell therapies have a toxicity profile that differs from toxicities observed in other immunotherapies. 4.1. Cytokine release syndrome (CRS). 4.2. Immune effect cell-associated neurotoxicity syndrome (ICANS). 4.2.1. Pathogenesis. 4.2.2. Grading. 4.2.3. Clinical features. 4.2.4. Imaging. 4.3. Hemophagocytic lymphohistiocytosis (HLH). 4.4. Immunosuppression and infection risk. 4.4.1. Bacterial pneumonia. 4.4.2. Viral respiratory tract infections. 4.4.3. Fungal pulmonary infections. 5. Conclusion. With the expected increase in the use of CAR T-cell therapy in the near future, it is important for radiologists to become familiar with this breakthrough treatment. This includes being able to identify radiologically evident adverse events that require prompt diagnosis and intervention. 6. Bibliography.
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NMMIEE

Nuclear Medicine & Molecular Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

NMMIEE-1 BASICS OF THERANOSTICS DOSIMETRY: OPTIMIZING SAFETY AND EFFICACY IN RADIOPHARMACEUTICAL THERAPIES

Jennifer J. Kwak, MD (*Presenter*)
Michael Silosky, MS (*Abstract Co-Author*)
Wendy Siman (*Abstract Co-Author*)

TEACHING POINTS

Great excitement in theranostics radiopharmaceuticals with the capability to image and treat tumors has been accompanied by a growing interest in the optimization of radiopharmaceutical therapies with dosimetry. The goal of this educational exhibit is to explain in simple terms and illustrate with figures and image rich case examples, the basic concepts of dosimetry, dosimetry methods, and utilization of dosimetry to optimize radiopharmaceutical therapies. Learning objectives are to discuss the role of dosimetry in radiopharmaceutical therapy, describe key steps in the performance of dosimetry, and review clinical applications and challenges of utilizing dosimetry.

TABLE OF CONTENTS/OUTLINE

I. Introduction : Theranostics and theranostic pair in nuclear medicine; Radiopharmaceutical dosing regimens II. Important Terms and Concepts in Dosimetr y: Dosimetry; Radionuclide; Radioactive decay; Count rate; Activity; Absorbed Dose; Prescribed Activity III. Key Steps in Dosimetry Data collection : Measurement of radiopharmaceutical biodistribution and clearance; Imaging methods; Defining the regions of interests Calculations : Absorbed dose calculations 1. Conversion of count rate to activity 2. Calculation of time integrated activity 3. Conversion of activity to absorbed dose Biological assessment : Assessing the biological effects of absorbed dose; Other factors affecting biological effects of radiation Prescribed activity recommendation IV. Clinical Implementation : Current challenges and potential solutions V. Case examples

NMMIEE-2 PRECISION IMAGING IN ESTROGEN RECEPTOR (ER)- POSITIVE BREAST CANCER: ^{18}F-FLUOROESTRADIOL (^{18}F-FES) PET-DRIVEN DECISION MAKING ACROSS CLINICAL SCENARIOS

Saurabh Jindal, MD,MBBS (*Presenter*)
Nusayba Bagegni (*Abstract Co-Author*)
Cynthia Ma (*Abstract Co-Author*)
Barry A. Siegel, MD (*Abstract Co-Author*)
Farrokh Dehdashti, MD (*Abstract Co-Author*)
Ashwin Singh Parihar, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Patients with 18 F-FES-negative disease are unlikely to benefit from endocrine therapies, despite ER-positive disease on pathology. 2. 18 F-FES PET can show the true extent of the disease in 18 F-FDG-negative cases with high clinical suspicion.

TABLE OF CONTENTS/OUTLINE

Section 1: Introduction Mechanism of ER-targeted PET imaging Comparison with 18 F-FDG PET Section 2: Appropriate Use Criteria-Based Clinical Scenarios. Sub-section includes illustrative cases and clinical rationale. [Scores 1-3: Rarely Appropriate; 4-6: May be appropriate; 7-9: Appropriate] Diagnosis Scenario 1: Primary breast cancer diagnosis (Score: 2) Scenario 2: Unknown primary malignancy, biopsy not feasible (Score: 5) Staging Scenario 3: T staging of primary tumor (Score: 1) Scenario 4: Axillary node staging (Score: 3) Scenario 5: Distant metastasis staging (Score: 5) Scenario 6: Staging invasive lobular/low-grade ductal carcinoma (Score: 5) Biopsy Assessment Scenario 7: Lesions accessible to biopsy (Score: 5) Scenario 8: Lesions difficult to biopsy (Score: 8) Therapy Selection Scenario 9: After disease progression, for considering 2 nd -line endocrine therapy (Score: 8) Scenario 10: At initial diagnosis of metastases, for considering endocrine therapy (Score: 8) Scenario 11: At primary diagnosis of primary cancer, for considering endocrine therapy (Score: 1) Other Uses Scenario 12: Measuring therapy response (Score: 1) Scenario 13: Suspected/known recurrent/metastatic disease (Score: 5) Scenario 14: Other imaging tests are equivocal or suggestive (Score: 8) Section 5: Limitations and Future Directions Monitoring response to SERM/D with 18 F-FDG PET Assessment of hepato-biliary disease Research needs for rare use cases

NMMIEE-3 MOLECULAR IMAGING FOR BREAST CANCER: CLINICAL IMPACT AND CORRELATION WITH OTHER IMAGING MODALITIES

Marcelo A. Queiroz, MD (*Presenter*)
Priscilla R. Dreyer, MD (*Abstract Co-Author*)
Rafael F. Nunes, MD (*Abstract Co-Author*)
Larissa B. Costa, MD (*Abstract Co-Author*)
Poliana Zampieri, MD (*Abstract Co-Author*)
Carolina Mautoni, MD (*Abstract Co-Author*)
Matheus Waitman, MD (*Abstract Co-Author*)
Artur M. Coutinho, MD,DSc (*Abstract Co-Author*)
Carlos A. Buchpiguel, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Describe clinical applications of FDG-PET/CT in breast cancer, including primary staging, therapeutic response, and recurrence detection. Discuss strengths and limitations of FDG-PET/CT compared to MRI, US, mammography, CT, bone scan, and FES PET. Recognize common interpretative pitfalls of FDG-PET/CT in breast cancer, including low FDG uptake in invasive lobular carcinoma, flare phenomenon, and challenges with sclerotic bone lesions. Review imaging criteria for treatment response and advances in molecular imaging, including novel PET tracers (e.g., FES, HER2-targeted agents) and hybrid techniques like PET/MRI and PET mammography.

TABLE OF CONTENTS/OUTLINE

1. Tumor biology and metabolism 1.1. Imaging features across different tumor subtypes 1.2. Patterns of spread according to tumor site and histology 2. Primary staging 2.1. Tumor (T) 2.1.1. Correlation with Breast MRI, US, MMG and FES PET/CT 2.2. Nodal (N) 2.2.1. Correlation with MRI, US and PLS 2.3. Metastasis (M) 2.3.1.

Correlation with CT, MR/DW, BS and FES PET/CT 3. Therapeutic response assessment 3.1. After neoadjuvant treatment - PET imaging as a tool for guiding therapeutic decision-making 3.2. After surgery 3.3. After systemic therapy 3.3.1. Flare phenomenon 3.3.2. Correlation with CT, MR/DW, BS and FES PET/CT 3.3.3. Imaging criteria (RECIST1.1 vs. others) 4. Recurrence detection 4.1. Local / distant recurrence 4.2. Differentiation from post-treatment changes (recurrence vs. inflammation) 5. New developments 5.1. New PET/CT tracers (ex.: FES, HER2) 5.2. PET/MRI and PET/mammography

NMMIEE-4 FDG-PET/CT IMAGING IN ESOPHAGEAL AND ESOPHAGOGASTRIC JUNCTION CANCER: A PRACTICAL GUIDE FOR CLINICAL DECISION-MAKING

Poliana Zampieri, MD (*Presenter*)
Priscilla R. Dreyer, MD (*Abstract Co-Author*)
Rafael F. Nunes, MD (*Abstract Co-Author*)
Artur M. Coutinho, MD,DSc (*Abstract Co-Author*)
Carolina Mautoni, MD (*Abstract Co-Author*)
Matheus Waitman, MD (*Abstract Co-Author*)
Marcelo A. Queiroz, MD (*Abstract Co-Author*)
Carlos A. Buchpiguel, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Describe the clinical applications of FDG-PET/CT in esophageal and EJC cancers, including initial staging, restaging after neoadjuvant therapy, and detection of recurrence. Explain the diagnostic value of FDG-PET/CT, particularly its specificity for locoregional lymph node involvement, sensitivity for distant metastases, and its ability to detect incidental and synchronous findings. Interpret key quantitative PET parameters (e.g., SUVmax, MTV, TLG) and discuss their prognostic relevance for patient stratification and treatment planning. Recognize the importance of structured reporting and explore emerging advances such as novel PET tracers and radiomics for future precision imaging.

TABLE OF CONTENTS/OUTLINE

FDG PET imaging for esophageal cancer Primary staging TNM classification: assessing tumor (T), nodes (N), and metastases (M) Detection of synchronous malignancies Incidental and unexpected findings Impact on treatment selection Restaging after neoadjuvant treatment Identification of interval progression or response Guiding surgical and therapeutic decisions Detection of recurrence Differentiating post-treatment changes from true recurrence Patterns of disease relapse: where to look for? Locoregional (anastomosis and lymph nodes) Visceral PET quantitative parameters Tumor volume and metabolic burden: what to measure? Prognostic value of PET-derived metrics Perspectives Structured report: What do oncologists need to know? Emerging PET tracers (e.g., FAPI, HER2-targeted agents) Radiomics

NMMIEE-5 A CLEAR VISION FOR TEAR MANAGEMENT: THE ROLE OF DACRYOSCINTIGRAPHY IN EPIPHORA DIAGNOSIS

William Denton, BA, MA (*Presenter*)
Hunter Colson (*Abstract Co-Author*)
Haseeb Ahmad (*Abstract Co-Author*)
Katherine Manning (*Abstract Co-Author*)
Ahmed Elsayed, MD (*Abstract Co-Author*)
Chris Jackel (*Abstract Co-Author*)
Johnson Deshommes, MD (*Abstract Co-Author*)
Mohamed Tarek S. Ahmed, MD, PhD (*Abstract Co-Author*)
Xingyu Nie (*Abstract Co-Author*)
Blaine T. Mischen, MD (*Abstract Co-Author*)
Riham H. El Khouli, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- Epiphora is a common ophthalmologic problem. - It is typically caused by nasolacrimal duct obstruction (NLDO), but in many cases no structural obstruction exists and functional obstruction is identified instead. - Dacryoscintigraphy is a sensitive, non-invasive nuclear medicine technique evaluating the physiological drainage of the lacrimal system and its patency.- It plays an important role in differentiating functional from anatomical NLDO, and aids in identifying the level of obstruction, impacting management decisions.- Dynamic imaging capability helps assess pre- and post-surgical outcomes, particularly in patients with persistent symptoms.- Understanding normal and abnormal transit patterns can refine patient selection for procedures such as dacryocystorhinostomy (DCR).

TABLE OF CONTENTS/OUTLINE

I. Anatomy and physiology of nasolacrimal ductal system.II. Pathophysiology and clinical presentation of NLDO.III. Dacryoscinitigraphy protocol: Radiopharmaceutical, positioning, image acquisition.IV. Discuss quantitative tear duct drainage rate assessment and correlation to physiologic and pathological drainage.V. Multiple representative cases* will include: a. Patent bilateral nasolacrimal system b. Bilateral and/or unilateral partial obstruction at different levels c. Overflow tearing.VI. Take-home highlights and key points.VII. Selected references.*Each case will include: clinical history, relevant anatomy, key images, quiz questions & answers, diagnosis, discussion, and diagnostic pearls.

NMMIEE-6 BREAKING DE PSMA PET (CT/MRI) CODE: WHEN MORE DATA DOES NOT MEAN MORE CLARITY

Roberto I. Lemus Mendez, MD, MSc (*Presenter*)
Mary E. Arevalo Molina, MD (*Abstract Co-Author*)
Jose L. Criales, MD (*Abstract Co-Author*)

TEACHING POINTS

-Assess which patients are appropriate candidates for PSMA-PET imaging.-Understand the clinical implications of staging and risk stratification with PSMA-PET.-Evaluate the strengths and limitations of current PSMA-PET reporting systems.-Apply structured frameworks to reduce interobserver variability when interpreting PSMA-PET.

TABLE OF CONTENTS/OUTLINE

-Brief overview of PSM-PET.-When is the use of PSMA-PET appropriate?-PSMA-PET staging and risk stratification.-Best practices for reporting PSMA-PET in prostate cancer (PCa): Optimizing clinical decision-making.-Current reporting tools: Are we communicating effectively with the attending physician? (case review)-What is the path forward?

NMMIEE-7 PAGET'S DISEASE OF THE BONE: AN UPDATE

Alexander D. Zhang, MD, BA (*Presenter*)
Prem P. Batchala, MD (*Abstract Co-Author*)

TEACHING POINTS

Paget's disease (PD) of the bone is a well-recognized, common disorder characterized by abnormal, excessive bone remodeling. It is relatively more common in the elderly. Although well-recognized clinically and on imaging, the etiology is poorly understood. In this update, we review the following: 1) Genetic basis for PD including SQSTM1 mutations that regulate osteoclast activity; appearance on pathology, 2) Clinical presentation and diagnosis of PD, 3) Imaging appearance on conventional imaging (radiographs, CT, MRI, bone scan) including characteristics signs, 4) Imaging appearance in non-conventional modalities such as PET/CT (FDG, DOTATATE, PSMA), 5) Diagnostic pitfalls and mimics, 6) Summary of clinical implications, treatment/management and follow-up

TABLE OF CONTENTS/OUTLINE

1) Introduction to Paget's Disease of Bone- Definition and epidemiology. 2) Pathogenesis/Genetics- Abnormal remodeling process- Role of SQSTM1 mutations in osteoclast regulation. 3) Histopathologic features- Clinical Presentation and Diagnosis. 4) Conventional Imaging Modalities- Radiographs, CT, MRI, Bone scintigraphy. 5) Non-Conventional Imaging- FDG PET/CT, DOTATATE PET/CT, PSMA PET/CT. 6) Imaging Pitfalls and Mimics- Differentiating PD from metastatic disease. 7) Management and Follow-Up- Clinical indications for treatment- Medical therapy (e.g., bisphosphonates)- Imaging and clinical surveillance strategies. 8) Conclusion- Key clinical implications and interdisciplinary considerations.

NMMIEE-8 IS PROSTATE MRI ALWAYS NECESSARY? EXPLORING PSMA PET/CT AS A STANDALONE MODALITY IN PROSTATE CANCER IMAGING

Jacob Teigen, BA, BA (*Presenter*)
Erica L. Martin-Macintosh, MD (*Abstract Co-Author*)
Allison J. Clapp, MD (*Abstract Co-Author*)

TEACHING POINTS

Imaging in Prostate Cancer Diagnosis Describe the biological and clinical basis of PSMA PET/CT Compare PET's diagnostic value with MRI Identify scenarios favoring PSMA PET/CT alone Discuss advantages, limitations, and future directions Purpose To evaluate whether PSMA PET/CT can serve as a comprehensive imaging modality for prostate cancer staging, potentially replacing MRI in select scenarios. This exhibit explores comparative performance, workflow benefits, and situations where PSMA PET/CT may be sufficient alone. Content Summary PSMA PET/CT enables high sensitivity, whole-body imaging in prostate cancer. Studies such as ProPSMA and F-18 PSMA-1007 Phase II show superior or equivalent performance to MRI for staging, particularly in nodal and distant metastasis detection. PET/CT offers streamlined workflow, improved access for MRI-ineligible patients, and reduces multiple imaging modalities. While MRI remains essential for assessing local, PSMA PET/CT is increasingly favored in preoperative staging, recurrence evaluation, and treatment planning. PET/MRI and theranostics are expanding with evolving guidelines supporting PET's broader use.

TABLE OF CONTENTS/OUTLINE

Introduction to PSMA PET/CT Comparative Evidence: PSMA PET/CT vs. Prostate MRI Scenarios Favoring PSMA PET/CT Alone Advantages Over MRI Limitations and Considerations Future Outlook Conclusion: PSMA PET/CT demonstrates diagnostic accuracy that can rival and even surpass prostate MRI—especially in staging and biochemical recurrence. While MRI remains valuable, selected patients may benefit from imaging using PSMA PET/CT alone, supporting a potential shift in imaging pathways for prostate cancer management.

NMMIEE-9 NOT ALL THAT'S HOT IS LYMPHOMA: IDENTIFYING INFECTIOUS, INFLAMMATORY, AND BENIGN MIMICS ON FDG PET/CT

Kristina Yancey, MD (*Presenter*)
Evani Patel (*Abstract Co-Author*)
Clifford Shin, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Recognize key non-malignant diseases that can mimic lymphoma on FDG PET/CT. Understand typical imaging patterns and distinguishing features of infectious, inflammatory, autoimmune, and benign lymphoproliferative mimics. Apply clinical and imaging correlation to reduce misdiagnosis and unnecessary biopsy or treatment.

TABLE OF CONTENTS/OUTLINE

1. Introduction - Overview of FDG PET/CT in lymphoma evaluation - Limitations and common false positives 2. Infectious Mimics - HIV, tuberculosis, infectious mononucleosis, toxoplasmosis - Imaging patterns and systemic correlation 3. Inflammatory and Autoimmune Mimics - Sarcoidosis, lupus, rheumatoid arthritis, Still's disease, mesenteric panniculitis - Symmetric nodal involvement and organ-specific signs 4. Benign Lymphoproliferative Disorders and Drug Reactions - Kikuchi-Fujimoto, Castleman's disease, Rosai-Dorfman, CAR-T therapy - Key imaging and histologic differentiators 5. IgG4-Related Disease and Overlapping Patterns - Imaging features and systemic fibrosing patterns - Use of serum markers and biopsy criteria 6. Diagnostic Approach - Structured checklist to evaluate FDG-avid nodes - Red flags for mimics vs true lymphoma - Case-based learning with histopathologic correlation (where available)

NMMIEE-10 ADVANCED CANCER IMAGING WITH HYPERPOLARIZED CARBON-13 MAGNETIC RESONANCE IMAGING: TECHNIQUES AND APPLICATIONS

Gigin Lin, MD (*Presenter*)
Ying-Chieh Lai (*Abstract Co-Author*)
Ching-Yi Hsieh, PhD (*Abstract Co-Author*)
Kuan-Ying Lu, MS (*Abstract Co-Author*)

TEACHING POINTS

Hyperpolarized carbon-13 magnetic resonance imaging (HP 13C-MRI) is an advanced metabolic imaging technique that enables noninvasive, real-time assessment of dynamic metabolic flux using dynamic nuclear polarization (DNP), which increases signal-to-noise ratio by up to 50,000-fold. [1-13C]pyruvate, highlights metabolic reprogramming in cancer and immune cells by tracing its conversion to lactate, alanine, and bicarbonate—revealing glycolytic and mitochondrial activity. HP 13C-MRI has demonstrated clinical potential in various cancers (e.g., prostate, brain, renal, breast) for tumor characterization, early therapy response, and immune activation assessment.

TABLE OF CONTENTS/OUTLINE

Introduction to Hyperpolarized 13C-MRI Principles of metabolic imaging Comparison with conventional MRI and PET Fundamentals of Dynamic Nuclear Polarization (DNP) Physics of carbon-13 hyperpolarization Signal amplification and polarization decay Imaging Techniques and Acquisition Model-based imaging (IDEAL CSI) Metabolite-specific imaging with spectral-spatial pulses Data Analysis Kinetic modeling (e.g., kPL) Model-free metrics (e.g., AUC ratios) Clinical Applications Prostate cancer: grading, biopsy targeting, treatment response Brain tumors: IDH mutation, gliomas, pediatric CNS tumors Renal and breast cancer: metabolic phenotyping and therapy monitoring Immune imaging: spleen activation, lymph node assessment Future Directions Emerging tracers beyond pyruvate Copolarization for multiplex metabolic and perfusion imaging Conclusion Clinical translation and research outlook

NMMIEE-11 ATOMIC CONTROL AGAINST CANCER: THE DIRECTED POWER OF YTTRIUM-90

Abigail Arriaga Contreras, MD (*Presenter*)
Rodrigo Hernandez Ramirez, MD (*Abstract Co-Author*)
Juan P. Chavez Torres, MD (*Abstract Co-Author*)
Miguel Angel Corza Ayala, MD (*Abstract Co-Author*)
Francisco Jesus Solano Caballero, MD (*Abstract Co-Author*)

TEACHING POINTS

Hepatocellular carcinoma (HCC) is the most common primary liver cancer and a leading cause of cancer-related deaths worldwide. Transarterial radioembolization (TARE) with Yttrium-90 (90 Y), also known as selective internal radiation therapy (SIRT), has emerged as a key LRT. It is a form of brachytherapy in which microspheres impregnated with the radioactive isotope Yttrium-90 are administered directly into the hepatic arteries supplying the tumor. TARE with 90 Y has become established as a valuable therapeutic option for patients with HCC in various clinical situations: Unresectable HCC Bridge to Transplant (BTT) or Resection Portal Vein Thrombosis (PVT) The pre-treatment evaluation and planning phase is a critical part of the procedure. It is a detailed workup that dictates the safety and potential efficacy of 90 Y treatment. It comprises: diagnostic angiography (1-3 weeks before 90 Y infusion) and 99m Tc-MAA simulation. Post-procedure imaging is a crucial quality assurance

step. Post-radioembolization adverse effects are common in 20-70% of patients. Symptoms may include fatigue (most frequent). Serious complications can occur (1-5%) and can include radioembolization-induced liver disease (REILD).

TABLE OF CONTENTS/OUTLINE

Introduction (general aspects of hepatocellular carcinoma). Clinical case presentation and imaging archive. What is hepatic radioembolization? Indications and contraindications. Treatment planning: angiography, simulation with 99m Tc-MAA, calculation of hepatopulmonary shunt and dose calculation. Administration of yttrium-90 treatment. Post-treatment imaging with PET/CT. Follow-up imaging. Adverse effects of the therapy. Conclusions

NMMIEE-12 THE CLINICAL UTILITY OF PET-CT IN HEREDITARY CANCER SYNDROMES. "ADVANCING SCREENING, DIAGNOSIS AND MANAGEMENT"

Ahmed H. Ebada Salem, MBBCh, PhD (*Presenter*)
Akram M. Shaaban, MBBCh (*Abstract Co-Author*)
Kathryn A. Morton, MD (*Abstract Co-Author*)
Ayman H. Gaballah, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

1. Hereditary Cancer Syndromes: Genetic, imaging and Pathologic Foundations 2. Comprehensive Whole-Body Surveillance 3. Early Detection and Risk Stratification 4. Improved Diagnostic Accuracy and Lesion Characterization on PET/CT using F-18 FDG or Ga-68 DOTATATE improves the ability to differentiate between benign and malignant lesions4. Evaluation in Post-Surgical and Altered Anatomy In patients with prior surgeries or anatomical distortion (e.g., from metallic implants or surgical clips), PET/CT can visualize areas obscured or limited on MRI or CT, facilitating the detection of residual or recurrent disease.5. Post-Treatment Surveillance 6. Tailored Imaging Based on Tumor Biology o Ga-68 DOTATATE PET/CT is ideal for neuroendocrine tumor surveillance in syndromes such as VHL, MEN, TS, and SDHB mutations.o F-18 FDG PET/CT is better suited for evaluating aggressive or dedifferentiated malignancies, including malignant transformation in NF1-related tumors.

TABLE OF CONTENTS/OUTLINE

Provide an overview of key hereditary cancer syndromes including NF1, NF2, VHL, MEN, SDHB, TS, BRCA mutations, Lynch syndrome, FAP, and Turcot syndrome . Review the molecular, imaging and genetic mechanisms that predispose these patients to multifocal, multi-organ neoplasms. Demonstrate the clinical utility of PET/CT , Present illustrative cases with multimodality imaging and pathology correlation

NMMIEE-13 BREAST CANCER MOLECULAR IMAGING: STATE OF THE ART

Mary E. Arevalo Molina, MD (*Presenter*)
Osvaldo Garcia-Perez, MD (*Abstract Co-Author*)
Mary C. Herrera-Zarza, MD (*Abstract Co-Author*)

TEACHING POINTS

- To describe the molecular and histopathological aspects of breast cancer.- To review the recent PET/CT indications for breast cancer.- To describe the main molecular imaging in clinical scenarios.- To understand how to evaluate breast cancer through different radiotracers.

TABLE OF CONTENTS/OUTLINE

- Introduction- Breast cancer molecular aspects and mutations- Breast cancer immunophenotype - PET/CT indications- PET/CT FDG according to clinical scenario- PET/CT other tracers- Take-home points- References

NMMIEE-14 CLINICAL APPLICATIONS OF DUAL-TRACER PET IMAGING: BENEFITS, LIMITATIONS, AND EMERGING OPPORTUNITIES

Bahar Ataeinia, MD, MPH (*Presenter*)
Sophia R. O'Brien, MD, MEd (*Abstract Co-Author*)
Austin Pantel, MD (*Abstract Co-Author*)

TEACHING POINTS

• Multiple dual tracer pairs are currently clinically available that can contribute to more accurate cancer phenotyping and guide patient management. • Dual tracer imaging can better evaluate indeterminate lesions on FDG PET and guide the choice of biopsy targets for improved metastatic burden evaluation and staging. • Indeterminate FDG avid lesions that are favored to be of inflammatory or infectious nature can be better characterized by dual tracer imaging to prevent additional invasive diagnostic approaches and unnecessary treatment. • Dual tracer imaging can characterize heterogeneous lesions and detect tumor progression toward poorly differentiated phenotypes that can have suboptimal responses to targeted therapies. • Current protocols require imaging on separate days to avoid radioactive interference. This separation burdens patients, increases costs and radiation exposure, and creates logistical inefficiencies that delay care. New protocols are needed to image two tracers in the same imaging session for optimal patient care.

TABLE OF CONTENTS/OUTLINE

1. Introduction to dual-tracer PET, available combinations, and clinical indications: • Breast cancer (FES + FDG) • Prostate cancer (PSMA + FDG) • Neuroendocrine tumors (DOTATATE + FDG) 2. Case-based applications: • Tumor phenotyping and staging adjustment • Malignancy and inflammation dilemma • Treatment planning and response assessment 3. Technical limitations, and future directions: • Limitations of the current dual tracer protocols • Moving toward same-day whole-body protocols

NMMIEE-15 WHEN PSMA MISLEADS: FALSE POSITIVES ON PSMA PET/CT IN NON-PROSTATIC CASES

Shayan Saeed (*Presenter*)
Ozivefueshe Dimowo, MD, MPH (*Abstract Co-Author*)
Lawrence Wang, DO (*Abstract Co-Author*)
Arash Anavim, MD, MBA (*Abstract Co-Author*)
Joseph E. Burns (*Abstract Co-Author*)
Anderanik Tomasian, MD (*Abstract Co-Author*)
Maryam Golshan Momeni, MD (*Abstract Co-Author*)
Peter H. Pham, MD (*Abstract Co-Author*)

TEACHING POINTS

[1] To review the biodistribution of prostate specific membrane antigen (PSMA) [2] To review the indications for PSMA PET/CT in prostate cancer [3] To provide own institution cases of false positives on PSMA PET/CT

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[1] Learning Objectives [2] Biodistribution of PSMA [3] Indications for PSMA in Prostate Cancer (i) PSMA PET CT is sensitive for prostate cancer metastasis but can show false positives, while bone MRI provides high-resolution images of bone marrow and lesions, often missing soft tissue uptake. [4] Bone MRI in Prostate Cancer Management (i) Bone MRI excels at detecting marrow involvement and subtle bone changes that PSMA/PET CT might miss, providing complementary information in metastatic assessment. [5] Discrepancies Between PSMA/PET CT and Bone MRI Findings (i) Common discrepancies occur with benign bone lesions or post-treatment changes, where PSMA/PET CT may show activity that MRI does not correlate with, leading to potential misinterpretation. [6] Summary and Key Takeaways (i) A multimodal approach, combining PSMA/PET CT with bone MRI, ensures more accurate diagnoses and reduces the risk of misdiagnosis.

NMMIEE-16 CAUSES OF ALTERED BIODISTRIBUTION OF F-18 FDG PET MIP IN MULTIPLE MYELOMA

(*Presenter*)
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McKenzie House (*Abstract Co-Author*)
Tarik Alfayyomi (*Abstract Co-Author*)
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Riyan Siddiqui (*Abstract Co-Author*)
Logan Lamar (*Abstract Co-Author*)
Vani Vijayakumar, MD (*Abstract Co-Author*)

TEACHING POINTS

Discuss the role of F-18 FDG in PET MIP, especially when imaging patients with multiple myeloma. Distinguish physiologic from pathologic causes of altered F-18 FDG uptake in skeletal muscles. Assess F-18 FDG uptake in precancerous plasma cell disorders, such as smoldering multiple myeloma. Correlate F-18 FDG uptake with lab findings to determine significant PET scan findings post monoclonal antibody treatment.

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Multiple myeloma is a malignant plasma cell cancer often characterized by various biomaterials, including monoclonal immunoglobulins and free light chains, that lead to destruction of bone marrow. F-18 fluorodeoxyglucose (FDG) is a radioactive tracer used in positron emission tomography maximum intensity projection (PET MIP) that collects in metabolically active areas of the body, namely those impacted by malignant cancers. Use of this technology allows for anatomic and pathological classification of disease and has proved useful in diagnosing and staging hematologic cancers like multiple myeloma. This exhibit will examine several cases of multiple myeloma in which the F-18 FDG PET MIP scans demonstrated altered distribution of this radioactive tracer in conjunction with disease traits. These include skeletal muscle uptake, staging of disease, physiological uptake, and comparison with lab values attributed to multiple myeloma.

NMMIEE-17 VARIANTS OF PRIMARY PROGRESSIVE APHASIA: DETECTION AND PREDICTION OF CLINICAL COURSE ON ^{18}FDG-PET/CT

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Zachariah Burns, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To clarify the value of 2-deoxy-2-[18F]fluoro-D-glucose (FDG)-positron emission tomography (PET) in the detection and diagnosis of the 3 variants of Primary Progressive Aphasia (PPA) 2. To predict the clinical course of PPA with FDG-PET, illustrated by multiple cases with corresponding clinical and MRI/CT findings.PPA is a rare neurodegenerative disorder characterized by language-predominant deficits involving the frontal and temporal regions of the left hemisphere with 3 characteristic subtypes. Often it leads to development of dementia, specifically semantic dementia (SD) for frontotemporal dementia (FTD) and logopenic progressive aphasia (LPA) as an atypical presentation of Alzheimer's disease (AD). Among the imaging-supported diagnostic criteria for the PPA variants, it appears FDG- PET has better diagnostic performance compared with Magnetic Resonance (MR) imaging, particularly for the LPA and Nonfluent/agrammatic Variant PPA (nfvPPA). Although the three PPA subtypes show distinct regions of glucose hypometabolism on FDG PET, there is significant overlap amongst hypometabolic areas complicating differential diagnosis. Furthermore, it seems PET imaging data could help predict the clinical course of PPA, which differs according to each variant. It has been shown that left anterior temporal and frontal medial hypometabolism in agrammatic variant is linked to motor neuron disease and atypical parkinsonism, respectively. It has also been shown to progress to fronto-temporal degeneration with tau pathology. As mentioned previously SD evolves to behavioral disorder; and LPA to AD.

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5 cases with legends presented in the PDF file illustrating the above teaching points

NMMIEE-18 RECENT ADVANCES IN MOLECULAR IMAGING INPROSTATE CANCER STAGING:PROMISE V2 AND THE PRIMARY SCORE

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TEACHING POINTS

PROMISE V2 and the PRIMARY ScoreProstate cancer, the most prevalent malignancy in men, demands precise diagnostic strategies. Molecular imaging with PSMA PET/CT has transformed disease staging and monitoring. The PROMISE V2 framework standardizes findings in molecular imaging, enhancing multicenter evaluations and supporting evidence-based decisions. Meanwhile, the PRIMARY score assesses intraprostatic patterns in PSMA PET/CT, classifying uptake intensity and location to differentiate malignant from benign lesions, thus improving diagnostic accuracy. This integration promotes personalized, evidence-based prostate cancer management.Despite technological progress, conventional imaging faces challenges in objective measurements and reproducibility. PROMISE V2 and the PRIMARY score address the need for standardized protocols, reducing interobserver variability and ensuring reliable interpretations of PSMA PET/CT images, crucial for clinical practice and research.

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In conclusion, the collaboration between PROMISE V2 and the PRIMARY score has improved diagnostic precision and personalized care in prostate cancer. Future efforts should focus on validating these systems in diverse populations and training multidisciplinary teams, aiming for broader clinical applications and health equity.

NMMIEE-19 SPECT/CT IN PSMA THERANOSTICS: INTERPRETATION GUIDELINES, RESPONSE PATTERNS, PITFALLS, AND STRUCTURED REPORTING

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Delphine L. Chen, MD (*Abstract Co-Author*)
Amir Iravani, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the role of SPECT/CT in PSMA theranostics, particularly for treatment response assessment. Identify common pitfalls in SPECT/CT interpretation, using teaching cases to highlight potential nuances. Explore the development of structured reporting guidelines for SPECT/CT in PSMA theranostics, focusing on creating a standardized reporting method to harmonized communication among physicians. Recognize treatment response patterns in SPECT/CT.

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I. Introduction Overview of SPECT/CT in PSMA theranostics and its growing role in clinical practice. II. Systematic approach to SPECT/CT interpretation Detailed body map segmentation by organ system. Differentiating physiological from pathological uptake. III. Common pitfalls in SPECT/CT imaging Misinterpretation of benign vs. malignant lesions. Artifacts and technical limitations. IV. Structured reporting proposal Proposed framework for structured reports in SPECT/CT.Key elements to include in the report. Importance of standardization to enhance reproducibility and communication. V. Response patterns in SPECT/CT Favorable response patterns : Case

examples of significant imaging changes, including complete and partial responses. Progression patterns : Imaging examples showing disease progression, new lesions, and increasing PSMA uptake. Mixed response patterns : Examples where some lesions show a response while others progress, demonstrating the heterogeneity of disease. VI. Clinical application and impact How proper interpretation and structured reporting guide therapy and optimize outcomes.Real-world examples demonstrating the use of SPECT/CT to influence treatment decisions.

NMMIEE-21 ENABLING PRECISION MEDICINE: ACHIEVING MULTIPLEXED PET (MPET) FOR IMAGING-BASED MOLECULAR CHARACTERIZATION OF DISEASE

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Craig Levin, PhD (*Abstract Co-Author*)
Hong Song, MD, PhD (*Abstract Co-Author*)
Andrei Iagaru, MD (*Abstract Co-Author*)
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TEACHING POINTS

Positron Emission Tomography (PET) enables non-invasive in vivo assessment of disease-related physiological and molecular processes. Conventional PET detects same-energy 511 keV annihilation photons, hindering energy-based discrimination and largely restricting PET to single-tracer studies. Disease heterogeneity, involving disruptions in multiple molecular pathways, presents a significant challenge for traditional PET. Multiplexing PET (mPET), or the detection of =2 molecular targets within a single imaging session offers a richer non-invasive molecular characterization of disease. This educational exhibit aims to explore the approaches to achieving mPET, highlighting advantages, disadvantages, and technical aspects associated with each. Ultimately, this exhibit will discuss the potential of mPET and imaging-based molecular expression data in driving precision medicine.

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1. Highlight disease heterogeneity and role of PET imaging. 2. Discuss advantages/disadvantages and technical aspects of various mPET methods: a) Sequential injection: imaging distinct radiotracers separated in time. b) Multi-tracer injection protocols and kinetic modeling: multi-tracer compartment modeling (MTCM) with acquired arterial input functions and dynamic PET. c) Multi-Isotope PET: distinct radiotracer half-lives or biodistribution. d) Detector technologies: Triple coincidences (prompt gammas), silicon photomultipliers (SiPMs) and large axial field of view (LAFOV) scanners. e) Deep learning/computational approaches to enabling mPET 3. Present imaging-based non-invasive molecular insights for detecting therapeutic targets and facilitating precision medicine.

NMMIEE-22 ADIPOSE TISSUE: NORMAL VARIANTS AND PATHOLOGIC INSIGHTS ON ^{18}F-FDG PET/CT

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Devaki Shilpa S. Surasi, MD (*Abstract Co-Author*)

TEACHING POINTS

Adipose tissue, a major metabolically active endocrine organ, is traditionally classified into white adipose tissue (WAT) and brown adipose tissue (BAT). F-18 FDG PET-CT has become an essential tool in distinguishing normal physiologic activity within adipose tissue from other pathological conditions. This exhibit will examine the role of F-18 FDG PET/CT in identifying and interpreting adipose metabolism, differentiating normal adipose tissue from other abnormal pathologies, and recognizing the limitations of imaging in this context

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1- Overview of Normal Fat Distribution and types of Adipose tissue including brown and white fat 2- FDG PET-CT Protocol at Our institution-:A review of imaging techniques and acquisitions parameters 3. Case studies of Normal physiologic Fat uptake: Recognizing normal variants and how to reduce it4. Common Fat Grafts: Imaging characteristics and clinical significance 5. Post -Surgical Adipose changes: PET/CT findings post operative patients6. Adipose pathology: Case based review of fat related pathologies including , lipomas, liposarcoma, teratomas , fatty tumor metaplasia and other conditions 7 Conclusion: Key takeaways and clinical implications.

NMMIEE-23 WHERE THE LIGHT BETRAYS. IMMUNOTHERAPY-RELATED ADVERSE EVENTS (IRAES) ON F-18 FDG PET-CT

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TEACHING POINTS

Immunotherapy Role in Cutaneous Malignancies Immune checkpoint inhibitors are a cornerstone in the management of advanced and high-risk cutaneous malignancies , used in both metastatic and adjuvant settings. Metabolic Pitfalls: irAEs on FDG PET/CT Immune-related adverse events (irAEs) are FDG-avid and can mimic tumor progression or other inflammatory/infectious processes. Differentiation is key: Known sites of tumor usually remain stable or improve , while new findings may reflect inflammatory toxicity rather than disease progression. Common irAEs on PET/CT Sarcoid-like lymphadenitis : Symmetric or isolated FDG-avid lymphadenopathy (e.g., hilar, mediastinal). Hypophysitis : FDG uptake in the pituitary region, may correlate with endocrine symptoms. Pneumonitis : Focal or diffuse FDG-avid pulmonary opacities, often without clear infectious etiology. Hepatitis : Diffuse hepatic uptake or hepatomegaly. Pancreatitis : Focal or diffuse pancreatic uptake. Colitis : Diffuse or segmental bowel uptake with or without wall thickening. Clinical Importance Recognizing irAEs helps prevent misdiagnosis of progression , avoids unnecessary changes in cancer therapy , and guides timely supportive treatment for toxicity.

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1. The rise of Immunotherapy in clinical oncology2. The paradox: Efficacy vs immune related events3. The Role of F18 FDG PET-CT in monitoring immune activation4. Mechanism of immune activation5.Distinguishing tumor response from immune relate event6.Spectrum of immune related events7. Challenges in interpretation 8.Clinical implications and future directions

NMMIEE-24 THE BLOOD'S NEW ALPHABET " CRITICAL INSIGHTS FOR RADIOLOGISTS IN UNDERSTANDING THE NEW WHO LYMPHOMA CLASSIFICATION”

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TEACHING POINTS

Hematologic malignancies (HM) represent a diverse spectrum of disorders characterized by varying incidence rates, clinical outcomes, and underlying causes. These conditions originate from either hematopoietic progenitor cells in the bone marrow or immune-related cells. Broadly, they are categorized into: - Mature B-cell neoplasms** (encompassing B-cell lymphomas and plasma cell dyscrasias) -Mature T-cell and natural killer (NK) cell lymphomas - Hodgkin lymphoma (HL)** - Post-transplantation lymphoproliferative disorders (PTLD) - Dendritic cell neoplasms The latest classification system for hematologic malignancies integrates cutting-edge advancements in hematology and oncology, introducing novel subtypes that reflect deeper biological insights. Modern diagnostic approaches increasingly rely on molecular and genomic markers, which guide targeted therapy selection and clinical trial eligibility. As research progresses, these molecular signatures are expected to further refine potentially redefine the classification of lymphomas and other hematologic cancers in the years ahead.

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1. F18 FDG PET-CT protocol for different lymphoma cases2. Updates from 5th edition of WHO classification 3. New entities and subtypes4. Imaging findings for common lymphoma types5. Imaging findings for uncommon/rare lymphoma types 6. Role of F18 FDG in management of lymphomas 7. Future directions

NMMIEE-25 BEYOND OSSEOUS METASTASIS: DEEP DIVE INTO BONE SCINTIGRAPHY

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Gabriel C. Fine, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Clinical Utility of Bone Scintigraphy • Sensitivity in detecting metabolic bone activity compared to anatomic detail.• Applications in oncology, trauma, infection, and metabolic disorders.2. Pitfalls & Pearls • Differentiating true pathology from artifacts or normal anatomy.• Overcoming limitations to minimize false positives and negatives.3. Beyond Metastases • Emphasizing non-malignant conditions (e.g., AVN, metabolic diseases, trauma).4. Multidisciplinary Impact • The role of accurate interpretation in guiding patient management.

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Introduction •• Objectives: Pitfalls, variants, and uncommon findings.2. Mechanism of Bone Scintigraphy • Tc-99m MDP uptake (hydroxyapatite binding, blood flow).• Reflects osteoblastic activity.3. Protocol & Technical Aspects • Patient prep (hydration, timing).• Imaging phases: flow, blood pool, delayed.• SPECT/CT value.4. Pitfalls & Challenges • Tracer-related : Poor labeling, free pertechnetate.• Artifacts : Non-uniformity, motion, attenuation, drug related • Anatomic variants : Accessory ossicles, rib variants, deltoid insertion 5. Soft Tissue Uptake • Lungs : Metastatic calcification, amyloidosis, metastasis • Liver/Spleen : Iron overload, sickle cell, metastasis • Muscles : Rhabdomyolysis, injections• Node : Intralymphatic injection6. Drug & Metabolic Effects • Bisphosphonates, G-CSF, chemotherapy (flare phenomenon).• Super Scan : Metastatic vs. metabolic causes (hyperparathyroidism, Paget's).7. NAT & AVN • NAT : Classic pediatric patterns.•Renal : Obstruction, absent kidney.• **Sacroiliitis, osteomyelitis, fibrous dysplasia. 9.. Conclusion

NMMIEE-26 V/Q SCINTIGRAPHY "MORE THAN A PE SCAN —KNOW THE PATTERNS, AVOID THE TRAPS!"

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TEACHING POINTS

Versatility of V/Q Imaging V/Q scintigraphy extends far beyond PE diagnosis—it can also evaluate intracardiac and intrapulmonary shunts , pulmonary hypertension , vasculitis , and other non-thromboembolic vascular pathologies . Optimizing Technique to Reduce Pitfalls SPECT/CT fusion , appropriate patient positioning, and protocol modifications can improve anatomical localization , reduce false positives, and distinguish true defects from technical or physiologic artifacts . Pitfalls vs. True Pathology Recognize common pitfalls such as free Tc-99m (renal or gastric activity) , clumping of radiotracer , or suboptimal aerosol deposition , and distinguish these from true pathology such as pulmonary vein occlusion or vasculitis. Unexpected Tracer Distribution as Diagnostic Clues Extrapulmonary uptake (e.g., in the liver or kidneys) or asymmetric lung perfusion may indicate systemic disease , including right-to-left shunts, hepatopulmonary syndrome, or cardiac dysfunction. .

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1. Introduction 2. Protocol & Technique • Patient Prep :• Ventilation : Technegas vs. DTPA aerosols (avoid swallowing artifact).• Perfusion : Supine injection, monitor for clumping/free Tc-99m3. Pitfalls & Technical Challenges 4. Beyond PE: Key Diagnoses • Pulmonary Hypertension (PH), Right-to-Left Shunts, Pulmonary Vein Occlusion, Air Trapping Unexpected Soft Tissue Uptake • Liver/Spleen, 6. Vascular & Inflammatory Conditions, Vasculitis (e.g., GPA): Pulmonary Sarcoma :• Focal perfusion defect with mass on CT.5. Conclusion

NMMIEE-27 CARDIAC TRANSTHYRETIN AMYLOIDOSIS FOR RESIDENTS: FUNDAMENTALS AND FUTURE DIRECTIONS OF 99MTC-PYP SCINTIGRAPHY

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Naohide Hotta (*Abstract Co-Author*)
Susumu Kobayashi (*Abstract Co-Author*)
Masanori Kitase (*Abstract Co-Author*)
Misugi Urano, MD, PhD (*Abstract Co-Author*)
Akio Hiwatashi, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

-Transthyretin cardiac amyloidosis (ATTR-CM) has been a fatal disease, but disease-modifying therapies, such as tafamidis (a transthyretin stabilizer), offer hope for improved prognosis. Early and accurate detection of ATTR-CM is crucial for better patient outcomes. - 99mTc-PYP scintigraphy is recognized as the gold standard for ATTR-CM screening. We will review conventional metrics based on planar imaging, such as the H/CL ratio and the visual Perugini score. We will also discuss their disadvantages, including susceptibility to contamination from other structures such as the blood pool and ribs. -We will then revisit the underlying mechanism of SPECT/CT and how this ensemble technique works. Thanks to its better anatomical localization and attenuation correction, SPECT/CT offers advantages compared to planar-imaging for ATTR-CM diagnosis. -In the future prospects section, we will summarize the several promising quantitative SPECT/CT metrics. We will also share our institutional experience with a SPECT/CT-based metric for ATTR-CM diagnosis. -Through this educational exhibit, we hope to provide a comprehensive understanding of ATTR-CM and the future direction of SPECT/CT-based quantitative imaging.

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1) Overview of ATTR-CM: Pathology and Epidemiology 2) Treatment: Advent of Disease-Modifying Drugs 3) Diagnosis: Role of 99mTc scintigraphy 4) Modality: Planar imaging vs. SPECT-CT 5) Future Prospects: Potential of Quantitative SPECT-CT including our institutional experience

NMMIEE-28 THE FORGOTTEN TERRITORY " THE BRAIN'S BLIND SPOT IN ONCOLOGIC PET/CT" WHY OVERLOOKED?"

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TEACHING POINTS

Up to 20% of significant brain findings on PET/CT are non-malignant , yet they can critically impact oncologic management, staging, and prognosis. Neurologic conditions such as HIV-related encephalopathy, stroke, autoimmune encephalitis, and paraneoplastic syndromes may mimic brain metastases or primary CNS tumors on PET/CT, complicating diagnosis. Differentiating malignant from non-malignant brain uptake Oncology-specific diagnostic pearls : In lung cancer and melanoma : Brain metastases are common, but immune-related encephalitis and paraneoplastic limbic encephalitis should be considered Assessing brain findings can guide accurate classification of lymphoma , primary CNS lymphoma (PCNSL) from secondary CNS involvement , which differ in chemotherapy regimens and prognosis. treatment intensity, intrathecal therapy decisions, and long-term outcomes.

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Introduction: Why the Brain Is Overlooked in Oncologic PET/CT Missed Malignant Lesions: Oncology-Relevant Brain Findings Brain metastases from solid tumors Primary brain tumors detected on whole-body PET/CT Help differentiate primary vs. secondary CNS lymphoma , which have vastly different therapeutic approaches Non-Malignant Brain Conditions Uncovered During Staging PET/CT Infectious and inflammatory (e.g., encephalitis, HIV-related changes) Vascular pathologies (e.g., infarcts, paraneoplastic vasculitis) Neurodegenerative changes (e.g., Parkinsonian patterns, Alzheimer's-like uptake) Incidental benign findings (e.g., demyelinating disease) Why Non-Oncologic Brain Findings Matter in Cancer Patients Toward a More Systematic Brain Review on PET/CT Takeaway

NMMIEE-29 NAVIGATING NEURODEGENERATION: HOW PET IMAGING GUIDES DIAGNOSIS AND TREATMENT

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Joseph R. Osborne, MD, PhD (*Abstract Co-Author*)
Anna Nordvig (*Abstract Co-Author*)
Gloria C. Chiang, MD (*Abstract Co-Author*)
Jana Ivanidze, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. PET imaging can provide valuable insight into the underlying biological processes of neurodegenerative diseases (NDs). 2. Recently, several PET radiotracers have become available in clinical practice, aiding in accurate diagnosis of common NDs. 3. Early detection of NDs allows for optimized management as novel therapeutics become available, leading to better patient outcomes.

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PET plays a pivotal role in the diagnosis and management of NDs. The ability to visualize/quantify key molecular changes in the brain with PET helps to improve diagnostic accuracy for NDs, particularly Alzheimer's (AD) and Parkinsons (PD). Accurate and early detection allows for tailored therapeutics. We will outline the use and utility of FDG-PET, amyloid PET, FDOPA PET and Tau PET. [F18]Fluorodeoxyglucose (FDG)-PET: Visualizes brain glucose metabolism. FDG PET is often the first brain PET for patients with cognitive impairment. Region-specific patterns of decreased cortical FDG avidity can help in the diagnosis of common NDs. Amyloid PET: There are 3 FDA-approved amyloid PET tracers. Amyloid PET confirms suspected AD diagnoses and assesses eligibility for amyloid-targeted therapies (ex. Lecanemab). Centiloid scores can also be calculated. Tau PET: [F18]Flortaucipir is currently the only FDA approved PET radiotracer visualizing Tau neurofibrillary tangles. As Tau burden correlates better with disease stage than amyloid burden, Flortaucipir is emerging as a useful clinical tool in the staging of AD. [F18]Fluorodopa (FDOPA) PET: FDOPA PET allows visualization of dopaminergic neurons, allowing more accurate diagnosis of Parkinsonian syndromes compared to [I123]Iodoflupane SPECT (DATSCAN).

NMMIEE-30 TAU PET IMAGING IN NEURODEGENERATIVE DISORDERS: A TAILORED APPROACH TO DIAGNOSIS AND MANAGEMENT

Michelle Chen, MD (*Presenter*)

TEACHING POINTS

1. Tau, a microtubule-associated protein essential for neuronal stability, aggregates into pathologic neurofibrillary tangles (NFTs) when hyperphosphorylated. 2. NFTs are a hallmark of Alzheimer's disease (AD) and other tauopathies (ex: PSP, CBD). 3. Tau PET uses radiolabeled tracers to selectively bind to tau aggregates in vivo, enabling visualization of regional tau deposition and correlation with Braak staging. 4. First-generation tracers demonstrate more off-target binding in subcortical regions whereas second-generation tracers show improved specificity for AD-type tau. 5. Baseline tau PET uptake predicts future cognitive decline and neurodegeneration in AD, independent of amyloid-ß status. 6. Tau PET is recommended for young-onset dementia, atypical AD, and amyloid-positive cases with unclear phenotypes. 7. Tau PET optimizes anti-tau therapies by monitoring tau burden reduction in Braak-defined regions (ex: temporal cortex) to assess therapeutic efficacy. 8. Emerging applications include integrating AI-driven quantification to automate Braak staging. 9. Tau PET bridges biomarker-driven diagnosis and therapeutic innovation to optimize individualized patient care.

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1. Tau biology and pathophysiology 2. Principles of Tau PET imaging 3. Appropriate use criteria 4. Evolution of tau PET tracers 5. Clinical and research applications 6. Future Directions

NMMIEE-31 MULTIMODALITY EVALUATION OF CARDIAC SARCOIDOSIS: PEARLS AND PITFALLS OF HYBRID IMAGING

Luis O. Tierradentro-Garcia, MD (*Presenter*)
Katerina H. Lee, MD (*Abstract Co-Author*)
Paco E. Bravo, MD (*Abstract Co-Author*)

TEACHING POINTS

- CMR, especially late gadolinium enhancement (LGE), is the gold standard modality in diagnosis and prognosis of cardiac sarcoidosis.- Chronic granulomatous inflammation leads to scar tissue formation, which can be visualized as LGE.- FDG-PET has a high sensitivity for detection of active inflammation in cardiac sarcoidosis.- Abnormal FDG-PET uptake is associated with increased risk of major adverse events.- CMR and FDG-PET are complementary modalities for diagnosis and monitoring of cardiac sarcoidosis.- Ga-DOTATATE PET/CT has demonstrated a potential role in diagnosing cardiac sarcoidosis

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- Pathophysiology and genetic factors associated with cardiac sarcoidosis.- Discuss common patterns of cardiac sarcoidosis imaging using CMR and FDG-PET.- Presentation of cases from a tertiary academic institution.- Propose a diagnostic algorithm for the interpretation of suspected cases of cardiac sarcoidosis.- Pearls and pitfalls: prognostic value of imaging, quantitative assessment, surveillance, dietary mechanisms (ketosis), SGLT2 inhibitors- Potential use of spatial proteomics in cardiac sarcoidosis.

NMMIEE-32 TRACERS IN TEST TUBES: IN VITRO TECHNIQUES FOR THE NUCLEAR RADIOLOGIST

Jonathan Porter, MD (*Presenter*)
Bryce Nelson (*Abstract Co-Author*)
Mariusz Bereznicki (*Abstract Co-Author*)
Adeline Le (*Abstract Co-Author*)
Jan Andersson (*Abstract Co-Author*)

TEACHING POINTS

A solid understanding of radiopharmaceutical production techniques is essential for clinicians, especially when unexpected production outcomes hinder accurate diagnostic interpretation. This exhibit will showcase several common radiopharmaceutical production techniques, providing an overview of their practical applications and synthesis steps, while illustrating cases from our institution where unexpected production results impacted clinical use. We explore solutions to these production challenges and conclude with future directions for improvement with implications for clinical practice. 1) White blood cell labeling: Covers the production technique used at our institution, including separation of white blood cells, labeling with 99m Tc, isolation and re-suspension, labeling efficiency determination, and reasons for poor labeling. 2) Red blood cell labeling: Focuses on labeling the Ultratag TM kit with 99m Tc, outlining production steps, pharmacology, labeling efficiency determination, and reasons for poor labeling. 3) GFR measurement: Discusses radiotracers developed for GFR evaluation such as 51 Cr-EDTA and 99m Tc-DTPA, basic principles of GFR evaluation, plasma sampling methods such as the Russell two-sample method, and the Gates camera-based method. 4) Urea breath test: Outlines the method of 14 C administration, activity measurements, and potential reasons for false negative or false positive results.

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1) Introduction; 2) White blood cell labeling; 3) Red blood cell labeling; 4) GFR measurement; 5) Urea breath test; 6) Future improvements and implications for clinical practice; 7) Conclusions; 8) References

NMMIEE-33 ^{68Ga}-DOTATATE PET IN MENINGIOMA: PATTERNS, PITFALLS, AND POST-TREATMENT PEARLS

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Michael C. Veronesi, MD, PhD (*Abstract Co-Author*)
Matthew E. Larson, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

Initially utilized for imaging neuroendocrine tumors, DOTATATE PET is now increasingly applied in meningioma due to high expression of somatostatin receptor subtype 2 (SSTR) on tumor cells. [1-3] We review the clinical utility of DOTATATE PET in meningioma evaluation, beginning with a brief overview of tumor biology and the role of SSTR2 in enabling targeted imaging. [4] We describe typical avidity patterns, with emphasis on common features and locations. [5] We review common pitfalls, including physiologic uptake. [2] We explore post-treatment interpretation through cases showing persistent uptake in surgical beds and irradiated tissue, highlighting the importance of MRI and serial imaging for distinguishing recurrence. [6] Additionally, we highlight DOTATATE's emerging role for peptide receptor radionuclide therapy (PRRT). [7] This exhibit incorporates our institution's experience with DOTATATE PET for meningioma, including representative cases and utilization trends. This real-world perspective may aid others facing implementation challenges and foster practical discussion.

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Introduction Meningioma characteristics and SSTR expression DOTATATE PET use in primary and recurrent disease Typical DOTATATE Avidity Patterns Imaging features Common sites: convexity, parasagittal region, skull base Pitfalls and Off-Target Uptake Physiologic uptake: pituitary gland, choroid plexus, nasal mucosa Benign inflammatory uptake Post-Treatment Imaging Challenges Persistent uptake MRI correlation/Serial Imaging Emerging Role for PRRT Utilization Trends and Practical Insights Real-world exam experience and utilization trends

NMMIEE-34 WHERE ARE MY BLINDSPOTS? A FDG-PET/CT SEARCH PATTERNS FEEDBACK TOOL VIA EYE-TRACKING AND NNUNET

Joy T. Wu, MBChB, MPH (*Presenter*)
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Stephan Altmayer, MD, PhD (*Abstract Co-Author*)
Ken Chang, MD,PhD (*Abstract Co-Author*)
Alexander C. Lee, MBChB (*Abstract Co-Author*)
Elizabeth Theng, BA, MD (*Abstract Co-Author*)
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Tomoaki Otani, PhD (*Abstract Co-Author*)
Brittany Z. Dashevsky, MD, DPhil (*Abstract Co-Author*)
Hye Lim Park (*Abstract Co-Author*)
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Kip E. Guja, MD, PhD (*Abstract Co-Author*)
Benjamin Risse (*Abstract Co-Author*)
Daniel Gruhl (*Abstract Co-Author*)
Guido A. Davidzon, MD (*Abstract Co-Author*)

TEACHING POINTS

Compared to experienced radiologists, in training radiologists on average spent more time evaluating anatomy. Becoming familiar with normal and variant anatomy is an important factor to becoming an efficient and thorough radiologist. We have many interesting examples from our dataset that attendings do alter their search patterns to pay more attention to areas related to cancer specific metastatic pathways. Real time and aggregate retrospective feedback on search patterns and blind spots could be a useful tool for training radiologists. Benefit to trainee learning will need to be further tested in practice.

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FDG-PET/CT is the standard of care for staging and follow-up of a wide range of cancers. There is increasing demand to read more of these complex studies rapidly. Fatigue, distractions and/or less experience are common factors contributing to higher errors, which can lead to suboptimal oncological care. We have built an interactive eye-tracking enabled PET/CT viewer that proposes lesion candidates for radiologists to efficiently validate or correct while their search patterns are collected at 60 Hz. With this viewer, search patterns for 318 studies were each collected from a trainee and a board certified attending. All original de-identified images were obtained from the public Tubingen FDG-PET/CT dataset. For this educational exhibit, we present the exploratory analyses and a prototype educational feedback tooling, which utilizes a deep learning 3D nnUNet anatomy segmentation model to provide a quantitative analysis of readers' search patterns. We will also be able to demonstrate our eye-tracking and Unet enabled PET/CT read feedback tool life at the exhibit.

NMMIEE-35 VORICONAZOLE-INDUCED FLUOROSIS AND PERIOSTEITIS: MULTIMODALITY IMAGING AND DIFFERENTIAL DIAGNOSIS

Ba D. Nguyen, MD (*Presenter*)
Alecio F. Lombardi, MD (*Abstract Co-Author*)
Paul Chroneos, MD (*Abstract Co-Author*)
Taejung Song (*Abstract Co-Author*)
Mackenzie Bartkus (*Abstract Co-Author*)
Felipe Martinez (*Abstract Co-Author*)

TEACHING POINTS

Voriconazole is a medication with high content in fluoride, administered as a preventive antifungal drug to oncologic patients. The high dose or long-term therapy of this medication could trigger fluorosis and periosteitis with bone pain symptomatology and characteristic radiologic and scintigraphic features. The teaching points of this educational exhibit are (1) to familiarize the viewers with its pharmacologic characteristics and side effects of fluorosis and periosteitis, (2) to present and illustrate the imaging features of voriconazole-induced fluorosis and periosteitis, and (3) to discuss the clinical entities constituting its differential diagnosis with imaging comparison.

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This educational exhibit has three components: (1) the description of the characteristic features of Voriconazole-induce fluorosis and periosteitis, consisting of curvilinear, amorphous or bulky periosteal deposits with radiopharmaceutical avidity, depicted by radiographs, CT, bone scintigraphy, SPECT/CT and 18F FDG PET/CT, (2) the presentation of the timing of occurrence of induced periosteitis under Voriconazole therapy and the timing of its resolution after discontinuation of the drug, and (3) the imaging comparison of other clinical entities resembling Voriconazole-induced fluorosis and periostitis such as primary and secondary hypertrophic osteoarthropathy, computer duster huffing addiction with difuoroethane, venous stasis, shin splints, thyroid acropachy , and tea consumption-induced fluorosis.

NMMIEE-36 "MISGUIDED MISSILES" WHEN RADIOTRACERS WANDER OFF COURSE

Ahmed H. Ebada Salem, MBBCh, PhD (*Presenter*)
Reham M. Ellessy, MBBCh (*Abstract Co-Author*)
Akram M. Shaaban, MBBCh (*Abstract Co-Author*)
Kathryn A. Morton, MD (*Abstract Co-Author*)
Ayman H. Gaballah, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Know Your Radio-tracer : Understanding the mechanism of action is key to predicting both normal and abnormal biodistribution for both PET and non PET tracers Physiology vs. Pathology : Some patterns may mimic disease; correlating with clinical context and other imaging is essential. Technical Errors Can Mimic Disease : Radiotracer QC failures can result in misleading biodistribution—always check the basics. Systemic Conditions Matter : Cardiac failure, endocrine disorders, and autoimmune diseases can significantly alter tracer uptake. Patient Prep Is Critical : Improper preparation can derail scan interpretation (e.g., insulin before FDG PET, no Lugol before Ioflupane). Recognize Common Pitfalls : Patterns like brown fat, rhabdomyolysis, or post-therapy inflammation have typical appearances but may be misread. Correlate and Confirm : Use multimodality imaging and follow-up to confirm atypical findings when in doubt.

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Introduction Basics Refresher Commonly used radiotracers (FDG, PSMA, FES, MIBG, PYP, MAA, MDP, Ioflupane, etc.) Normal biodistribution patterns Mechanisms of action (molecular targets and physiological uptake) Mechanisms of Altered Distribution Technical factors, Physiological and pathological conditions or patient-related factors Case-Based Review Categories of Atypical Uptake Extravascular leakage (e.g., rhabdomyolysis, edema) Shunting and altered flow (e.g., MAA in brain from ASD) Off-target binding (e.g., PSMA in stroke or inflammation) Technical artifacts and QC failures (e.g., free F-18 in blood pool) Physiologic mimics (e.g., brown fat, muscle uptake) Strategies to Reduce or Avoid Pitfall

NMMIEE-37 FDG PET/CT IN DECIPHERING THE CAUSES OF FEVER OF UNKNOWN ORIGIN: A PICTORIAL REVIEW

Nana Fujita (*Presenter*)
Masatoshi Hotta, MD, PhD (*Abstract Co-Author*)
Takeyuki Watadani, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Fever of Unknown Origin (FUO) represents a significant diagnostic challenge, encompassing a wide spectrum of potential etiologies. As an advanced imaging modality, FDG PET/CT plays a central role in the diagnostic workup of FUO, providing critical insights into its underlying causes. This educational exhibit aims to: 1) Highlight the diagnostic utility of FDG PET/CT in FUO compare to other modalities such as Ga-citrate scintigraphy. 2) Present illustrative cases where FDG PET/CT contributed to the successful diagnosis of FUO. 3) Describe characteristic FDG PET/CT findings associated with various FUO etiologies to aid differential diagnosis.

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? Overview - Definition and diagnostic challenges of FUO. - Role of FDG PET/CT in the diagnosis of FUO. ? FDG PET/CT of underlying conditions of FUO 1. Infection: infective endocarditis, occult abscess, bone and joint infection, soft-tissue infection, tuberculosis, syphilis, fungal infections (e.g., histoplasmosis). 2. Non-Infectious Inflammatory Diseases (NIID): polymyalgia rheumatica (PMR), adult-onset Still's disease (AOSD), systemic lupus erythematosus (SLE), sarcoidosis (Lofgren syndrome), inflammatory bowel disease (e.g., Crohn's disease), vasculitis (e.g., Takayasu arteritis, giant cell arteritis, polyarteritis nodosa, granulomatosis with polyangiitis, eosinophilic granulomatosis with polyangiitis). 3. Neoplasm: lymphoma (e.g., intravascular lymphoma), Castleman disease, TAFRO syndrome. 4. Miscellaneous: thyroiditis, hyperthyroidism, necrotizing lymphadenitis (Kikuchi-Fujimoto disease).

NMMIEE-38 EMBRACING DIFFERENCES: UNDERSTANDING DISCREPANCIES BETWEEN PROSTATE MRI AND PSMA PET AND THEIR IMPLICATIONS

Susan Dhamala, MD (*Presenter*)
Lilja B. Solnes, MD, MBA (*Abstract Co-Author*)
Katarzyna J. Macura, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

-Prostate MRI and PSMA PET play a crucial and complementary role in the management of prostate cancer. -Prostate MRI is currently the initial imaging modality of choice in the diagnostic pathway of prostate cancer to identify suspicious areas, guide targeted biopsies, and aid in treatment planning and active surveillance decisions. -Given that prostate cancer has a wide range of aggressiveness, interpretation of prostate MRI relies on combining information from multiparametric sequences and assigning a PI-RADS assessment category intended to represent the lesion's likelihood of clinically significant prostate cancer (Grade Group 2 and above). -In conjunction with MRI, PSMA PET has emerged as an important staging tool in patients with newly diagnosed intermediate and high-risk disease. -PSMA PET imaging uses a radioactive tracer that binds to PSMA proteins, which is overexpressed in most prostate cancer cells, allowing detection of both local and distant disease spread. -Growing number of patients undergo combined assessment with prostate MRI and PSMA PET/CT leading to questions regarding discrepant findings between the two modalities. -Understanding the principles behind these imaging modalities and varying histology of prostate cancer can help explain their different presentation on imaging. -Discrepancies between prostate MRI and PSMA PET/CT also can impact treatment decisions in prostate cancer and PSMA theranostics.

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1. Introduction to prostate cancer 2. Basis of prostate MRI and PSMA PET 3. Cases of prostate MRI and PSMA PET/CT concordance and discordance 4. Reasons for discrepant findings between imaging modalities 5. Clinical implications for treatment decisions

NMMIEE-39 Surprise Hotspots: A Quality Initiative in Nuclear Medicine QC

Bhargavi S. Sovani, MD,MBBS (*Presenter*)
Jerold W. Wallis, MD (*Abstract Co-Author*)
Maria R. Ponisio, MD (*Abstract Co-Author*)

TEACHING POINTS

Quality Control (QC) in nuclear medicine is a crucial skill that may have been impacted during the pandemic. Effective QC in nuclear medicine necessitates a comprehensive understanding of normal tracer biodistribution and the potential causes of deviations, which can be due to technical issues, contamination, or unexpected findings. Maintaining high standards in QC ensures reliable diagnostic outcomes. 1. Purpose: This educational exhibit aims to illustrate common misleading events through cases that can lead to incorrect image interpretations. 2. Methods: Review and analysis of case studies where QC issues led to image misinterpretation. Identification of the types of errors, such as technical faults, contamination, and unexpected tracer distribution. Documentation of corrective actions taken and recommendations for future QC practices. 3. Results: Compilation of case studies showing common QC errors and their impact on image interpretation. Detailed analysis revealing the root causes of the identified errors. Recommendations for improving QC protocols to prevent similar issues in the future. 4. Conclusion Through methodical examination of case studies and identification of common QC errors, this exhibit highlights the importance of rigorous QC processes in nuclear medicine. It is an educational resource to better train radiology with the knowledge and skills to ensure accurate image interpretation and diagnostic reliability.

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Studies Included Bone scans, I-131, In-111 Pentetreotide (OctreoScan), VQ, renal, sestamibi, brain, Meckel, PET scans. The following will be reviewed: Common indications, Expected biodistribution, History to look for, Practical QC checklist

NMMIEE-40 DECODING PARKINSONIAN SYNDROMES WITH MOLECULAR IMAGING: A PRIMER FOR RESIDENTS

Andres Guillermo Tarra Romero, MD (*Presenter*)
Shahin Soltani Darani, MD (*Abstract Co-Author*)
Santiago Carrillo, MD (*Abstract Co-Author*)
Julian Rodriguez Cely, MD (*Abstract Co-Author*)

TEACHING POINTS

• The uptake of presynaptic radiotracers, such as 6-[¹8F]FDOPA, is decreased in conditions like Parkinson's disease and atypical parkinsonian syndromes.• In drug-induced parkinsonism, essential tremor, Alzheimer's disease, and other conditions, presynaptic radiotracer concentration is typically preserved. • Postsynaptic radiotracer concentration generally remains normal in Parkinson's disease, but shows variable alterations in atypical parkinsonian syndromes. • The lateralized pattern helps differentiate DCB from other parkinsonian syndromes, which typically show more symmetric involvement.

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Introduction Anatomy Normal Brain Glucose and Dopamine Metabolism Imaging in Parkinson's Disease Imaging of Atypical Parkinsonian Syndromes Take-Home Messages Conclusions References

NMMIEE-41 TO DOSE OR NOT TO DOSE: PET-CT IN PREGNANCY-ASSOCIATED CANCERS

Amy Maduram, MD (*Presenter*)
Michael Hansen, MD (*Abstract Co-Author*)
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Andrea N. Saldana, MD (*Abstract Co-Author*)
Lilian Wang, MD (*Abstract Co-Author*)
Vidushani S. Perera, MD (*Abstract Co-Author*)

TEACHING POINTS

Pregnancy-associated cancers (PAC), affecting 1 in 1000 pregnancies, present a complex clinical challenge at the intersection of radiology, oncology, and maternal-fetal medicine. These patients are often diagnosed at more advanced stages, as delays hinder early detection in evaluation and treatment. PET/CT offers clear clinical benefits for staging and recurrence detection, but its use during pregnancy is controversial as FDG crosses the placenta. Fetal radiation exposure concerns, limited counselling on risk-benefit trade-offs, and medicolegal concerns have limited its application. Furthermore, although PET-CT is not absolutely contraindicated during pregnancy per ACR guidelines, recent NCCN guidelines for pregnancy-associated breast cancers notably contraindicate nuclear imaging, and ASCO practice management guidelines discourage 18FDG PET-CT to assess for distant metastases. This exhibit will demonstrate the multidisciplinary approach and rationale for using PET-CT during pregnancy and how it can significantly influence clinical management and outcomes of PAC.

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1. Review the role of PET/CT in staging and evaluating treatment response. 2. Discuss the risks, benefits, and safety considerations of PET/CT in pregnant patients, including fetal radiation exposure. 3. Identify patterns of physiologic FDG uptake in lactating breast tissue and potential mimics or obscuration of pathology. 4. Cases of PET/CT performed during pregnancy for patients with breast and lung cancer. 5. Cases of PET/CT contributing to detecting more extensive metastatic disease in PAC. 6. Self-assessment quiz.

NMMIEE-42 USING 18F-FET PET/MR FOR DETECTION OF RECURRENT DISEASE IN HIGH-GRADE GLIOMAS: TIPS AND TRICKS FOR INTERPRETATION

Timothy L. Chen, MD (*Presenter*)
Javier Villanueva-Meyer, MD (*Abstract Co-Author*)
Robert R. Flavell, MD, PhD (*Abstract Co-Author*)
Nancy Ann Oberheim Bush (*Abstract Co-Author*)
Thomas A. Hope, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Understand the difficulties of differentiating recurrent disease from treatment effect in imaging of high-grade gliomas with current standard of care MRI-based techniques 2. Understand the key advantages of FET PET compared to other radiotracers in imaging of the gliomas 3. Learn how to interpret FET PET using a semi-quantitative approach 4. Recognize limitations of FET PET and pitfalls in interpretation

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1. The dilemma: treatment effect vs. progressive disease in gliomas 2. A review of current and historic approaches to follow up of high-grade gliomas: MRI, PET, and SPECT 3. Introduction to FET PET imaging a. What is FET b. Advantages and disadvantages of FET to resolve treatment effect vs progressive disease compared to other radiotracers such as FDG and F-DOPA 4. FET PET/MRI imaging protocol 5. Semi-quantitative interpretation approach for FET PET 6. Case series: positive, negative, and ambiguous examples 7. Summary of challenges and pitfalls in interpretation

NMMIEE-43 ONCOLOGY AND TOXICOLOGY INTERSECT: THE ROLE OF NUCLEAR MEDICINE IN DETECTING CHEMOTHERAPY-INDUCED ADVERSE EFFECT

Ryogo Minamimoto, MD, PhD (*Presenter*)
Yumi Abe (*Abstract Co-Author*)
Rintaro Ito, MD, PhD (*Abstract Co-Author*)
Ryota Asai, MD (*Abstract Co-Author*)
Katsuhiko Kato, MD, PhD (*Abstract Co-Author*)
Shinji Naganawa, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Nuclear medicine has been widely utilized to guide treatment strategies in oncologic patients; however, it also provides important insights into chemotherapy-related adverse effects. This presentation explores the role of nuclear medicine in identifying treatment-induced toxicities across various organ systems. Chemotherapy can elicit inflammatory, infectious, or immune-mediated changes that manifest as abnormal radiotracer uptake, sometimes mimicking disease progression. Recognizing these incidental findings is critical to avoid diagnostic pitfalls and ensure appropriate patient management. Characterization of abnormal uptake patterns can aid in differentiating adverse events from tumor recurrence or metastasis, facilitate early detection of complications, and support timely therapeutic interventions. Increased awareness among radiologists and nuclear medicine physicians of these imaging patterns contributes to improved diagnostic accuracy and optimized care pathways for oncology patients. Incorporating the assessment of chemotherapy-induced changes into nuclear medicine imaging interpretation is becoming an essential component of comprehensive oncologic evaluation.

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- Drug-induced pneumonitis in testicular cancer patient receiving BEP (Bleomycin, etoposide and platinum) - Gemcitabine induced vasculitis - Immune-related adverse events (irAEs) from immune checkpoint inhibitors - Fat Necrosis during the R-CHOP therapy in lymphoma - G-CSF (pegfilgrastim) induced side effect

NMMIEE-44 AMYLOID PET IN ALZHEIMER'S DISEASE: CURRENT EVIDENCE, CLINICAL UTILITY, QUANTITATIVE ADVANCES, AND THERAPEUTIC IMPLICATIONS

Shir Hazut Krauthammer, MHA,MD (*Presenter*)
Jeremy N. Ford, MD,MBA (*Abstract Co-Author*)
Hina Shah, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review the evolution of amyloid PET tracers, their technical characteristics, interpretation criteria, and clinical value in Alzheimer's disease (AD).2. Understand the complementary roles of visual interpretation and quantitative analysis in amyloid PET imaging.3. Learn how the Centiloid scale enables standardized assessment of amyloid burden and supports clinical decision making.4. Highlight the need for a structured synthesis of growing evidence and propose practical, context-of-use recommendations for the Centiloid scale.5. Recognize real-world clinical applications of quantitative amyloid PET in diagnosis, longitudinal monitoring, and clinical trial design.

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1. Background and Pathologic Basis 1.1. AD pathophysiology and ß-amyloid role 1.2. Dementia continuum and staging definitions 1.3. Histopathology to in vivo imaging 1.4. Anti-amyloid therapy landscape 1.5. Diagnostic integration of amyloid PET 2. Amyloid PET Imaging 2.1. FDA-approved [^{18}F] tracers 2.2. Tracer kinetics and positivity thresholds 2.3. Case examples of positive and negative scans 3. Quantitative Tools in Amyloid PET 3.1. Visual vs. quantitative assessment 3.2. Key metrics and Centiloid scale 3.3. Software reproducibility and thresholds 4. Updated Appropriate Use Criteria (AUC 2025) 4.1. Expanded diagnostic indications 4.2. PET's role in therapeutic planning 4.3. Representative clinical scenarios with case examples 5. Special Considerations 5.1. CAA and implications for imaging 5.2. ARIA in anti-amyloid treatment monitoring 5.3. Complementary use of FDG and amyloid PET

NMMIEE-45 MULTIMODALITY IMAGING FOR NEUROFIBROMATOSIS TYPE 1-ASSOCIATED PERIPHERAL NERVE SHEATH TUMORS

Ryota Asai, MD (*Presenter*)
Ryogo Minamimoto, MD, PhD (*Abstract Co-Author*)
Rintaro Ito, MD, PhD (*Abstract Co-Author*)
Tomohiro Komada (*Abstract Co-Author*)
Shinji Naganawa, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Malignant peripheral nerve sheath tumors (MPNSTs) are highly aggressive sarcomas that represent a major cause of mortality in individuals with neurofibromatosis type 1 (NF1). These tumors develop in approximately 8-13% of NF1 patients over their lifetime, making early detection and accurate diagnosis crucial for improving outcomes. Historically, the classification of nerve sheath tumors with atypical features but lacking definitive malignancy was challenging, often grouped under the ambiguous term "atypical neurofibroma". A significant advancement occurred with the 2017 consensus statement, which introduced standardized criteria and the concept of atypical neurofibromatous neoplasm of uncertain biologic potential (ANNUBP) to better define these intermediate lesions, particularly in the context of NF1. These refined classifications have since been incorporated into the WHO Classification of Tumours, 5th Edition. Given the limitations and risks associated with invasive biopsies, non-invasive diagnostic methods are essential for surveillance and clinical decision-making. This review focuses on the role of multimodality imaging for evaluating NF1-associated peripheral nerve sheath tumors.

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1. Proposed nomenclature for NF1-associated peripheral nerve sheath tumors, 2. Neurofibroma and ANNUBP, 3. Cellular neurofibroma, 4. ANNUBP, 5. MPNST, high-grade

NMMIEE-46 MOLECULAR IMAGING OF SOFT-TISSUE SARCOMAS: PEARLS, PITFALLS, AND CLINICAL UTILITY OF FDG PET

Se-Young Yoon, MD (*Presenter*)
Jagruti Shah, MD, MBBS (*Abstract Co-Author*)
Geoffrey M. Riley, MD (*Abstract Co-Author*)
Kip E. Guja, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Soft tissue sarcomas are a rare and heterogeneous group of tumors requiring multimodality imaging and multidisciplinary management. Molecular imaging with FDG PET can provide metabolic information that is unique and complementary to conventional anatomic imaging techniques. FDG PET imaging often correlates with tumor grade, can help guide biopsy, and frequently detects additional sites of disease compared to conventional imaging in patients being considered for definitive or salvage therapy. Traditional size-based evaluation of treatment response is often inadequate in soft tissue sarcoma and changes in metabolic activity can add significant value to interim and end of treatment imaging for high-grade sarcomas. FDG PET can be used for detection of recurrence or malignant transformation and thus play a vital role in surveillance. The use of FDG PET for low-grade subtypes is more limited, and studies should be interpreted cautiously, with attention to potential false negative and false positive results.

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Topics include: Current role of FDG PET in soft tissue sarcoma diagnosis and management with illustrative case examples of various sarcoma subtypes, benign versus malignant features, false positives and false negatives, added value of FDG PET in staging and restaging, and potential role for quantitative FDG PET metrics such as total lesion glycolysis and total metabolic tumor volume.

NMMIEE-47 HOT SPOTS AND COLD TRUTHS: A TRAINEE'S GUIDE TO PATTERN AND PITFALLS ON BONE SCANS

Ronald Gathagan, MD (*Presenter*)
Caroline Merriam, DO (*Abstract Co-Author*)
Manroop Kaur, MD (*Abstract Co-Author*)
Ming-Kai Chen, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Bone scintigraphy remains a vital component of musculoskeletal imaging, particularly in the evaluation of skeletal abnormalities and metabolic bone disease. While cross-sectional modalities such as MRI and CT provide detailed anatomic information, bone scans offer high sensitivity for detecting conditions including metastatic disease, occult fractures, infection, and arthropathy. Recognizing characteristic patterns of radiotracer uptake allows radiologists to identify both normal variants and pathologic findings with confidence. The objective of this presentation is to provide radiology trainees with a structured framework for understanding and interpreting Tc-99m MDP bone scans. Topics will include the basic principles of radiotracer selection and image acquisition, patterns of normal and abnormal distribution, interpretation of increased and decreased uptake, the utility of triple-phase imaging, and common diagnostic pitfalls.

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1. Basic principles -- a. Radiotracer selection -- b. Properties of MDP -- c. Imaging protocol 2. Normal distribution 3. Abnormal distribution 4. Findings with increased uptake -- a. Fractures -- b. Benign bone lesions -- c. Bone malignancies -- d. Soft tissue lesions 5. Findings with decreased uptake -- a. Avascular necrosis, infarction, multiple myeloma 6. Three-phase bone scan 7. Common pitfalls -- a. Artifacts -- b. Post-surgical material -- c. Degenerative joint disease -- d. Radiation osteonecrosis

NMMIEE-48 BEYOND THE OBVIOUS: PET/CT DETECTION OF CUTANEOUS AND SUBCUTANEOUS METASTASES AS EARLY INDICATORS OF SYSTEMIC MALIGNANCY

Antonio Santana Veliz, MD (*Presenter*)
Gilberto J. Aquino, MD (*Abstract Co-Author*)
Garrett Depalma, DO (*Abstract Co-Author*)
Arwa Elsamny, MBBCh (*Abstract Co-Author*)
Andrij R. Wojtowycz, MD (*Abstract Co-Author*)
David J. Lubin, MD (*Abstract Co-Author*)
Michal Kawzowicz, MD (*Abstract Co-Author*)
Alexandra Panyukova, MD (*Abstract Co-Author*)

TEACHING POINTS

Cutaneous and subcutaneous metastases are rare but critical manifestations of visceral malignancies. Early radiologic recognition is essential, as these lesions may be the first indicator of metastatic disease. PET/CT imaging, particularly true whole-body PET/CT, enhances detection and characterization of soft tissue metastases, guiding diagnosis and management. Distinguishing these from benign mimics like post-surgical changes or inflammation is vital to avoid misdiagnosis.

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1-Introduction to cutaneous and subcutaneous metastases.Epidemiology and clinical relevance.Imaging modalities with a focus on 18F-FDG PET/CT. 2-Common primary tumors associated with cutaneous spread Breast, lung, melanoma, esophageal, colorectal, bladder, renal. 3-Radiologic patterns and pitfalls: differentiating metastases from benign lesions. 4-Institutional Case Series Illustrative cases from our PACS archiveEmphasis on PET/CT findings, clinical correlation, and management impact. 5-Role of true whole-body PET/CT in comprehensive assessment. 6-Conclusion: Implications for practice and patient outcomes

Abstract Archives of the RSNA, 2025

NPMEE

Noninterpretive Skills (Beyond Imaging) Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

NPMEE-1 COGNITIVE CARTOGRAPHY: ENHANCING RADS MASTERY THROUGH RIGHT-BRAIN VISUALIZATION AND WHOLE-BRAIN LEARNING

Sean Cassingham (*Presenter*)
Aryan Ahuja (*Abstract Co-Author*)
Zhiyun Yang, MD (*Abstract Co-Author*)

TEACHING POINTS

1. RADS are cognitively demanding, difficult to retain and recall using traditional rote (table-based) methods alone, which predominantly engage the left brain. 2. Right-brain visual memory techniques can transform abstract concepts into memorable, intuitive symbols/ figures. 3. Our study investigates the efficacy of a novel, right-brain learning tool—using color, imagery, emotion, and metaphor—for improving grasp and recall of the RADS systems 4. Whole-brain learning (table + figures) improves both recall time and accuracy by engaging both logic and imagination. 5. Crossover study results attest to the benefit of adding right-brain visual tools, especially for visual learners. 6. This approach is adaptable for broader radiology education helping overcome cerebral overload in complex classification systems.

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1.Introduction & Learning Challenge 1A.Why RADS are challenging to master 1B. Cognitive overload in traditional approaches2.Whole-Brain Learning Framework 2A.Left-brain vs. Right-brain memory processing 2B.Four-step method: Read ? Identify ? Visualize ? Recall3.Visual Tools for RADS Mastery - Part 1 3A.Mind map overview of 9 RADS systems 4.Visual Tools for RADS Mastery - Part 2 4A.Right-brain principles: connection, color, exaggeration, cartoon, and emotion 5.Study Design, Results & Educational Impact 5A.Crossover study design and participant methods 5B.Score and time comparisons (Figures 1-3) 5C.Survey feedback and learner preference (Figure 4) 5D.Educational takeaways and implications for future radiology training

NPMEE-3 IMPLEMENTATION OF LUNG CANCER SCREENING AND MULTIDISCIPLINARY CARE IN RURAL SETTINGS: BARRIERS AND OPPORTUNITIES

Diego Collazo-Irizarry, BSc (*Presenter*)
Kyle Burton (*Abstract Co-Author*)
Noelle K. LoConte, MD (*Abstract Co-Author*)
Anand K. Narayan, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1) Introduction a. Lung Cancer Outcomes in Rural Populations b. Role of Multidisciplinary Care in Lung Cancer Outcomes 2) Unique Barriers in Rural Practice Settings a. Geographic access b. Connections between local and referral centers c. Lack of common electronic medical record systems d. Insurance coverage and reimbursement issues 3) Unique Assets in Rural Practice Settings a. Strong community cohesion and connections b. Opportunity for Radiologists and Radiation Oncologists to Make a Difference i. Care Coordination ii. Reducing Health Disparities 4) Models of Multidisciplinary care in Rural Practice Settings a. Tumor boards/Meetings b. Co-localization in multidisciplinary clinics c. Refer-as-you-go 5) Innovations in Rural Radiology and Radiation Oncology Care a. Kentucky Community Engagement Terminate Lung Cancer Study b. Multi-disciplinary Remote Tumor Boards c. Mobile Lung Cancer Screening Units

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This educational exhibit describes barriers to the implementation of lung cancer screening and multidisciplinary care models in rural practice settings. To solve these problems, this exhibit describes current and proposed innovative care models to improve access to radiology and radiation oncology services in rural practice settings.

NPMEE-4 MORE THAN JUST DYE: WHAT EVERY RADIOLOGIST SHOULD KNOW ABOUT CONTRAST SAFETY

Koju Nakai, MD (*Presenter*)
Jay Starkey, MD (*Abstract Co-Author*)

TEACHING POINTS

Differentiate types and characteristics of iodinated and gadolinium-based contrast agents, including safety implications Understand mechanisms of contrast-related adverse reactions across acute, delayed, and very late phases Clarify evolving concepts around contrast-associated acute kidney injury and its risk Identify patient-specific risk factors for contrast reactions and injury Apply evidence-based strategies to prevent, manage, and mitigate contrast-related complications

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Introduction Rise in contrast media use and importance of safety in imaging Types and Characteristics of Contrast Agents Iodinated contrast: LOCM vs. IOCM, route-specific AKI risks, cost considerations Gadolinium-based contrast: Linear vs. macrocyclic; safety in renal impairment Mechanisms of Adverse Reactions Acute: Mast cell activation, complement, chemical toxicity Late: T-cell mediated hypersensitivity Very Late: NSF due to gadolinium retention Contrast-Associated Acute Kidney Injury (CA-AKI) Redefined concepts: CA-AKI vs. CI-AKI; limited causality evidence Patient Risk Factors Prior reactions, asthma, low eGFR, sex, age, autoimmune or allergic conditions Management and Prevention Severity-based treatment: antihistamines to epinephrine Hydration and premedication for high-risk patients

NPMEE-5 CLOSING THE REPORTING GAP: AN AI-ENHANCED DICTATION PRACTICE TOOL FOR MEDICAL STUDENTS

Ethan Vyhmeister (*Presenter*)
Mei Carter (*Abstract Co-Author*)
Amanda Aguilera, MD (*Abstract Co-Author*)

TEACHING POINTS

Radiology is underrepresented in medical school curricula, limiting early exposure to imaging interpretation and clinical communication. Traditional electives often face barriers to dictation practice, including restricted imaging software access, IT challenges, and billing constraints. This project introduces an AI-powered platform that addresses these challenges by providing medical students with a flexible, self-directed way to practice dictation. Students engage with curated radiology cases selected from institutional standard reports, dictating findings via integrated voice-to-text tools to simulate real-world workflows. An AI chatbot compares each dictation to an attending radiologist's report, offering immediate feedback on structure, clarity, and completeness. A progress tracker summarizes strengths and weaknesses, while an instructor dashboard enables faculty oversight and longitudinal assessment. By combining interactive dictation, case-based learning, and AI feedback, this platform offers an innovative, scalable approach to teaching structured reporting and communication skills in radiology.

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Rationale and Program Overview Platform Features and Structure Sample Case Walkthrough Faculty Oversight and Platform Flexibility Future Work: Curriculum Development, Pilot Testing, and Outcome Tracking

NPMEE-6 MAGNETIC PERSONALITY, DANGEROUS ATTRACTION: SAFETY IN THE MRI SUITE

Koju Nakai, MD (*Presenter*)
Jay Starkey, MD (*Abstract Co-Author*)

TEACHING POINTS

MRI accidents arise from projectile, thermal, and mechanical injuries due to the magnet's powerful forces. Staff education is essential to prevent fatal incidents involving ferromagnetic objects. Thermal injuries can occur without direct contact with metal, requiring attention to patient positioning and leads. Image quality can be preserved by understanding and mitigating artifact sources. MRI-specific risks like acoustic noise and claustrophobia must be actively managed to ensure patient safety.

TABLE OF CONTENTS/OUTLINE

Introduction Scope of MRI-related safety concerns Brief overview of accident case studies Magnetic Environment and Risk Without Metal Static, gradient, and RF field interactions Risks from patient position, motion, and non-metal sources Projectile Events Force dynamics and magnet proximity Examples of common projectiles (e.g., oxygen tanks, wheelchairs) Fatal cases and prevention strategies Torque and Mechanical Injuries Physics of torque on implants and tools Real-life cases of torque-induced accidents Thermal Injuries Mechanism of RF-induced heating Loop formation and patient positioning risks Safe wire and electrode practices Artifact Recognition and Reduction Types and causes of artifacts Techniques to minimize artifacts in challenging scenarios Non-Magnetic Hazards Acoustic damage and use of ear protection Managing claustrophobia: sedation, open MRI, and patient communication

NPMEE-7 HOT TAKES ON THE HOT SEAT: EXPLORING TEACHING STRATEGIES IN THE GEN-Z AND MILLENNIAL ERA

Hannah Conley, MD (*Presenter*)
Amanda C. Gibson, DO (*Abstract Co-Author*)
Katherine Copely, MD (*Abstract Co-Author*)
Fara Y. Shikoh, MD (*Abstract Co-Author*)
Andres R. Ayoob, MD (*Abstract Co-Author*)

TEACHING POINTS

With the impending return of oral boards, a hot topic in radiology education is defining the most effective teaching strategies for both board preparation and real-life practice. For many years, the classic style of teaching was considered the "hot-seat" case-based conference in which a resident discusses an unknown case in the presence of their peers and the presenting radiologist. More recently, with the transition to multiple choice examinations in lieu of an oral examination and to virtual lectures during the COVID-19 pandemic, programs saw a significant increase in non-interactive didactic lectures. With the reappearance of an oral board examination, it is natural to assume a return to the "hot-seat" conference as the predominate teaching style. However, given the ever-evolving educational landscape, it is more important than ever to consider other factors, including new generations of learners and high rates of resident burnout and feelings of isolation. Educational research indicates effective teaching strategies promote active engagement, critical thinking, and clinical reasoning and can be achieved through various approaches. This project aims to discuss evidenced-based advantages and challenges of different teaching strategies to guide programs in creating safe, collaborative, and effective teaching sessions for learners.

TABLE OF CONTENTS/OUTLINE

1. Description of different teaching strategies 2. Discussion of the advantages and challenges of these methods, including their association with resident isolation, burnout, and wellness 3. Summary of published survey literature on residents' perception of various teaching styles

NPMEE-8 "JUST SIGN HERE?": RETHINKING INFORMED CONSENT IN RADIOLOGY

Jay Starkey, MD (*Presenter*)
Shoichi Maeda (*Abstract Co-Author*)
Eri Ishikawa (*Abstract Co-Author*)

TEACHING POINTS

Informed consent is an ethical and legal obligation grounded in patient autonomy. Radiologists must understand which procedures require consent and how to obtain it appropriately. Consent must be tailored to patient age, mental status, language, and procedure risk. The difference between consent and assent is essential in pediatric and adolescent imaging. Failure to obtain adequate informed consent can result in ethical violations and legal liability.

TABLE OF CONTENTS/OUTLINE

Introduction What is informed consent? Historical and ethical foundations Informed Consent in Radiology When consent is required: diagnostic vs. interventional procedures Contrast media: when and how to disclose risks Documentation and communication strategies Ethical and Legal Dimensions Respect for autonomy and decision-making capacity Consent vs. coercion Legal precedents and malpractice risk Special Populations and Situations Informed consent vs. assent in minors Patients with cognitive impairment or language barriers Emergency exceptions and surrogate decision-makers Best Practices and Pitfalls Elements of a well-conducted informed consent Common errors and how to avoid them Case examples: negligence, misunderstanding, and communication failures

NPMEE-9 THE WEIGHT OF SITTING: LOWER BODY WORK MUSCULOSKELETAL DISORDERS AMONGST DIAGNOSTIC RADIOLOGISTS AND PROPHYLAXIS

Matthew Phillipi (*Presenter*)
Shayan Saeed (*Abstract Co-Author*)
Erwin Ho, BS (*Abstract Co-Author*)
Roozbeh Houshyar, MD (*Abstract Co-Author*)

TEACHING POINTS

The transition from film to picture archiving and communication systems (PACS) has led to an increase in computer-based work for radiologists. In addition, case volume has also increased, effectively expanding radiologist's workload and time spent at PACS stations. While PACS has increased radiologist efficiency, the sedentary nature of PACS stations elevates radiologists' risk for work musculoskeletal disorders (WMSD) and repetitive stress injuries (RSI). A study on a PACS-based radiology department found that 58% of radiologists experience RSI symptoms and 38% of them are diagnosed with an RSI. To combat the risk for WMSDs and RSIs, ergonomic and prophylactic interventions can be utilized by the radiologist. While there is extensive research about upper body WMSDs, there is limited information about the lower

body. In this comprehensive review, we aim to educate radiologists on potential lower body WMSDs resulting from PACS stations. Additionally, we will advise on ergonomic and prophylactic interventions to prevent and manage lower body WMSDs.

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1. Radiologist Risk for Lower Body Work Musculoskeletal Disorders (WMSD) 2. Lumbar Spine Stiffness 3. Hollowing Technique Exercise 4. Dynamic Lumbar Extension Exercise 5. Lumbar Disc Herniation 6. Body Weight Planks Exercise 7. Body Weight Bridges Exercise 8. Cat Cow Stretching Pose 9. Decreased Passive Hip Extension 10. Standing Hip Flexor Stretch 11. Modified Kneeling Lunge Stretch 12. Deep Vein Thrombosis 13. Weight Transfer Maneuver Exercise 14. Knee Osteoarthritis 15. Seated Knee Extensions Exercise 16. Wall Sit Exercise 17. Body Weight Squats Exercise 18. Standing Lunges Exercise 19. Conclusion

NPMEE-10 FRAMEWORK FOR INTEGRATING EDI INTO THE AI CURRICULUM OF RADIOLOGY RESIDENCY PROGRAMS

Nicole Bodnariuc (*Presenter*)
Sonali Sharma, BSc (*Abstract Co-Author*)
Charlotte J. Yong-Hing, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

Describe current gaps in equity, diversity, and inclusion (EDI) representation in AI-related radiology education. Analyze barriers and enablers to integrating EDI content into formal AI education in Canadian residency programs. Evaluate strategies for equitable access to AI education, especially for underrepresented or marginalized learners. Identify actionable recommendations for curriculum developers to promote inclusivity and fairness in AI education.

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Introduction Without inclusive education, AI may perpetuate healthcare inequities. Trainees from underrepresented groups face systemic barriers to engaging in AI learning (e.g., lack of mentors, digital literacy gaps, resource access). Data from radiology literature shows underrepresentation of women in AI research. National Survey Survey launched to assess how EDI principles (algorithmic bias, fairness, data diversity) are taught in AI education in Canadian residency programs. Data explores teaching formats, institutional barriers, and recommendations for inclusive AI training. Barriers Limited faculty expertise Lack of formal teaching on fairness, representation, or ethics Lack of interdisciplinary collaboration. Time constraints. Proposed Framework Adapt a model to foster fairness and inclusion in AI education. Advocate for peer learning, mentorship, interdisciplinary collaboration, and faculty development around bias and fairness in AI. Recommendations and Implications Develop educational resources and toolkits for program directors and curriculum developers. Incorporating EDI in AI curricula prepares residents to critically engage with technology and deliver more equitable care.

NPMEE-11 ROOTING FOR EXCELLENCE: MOCK RCA EVENTS TO CULTIVATE QUALITY EDUCATION IN RESIDENCY

Jonathan A. Flug, MD, MBA (*Presenter*)
Cathy Hannafin, MBA, BSN (*Abstract Co-Author*)
Lisa Ponce, RT (*Abstract Co-Author*)

TEACHING POINTS

1. The ACGME requires annual resident participation in a safety event review 2. A Mock Root Cause Analysis (RCA) can be an effective resident centered approach to meet this requirement 3. Utilizing an interdisciplinary review with the principles of a fair and just culture can lead to real practice improvements and engender a culture of improvement within residents and allied health staff 4. Mock RCA events are easily replicated and can be modified to meet organizational and departmental needs.

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1. Background of ACGME requirements 2. Elements of fair and just culture and case discussion 3. Designing a case appropriate for resident review 4. Identifying team members for the review 5. Examples of Mock RCA cases used in our department 6. Fishbone diagrams and action plan generation 7. Lessons learned and future directions

NPMEE-12 ACTIVE LEARNING IN RADIOLOGY: STRATEGIES TO ENHANCE EDUCATIONAL OUTCOMES

Francisco J. Garrido Cisterna, MD (*Presenter*)
Catalina Alarcon Del Campo, MD (*Abstract Co-Author*)
Javier Suarez, MD (*Abstract Co-Author*)
Carlos R. Riquelme, MD (*Abstract Co-Author*)
Alvaro Huete Garin, MD (*Abstract Co-Author*)

TEACHING POINTS

1. University teaching often relies on passive learning strategies that are teacher-centered and involve little student participation in their learning process. 2. Active learning is defined as teaching-learning strategies that rely on student motivation, attention, and active engagement, promoting higher-order cognitive processes. 3. The integration of these strategies into radiology education promotes deeper student learning and is applicable in both undergraduate and residency settings.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Passive vs. active learning 3. Teaching strategies to enhance radiology learning: Flipped classroom, Team-based learning and cooperative learning, Case-based learning, Problem-based learning, Simulation, Gamification, Virtual learning strategies 4. What to do in the reading room? 5. Conclusions

NPMEE-13 BIAS BUSTERS: COUNTERING COMMONLY SEEN EPIDEMIOLOGICAL BIASES IN RADIOLOGY RESEARCH

Arissa Milton, BS (*Presenter*)
Christoph I. Lee, MD,MS (*Abstract Co-Author*)
Ruth C. Carlos, MD, MS (*Abstract Co-Author*)
Farouk Dako, MD, MPH (*Abstract Co-Author*)
Randy C. Miles, MD, MPH (*Abstract Co-Author*)
Efren J. Flores, MD (*Abstract Co-Author*)
Anand K. Narayan, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Epidemiology is the study of why and how often diseases occur in different groups of people • Selection and information biases represent two major categories of epidemiological biases that impact clinical research studies • Selection bias occurs when the participants in the research study are not representative of the population of interest to the study authors • Information bias occurs when there are errors in the measurement of study variables • Understanding types of epidemiological biases can help to improve the design and evaluation of radiology research studies

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This educational exhibit reviews epidemiological biases that influence the design and evaluation of radiology research studies. The exhibit emphasizes commonly seen issues in radiology journal submissions and describes standardized approaches to mitigating these biases. At the end of this exhibit, radiology researchers will be able to identify the major types of biases in epidemiology that influence radiology research studies and implement proactive strategies to address these biases. 1) Introduction to Epidemiology a) Definition b) Applications of Epidemiology in Radiology Research 2) Selection Bias a) Non-response bias b) Loss to follow-up bias c) Volunteer bias d) Incidence-prevalence bias e) Berkson's bias f) Healthy Worker bias g) Control selection h) Length-time bias i) Sampling bias 3) Information Bias a) Recall bias b) Misclassification c) Observation bias d) Interviewer bias e) Measurement error f) Surveillance bias g) Lead-time bias 4) Confounding 5) Test Your Knowledge

NPMEE-14 RETHINKING THE FUTURE OF RADIOLOGY: ELEVATING THE ENTIRE IMAGING EXPERIENCE WITH CONVENIENCE, COMMUNICATION, AND CARE

Karthika Devi D S, MBBS (*Presenter*)
Manjiri K. Dighe, MD (*Abstract Co-Author*)
Gulnoor Sheriff, RT (*Abstract Co-Author*)
Domenico Mastrodicasa, MD (*Abstract Co-Author*)
Sarabjeet Singh, MD, MBA (*Abstract Co-Author*)
Dushyant Sahani, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Discuss ways to improve patients' perceptions & experience of radiology services. 2. Crafting digital patient journey to be more seamless, integrated, & customized to patients' needs. 3. Apply best practices from custom-centered industries & leverage AI integrated tools to support a patient-centric, AI-enabled imaging vision.

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1. Changing volume to value: • Current trends - review literature on patient's imaging experience. • Identify problems affecting patient experience (fishbone diagram). • Create an overview with overlapping concepts of general principles governing & enriching patient experience. 2. Appropriate exam ordering: • Imaging order appropriateness determination based on the clinical indication. • Using clinical data to estimate pre-test probability and guide imaging orders. 3. Exam scheduling & customization: • Appointment location & time based on zip code & preference. • Synchronous/asynchronous scheduling with clinical visits. • Automated digital instructions delivery for imaging appointment. • Digital check-in and screening forms - integrated into EHR. 4. Seamless scanning environment: • Customized patient experience: scenery selection, name display. • Cloud-based protocol management. 5. Post-scanning AI: • Detection & triage of critical findings (PE, fracture). • Automate report generation using a disease-focused lexicon. 6. Collaboration & Communicating results. Provider=• Effective result communication - Digital • Structured disease-specific report. Patient=• Report summaries using patient-friendly language. 7. Solicit feedback. • Embedded hyperlink in image report- solicit feedback from patient for continuous quality improvement.

NPMEE-15 BUILDING A BREAST IMAGING EDUCATIONAL COLLABORATION IN JAKARTA, INDONESIA

Stefanie A. Woodard, DO (*Presenter*)
Eniola T. Oluyemi, MD, MPH (*Abstract Co-Author*)
Sidhvi Reddy (*Abstract Co-Author*)
Wei T. Yang, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

• Subspecialty breast imaging training is limited in Jakarta, Indonesia. • A structured international collaboration between U.S. breast radiologists and Ciptomangunkusumo National Referral Hospital radiology department was developed under the RSNA Global Learning Center (GLC). • The partnership emphasized curriculum based on local needs, multimodal delivery and sustainability. • Learner performance was tracked and programs established to measure educational outcomes via pre/post-lecture testing. • This model can serve as a replicable framework for global radiology education, particularly in low- and middle-income countries.

TABLE OF CONTENTS/OUTLINE

I. Introduction a. Breast cancer epidemiology in Indonesia b. Educational and clinical infrastructure gaps c. Rationale for international academic partnership II. Program Design a. Needs assessment methodology and stakeholder input b. Curriculum planning and topic selection c. Virtual lectures and hybrid delivery d. In-person workshops and procedural training e. VR-based breast biopsy simulation f. Multidisciplinary tumor boards and journal clubs III. Content Highlights a. Mammography and ultrasound basis b. MRI indications and protocols c. Post-treatment imaging d. Interventional procedures e. Quality metrics IV. Assessment and Outcomes a. Quiz-based pre/post strategy b. Hypothesis: i. Improvements in test scores by topic ii. Increased engagement over time c. Feedback-driven changes V. Conclusion a. Educational impact and sustainability b. Lessons learned and scalability c. Future directions toward a breast imaging fellowship

NPMEE-16 GENERATIVE AI IN RADIOLOGY EDUCATION: EMERGING TOOLS, USE CASES, AND LIMITATIONS

Samantha Leech, MD (*Presenter*)
Scott J. Adams, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Define generative AI and its growing relevance in radiology education. • Demonstrate how GenAI supports curriculum development, teaching and learning, and learner assessment. • Explain how GenAI enables exposure to rare cases, adapts to learner level, and reduces educator workload. • Identify key risks and limitations of GenAI in radiology education. • Explore future integration of GenAI into radiology workflows to support radiology education.

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1. Introduction to Generative AI in Radiology Education • What GenAI is, how it works, and why it matters for radiology education 2. Opportunities for Learners and Educators • Curriculum development • Teaching and learning • Learner assessment 3. Key Challenges and Limitations • Risk of hallucinations, factual drift, or vague language in outputs • Data privacy, transparency, and academic integrity concerns • Bias and equity risks related to model training and user interaction 4. Future Integration and Implementation • Workflow embedding into PACS

NPMEE-17 CORE COMMUNICATION SKILLS FOR PATIENT ENCOUNTERS IN RADIOLOGY: A TOOLKIT

Amina Karage, MD (*Presenter*)
Anand K. Narayan, MD, PhD (*Abstract Co-Author*)
Victoria L. Mango, MD (*Abstract Co-Author*)
Jade A. Anderson, MD (*Abstract Co-Author*)

TEACHING POINTS

• Patient Centered Care is associated with improved patient satisfaction, improved health outcomes, and reduced burnout among healthcare providers • Common patient encounters in radiology departments, such as delivering cancer diagnoses, represent some of the most impactful encounters across the healthcare continuum • Radiologists and technologists can improve patient centered communication skills using evidence-based formal and informal resources adapted from other subspecialties

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Effective patient centered communication between radiologists and patients improves patient safety, health outcomes, and improves professional satisfaction and engagement. However, there are limited formal educational resources available for radiologists to provide high quality, patient centered care during imaging encounters. This communication toolkit adapts educational resources from the American Association of Family Practitioners to provide discrete tools and resources for radiologists to provide high quality, patient centered care during imaging encounters. 1) Sequence for Imaging Encounter a) Introduce and Build Report i) Verbal Communication Skills ii) Non-Verbal Communication Skills b) Elicit Patient's Agenda c) Discuss Patient's Concerns d) Empathize (e.g. NURSE mnemonic) e) Summarize f) Engage in Shared Decision Making 2) Evidence Based Recommendations for Practice a) Avoiding Interruptions b) Elicit Patient's Agenda c) Patient Centered Communication Training Courses i) Improvement in Communication Skills ii) Improvements in Patient Outcomes 3) Case Scenarios in Radiology Departments a) Delivering Bad News b) Informed Consent c) Trauma Informed Health Care

NPMEE-18 ¨BEYOND THE MAGNET-MASTERING MRI SAFETY¨

Mariam Vargas Gonzalez, MD (*Presenter*)

TEACHING POINTS

MRI is a powerful imaging tool, its strong magnetic fields pose significant safety risks. This guide covers key safety aspects, from magnetic force control to emergency preparedness and emerging innovations. • Invisible Forces, Real Dangers MRI magnets are always active, generating strong, invisible fields that can turn metal objects into dangerous projectiles. • First Line of Defense Proper screening is critical. Missing a single implant can turn a routine scan into a disaster. • Zones of Safety or Risk The four-zone MRI safety model separates order from chaos, shielding patients and staff from magnetic hazards. • Preparing for the Unthinkable Regular emergency drills and cutting-edge training prevent severe incidents like burns and RF injuries. • The Future of MRI Safety As MRI tech advances, so must safety strategies. AI-driven screening and real-time patient monitoring promise a safer tomorrow.

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Introduction - The Magnetic Frontier Why MRI safety is more than a protocol,it's a mission. The Hidden Force - Understanding the Magnetic Beast The unyielding power of a 3 T field, always on, always dangerous. Red Zones - Navigating the Magnetic Battlefield The Four-Zone Model, from open spaces to high-risk areas. First Line of Defense - Human Vigilance Beyond the checklist - the critical role of human awareness and AI in proactive safety. Emergencies - When Things Go Wrong Real life incidents and lessons learned - from projectile injuries to life saving drills. The Next Frontier - Pioneering a Safer Tomorrow Innovations shaping the future of MRI safety, from smart algorithms to automated screening. Conclusion - Beyond the Magnet, Beyond the Risk The ongoing quest for 0 harm in the age of powerful fields.

NPMEE-19 TRANSFORMATIONAL LEADERSHIP IN THE DIGITAL AND HEALTHCARE ERA

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Juan Cruz Gallo, MD, MD (*Abstract Co-Author*)
Carlos Capunay, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the evolution of leadership in the digital and healthcare sectors, emphasizing the transition from hierarchical models to adaptive, high-performance leadership approaches. Explore the principles of transformational leadership. Examine the role of digital transformation in leadership, focusing on data-driven decision-making, agile structures, and technology adoption. Identify key strategies for leading through change and uncertainty. Apply leadership principles in healthcare and medical imaging.

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The Four Key Factors of Leadership Success Simplifying complexity and operationalizing strategic goals. Encouraging ambition and alignment across the organization. Understanding and promoting effective teamwork. Developing future leaders through mentorship and empowerment. Leadership in the Digital Age The shift from hierarchical structures to networked, agile organizations. The role of data-driven decision-making and technological adoption. Balancing operational efficiency with innovation and flexibility. Leading Through Change and Uncertainty Adaptive leadership as a key competency in fast-evolving industries. The importance of resilience and emotional intelligence. Strategies for fostering a culture of continuous learning and collaboration. Application in Healthcare and Medical Imaging Leadership strategies for managing cross-functional teams in radiology and diagnostics. Implementing digital transformation while maintaining clinical excellence. The role of leadership in driving AI adoption and operational efficiency.

NPMEE-20 KEY INGREDIENTS FOR BUILDING A RESILIENT RADIOLOGY PRACTICE

Jonathan B. Kruskal, MBChB (*Presenter*)
Jeffrey L. Weinstein, MD (*Abstract Co-Author*)
James V. Rawson, MD (*Abstract Co-Author*)
Muneeb Ahmed, MD (*Abstract Co-Author*)
Jonathan G. Goldin, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Describe why radiology practice resilience has become so important for preserving and advancing our tripartite missions. 2. Describe what practice resilience is and looks like. 3. Illustrate what are considered the essential requirements and building blocks of a resilient practice. 4. Describe contemporary approaches for addressing and implementing each of these components

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Structural and functional elements that ensure and sustain a resilient radiology practice; Building a learning and improvement culture - fostering a growth mindset; Keep your blinkers wide open: know the headwinds; Over enunciate the progress towards prioritized annual goals, and your mission and vision; Optimize workflow, workplace and workforce efficiency; Reimagine and prioritize service delivery; Retain your excellent team members - retention strategies that work; clear job descriptions prevent mission creep; The due process and accountability practices; Develop the skills to advance your staff; Be nimble; Effective financial stewardship; Manage all risk proactively; Anticipate and manage staff concerns and anxiety; all staff have heard voices; communicate strategically and effectively; foster an inclusive culture; Build a peak performing team (address the building blocks for such a team); Know then address all barriers to effective team function; preserve the reputation of your practice; build and sustain a resilient workforce

NPMEE-21 APPLYING QUALITY IMPROVEMENT TOOLS TO ENHANCE RADIOLOGY RESIDENTS EDUCATION

Omar Msto Hussain Nasser, MD (*Presenter*)
Sophia R. O'Brien, MD, MEd (*Abstract Co-Author*)
Scott A. Simpson, DO, MEd (*Abstract Co-Author*)
James V. Rawson, MD (*Abstract Co-Author*)

TEACHING POINTS

• The quality improvement (QI) tools used to improve clinical performance can also be used to improve radiology resident education. • The seven basic quality improvement tools provide radiology educators with a structured, data-driven framework to analyze and improve training for more efficient, targeted learning. Ishikawa noted these simple methods can address ~95% of quality issues. • These and other QI tools can be used to identify high yield changes in resident education. • QI tools also foster a culture of continuous improvement in graduate medical education.

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1. Introduction to the seven basic quality improvement tools other QI tools and their relevance to educational processes: a. 1) Check Sheets: Encourage standardized skill evaluation and checklist-based learning i. 1) Check sheets, 2) histograms, and 3) control charts improve performance tracking and identify trends and gaps. b. 4) Pareto analysis and 5) fishbone diagrams help identify key drivers and diagnose root causes of training challenges. c. 6) Scatter diagrams and 7) stratification uncover correlations and hidden trends in learning outcomes. d. Scripted Education: Use concise, structured teaching scripts to support efficient point-of-care instruction. e. Microlearning: Deliver brief, high-yield content in asynchronous formats to reinforce learning in limited time. f. Pre-work Strategies: Use structured orientation tools to reduce cognitive load and accelerate learning at rotation start. 2. Benefits and limitations. 3. Conclusions.

NPMEE-22 NEURODIVERSITY IN RADIOLOGY EDUCATION: RETHINKING HOW WE TRAIN AND ASSESS NON-NEUROTYPICAL LEARNERS

Waqas Ahmad I, MBBS (*Presenter*)

TEACHING POINTS

Neurodiversity includes a range of cognitive profiles—such as ADHD, autism spectrum disorder (ASD), and dyslexia—that affect how radiology trainees perceive, process, and communicate information. Standard radiology training and assessment methods may unintentionally disadvantage neurodiverse learners, leading to performance

disparities unrelated to competence. Inclusive educational strategies—such as visual-based learning, chunked instruction, flexible assessments, and sensory-adapted workspaces—can significantly improve engagement, performance, and well-being for neurodiverse trainees. Faculty awareness and training are essential to recognize neurodiversity not as a limitation but as a strength, unlocking unique diagnostic talents and creative problem-solving approaches in radiology. Redesigning radiology education to support neurodiverse learners contributes to broader goals of equity, diversity, and innovation within academic medicine.

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Introduction Why neurodiversity matters in radiology education Common Neurodiverse Profiles ADHD, ASD, dyslexia, and their relevance to radiology training Challenges in Current Training Models Barriers in teaching, assessment, and clinical environments Inclusive Educational Strategies Practical adaptations for teaching, feedback, and support Rethinking Assessments Alternatives to time-based evaluations and rigid formats Faculty and Institutional Recommendations Awareness, mentorship, and systemic change Conclusion Summary and actionable roadmap

NPMEE-24 STATE OF THE FIELD: DIAGNOSTIC RADIOLOGY & SPACE

Orhun Davarci (*Presenter*)
Roberto R. Galuppo Monticelli, MD (*Abstract Co-Author*)

TEACHING POINTS

Currently, the only officially clinically employed medical imaging modality in space is the ultrasound system in the International Space Station. Although it's one of the most portable imaging systems, it's well known that some diseases are not well suited to be evaluated via ultrasound. Astronauts go through extensive medical work-up for a variety of diseases before launch. However, many medical conditions can arise quickly & endanger the health of an astronaut, jeopardizing mission objectives. In the past, NASA guidelines have focused on returning the astronauts to Earth in case of severe medical problem. However, with manned missions to Mars in the horizon, there's a severe need to develop extensive on-board medical imaging systems capable of generating high-quality images. Real progress have been made within the last 2 decades, as miniaturized systems are now capable of taking diagnostic-level X-ray images in space. In the future, we expect to see the development of newer technologies and radiology workflows.1- To review the recent advancements in diagnostic radiology related in space medicine.2- To understand the limitations facing the diagnostic radiology applications in space.3- To recognize the potential ways into increase adoption of diagnostic radiology in space medicine.

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1- The latest developments of using medical imaging in space and the cursory specifications. 2- The speed at which the X-ray systems are being developed for uses in imaging procedures. 3- US capable pathologies for diagnostics and added value of x-rays in diagnostics. 4- Telemedicine vs Radiology-on-board approaches to incorporate medical imaging into clinical-decision making in space. 5- Take home points

NPMEE-26 YOU'LL PROBABLY BE SUED, BUT THAT'S OK: A REVIEW OF MEDICAL MALPRACTICE LIABILITY & INSURANCE FOR RADIOLOGISTS

Shailin Thomas, MD (*Presenter*)

TEACHING POINTS

After completion of this presentation, the reader will be able to:• Understand the prevalence of malpractice litigation in the field of radiology• Identify the four elements of a malpractice action and describe the concepts of standard of care, proximate cause, and but-for cause• Describe the different types of damages available to plaintiffs in a malpractice action• Understand the scope of their liability, whether they are an attending or a trainee• Describe the common types of malpractice insurance and determine in what situations they may need tail insurance coverage

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• Backgroundo Many radiologists are sued over the course of their careers, but many radiologists and radiology trainees do not know the basics of medical malpractice claims or insurance o Data on percentage of radiologists sued over their career, payouts, and settlements • Elements of a malpractice case o Duty — Standard of care o Breach— Failure to adhere to standard of care o Causation — Defendant's breach must cause plaintiff's injury (proximate cause & but-for cause) o Damages— Many types: Economic, non-economic, and punitive • Who is liable? — Mostly attendings, but trainees are not free from liability • Malpractice insurance o Occurrence— ACGME requires occurrence malpractice insurance for trainees o Claims-Made o Tail coverage

NPMEE-28 THE WEIGHT WE CARRY: A REVIEW OF RADIATION PROTECTION AND ERGONOMICS FOR INTERVENTIONAL RADIOLOGY TEAMS

Vandilson dos Santos Galdino, MD (*Presenter*)
Luiz Ybarra (*Abstract Co-Author*)
Leandro Cardarelli Leite, MD (*Abstract Co-Author*)

TEACHING POINTS

Review traditional and advanced radiation shielding technologies used in interventional radiology. Explain and compare the advantages and ergonomic limitations of radiation shielding technologies. Summarize current evidence supporting the use of traditional and advanced shielding systems. Discuss the ergonomic aspects and musculoskeletal risks associated with prolonged PPE use and strategies to mitigate them, focusing on practical considerations.

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1. Introduction Radiation safety and the physical burden of protection. 2. Foundations Review of traditional protective equipment including caps, glasses, thyroid shields, aprons, and gloves. 3. Innovation Overview of advanced radiation shielding technologies such as ceiling-mounted systems, robotic and portable barriers, and integrated shielding platforms. 4. Solutions: Highlights of additional shielding options such as rolling shields, lead curtains, disposable scatter shields, and vertical attenuation pads. 5. Evidence Review What does the literature say about effectiveness and adoption of these tools? 6. Looking Ahead Practical recommendations, upcoming trends in radiation safety, and ergonomic considerations to minimize occupational injury.

NPMEE-29 EYE-OPENER: WHY THE LENS NEEDS PROTECTION FROM RADIATION

Koju Nakai, MD (*Presenter*)
Jay Starkey, MD (*Abstract Co-Author*)

TEACHING POINTS

The crystalline lens is one of the most radiosensitive organs, with cataract formation being a critical occupational risk in imaging. The threshold dose for radiation-induced cataract has been revised downward, now as low as 0.5 Gy, with a 20 mSv annual limit. Fluoroscopic and interventional procedures result in high cumulative dose to the lens, especially without protective gear. Radiation protection for the lens should follow time, distance, and shielding principles, with lead goggles and ceiling shields being highly effective. Awareness, policy, and equipment design improvements are necessary to increase compliance with lens protection.

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Introduction The radiosensitivity of the crystalline lens Historical context and recent ICRP dose limit revisions Pathogenesis of Radiation-Induced Cataracts Oxidative stress and DNA damage in lens epithelial cells Impaired repair mechanisms and accumulation of damaged cells High-Risk Procedures and Exposure Estimates Fluoroscopy-guided surgery, interventional cardiology, ERCP Radiation dose estimates per procedure and per unit time Protective Strategies: Time, Distance, Shielding Fluoroscopy time/frame rate reductions Distance: inverse square law and operator positioning Shielding: beam collimation, lead goggles, and ceiling-mounted shields Barriers and Solutions to Lead Goggle Use Access, comfort, and integration with prescription eyewear Institutional mandates and ergonomic equipment improvements Conclusion Lens protection is vital for long-term safety of imaging professionals Combined use of all protective principles allows for safer and more sustainable procedural practice

NPMEE-30 FROM LIKES TO PATIENTS: THE ROLE OF SOCIAL MEDIA TO IMPROVE BREAST RADIOLOGISTS AND PATIENTS RELATIONSHIP

Myriam F. Montes, MD (*Presenter*)
Noelia Arevalo (*Abstract Co-Author*)
Nancy Sanchez Rubio, MD (*Abstract Co-Author*)
Beatriz Lannegrand Menendez (*Abstract Co-Author*)
Maria J. Ciudad, MD (*Abstract Co-Author*)
Laura Escudero, MD (*Abstract Co-Author*)
Carlota Garcia Baron (*Abstract Co-Author*)

TEACHING POINTS

To understand how social media can be our social stethoscope to diagnose the doubts and needs of our patients. To demonstrate the usefulness and impact of social media in: 1) Providing the population with scientific evidence translated into colloquial language. 2) To counteract the dissemination of false myths and fake news about breast radiology. To acknowledge why social media can be a powerful tool that allows breast radiologists to get closer to our patients, improving our communication and interaction.

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Although radiologists are using social media more and more, we still undermine the potential of social media in improving our relationship with our patients. Social media in medicine is here to stay and SM in health, matters Social media offers us opportunities for social interaction and plays a role in several medical services, particularly regarding patients. We will review several key aspect of social media that can help us to improve our relatioship with patients by knowing our patients' needs and feelings better, like our social stethoscope. We will show also different estrategies to improve our visibility and interact with patients being part of support networks that empower people, and influence health awareness at the societal level.

NPMEE-31 STRATEGIES TO INCREASE ACCESS AND EQUITY IN IMAGING: LESSONS FROM AND FOR RURAL AND REMOTE COMMUNITIES

Samantha Leech, MD (*Presenter*)
Ivar Mendez, MD,PhD (*Abstract Co-Author*)
Brent E. Burbridge, MD, FRCPC (*Abstract Co-Author*)
Scott J. Adams, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Identify disparities in access to medical imaging in rural and remote communities. • Identify operational, technological, and workforce strategies to expand access to imaging in rural and remote settings. • Describe real-world examples of community-driven and technology-enabled solutions that have improved imaging access. • Apply tools and metrics to measure progress toward improved imaging access and equity.

TABLE OF CONTENTS/OUTLINE

1. Understanding Imaging Inequities in Rural and Remote Settings • Social determinants of health and imaging access • Structural barriers and system-level inequities, including geographic, logistical, and sociocultural challenges in rural and remote communities • A conceptual model for equitable imaging 2. Strategies to Improve Imaging Access in Rural and Remote Communities 2.1 Operational and delivery innovations • Remote scanning • Mobile imaging units • Fly-in and pop-up clinics • Regional hub-and-spoke models • AI-augmented acquisition and triage 2.2 Workforce development and support • Cross-training and task-shifting • Tele-education and mentorship • Retention and incentive programs for imaging personnel. 2.3 Culturally safe and community-led models • Co-design with local communities • Cultural safety training 3. Case Examples • Telerobotic ultrasound • Remote scanning (CT and MRI) • Low-field MRI 4. Data, Evaluation, and Advocacy • Measuring progress and outcomes • Radiologist-led advocacy and innovation 5. Resources and References • Toolkits, sample workflows, and further reading

NPMEE-32 INNOVATIVE EDUCATIONAL APPROACH TO IMPROVE PROBLEM SOLVING SKILLS: AN EXPERIENCE FROM DEPARTMENT OF ALLIED HEALTH PROFESSIONS OF CAREGGI UNIVERSITY HOSPITAL

Andrea Lastrucci (*Presenter*)
Nicola Iosca (*Abstract Co-Author*)
Angelo Barra, RT (*Abstract Co-Author*)
Cinzia Bastida (*Abstract Co-Author*)
Yannick Wandael (*Abstract Co-Author*)
Renzo Ricci (*Abstract Co-Author*)

TEACHING POINTS

The Department of Allied Health Professions at Careggi University Hospital has developed a series of innovative educational courses for radiographers and radiation therapists, aimed at strengthening their clinical reasoning and problem solving skills. These courses use a blended educational approach that integrates virtual reality (VR), gamification and the teach-back method.

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Last year, these training courses were organized and delivered using a mixed and innovative approach:Total Body Irradiation (TBI) training course in Virtual Reality involved 30 radiation therapists. The program included theoretical lessons on the proper use of Virtual Reality tools, as well as asynchronous modules covering clinical and physical principles and the delivery of all TBI procedures within a virtual environment. The primary aim of the course was to enhance memory retention of the procedural steps involved in TBI delivery."Escape from the control Room" was a gamification learning method involved 18 radiation therapist. This educational escape room set whitin a radiotherapy scenario. The primary focus of this training course was related to improve the knowledge and recognizition of potential error in a risk free offline environment.At the end of each training course, an interactive teach-back session was conducted in which participants completed a real-time questionnaire to assess improvement in knowledge and confidence. This session provided an opportunity to openly discuss participants' perspectives and feedback on the training methods.

NPMEE-33 IMPROVING WOMEN'S EXPERIENCE IN DIAGNOSTIC EXAMS: HOW RADIOLOGISTS CAN FOSTER EMPATHY AND MAKE A DIFFERENCE

Marcela C. Lauar, MD (*Presenter*)
Brunna C. Oliveira, MD, MSc (*Abstract Co-Author*)
Ana Luisa A. De Nicola, MD (*Abstract Co-Author*)
Carla C. Benetti, MD (*Abstract Co-Author*)
Aline C. Oliveira (*Abstract Co-Author*)
Cinthia C. Barbisan, MD (*Abstract Co-Author*)

Gabriela Lauar, MD (*Abstract Co-Author*)
Luciana P. Chamie, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Although traditional radiology models have not emphasized interaction between patients and radiologists, patient-centered care requires a more active role from radiologists, with increased engagement and processes centered around patients' needs and preferences. Effective communication, emotional support, physical comfort, and alleviation of fear are essential components. Women's imaging exams—such as mammography, pelvic MRI, or transvaginal ultrasound—are often associated with high levels of anxiety and physical discomfort. Many patients arrive already distressed due to fears of diagnoses like breast cancer, infertility, or endometriosis, or due to concerns about body exposure and pain. Patient satisfaction and trust are directly linked to better adherence and outcomes. Empathy and a welcoming approach can reduce stress and pain perception. This work highlights how diagnostic exams may become distressing for female patients and presents strategies to humanize the experience.

TABLE OF CONTENTS/OUTLINE

1- Importance of patient-centered care in diagnostic imaging.2- Communication strategies for women's imaging exams.3- Best practices for delivering bad news.4- How environment, scheduling, and post-exam care affect experience.5- Writing sensitive and clear radiology reports.6- Role of AI in patient communication.

NPMEE-34 SHOULD I PURCHASE THIS AI SOFTWARE? A TOOLKIT FOR DEPARTMENT LEADERS TO DETERMINE RETURN ON INVESTMENT

Anand K. Narayan, MD, PhD (*Presenter*)
Robert K. Bour, MD (*Abstract Co-Author*)
Dania Daye, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

• Radiology department leaders are frequently asked to consider purchasing new software and equipment, such as artificial intelligence algorithms. • Examining the financial implications of proposed initiatives can help radiology department leaders make informed decisions when prioritizing new initiatives. • A return on investment (ROI) analysis estimates the net financial gains (or losses) for new initiatives by assessing potential changes in costs and revenues. • ROI analyses can support ongoing monitoring of the financial benefits and costs after implementation.

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This toolkit provides step-by-step methods, resources, and case studies to calculate the ROI for new imaging initiatives. The toolkit has been adapted from the Agency for Healthcare Research and Quality (AHRQ) toolkit designed to evaluate the ROI for quality improvement initiatives. 1) Return on Investment (ROI) a) Definition b) ROI vs Cost Effectiveness Analyses 2) Core Design Considerations a) Definition of Scope b) Implementation Timeline (Inflation, Discounting, Depreciation of Equipment) c) Comparison Group d) Financial Contributors 3) Costs (Denominator) a) Categories (Personnel, Supplies, Equipment and Depreciation, Training, Information Systems, Outreach and Communication, External Consultant Costs) b) Phases of Improvement Actions (Planning and Development, Training, Startup, Ongoing Operation and Maintenance, Shutdown) 4) Financial Changes (Numerator) a) Hospitalizations b) Payments from Insurance Companies c) New Services Provided d) Avoidance of Penalties from Payers e) Changes in Service Operating Costs f) Liability Costs g) Productivity Changes h) Other 5) Case Examples 6) Resources

NPMEE-35 SIMPLIFYING QUALITY IMPROVEMENT MODELS IN RADIOLOGY

Niyati Hansaria (*Presenter*)
Dhiraj Baruah, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

- Quality improvement (QI) is an important component of healthcare and different models can be utilized within radiology- Root Cause Analysis is a retrospective process which analyzes contributing factors to an event and targets each of these factors for improvement.- Failure Mode and Effect Analysis (FMEA) is a prospective process to identify potential issues and prevent negative events.- Plan Do Study Act (PDSA) incorporates a team approach to troubleshooting errors and can be a continuous process to improving practice.- Lean Management, through waste reduction, and Six Sigma, through variation reduction, can be utilized within radiology to improve quality.

TABLE OF CONTENTS/OUTLINE

Introduction: importance of QI in radiology history of QI requirements related to QI Terminologies Measurement of improvement Models/ Tools for QI with examples Root Cause Analysis Retrospective process best completed as soon as possible after the event Identify possible causes or contributions to event occurring and formulate risk reduction strategies and improvement actions related to each cause Failure Mode and Effect Analysis Prospective process to proactively identify and prevent incidents from happening Define topic, assemble team, develop process map, conduct hazard analysis, develop action and measures Plan Do Study Act Trial and learning approach, continuous process which can be repeated multiple times Lean Management Continuous process; group involvement in sustained improvement Defining value, mapping stream value, creating flow, establishing pull, pursuing perfection A3 tool Six Sigma Quality standard- reducing variability Steps: define, measure, analyze, improve, change Conclusions

NPMEE-36 HOW IS THE MEDICAL COMMUNITY USING SOCIAL MEDIA FOR RADIOLOGY EDUCATION? RESULTS OF A GLOBAL SURVEY

Lilly Kauffman, BA (*Presenter*)
Elliot K. Fishman, MD (*Abstract Co-Author*)

TEACHING POINTS

- The medical community is using social media for radiology education.- Over half of respondents from our survey use social media for radiology education every day- YouTube is the most actively used, and the preferred, platform for radiology education- Most respondents use social media to learn more about radiology or to keep abreast of current events- Over 75% of respondents say they find social media "extremely useful" or "very useful" and over 47% indicate they find social media more useful than traditional resources such as textbooks

TABLE OF CONTENTS/OUTLINE

- An introduction to social media in the realm of radiology education- The results of our survey: demographics- The results of our survey: social media--- What social media platforms are popular--- What individuals' goal is by using social media- Indications for radiology educators

NPMEE-37 RADBOARDSAI: VOICE-INTERACTIVE AI PLATFORM FOR DIAGNOSTIC RADIOLOGY ORAL-BOARD SIMULATION

Rohit Reddy, MD (*Presenter*)
Nicholas Ott, MD (*Abstract Co-Author*)
Nicolas Litardo (*Abstract Co-Author*)
Nicole O. Brofman, MD (*Abstract Co-Author*)
Katharine Lampen-Sachar, MD (*Abstract Co-Author*)

TEACHING POINTS

1. ABR's 2028 of the oral exam reinstatement requires scalable methods for case-based diagnostic reasoning practice.2. Voice-interactive AI that is built on siloed speech-text-speech (STS) model logic can emulate realistic ABR board-style cases.3. Cloud-hosted micro-services (voice gateway, moderator, scoring) can be replicated and shared, giving residents in small or rural programs the same high-fidelity practice opportunities traditionally available only at large academic centers.4. Evidence-based design and rubric-based longitudinal feedback allow trainees and program leadership to track competency.

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Background & Need : ABR oral exam return; faculty time constraints limit mock oral boards simulations. Current Landscape: Early pilots do not cover DR's full subspecialty breadth and layered knowledgebase. System & Deployment Architecture : Docker/Kubernetes micro-services (voice gateway, moderator, scoring, PACS, UI) with tenant isolation and tested API connectors for multi-center use. Case Pipeline & Prompt Engineering: ABR based templates ? automated prompt synthesis with case-metadata overlays, phase state-machine, and safety guardrails refined through iterative testing.Evidence-Based Design : self-paced practice, immediate feedback, spaced repetition, and adaptive reinforcement.Interactive Examination Workflow : case selection ? image review ? voice dialogue ? multilayer cases ? real-time feedback.Validation Data : multi-cohort metrics, resident uptake, rubric consistency, 99.5 % service uptime.Next Steps multilingual guidance already built to support non-native speakers; federated model updates protect resident data.

NPMEE-38 WILL AI REPLACE RADIOLOGISTS? THE TRUTH BEHIND LARGE LANGUAGE MODELS

Jose Ignacio Debes, MD (*Presenter*)
Pilar Navarro Azurmendi, MD (*Abstract Co-Author*)
Sofia D. Gambetta I, MD (*Abstract Co-Author*)

TEACHING POINTS

- Understand the capabilities and limitations of Large Language Models (LLMs) in radiology.- Recognize practical applications of LLMs in clinical reporting, education, and workflow optimization. - Learn basic prompt engineering strategies to maximize the effectiveness of LLMs. - Reinforce the indispensable role of radiologists in the AI era.

TABLE OF CONTENTS/OUTLINE

INTRODUCTION - The growing impact of AI and LLMs in radiology. - Debunking myths about AI "replacing" radiologists. -WHAT ARE LLMS?: - How LLMs transform unstructured text into clinical assistance. - Large language models developed for general medical tasks, clinical prompting, and biomedical text analysis. -APPLICATIONS IN RADIOLOGY: - Drafting clinical reports. - Supporting education and research. - Optimizing workflow processes. -PROMPT ENGINEERING FOR RADIOLOGISTS: - Simple strategies to craft effective prompts. - Examples of clinical, educational, and research-oriented prompts. -CHALLENGES, ETHICAL CONSIDERATIONS, AND FUTURE PERSPECTIVES: - Managing hallucinations, bias, and privacy risks. - Augmented radiology: human expertise enhanced—not replaced—by AI.

NPMEE-39 THE DUAL DIAGNOSIS: MOTHERHOOD AND RESIDENCY IN RADIOLOGY

Zohaib Mallick, MBBS (*Presenter*)
Amal Mahmood (*Abstract Co-Author*)
Uffan Zafar, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit addresses the multifaceted challenges and triumphs of navigating motherhood during radiology residency. It explores the impact of this "dual diagnosis" on training, professional development, and personal well-being. The exhibit will examine strategies for balancing clinical responsibilities, academic pursuits, and family life, and highlight institutional support systems that facilitate success. It will also discuss the evolving landscape of parental leave policies and the importance of mentorship in fostering a supportive environment for resident mothers. Identify the primary challenges faced by radiology residents who are mothers.

TABLE OF CONTENTS/OUTLINE

I. Introduction: The Intersections of Motherhood and Residency A. Unique challenges faced by resident mothers B. Impact on training, well-being, and career trajectory II. Time Management and Work-Life Integration Strategies A. Effective scheduling and prioritization techniques B. Utilizing technology and support systems C. Strategies for managing on-call duties and unpredictable hours III. The Role of Institutional Support A. Parental leave policies: Current status and best practices B. Flexible training options and childcare resources C. Creating a supportive and inclusive work environment IV. Mentorship and Networking A. The importance of mentorship for resident mothers B. Building a professional network C. Finding role models and peer support V. Conclusion: Fostering a Sustainable and Supportive Future A. Recommendations for residency programs and institutions B. Future directions for research and advocacy

NPMEE-40 STRATEGIES FOR SURVEILLANCE AND CARE OF VULNERABLE AND UNDERSERVED POPULATIONS AT RISK FOR CHRONIC LIVER DISEASE AND HCC

Ania Z. Kielar, MD, FRCPC (*Presenter*)
Tasneem A. Lalani, MD (*Abstract Co-Author*)
James T. Lee, MD (*Abstract Co-Author*)
Satheesh Krishna, MD (*Abstract Co-Author*)
James V. Rawson, MD (*Abstract Co-Author*)

TEACHING POINTS

Prevalence of chronic liver disease is increasing in North America with risk factors including increasing rates alcohol, and metabolic dysfunction-associated steatotic liver disease (MASLD), and decreasing rates of virus-related liver disease (such as hepatitis B and C).. Often, individuals do not realize they have liver disease until their health is significantly compromised, yet in many cases, especially MASLD, there are modifiable factors which can help reduce their risk of developing cirrhosis and HCC. Patients at risk for chronic liver disease and HCC include those who are underserved and often considered to be vulnerable due to their socioeconomic status as well as other factors. Finding ways to identify, stratify and treat this group of patients can help reduce health care costs, as well as patient suffering, down the road.

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Identifying vulnerable and underserved populations associated with development of chronic liver disease and HCC.Role of opportunistic screening in identifying patients at risk for chronic liver disease and HCC..Compare and contrast current worldwide MASLD guidelines, include EASL, AASLD, Worldwide gastroenterology, and Canadian Association of Radiologist guidelines. . Develop potential ideas to screen and stratify vulnerable patients at risk for chronic livers disease. Creation of multidisciplinary clinics (MDC) to provide all aspects of care in as few visits as possible for patients who live remotely or have low SES with risk factors for "no shows". This includes key members of MDC ClinicsDescribing the role of MDC clinics in ensuring best patient care

NPMEE-41 HOW CAN WE EARN TRUST? OPTIMIZING MEDIA CHANNELS FOR RADIOLOGY MARKETING AND PUBLIC RELATIONS CAMPAIGNS

Vilert A. Loving, MD, MMM (*Presenter*)

TEACHING POINTS

1. Marketing and public relations strategies serve two critical roles for radiology practices: a) attract and retain imaging service utilization; b) educate community members and providers regarding radiology-related topics. 2. Radiology marketing and public relations teams communicate to patients and providers via four media channel categories: paid, earned, shared, and owned. 3. Media channels facilitate patients' and referring providers' progression through the marketing communication lifecycle: awareness, interest, desire, and action. Awareness = knowledge that a service/topic exists. Interest = curiosity to learn more about the messaged service/topic. Desire = intent to pursue the service or develop deeper understanding about the educational topic. Action = actual follow through with the imaging service or to study/propagate the educational content. 4. Measuring a media campaign's success is important to determine if the chosen media channel warrants additional resource investment or should be abandoned.

TABLE OF CONTENTS/OUTLINE

1. Why do radiology practices need marketing and public relations? 2. Identifying the target audience: patients, providers, journalists, and influencers 3. The four media channel categories 4. Advantages and disadvantages of the four media channel categories 5. Introduction to the marketing communication lifecycle 6. Media channel

selection and their impact on marketing communication lifecycle 7. Measuring media campaign success

NPMEE-42 RADIOLOGY WITHOUT BORDERS: YOUTUBE'S IMPACT ON GLOBAL LEARNING

Zohaib Mallick, MBBS (*Presenter*)
Reyan Hussain Shaikh (*Abstract Co-Author*)
Uffan Zafar, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit will explore YouTube's transformative role in democratizing radiology education, highlighting its potential to bridge global disparities in access to learning resources. Specifically, the exhibit will: Showcase exemplary channels Analyze content effectiveness Discuss the platform's limitations and ethical considerations, including issues of quality control and misinformation. Delve into the use of YouTube for subspecialty training and continuing medical education (CME) Provide strategies for effective use in radiology education Emphasize YouTube's potential to foster a global community of practice.

TABLE OF CONTENTS/OUTLINE

I. Introduction: YouTube as a Global Educational ResourceII. Democratization of Radiology Education: Bridging the GapIII. Exemplary YouTube Channels in Radiology: A Curated SelectionIV. Content Analysis: Effectiveness and Limitations, including Quality ControlV. Ethical Considerations and Best Practices: Addressing MisinformationVI. Strategies for Effective Use in Radiology Education: A Practical GuideVII. Case Studies: Impact on Learning Outcomes and Skill DevelopmentVIII. The Future of Radiology Education on YouTube: Innovation and TrendsIX. Conclusion: Harnessing YouTube's Potential for a Global Community of Practice

NPMEE-43 PRACTICAL SHOWCASE FOR RADIOLOGY RESIDENT LEADERS IN COMMUNITY ENGAGEMENT NATIONWIDE THROUGH "COMMUNITIES CRUSHING CANCER"

Liz Z. Lin, MD, BA (*Presenter*)
Somiah Almeky, MD (*Abstract Co-Author*)
Carlos D. Aramayo, MD (*Abstract Co-Author*)
Madhurya Amirapu, MBBS (*Abstract Co-Author*)
Priscilla J. Slanetz, MD, MPH (*Abstract Co-Author*)

TEACHING POINTS

1. The "Communities Crushing Cancer (CCC)" initiative, a nationwide resident-led event focusing on patient education, can serve as a model for outreach efforts. 2. Residents and trainees are most powerful when working together, in collaboration with community partnerships and organized medicine. 3. Stepwise progression to statewide, and national expansion requires a network. A designated liaison for expansion efforts at each site are essential. 4. Social media outreach efforts are invaluable for both identifying new sites for engagement but also to support solidarity.

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Identify a cause Formulate an intervention Identify stakeholders Verify content Understand current practice and contexts Start locally Secure buy-in Human capital Department support Apply for internal/external grants Identify existing collaborators Expand statewide Find quality liaisons Build a Toolkit for success Centralize information Lower barriers to access Expand nationwide What makes a good partnership or coalition? Secure buy-in Funding opportunities via organized medicine and other sponsorships Marketing and Outreach Social media Establish platforms, recruit superusersEngage with short form content and videos, challenges Sustainability Prioritize recruitment of junior residents and trainees Collect data Reflect

NPMEE-44 SUSTAINABLE DEVELOPMENT IN RADIOLOGY: STRATEGIES FOR ENVIRONMENTALLY RESPONSIBLE IMAGING CENTERS

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Juan Cruz Gallo, MD, MD (*Abstract Co-Author*)
Carlos Capunay, MD (*Abstract Co-Author*)
Patricio J. Sita (*Abstract Co-Author*)
Valeria Szymanowski (*Abstract Co-Author*)

TEACHING POINTS

Environmental Impact of Radiology - Understanding the carbon footprint of imaging modalities, including energy-intensive MRI and CT scanners, and the waste generated from contrast media and consumables. Energy-Efficient Radiology Practices - Strategies to reduce electricity consumption through smart scheduling, AI-powered image reconstruction, and energy-efficient equipment. Waste Management and Recycling - Implementation of contrast media recycling programs, paperless workflows, and proper disposal of radiological materials. Economic and Social Sustainability - The role of cost-effective digital solutions, telemedicine, and patient-centered approaches in promoting sustainability. Green Certification and Policies - Overview of sustainable healthcare certifications (e.g., LEED, Energy Star) and policy frameworks to promote eco-friendly radiology practices.

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Introduction - The need for sustainability in radiology and its impact on healthcare systems. Energy Consumption in Medical Imaging - Analysis of power usage in different imaging modalities and potential savings with energy-efficient practices. Strategies for Sustainable Imaging Centers - Practical steps, including AI integration, energy-efficient scanner utilization, and eco-friendly facility design. Case Studies and Best Practices - Examples of radiology departments successfully implementing green initiatives. Challenges and Future Directions - Addressing barriers to sustainability adoption and exploring technological advancements that will shape eco-friendly radiology.

Abstract Archives of the RSNA, 2025

NREE

Neuroradiology Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

NREE-2 CRACKING THE CODE: IMAGING CLUES TO DISTINGUISH LONG-TERM EPILEPSY-ASSOCIATED TUMOR (LEAT) SUBTYPES

Julian Rodriguez Cely, MD (*Presenter*)
Andres Guillermo Tarra Romero, MD (*Abstract Co-Author*)
David F. Loaiza Ramirez SR, MD (*Abstract Co-Author*)
Rodrigo Arrieta Darras, MD (*Abstract Co-Author*)

TEACHING POINTS

LEATs (Long-term Epilepsy-Associated Tumors) are low-grade glioneuronal or glial neoplasms often causing pharmacoresistant epilepsy in young patients. MRI plays a key role in detecting, characterizing, and localizing these tumors, essential for surgical planning. Recognizing MRI patterns (e.g., bubbly multivesicular appearance in DNET, cystic-solid mural nodules in gangliogliomas or PXAs) improves diagnostic confidence and distinguishes LEATs from mimics. Correlation with histopathology and molecular markers (e.g., FGFR1, BRAF V600E) refines prognostic assessment. Awareness of rare LEAT entities (PGNT, PLNTY, MVNT, angiocentric gliomas) broadens the diagnostic scope.

TABLE OF CONTENTS/OUTLINE

Introduction Definition of LEATs Clinical significance in epilepsy surgery Imaging Features by Tumor Type Dysembryoplastic Neuroepithelial Tumor (DNET) Ganglioglioma (GG) Pleomorphic Xanthoastrocytoma (PXA) Papillary Glioneuronal Tumor (PGNT) Isomorphic Glioma Molecular and Histopathological Correlation WHO Classification updates Common genetic mutations (FGFR1, BRAF) Clinical and Surgical Relevance Role of MRI in localizing epileptogenic zones Importance of identifying cortical dysplasia Summary and Take-Home Messages

NREE-3 IMAGING INSIGHTS OF THE OPTIC NERVE IN MS DIANGOSIS: HOW TO USE THE FIFTH ELEMENT PRESERVING SPECIFITY

Tamara Hernandes Ricci, MD (*Presenter*)
Manoel Barbosa, MD (*Abstract Co-Author*)
Tatiana Iutaka, BDS (*Abstract Co-Author*)
Beatriz D. Prado, MD (*Abstract Co-Author*)
Ana Paula A. Fonseca, MD (*Abstract Co-Author*)
Felipe T. Pacheco, MD, PhD (*Abstract Co-Author*)
Felipe Scortegagna SR, MD (*Abstract Co-Author*)
Renato Hoffmann Nunes, MD, MBA (*Abstract Co-Author*)
Antonio Carlos M. Maia JR (*Abstract Co-Author*)
Antonio J. Da Rocha, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The objectives of this exhibit are to: ? Introduce the optic nerve as a fifth region for Dissemination in Space (DIS) in the upcoming 2024 revision of the McDonald criteria for Multiple Sclerosis. This addition aims to enhance the sensitivity of the diagnostic process while maintaining high specificity.? Highlight the clinical significance of including the optic nerve in the early diagnosis of Multiple Sclerosis, emphasizing how this can lead to earlier detection and better patient outcomes.? Review the underlying principles and current recommendations for incorporating the optic nerve as a diagnostic criterion, providing a comprehensive understanding of its role in the diagnostic framework.? Discuss the differential diagnosis of optic neuritis in Multiple Sclerosis and explore their respective MRI findings. It aims to provide a comprehensive understanding of how to distinguish MS-related optic neuritis from other conditions with similar clinical presentations, highlighting key imaging features that aid in accurate diagnosis."

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? Introduction and initial considerations? Principles and recommendations for including the optic nerve as a diagnostic criterion? Optic neuritis as the first manifestation of multiple sclerosis? Differential diagnostics between demyelinating and non-demyelinating diseases with didactic illustrations? Final remarks

NREE-4 WHITE MATTER WHISPERS: NEUROIMAGING FEATURES OF PROGRESSIVE MULTIFOCAL LEUKOENCEPHALOPATHY

Lara Mori, MD (*Presenter*)
Diogo G. Correa, MD (*Abstract Co-Author*)
Tomas Freddi, MD (*Abstract Co-Author*)
Celso Hygino, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Progressive multifocal leukoencephalopathy (PML) is an infection caused by a human polyomavirus John Cunningham (JC) virus. In immunocompromised hosts, its reactivation causes an often fatal disease characterized by direct involvement of oligodendrocytes.Most patients with PML are HIV-positive, or use monoclonal antibodies.The clinical presentation usually includes paresis, sensory deficit, hemianopia, cognitive dysfunction, aphasia, and gait difficulties.Typically, imaging shows lesions involving mainly the subcortical white matter, without mass effect, hypodense on CT and with hyperintense signal on T2-weighted imaging and FLAIR, on MRI.Lesions are usually non-enhancing or with mild peripheral enhancement, bilateral but asymmetrical, or unilateral.In some cases, diffusion restriction may be observed in the periphery of the lesion.When associated with immune reconstitution inflammatory syndrome, PML is associated with atypical findings, such as marked contrast enhancement and mass effect.Important differential diagnosis are:HIV encephalitis, which generally affects the periventricular white matter and spares the subcortical white matter, unlike PML.Lymphoma: Some findings, such as contrast enhancement, restricted diffusion and hyperperfusion, suggest lymphoma. Other opportunistic infections: cytomegalovirus and toxoplasmosis, although characterized by areas of enhancement.

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Introduction and Definition Epidemiology Pathophysiology Imaging findings Classic imaging findings SWI characteristics Shrimp sign Milky way sign Bar bell sign PML in Multiple sclerosis JC virus granule cell neuronopathy Differential Diagnosis Conclusion

NREE-5 THE MYSTERIOUS MESH: EXPLORING RETE-LIKE CONFIGURATIONS OF THE MIDDLE CEREBRAL ARTERY

Pedro Mecate Prada, MD (*Presenter*)
Marcelo Z. Bringel Martins, MD (*Abstract Co-Author*)
Carlos Felipe D. Reyna, MD (*Abstract Co-Author*)
Juarez Pimentel, MD (*Abstract Co-Author*)
Marcos V. Camargo, MD (*Abstract Co-Author*)
Frederico Adolfo B. Silva, MD (*Abstract Co-Author*)
Flavia I. Cevasco, MD (*Abstract Co-Author*)
Guilherme Swerts Pereira (*Abstract Co-Author*)
Lara Quiche, MD (*Abstract Co-Author*)
Caio Nunes, MD (*Abstract Co-Author*)
Margrit E. Muller, MD (*Abstract Co-Author*)
Lucas Da Silva Costa, MD (*Abstract Co-Author*)
Breno A. Matos, MD (*Abstract Co-Author*)

TEACHING POINTS

- To review the embryology and pathophysiology of the Rete-like configurations of the Middle Cerebral Artery. - To recognize the imaging features of the Rete-like configurations of the Middle Cerebral Artery, and to review the differential diagnosis, highlighting the key diagnostic features. - To understand the hemodynamic repercussions of the Rete-like configurations of the Middle Cerebral Artery, including on the perfusion imaging. - To recognize complications associated with the Rete-like configurations of the Middle Cerebral Artery, particularly its relation to ischemic and hemorrhagic stroke. - Emphasize the importance of recognizing Rete-like configurations of the Middle Cerebral Artery to prevent diagnostic errors and inappropriate interventions.

TABLE OF CONTENTS/OUTLINE

- Definition, embryological basis, and hemodynamic repercussions - Clinical considerations and management strategies - Imaging features, and Complications, with teaching cases - Perfusion assessment - Differential diagnoses - Take Home Messages - References

NREE-6 READING BETWEEN THE PEAKS SPECTROSCOPY IN CHALLENGING NEURO-ONCOLOGY CASES

Pablo Nahuel Montalto, MD (*Presenter*)

TEACHING POINTS

Introduce the clinical indications and added value of MR spectroscopy in neuro-oncologic imaging. Recognize metabolic patterns in complex neuro-oncologic cases where spectroscopy can aid diagnosis. Understand the significance of key metabolites: NAA, Choline, Creatine, Lipids, and Lactate. Illustrate how spectroscopy findings correlate with treatment response and pathology. Emphasize how MRS complements conventional MRI, improving diagnostic confidence.

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The role of MR spectroscopy in complex neuro-oncology cases Technical principles of MR spectroscopy and metabolic interpretation Spectroscopic findings in high-grade vs. low-grade gliomas Differentiation between tumor recurrence and radiation necrosis Spectroscopy in pseudoprogression and treatment-related changes Summary of clinical cases illustrating diagnostic impact Conclusion: MRS as a non-invasive tool to support decision-making in neuro-oncology

NREE-7 SHEDDING LIGHT ON ACUTE SPINAL CORD INFARCTION: IMAGING PEARLS, PITFALLS & DIFFERENTIAL DIAGNOSIS

Dhruti J. Maisuri, MD, MBBS (*Presenter*)

TEACHING POINTS

1.) Case based review that demonstrates the key MRI findings of acute spinal cord ischemia (ASCI) in both adults and children.2.) Review the vascular anatomy of the spinal cord as it pertains to imaging findings in ASCI.3.) Common and uncommon etiologies of ASCI and radiological differential diagnosis of ASCI.

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Acute spinal cord ischemia (ASCI)is an uncommon diagnosis that requires a high index of suspicion by both the referring clinician and neuroradiologist interpreting the spinal MRI. Diagnosis can be especially challenging in the pediatric patient. This educational exhibit will present case based review of ASCI in pediatric and adult patients from our tertiary care center with an emphasis on the MRI findings including the importance of DWI. For example "Owl's eye " appearance is pathognomic for anterior spinal cord infarct. Based on our experience, diffusion weighted imaging (DWI) is highly recommended in all cases of acute myelopathy when possible. The STIR sequence is essential for detection of associated bone infarcts. The cases will demonstrate and discuss, a variety of etiologies of ASCI including atherosclerotic disease, thoracoabdominal dissection/ aneurysm repair, trauma, bronchial artery embolization for hemoptysis, sports related injury and fibrocartilaginous emboli. Examples of anterior and posterior spinal artery infarcts will be shown. The exhibit will also review spinal cord vascular anatomy as it pertains to the MRI findings of ASCI. Finally, we will discuss the radiological differential diagnosis(like tumour, infection/inflammation, demyelination).

NREE-8 NOT JUST A STROKE OF BAD LUCK: OVERVIEW OF SICKLE CELL NEUROVASCULAR COMPLICATIONS AND VENOUS HYPERINTENSITIES

Alejandro Gonzalez, BS (*Presenter*)
Kamish Marrero (*Abstract Co-Author*)
Manus Donahue, PhD (*Abstract Co-Author*)
Sumit Pruthi, MBBS (*Abstract Co-Author*)
Lori Jordan (*Abstract Co-Author*)

TEACHING POINTS

- 1. Sickle cell disease (SCD) is an inherited hemoglobinopathy causing RBC sickling and chronic anemia - 2. Neurologic complications include stroke , silent cerebral infarcts (SCIs) , moyamoya disease , and cerebral aneurysms - 3. Elevated cerebral blood flow (CBF) reflects impaired cerebral hemodynamics - 4. Neuroimaging is key for diagnosis of neurologic complications

TABLE OF CONTENTS/OUTLINE

- I. SCD pathophysiology and neurological complications - II. Neuroimaging findings of complications - III. Advanced neuroimaging techniques and treatments - IV. Conclusion SCD is associated with neurovascular complications such as SCIs, overt stroke, and cerebral vasculopathy. SCIs increase with age, affecting ~50% of patients by age 30, appearing on FLAIR as = 3mm white matter hyperintensities in border zones of CBF. Ischemic strokes, often involving the MCA territory, occur in early childhood. Hemorrhagic strokes are more frequent in the 3 rd -4 th decades of life. Both stroke types are linked to vasculopathy. MRA in moyamoya vasculopathy often reveals ICA occlusion/stenosis with lenticulostriate collaterals. Aneurysms occur often in atypical locations across anterior/posterior circulation. Elevated CBF, detected via advanced MRI techniques, compensates for reduced O 2 delivery due to chronic anemia but can result in cerebral capillary shunting and impaired O 2 extraction. Shunting appears as hyperintense signals in dural sinuses on arterial spin labeling MRI and is quantified by venous hyperintensity score (VHS). These findings

may serve as non-invasive markers of cerebrovascular dysfunction. Notably, stem cell transplant has been shown to significantly decrease CBF and reduce venous hyperintensities.

NREE-9 MYELINATION AND BEYOND: DEVELOPMENTAL MILESTONES, MOLECULAR GATEKEEPERS, AND MRI TOOLS FOR ACCURATE RECOGNITION OF HYPOMYELINATING AND DELAYED MYELINATION SYNDROMES

Mario Mahecha, MD (*Presenter*)
Camilo Perdomo, MD (*Abstract Co-Author*)
Fabricio G. Goncalves, MD (*Abstract Co-Author*)
Matt T. Whitehead, MD (*Abstract Co-Author*)

TEACHING POINTS

• Compare myelination patterns with standardized, age-matched MRI atlases to reduce diagnostic bias. • When findings are inconclusive, schedule follow-up MRI every 3-6 months to assess for progression versus stability. • Look for ancillary abnormalities that may suggest specific genetic or metabolic syndromes.

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Objectives Review normal myelination milestones and their appearance on T1- and T2-W MRI. Differentiate key radiologic and clinical features of hypomyelination versus delayed myelination. Provide a visual key of each disorder using clearly labeled diagrams for rapid recognition and comparison. Introduction Myelination follows a predictable pattern reflecting neurodevelopment and depends on coordinated genetic and molecular signaling, which may be disrupted by leukodystrophies, hypothyroidism or environmental factors. Key Imaging Features Delayed Myelination: Evolving T1 and T2 shortening over time, consistent with age-adjusted norms. Hypomyelination: Stable T2 hyperintensity and lack of age-appropriate T1 shortening beyond expected developmental windows. Advanced Imaging Strategies Use inversion recovery sequences, diffusion tensor imaging (DTI), and myelin water fraction mapping. Common Pitfalls Confusing gliosis, edema, or volume loss with hypomyelination; missing early progression due to inadequate follow-up. Conclusion Distinguishing hypomyelination from delayed myelination requires integrating imaging, neurodevelopmental context and genetics to guide diagnosis and management.

NREE-10 DON’T BE BLIND: ORBITAL AND OCULAR PATHOLOGIES IN TRAUMA

Stephanie McClintock-Batista, MD, BS (*Presenter*)
Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Pedro Collazo-Ornes, MD (*Abstract Co-Author*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Ana Davila Rodriguez (*Abstract Co-Author*)
Neian Contreras Alvarado (*Abstract Co-Author*)

TEACHING POINTS

1. Identify normal orbital anatomy using a space-themed visual analogy. 2. Recognize and classify orbital fractures and mechanisms of injury. 3. Use a structured CT search pattern to assess injury extent and guide clinical decisions. 4. Detect critical findings such as retrobulbar hemorrhage, globe rupture, optic nerve injury, or air tracking.

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I. Introduction II. Objectives III. Anatomy Review IV. Mechanisms of Injury and Symptoms V. Imaging Search Pattern and CT Findings: 1. Orbital Wall Fractures 2. Globe Injury, Rupture, Intraorbital Hemorrhage 3. Retina, Muscles, Extraconal Soft Tissue VI. Management and Clinical Decision-Making VII. Conclusion Abstract: Orbital trauma is a common scenario for radiology residents, demanding swift and accurate CT interpretation. Given the complex anatomy and risk of multiple concurrent injuries, a systematic approach is vital. This exhibit guides learners in identifying key structures and trauma patterns, integrating mechanisms of injury and red flags to support timely clinical action. A creative space analogy enhances anatomical understanding: the lens is a hologram, the globe a fragile blue glass ball, muscles as robotic arms, optic foramen as a projection system, and the optic nerve as a power cable. CT cases from our institution illustrate critical findings, aiding learners in producing relevant, management-oriented reports. This engaging educational tool supports students, residents, and imaging specialists alike.

NREE-11 PUT A RING ON IT, DR. MAGIC: LET'S DISCUSS RING ENHANCING LESIONS OF THE BRAIN

Stephanie McClintock-Batista, MD, BS (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Noralys E. Pagan (*Abstract Co-Author*)
Lina Mercedes Bernier Colon (*Abstract Co-Author*)
Pedro Collazo-Ornes, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Provide an anatomical review of the relevant structures involved in ring enhancing lesions. 2. Discuss the mechanism and subtypes of ring enhancing lesions. 3. Explain characteristic imaging findings and their correlation with specific subtypes. 4. Use engaging imagery and the mnemonic of Dr. MAGIC to create visual associations that improve memory and understanding of ring enhancing pathologies.

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I. Introduction II. Objectives III. Anatomy Review IV. Ring enhancing lesions. 1. Subtypes- MAGICDR M: Metastasis A: Abscess G: Glioblastoma I: Infarct (subacute phase) or Inflammatory (neurocysticercosis) C: Contusion D: Demyelinating disease R: Radiation necrosis or resolving hematoma VII. Conclusion Abstract: Ring-enhancing brain lesions can result from various pathological processes. These lesions often remain undiagnosed during initial presentation, particularly in patients managed conservatively or with subtle clinical symptoms. Accurate imaging interpretation using CT and MRI is essential but challenging due to overlapping enhancement patterns, diffusion characteristics, and associated features. This exhibit introduces the mnemonic Dr. MAGIC, which represents etiologies, such as infectious, neoplastic, inflammatory/autoimmune, vascular, and others aiming to provide a structured approach to evaluating ring enhancing lesions.

NREE-12 LAYER BY LAYER - A DEEP DIVE INTO CERVICAL AND INTRACRANIAL ARTERIAL DISSECTION

Lucas Aquino (*Presenter*)
Rafael Docema, MD (*Abstract Co-Author*)
Vitor C. Romano, MD (*Abstract Co-Author*)
Carlos Felipe D. Reyna, MD (*Abstract Co-Author*)
Tatiana L. Arcanjo, MD (*Abstract Co-Author*)
Renata Bertanha, MD (*Abstract Co-Author*)
Rogerio Iquizli, MD (*Abstract Co-Author*)
Breno A. Matos, MD (*Abstract Co-Author*)

TEACHING POINTS

- To review the pathophysiology of cervical and intracranial arterial dissection - To review the imaging technique and protocols for the evaluation of cervical and intracranial arterial dissection - To recognize the imaging features of cervical and intracranial arterial dissection and to review the differential diagnosis and mimics, highlighting the key diagnostic features - To be familiarized with the evolution of arterial dissection and mural hematoma - To recognize the complications associated with the cervical and intracranial arterial dissection

TABLE OF CONTENTS/OUTLINE

- Introduction and pathophysiology - Imaging technics and protocols - Imaging features with teaching cases: - Doppler US, CT and CTA, MRI and MRA, VWI - Evaluation of the mural hematoma - Evolution and complications, with teaching cases - Differential diagnosis / Mimics, with teaching cases - Take home messages - References

NREE-13 UNDERSTANDING SELLAR AND PARASELLAR LESIONS: AN APPROACH BASED ON SELLAR DISPLACEMENT

Jordan Hughes, MD (*Presenter*)
Anish Neupane, MBBS, MD (*Abstract Co-Author*)
Amit Mahajan, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Lesions of the sella and parasellar regions are not uncommonly encountered by radiologists with a variety of etiologies including congenital, inflammatory, vascular and neoplastic. We will provide a brief review of the embryology and anatomy of the parasellar region as it can appear on imaging. Additionally, we will present a schema that can be useful in formulating a differential diagnosis for anterior and middle cranial fossa lesions focusing on how these lesions displace the sellar contents. We aim to demonstrate this approach using imaging examples and clinical correlates from our institution. Our suggested approach can be supplemental to CT and MRI characteristics thereby guiding the radiologist to an appropriate and comprehensive differential diagnosis. This as a result may allow for more targeted clinical management.

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1. Introduction and background a. Clinical presentation b. Displacement as guiding tool 2. Anatomy and embryology 3. Inferior displacement a. Craniopharyngioma b. Dermoid/epidermoid c. Germinoma 4. Superior displacement a. Chondrosarcoma b. Clival plasmacytoma 5. Lateral displacement a. Meningioma b. Schwannoma c. Aneurysm 6. Intrinsic sellar lesions a. Pituitary adenoma b. Chloroma c. LCH 7. Discussion/conclusion 8. References

NREE-14 FROM SCAN TO SCALPEL: DECODING MENINGIOMAS THROUGH RADIOLOGY AND RESECTION

Mariana Carmo, MD (*Presenter*)
Andressa C. Kuzma, MD (*Abstract Co-Author*)
Enzo Fatuch (*Abstract Co-Author*)
Miguel Lins Quintella (*Abstract Co-Author*)
Bruno Coghi (*Abstract Co-Author*)
Sebastiao B. de Araujo Neto, MD (*Abstract Co-Author*)
Stenio Burlin, MD (*Abstract Co-Author*)
Luis Antonio Tobaru Tibana, MD (*Abstract Co-Author*)
Gustavo D. Gomez, MD (*Abstract Co-Author*)

TEACHING POINTS

To understand the imaging characteristics, mainly in preoperative planning. Radiologists must assess tumor relationships with cortex, and neural/vascular structures to guide surgical approach and outcomes. To study the radiological features suggesting specific histological subtypes. These findings can raise suspicion for a higher-grade tumor and prompt more aggressive surgical planning and consideration of adjuvant therapies. Understanding these correlations aids neurosurgeons in predicting tumor behavior. To assist in risk stratification and help determine the frequency of follow-up imaging and whether adjuvant treatment is warranted, even after gross total resection. Larger tumor size, presence of peritumoral edema, irregular shape, dural tail extending a long distance, and heterogeneous enhancement have all been linked to higher-grade meningiomas (WHO Grade II or III) and increased recurrence rates.

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Meningiomas, common extra-axial intracranial tumors, require accurate radiology for effective neurosurgical planning. While definitive grading requires histology, radiologists should comment on features suggestive of higher-grade lesions (e.g., irregular margins, heterogeneous enhancement, brain invasion, peritumoral, and restricted diffusion). The WHO classification (Grades I, to III) reflects increasing aggressiveness. We will correlate radiological and histopathological findings from surgical specimens across 15 meningioma classification types. Neurosurgeons rely on radiologists for a comprehensive "roadmap" of anatomical relationships, aggressiveness, and complications, enabling safe surgery and complication anticipation.

NREE-15 ADVANCES IN NEUROIMAGING IN THE ASSESSMENT OF MENINGIOMAS - SURGICAL IMPLICATIONS AND MOLECULAR MARKERS

Rafael Docema, MD (*Presenter*)
Luiz R. Uchoa, MD (*Abstract Co-Author*)
Youssef Bazzoun (*Abstract Co-Author*)
Lavinia Dias, MD (*Abstract Co-Author*)
Margrit E. Muller, MD (*Abstract Co-Author*)
Eduardo C. Ribas, MD,PhD (*Abstract Co-Author*)
Guilherme C. Ribas, MD,PhD (*Abstract Co-Author*)
Fabiana D. Hirata, MD (*Abstract Co-Author*)
Renata Bertanha, MD (*Abstract Co-Author*)
Luis F. Godoy, MD (*Abstract Co-Author*)

TEACHING POINTS

- Understanding the pathophysiology of meningiomas, risk factors and relation with genetic syndromes - Understanding the dual arterial supply of meningiomas, the contribution of pial arteries and the relation with subjacent brain parenchyma edema - Understanding and classifying the degree of dural sinuses invasion and the implications for tumor resection - Discussing molecular markers and updates in the classification of meningiomas - Understanding the relation between meningioma's imaging aspects and the degree of aggressiveness and prognostic impact - Discussing mimics and red flags of meningiomas

TABLE OF CONTENTS/OUTLINE

- Introduction - Arterial supply - Pial arteries and edema - Dural sinuses - Molecular markers and classification updates - Imaging aspects and correlation with aggressiveness and prognosis - Teaching cases - Red flags / Mimics - Take home messages - References - Authors

NREE-16 NEURODEGENERATION IN FOCUS: IMAGING THE HIDDEN PATTERNS OF MOVEMENT DISORDERS

Motaz A. Daraghma, MD (*Presenter*)
Qays Abu-Saymeh (*Abstract Co-Author*)
Ayman Nada, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

After completing this exhibit, the viewer will be able to:*Understand the key pathogenesis of Parkinson’s disease and Parkinson syndromes*Correlate between the pathogenesis and the imaging techniques*Learn about the clinical significance of imaging biomarkers and their role in diagnosis, planning of treatment, and management of patients.*Identify the specific findings of Parkinsonian syndromes on MRI*Differentiate between Parkinson’s disease and atypical Parkinsonian disorders, such as: progressive supranuclear palsy, corticobasal degeneration, and multiple system atrophy.*Avoid common diagnostic pitfalls by correlating clinical features with neuroimaging patterns.*Recognize new MRI techniques and their potential future clinical applications.

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*Introduction and overview of movement disorders and the role of imaging*The key mechanisms of disease development and how these help in developing specific imaging techniques*Clinical Correlations and Diagnostic Pitfalls*Imaging workup for a suspected cases of Parkinson's disease or syndrome*MRI Findings in Parkinsonian Syndromes*Impact of various imaging findings on patients' outcomes*Rule of the imaging biomarkers in treatment evaluation, and monitoring disease progression*Clinical Implications and Future Directions

NREE-17 IDENTIFYING ORBITAL MASSES AND MASS-LIKE LESIONS

Jo Ann Sun (*Presenter*)
Tausif Siddiqui (*Abstract Co-Author*)
Akm Rahman, DO (*Abstract Co-Author*)

TEACHING POINTS

1. Orbital masses present with overlapping clinical symptoms such as proptosis, vision changes, or pain. Multimodal imaging and pathologic correlation are critical for accurate diagnosis. 2. Understanding orbital compartmental anatomy (intraconal vs. extraconal) provides a systematic approach to lesion localization and diagnosis. 3. Characteristic imaging signs, such as "tram-tracking" in optic nerve sheath meningioma, provide diagnostic clues. 4. Awareness of emergent entities like orbital compartment syndrome is critical due to the risk of vision loss and intracranial complications. 5. Non-neoplastic mimics, including inflammatory conditions like orbital pseudotumor or thyroid eye disease, can manifest similarly to tumors and should be considered in the differential.

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1. Background 2. Orbital Anatomy Overview 3. Common Orbital Lesions 3a. Orbital Lymphoma 3b. Pleomorphic Adenoma 3c. Optic Pathway Glioma 3d. Rhabdomyosarcoma 3e. Optic Nerve Sheath Meningioma 3f. Schwannoma 3g. Orbital Cavernous Venous Malformation 3h. Arteriovenous Malformation (AVM) 4. Emergent and Inflammatory Conditions 4a. Orbital Compartment Syndrome 4b. Orbital Pseudotumor 5. Miscellaneous Orbital Lesions 5a. Retinoblastoma 5b. Phthisis Bulbi 5c. Thyroid Eye Disease 6. Key Points

NREE-18 IMAGING FINDINGS OF COMPLICATIONS FROM MIDDLE MENINGEAL ARTERY EMBOLIZATION

Zack Nigogosyan, MD (*Presenter*)
Uma Mani, MD (*Abstract Co-Author*)
Noor Alnazal, DO (*Abstract Co-Author*)
Sarah Alnazal, DO (*Abstract Co-Author*)
Ayman Nada, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Describe indications and pathophysiology of middle meningeal artery embolization? 2. Understand anatomy of the middle meningeal artery? 3.Recognize possible complications related to middle meningeal artery embolization ? 4. At the completion of this presentation, the participant will be able to: ? Understand the middle meningeal artery origin and its variant anatomy? Determine possible complications related to middle meningeal artery embolization ? Comprehend procedural techniques that can be used to reduce risk of complications? Describe imaging that can be performed to detect and prevent potential complications?

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Introduction to middle meningeal artery embolization? Pathophysiology of middle meningeal artery embolization in chronic subdural hematoma ? Anatomy of the middle meningeal artery? Case-based study of complications of middle meningeal artery embolization ? Embolic? Middle meningeal artery perforation ? Off target embolizationDevice complications (ex. retained catheter after glue)?

NREE-19 CLINICAL UTILITIES OF SUPER-SELECTIVE ARTERIAL SPIN LABELING

Takashi Katsube, MD (*Presenter*)
Aiko Gobara, MD (*Abstract Co-Author*)
Hiroya Asou (*Abstract Co-Author*)
Makoto Obara (*Abstract Co-Author*)
Takeshi Yoshizako, MD (*Abstract Co-Author*)
Yasushi Kaji, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The application of super-selective arterial spin labeling (SS-ASL) has made it possible to acquire vascular-selective cerebral perfusion images and vascular-selective 4D-MR angiography (4D-S-PACK), which were previously difficult to obtain. Importantly, SS-ASL enables the evaluation of cerebral blood flow information that cannot be assessed with conventional ASL or MR angiography. These images can be acquired alongside routine MRI scans using a non-invasive method without radiation exposure. 1. SS-ASL provides novel imaging information by generating vascular-selective perfusion images in brain axial sections. This section will discuss the clinical utility of SS-ASL in visualizing changes in cerebral blood flow distribution due to vascular lesions and characterizing blood flow patterns in brain tumors. 2. 4D-S-PACK is a non-invasive imaging technique that provides dynamic vascular information closely resembling digital subtraction angiography (DSA). This section will highlight the clinical utility of 4D-S-PACK in assessing various vascular pathologies, including moyamoya disease, arteriovenous malformations, and dural arteriovenous fistulas.

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A. Principles of SS-ASL technique 1. SS-ASL: vascular-selective pseudo-continuous ASL image 2. 4D-S-PACK: vascular-selective 4D-MR angiography B. Limitations and Accuracy of SS-ASL and 4D-S-PACK 1. Diffiulti in selecting blood vessels 2. Artifacts and pitfalls C. Clinical Utilities of SS-ASL and 4D-S-PACK 1. Moyamoya disease, Cerebral vascular stenoses 2. Superficial temporal artery-middle cerebral artery bypass evaluation 3. Arteriovenous malformations, Arteriovenous fistulas 4. Brain tumors

NREE-20 NEUROLYMPHOMATOSIS IMAGING: UNVEILING THE INVISIBLE — A CASE-BASED REVIEW

Greg Pommier (*Presenter*)
Seulah Choi, MD (*Abstract Co-Author*)
Sasicha Manupipatpong, MD (*Abstract Co-Author*)
Jake Schick, BS, MD (*Abstract Co-Author*)
Francis Deng, MD (*Abstract Co-Author*)
Majid A. Khan, MD (*Abstract Co-Author*)

TEACHING POINTS

Neurolymphomatosis (NL) is a rare but serious manifestation of lymphoma, characterized by infiltration of cranial and/or peripheral nerves by malignant lymphocytes. Clinical presentation is highly variable and may mimic neuropathies or cranial nerve palsies, making diagnosis particularly challenging—especially when NL is the initial manifestation of lymphoma. MRI and [^{18}F]FDG-PET are key imaging modalities, frequently demonstrating nerve thickening, contrast enhancement, and/or FDG avidity. Definitive diagnosis often requires nerve biopsy; however, this is invasive and may be deferred when imaging and clinical features are strongly suggestive. Treatment typically involves systemic chemotherapy and/or radiation therapy. While the overall prognosis is poor, early recognition and aggressive management may improve outcomes.

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Introduction: definition and epidemiology of NL; clinical significance and diagnostic challenges. Case Series: composed of five cases corresponding to Figures 1-5 (attached). Pathophysiology and Disease Spectrum: mechanisms of lymphomatous nerve infiltration; central vs. peripheral nervous system involvement; common lymphoma subtypes associated with NL. Diagnostic Workup: clinical features and differential diagnosis; imaging modalities (MRI and [^{18}F]FDG-PET/CT); importance and limitations of nerve biopsy. Management Strategies: systemic chemotherapy regimens; indications for radiation therapy; supportive care and symptom management. Clinical Implications and Future Directions: importance of early recognition; challenges in diagnosis and treatment; ongoing research into targeted therapies and biomarkers.

NREE-21 BRIDGING THE GAP: DECODING CORPUS CALLOSAL ABNORMALITIES WITH FETAL MRI

Kranthi K. Marathu, MD, MBBS (*Presenter*)
Shehbaz M. Ansari, MD, MBBS (*Abstract Co-Author*)
Okan Ince, MD (*Abstract Co-Author*)
Kapil Semalti, MBBS, MD (*Abstract Co-Author*)
Aysha Lamis Vattoth, MD (*Abstract Co-Author*)
Sumeet G. Dua, MD (*Abstract Co-Author*)
Santhosh Gaddikeri, MD (*Abstract Co-Author*)
Miral D. Jhaveri, MD, MBA (*Abstract Co-Author*)
Surjith Vattoth, MD, FRCR (*Abstract Co-Author*)
Sharon E. Byrd, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Outline the current classification system for fetal corpus callosal abnormalities 2. Familiarize the audience with the embryological development process of corpus callosum 3. To illustrate and discuss fetal MRI images with corpus callosal abnormalities and associated central nervous system (CNS) and non-CNS anomalies

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Corpus callosal abnormalities (CCA) encompass a range of structural malformations that can occur in isolation or with other CNS and non- CNS anomalies. While these abnormalities have been frequently described in the literature, a universally accepted classification system remains absent. Historically, prenatal diagnosis relied heavily on ultrasound, which, despite its accessibility, has limitations in detecting subtle brain malformations and associated syndromic features. Fetal MRI has emerged as a superior modality enabling more accurate characterization of CCA subtypes, assessing the severity and in identifying associated anomalies. This detailed imaging aids in recognition of genetic syndromes, supporting early diagnosis, assessing the potential neurodevelopmental prognosis, guiding parental counseling. For radiologists and clinicians, fetal MRI also provides valuable information about the expected findings at different gestational ages and informs both prenatal management and postnatal follow-up. This pictorial essay presents illustrative embryological diagrams detailing the development of the corpus callosum. Additionally, we introduce the latest classification of CCA, accompanied by representative fetal MRI findings highlighting associated midline anomalies, cortical malformations, and posterior fossa abnormalities.

NREE-22 SUBACUTE AND CHRONIC CEREBRAL VENOUS THROMBOSIS: A RADIOLOGIC ROADMAP TO DIAGNOSIS AND FOLLOW-UP

Griselda T. Romero Sanchez, MD (*Presenter*)
Michelle Y. Gonzalez Putoy SR, MD (*Abstract Co-Author*)
Angela M. Sosa, MD, MSc (*Abstract Co-Author*)
Kristina Ramirez Garcia, MD (*Abstract Co-Author*)
Jason R. Shewchuk, MD (*Abstract Co-Author*)
Mahmud Mossa-Basha, MD (*Abstract Co-Author*)

TEACHING POINTS

Describe the cerebral venous system anatomy and its relevance in cerebral venous drainage. Understand the pathogenesis and risk factors associated with subacute and chronic venous thrombosis (CVT). Review the optimal imaging modalities for diagnosing and monitoring CVT, including CTV, MRI, and MRV. Highlight the importance of follow-up imaging in determining prognosis and guiding patient management. Identify key imaging findings in acute, subacute and chronic settings of CVT.

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1 . Introduction: -Cerebral Venous Anatomy:- Dural venous sinuses: Superior and Inferior Dural Sinuses. -Cerebral veins: Cortical veins, deep venous system, and transcerebral anastomoses. - Anatomical Pitfalls: Hypoplasia, high-riding bifurcations, septi, and Arachnoid granulations. 2. Imaging Approach for Diagnosis and Follow-Up: - Role of CT, CTV, MRI, MRV and VW-MRI in diagnosis. - Strengths and limitations of each modality- Follow-up imaging protocols and interpretation. 3. Imaging Findings Across Disease Phases: Case-Based Review. -Acute CVT: Direct signs: Dense triangle sign, cord sign, empty delta sign. Indirect signs: Venous infarction, cerebral edema, subarachnoid/subdural hemorrhage. - Subacute CVT: Thrombus propagation, evolving infarction or hemorrhage, and early recanalization.- Chronic CVT and Complications: Imaging of dural arteriovenous fistulas (dAVFs), signs of intracranial hypertension, and veno-occlusive patterns. 4. Prognostic and Management Implications: - Clinical relevance of imaging follow-up.- Correlation with outcomes and decision-making regarding anticoagulation, or endovascular therapy.

NREE-23 AN UPDATED REVIEW OF THE IMAGING FINDINGS OF THE FULL SPECTRUM OF CNS LYMPHOMA

Mana Shams, MD (*Presenter*)
Keon Mahmoudi, MD (*Abstract Co-Author*)
Ameera F. Ismail, MD (*Abstract Co-Author*)

TEACHING POINTS

CNS lymphoma is the second most frequent primary brain malignancy in adults after gliomas. Historically the literature has described the radiological features of the most typical imaging appearances of CNS lymphoma without accounting for rarer presentations or subtypes encountered in the real world. Classification of CNS lymphoma is evolving and has been updated in the World Health Organization Classification of CNS tumors 2021 and Hematolymphoid Tumors 2022. Knowledge of the full spectrum of disease is essential for the radiologist to avoid misdiagnosis and for early detection and initiation of treatment.

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CNS lymphoma is the second most common primary brain malignancy in adults. Early suspicion of the disease and initiation of treatment has a favorable impact on survival. Radiologists play a key role in its diagnostic workup, and failure to suggest its possibility carries negative clinical impact. The radiological features most often described in the literature pertain to the characteristics of primary diffuse large B-cell lymphoma (DLBCL) of the CNS negative for Epstein-Barr virus. However, rarer presentations of DLBCL and other specific subtypes with their own distinct imaging features are infrequently described in the literature, yet regularly encountered in real practice. We will provide the radiologist an updated review of the full spectrum of CNS lymphoma through a range of neuroradiological cases reflecting typical and atypical presentations. Cases of primary DLBCL of the CNS, immunodeficiency-associated lymphoma, mucosa associated lymphoid tissue lymphoma, intravascular lymphoma, and lymphomatosis cerebri will be reviewed, among other cases of secondary lymphoma.

NREE-24 ORBITAL APEX DISORDERS: FROM ANATOMY TO IMAGING — A COMPREHENSIVE REVIEW FOR IMPROVING CLINICAL OUTCOMES

Aiko Gobara, MD (*Presenter*)
Takashi Katsube, MD (*Abstract Co-Author*)
Takeshi Yoshizako, MD (*Abstract Co-Author*)
Yasushi Kaji, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Orbital Apex Disorders (OADs), including Orbital Apex Syndrome, Superior Orbital Fissure Syndrome, and Cavernous Sinus Syndrome, share overlapping features due to intricate, contiguous anatomy. This complexity presents diagnostic challenges, making accurate imaging crucial for outcomes. This exhibit provides a structured review correlating anatomy, clinical symptoms, and pathology to improve diagnostic accuracy and guide management. 1. To describe the detailed anatomy of the orbital apex and surrounding structures.2. To correlate OADs symptoms with the precise anatomical location of the lesions.3. To recognize characteristic imaging findings of various diseases affecting the orbital apex.4. To identify optimal imaging techniques and protocols for evaluating suspected OADs.5. To integrate clinical and imaging findings for differential diagnoses and appropriate patient management.

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A. Anatomy: Detailed review of the orbital apex and related structures. B. Clinical Syndromes: OAD presentation; linking symptoms to affected structures. C. Pathology & Imaging: Overview of OADs with imaging examples: Inflammatory/Infectious, Neoplastic (Benign & Malignant), Vascular, Traumatic/Iatrogenic, Endocrine & Miscellaneous. D. Imaging Techniques: CT and MRI protocols for OADs; role of advanced MR sequences. E. Diagnostic Algorithm & Management: Systematic approach integrating clinical presentation, imaging findings, and management considerations.

NREE-25 SUPRATENTORIAL PEDIATRIC BRAIN TUMORS: INSIGHTS FROM THE WHO 2021 CLASSIFICATION AND RECENT UPDATES

Mariko Kurokawa, PhD, MD (*Presenter*)
Ryo Kurokawa, MD, PhD (*Abstract Co-Author*)
Aristides A. Capizzano, MD (*Abstract Co-Author*)
Osamu Abe, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. pHGGs are classified into four molecular subtypes:DMG-H3K27a, DHG-H3G34m, H3/IDH-wildtype, and IHG differ in genetics and clinical features. 2. MRI helps predict tumor subtype noninvasively:Findings like T2-FLAIR mismatch (DMG-H3K27a) or well-defined enhancement (MYCN-subtype) aid diagnosis.3. Imaging and molecular data enable radiogenomic prediction:Radiomics and AI can detect mutations such as H3K27M or G34R/V. 4. Prognosis and therapy differ by subtype:IHG has better outcomes; DHG-H3G34m and MYCN-subtype are more aggressive. 5. WHO CNS5 stresses age- and mutation-based diagnosis:Molecular tests (e.g., methylation, NGS) guide classification and targeted treatment.

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Pediatric-type high-grade gliomas (pHGGs) are aggressive tumors classified into four WHO CNS5 subtypes: DMG-H3K27a, DHG-H3G34m, pediatric-type HGG (H3/IDH-wildtype), and IHG. These differ in age, location, imaging, genetics, and prognosis. MRI offers key non-invasive clues: DMG-H3K27a shows midline location, T2-FLAIR mismatch, and minimal enhancement; DHG-H3G34m presents as large hemispheric masses with necrosis and hemorrhage. MYCN subtype appears well-circumscribed with solid enhancement. IHG occurs in infants as large cystic tumors with enhancing walls. Radiogenomic tools such as radiomics and AI help predict mutations like H3K27M or G34R/V, especially when biopsy is limited. Prognosis varies—IHG often has better outcomes, while DMG-H3K27a and DHG-H3G34m are more aggressive. Molecular diagnostics and targeted therapies (e.g., NTRK, EGFR, ALK inhibitors) are essential. Integrating imaging and molecular data is key to personalized care in pediatric neuro-oncology.

NREE-28 CT-GUIDED PERCUTANEOUS BIOPSY FOR DISCITIS-OSTEOMYELITIS; A PRIMER

Josephina A. Vossen, PhD (*Presenter*)
Yujie Qiao, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit will review indication, techniques and potential complications of CT-guided percutaneous biopsy for discitis-osteomyelitis. CT-guided disc/endplate sampling is a minimally invasive, safe and accurate procedure for tissue diagnosis.

TABLE OF CONTENTS/OUTLINE

- Discuss the indications and contraindications of CT-guided percutaneous biopsy for discitis-osteomyelitis, including review of current Infectious Diseases Society of America guidelines. - Review of the commonly used approaches to access the disc and/or vertebral body endplate. This includes pre-procedural planning, patient positioning, needle angulation and identification of vital structures. - Describe and illustrate the expected imaging appearance during CT-guided percutaneous vertebral biopsies and discuss techniques to maximize sampling success. - Describe complications and their imaging appearance.

NREE-29 SELLARCRANIAL CYST CONUNDRUM: CAN YOU SPOT THE DIFFERENCE?

Zeshan Tariq (*Presenter*)
Hrishikesh A. Kale, MD, MBBS (*Abstract Co-Author*)
Hussam Abou-al-Shaar (*Abstract Co-Author*)
Paul Gardner (*Abstract Co-Author*)
Vikas Agarwal, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

Sellar cystic lesions encompass a broad, differential (Rathke cleft cyst (RCC), arachnoid cyst (AC), cystic pituitary adenomas (CPA), epidermoid cyst, dermoid cyst, craniopharyngiomas, xanthogranulomas, and others) each of which require different surgical treatments thereby providing impetus for specific identification. Of particular importance is the ability to differentiate between the easily misidentified RCC, AC, and CPA. Our specific teaching points are as follows : 1. Review the imaging characteristics of the sellar region on CT and MRI 2. Provide representative clinical presentations and imaging characteristics of RCC, AC, CPA 3. Highlight differences in pathological mechanisms of each entity and correlate them to radiological modalities 4. Practice differentiation between all three entities and the usage of a decision tree cognitive aid 5. Describe neurosurgical management and approaches for each entity.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Mechanism, clinical presentation, imaging characteristics, treatment a. RCC b. AC c. CPA 3. Decision Tree Overview 4. Case Challenge with highlights of common pitfalls 5. Conclusion

NREE-30 RADIOLOGIC ATLAS OF CRANIAL NERVE NEOPLASMS: DIAGNOSTIC STRATEGIES, IMAGING INSIGHTS, AND KEY MIMICS ALONG ANATOMICAL PATHWAYS

Naman Gupta, MD (*Presenter*)
Ankita Gupta, MBBS, MD (*Abstract Co-Author*)
Parul Gupta, MBBS, MD (*Abstract Co-Author*)
Divyansh Gupta, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

An imaging-first, anatomy-guided approach allows accurate identification of cranial nerve tumors and distinction from mimics. Advanced MRI sequences aids in lesion localization and characterization. Case-based learning highlights the importance of recognizing atypical presentations and maintaining high clinical suspicion.

TABLE OF CONTENTS/OUTLINE

. Introduction • Overview of cranial nerve anatomy and clinical relevance• Diagnostic challenges: rarity, symptoms, complex anatomy• Imaging's central role in localization and differential diagnosis 2. Imaging Strategy & Workflow • MRI (T1, T2, FLAIR, contrast, DWI, CISS/FIESTA), CT for bony detail• Structured approach: nerve origin, course, morphology, enhancement, skull base changes• Malignancy clues: red flags, atypical features 3. Case-Based Tumor Spectrum • CN I: Meningioma vs esthesioneuroblastoma• CN II: Sheath meningioma vs glioma• CN III: Schwannoma, rare pediatric ATRT• CN V: V1/V3 schwannomas • CN VI: Intraorbital abducens schwannoma• CN VII-VIII: Bilateral schwannomas , facial pseudocysts• CN IX-XI: Jugular schwannoma (NF2) vs paraganglioma• CN X: Vagal schwannoma vs paraganglioma• CN XII: Hypoglossal palsy from breast cancer metastasis 4. Mimics & Differentiation • Imaging distinctions: cranial nerve tumors vs meningiomas• Common mimics: metastases, infections, perineural spread• Key signs: dural tail, calcification, bone changes 5. Teaching Pearls • Annotated imaging with key takeaways• Localization strategy and diagnostic pitfalls• Checklist: nerve-based vs dural-based lesions 6. Conclusion • Radiologist's role in early, accurate diagnosis• Importance of a structured approach• Impact on surgical planning and outcomes

NREE-31 UNLOCKING THE SINUS: IMAGING INSIGHTS INTO INTRACRANIAL HYPERTENSION AND STENTING

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Thiago G. Abud, MD (*Abstract Co-Author*)
Fabiana D. Hirata, MD (*Abstract Co-Author*)
Tatiana L. Arcanjo, MD (*Abstract Co-Author*)
Renata Bertanha, MD (*Abstract Co-Author*)
Luis F. Godoy, MD (*Abstract Co-Author*)
Breno A. Matos, MD (*Abstract Co-Author*)

TEACHING POINTS

To discuss the association between transverse sinus stenosis and intracranial hypertension, and to emphasize the importance of neuroimaging in the diagnostic, especially when clinical suspicion is low. To review the imaging technique and protocols for the evaluation of transverse sinus stenosis and intracranial hypertension. To recognize the imaging features of the transverse sinus stenosis and intracranial hypertension. To discuss the role of endovascular stenting in the treatment of transverse sinus stenosis and intracranial hypertension. To be familiarized with the post-angioplasty imaging features. To present follow-up strategies to evaluate stent patency and monitor for signs of intracranial hypertension.

TABLE OF CONTENTS/OUTLINE

Introduction; Anatomy and pathophysiology; Imaging features of transverse sinus stenosis and intracranial hypertension, with teaching cases; Dural sinus angioplasty, with teaching cases; Post-angioplasty imaging evaluation, with teaching cases. Take home messages; References.

NREE-32 MRI CHANGES IN CLIVAL CHORDOMAS FOLLOWING ADJUVANT PROTON THERAPY

Marina Siesto Marcos, MD (*Presenter*)
Maria Teresa Corbalan Sevilla (*Abstract Co-Author*)
Jose Maria Lara Torres, PhD (*Abstract Co-Author*)
Eva E. Romo (*Abstract Co-Author*)
Oscar Felipe Gutierrez Arteaga (*Abstract Co-Author*)
Pagliarani Gil Pablo, MD (*Abstract Co-Author*)
Maria Castillo (*Abstract Co-Author*)
David Amo Calzas, MD (*Abstract Co-Author*)

TEACHING POINTS

The main objective of this study is to evaluate the MRI findings of skull base chordomas and the changes following adjuvant treatment with proton therapy.

TABLE OF CONTENTS/OUTLINE

1. Purpose or Learning Objective: The main objective of this study is to evaluate the MRI findings of skull base chordomas and the changes following adjuvant treatment with proton therapy. 2. Methods: We performed a retrospective review of the clivus chordomas and their treatments, and we describe a case of clivus chordoma diagnosed at our centre that was treated with proton therapy as adjuvant therapy. 3. Results: MRI scans after adjuvant proton therapy showed some of the characteristic findings associated with this type of therapy. 4. Conclusion: Total resection of skull base chordomas is often not possible due to the involvement of surrounding neurovascular structures. Therefore, residual tumors must be treated with adjuvant therapy, with proton therapy playing an increasingly prominent role in recent years. The neuroradiologist has a key role in identifying the initial and/or residual disease, recurrence, and treatment complications.

NREE-33 NEUROIMAGING IN YOUNG STROKE : A PICTORIAL REVIEW

Divya Saikumar, MBBS, MD (*Presenter*)

TEACHING POINTS

1. To review the etiology of young stroke, their characteristic imaging findings and classic signs 2. To explore the role of advances in neuroimaging in the timely diagnosis and management of young stroke 3. To develop an algorithmic approach to young stroke based on their imaging features and to differentiate them from common mimics. We did a retrospective review of 63 cases of young stroke of various etiologies which came to our institution during a one year period for teaching purposes. We present a pictorial review of the above cases highlighting their differentiating imaging features and formulate an algorithmic approach to the diagnosis of young stroke. We explore the role of various diagnostic neuroimaging techniques and interventional radiology in the timely diagnosis and management of young stroke.

TABLE OF CONTENTS/OUTLINE

A. Learning Objectives B. Background C. Role of imaging D. Imaging modalities in stroke - Non-contrast CT and MRI, Cross sectional angiography, Perfusion imaging, Vessel wall imaging, Catheter angiography E. Causes of young stroke, various imaging signs and management 1. Cardioembolic causes 2. Dissection and vasculitis 3. Prothrombotic causes 4. Reversible cerebral vasoconstriction syndrome (RCVS) 5. Monogenic causes like cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) 6. Moya Moya disease 7. Mitochondrial Encephalopathy, Lactic Acidosis and Stroke like episodes (MELAS) 8. Rare genetic causes like Adenosine deaminase 2 deficiency (DADA2) F. Conclusion

NREE-34 EXTRAOCULAR INVOLVEMENT OF RETINOBLASTOMA: IMAGING FINDINGS

Mariana Faria Amaral, MD (*Presenter*)
Giulia Caroline Paes Scopel, MD (*Abstract Co-Author*)
Tereza Souto, MD (*Abstract Co-Author*)
Carolina Albernaz Henriques, MD (*Abstract Co-Author*)
Jose Lucas De Araujo Rabelo (*Abstract Co-Author*)
Gabriel Tizey (*Abstract Co-Author*)
Luiz Paulo Faria Renzi, MD (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is: To provide a general education review of some of the most common types of extraocular involvement of retinoblastoma. Teaching points: A) Understanding general aspects of retinoblastoma such as definition, epidemiology and diagnostic methods. B) Highlighting the importance of extraocular involvement as a marker of poor prognosis and of significantly increased risk of distant metastasis. C) Pointing out the role of orbit and neuroaxis MRI in the diagnosis and

monitoring of patients with extraocular retinoblastoma. D) Presenting MRI findings of extraocular involvement that radiologists should know in order to report these cases, such as trilateral involvement, leptomeningeal spread and tumor recurrence in ocular implants after enucleation for treatment of primary involvement.

TABLE OF CONTENTS/OUTLINE

A) Retinoblastoma definition, epidemiology and diagnostic. B) Extraocular involvement of retinoblastoma and imaging features: 1- local extraocular dissemination; 2- trilateral retinoblastoma; 3- leptomeningeal involvement and 4- tumor recurrence in ocular implant. C) Treatment and prognosis. D) Take home messages.

NREE-35 PRACTICAL APPROACH TO NEUROIMAGING OF EPILEPTOGENIC TUMORS: A COMPREHENSIVE REVIEW

Max Yunior Orsi Salazar, MD (*Presenter*)
Ana Paula A. Fonseca, MD (*Abstract Co-Author*)
Larissa A. Martins, MD (*Abstract Co-Author*)
Tatiana Iutaka, BDS (*Abstract Co-Author*)
Felipe T. Pacheco, MD, PhD (*Abstract Co-Author*)
Felipe Scortegagna SR, MD (*Abstract Co-Author*)
Renato Hoffmann Nunes, MD, MBA (*Abstract Co-Author*)
Antonio J. Da Rocha, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

This article provides a comprehensive overview of neuroimaging protocols and diagnostic approaches for epileptogenic tumors.The purposes of this exhibit are to:? Discuss the MRI protocol, including the International League Against Epilepsy-endorsed Harmonized Neuroimaging of Epilepsy Structural Sequences (HARNESS)? Address Long-term Epilepsy-Associated Tumors (LEATs), their diagnostic characteristics, and different representatives: gangliogliomas, dysembryoplastic neuroepithelial tumors (DNETs), pilocytic astrocytomas, angiocentric gliomas, and the recently included tumors, such as diffuse astrocytoma MYB or MYBL1 altered, polymorphous low-grade neuroepithelial tumor of the young (PLNTY), and multinodular and vacuolating neuronal tumor (MVNT)? Discuss the differential diagnoses of epileptogenic lesions, such as focal cortical dysplasia, encephalitis, other tumors, vascular malformations, and post-ictal changes? Propose a flowchart for the practical approach to epileptogenic tumors"

TABLE OF CONTENTS/OUTLINE

? Introduction? MRI Protocolo Including the HARNESS protocol? Long-term Epilepsy-Associated Tumors (LEATs)o Required characteristics for LEATso LEATs:? Gangliogliomas? DNET? Pilocytic astrocytomas? Angiocentric gliomas? Diffuse astrocytoma MYB or MYBL1 altered? PLNTY? MVNT? Differential diagnosiso Focal cortical dysplasiao Encephalitiso Other tumorso Vascular malformationso Post-ictal changeso Other? Flowchart of the practical approach to epileptogenic tumors? Conclusion and key points

NREE-36 BEYOND STENOSIS: INTRACRANIAL VESSEL WALL MRI IN RESIDENT PRACTICE

Daniel Ignacio Lira Munoz, MD (*Presenter*)
Patricio M. Latorre Brajovic, MD (*Abstract Co-Author*)
Andres R. Miranda Merchak, MD (*Abstract Co-Author*)
Andrea Maldonado, MD (*Abstract Co-Author*)
Salvador Camelio (*Abstract Co-Author*)

TEACHING POINTS

Intracranial vessel wall imaging (VWI) MRI can provide diagnostic insights beyond conventional lumen-based imaging techniques, allowing direct visualization of arterial wall pathology and detection of subtle or angiographically occult lesions. Distinctive wall features on VWI, including vessel wall thickness, remodeling pattern, and contrast enhancement, may help differentiate specific intracranial vascular pathologies. Awareness of common artifacts and interpretation pitfalls during acquisition and interpretation can help minimize diagnostic errors.

TABLE OF CONTENTS/OUTLINE

Introduction to VWI MRI as a complement to conventional vascular imaging techniques. Fundamental imaging techniques: Resolution, sequences, and contrast enhancement. Structured pictorial review using a standardized VWI analysis framework with representative pathological cases. Clinical case-based examples: Intracranial atherosclerosis, vasculitis, inflammatory vasculopathies, moyamoya disease, intracranial aneurysms, intracranial arterial dissections, non-atherosclerotic intracranial stenosis, post-endovascular treatment evaluation and reversible cerebral vasoconstriction syndrome. Common interpretation pitfalls and artifact management. Summary emphasizing clinical relevance and diagnostic impact of VWI in routine practice.

NREE-37 STRUCTURAL MRI BIOMARKERS OF OLFACTORY DYSFUNCTION IN NEURODEGENERATIVE DEMENTIAS

Omar Rodriguez-Mendoza, MD, MSc (*Presenter*)
Laura M. Sanchez, MD (*Abstract Co-Author*)
Johnatan Rubalcava Ortega, MD (*Abstract Co-Author*)

TEACHING POINTS

Olfactory dysfunction is a frequent prodromal symptom across multiple neurodegenerative dementias, including Alzheimer's disease, Parkinson's disease and progressive supranuclear palsy. Structural MRI enables the detection of early morphological alterations in olfactory structures, particularly in the olfactory bulb, piriform cortex, entorhinal cortex, and orbitofrontal regions. Quantitative MRI techniques, such as olfactory bulb volumetry and cortical thickness analysis, provide non-invasive imaging biomarkers that may facilitate the early diagnosis and risk stratification of dementias.

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Clinical Overview of Early-Stage Dementias (Alzheimer's Disease, Parkinson's Disease, Progressive Supranuclear Palsy) The Prodromal Phase: Hyposmia as an Early Clinical Marker Structural MRI Anatomy of the Olfactory System (Olfactory bulb, tract, piriform cortex, amygdala, entorhinal and orbitofrontal cortices) MRI Acquisition Protocols and Volumetric Assessment Techniques Key Structural MRI Findings Across Dementias 5.1. Olfactory Bulb Atrophy Patterns in Neurodegenerative Diseases 5.2. Morphological Alterations in Olfactory-Related Cortical Regions Quantitative Imaging and Volumetry for Early Diagnosis Emerging Applications of Machine Learning in Olfactory MRI Biomarkers Conclusion: Structural MRI as a Non-Invasive Tool for Early Diagnosis and Risk Stratification

NREE-38 REVIEW OF IMAGING MANIFESTATIONS OF MYELIN OLIGODENDROCYTE GLYCOPROTEIN ANTIBODY-ASSOCIATED DISORDERS (MOGAD)

Shreyas Reddy Kankara, MBBS, MD (*Presenter*)
Ankit Arora, MBBS, MD (*Abstract Co-Author*)
Sabha Ahmed, MD, FRCR (*Abstract Co-Author*)
Shravan Reddy K, MBBS (*Abstract Co-Author*)
Unnathi Nayak, MBBS (*Abstract Co-Author*)

TEACHING POINTS

• Myelin oligodendrocyte glycoprotein antibody-associated disorders (MOGAD) are a relatively new neuroinflammatory demyelinating disorder. • They are characterised by the presence of serum antibodies to MOG, which is an extracellular myelin protein. • Key imaging characteristics include ill-defined, T2/FLAIR hyperintense lesions affecting white and grey matter, frequently involving the basal ganglia, thalamus, and brainstem. • In the spinal cord, central grey matter and conus medullaris involvement are typical, while hallmark optic pathway findings include longitudinally extensive optic neuritis, retrobulbar segment involvement, optic disc oedema, and

optic perineuritis. • Though there is significant overlap with other demyelinating diseases, the present immunological, laboratory and imaging evidence demonstrated MOGAD as a distinct disease entity.

TABLE OF CONTENTS/OUTLINE

• Overview of the pathophysiology and clinical presentation of MOGAD. • Comprehensive review of neuroimaging features of MOGAD, emphasising key findings. o Brain - ADEM-like, meningitis, brainstem and cortical encephalitis. o Optic nerves - Retrobulbar and bilateral involvement, optic disc swelling, perineuritis o Spinal cord - Transverse myelitis, conus involvement, and leptomeningitis. • Description of unusual and atypical imaging phenotypes - Leukodystrophy-like pattern, acute haemorrhagic leukoencephalitis, cranial nerve palsies, FLAIR-hyperintense lesions in anti-MOG associated encephalitis with seizures (FLAMES), tumefactive demyelination, perivascular enhancement, limbic encephalitis. • Comparison imaging analysis of MOGAD with Multiple Sclerosis and Neuromyelitis optica.

NREE-40 FROM NECK TO BRAIN: KEY INSIGHTS INTO VASCULAR IMAGING IN ACUTE ISCHEMIC STROKE

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Gabriel Figueiredo, MD (*Abstract Co-Author*)
Margrit E. Muller, MD (*Abstract Co-Author*)
Lucas Aquino (*Abstract Co-Author*)
Rogerio Iquizli, MD (*Abstract Co-Author*)
Tatiana Marques, BSc (*Abstract Co-Author*)
Luis F. Godoy, MD (*Abstract Co-Author*)
Breno A. Matos, MD (*Abstract Co-Author*)

TEACHING POINTS

-Tips and Challenges in the Evaluation of Cervical and Intracranial Vascularization in Acute Ischemic Stroke (AIS). -Recognize key imaging features of acute arterial occlusion, and demonstrate a systematic approach to initial evaluation of the vascularization in the acute stroke scenario. -Discuss frequent pitfalls and unusual vascular syndromes that may impact diagnostic interpretation and management. -Emphasize the importance of an active search for the underlying etiologic factor/mechanism in AIS.

TABLE OF CONTENTS/OUTLINE

Introduction Relevance of vascular imaging in AIS. Systematic CTA Evaluation Structured approach improves detection of occlusions and emboli, including calcified emboli mimicking artifacts. Pitfalls & Collaterals Diagnostic tips, importance of assessing distal collaterals, and avoiding satisfaction of search errors. Vascular Syndromes Imaging of Moyamoya, MCA rete-like pattern, and ICA agenesis. Cervical/Intracranial Findings Carotid web, unstable plaques, intraluminal thrombi, and heavily calcified plaques or valves. Dissections & Stenosis High-grade and multisegmental stenoses; distinguishing vasculitis, atherosclerosis, and vasoconstriction. Etiology & Workflow Integrating imaging with clinical data for etiologic classification and treatment planning.

NREE-41 FROM BABIES' HEADS TO DOCS' BRAINS: THE ULTRASOUND THAT REVEALS IT ALL

Eva S. Lemus Palma, MD (*Presenter*)

TEACHING POINTS

- review neuroanatomy and transfontanellar ultrasound techniques.- advantages of this technique such as the absence of ionizing radiation, availability, portability, and low cost. - know the normal and pathologic anatomy in neonates including premature and term infants. - know its limitations in the evaluation of complex malformations, and in the assessment of damage to white matter. - use in diagnosis and follow up for congenital and acquired neurological conditions.

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- Review the normal neuroanatomy and its variants-Transfontanellar ultrasound techniques for anterior fontanelle assessment. - Review the different spectrums of neurological diseases in neonates. -Review its limitations in the evaluation of complex malformations, and in the assessment of damage to white matter. -Demonstration of a variety of institutional neurological cases.

NREE-42 CHOOSING YOUR WORKHORSE: CONTRAST-ENHANCED T1-WEIGHTED SEQUENCES IN NEURORADIOLOGY

Elena Luque, MD (*Presenter*)
Ester Carballo, MD (*Abstract Co-Author*)
Maria del Carmen A. Polidura, MD (*Abstract Co-Author*)
Maria Natividad Gomez Ruiz (*Abstract Co-Author*)
Manuela M. Jorquera (*Abstract Co-Author*)
Miguel Yus Fuertes, MD (*Abstract Co-Author*)

TEACHING POINTS

• To review the technical principles of MRI T1-weight sequences (T1ws). • To examine contrast-enhanced (CE) T1ws used in neuroimaging, differentiating them by technical aspects and applications, and comparing their strengths and limitations.

TABLE OF CONTENTS/OUTLINE

• Introduction to T1ws. T1ws are typically acquired using short repetition and echo times. Pulse sequences are categorized into Spin-Echo (SE), which offer high signal-to-noise ratio (SNR), robust tissue contrast, and reduced field inhomogeneity sensitivity; and Gradient-Echo (GRE), which provide faster acquisition but are more prone to susceptibility artifacts. Volumetric (3D) acquisition offers isotropic resolution, improved SNR, and reduced partial volume effects (enhancing small lesion detectability), but their sensitivity to motion artifacts is increased due to longer scan times. • Review the different CE-T1ws used in neuroimaging . Gadolinium agents shorten T1 relaxation times, enhancing tissue contrast. They are essential for assessing blood-brain barrier integrity and detecting pathological enhancements. Depending on the clinical context, the chosen sequence may vary, considering the advantages and limitations of each. CE T1ws can be classified based on pulse sequence type, acquisition method (2D vs 3D), use of inversion-recovery pulses (e.g. MPRAGE), dynamic vs static imaging (e.g. LAVA) and the use of innovative black-blood enhancement techniques (e.g. MSDE). While CE T1w FSE offers superior sensitivity compared to GRE for detecting pathological enhancements (meningeal, cranial nerve, etc.), GRE sequences provide higher anatomical detail and are more suitable for evaluating vessel lumen.

NREE-43 THE RADIOLOGIC FACES OF NEUROMELIOIDOSIS: INSIGHTS INTO IMAGING PHENOTYPES

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Shreyas Reddy Kankara, MBBS, MD (*Abstract Co-Author*)
Ankit Arora, MBBS, MD (*Abstract Co-Author*)
Shravan Reddy K, MBBS (*Abstract Co-Author*)
Jitender Saini, MD,MBBS (*Abstract Co-Author*)

TEACHING POINTS

1.Neuromelioidosis is caused by Burkholderia pseudomallei, seen in endemic tropical regions, commonly in immunocompromised patients.2.CNS dissemination occurs following aspiration, inhalation or inoculation via the hematogenous or transneural routes.3. Key imaging features consistent of T2/FLAIR hyperintense lesions that maydemonstrate diffusion restriction, ring enhancement, or haemorrhagic changes, most commonly affecting the basal ganglia, brainstem, and corticospinal tracts.4. Linear white matter tract involvement is called the 'Tunnel sign'.5.Cranial nerve involvement, myelitis, osteomyelitis, meningeal enhancement, epidural and subdural collections are also frequently observed.6. Rarely, cerebral venous sinus thrombosis (CSVT) and haemorrhage can also occur.7. Given its ability to mimic other infectious and inflammatory diseases, a high index of suspicion and correlation with systemic findings are crucial for early diagnosis.

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& 3; Overview of the pathophysiology and clinical presentation of neuromelioidosis.& 3; Review of imaging findings in neuromelioidosis, with emphasis on key radiologicalpatterns.o Brain involvement: Cerebritis, microabscesses, white matter and cranialnerve involvement, leptomeningeal/pachymeningeal enhancement.o Spinal cord: Transverse myelitis, epidural or subdural collections,osteomyelitis and discitis.o Description of atypical presentations and complications: Intracerebralhaemorrhage, CSVT. & 3; Differential diagnosis and comparison with other infectious, inflammatory andneoplastic mimics.

NREE-44 ABCS OF THE PARANASAL SINUSES: WHAT RADIOLOGISTS NEED TO KNOW

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Runail Ratnani, MD (*Abstract Co-Author*)
Nikhil Kapil (*Abstract Co-Author*)
Fabricio S. Feltrin, MD (*Abstract Co-Author*)
Marco C. Pinho, MD (*Abstract Co-Author*)
Kirang Patel, MD (*Abstract Co-Author*)

TEACHING POINTS

Radiologists play a vital role in detecting causes of sinonasal diseases as well as providing pre-operative CT planning for various surgeries such as Functional Endoscopic Sinus Surgery (FESS) or transsphenoidal surgeries for sellar tumors. Understanding and recognizing the major sinonasal drainage pathways, key anatomic variants and bony landmarks in a systematic approach can give radiologists the essential information to help diagnose causes of various sinusitis and help prevent serious surgical complications. The primary purpose of this educational exhibit is to use the mnemonic "ABCs" as a systematic and easy way to approach and evaluate the paranasal sinuses which can in turn optimize patient care. The purpose of this exhibit is to: Provide a systematic approach using the ABCs method Discuss critical anatomic variants Provide imaging examples of these variants Highlight clinical relevance and potential surgical complications related to these pitfalls

TABLE OF CONTENTS/OUTLINE

-Review of normal sinonasal anatomy -Introduce systematic approach for evaluating sinonasal anatomy using "ABCs" method which includes Aeration, Bony landmarks, and Cells and variants. -Imaging manifestations of sinonasal variants and examples of relevant pathology. -Describe the role of radiologists in preoperative planning and relevant surgical complications with undiagnosed anatomic variants. - Aeration Nasal cavity Osteomeatal complex (OMC) Sphenoethmoidal recess - Bony Landmarks Cribriform plate Lamina paprycea Sella/Clivus Sphenoid sinus septations Skull base - Cells and Variants Onodi cell Agger Nasi cell Haller cell Supraorbital cell Concha bullosa Paradoxical turbinate

NREE-45 DECODING MULTINODULAR AND VACUOLATING NEURONAL TUMOR (MVNT) AND ITS MIMICKERS

Alisa Trundaeva, MD (*Presenter*)
Marta Mazuque Mancilla (*Abstract Co-Author*)
Albina Polianskaia, MD, MD (*Abstract Co-Author*)
Eva Gimenez Comet, MD (*Abstract Co-Author*)

TEACHING POINTS

- MVNT typically appears as "bubbly" subcortical lesions, most often in the temporal lobes, and are usually asymptomatic. -On MRI, it shows high T2/FLAIR signal without diffusion restriction or contrast enhancement. - Key differential diagnoses include dysembryoplastic neuroepithelial tumor (DNET), focal cortical dysplasia type II, and enlarged perivascular spaces.

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MVNT represents a newly recognized cytoarchitectural pattern recently added to the revised 2016 edition of the WHO classification of CNS tumors. Although most cases are asymptomatic, depending on the location, they may be associated with epileptic seizures or other neurological symptoms. Being frequently an incidental finding, they can be easily misinterpreted or underestimated by radiology specialists. On MRI, MVNT typically appears as multiple small subcortical nodules, most commonly located in the temporal lobes. These lesions show high signal intensity on T2-weighted sequences and remain hyperintense on FLAIR, with no diffusion restriction on DWI or enhancement on the post-contrast sequences. The main differential diagnoses include DNET, focal cortical dysplasia type II, and enlarged perivascular spaces. Awareness of this entity and the description of new cases contributes to a better understanding of their radiological features, improving the clinical management of these patients and avoiding aggressive treatment approaches.

NREE-46 NON-CONTRAST MRI EVALUATION OF PEDIATRIC MOYAMOYA BEFORE AND AFTER EDAS SURGERY: A MULTIPARAMETRIC APPROACH WITH TOF, VENOGRAPHY, 4D TRANCE AND ASL PERFUSION

Albina Polianskaia, MD, MD (*Presenter*)
Marta Gomez-Chiari, MD (*Abstract Co-Author*)
Jaroslaw M. Smiechowicz (*Abstract Co-Author*)
Monica Rebollo Polo, MD (*Abstract Co-Author*)
Monica Ruiz Moreno (*Abstract Co-Author*)
Mariana C. Planells, MD (*Abstract Co-Author*)
Emilio Inarejos Clemente, MD (*Abstract Co-Author*)
Diego Preciado, MD (*Abstract Co-Author*)
JORDI MUCHART LOPEZ (*Abstract Co-Author*)

TEACHING POINTS

-Moyamoya vasculopathy (MMV) leads to progressive intracranial arterial stenosis, requiring surgical revascularization to optimize cerebral perfusion.-Encephaloduroarteriosynangiosis (EDAS) is a surgical procedure in which a segment of the superficial temporal artery is transposed onto the brain surface to promote collateral blood flow in children with MMV.-Non-contrast MRI techniques enable comprehensive evaluation of cerebral morphology, vascular anatomy, hemodynamics, cerebral blood flow (CBF) and collateralization in MMV.-Cerebrovascular reserve (CVR) assessment with an acetazolamide test is useful for evaluating cerebral hemodynamics before and after EDAS.

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Moyamoya vasculopathy (MMV) is characterized by progressive stenosis of the intracranial arteries, often necessitating surgical revascularization to improve CBF. Evaluation of CBF and CVR is essential both pre- and post-operatively to assess cerebral hemodynamics. Although EDAS is a commonly used indirect revascularization technique, few studies have assessed its impact on CBF and CVR in pediatric patients. In this article, we present our initial experience using a non-contrast MRI cerebrovascular protocol, which includes TOF and phase contrast venography, 4D TRANCE and ASL perfusion to evaluate vascular anatomy, filling pattern, CBF and CVR before and after EDAS surgery in children with MMV. We observed encouraging post-surgical changes in both CBF and CVR, suggesting improved hemodynamic status. This novel multiparametric MRI protocol proved to be a valuable and reproducible tool for surgical planning and outcome assessment in pediatric MMV patients undergoing EDAS revascularization.

NREE-47 NORMAL PRESSURE HYDROCEPHALUS: BEYOND VENTRICULOMEGALY

Florencia D. Vespa SR, MD (*Presenter*)
Stefania Solanot, MD (*Abstract Co-Author*)
Luis A. Miquelini, MD (*Abstract Co-Author*)
Manuel S. Perez Akly, MD (*Abstract Co-Author*)
Cristina H. Besada SR, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1) Diagnostic imaging criteria include Evans' index >0.3, callosal angle =80°, absence of macroscopic CSF flow obstruction, and enlarged temporal horns not solely attributable to hippocampal atrophy. 2) In Alzheimer's disease the subarachnoid space and cortical parietal sulci of the brain are enlarged due to atrophy. DESH findings may be useful for differentiating TNH from Alzheimer's disease. 3) Callosal angle is an accepted parameter to differentiate iNPH from atrophic hydrocephalus and a predictor of prognosis. 4) Early diagnosis and CSF shunting intervention in iNPH yield more favorable outcomes, emphasizing the importance of timely identification and treatment. 5) Asymptomatic ventriculomegaly with iNPH features on MRI (AVIM) may represent a preclinical stage of iNPH with an estimated annual progression rate of 17%.

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1) Introduction to Normal Pressure Hydrocephalus2) Pathophysiology: CSF Dynamics and Pulse Distribution3) Imaging Criteria and DESH Findings 4) Differential Diagnosis from Alzheimer's Disease and Atrophic Hydrocephalus5) AVIM: Preclinical Stage and Progression Rate 6) AI Applications in iNPH Diagnosis

NREE-48 MOGAD : DECODING THE MRI SPECTRUM OF A NEUROIMAGING CHAMELEON

Abhijit D. Pawar, MD (*Presenter*)
Aparna H. Chandorkar, MBBS,MD (*Abstract Co-Author*)
Suyog P. Somkuwar, MD (*Abstract Co-Author*)

TEACHING POINTS

1. MOGAD mimics multiple demyelinating disorders. Differentiation from MS and NMOSD is crucial. 2. MRI patterns in MOGAD are diverse involving the brain, spinal cord and optic nerves. 3. MRI findings to be correlated with history, presentation, CSF analysis and serologic testing for anti-MOG antibody. 4. Use of radiologic algorithm enhances diagnostic accuracy.

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1. What is MOGAD? New Face in the Demyelination family: Brief history, clinical relevance and pathophysiology 2. MOGAD Vs the usual suspects (MS, NMOSD, ADEM): Key differentiating clinical and imaging features 3. Master of Disguise: MOGAD's many faces on MRI: MRI spectrum in MOGAD: brain, spine (not just your typical LETM), optic nerves. 4. Mimics and misdiagnoses: How MOGAD masquerades as other pathologies on imaging: Red-flags, pitfalls and mimickers. 5. The Missing Links: Clinical clues, CSF, and Anti-MOG antibodies 6. Cases from clinical practice 7. MOGAD decoded: A radiologic roadmap: Diagnostic algorithm for radiologic diagnosis of MOGAD. 8. Management implications: How imaging influences treatment decisions. 9. Key takeaways: Key imaging pearls. 10. References.

NREE-49 CIRCUMSCRIBED GLIOMAS: LIKE PEAS IN A POD, YET WORLDS APART!

Francesco Schimperna, MD (*Presenter*)
Matia Martucci, MD (*Abstract Co-Author*)
Francesca Lisi, MD (*Abstract Co-Author*)
Giovanni Pentassuglia (*Abstract Co-Author*)
Giuliana Tattaresu (*Abstract Co-Author*)
Giuseppe Varcasia, MD (*Abstract Co-Author*)
Rosellina Russo (*Abstract Co-Author*)
Simona Gaudino (*Abstract Co-Author*)

TEACHING POINTS

- Describe the common features of this new group, made up of tumors that differ in epidemiology, site, MRI characteristics and grading, and with an overview of their molecular alterations, that may be therapeutic targets. - Describe MRI characteristics of each tumor and their differential diagnosis.

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Background: the new WHO CNS5 classification, considering recent discoveries in molecular genetics of brain tumors and its increasingly central role in patient care, has made some changes regarding the previous subdivisions and has introduced new entities. Notably, it introduced a new group named "Circumscribed Astrocytic Gliomas", including Pilocytic Astrocytoma, Pleomorphic Xanthoastrocytoma, Subependymal Giant Cell Astrocytoma, Chordoid Glioma and two new entities, High-grade Astrocytoma with Piloid Features and Astroblastoma, MN1-Altered. Cases presentation: to describe their features, including epidemiology, site, neuroradiological findings, genetic alterations, grading/prognosis and differential diagnosis. Underline of common characteristics: 1- They are circumscribed, with a good distinction between healthy and pathological tissue, both radiologically and histologically. 2- They lack IDH mutation, but a broad spectrum of other mutations that may be therapeutic targets, like BRAF or TSC.

NREE-50 INFECTION-RELATED ENCEPHALOPATHY SYNDROMES: A RADIOLOGIC PATTERN-BASED DIAGNOSTIC APPROACH

Naman Gupta, MD (*Presenter*)
Ankita Gupta, MBBS, MD (*Abstract Co-Author*)
Divyansh Gupta, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

Infection-triggered encephalopathy syndromes (ITES) are acute neuroinflammatory disorders following systemic infections, often without direct CNS involvement. Syndromes like AESD, ANE, FIRES, HHE, and MERS have overlapping but distinct imaging features. A pattern- and anatomy-based approach helps differentiate ITES from autoimmune, metabolic, or toxic encephalopathies. MRI, especially DWI, is key for early detection and guiding management, particularly in pediatric, post-viral, or immunocompromised patients. Epidemiologic awareness and age-specific patterns improve diagnostic accuracy. ITES offer radiology trainees valuable integration of clinical context and imaging.

TABLE OF CONTENTS/OUTLINE

I ntroduction : Definition, pathophysiology, symptoms (AMS, seizures), risk factors (immunocompromised, elderly), radiology's role Imaging Modalities : MRI (T2, FLAIR, DWI) preferred; CT in acute settings Syndromes & Patterns :• AESD: Biphasic, subcortical DWI• ANE: Bilateral thalami, hemorrhage• MERS: Transient splenial lesion• FIRES: Delayed hippocampal/cortical changes• HHE: Unilateral DWI, later atrophy Interpretation Strategy : Stepwise, pattern-based; identify edema, cortical-subcortical and deep structure involvement Mimics & Red Flags : Differentiate from stroke, metabolic causes; watch for mass effect, asymmetry Management Impact : Imaging guides antivirals, steroids, detects complications; aids prognosis Pitfalls & Pearls : Early DWI clues, missed CT signs, mimics Conclusion : Summarize key findings, stress clinical context Case-Based Learning : Interactive, annotated cases with highlighting diagnostic strategies

NREE-51 I'M STILL HERE: MYCOBACTERIUM TUBERCULOSIS SPECTRUM OF DISEASE

Bruno Rigonato (*Presenter*)
Bruno Matos (*Abstract Co-Author*)
Gustavo Yamada, MD (*Abstract Co-Author*)
MATHEUS KRAUSE (*Abstract Co-Author*)
Pedro Tiradentes (*Abstract Co-Author*)
Adolfo Souza (*Abstract Co-Author*)
Matheus Ruffini (*Abstract Co-Author*)
Lillian Goncalves Campos (*Abstract Co-Author*)
Lais Cordeiro (*Abstract Co-Author*)

Juliana Duarte (*Abstract Co-Author*)
Fabiano Reis (*Abstract Co-Author*)

TEACHING POINTS

Tuberculosis is an infectious disease caused by the Mycobacterium tuberculosis complex, a group of aerobic, bacilli species bacteria, characterized by their mycolic acid cell wall. It can lead to a variety of clinical and radiological manifestations, depending mainly on the immunological status of the patients. Represents a poverty-related disease, with a higher burden in lower-income countries and groups. The infection was responsible for an estimated 10.8 million new cases in 2023. Concurrent with its high incidence values, tuberculosis represents the leading infectious cause of death globally and the tenth leading cause of death in 2021. THEACHING POINTS Review and illustrate the imaging findings of tuberculosis, their correlation with pathological images and the differential diagnoses. Describe through illustrative presentations the benefits of the multimodality imaging approach to the diagnosis of neurocysticercosis. Establish the characteristic findings and how they can help the radiologist reach the correct diagnosis.

TABLE OF CONTENTS/OUTLINE

TABLE OF CONTENTS - Introduction - Epidemiology of tuberculosis - Natural history of the disease and stages - Clinical manifestations - Diagnostic clues - Imaging investigation (characteristic imaging findings) - Differential diagnoses - Pitfalls Final Remarks

NREE-52 WHEN THE WALL SPEAKS: WHAT VWI TELLS US ABOUT VASCULITIS

Roberta Linhares, MD (*Presenter*)
Andre F. Formiga, MD (*Abstract Co-Author*)
Lara Quiche, MD (*Abstract Co-Author*)
Guilherme Swerts Pereira (*Abstract Co-Author*)
Nicole Lambrakos, MD (*Abstract Co-Author*)
Marcos V. Camargo, MD (*Abstract Co-Author*)
Tatiana L. Arcanjo, MD (*Abstract Co-Author*)
Rogerio Iquizli, MD (*Abstract Co-Author*)
Mariana A. Rodrigues, MD (*Abstract Co-Author*)
Fabiana D. Hirata, MD (*Abstract Co-Author*)
Luis F. Godoy, MD (*Abstract Co-Author*)
Breno A. Matos, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the principles and technical aspects of Vessel Wall Imaging (VWI) in the evaluation of central nervous system vasculitis To review the normal and abnormal imaging findings of cervical and intracranial vessel walls, emphasizing key patterns seen in vasculitis To differentiate vasculitis from its main mimics using VWI characteristics and clinical context To illustrate the clinical relevance of VWI in diagnosis, treatment guidance, and follow-up of vasculitis

TABLE OF CONTENTS/OUTLINE

Introduction Principles of MRI and Vessel Wall Imaging in the Evaluation of Vasculitis Normal vs. Abnormal Vessel Wall Appearance VWI Features of CNS Vasculitis: Typical Patterns and Teaching Cases Differential Diagnoses Clinical Applications and Impact on Management Take Home Messages References

NREE-53 THE RADIOLOGIC FACE OF HISTONE MUTATIONS: DECODING PEDIATRIC DIFFUSE HIGH-GRADE GLIOMAS

Andrey Ribeiro, MD (*Presenter*)
Luiza A. Nahoum, MD (*Abstract Co-Author*)
Nina Ventura, MD (*Abstract Co-Author*)

TEACHING POINTS

- Explain the recent molecular characterization of pediatric-type diffuse high-grade gliomas. - Describe the key imaging features of histone-related pediatric-type diffuse high-grade gliomas on magnetic resonance imaging (MRI).

TABLE OF CONTENTS/OUTLINE

I. Introduction Pediatric-type diffuse high-grade gliomas (pHGGs) were included in the 2021 WHO Classification and account for most high-grade gliomas in children. They are defined by specific molecular alterations, particularly those related to histone mutations, including diffuse midline gliomas (DMGs) and diffuse hemispheric gliomas (DHGs). DMGs arise in midline structures such as the brainstem, thalami, and spinal cord, and are classically associated with H3 K27M mutations in the H3.1 or H3.3 variants. They exhibit an infiltrative and expansile pattern. More recently, cases with EGFR alterations have also been included. DHGs , in contrast, occur in the cerebral hemispheres and are defined by a G34 mutation in histone H3.3. They share aggressive imaging features, such as diffusion restriction, heterogeneous enhancement, and frequently leptomeningeal contact. II. Imaging Findings Magnetic resonance imaging (MRI) is essential for evaluation, revealing a spectrum of findings ranging from low-enhancing infiltrative lesions to necrotic, hyperenhancing and diffusion restricted masses. Recognizing these radiologic patterns supports early diagnosis and correlates strongly with molecular subtypes, playing a crucial role in clinical and therapeutic management. III. Conclusion: Imaging techniques, particularly magnetic resonance imaging (MRI), offer strong correlation with molecular diagnoses and play a key role in early detection.

NREE-54 FROM ANATOMY TO DIAGNOSIS: A COMPREHENSIVE REVIEW OF SPINAL CORD INFARCTION IMAGING

Eiko Yamamori, MD (*Presenter*)
Hidenobu Takagi, MD, PhD (*Abstract Co-Author*)
Mirei Abe (*Abstract Co-Author*)
Hinano Anaba (*Abstract Co-Author*)
Erina Kato (*Abstract Co-Author*)
Chiaki Maeda (*Abstract Co-Author*)
Yohei Morishita (*Abstract Co-Author*)
Atsushi Umetsu, MD (*Abstract Co-Author*)
Hideki Ota, PhD (*Abstract Co-Author*)
Kei Takase, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Spinal cord infarction (SCI) is a rare condition that is often misdiagnosed due to the lack of standardized diagnostic criteria and specific imaging findings. Recognizing its symptoms, clinical course, and imaging findings can help avoid unnecessary tests and invasive procedures. A better understanding of spinal cord vascular anatomy and its typical infarct distribution patterns enhances diagnostic accuracy. It is also important to recognize the temporal evolution of imaging findings. Radiologists must recognize the various underlying conditions and disease processes that can cause SCI and be familiar with key differential diagnoses.

TABLE OF CONTENTS/OUTLINE

1. Clinical features of SCI : Epidemiology, typical symptoms, diagnostic criteria, clinical course, and clinical impact of misdiagnosing. 2. Normal Vascular Anatomy of the Spinal Cord : Vertical perfusion of the spinal cord varies by level, arterial territories of anterior spinal artery and posterior spinal arteries, and origins of the artery of Adamkiewicz. 3. Imaging of SCI : MR imaging protocols, typical findings on DWI, T2WI and contrast enhanced T1WI, lesion distribution patterns, and temporal evolution. 4. Case presentation, Differential Diagnoses and Mimics : including surgery-related SCI and SCI with aortic dissection/occlusion.

NREE-55 THE MANY FACES OF HISTIOCYTOSES IN THE CENTRAL NERVOUS SYSTEM: AN IMAGING ATLAS

Marina Nori Hilario, MD (*Presenter*)
Carolinny Cruvinel Maia, MD (*Abstract Co-Author*)
Vinicius Martins, MD (*Abstract Co-Author*)
Paula Cristina Amaral, MD (*Abstract Co-Author*)
Guilherme L. Gaiotto, MD (*Abstract Co-Author*)
Camila Almeida, MD (*Abstract Co-Author*)
Felipe Cintra Valentin (*Abstract Co-Author*)
Leonardo Lima (*Abstract Co-Author*)
Bruno S. Inada, MD (*Abstract Co-Author*)
Lazaro F. Amaral, MD (*Abstract Co-Author*)
Fernanda B. Assuncao, MD (*Abstract Co-Author*)

TEACHING POINTS

To present the main subtypes of histiocytoses affecting the central nervous system (CNS). To illustrate the characteristic radiological findings of the major CNS histiocytoses through clinical case examples. To discuss the diagnostic challenges in imaging differentiation, particularly on magnetic resonance imaging (MRI).

TABLE OF CONTENTS/OUTLINE

Central Nervous System (CNS) histiocytoses are rare diseases characterized by the proliferation of abnormal cells of the monocyte-macrophage system. They are divided into two major groups: Langerhans cell histiocytosis (LCH), which is more common, and non-Langerhans histiocytoses, primarily represented by Erdheim-Chester disease and Rosai-Dorfman disease. In Langerhans cell histiocytosis (LCH), the main findings include lytic bone lesions, loss of the normal spontaneous T1 hyperintensity of the neurohypophysis (often associated with diabetes insipidus), and signal intensity changes during the degenerative phase. Erdheim-Chester disease typically presents with extra-axial masses in the sellar or retro-orbital regions and persistent, delayed post-gadolinium enhancement lasting up to 8 days. Rosai-Dorfman disease may manifest with painless cervical lymphadenopathy and extra-axial masses showing homogeneous contrast enhancement. Recognition of these imaging patterns, particularly through magnetic resonance imaging (MRI), is essential for accurate diagnosis and appropriate management.

NREE-56 LOW PRESSURE, HIGH IMPACT: UNDERSTANDING SPONTANEOUS INTRACRANIAL HYPOTENSION

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Gustavo Zoega Salles Bueno, MD (*Abstract Co-Author*)
Breno A. Matos, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)
Murilo Prevital Correia, MD (*Abstract Co-Author*)
Luis F. Godoy, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the pathophysiology and complications of cerebrospinal fluid fistulas and cerebral hypotension. To review the typical imaging findings, highlighting the key diagnostic features, as well as the role of myelotomography. To recognize the main types of treatment and post-treatment monitoring.

TABLE OF CONTENTS/OUTLINE

Introduction. Pathophysiology and complications of cerebrospinal fluid fistulas and cerebral hypotension. Typical Imaging Features, Complications, Types of treatment and Evolution, with teaching cases. The role of myelotomography. Take Home Messages. References.

NREE-57 UNMASKING ACUTE LEUKEMIA: IMAGING INSIGHTS INTO HEAD & NECK INVOLVEMENT

Mostafa A. Shehata, MD (*Presenter*)
Selin Ocal, MD (*Abstract Co-Author*)
Ezana E. Lulseged, MD (*Abstract Co-Author*)
Francis Deng, MD (*Abstract Co-Author*)

TEACHING POINTS

Define updated diagnostic and classification terminology for acute leukemia and related hematopoietic neoplasms, including recent updates from the WHO 2022 hematolymphoid tumor classification Identify the imaging manifestations of acute leukemia lesions in extracranial and intracranial head & neck structures with an emphasis on advanced imaging techniques Recognize infectious, inflammatory, vascular and neoplastic complications of acute leukemia and its therapies, with diagnostic pearls to distinguish these entities

TABLE OF CONTENTS/OUTLINE

1. Introduction to Acute Leukemia and Innovations in Diagnosis o Overview of acute myeloid leukemia (AML) and acute lymphoblastic leukemia (ALL) o 2022 WHO classification updates for hematopoietic tumors and imaging relevance 2. Intracranial and Extracranial Imaging Manifestations of Leukemia o Extramedullary disease manifestations (myeloid sarcoma and lymphoblastic lymphoma) o Bone marrow and adjacent soft tissue infiltration (e.g., calvarium, spine, sinonasal, oral cavities) o Neuroleukemiosis and orbital involvement with diagnostic MRI features o Vascular manifestations 3. Complications of Leukemia and Associated Treatment in the Head & Neck, including Vascular, Infectious, & Neoplastic Complications 4. Advanced Imaging Techniques in the Evaluation of Head & Neck Leukemia o Integration of PET/MRI for functional and anatomical assessment o DWI in evaluating acute leukemia, particularly in assessing treatment response and detecting complications 5. Case-Based Education o Cases highlighting imaging manifestations, pitfalls, & multidisciplinary management o Rare neoplastic mimics (ie Small Round Blue Cell Tumors, Histiocytic Sarcoma)

NREE-58 CT PERFUSION: BEYOND ISCHEMIA. TECHNICAL CONSIDERATIONS, SOURCES OF ERROR, AND MIMICS

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Daniela Florez, MD (*Abstract Co-Author*)
Nicolas Herrera Parra (*Abstract Co-Author*)
David Ortigoza (*Abstract Co-Author*)
Ana M. Granados, MD (*Abstract Co-Author*)
Juan C. Marquez, MD (*Abstract Co-Author*)

TEACHING POINTS

Brain perfusion computed tomography (CTP) is a non-invasive technique that evaluates capillary blood flow and parenchymal blood delivery by tracking contrast medium passage. Currently, its primary indication is the diagnosis of ischemic stroke , identifying and quantifying infarcted tissue (core) and salvageable tissue (penumbra) to guide therapeutic decisions.This poster aims to describe the key technical considerations radiologists must know when performing these studies—crucial for obtaining high-quality images and preventing inaccurate parameter estimations. Topics include contrast injection protocols, image acquisition, post-processing techniques, and potential sources of technical errors.We will present essential tools for interpreting perfusion in ischemic events. Additionally, this technique can detect stroke mimics ; their key imaging findings will also be highlighted.

TABLE OF CONTENTS/OUTLINE

Introduction Definition and Overview of Perfusion Technical Considerations 3.1. Contrast Injection 3.2. Image Acquisition 3.3. Post-Processing Sources of Error 4.1. Arterial Input and Venous Output Curve Evaluation 4.2. Arterial Input Selection 4.3. Venous Output Selection 4.4. Patient Motion Acute Ischemia on Perfusion Imaging and Interpretation Pitfalls Ischemic Stroke Mimics 6.1. Seizures 6.2. Migraine 6.3. Infections 6.4. Tumors 6.5. Vascular Malformations 6.6. Brain Death 6.7. Anatomical Variants Conclusions The accompanying slides include original work by the authors and images acquired at the authors' institution.

NREE-59 LANDMARK OF LOSS: A COMPREHENSIVE GUIDE TO MRI STRUCTURED REPORTING FOR DEMENTIA

Jimin Lee (*Presenter*)
Benjamin M. Pizarro-Galleguillos, MD (*Abstract Co-Author*)
Paula Alcaide, MD (*Abstract Co-Author*)

TEACHING POINTS

A standardized imaging protocol and comprehensive structured report template are essential tools to ensure consistency in the imaging assessment of patients with cognitive complaints. Evaluation of dementia should include isotropic 3D T1-weighted imaging with specific multiplanar reconstructions to enable accurate application of visual and quantitative scales of brain atrophy. Brain atrophy can be assessed using validated rating scales such as the Global Cortical Atrophy scale and the Medial Temporal Atrophy scale. Blood-sensitive sequences are critical for detecting microbleeds and superficial siderosis, which are relevant for determining eligibility for Alzheimer's disease-modifying treatments. Vascular pathology is evaluated using T2-weighted FLAIR and blood-sensitive sequences to identify infarcts, cerebral microbleeds, and microangiopathic white matter changes, rated using the Fazekas scale. Structured dementia reports should incorporate these key scales to support a thorough and standardized assessment.

TABLE OF CONTENTS/OUTLINE

Introduction: dementia from pathophysiology to imaging MRI protocol: a standardized proposal Grading scales how, when, and why (Key anatomy landmarks for reproducible measurements, MTA Scale, GCA Scale, Fazekas scale) Disease-specific MRI patterns (AD, FTLD, PSP, MSA, CBD) A quick overview of standardized reporting Structured report in dementia: a proposal Dementia structured report in the AD modifying treatment era

NREE-60 BLEED IT OUT: NEUROIMAGING SPECTRUM OF HEMATOLOGICAL DISEASES

Milena Yonamine (*Presenter*)
JEAN LEVI RIBEIRO DE PAIVA (*Abstract Co-Author*)
Gustavo Yamada, MD (*Abstract Co-Author*)
Raissa Cabral Pili, MD (*Abstract Co-Author*)
Fabiano Reis (*Abstract Co-Author*)

TEACHING POINTS

Highlight the key features of imaging in CNS involvement of several hematological conditions, including lymphoma, multiple myeloma, leukemic infiltration, mastocytosis, immune thrombocytopenia, and aceruloplasminemia. Furthermore, our objective is to delineate the diagnostic challenges, differential diagnoses, and complications associated.

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Central nervous system involvement in hematological diseases is rare and denotes a guarded prognosis when it occurs. In this educational study, we will demonstrate the imaging patterns observed in computed tomography and magnetic resonance imaging of the aforementioned hematological conditions, based on cases from a tertiary care institution. The study aims to clarify the main imaging features and diagnostic challenges. When patients develop neurological symptoms, it is recommended to investigate potential neurological involvement through both imaging and laboratory assessments, as imaging findings can often assist in diagnosis and refine differential considerations. The malignant status of hematological diseases renders patients susceptible to complications such as opportunistic infections, cerebrovascular events, and other treatment-related conditions, particularly those associated with chemotherapeutic regimens. These conditions are discussed in this study, highlighting their specific imaging characteristics, which are of paramount importance given their high mortality rates.

NREE-61 POSTOPERATIVE IMAGING IN ANTERIOR SKULL BASE SURGERY

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Eduardo Ortega Matute, MD (*Abstract Co-Author*)
Kristina Ramirez Garcia, MD (*Abstract Co-Author*)
Angela M. Sosa, MD, MSc (*Abstract Co-Author*)
Michelle Y. Gonzalez Putoy SR, MD (*Abstract Co-Author*)
Lindsay A. Milroy, MD (*Abstract Co-Author*)
Almudena Perez-Lara, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

? Describe the normal radiological anatomy of the anterior skull base and the imaging characteristics of common lesions, including tumors, trauma, and infection. ? Illustrate the expected post-surgical imaging findings, including the appearance of surgical materials and normal healing patterns. ? Identify potential complications of anterior skull base surgery using CT, CT myelography and MRI. ? Emphasize key aspects for an accurate and structured postsurgical radiological report.

TABLE OF CONTENTS/OUTLINE

Overview of anterior skull base anatomy Summary of lesions of the anterior skull base Tumors (Esthesioneuroblastoma, meningiomas of the olfactory groove) Trauma Infectious processes Congenital lesions Imaging techniques in preoperative planning Key imaging modalities (CT, MRI) Preoperative findings in common tumors Surgical approaches to anterior skull base pathology Endoscopic Endonasal Approach (EEA) and Functional Endonasal Sinus Surgery (FESS) Craniofacial resection Craniotomies and craniectomies Surgical materials and their imaging appearance Synthetic grafts (Duramatrix, Tisseel, DuraGen, Neuro-Patch) Autologous fascia lata Fat grafts Acellular dermal matrix (AlloDerm) Hydroxyapatite cement Post-Surgical imaging of the anterior skull base Normal post-surgical findings Appearance of adjacent brain, bone, and mucosa Imaging techniques for follow-up Post-Surgical complications and their imaging features CSF leaks Infections Tumor recurrence

NREE-62 DECODING BRAINSTEM LESIONS: A VISUAL GUIDE TO ANATOMICAL-IMAGING-CLINICAL CORRELATION

Thiago Costa Haiter, MD (*Presenter*)
Gustavo Yamada, MD (*Abstract Co-Author*)
Luiz Borella (*Abstract Co-Author*)
Sofia Marchi (*Abstract Co-Author*)
Fabio Montico (*Abstract Co-Author*)
Elaine Minatel (*Abstract Co-Author*)
Fabiano Reis (*Abstract Co-Author*)

TEACHING POINTS

Brainstem lesions require a deep understanding of anatomy and imaging to correlate with clinical symptoms. This exhibit aims to explore how to: - Identify key neuroanatomical structures of the midbrain, pons, and medulla on MRI (T1, T2, FLAIR, DWI). - Correlate specific imaging findings with clinical symptoms in brainstem lesions. - Diagnose complex brainstem syndromes (e.g., Dejerine Syndrome - Parinaud Syndrome, Wallenberg Syndrome) using a structured, case-based approach. - Understand key imaging signs, including MRI findings and histologic correlations, to enhance diagnostic accuracy.

TABLE OF CONTENTS/OUTLINE

Introduction Importance of understanding brainstem lesions for accurate diagnosis. Anatomy of the Brainstem Overview of the midbrain, pons, and medulla oblongata structures relevant for lesion identification. MRI Imaging Modalities in Brainstem Lesions Discussion of MRI techniques (T1, T2, FLAIR, DWI) and their role in visualizing brainstem lesions. Case Studies :Locked-In Syndrome;Wallenberg Syndrome;Millard-Gubler Syndrome;Benedikt Syndrome;Middle Cerebellar Peduncle;DegenerationHypertrophic;Olivary Degeneration;Dejerine Syndrome;Parinaud Syndrome;Facial Colliculus Syndrome; Correlating Imaging with Clinical

Symptoms Case-based analysis linking MRI findings to clinical presentation. Differential Diagnoses and Common Pitfalls Common misdiagnoses and how to avoid them. Diagnostic Challenges and Solutions Strategies for overcoming diagnostic challenges in brainstem lesions.

NREE-63 FRAGMENTED GAIT, FOCUSED VIEW: MRI GENOTYPE-PHENOTYPE CORRELATES IN HEREDITARY ATAXIC DISORDERS

Benjamin M. Pizarro-Galleguillos, MD (*Presenter*)
Claudio A. Lema Olivares, MD (*Abstract Co-Author*)
Marcelo Miranda (*Abstract Co-Author*)
M.Leonor Bustamante (*Abstract Co-Author*)
Roberta La Piana (*Abstract Co-Author*)
Ana Patricia P. Orellana, MD (*Abstract Co-Author*)

TEACHING POINTS

1 . Hereditary ataxias are a heterogeneous group of inherited neurodegenerative disorders characterized by progressive unsteadiness of gait, dysmetria, and dysarthria. 2. MRI serves as a valuable diagnostic tool, complementing genetic studies by excluding alternative causes and revealing distinctive neuroimaging patterns. 3. Two main imaging patterns are recognized: ataxias with and without global cerebellar atrophy. 4. Characteristic findings include the hot cross bun sign in Spinocerebellar Ataxia (SCA), the middle cerebellar peduncle sign in Fragile X-associated Tremor/Ataxia Syndrome (FXTAS), bilateral hyperintensity of the dentate nuclei in Spastic Paraplegia Type 7 (SPG7) and Cerebrotendinous Xanthomatosis (CTX), and T2 hyperintensity in the pons in Autosomal Recessive Spastic Ataxia of Charlevoix-Saguenay (ARSACS). 5. The recently proposed CHARON algorithm supports a structured MRI-based approach to the diagnosis of hereditary ataxias.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Clinical and Genetic Overview of Hereditary Ataxias. 2. Classification of Hereditary Ataxias: Subtypes and Inheritance Patterns. 3. MRI protocols: Recommended Sequences. 4. Imaging Features: Characteristic Signs and Patterns. 5. The CHARON Algorithm: A Practical Diagnostic Framework: a) Ataxias with global cerebellar atrophy. b) Ataxias without global cerebellar atrophy. 6. Genotype-Imaging Correlations: a) SCA. b) Ataxia-Telangectasia. c) ARSACS. d) FXTAS. e) SPG7. f) CTX. 7. Structured Reporting of Hereditary Ataxias on MRI. 8. Future Directions in Imaging of Hereditary Ataxias. 9. Conclusions.

NREE-64 CENTRAL AND EXTRAVENTRICULAR NEUROCYTOMAS: RADIOLOGIC-PATHOLOGIC CORRELATION AND HISTORICAL PERSPECTIVES

Robert Y. Shih, MD (*Presenter*)

TEACHING POINTS

1. Central neurocytoma is a rare neuronal tumor (<1% of primary brain tumors) of the ventricular system that usually presents in young adults (20-40 years old) with symptoms related to elevated intracranial pressure. 2. While rarely encountered in the reading room, central neurocytomas typically present as an avidly enhancing mass with a bubbly appearance on T2-weighted imaging within the anterior half of the lateral ventricles. 3. Histopathologically, central neurocytomas typically present with monotonous neoplastic cells with round nuclei (salt & pepper chromatin) in a fibrillary matrix that stain positive for synaptophysin (neuronal marker). 4. Gross total resection, or maximal safe resection when not possible, is the main treatment modality. Adjuvant radiation may be used to reduce risk of recurrence for subtotal resection or atypical tumors (elevated Ki-67). 5. Extraventricular neurocytomas are similar to central neurocytomas on imaging and histopathology but are located outside the ventricles, usually in the cerebral hemispheres (FGFR1-TACC1 fusion is a molecular feature).

TABLE OF CONTENTS/OUTLINE

1. What is a Central Neurocytoma? = case presentation of central neurocytoma, brief history of central neurocytoma 2. Clinical Features of Central Neurocytoma: discuss typical clinical presentation, transcortical vs transcallosal surgery 3. Radiologic Features of Central Neurocytoma: discuss typical imaging features, illustrate with panel of select images 4. Pathologic Features of Central Neurocytoma: discuss typical histopathology plus immunohistochemical features 5. What is an Extraventricular Neurocytoma? = present case of extraventricular neurocytoma (FGFR1-TACC1 fusion)

NREE-65 UNDERSTANDING MESIAL TEMPORAL LOBE LESIONS: DIFFERENTIAL DIAGNOSES AND GUIDING CARE

Kyle Sporn (*Presenter*)
Kevin Thomas, BS (*Abstract Co-Author*)
Shannon Chu (*Abstract Co-Author*)
Markus Lammle, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review normal anatomy, landmarks, and functions of the mesial temporal lobe. 2. Review various etiologies of mesial temporal lobe lesions, including mesial temporal sclerosis, neoplasms, inflammatory, autoimmune, and infectious disorders, and their classic MRI imaging features.

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1. Normal anatomy and landmarks of the mesial temporal lobe. 2. Differential diagnosis of mesial temporal lobe lesions and classic MR imaging features. a. Mesial temporal sclerosis. b. Neoplasms: Low-grade Gliomas, Pleomorphic Xanthoastrocytoma, Glioblastoma, Primary CNS Lymphoma, and Dysembryoplastic Neuroepithelial. c. Inflammatory/Infectious: Postictal Edema, HSV Encephalitis, Tuberculosis, Neurocysticercosis, and Toxoplasmosis. d. Autoimmune: Autoimmune Limbic Encephalitis. e. Genetic: Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL). 3. Management considerations. 4. Summary

NREE-66 GLIONEURONAL TUMORS AND THEIR MIMICS: NEUROIMAGING REVIEW WITH PATHOLOGY AND GENETIC ASSOCIATIONS

Smily Sharma, MD, FRCR (*Presenter*)
Venkata Subbaih Arunachalam, MD (*Abstract Co-Author*)
Bejoy Thomas (*Abstract Co-Author*)
Chandrasekharan Kesavadas, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To study the classification and imaging features of common and rare glioneuronal tumors along with their pathological associations, using a case-based review. 2. To study genetic associations of glioneuronal tumors, such as BRAF with gangliogliomas, FGFR1 and PDGFRA with dysembryoplastic neuroepithelial tumor. 3. To define an imaging protocol for the evaluation of glioneuronal tumors. 4. To study features differentiating glioneuronal tumors from common mimics like polymorphous low grade neuroepithelial tumor of the young (PLNTY) and pilocytic astrocytomas 5. To provide a systematic approach for the imaging evaluation of glioneuronal tumors

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1. Introduction 2. Imaging Protocol 3. WHO 2021 Classification of Brain Tumors: Glioneuronal and Neuronal Tumors 4. Genetic Associations of Glioneuronal Tumors 5. Radiology-Pathology features of Various Glioneuronal Tumors i. Ganglioglioma, common and rare manifestations ii. Desmoplastic Infantile Ganglioglioma iii. Dysembryoplastic Neuroepithelial Tumor iv. Papillary Glioneuronal Tumor v. Rosette Forming Glioneuronal Tumor vi. Diffuse Leptomeningeal Glioneuronal Tumor vii. Dysplastic cerebellar gangliocytoma viii. Neurocytoma ix. Newly recognized tumor types: DGONC, MGNT, MVNT 6. Mimics of Glioneuronal Tumors 7. Systematic imaging approach for evaluation of glioneuronal tumors 8. Take Home Points

NREE-67 SPINAL VASCULAR MALFORMATIONS: COMPREHENSIVE INSIGHTS FROM ANATOMY TO ENDOVASCULAR MANAGEMENT

Radhika More, MBBS (*Presenter*)
Sharath Kumar G G (*Abstract Co-Author*)

Payal Agrawal I, MD (*Abstract Co-Author*)
Savith Kumar, MBBS, MD (*Abstract Co-Author*)
Satya Narayana Mandalapu (*Abstract Co-Author*)

TEACHING POINTS

Overview of spinal vascular anatomy and SVM classification. Pathophysiology and clinical features of SVM. Imaging features with case illustrations. Endovascular management strategies with examples.

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OUTLINE: Spinal vascular malformations (SVMs) are rare lesions with variable clinical presentations due to differences in anatomy and angioarchitecture. A solid understanding of spinal vascular anatomy and pathophysiology is essential for accurate diagnosis and treatment. Various classification systems exist, based on lesion location and flow characteristics—high-flow, low-flow, and no-shunt types. High-flow shunts may cause hemorrhage, mass effect, or be incidental findings. Low-flow SVMs, often acquired, typically affect older men and present with progressive myelopathy due to venous hypertension. MRI is useful for initial diagnosis; spinal DSA remains the gold standard for detailed evaluation and treatment planning. Endovascular embolization is the preferred treatment in most cases, aiming for complete occlusion with preservation of normal vasculature or targeted therapy at weak points if full occlusion is not feasible. Table of Contents: Spinal arterial and venous anatomy. Case-based clinical and imaging features of SVM. MRI features and feeder identification. Angioarchitecture and types of SVM. Endovascular embolization techniques.

NREE-68 CNS EMBRYONAL TUMORS AND THEIR MIMICS: WHAT A RADIOLOGIST SHOULD KNOW?

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Venkata Subbaih Arunachalam, MD (*Abstract Co-Author*)
Chandrasekharan Kesavadas, MD (*Abstract Co-Author*)
Bejoy Thomas (*Abstract Co-Author*)

TEACHING POINTS

1. To study clinical presentation and imaging features of common and rare embryonal tumors, using an illustrative case-based review. 2. To study the pathology correlations of embryonal tumors. 3. To study syndromic associations of common embryonal tumors like medulloblastoma 4. To study imaging features of common mimics like ependymomas and infantile hemispheric gliomas, and discuss the differentiating features from embryonal tumors 5. To discuss the imaging protocol and derive a systematic approach for the evaluation of embryonal tumors

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Classification of embryonal tumors 3. Imaging protocol 4. Medulloblastoma: general and molecular subtype-specific features 5. Other embryonal tumors: 5A. Atypical teratoid/rhabdoid tumor (AT/RT) 5B. Embryonal tumor with multilayered rosettes (ETMR) 5C. CNS Neuroblastoma, FOXR2-activated 5D. CNS tumor with BCOR internal tandem duplication 6. Syndromic associations of embryonal tumors (with emphasis on medulloblastoma) 7. Mimics of embryonal tumors: 7A. Mimics of medulloblastoma (posterior fossa ependymoma, pilocytic astrocytoma, metastasis) 7B. Mimics of other embryonal tumors (Supratentorial ependymoma, infant-type hemispheric glioma) 8. Systematic approach for evaluation of CNS embryonal tumors 9. Take home points

NREE-69 DIAGNOSIS AND TREATMENT OF DEGENERATIVE SPINAL CYSTS

Khoi Nguyen (*Presenter*)
Linda Lu (*Abstract Co-Author*)
Jay Acharya, MD (*Abstract Co-Author*)

TEACHING POINTS

Symptomatic spinal cysts are an uncommon cause of severe back pain that may be definitively managed with non-invasive image-guided interventions. Intraspinal synovial cysts arise from degenerative facet joints and appear as extradural T2W hyperintense cysts with possible nerve compression. Image-guided cyst rupture, aspiration, and fenestration have shown significant improvement in symptoms and disability. Discal cysts are thought to arise from annular fissures and epidural venous plexus rupture. Case series report that CT-guided aspiration or fenestration may lead to complete symptom resolution. Ligamentous cysts arise from the ligamentum flavum or posterior longitudinal ligament and appear as a midline extradural T2W hyperintense cyst that can result in nerve compression. Transforaminal epidural injections can be used for pain management. Finally, interspinous pseudarthroses can lead to interspinous bursitis and extension of the bursa between the ligamentum flavum, creating an extradural cyst. Imaging shows communication between the cyst and interspinous bursa. Surgical management includes decompression or interspinous fusion to address degenerative changes. Alternatively, patients may undergo image-guided steroid injections for symptomatic management or aspiration/fenestration. Overall, image-guided interventions can provide symptomatic relief for a variety of degenerative spinal cysts and should be considered prior to surgical management.

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Background, Intrapsinal Synovial Cysts, Ligamentous Cysts, Discal Cyst, Interspinous Bursitis (Baastrup's disease), Conclusion

NREE-72 FROM SYMPTOMS TO SCANS: BRIDGING CLINICAL INSIGHTS, IMAGING FINDINGS, AND ROLE OF INTERVENTIONAL RADIOLOGY IN INTRACRANIAL DURAL ARTERIOVENOUS FISTULAS ACROSS COGNARD GRADES

Sudhan Rackimuthu, MBBS (*Presenter*)
Elango Swamiappan, MBBS, MD (*Abstract Co-Author*)
Devanand Balalakshmoji, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize the clinical variability of intracranial dural arteriovenous fistulas (dAVFs), focusing on symptoms such as pulsatile tinnitus, headaches, and visual disturbances. Understand the Cognard grading system for classifying dAVFs based on venous drainage patterns and their correlation with clinical risk. Learn the role of multimodal imaging techniques (CT, MRI, DSA) in diagnosing and characterizing dAVFs, with an emphasis on differentiating between Cognard grades. Identify critical imaging findings in different Cognard grades, particularly in relation to venous reflux, ectasia and sequestered sinus Explore the role of interventional radiology in managing dAVFs and how treatment strategies vary based on anatomy and Cognard grades.

TABLE OF CONTENTS/OUTLINE

Introduction to Intracranial Dural Arteriovenous Fistulas (dAVFs) Definition, pathophysiology, and clinical presentation. Cognard Grading System Grading dAVFs based on venous drainage patterns and clinical risk. Differentiating between Cognard grades I-V. Imaging Modalities CT: Initial evaluation, detecting venous congestions, hemorrhage, and osseous changes MRI/MR Angiography: Identifying venous reflux and ectasia. DSA: Final classification of dAVFs and assessing venous drainage. Use of a structured algorithm for multimodality imaging integration Case Studies Example cases for each Cognard grade, with detailed and annotated imaging findings. Interventional Radiology in dAVF Management Management strategies for different Cognard grades, focusing on embolization and surgical options. Pitfalls and Pearls Key imaging and diagnostic challenges in grading dAVFs.

NREE-73 UPDATED INSIGHTS IN MULTIPLE SCLEROSIS NEUROIMAGING AND NEW MCDONALD CRITERIA: PRACTICAL RADIOLOGICAL IMPLICATIONS

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Ana Paula A. Fonseca, MD (*Abstract Co-Author*)
Felipe Scortegagna SR, MD (*Abstract Co-Author*)
Antonio J. Da Rocha, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

This article provides a comprehensive overview of neuroimaging in Multiple Sclerosis (MS) New McDonald Criteria review: 1. Optic Nerve Integration: Now include optic nerve lesions as a fifth dissemination-in-space site.2. Paramagnetic Rim Lesions (PRLs): Hypointense T2* rings at lesion edges enhance specificity for MS (96% vs. mimics). These correlate with chronic active lesions and disability progression.3. Central Vein Sign (CVS): =40% periventricular lesions with central veins on SWI/FLAIR improve diagnostic accuracy (sensitivity 88%, specificity 93%).

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1. McDonald Criteria Evolution (2010 - 2017 - 2024):• 2024 revisions eliminate dissemination-in-time requirements for radiologically isolated syndrome (RIS) and integrate optic nerve lesions as a fifth anatomical site for dissemination-in-space.2. Optic Nerve Specificity:• Optic nerve lesions require T2 fat-sat/STIR sequences for detection; =3 mm lesions with perineural enhancement increase specificity for MS (89%).3. No longer require dissemination in time (DIT):• DIS (Dissemination in Space) revised: Five anatomical areas.• Radiologically Isolated Syndrome (RIS): can be diagnosed without clinical symptoms4. High-Specificity Biomarkers:• Central Vein Sign (CVS): =40% periventricular lesions with central veins on SWI/FLAIR (specificity 93% vs. mimics).• Paramagnetic Rim Lesions (PRLs): Hypointense T2* rings (specificity 96%) correlate with chronic active lesions.5. MS mimics• Microangiopathy• Leuconcefalopatia (AARS 2)• Other demyelinating diseases (MOGAD, NMOSD)• PRESS6. Possible treatment complications• LEMP• Fingolimod-related pseudotumoral lesion

NREE-74 IMAGING THE VASCULAR REPERCUSSIONS: INTRACRANIAL VASCULAR COMPLICATIONS OF RHINO-ORBITO-CEREBRAL MUCORMYCOSIS

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Swarna Gupta, MBBS (*Abstract Co-Author*)
M Sarthak Swarup, MD,MBBS (*Abstract Co-Author*)
Geetika Sindhwani, MBBS (*Abstract Co-Author*)
Megha Jain, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. To review the pathophysiology of ROCM and its predilection for intracranial vascular involvement 2. Illustrate the imaging spectrum of vascular complications including subtle vessel wall changes, presence of intraluminal fungal hyphae to aneurysm formation and infarctions 3. To identify the early radiographic signs of vascular involvement on routine CEMRI 4. Establish a standardised imaging protocol and reporting checklist emphasising the critical role of routine contrast-enhanced MRI (CE-MRI) for early detection of vascular complication

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Rhino-Orbito-Cerebral Mucormycosis (ROCM) is a life threatening fungal infection with increasing incidence in post-COVID-19 era and in immunocompromised patients. Due to its angio-invasive behaviour it can spread directly through vascular lumen or perivascular and perineural route. Intracranial vascular complications include vessel wall inflammation, thrombosis, infarction, and aneurysm formation. We present 130 cased of ROCM, of which 17 cases had intracranial vascular complications. Illustrative cases demonstrate: 1. Key vascular territories involved include the cavernous segment of the ICA, anterior cerebral circulation, posterior communicating artery, and dural venous sinuses. 2. Early signs : vessel wall thickening, enhancement (post-contrast MRI) and presence of intra-luminal fungal hyphae 3. Stenotic and Thrombotic phase : luminal narrowing, stenosis, and thrombosis 4. Advanced complications : mycotic aneurysms, pseudo-aneurysms, infarctions 5. Patterns and route of spread : from cavernous sinus, orbital apex, to ICA involvement

NREE-75 FRACTURES IN FOCUS: WHAT MAKES PEDIATRIC ORBITS DIFFERENT? A DEEP DIVE INTO UNIQUE INJURY PATTERNS AND ASSOCIATED COMPLICATIONS

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Lynsey Ploenzke, BS (*Abstract Co-Author*)
Erica Allen (*Abstract Co-Author*)
Ian T. Mark, MD (*Abstract Co-Author*)
Norbert G. Campeau, MD, MSc (*Abstract Co-Author*)
Paul J. Farnsworth, DO (*Abstract Co-Author*)
Laurence J. Eckel, MD (*Abstract Co-Author*)
Julie B. Guerin, MD (*Abstract Co-Author*)

TEACHING POINTS

Introduction:Pediatric orbital fractures differ from adult patterns due to unique craniofacial anatomy and biomechanics. The pliable nature of pediatric bone predisposes children to trapdoor fractures with soft tissue entrapment and minimal bony displacement. Classic entities such as a white-eyed blowout fracture (WEBOF) can be missed. Rare post -traumatic complications such as orbitocele and blepharocele mimic more common findings such as orbital hematomas leading to diagnostic uncertainty. This exhibit highlights key imaging and clinical features of pediatric orbital trauma to improve diagnostic accuracy and guide management. Teaching Points1. Pediatric orbital trauma includes linear, blow out, and trapdoor fractures.2. Trapdoor fractures, most common in children, may involve fat and/or muscle entrapment, with minimal displacement.3. WEBOF presents with minimal periorbital bruising but significant risk of long-term deficits, if unrecognized.4. Prompt diagnosis of muscle entrapment is critical to avoid muscle ischemia, fibrosis and permanent motility issues.5. Rare complications such as orbitocele and blepharoceles will be illustrated.

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• Pediatric orbital anatomy• Common pediatric orbital fracture types: linear, blowout, trapdoor, WEBOF• Imaging pearls and pitfalls: reformats, teardrop sign, muscle changes• Complications: diplopia and enophthalmos, orbitocele, blepharocele• Management: surgical timing vs facial growth considerations.• Case-based examples: classic, subtle findings, and complication driven findings.

NREE-76 WHEN NERVES LIGHT UP: CRANIAL AND PERIPHERAL NERVE ENHANCEMENT ON MRI, WHY A MULTIDISCIPLINARY PERSPECTIVE MATTERS

Paula Munoz Carrasco, MD (*Presenter*)
Antonio Barbosa, MD (*Abstract Co-Author*)
Maria Elena Capilla, MD (*Abstract Co-Author*)

TEACHING POINTS

- To review cranial and peripheral nerves enhancement patterns on MRI.- To illustrate different cases where a multidisciplinary approach was key.

TABLE OF CONTENTS/OUTLINE

Abnormal enhancement of cranial and peripheral nerves on MRI is a common and challenging finding and can indicate a wide range of pathologies, from inflammatory to neoplastic processes. Interpretation requires not only radiological expertise but also integration with clinical, neurological, neurophysiological, and laboratory findings. A multidisciplinary approach is key to timely diagnosis and optimal patient management.This presentation reviews imaging patterns of cranial and peripheral nerve enhancement, emphasizing their diagnostic significance and differential diagnoses.We illustrate key cases where collaboration between radiologists, neurologists, and other specialists was essential for accurate interpretation and treatment decisions. By highlighting the complexity and diversity of nerve enhancement findings, we advocate for multidisciplinary teamwork in addressing these often subtle but clinically critical signs.

NREE-77 UNWANTED TENANTS. INFECTIOUS GRANULOMATOUS DISEASES OF THE CENTRAL NERVOUS SYSTEM

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Henrique Scalet (*Abstract Co-Author*)
Manoel Barbosa, MD (*Abstract Co-Author*)
Narriman P. Hazime, MD (*Abstract Co-Author*)
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Thiago Luiz P. Scoppetta, MD (*Abstract Co-Author*)
Antonio J. Da Rocha, MD, PhD (*Abstract Co-Author*)
Antonio Carlos M. Maia JR (*Abstract Co-Author*)

TEACHING POINTS

Review the epidemiology, clinical presentation, and imaging findings of infectious granulomatous diseases affecting the CNS Recognize the key imaging patterns in MRI and CT that suggest these diagnoses Highlight imaging-based diagnostic clues to differentiate infectious granulomatous diseases from neoplastic or other inflammatory lesions

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Granulomatous infections of the CNS represent a major diagnostic challenge in endemic and immunocompromised populations. Multiple pathogens—including Mycobacterium tuberculosis , Taenia solium , Toxoplasma gondii , Cryptococcus neoformans , and Paracoccidioides spp. —can cause similar imaging patterns. Understanding their radiologic signatures is essential for appropriate diagnosis and management. Infectious granulomatous diseases of the CNS are diverse and can present with overlapping imaging features. A compartmental and etiological approach based on radiologic patterns, combined with clinical and epidemiological data, is crucial for accurate diagnosis and targeted therapy. Recognizing key signs—such as the eccentric target sign in toxoplasmosis or gelatinous pseudocysts in cryptococcosis—may help avoid unnecessary invasive procedures.

NREE-78 BRAIN DAMAGE: AN ACID METABOLIC TRIP ON THE NEUROIMAGING SPECTRUM

Bruno Rigonato (*Presenter*)
Gustavo Yamada, MD (*Abstract Co-Author*)
MATHEUS KRAUSE (*Abstract Co-Author*)
Matheus Ruffini (*Abstract Co-Author*)
Adolfo Souza (*Abstract Co-Author*)
Juliana Duarte (*Abstract Co-Author*)
Fabiano Reis (*Abstract Co-Author*)

TEACHING POINTS

Understand the neurotoxic impact of rare inherited metabolic disorders classified as organic acidurias. Recognize distinctive MRI patterns, including basal ganglia involvement, frontotemporal atrophy, and white matter abnormalities. Appreciate the role of advanced imaging techniques—such as diffusion-weighted imaging and magnetic resonance spectroscopy—in detecting early metabolic disturbances. Correlate neuroimaging findings with clinical and biochemical data to guide diagnosis and therapeutic decisions in pediatric patients.

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1. Overview of organic acidurias and pathophysiological mechanisms of neurotoxicity. 2. Imaging hallmarks of glutaric aciduria types one and two. 3. Neuroimaging spectrum of propionic acidemia, methylmalonic acidemia, and isovaleric acidemia. 4. Characteristic findings in Canavan disease and its diagnostic reliance on MR spectroscopy. 5. Diffusion-weighted imaging and spectroscopy as tools for early detection. 6. Pictorial review of representative clinical cases with multimodal MRI. 7. Diagnostic pitfalls and mimics in metabolic encephalopathies. 8. Integrating clinical, biochemical, and radiologic data for improved diagnostic accuracy.

NREE-79 FROM IMAGE TO INCISION: THE ROLE OF T2 SPACE-MRA FUSION IN BRAINSTEM VASCULAR COMPRESSION

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Bhagyashree Chavan, MBBS (*Abstract Co-Author*)
Kapil Jhamnani, MBBS (*Abstract Co-Author*)
Hrishikesh A. Kale, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

• Fusion imaging with 3D T2 SPACE and modified 3D TOF MR sequences can enhance visualization of neurovascular compression in trigeminal neuralgia (TN) and hemifacial spasm (HFS). • It offers more accurate preoperative identification of offending vessels than conventional MR, aiding neurosurgical planning. • Integrating fusion imaging into diagnostic workflows can improve surgical outcomes by reducing complications and enhancing precision.

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• TN and HFS are characterized by episodic facial pain or spasms, often caused by neurovascular compression of CN V or CN VII. Accurate identification of the offending vessel is key for surgical success. • T2 SPACE and 3D TOF MRA images of patients with unilateral TN or HFS was fused using Syngovia software. TOF sequences were modified for improved arterial visualization. Findings were compared with intraoperative results to assess the accuracy of fused vs. conventional imaging. • T2 SPACE delineates nerves but not arteries/veins. TOF highlights arteries but lacks nerve detail. Fusion resolves both limitations. The degree of T2 SPACE and TOF MRA overlap can be digitally adjusted to optimize visualization of both nerve and artery. • Fused imaging improved preoperative localization of neurovascular contact, aiding targeted decompression and reducing uncertainty. This lowers operative time and complications, and improves outcomes. • Intraoperative correlation of imaging findings will be provided.

NREE-80 THE HIDDEN CAVE: A RADIOLOGIC ATLAS OF MECKEL'S CAVE PATHOLOGIES

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Shahd Mohammedain (*Abstract Co-Author*)
Syeda Shabistan Intekhab, MBBS (*Abstract Co-Author*)
Mohammad Mohsin Arshad, MD (*Abstract Co-Author*)
Devendra Kumar, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

1-Review Meckel's Cave anatomy and relevant adjacent structures.2-Recognize key imaging features of lesions in the differential diagnosis.3-Differentiate Meckel's Cave lesions based on imaging and location.Background:Meckel's Cave is a dural recess in the middle cranial fossa that contains the trigeminal ganglion and proximal portions of the trigeminal nerve divisions. It lies at a critical anatomical junction bordered by the cavernous sinus, petrous apex, internal carotid artery, and the superior and inferior petrosal sinuses. Despite its small size, Meckel's Cave is frequently involved by a range of pathologies, both intrinsic and extrinsic, which can be challenging to identify radiologically. This educational exhibit begins with a focused review of Meckel's Cave anatomy and adjacent neurovascular structures using high-resolution MRI. Through a case-based approach, we illustrate normal and abnormal appearances of Meckel's Cave, emphasizing patterns of involvement, signal intensity, enhancement,

lesion morphology, and anatomical distortion. The primary objective of this exhibit is to enable radiologists to confidently diagnose Meckel's Cave lesions by identifying abnormal imaging findings and differentiating potential diagnoses through integration of imaging characteristics, anatomical localization, and lesion behavior.

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1- Introduction to Meckel's Cave2- Review of anatomical importance and structural relationships3- Key imaging features of normal versus abnormal Meckel's Cave4- Case-based presentation of pathologies affecting Meckel's Cave5- Summary and differentiation between Meckel's Cave lesions

NREE-81 IMAGING PATTERNS OF BILATERAL GLOBUS PALLIDUS ABNORMALITIES: A PICTORIAL REVIEW

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Manoel Barbosa, MD (*Abstract Co-Author*)
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Antonio J. Da Rocha, MD, PhD (*Abstract Co-Author*)
Antonio Carlos M. Maia JR (*Abstract Co-Author*)

TEACHING POINTS

Review the anatomy and vulnerability of the globus pallidus, highlight key MRI findings in bilateral lesions, and propose an imaging-based classification to guide differential diagnosis.

TABLE OF CONTENTS/OUTLINE

Introduction Highlight the globus pallidus's anatomical relevance, high metabolic demand, and vulnerability to systemic, toxic, metabolic, and genetic insults.Methods Retrospective multicenter review of brain MRIs with bilateral globus pallidus abnormalities, correlated with clinical data to define imaging phenotypes.Imaging Patterns and Etiologic Correlation T1 Hyperintensity Common in manganese intoxication and chronic liver disease. T2 Hyperintensity Observed in acute toxic encephalopathies Seen in inborn errors of metabolism. Associated with hypoxic-ischemic injury. T2 Hypointensity Related to iron or calcium deposition. Diffusion Restriction Seen in uremic encephalopathy, hypoxic injury, and vigabatrin toxicity. Mixed Patterns Associated with complex metabolic syndromes or overlapping etiologies. Additional Findings Involvement of adjacent white matter or other basal ganglia nuclei can help differentiate systemic vs. localized processes. Diagnostic Approach Proposal Imaging flowchart integrating clinical context with radiologic pattern to narrow differential diagnosis. ConclusionRecognition of typical imaging patterns involving the globus pallidus allows radiologists to narrow the differential diagnosis effectively. When integrated with clinical and laboratory data, this approach contributes to early and accurate diagnosis, guiding appropriate treatment while minimizing unnecessary investigations.

NREE-82 NEURO-DENGUE: A RADIOLOGICAL PERSPECTIVE

Zohaib Mallick, MBBS (*Presenter*)
Muhammad Abdullah (*Abstract Co-Author*)
Uffan Zafar, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit will illustrate the spectrum of neuroimaging findings in dengue encephalitis, emphasizing key differentiating features. We will review typical and atypical manifestations, including characteristic MRI patterns, to improve radiologic diagnosis and understanding of this emerging complication.

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Introduction to Dengue Encephalitis Pathophysiology and Clinical Presentation Typical Imaging Findings MRI Sequences (T2, FLAIR, DWI, SWI) Commonly Affected Areas (Thalami, Basal Ganglia, Brainstem, Cerebellum) Characteristic Patterns (e.g., symmetrical involvement) Atypical Imaging Findings Uncommon Locations (e.g., cortical involvement, spinal cord) Variations in Presentation (e.g., hemorrhage, edema) Differential Diagnosis Other Viral Encephalitides ADEM Vascular Complications Case Examples Representative cases with imaging and clinical correlation Conclusion References

NREE-83 FLOW DIVERTER IMPLANTATION: EARLY PROCEDURAL COMPLICATIONS AND IMAGING CORRELATES

Laura Peter, MD (*Presenter*)
Felix Gallo, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review the clinical and radiologic findings associated with neurological symptoms during flow diverter implantation.- Identify complications related to device implantation and correlate them with device location and procedural technique.- Illustrate how retrospective case analysis contributes to improving clinical practice and follow-up protocols in interventional neuroradiology.

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Flow diverters are endovascular devices primarily used to treat large, wide-necked, or fusiform intracranial aneurysms. We reviewed 29 patients with brain aneurysms who underwent flow diverter treatment and developed neurological complications during or within the first few hours after implantation. Clinical presentation, aneurysm location, device type, imaging features, and outcomes were evaluated. Early neurological complications following flow diverter implantation are uncommon but clinically significant. Prompt recognition and imaging evaluation are essential to guide management and improve patient outcomes. Retrospective analysis of such events can help refine procedural techniques and enhance safety in future interventions.

NREE-84 A SYRINX IS JUST THE BEGINNING: DIAGNOSTIC CLUES, PITFALLS, AND MANAGEMENT

Donna Parizadeh, MD,MPH (*Presenter*)
Ahmed W. Moawad, MBBch (*Abstract Co-Author*)
Gabriel Virador, MD (*Abstract Co-Author*)
Abiel B. Habtezghi, MD (*Abstract Co-Author*)
Adam Averbuch, DO (*Abstract Co-Author*)
Christian Pedersen, MD (*Abstract Co-Author*)

TEACHING POINTS

We will use a combination of interactive image-based questions, radiologic illustrations, and flowcharts to:1-Differentiate central canal dilatation, hydromyelia, and syringomyelia. 2- Identify underlying causes of syrinx formation with interactive case examples. 3-Discuss the current theories on pathophysiology of syrinx. 4-Understand the role of different imaging techniques in management. 5-Apply a stepwise diagnostic and management algorithm incorporating diagnosis and treatment techniques

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1-Introduction-Imaging Spectrum and Terminology: Demonstrates imaging examples and definition of normal central canal, mild dilatation, hydromyelia, and syringomyelia on MRI. 2- Pathophysiology and Etiologies: Reviews current theories of syrinx formation. 3-Explores common and uncommon causes including Chiari malformation, arachnoiditis, spinal cord tethering, tumors, trauma, and rare causes such as CSF venous fistulas. 4. Case-Based Learning: Presents multiple interactive MRI cases simulating real-world diagnostic challenges. 5. Diagnostic Algorithm: Integrates findings into a diagnostic and management algorithm that incorporates clinical symptoms, imaging clues, MRI with contrast, cine MRI, CT myelogram, and decision points for surgical referral vs observation. 6. Key Takeaways: Concludes with a synthesis of pearls and pitfalls, emphasizing the importance of recognizing imaging red flags that necessitate further workup or neurosurgical referral, and conditions that may be safely monitored

NREE-85 NEUROLOGICAL JANUS: EXPLORING THE TWO-FACED NATURE OF MOGAD WITH INFECTIONS - SIMILARITIES AND DIFFERENCES

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Felipe Correa Brito, MD (*Abstract Co-Author*)
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Thiago Luiz P. Scoppetta, MD (*Abstract Co-Author*)
Antonio Carlos M. Maia JR (*Abstract Co-Author*)
Antonio J. Da Rocha, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

This educational exhibit provides a comprehensive overview of neuroimaging in Myelin Oligodendrocyte Glycoprotein Antibody-associated Disease (MOGAD). A review of MOGAD imaging phenotypes: FLAMES , ADEM-like , Myelitis , Neuritis/Perineuritis , and Infratentorial Syndromes . Key imaging-based similarities and differences between MOGAD and various infectious diseases , organized according to each MOGAD phenotype.

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1. Introduction and overview of MOGAD 2. FLAMES - T2 and FLAIR hyperintensity affecting the cortex, usually unilateral, often with cortical and leptomeningeal enhancement Main differential : Viral encephalitis 3. ADEM-like phenotype - Extensive T2 and FLAIR hyperintensities in the subcortical white matter and deep gray nuclei Main differential : Progressive Multifocal Leukoencephalopathy (PML) 4. Myelitis - Longitudinally extensive spinal cord lesions (=3 vertebral segments), often involving the central gray matter Main differential : Tuberculous myelitis 5. Optic neuritis/perineuritis - Long-segment involvement of the optic nerves, often bilateral, with perineural enhancement Main differential : Syphilitic neuroretinitis and perineurinitis. 6. Infratentorial involvement - T2 hyperintensity in the brainstem and middle cerebellar peduncles Main differential : JC virus-associated granule cell neuronopathy and HIV encephalopathy

NREE-86 WHEN THROMBECTOMY GOES WRONG: A RADIOLOGIC REVIEW OF PROCEDURAL COMPLICATIONS

Laura Peter, MD (*Presenter*)
Felix Gallo, MD (*Abstract Co-Author*)

TEACHING POINTS

- Mechanical thrombectomy is a life-saving intervention in acute ischemic stroke, yet procedural complications remain a significant concern. - A systematic analysis of real-world complications can guide interventional radiologists in preventing, recognizing, and managing adverse events. - Technique selection (aspiration vs stent retriever vs combined) and number of device passes may influence complication rates and angiographic outcomes.

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Introduction Overview of thrombectomy in ischemic stroke and clinical relevance of procedure-related complications. Materials and Methods Retrospective review of patients undergoing thrombectomy at a tertiary care center. Data includes demographics, thrombectomy technique, number of passes, angiographic outcome (TICI), and complications. Results Common complications included new territory embolism and vessel perforation. Most procedures used a combined technique. Higher number of passes showed a trend toward increased complications. Imaging Examples Radiologic cases highlighting the most frequent and severe complications. Discussion Interpretation of findings, correlation with literature, and procedural considerations to minimize risks. Conclusion Awareness of complication patterns and risk factors can enhance safety and outcomes in stroke thrombectomy.

NREE-87 HIDDEN CONNECTIONS: NEUROVASCULAR LESIONS IN HEREDITARY HEMORRHAGIC TELANGIECTASIA

Ayelen Leao, MD (*Presenter*)
Kevin Kurt Mac Allister (*Abstract Co-Author*)
Stefania Solanot, MD (*Abstract Co-Author*)
Manuel S. Perez Akly, MD (*Abstract Co-Author*)
Cristina H. Besada SR, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1) Hereditary Hemorrhagic Telangiectasia can manifest with a variety of neurovascular lesions such as arteriovenous malformations (AVMs), capillary malformations and developmental venous anomalies. 2) Primary neurologic complications include stroke, intracerebral hemorrhage, cerebral edema, seizure, and migraines. 3) Silent lesions such as AVMs are underrecognized and often underreported 4) MRI is widely used as a primary screening tool for detecting cerebral AVMs, while Digital Subtraction Angiography remains the gold standard for the definitive diagnosis of cerebral AVMs due to its superior spatial resolution and ability to provide dynamic vascular flow information.5) Genotype-phenotype correlation in HHT can guide surveillance strategies.

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HHT is a rare autosomal dominant disorder characterized by vascular malformations throughout multiple organ systems. CNS manifestations pose significant diagnostic and management challenges due to their potential for serious complications. The spectrum of neurovascular anomalies include brain AVM, arteriovenous fistulas, and capillary malformations, each with distinct imaging features. Many CNS lesions remain asymptomatic and are incidentally discovered during screening, early detection is essential for risk stratification and prevention of catastrophic events. This educational exhibit explores the spectrum of CNS manifestations in HHT, key radiological features, diagnostic approaches, and interventional management strategies. 1) Introduction to HHT 3) Spectrum of radiological findings and differential diagnosis. 4) Recommended Imaging Protocols 5) Surveillance Recommendations 6) Treatment 7) Conclusions

NREE-88 CLIPS (CLINOIDAL, LATERAL, INFERIOR, POSTERIOR, SUPERIOR): DEVELOPMENT OF A MAGNETIC RESONANCE GRADING SYSTEM TO PREDICT PITUITARY ADENOMA INVASION OF CAVERNOUS SINUS COMPARTMENTS

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Johannes H. Decker, MD,PhD (*Abstract Co-Author*)
Nancy J. Fischbein, MD (*Abstract Co-Author*)
Felipe Constanzo (*Abstract Co-Author*)

TEACHING POINTS

Advances in Endoscopic Endonasal Approach (EEA) to Pituitary adenoma resection allow for better access to the cavernous sinuses and increase chances of gross total resection. Existing imaging based classification systems of pituitary adenoma invasion were developed without the advanced access that EEA provides, leading neurosurgeons to consider new anatomic based classification systems to aid them in surgical planning. CLIPS is a new MR based classification system of cavernous sinus compartment invasion by pituitary adenoma that takes into account the advances in EEA and neurosurgical anatomic classification. CLIPS stands for Clinoidal, Lateral, Inferior, Posterior, and Superior, referring to the 4 cavernous sinus compartments (superior, inferior, lateral, and posterior) and the clinoid venous space beyond the proximal dural ring, which are relevant sites of invasion that are accessible to EEA. CLIPS has high sensitivity, specificity, and inter-rater reliability

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Review anatomy of pituitary, sella, and surrounding structures. Review pituitary lesions, with emphasis on pituitary adenomas. Review surgical approaches to the sella (Transcranial, Transsphenoidal Microsurgery, and Endoscopic Endonasal Approach). Review Knosp MR classification and limitations (Original study, Modification, and Inter-rater reliability). Introduction to CLIPS MR Classification System.Illustration of examples of invasion into each compartment (Figure 1).Binary grading for each of the 5 compartmentsSingle bisecting line using anatomic planes.Examples w/ illustration of each compartment (Figures 2-4).Summary statistics and inter-rater agreement (Tables 1 and 2).

NREE-89 NEURORADIOLOGY OF THE VENTRICLES: DECIPHERING TUMOR PATHOLOGY

Daniel Santiago Ramirez Amaya, MD (*Presenter*)
Cesar Andres Rodriguez Pulido, MD (*Abstract Co-Author*)
Carolina Tramontini (*Abstract Co-Author*)

TEACHING POINTS

• Understand the intricate ventricular anatomy and its embryological origin, emphasizing the diverse tissue formations and cell lineages implicated in intraventricular tumorigenesis. • Recognize, via magnetic resonance imaging (MRI), the distinctive radiologic features of intraventricular lesions by evaluating their location, morphology, and contrast enhancement patterns. • Implement a systematic approach, incorporating patient age and anatomical localization, to effectively differentiate intraventricular masses. • Integrate epidemiologic and anatomical data into a diagnostic algorithm that enhances precise clinical decision-making.

TABLE OF CONTENTS/OUTLINE

1. Introduction.2. Objectives.3. Classification.4. Tumor approach.5. Key Messages.

NREE-90 DECIPHERING THE EPILEPTIC BRAIN: AN ATLAS OF IMAGING FINDINGS

Oreanna Quintero, MD (*Presenter*)
Andres F. Caliz Cabrales, MD (*Abstract Co-Author*)
Julian M. Gandur, MD (*Abstract Co-Author*)
Sara Gomez Milanes, MD (*Abstract Co-Author*)
Jesus Eduardo Barreto Fernandez (*Abstract Co-Author*)
Luz A. Unigarro, MD (*Abstract Co-Author*)
Alejandro Blanco Rojas, MD (*Abstract Co-Author*)
Carolina Tramontini (*Abstract Co-Author*)

TEACHING POINTS

Imaging's Crucial Role: Neuroimaging is vital for identifying epilepsy's underlying causes, going beyond seizure description and EEG. Specific imaging findings strongly suggest distinct etiologies. MCDs: Developmental Disruptions: FCD Polymicrogyria Schizencephaly MTS: Temporal Lobe Epilepsy Hallmark Neoplastic Origins: DNET: Low-Grade Tumors: Astrocytomas: Variable (solid to cystic), slow growth, subtle mass effect. Gangliogliomas: Cystic with enhancing nodule, linked to chronic epilepsy. Oligodendrogliomas: Calcifications, well-defined borders, often frontal or temporal. Vascular Anomalies: Cavernomas Temporal Evolution: Imaging shows progression in conditions like MTS and tumor growth, crucial for understanding disease course. Interpretation & Accuracy: Strengths and limits of MRI, CT, PET for specific causes. Expert interpretation is key to avoid pitfalls. Visual Atlas Value: Aids clinicians/trainees in accurate image interpretation, pattern recognition, and differential diagnosis.

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I. Introduction: Imaging in Epilepsy Etiology A. Beyond Semiology and EEG B. Imaging Modalities Overview C. Atlas GoalsII. Malformations of Cortical Development (MCDs) A. Focal Cortical Dysplasia (FCD) B. Neuronal Migration Disorders: Heterotopias C. Polymicrogyria D. SchizencephalyIII. Mesial Temporal Sclerosis (MTS) IV. Neoplastic Origins A. Dysembryoplastic Neuroepithelial Tumor (DNET) B. Other Low-Grade Tumors V. Vascular Malformations A. CavernomasVI. Temporal Evolution of Imaging VII. Principles of Interpretation & Accuracy A. Modality Strengths & Limitations VIII. Visual Atlas of Imaging Findings IX. Conclusion: Empowering Diagnosis & Management.

NREE-91 HIGH-GRADE GLIOMAS OF THE YOUNG ADULT: CONVENTIONAL AND ADVANCED NEUROIMAGING WITH HISTOLOGICAL CHARACTERISTICS

Bernardo C. Teixeira, MD, PhD (*Presenter*)
Joao Nadal (*Abstract Co-Author*)
Joao V. de Oliveira Souza, MD (*Abstract Co-Author*)
Leonardo Kami, MD (*Abstract Co-Author*)
James H. Yared, MD (*Abstract Co-Author*)
Bruno A. Telles, MD (*Abstract Co-Author*)
Marcela Santos Cavalcanti (*Abstract Co-Author*)
Erasmo Barros Da Silva Junior (*Abstract Co-Author*)
Ricardo Ramina (*Abstract Co-Author*)

TEACHING POINTS

High-grade gliomas in adolescents and young adults are aggressive diffusely infiltrating brain tumors. Under the 2021 WHO classification, adult-type diffuse gliomas include astrocytomas (IDH-mutant) and glioblastomas (IDH-wildtype), as well as oligodendrogliomas (IDH-mutant, 1p/19q-co-deleted). In young adults, On MRI these tumors are T1-hypointense, T2/FLAIR-hyperintense, often with irregular enhancement, necrosis and surrounding edema. A classic MRI clue is the T2-FLAIR mismatch sign which is highly specific for IDH-mutant, 1p/19q non-codeleted astrocytoma.

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1. Advanced MRI Perfusion shows elevated rCBV in high-grade regions, reflecting neovascularity. DWI often reveals the foci of restricted diffusion in densely cellular tumor areas. Spectroscopy shows markedly increased choline and reduced N-acetylaspartate in high-grade tumors, often with lactate/lipid peaks; a high Cho/Cr ratio and presence of lactate/lipid peak strongly favor anaplastic glioma over low-grade. 2. Histological/Molecular Features IDH1/2 mutation is a hallmark of “lower-grade” adult gliomas; IDH-mutant astrocytomas often harbor concurrent ATRX loss and TP53 mutation, while 1p/19q co-deleted tumors have intact ATRX and TERT promoter mutations. IDH-wildtype high-grade gliomas frequently show EGFR amplification, +7/-10 and methylated MGMT promoter. 3. Diagnostic/Prognostic Relevance Diffuse midline gliomas with H3 K27-alteration occur in midline structures of younger patients. Overall, IDH-mutant gliomas have significantly longer survival than IDH-wildtype; for example, IDH-mutant “glioblastomas” fare much better than true IDH-wild glioblastoma.

NREE-92 DECODING STROKE MIMICS: WHEN IMAGING TELLS A DIFFERENT STORY

Zainab Salman, MD (*Presenter*)
Jasmina Boban, MD,PhD (*Abstract Co-Author*)
Sarah Salman Siddiqui (*Abstract Co-Author*)

TEACHING POINTS

1. Revise the imaging findings in acute, subacute and chronic ischemic stroke on non enhanced CT and MRI. 2. Understand the variety of pathologies that may present as stroke mimics. 3. Classify stroke mimics based on imaging patterns and recognize their key imaging findings. 4. To improve the performance of the Radiologist in stroke mimic scenarios.

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Imaging Pattern-Based Approach Through Cases: 1. Regional gray and white matter: Seizures and post ictal deficits, Migraine, HSV encephalitis, Venous thrombosis, Hypoglycemia, Tumor, MELAS 2. Cortical and deep gray matter: HIE, Hepatic encephalopathy, CJD, Wernicke's encephalopathy. 3. Deep gray matter: CO poisoning, extrapontine myelinolysis, CJD, Nonketotic Hyperglycemia, Venous thrombosis, Wernicke's. 4.White matter: CADASIL, Susac's, demyelination, metronidazole toxicity, Heroin leukoencephalopathy. 5.Watershed zones: RCVS, PRES, Moya-Moya. 6.Scattered Foci: Fat emboli, Diffuse axonal injury, Embolic infarcts, Metastasis. 7.Corpus Callosum: CLOCCs, Seizures, Marchiafava-Bignami.

NREE-93 THE CEREBELLAR PATHWAYS: DIFFERENTIAL DIAGNOSES OF MIDDLE CEREBELLAR PEDUNCLE ABNORMALITIES

Manoel Barbosa, MD (*Presenter*)
Beatriz Helena Maia Tourao (*Abstract Co-Author*)
Leticia Victorazzo Louzada, MD (*Abstract Co-Author*)
Narriman P. Hazime, MD (*Abstract Co-Author*)
Mauricio Pedreira, MD (*Abstract Co-Author*)
Henrique Scalet (*Abstract Co-Author*)
Isis Prado (*Abstract Co-Author*)
Angelo C. Duarte, MD (*Abstract Co-Author*)
Felipe T. Pacheco, MD, PhD (*Abstract Co-Author*)
Thiago Luiz P. Scoppetta, MD (*Abstract Co-Author*)
Lazaro F. Amaral, MD (*Abstract Co-Author*)
Renato Hoffmann Nunes, MD, MBA (*Abstract Co-Author*)
Antonio J. Da Rocha, MD, PhD (*Abstract Co-Author*)
Antonio Carlos M. Maia JR (*Abstract Co-Author*)

TEACHING POINTS

This educational exhibit aims to provide a comprehensive review of conditions affecting the middle cerebellar peduncles (MCPs) and their neuroimaging characteristics.- To review the anatomy and function of the middle cerebellar peduncle. - To present the neuroimaging features and specific aspects of various differential diagnoses involving the MCPs.

TABLE OF CONTENTS/OUTLINE

Anatomy and function of the middle cerebellar peduncle. 1. Degenerative Diseases a. Multiple system atrophy - cerebellar type (MSA-C) b. Spinocerebellar ataxias (SCAs) c. Fragile X-associated tremor/ataxia syndrome (FXTAS) 2. Demyelinating conditions a. Myelin Oligodendrocyte Glycoprotein Antibody-associated Disease (MOGAD) b. Multiple Sclerosis (MS) c. Adrenoleukodystrophy (ALD) d. Behçet’s Disease 3. Infectious diseases a. Neurotuberculosis b. Progressive multifocal Leukoencephalopathy (PML) c. Granule cell neuronopathy caused by JC virus 4. Neoplastic conditions a. Gliomas b. Medulloblastoma c. Lymphoma d. Metastases 5. Vascular conditions a. Posterior reversible encephalopathy syndrome (PRES) b. Inflammatory vasculopathy c. Ichemia 6. Toxic and metabolic alterations a. Wilson’s Disease b. Marchiafava-Bignami c. Chemotherapic neurotoxicity

NREE-94 INTRATUMORAL ONCOLYTIC VIROTHERAPY FOR DIFFUSE PEDIATRIC HIGH-GRADE GLIOMAS

Carmen Mbongo, MD (*Presenter*)
Marta Calvo-Imirizaldu, MD (*Abstract Co-Author*)
Pablo D. Dominguez, MD (*Abstract Co-Author*)
Reyes M. Garcia-Eulate (*Abstract Co-Author*)

TEACHING POINTS

• Oncolytic viruses selectively replicate within tumor cells, promoting immunogenic cell death and stimulating antitumor immune responses.• This therapeutic approach offers a promising strategy for diffuse pediatric high-grade gliomas , which are characterized by infiltrative growth, limited treatment options, and unfavorable prognosis.• MRI plays a critical role in identifying and characterizing treatment-related changes and tumor response assessment in patients undergoing intratumoral oncolytic virotherapy.

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Oncolytic virotherapy is an emerging treatment for diffuse pediatric high-grade gliomas , aggressive tumors with limited response to standard therapies. Intratumoral delivery , performed via neuronavigation-guided injection, enhances local viral concentration and bypasses systemic barriers. MRI is central to evaluating treatment response and post-infusion changes . This exhibit reviews the rationale and imaging considerations of intratumoral oncolytic virotherapy, focusing on adenoviral-based agents. A dedicated MRI protocol includes baseline scans, immediate post-infusion imaging, and serial follow-up every four weeks with T2, FLAIR, DWI, and contrast-enhanced T1 sequences. Response is assessed using iRANO/RAPNO criteria, based on T2/FLAIR signal in non-enhancing tumors.Common findings include stable or decreasing hyperintensity, tumor volume reduction, and transient enhancement along the cannula tract. Accurate interpretation is essential to avoid misclassification of expected post-treatment changes. MRI thus plays a key role in guiding clinical decisions in this context.

NREE-95 GREEN MRI FOR NEUROIMAGING: FOLLOW-UP OF BRAIN TUMORS BY NON-CONTRAST SEQUENCES

Kazuhiro Tsuchiya, MD, PhD (*Presenter*)
Miho Gomyo (*Abstract Co-Author*)
Shichiro Katase (*Abstract Co-Author*)
Kenichi Yokoyama, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To learn the basic concepts of “green” MRI. 2. To learn whether contrast agents are needed when using MRI to follow-up brain tumors. 3. To know what kinds of brain tumors can be followed up by non-contrast MRI and their recommended scan protocols.

TABLE OF CONTENTS/OUTLINE

1. Basic issues of green MRI, including reduced use of Gd-based contrast agents (GBCAs), reduced electric power consumption, reduced waste materials, and so on. 2. Currently known issues of negative environmental impacts of GBCAs. 3. What kinds of brain tumors can be followed up with non-contrast MRI and what are their recommended scan protocols? 4. Presentation of clinical cases followed up by non-contrast MRI. 5. Additional discussion on current limitations as well as future directions.

NREE-96 ASSESSMENT OF HEMODYNAMICS OF VARIOUS INTRACRANIAL VASCULAR AND NEOPLASTIC LESIONS BY SUPER-SELECTIVE PSEUDO-CASL TECHNIQUE

Kazuhiro Tsuchiya, MD, PhD (*Presenter*)
Miho Gomyo (*Abstract Co-Author*)
Keita Fukushima (*Abstract Co-Author*)
Kenichi Yokoyama, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To learn the basic concepts and technical aspects of the super-selective pseudo-continuous arterial spin labeling (ss-pCASL) technique. 2. To learn the clinical significance of assessing hemodynamics of cerebral vascular and neoplastic lesions supplied by multiple arterial systems. 3. To learn through case studies what types of cerebrovascular and neoplastic lesions can benefit from ss-pCASL.

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1. Basic technical issues of CASL and ss-pCASL. 2. What kinds of cerebral vascular lesions develop arterial blood supply by different flow systems from normal status? 3. What kinds of brain tumors develop arterial blood supply by multiple blood flow systems? 4. Presentation of clinical cases whose hemodynamic status is effectively visualized by ss-pCASL. 5. Additional discussion on current limitations as well as future directions.

NREE-97 BEYOND FEVER: MRI INSIGHTS INTO SCRUB TYPHUS-RELATED CNS MANIFESTATIONS

Shalini Bangalore Suresh JR, MBBS, MD (*Presenter*)

TEACHING POINTS

1.Scrub typhus is a significant but often underrecognized cause of CNS infection in endemic regions, presenting with varied neurological symptoms and imaging patterns. 2.Scrub typhus typically presents with fever and altered sensorium, often accompanied by thrombocytopenia (low platelet count), elevated liver transaminases (LFT derangement), splenomegaly, and sometimes pleural effusions. 3.Key MRI findings include: Leptomeningeal enhancement (55%), Cerebellitis (16), White matter changes, Rhombencephalitis, encephalitis, Cranial nerve enhancement and Acute Necrotising Encephalopathy (ANE) like presentation. 4.CT scan findings (where available) shows diffuse cerebral edema, hypodensities in white matter regions and cerebellum, subtle meningeal enhancement (best appreciated post-contrast). 5.Early recognition of these patterns, alongside supportive lab findings, allows prompt initiation of doxycycline, substantially reducing morbidity and mortality.

TABLE OF CONTENTS/OUTLINE

Introduction Epidemiology & diagnostic challenges of scrub typhus neuroinfection. Methods Retrospective review of 36 seropositive cases (mean age 30 y) using 1.5T/3T MRI and CT. Imaging Spectrum Leptomeningitis Cerebellitis (DWI & ASL hyperperfusion) Deep white matter hyperintensities Rhombencephalitis (pons/MCP) Cranial nerve enhancement Acute necrotizing encephalopathy Case Gallery Annotated high-yield MRI examples. Radiologist’s Pearls Key diagnostic tips & pitfalls. Conclusion MRI’s crucial role in febrile encephalopathy; one of the largest scrub typhus neuroimaging cohorts

NREE-98 COLOR-CODED MULTIPHASIC CTA OF THE BRAIN: WHAT THE RADIOLOGIST NEEDS TO KNOW

Saravana Kumar Swaminathan, MBBS, FRCR (*Presenter*)

TEACHING POINTS

Color-coded multiphase CT angiography (mCTA) is an innovative software tool that synthesizes information from all mCTA phases into a unified dataset and provides color-coded visualization based on contrast arrival timing in the intracranial vasculature. Through carefully selected case illustrations the author will provide multiple color-coded mCTA examples demonstrating their various clinical applications. Corresponding digital subtraction angiograms and follow-up MR images will also be included to enhance understanding.

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The purpose of this exhibit is to demonstrate: The fundamental principles of acquisition, processing and interpretation of color-coded multiphasic CTA images of the brain The clinical applications of this imaging modality in stroke assessment including, a. Rapid detection of large vessel occlusions and multifocal occlusions across different vascular territories, b. Enhanced detection of medium and distal vessel occlusions, c. Efficient assessment of the collateral status and d. Differentiation acute thrombotic occlusions from chronic atherosclerotic stenotic occlusions The primary limitations of color-coded multiphasic CTA and compare with other imaging modalities used in acute stroke assessment such as routine CT angiogram and CT perfusion

NREE-99 ADVANCED NEUROVASCULAR EVALUATION WITH BLACK BLOOD MRI: DIAGNOSTIC APPLICATIONS OF VESSEL WALL IMAGING AND CURVED MULTIPLANAR RECONSTRUCTION

Elham Tavakkol, MD (*Presenter*)
Laura A. Ocasio, MD, MSc (*Abstract Co-Author*)
Konstanze Guggenberger, MD (*Abstract Co-Author*)
Juan Ricardo, MD (*Abstract Co-Author*)
Roy Riascos, MD, MBA (*Abstract Co-Author*)
David E. Timaran Montenegro, MD (*Abstract Co-Author*)

TEACHING POINTS

Review the use of Black Blood MRI (BB-MRI) in vessel wall imaging (VWI) for neurovascular evaluation. Demonstrate clinical applications in intracranial and extracranial distinguishing vascular pathologies. Highlight curved multiplanar reconstruction as a valuable postprocessing technique. Recognize common pearls and pitfalls in image interpretation of BB-MRI.

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1. Introduction to BB-MRI: Introduce BB-MRI as a key tool for neurovascular imaging. Emphasize technical aspects such as 3D acquisition, effective flow suppression, optimized contrast weighting, high spatial resolution, and compressed sensing to improve image quality. 2. Differentiation of Vascular Pathologies with VWI: Illustrate diagnostic utility in identifying intracranial atherosclerotic disease, vasculitis, arterial dissection, Moyamoya disease, saccular aneurysms, vasospasm, and giant cell arteritis. 3. New MRI Techniques: Describe 3 curved multiplanar reconstructions as a postprocessing method for quantitative analysis of vessel wall remodeling. Demonstrate its use with fly-through technique for visualization of vessel morphology. 4. Pitfalls and Pearls in Interpretation: Review common challenges, including flow artifacts, venous and vasa vasorum enhancement, post-treatment changes, leptomeningeal enhancement, organized thrombus with recanalization, and findings mimicking pathology in Moyamoya disease.

NREE-100 SPONTANEOUS INTERNAL CAROTID ARTERY DISSECTION: FROM PATHOPHYSIOLOGY TO CTA/MRI FINDINGS — A PRACTICAL GUIDE

Sergio Colomer Rosell, MD (*Presenter*)

TEACHING POINTS

Spontaneous internal carotid artery (ICA) dissection affects the arterial wall, potentially causing local symptoms or neurological deficits. Although uncommon, it accounts for up to 20% of strokes in young adults. It can occur in any ICA segment, but is more frequent in the extracranial portion. Two main mechanisms are described: intramural hematoma from vasa vasorum rupture, or intimal tear with blood entering the wall, both resulting in arterial wall layer separation. Based on blood location,

dissection is classified as subintimal—stenotic and eccentric lumen—or subadventitial—dissecting aneurysm. Historically, digital subtraction angiography (DSA) was the diagnostic gold standard. Currently, CT angiography (CTA) and MRI are preferred due to their non-invasive nature and better availability. CTA plays a key role in acute settings with high-resolution vessel wall assessment. MRI, particularly T1 fat-saturated sequences, directly depicts intramural hematoma.Imaging findings often reflect pathophysiology. The most frequent finding is an irregular, stenotic, and eccentric lumen which -when identified in its typical location- allows for a confident diagnosis. Other findings include the intimal flap, double lumen, or "target sign". Therefore, understanding the pathophysiology is essential for accurate recognition on CTA and MRI, the most commonly used modalities in clinical practice.

TABLE OF CONTENTS/OUTLINE

Introduction. Risk Factors and symptoms. Pathophysiology: - Dissection. - Stroke. Imaging Findings and Correlation: - CTA. - MRI. Imaging Evolution. Differential Diagnosis.

NREE-101 REVEALING THE LANGUAGE NETWORK OF THE HUMAN BRAIN AND ASSOCIATION WHITE MATTER PATHWAYS WITH DUAL LANGUAGE AND LIMBIC FUNCTIONS

Nithya Narayana (*Presenter*)
Anusha Gandhi, MD (*Abstract Co-Author*)
Arash Kamali, MD (*Abstract Co-Author*)

TEACHING POINTS

The purposes of the exhibit are: 1. Expanding beyond the dual-stream model of language processing as advances in fMRI and DTI have revealed a more interconnected system. 2. Presenting a seven-language center-based approach to illustrate the integration of language and cognitive processing. 3. Association of the language pathways with the limbic system may explain language disorders with emotional comorbidities. 4. Visualizing neural connections highlights the importance of integrating language, executive function, and emotion in understanding speech related disorders.

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1. Background a. Dual-stream model b. Advances in neuroimaging and white matter mapping. 2. Introduction a. Justification for a center-based approach in language processing. b. Bridging language and limbic system functions 3. Language Centers 4. Association White Matter Tracts 5. Implications for Language Disorders a. Impact of white matter integrity on language recovery (stroke-induced aphasia and rehabilitation). 6. Future Directions and Clinical Applications a. The interwoven nature of language and emotion points towards a more holistic approach to understand and treating language disorders.

NREE-102 RADIOLOGIC ASSESSMENT OF POSTOPERATIVE LUMBAR SPINE

Laura Oleaga, MD, PhD (*Presenter*)
Camilo Pineda Ibarra, MD (*Abstract Co-Author*)
Miren L. Olondo, MD (*Abstract Co-Author*)
Carlos Cardenal (*Abstract Co-Author*)
Valeria Richart Sierra, MD (*Abstract Co-Author*)
Nuria Bargallo, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

To review the fundamental principles in the evaluation of the postoperative spine, including key anatomical and radiological findings. To understand and optimize the assessment of the instrumented spine, focusing on imaging modalities, hardware positioning, and alignment. To identify and analyze common postoperative complications, including infection, hardware failure, pseudarthrosis, and adjacent segment disease.

TABLE OF CONTENTS/OUTLINE

Introduction Overview of lumbar spine surgeryImportance of postoperative evaluation Surgical Techniques Decompressive procedures (herniated disc, spinal stenosis)Deformity correction (degenerative disc disease, spondylolisthesis, trauma)Vertebral body replacement (tumour, trauma, infection) Postoperative Findings in Lumbar Spine Surgery Normal Postoperative Changes Soft Tissue Changes Edema in paraspinal muscles or surgical planes Enhancement of the annulus fibrosus Bone Changes Vertebral endplate enhancement Bone remodeling around screw tracts or fusion sites Presence of bone graft material Surgical Hardware Screws, rods, interbody cages (expected appearance) Instrumented Spine Complications Early Complications Implant malpositioning Postoperative collections (hematoma, seroma) Pseudomeningocele Discitis, osteomyelitis, epidural abscess Late Complications Implant loosening or fracture Sterile radiculitis or arachnoiditis Recurrent disc herniation Epidural fibrosis Spondylolysis and spondylolisthesis Degenerative changes at adjacent segments Spondylodiscitis Conclusion Crucial role of imaging in the management of treated patients

NREE-103 WHEN NEURONS MISFIRE: MAPPING A PICTORIAL JOURNEY OF SEIZURE PATHOLOGIES

Gabriel Frattallone, MD (*Presenter*)
Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Ricardo Vargas Figueroa, MD (*Abstract Co-Author*)
Joaquin Ruiz-Lopez, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review key anatomical structures involved in epilepsy - Use a map analogy with engaging imaging to illustrate seizure causes and locations - Discuss causes, imaging findings (MRI/CT), and clinical relevance in intractable epilepsy

TABLE OF CONTENTS/OUTLINE

- Introduction - Objectives - Anatomy Review - Cases: Developmental, Epileptogenic Tumors, Gliosis/Scarring, Neurocutaneous Syndromes, Miscellaneous - Conclusion Epilepsy is a complex disorder with varied causes. Intractable epilepsy often stems from identifiable developmental or structural abnormalities that may be subtle and easily missed. This exhibit uses a visual map analogy —brain parenchyma as land, cerebrospinal fluid as sea—to enhance comprehension and memory of seizure-related pathologies. We will present real cases from our institution, categorized as: - Developmental Focal cortical dysplasia, heterotopia, polymicrogyria, hemimegalencephaly, schizencephaly - Epileptogenic Tumors Ganglioglioma, DNET, pleomorphic xanthoastrocytoma, hypothalamic hamartoma - Gliosis and Scarring - Neurocutaneous Syndromes: Sturge-Weber, tuberous sclerosis, neurofibromatosis 1, Von Hippel-Lindau - Miscellaneous: Rasmussen encephalitis, cavernous hemangioma By recognizing these entities, radiologists can improve diagnostic accuracy and patient outcomes.

NREE-104 BRAINS BEHIND THE NAMES: EPONYMS IN NEURORADIOLOGY

Gabriel Frattallone, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Christopher Quintana (*Abstract Co-Author*)
Maria Dossantos Torres (*Abstract Co-Author*)
Joaquin R. Ortiz-Cruz, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Provide a comprehensive review of frequently encountered neurology pathologies emphasizing their clinical presentation, historical significance, and key imaging features. 2. Use a timeline for visual representation, and facilitate the study and recognition of commonly used eponyms in neurology medicine encountered at our

facility. 3. Illustrate the critical imaging features of these pathologies, focusing on the role of different modalities (X-rays, CTs, and MRIs) in accurately diagnosing and documenting these pathologies for effective treatment and management.

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Objectives III. Timeline IV. Cases - Etiology and historical context, clinical manifestation, focused anatomical diagrams V. Conclusion Eponyms are common in medical language, though there is debate—some advocate for their abandonment—others believe eponyms enhance memorability, encapsulate complex concepts, and foster appreciation for medical history. This exhibit presents a timeline of over 20 neuroradiology-related eponyms encountered at our institution, illustrated through real cases using X-rays, CTs, and MRIs. Each eponym and associated pathology is discussed to emphasize its clinical relevance and educational impact. By combining history with diagnostic imaging, this timeline-based approach aims to engage medical students, residents, and imaging specialists, reinforcing key concepts and advancing radiologic education.

NREE-105 THE DEEP GRAY… MATTERS: A PUZZLE WORTH SOLVING

Gabriel Frattallone, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Santiago A. Saldana Mendez, MD, BS (*Abstract Co-Author*)
Maria Dossantos Torres (*Abstract Co-Author*)
Andrea Natalia Viruet Pantoja, MD (*Abstract Co-Author*)
Carlos I. Llorens, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review deep gray matter anatomy - Describe common pathologies using a puzzle piece analogy to aid visual learning - Illustrate key findings with CTs and MRIs from our institution

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Objectives III. Anatomy of the deep gray matter IV. Cases - Toxic : Carbon Monoxide, Ethylene Glycol - Vascular : Hypoxic-Ischemic Injury, Infarct, Internal Cerebral Vein Thrombosis - Infectious : Toxoplasmosis - Metabolic/Genetic Propionic Acidemia, Pyruvate Dehydrogenase Deficiency, MSUD, Fahr Disease, Hypoparathyroidism, Iron deposition - Hemorrhagic V. Imaging: CT, MRI VI. Pathophysiology VII. Clinical Features VIII. Treatment IX. Conclusion --- The deep gray matter—basal ganglia and thalami—is central to motor, sensory, and cognitive functions. This exhibit uses a puzzle analogy, presenting each nucleus as a key piece of the brain's framework. We review toxic, vascular, infectious, metabolic, and hemorrhagic pathologies using CT and MRI cases from our institution. This integrated approach aids trainees and radiologists in practice in mastering anatomy, pathology, and imaging findings to improve diagnostic accuracy.

NREE-106 ARTERIAL DETOURS: A COMPREHENSIVE LOOK AT INTRACRANIAL VASCULAR VARIANTS

Gabriel Frattallone, MD (*Presenter*)
Alejandra Cardona Del Valle, MD (*Abstract Co-Author*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Juan Gonzalez, MD (*Abstract Co-Author*)
Lyan Cabello Ballester (*Abstract Co-Author*)
Emilio Cepeda (*Abstract Co-Author*)
John Melendez Moreno (*Abstract Co-Author*)
Mario J. Polo, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review the anatomy of the intracranial arterial system. - Use a road analogy to explain arterial variants and their embryological development. - Present real case examples of variants using CTA, MRA, and DSA.

TABLE OF CONTENTS/OUTLINE

- Introduction - Objectives - Anatomy Review - Intracranial Arterial Variants: - Aberrant, fenestration, azygos, accessory, persistent primitive, duplication, and extracranial location (anterior & posterior circulation) - Imaging Modalities - Conclusion Intracranial artery variants result from deviations in embryologic development and vascular remodeling. Often asymptomatic, their detection is key for accurate diagnosis and avoiding complications. This exhibit reviews common and rare variants using real cases imaged with CTA, MRA, and DSA. A road network analogy is used for clarity: persistent primitive arteries are like old roads still in use; fenestrations and duplications act like bridges rerouting traffic. By blending real imaging and relatable analogies, we offer a practical and memorable approach to understanding these variants.

NREE-107 FAT EMBOLISM SYNDROME VS ITS MIMICS: A DIAGNOSTIC APPROACH

Diana Kokash, MD (*Presenter*)

TEACHING POINTS

Fat Embolism Syndrome (FES) should be suspected in patients presenting with acute pulmonary, neurological, or cutaneous symptoms within 12 to 72 hours following traumatic skeletal injuries. While imaging plays a supportive role, diagnosis requires integration of clinical context—specifically recent trauma and signs of respiratory or neurologic compromise. Initial CT brain may appear normal; follow-up MRI within 24-48 hours is often necessary to detect evolving findings. Differentiating cerebral fat embolism from other differentials such as diffuse axonal injury relies heavily on clinical history and injury mechanism. Imaging findings in FES may be transient, underscoring the importance of early recognition to improve patient outcomes.

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Introduction, pathophysiology, and diagnostic challenges. Chest imaging findings, brain MRI patterns and its subtypes. case examples, chest differentials (ARDS, septic emboli) and brain differentials (diffuse axonal injury, septic emboli, hypoxic-ischemic and hypoglycemic encephalopathy, toxic and delayed hypoxic leukoencephalopathy). A comparative summary table highlights distinguishing imaging features. Diagnostic criteria including Gurd's and Schonfeld's systems are reviewed, concluding with management strategies and key learning points.

NREE-108 AMYLOID RELATED IMAGING ABNORMALITIES (ARIA): NEUROIMAGING INSIGHTS IN ALZHEIMER'S DISEASE-MODIFYING THERAPEUTICS

Michelle Chen, MD (*Presenter*)

TEACHING POINTS

1. Anti-amyloid (Aß) monoclonal antibodies may slow early Alzheimer's disease (AD) progression, but they can pose significant risks, often identified on MRI as amyloid related imaging abnormalities (ARIA). 2. Anti-Aß therapies disrupt vascular permeability and exacerbate inflammatory responses, which serves as the underlying pathophysiology of ARIA-E (edema) and ARIA-H (microhemorrhage) subtypes. 3. Certain risk factors are associated with ARIA-E and ARIA-H development, such as APOE e4 status and baseline cerebral amyloid angiopathy (CAA) or multiple microhemorrhages, necessitating MRI-based pre-treatment risk stratification to exclude high-risk patients. 4. Radiologists play a pivotal role in the safe and effective use of anti-Aß therapies, from baseline risk assessment and protocol optimization to early ARIA detection, standardized reporting, and multidisciplinary care coordination. 5. Familiarity with ARIA mimics (ex: subarachnoid hemorrhage, posterior reversible encephalopathy) and potential pitfalls is essential to avoid misdiagnosis and inappropriate therapy discontinuation. 6. Emerging AI tools can automate ARIA grading, reducing interobserver variability.

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1. Overview of ARIA as a critical adverse event in AD therapies 1a) Pathophysiology and risk factors 1b) Features of ARIA subtypes 2. Imaging protocols 2a) MRI sequences and timing 2b) Grading severity 3. Clinical management and multidisciplinary collaboration 4. Emerging AI integration for automated ARIA detection

NREE-109 AUTOSOMAL DOMINANT HEREDITARY SMALL VESSEL DISEASES: A RADIOLOGIC REVIEW WITH ILLUSTRATIVE CASES OF CADASIL AND CARASAL

Maria J. Redondo, MD (*Presenter*)
Marina Daniela Sarmiento, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit's purpose is to review the spectrum of hereditary small vessel diseases (hSVDs), a heterogeneous group of disorders that affects the microvasculature, leading to leukoencephalopathy, lacunar infarcts and cognitive decline. With a description on its phenotype, genotype, pathogenesis and imaging methods and diagnoses, doing emphasis on imaging patterns of each lesion involving cerebral small vessel disease and white matter lesions.

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CADASIL - CARASAL - HTRA1-SVD - Pathogenesis - Cerebral imaging - Neuropathology - Leukoencephalopathy - Stoke- Microangiopathy - Hereditary small vessel disease- Genotype - Diagnosis- Differential diagnosis

NREE-110 DUAL ENERGY CT (DECT) IN THE ASSESSMENT OF HEMORRHAGIC COMPLICATIONS AFTER ENDOVASCULAR THROMBECTOMY (EVT)

Giovanni Furlan, MD (*Presenter*)
Manuel Belgrano, MD (*Abstract Co-Author*)
Maria A. Cova, MD (*Abstract Co-Author*)

TEACHING POINTS

To illustrate the role of Dual Energy Computed Tomography (DECT) in detecting hemorrhagic complications after endovascular thrombectomy (EDT).

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DECT is an advanced CT technique that allows the identification of structures presenting different elemental compositions that may have similar attenuation values at conventional unenhanced CT scans. One of its major applications is its role in distinguishing blood and iodine contrast, both of which appear hyperattenuating at standard unenhanced CT scans. In absence of contraindications and when performable, EDT is the treatment of choice in patients with acute ischemic stroke. Considering its invasiveness, EDT has a significant risk of hemorrhagic complications. Still, at CT scans performed after EDT, it is not unusual to observe non-hemorrhagic hyperattenuating areas representing iodine contrast extravasation due to hematoencephalic barrier damage; these two conditions are not easily distinguishable at conventional CT scans, while they can be easily differentiated at DECT since blood and iodine contrast agents show different attenuation characteristics at different energy values. The capability of obtaining early differentiation between hemorrhagic complications and iodine contrast extravasation in patients who underwent EDT can help the neurologist in the correct clinical management of the patient (e.g., to allow early administration of antiplatelets or anticoagulants in order to reduce the risk of reocclusion). A wider use of DECT in patients who underwent EDT is therefore desirable both to obtain early diagnosis of hemorrhagic complications and not to postpone antiplatelet/anticoagulant treatment.

NREE-111 INTERPRETING COMPUTED TOMOGRAPHY PERFUSION OF THE BRAIN - A COMPREHENSIVE GUIDE FOR STROKE MIMICS AND PITFALLS

Otavio Augusto Ferreira Dalla Pria, MD (*Presenter*)
Laiz Godoy, MD (*Abstract Co-Author*)
Nitesh Shekhrajka, MD,MBBS (*Abstract Co-Author*)
Daniel Gewolb, MD (*Abstract Co-Author*)
Daniella Karassawa Zanoni, MD (*Abstract Co-Author*)
Thomas Reith, MD (*Abstract Co-Author*)
Joan E. Maley, MD (*Abstract Co-Author*)
Robert Kurtz (*Abstract Co-Author*)
Minako Hayakawa, MD (*Abstract Co-Author*)

TEACHING POINTS

Stroke affects hundreds of thousands of Americans every year and is considered a medical emergency due to its time-sensitive therapeutic plan. In this setting, proper imaging evaluation is crucial to determine the appropriateness of interventional treatment. Radiologists play a pivotal role in this scenario by analyzing cerebral hemodynamics and helping neurologists/neuro-interventionists select patients with at-risk but still viable brains through advanced imaging techniques. In this context, Perfusion computed tomography (CTP) of the brain is a reliable method of evaluating acute stroke. Sometimes, CTP is the first brain imaging in the patient's life, and considering that time is vital for decision-making, it's essential to be aware of potential pitfalls and differentials for CTP findings. Knowledge of imaging patterns and potential pitfalls of this technique is essential to the radiologist since not all perfusion abnormalities happen due to stroke.

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1. Summary of the basics of the imaging technique and applicability of CTP. 2. Potential pitfalls with imaging acquisition and underlying patient conditions that may affect results. 3. Illustration of several cases demonstrating the use of CTP in the evaluation of acute stroke. 3. Case series showing differential diagnosis that caused abnormal CTP findings to mimic or mask stroke, and 4. Conclusion and take-home messages.

NREE-112 2024 UPDATED CRITERIA FOR MULTIPLE SCLEROSIS: KEY TAKEAWAYS FOR RADIOLOGISTS

Edgar A. Zamora, MD (*Presenter*)
Angela M. Sosa, MD, MSc (*Abstract Co-Author*)
Carlos Zamora, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Review key imaging updates in the 2024 McDonald Criteria for multiple sclerosis (MS). Describe the inclusion of the optic nerve as a fifth topography for dissemination in space (DIS). Highlight the emerging roles of the central vein sign (CVS) and paramagnetic rim lesions (PRLs). Outline new diagnostic pathways for radiologically isolated syndrome (RIS). Summarize the use of kappa free light chains (kFLCs) and oligoclonal bands (OCBs).

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The 2024 McDonald Criteria improve diagnostic sensitivity for early and atypical MS by incorporating advanced imaging and CSF biomarkers. The optic nerve is now the fifth region for demonstrating DIS. Diagnosis can be made with DIS and either OCBs or kFLCs, without requiring dissemination in time (DIT). RIS may fulfill MS criteria when DIS is present with DIT, positive CSF, or =6 CVS-positive lesions. Criteria apply to both relapsing and progressive forms, with added consideration for age and vascular risk. CVS (=6 lesions) and PRLs (=1 lesion) improve diagnostic confidence. SWI or T2* sequences at =3T are recommended. RIS refers to incidental MS-typical lesions in asymptomatic individuals. Radiologists must recognize key imaging features and apply optimized protocols, as the revised criteria place greater diagnostic emphasis on imaging and fluid biomarkers.

NREE-113 IMAGING OF VISUAL DISORDERS: CORRELATION OF RADIOLOGIC AND SURGICAL FINDINGS

Fumiyo Higaki (*Presenter*)
Jun Haruma (*Abstract Co-Author*)
Masafumi Hiramatsu (*Abstract Co-Author*)
Joji Ishida (*Abstract Co-Author*)
Shota Tanaka (*Abstract Co-Author*)
Takao Hiraki, MD, PhD (*Abstract Co-Author*)
Takahiro Kitayama, MD, PhD (*Abstract Co-Author*)
Yusuke Matsui, MD, PhD (*Abstract Co-Author*)
Yoshihiro Otani (*Abstract Co-Author*)
Yuka Takahashi (*Abstract Co-Author*)

TEACHING POINTS

Objective This study provides an overview of visual disorders by correlating radiologic imaging findings with surgical perspectives, focusing on lesions along the visual pathway. Diseases are classified into three regions: Optic Nerve Level, Optic Chiasm and Tract Level, and Optic Radiation and Occipital Lobe Level. For each lesion, characteristic MRI and CT findings are described. In addition, angiographic findings and surgical observations are presented to enhance diagnostic and therapeutic understanding. Representative diseases for each region are selected to illustrate key imaging characteristics and surgical correlations, facilitating a comprehensive understanding of visual pathway disorders. The integration of radiologic and surgical findings provides valuable insights into the diagnosis and management of a wide spectrum of visual disorders.

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Optic Nerve Level Disorders Inflammatory: NMOSD(Neuromyelitis Optica Spectrum Disorder)MOGAD (Myelin Oligodendrocyte Glycoprotein Antibody- Associated Disease)Tumors : Optic nerve sheath meningioma, Optic nerve sheath schwannoma,glioma, malignant lymphoma Vascular: Ophthalmic artery aneurysm, venous malformations Bone lesions: Fibrous dysplasia, Osteosarcoma Other: IgG4-related disease Optic Chiasm and Tract Level Disorders Tumors: Pituitary Neuroendocrine Tumor, Craniopharyngiomas, Meningioma , Metastatic TumorVascular: Cerebral aneurysms and post-treatment complications Optic Radiation and Occipital Lobe Level Disorders Vascular: infarctions Tumors: gliomas, metastasisOther: PRES(posterior reversible encephalopathy syndrome)

NREE-114 FROM CLINIC TO PHYSICS: UNPACKING PERFUSION MRI IN DEPTH

Zhongwei Zhang, MD, PhD (*Presenter*)
Matthew F. Glasser, MD,PhD (*Abstract Co-Author*)
Liang Wang, MD (*Abstract Co-Author*)
Cyrus A. Raji, MD, PhD (*Abstract Co-Author*)
Tammie S. Benzinger, MD, PhD (*Abstract Co-Author*)
Joshua S. Shimony, MD, PhD (*Abstract Co-Author*)
Robert C. McKinstry III, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Perfusion MRI is a cornerstone in studying cerebral hemodynamics. This exhibit serves as a comprehensive bridge between clinical practice and the underlying physics, guiding learners through real-world cases to explore the full workflow of perfusion MRI—from image acquisition and post-processing to advanced analysis and clinical interpretation. We delve into state-of-the-art techniques, unpacking their physical foundations, mathematical models, and practical applications, while addressing common challenges with actionable solutions. Participants will deepen their understanding of key concepts such as contrast agent dynamics, deconvolution techniques, T1 and T2* relaxation effects, and non-contrast arterial spin labeling (ASL), ultimately enhancing their diagnostic acumen in neuroimaging.

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1. Overview of Perfusion MRI 2. Introduction to Perfusion MRI in Brain Studies 3. Clinical Relevance and Applications 4. Perfusion MRI methods and their added value 5. Dynamic Susceptibility Contrast (DSC)-MRI (T2*-Weighted) 1) Case-Based Learning & Discussion: Clinical Applications and Challenges 2) Physical Principles: Contrast Agents and Administration, Signal-to-Concentration Relationships, Deconvolution, GBCA Leakage effect and Correction 6. Arterial Spin Labeling (ASL)-MRI 1) Case-Based Learning & Discussion: Clinical Applications and Challenges; 2) Physical Principles: Non-Contrast ASL Techniques (PASL, CASL, PCASL, VS-ASL), Technical Considerations, and Data Acquisition; 3) Qualitative and Quantitative interpretation; 4) Emerging Techniques and Future Directions

NREE-117 IMAGING STRATEGIES FOR SELLAR ,SUPRASELLAR AND RARE SUPRASELLAR LESIONS RAD-PATH CORRELATION

Reefath Jabaraj, DMRD,MBBS (*Presenter*)
Krishnaveni V. Pillai, MBBS (*Abstract Co-Author*)
Madhura P. Ghate, MD,MD (*Abstract Co-Author*)

TEACHING POINTS

Rare sellar and suprasellar lesions, its imaging approach and how to differentiate familiarity with uncommon conditions may help clinician and radiologist in arriving at correct diagnosis imaging approach to common sellar and suprasellar pathologies

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introduction learning objectives anatomy of sella and suprasellar regioncommon pathologies involving sella and suprasellar region Brief description of uncommon pathologies Imaging approach: what radiologist and clinician wants to knowdifferential diagnosis case based approach take home points conclusion

NREE-118 PERSONALIZED TARGETING OF MR-GUIDED FOCUSED ULTRASOUND VIM THALAMOTOMY FOR ESSENTIAL TREMOR: OVERVIEW AND HOW WE DO IT

Toshio Yamaguchi, MD, PhD (*Presenter*)

TEACHING POINTS

1. Provide a comprehensive review of the targeting methods of MR imaging-guided focused ultrasound VIM thalamotomy (MRgFUS) for essential tremor (ET) 2. Describe how we plan and measure individually towards personalized targeting and lesion prediction at our site. 3. Increase awareness among radiologists to promote safe informed use of this relatively newer incisionless treatment in the brain

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1. What is ET? incidence, etiology, dentatorubrothalamic tract (DRTT) loop (Fig. 1) 2. Surgical treatment: radio-frequency (RF) ablation, MRgFUS and DBS. 3. MR neuroanatomy: Vim and cortico-spinal tract (CST) (Fig. 2) 4. Indirect targeting (Fig. 3) 5. Direct (image navigated) targeting (Fig.3) 1) VIM segmentation (THOMAS), 2) Tract-based targeting (DRTT, CST) 3) Use of CST as an anatomic landmark 6. Basic strategy at our site: Relieve distal tremor initially (posterolateral ventral area of VIM) followed by proximal tremor relief with consideration of VIM somatotopy (Fig.4) 7. How we do it towards personalized targeting 1) Obtain precise CST-weighted T2 orthogonal MR image individually (Fig. 5) 2) Measure posterior CST at AC-PC plane 3) Simulate tentative targeting on 3-D planes 4) And target using fusion tract with CST weighted image: on DRTT and off medial lemniscus (ML) 5) Evaluate real-time clinical response 8. Predict temperature raise and lesion shape with segmental CT analysis individually 9. Take-home messages: tailored therapy along with imaging the individual

NREE-119 THE SELLAR-SUPRASELLAR CONUNDRUM: IMAGING CLUES AND DIAGNOSTIC CHALLENGES OF UNUSUAL LESIONS

Suman T. Prabhakar, MD, FRCR (*Presenter*)
Nerses Nersesyan, MD (*Abstract Co-Author*)
Sushmitha Puttappa Shivagange, MBBS (*Abstract Co-Author*)
Paulo C. Puac Polanco, MD, MSc (*Abstract Co-Author*)
Maria Lucia Brun, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review rare atypical lesions of the sellar and suprasellar regions. 2. Highlight key CT and MRI imaging features that aid in narrowing differential diagnoses. 3. Discuss each pathology briefly with histopathological correlation

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The complex sellar-suprasellar region encompasses wide spetrum of pathologies. While pituitary adenomas remain the most commonly diagnosed lesion, other rare pathologies can mimic these benign masses both clinically and radiologically, leading to potential diagnostic challenges. MRI is the preferred imaging modality for accurate characterization of these lesions. This pictorial review presents a selection of histopathologically confirmed, rare sellar and suprasellar lesions using a structured, case-based approach. Each case is introduced with key imaging findings, followed by a discussion of relevant differential diagnoses, the final diagnosis, and a concise description of the pathology. Lesions Discussed Include Infectious/Inflammatory Lesions Tuberculosis Granulomatous hypophysitis Rosai-Dorfman disease Neoplastic Lesions Benign Tumors Pituicytoma Granular cell tumor Chordoid glioma Gangliocytoma Angiolipoma Choristoma Chordoid meningioma Malignant Tumors Glioblastoma multiforme SummaryRare sellar-suprasellar lesions, though accounting for less than 1% of cases, can closely mimic common pathologies like pituitary adenomas. This exhibit presents illustrative cases with key imaging features and histopathological correlations to aid accurate diagnosis. Recognizing imaging red flags and atypical patterns is essential to avoid misdiagnosis and ensure appropriate clinical management.

NREE-120 CLINICALLY RELEVANT ANATOMY OF THE BRAINSTEM, CEREBELLUM, AND THALAMUS: AN INTERACTIVE WEBSITE

Frank Salamone, MD (*Presenter*)
Noriko Salamon, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

We present a free neuroanatomy website designed to introduce clinically relevant anatomy of the brainstem, cerebellum, and thalamus using unique illustrations, annotated cross-sectional images, practice questions, and clinical cases with interactive components. Material is inspired by neuroanatomy lectures that have been refined over 20 years by a board certified neuroradiologist and delivered to medical students and trainees in radiology, neurology, and neurosurgery. The content is designed to build in complexity from a baseline of minimal pre-existing knowledge. For example, brainstem anatomy is organized in five levels of increasing complexity, beginning with the gross divisions of the brainstem and ending with more intricate and difficult to appreciate nuclei. Pathophysiology and functional surgical techniques, like deep brain stimulation, are used to reinforce the structure and location of clinically relevant structures. We hope that a motivated user who reviews the material will find value for both their understanding of neuroanatomy and the interpretation of neuroradiological studies.

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1. Thalamus a. Relevant nuclei b. Function c. Functional neurosurgery d. Vascular anatomy e. Clinical cases, bilateral thalamic lesions 2. Brainstem a. Levels 1-5 of brainstem sectional anatomy b. Clinical cases 3. Cerebellum a. Surface anatomy b. Nuclei c. Function d. Vascular anatomy f. Clinical cases

NREE-121 IMAGING THE EFFICACY AND SIDE EFFECTS OF CAR T-CELL THERAPY IN PEDIATRIC CANCER PATIENTS

Zahra Shokri Varniab, MD (*Presenter*)
Iryna Vasyliv, MD (*Abstract Co-Author*)
Sneha Ramakrishna (*Abstract Co-Author*)
Heike E. Daldrup-Link, MD (*Abstract Co-Author*)

TEACHING POINTS

CAR T-cell therapy is a transformative immunotherapy for pediatric patients with relapsed or refractory malignancies. Imaging plays a crucial role in evaluating treatment efficacy and detecting complications such as cytokine release syndrome (CRS) and immune effector cell-associated neurotoxicity syndrome (ICANS). Familiarity with characteristic imaging patterns allows radiologists to support clinical decision-making and optimize patient care.

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Introduction: Overview of CAR T-cell therapy, FDA-approved indications, and timeline from apheresis to infusion. Emphasis on radiologic checkpoints, including pseudoprogression and hyperprogression, typically seen on imaging within 6-12 weeks post-infusion. Imaging Efficacy: Role of imaging in identifying treatment response in hematologic malignancies and solid tumors, with emphasis on bone marrow and visceral organ changes. Imaging Side Effects: Imaging correlates of ICANS, including white matter changes and cerebral edema, as well as thoracic findings associated with CRS such as pleural effusions, atelectasis, cardiac inflammation. Management and Outcomes: Radiologic assessment supports decisions regarding escalation of therapy, and identification of treatment-related sequelae. Conclusion: Radiologists play a pivotal role in detecting complications and confirming therapeutic response to CAR T-cell therapy. Knowledge of imaging biomarkers can improve outcomes in pediatric cancer care.

NREE-122 NEXT-GEN MS IMAGING: CENTRAL VEIN SIGN AND PARAMAGNETIC RIM LESIONS IN THE UPDATED 2024 MCDONALD CRITERIA

Priscilla Stecher, MD, MBA (*Presenter*)
Yin-Chen Hsu, MD, MS (*Abstract Co-Author*)
Pascal Sati (*Abstract Co-Author*)
Daniel Ontaneda (*Abstract Co-Author*)
Daniel S. Reich, MD, PhD (*Abstract Co-Author*)
Marcel M. Maya, MD (*Abstract Co-Author*)
Quy Cao (*Abstract Co-Author*)
Matthew Schindler (*Abstract Co-Author*)
Russell Shinohara (*Abstract Co-Author*)
Jae W. Song, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

The diagnosis of multiple sclerosis (MS) is undergoing a transformative evolution. In 2024, revisions to the McDonald criteria redefined how clinicians will diagnose MS. The new criteria move beyond traditional temporal dissemination and incorporate new imaging biomarkers: the Central Vein Sign (CVS) and Paramagnetic Rim Lesions (PRLs). In this educational exhibit, we will discuss the central role of neuroimaging for MS and equip you with the knowledge to identify and report these diagnostic criteria with confidence. We will discuss how to use these criteria to enhance diagnostic accuracy, reduce misdiagnosis, and predict disease trajectory in patients with MS. The learning objectives are: 1. Key updates in the 2024 McDonald Criteria 2. Primer for recognizing the CVS and PRLs on MRI 3. Technical considerations and requirements (imaging protocols, pulse sequence parameters and magnet strength) 4. Role of neuroimaging in MS prognostication

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1: Reimagining MS Diagnosis: From 2017 to 2024 a. Addressing diagnostic uncertainty, overdiagnosis, therapeutic delay b. Review of 2017 Criteria and Proposed 2024 Criteria 2: Central Vein Sign (CVS): Signature of Perivenular Demyelination a. Radiology-pathology correlation b. CVS on MRI c. Optimizing pulse sequences and field strength considerations d. Diagnostic strategies: "Select 3" vs "Select 6" rules e. Pitfalls and mimics 3: Paramagnetic Rim Lesions (PRLs): Chronic Inflammation Visualized a. Radiology-pathology correlation: Iron-laden microglia b. PRLs on MRI c. Using susceptibility-based imaging (SWI/QSM) d. Interpretive pitfalls 4: Imaging Biomarkers and MS Prognosis a. Emerging evidence on CVS/PRLs and MS progression

NREE-123 NEUROIMAGING OF CEREBRAL SMALL VESSEL DISEASE: A COMPREHENSIVE REVIEW WITH CURRENT PERSPECTIVES

Tatiana Iutaka, BDS (*Presenter*)
Leticia Costa (*Abstract Co-Author*)
Larissa A. Martins, MD (*Abstract Co-Author*)
Felipe Scortegagna SR, MD (*Abstract Co-Author*)
Renato Hoffmann Nunes, MD, MBA (*Abstract Co-Author*)
Antonio J. Da Rocha, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Esta apresentação fornecerá uma visão geral abrangente da Doença Cerebral de Pequenos Vasos (DCVS). Os objetivos desta exposição são: - Elucidar a fisiopatologia do DCVS e os marcadores de neuroimagem padronizados definidos sem consenso STRIVE. -Explorar as duas principais formas esporádicas de DCVS: Arterioloesclerose (DCVS hipertensiva) e Angiopatia Amilóide Cerebral (AAC), destacando seus achados característicos distintos em ressonância magnética. - Discutir os Critérios de Boston 2.0 atualizados para o diagnóstico de DCVS, enfatizando as principais modificações da versão 1.5. - Revisar as variantes da DCVS, incluindo DCVS inflamatória e amiloidoma, e examinar a relação entre DCVS e Doença de Alzheimer. - Discutir a nova terapia para Doença de Alzheimer e Anormalidades de Imagem Relacionadas à Amiloide (ARIA). - Abordar as causas genéticas da DCVS, destacando suas características clínicas e de imagem únicas. - Discutir os avanços recentes em técnicas de neuroimagem para detecção e monitoramento de DCVS, discutindo direções futuras em pesquisa e manejo clínico.

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Introdução Fisiopatologia e biomarcadores de RM Arteriolosclerose e CAA Resultados de ressonância magnética Critérios de Boston 2.0 CAA inflamatório, amiloidoma e doença de Alzheimer CAA vs. arteriolosclerose Nova terapia para doença de Alzheimer e anormalidades de imagem relacionadas a amiloide (ARIA) Causas genéticas da DCV Mutação CADASIL, CARASIL, doença de Fabry, MELAS, APP, COL4A1/COL4A2, FOXC1/FOXC2 e TREX1 Avanços em imagem e perspectivas atuaisConclusão e pontos-chave

NREE-124 MULTIMODAL STRATEGIES FOR NEUROFLUID ASSESSMENT: FROM INDIVIDUAL BIOMARKERS TO AN INTEGRATED NEUROFLUID PROFILE

Toshiaki Taoka, MD, PhD (*Presenter*)
Rintaro Ito, MD, PhD (*Abstract Co-Author*)
Rei Nakamichi (*Abstract Co-Author*)
Toshiki Nakane (*Abstract Co-Author*)
Shinji Naganawa, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Cognitive impairment has been increasingly linked to dysfunction of the glymphatic system, which plays a crucial role in clearing metabolic waste from the brain and is implicated in neurodegenerative diseases. 2. Imaging techniques such as diffusion tensor image analysis along the perivascular space (DTI-ALPS), choroid plexus volumetry (CPV), free water imaging (FWI), arterial spin labeling (ASL), and intrathecal gadolinium-based contrast agent (IT-GBCA) each target different aspects of this complex system, with varying degrees of invasiveness, repeatability, and clinical feasibility. 3. A multimodal approach enhances understanding by integrating the complementary strengths of individual modalities, as visualized via radar charts.

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1. Clinical Significance: The glymphatic system, proposed as a brain-wide waste clearance mechanism, is implicated in a wide range of neurological disorders. 2. Imaging Biomarkers: DTI-ALPS provides a noninvasive index of perivascular diffusion, while PVS volumetry and CPV reflect structural features linked to fluid stasis. FWI and ASL further offer physiological insights into free water content and perfusion. 3. Complementarity of Methods: No single modality captures the full spectrum of neurofluid dynamics. Integration is essential for a holistic evaluation. 4. Educational Visualization: A radar chart highlights the strengths and limitations of each method. Multimodal assessment approaches a balanced, circular profile, reinforcing their complementarity. 5. Future Directions: Combining structural, functional, and dynamic metrics may advance our understanding of neurofluid dysregulation in aging and disease.

NREE-125 PROGRESSIVE MULTIFOCAL LEUKOENCEPHALOPATHY — MRI FINDINGS AS A BIOMARKER FOR EARLY DIAGNOSIS —

Koichiro Mori, MD (*Presenter*)
Mariko Kurokawa, PhD, MD (*Abstract Co-Author*)
Masafumi Harada, MD, PhD (*Abstract Co-Author*)
Yasunobu Takaki (*Abstract Co-Author*)
Yoshiharu Miura (*Abstract Co-Author*)

TEACHING POINTS

PML is generally a disease with poor prognosis, however early diagnosis in the asymptomatic stage, particularly in natalizumab-associated cases, significantly improves survival outcomes. This highlights the need for reliable biomarkers in addition to JCV PCR testing of cerebrospinal fluid. Understanding the typical MRI findings and progression patterns of PML lesions in correlation with pathological findings is essential fundamental knowledge. Natalizumab-associated PML can often present with atypical clinical symptoms and imaging features. Characteristic MRI findings in early PML include "Punctate Pattern" and "Milky Way appearance," which have been reported as useful imaging findings for detection of PML lesions in early and asymptomatic stages. Susceptibility-weighted imaging (SWI) demonstrates potential value in early PML diagnosis through identification of low signal abnormalities. MRI can serve as a useful biomarker for early PML diagnosis.

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Introduction Epidemiology of PML Impact of early diagnosis on survival outcomes Limitations of current diagnostic methods Fundamental Aspects of MRI Findings in PML Established MRI features of PML in correlation with pathological findings Imaging Characteristics for Early PML Diagnosis: Natalizumab-Associated PML and Low CSF JCV Cases Early imaging biomarkers: "Punctate Pattern" and "Milky Way appearance" Value of susceptibility-weighted imaging (SWI) in early diagnosis Other important imaging features for early diagnosis and differential diagnosis Key differential points between MS relapse and PML Towards establishing optimal MRI surveillance protocols and intervals Conclusion

NREE-126 BEHIND THE SMOKE AND MIRRORS-UNRAVELING THE VARIOUS FACETS AND MIMICS OF CNS LYMPHOMA

Meghana Kancharla, MBBS, MD (*Presenter*)
Clyde Richard Menezes (*Abstract Co-Author*)
Dhanush Jayanna (*Abstract Co-Author*)

TEACHING POINTS

Diagnostic uncertainty regarding Primary CNS lymphoma (PCNSL) arises particularly in atypical variants, immunocompromised states, or rare subtypes. This pictorial review aims to: Review classic & atypical imaging features of CNS lymphoma, including rare subtypes. Highlight the role of advanced imaging in diagnosis Outline a practical imaging-based framework for distinguishing CNS lymphoma from its mimics.

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Background: PCNSL is intra-axial with an angiocentric growth pattern. Diagnostic Features Classic radiologic signs include "snowball", "notch", "reef", "T2 pseudonecrosis","peritumoral leukomalacia" signs to name a few. Atypical features include ring enhancing or non-enhancing lesions, necrosis, hemorrhage, calcifications. Advanced Imaging: Contrast-enhanced MRI with DWI/ADC, DSC perfusion, MR spectroscopy, SWI act as a surrogate for histopathology by assessing cellularity, vascularity, tumor microenvironment. This review highlights imaging clues to differentiate PCNSL from special subtypes —Primary Dural Lymphoma, Secondary CNS Lymphoma, and Intravascular Lymphoma and imaging mimics —glioblastoma, metastases, demyelination, abscesses, toxoplasmosis Clinical Relevance Imaging enables early diagnosis, track treatment response, detect recurrence. Steroid therapy before biopsy may obscure characteristic imaging features. Low ADC, rCBV values are associated with poor prognosis, aggressive disease. Conclusion: Awareness of classic & atypical features of CNS lymphoma, with advanced imaging facilitates differentiation from mimics & management. Given its wide radiological spectrum, CNS lymphoma remains a master of disguise in neuro-oncology.

NREE-127 GUIDE TO CAROTID PLAQUE-RADS FOR REAL WORLD APPLICATION

Sriharsha Voleti, MD (*Presenter*)
Ronald L. Wolf, PhD (*Abstract Co-Author*)
Brett Cucchiara (*Abstract Co-Author*)
Scott Kasner (*Abstract Co-Author*)
Joseph S. McNally, MD (*Abstract Co-Author*)
Chun Yuan, PhD (*Abstract Co-Author*)
Elias Johansson (*Abstract Co-Author*)
Tobias Saam, MD (*Abstract Co-Author*)
Luca Saba, MD (*Abstract Co-Author*)
Jae W. Song, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

Carotid artery atherosclerosis is a well-established risk factor for cerebrovascular events. While luminal stenosis has traditionally guided clinical management, growing evidence highlights the importance of plaque composition and morphology for more accurate risk stratification. To support standardized evaluation, the Carotid Plaque Reporting and Data System (Plaque-RADS) was recently introduced, providing a structured framework for assessing cervical carotid plaque across imaging modalities. Given its recent development, clinicians and trainees may not be familiar with its application in clinical practice. We focus on how to apply Plaque-RADS to CTA neck or Carotid Vessel Wall MR exams. In this educational exhibit, we aim to: 1. Review Carotid Plaque-RADS classification system and criteria 2. Provide a guide to assist learners in easily applying Plaque-RADS to neck CTA or carotid vessel wall MRA exams 3. Share CTA and MRI examples of Plaque-RADS 4. Identify potential pitfalls in Plaque-RADS application based on imaging modality

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1. Carotid plaque introduction a. Anatomy b. Plaque composition/morphology c. Overview of CT/MRI high-risk plaque features 2. Carotid Plaque-RADS scoring system overview a. Description and example cases of each Plaque-RADS classification (1-4) 3. Practical considerations for applying Plaque-RADS a. CTA neck algorithm b. Limitations of using CT c. Carotid Vessel Wall MRA algorithm d. Limitations of MR/MRI e. Recommendation of additional imaging 4. Potential limitations/pitfalls of Plaque-RADS a. CTA b. MR/MRA 5. Inter-modality (MRA/MRI vs CTA) and intra-modality differences (MRA vs MRI; energy integrating detector CTA vs photon counting CTA)

NREE-128 DEMYSTIFYING HEMATOLYMPHOID TUMORS OF THE CENTRAL NERVOUS SYSTEM (CNS), LYMPHOPROLIFERATIVE DISORDERS, AND THEIR MIMICS

Lidia Guzhva, MD (*Presenter*)
Tyler Richards, MD (*Abstract Co-Author*)
Blair A. Winegar, MD (*Abstract Co-Author*)
Joe Mendez (*Abstract Co-Author*)
Karen L. Salzman, BS, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Hematolymphoid tumors of the CNS are distinct entities as defined by the 2021 WHO 5th edition of CNS Tumors, with key imaging features that can lead to an accurate pre-operative diagnosis. 2. Though primary CNS lymphoma does have a classic imaging appearance, due to disease and patient factors, its presentation may be more variable. This is why it is known as a great mimicker. 3. Due to the diverse and overlapping imaging characteristics of CNS lymphomas and lymphoproliferative disorders, the differential diagnosis should include a broad spectrum of malignant, infectious, and inflammatory conditions. The patient's immunocompetence should also be considered.

TABLE OF CONTENTS/OUTLINE

All listed pathologies will include local radiologic examples. Distinguishing imaging and patient characteristics, pathologic features, and molecular markers will be discussed. CNS Lymphomas - Primary diffuse large B-cell lymphoma of the CNS - Immunodeficiency-associated CNS lymphoma - Lymphomatoid granulomatosis - Intravascular large B-cell lymphoma - Histiocytic tumors: Erdheim-Chester disease, Rosai-Dorfman disease, Langerhans Cell Histiocytosis, Juvenile xanthogranuloma Malignancy Mimics - Glioblastoma, IDH-wildtype - Metastases Mimics in immunocompromised patients - Toxoplasmosis - Progressive Multifocal Leukoencephalopathy (PML)/Immune-reconstitution Inflammatory Syndrome (IRIS) - Post-transplant lymphoproliferative disorder (PTLD) Infectious or inflammatory Mimics - Tumefactive demyelination - Sarcoidosis - Vasculitis - Chronic lymphocytic inflammation with pontine perivascular enhancement responsive to steroids (CLIPPERS) - Abscess - Tuberculosis - Lyme disease

NREE-129 TRAUMATIC BRAIN INJURY: CURRENT GUIDELINES AND EVOLVING MODALITIES

Jo Ann Sun (*Presenter*)
Akm Rahman, DO (*Abstract Co-Author*)
Tausif Siddiqui (*Abstract Co-Author*)

TEACHING POINTS

1. Discuss the epidemiology of traumatic brain injury (TBI), as well as the mechanism of injury and pathophysiology of TBI: TBI has an estimated annual global incidence of 69 million and a diverse etiology including falls, contact sports, and motor vehicle accidents. Its physiology is complex, demanding precise diagnostic and prognostic tools to guide clinical decisions. 2. Summarize current TBI imaging guidelines and discuss the utility and limitations of various imaging modalities: First-line management of TBI involves non-contrast head CT, which is a rapid, cost-effective assessment for triage. However, CT is limited in detecting certain TBI pathologies, for which MRI sequences such as gradient echo (GRE), FLAIR, and susceptibility-weighted imaging (SWI) may be more sensitive. Diffusion tensor imaging (DTI) and functional MRI (fMRI) are able to provide further functional information about the brain’s post-injury white matter integrity and metabolic activity. 3. Describe the potential for novel tools in TBI imaging, including proton magnetic resonance spectroscopy (1H-MRS), perfusion computed tomography, new DTI modalities, and convolutional neural networks.

TABLE OF CONTENTS/OUTLINE

1. Overview and Epidemiology 2. Mechanism of Injury 3. Imaging Guidelines 4. Overview of Current Modalities: FLAIR, DWI, SWI, DTI, fMRI 5. Novel Imaging Modalities 6. Deep Learning Models 7. Key Points

NREE-130 THE BRAIN UNDER SIEGE: DECODING NEUROINVASION BY HISTIOCYTIC DISORDERS

Gauri Bornak, MD,MBBS (*Presenter*)
Jitender Saini, MD,MBBS (*Abstract Co-Author*)
Sabha Ahmed, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

The histiocytoses are rare disorders characterized by the accumulation of macrophage, dendritic cell or monocyte-derived cells in various tissues and organs of children and adults. More than 100 different subtypes have been described, with a wide range of clinical manifestations, presentations, and histologies. Neurological manifestations of Langerhans' cell histiocytosis (LCH) has been widely studied and it known to radiologists and clinicians. Non-Langerhans cells histiocytosis (NLCH), which includes entities such as hemophagocytic lymphohistiocytosis (HLH), Erdheim-Chester disease (ECD) and Rosai-Dorfman disease (RDD) also show CNS involvement to variable extent. The aim of this review is to describe the imaging spectrum of the histiocytic disorders affecting the central nervous system and to simplify the plethora of findings associated with this entity.

TABLE OF CONTENTS/OUTLINE

Table of contents: 1) Introduction 2) Aims and objectives 3) WHO classification of Histiocytic disorders 4) Case Illustrations: Langerhans cell histiocytosis, Rosai-Dorfman disease, Erdheim-Chester Disease, Hemophagocytic Lymphohistiocytosis and ALK positive histiocytosis. 5) Overview of the neurological and systemic manifestations of the histiocytoses 6) Conclusion

NREE-131 THE PRICE OF SURVIVAL: IMAGING MANIFESTATIONS OF CNS TUMOR TREATMENT COMPLICATIONS

Ilkyu D. Oh, MD (*Presenter*)
Runail Ratnani, MD (*Abstract Co-Author*)
Nikhil Kapil (*Abstract Co-Author*)
Sarvani Uppati (*Abstract Co-Author*)
Kirang Patel, MD (*Abstract Co-Author*)
Fabricio S. Feltrin, MD (*Abstract Co-Author*)
Karuna M. Raj, MD (*Abstract Co-Author*)
Marco C. Pinho, MD (*Abstract Co-Author*)

TEACHING POINTS

To review common CNS tumor treatments and recognize typical post-treatment imaging findings, including manifestations of treatment-related neurotoxicity. To identify key imaging pitfalls following CNS tumor treatment and distinguish them from true tumor recurrence. To recognize atypical imaging patterns of treatment-related toxicity and emphasize the radiologist's role in early detection of life-threatening complications.

TABLE OF CONTENTS/OUTLINE

Review of current therapeutic strategies for CNS tumors, including both traditional approaches and newly emerging techniques.•Surgical resection, including indications and impact on prognosis.•Radiation therapy, including whole brain, stereotactic, and proton beam therapies.•Pharmacotherapy, including chemotherapy and targeted molecular and immunotherapies.•Other emerging and experimental therapies, including novel agents and gene therapies. Imaging Manifestations in the Post-Treatment Setting:• Review of benign, non-pathologic, and expected post-treatment changes.• Review of radiologic features of post-treatment complications: vascular, infection, autoimmune, metabolic, iatrogenic, neoplastic, drug-effect. Diagnostic pearls and pitfalls in distinguishing true tumor recurrence from atypical post-treatment imaging manifestation.• Pseudo-progression• SMART syndrome• ICANS• PRES• Radiation injuries• Medication-induced neurotoxicity. Review of advanced MRI techniques in challenging cases: The role of techniques such as diffusion, perfusion, and spectroscopy in improving diagnostic accuracy and guiding clinical management.

NREE-132 PROTEAN YET PREDICTABLE? A CONTEMPORARY IMAGING TAKE ON NEUROSARCOIDOSIS

Kapil Semalti, MBBS, MD (*Presenter*)
Surjith Vattoth, MD, FRCR (*Abstract Co-Author*)
Okan Ince, MD (*Abstract Co-Author*)
Kranthi K. Marathu, MD, MBBS (*Abstract Co-Author*)
Romessa Shaikh (*Abstract Co-Author*)
Alaa Radaideh, MD (*Abstract Co-Author*)
Santhosh Gaddikeri, MD (*Abstract Co-Author*)
Miral D. Jhaveri, MD, MBA (*Abstract Co-Author*)
Shehbaz M. Ansari, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. To review the clinical symptoms and updated Neurosarcoidosis Consortium Consensus Committee (NCCC) diagnostic criteria (2018) 2. To illustrate the spectrum of imaging manifestations of neurosarcoidosis in the brain, spine, and orbits. 3. To discuss common imaging differentials for various imaging manifestations of neurosarcoidosis.

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Patients with systemic sarcoidosis have imaging manifestations of CNS involvement in 10% cases. Given the broad spectrum of clinical and imaging manifestations of neurosarcoidosis, a strong knowledge of the imaging spectrum of neurosarcoidosis is vital for a structured diagnostic approach. Neuroimaging is pivotal in establishing the diagnosis of neurosarcoidosis along with integration of clinical information, CSF analysis and histopathological results. We will commence the discussion with an outline of the clinical manifestations and updated NCCC Diagnostic Criteria for Neurosarcoidosis, along with illustrations showing imaging spectrum of neurosarcoidosis. Subsequent slides will systematically delineate the myriads of MRI and CT imaging findings in patients of neurosarcoidosis from our institution, along with discussion of common differentials for various imaging findings. We will first highlight the diverse intracranial manifestations including meningeal and brain parenchymal involvement followed by other intracranial findings including involvement of various cranial nerves, hydrocephalus, vascular complications and sellar/suprasellar involvement. We will then outline calvarial and orbital involvement and conclude by outlining the spectrum of spinal involvement.

NREE-133 TRACING TOXIC AND METABOLIC ENCEPHALOPATHIES

Zainab Salman, MD (*Presenter*)
Noor Badrawi, MBBS (*Abstract Co-Author*)
Shaikh Sayeed Iqbal, FRCR (*Abstract Co-Author*)
Ayoub A. Abedzadeh (*Abstract Co-Author*)

TEACHING POINTS

• Identify the imaging features in various common and uncommon toxic and metabolic brain disorders.• Develop a pattern-based approach to help narrow down the differential diagnosis. • Understand the underlying pathophysiology of various disorders. • Recognize the myriad of etiologies that can mimic toxic and metabolic brain disorders.

TABLE OF CONTENTS/OUTLINE

Background Toxic and metabolic encephalopathies comprise a heterogeneous group of disorders that present with a spectrum of neurological symptoms, ranging from mild confusion to critical conditions such as coma.Developing a pattern-based approach helps narrow the differentials and aids in timely patient management. Introduction Diagnosis is often a puzzle which requires a combination of clinical, imaging and laboratory features. Imaging Pattern-Based Approach Through CasesCortical grey patterns CHANTER syndrome, Hepatic encephalopathy, Hypoglycemic encephalopathy, MDMA induced encephalopathy. Pattern mimic - hypoxic ischemic encephalopathy White matter patterns Acute heroin induced leukoencephalopathy, PRES, Osmotic demyelination syndrome, CLOCC, Marchiava Bignami . Pattern mimic: Progessive multifocal leukoencephalopathy, Acute disseminated encephalomyelitis, CADASIL, Metachromatic leukodystrophy. Deep grey patterns Wernickes encephalopathy, Carbon monoxide poisoning, Methanol poisoning, Uremic encephalopathy, Diabetic striatopathy, Pattern mimic - Artery of Percheron infarct. Summary table highlighting anatomical based approach to various toxic and metabolic disorders with distinguishing imaging features.

NREE-134 DIFFUSION TENSOR MR IMAGING : A STALWART TOOL FOR PREOPERATIVE MAPPING OF BRAIN TUMOURS

Mahitha Jujjavarapu, MBBS, MD (*Presenter*)
Babu Peter S (*Abstract Co-Author*)

TEACHING POINTS

The purpose of this exhibit is: 1. To discuss the applications and techniques of diffusion tensor magnetic resonance imaging in brain tumours. 2. Learn to identify the brain white matter tracts using Diffusion tensor imaging (DTI) and 3D fibre tractography. 3. Illustrate a series of cases of brain tumours and interpret the patterns of white matter involvement 4. To review utility of the technique in clinical and surgical management of brain tumours.

TABLE OF CONTENTS/OUTLINE

1. Introduction to Diffusion Tensor imaging (DTI) of the brain2. Techniques and parameters.4.Methodology - Preoperative contrast-enhanced MRI and DTI examinations were conducted in 3T Magnetic Resonance imaging (MRI) on brain tumour patients. Patients underwent conventional MRI, followed by DTI and 3D fibre tractography.3. Brief review of normal DTI and fibre tractographic white matter anatomy4. Classification of Patterns of effect on white matter tracts in brain tumours5. Case-based illustration of brain tumours including interpretation of patterns of white matter involvement6. Discussion on clinical and surgical impact of imaging findings on management of brain tumours7. Summary and conclusions

NREE-135 AMYLOID-RELATED IMAGING ABNORMALITY (ARIA) REPORTING MADE EASY: A GUIDE TO STRUCTURED REPORTING

Ali S. Tejani, MD (*Presenter*)
Matthew Barkovich, MD (*Abstract Co-Author*)
Kambiz Nael, MD (*Abstract Co-Author*)
Javier Villanueva-Meyer, MD (*Abstract Co-Author*)
Andreas M. Rauschecker, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Review challenges for consistent and reproducible reporting of Amyloid-Related Imaging Abnormalities (ARIA) 2. Introduce reporting templates to guide structured ARIA reporting 3. Provide a visual review of best practices when using structured reporting, including challenging scenarios

TABLE OF CONTENTS/OUTLINE

1. Introductiona. Brief review of ARIA findings i. Impact of reports on treatment adjustments b. Review of MRI Protocol for ARIA assessment i. Technical considerations (GRE versus SWI, 2D versus 3D T2/FLAIR) ii. Value of protocol standardization c. Introduce structured reporting templates for ARIA i. Example templates ii. Improving multidisciplinary communication d. Challenges i. Consistent and appropriate use of report fields 2. Visual guide for reporting templates a. Baseline studies i. History and Technique ii. Findings 1. Microhemorrhages (number and location) 2. Superficial siderosis (defining “focal areas” and locations)3. Recommendations on reporting discrepancies between T2* versus SWI sequences iii. Impression b. Follow-up studies i. History and Technique ii. Findings 1. Prior versus new ARIA-E 2. Distinguishing “pre-treatment baseline,” “treatment emergent,” and “new” microhemorrhages using examples a. Which microhemorrhages are “incident?” 3. When should studies reset after initial worsening ARIA-E or ARIA-H? How is this reported? 4. When do we stop additional follow-up? iii. Impression 1. Challenging scenarios a. Follow-up continued to assess worsening ARIA-E, but stable treatment emergent ARIA-H, or vice versa. How is severity reported? b. T2* shows mild ARIA-H, but SWI shows moderate ARIA-H. What should the impression report?

NREE-136 INTRACRANIAL MENINGIOMAS: ASSESSMENT BY IMAGING TECHNIQUES

Eva Taibo Gimenez, MD (*Presenter*)
ALEJANDRO MANUEL DIAZ GARCIA (*Abstract Co-Author*)
Andres Vega Chaves, MD,MD (*Abstract Co-Author*)

TEACHING POINTS

- Updates for meningiomas in the 5th edition of the WHO classification of CNS tumors. - Review of the imaging features of typical, atypical, and anaplastic meningiomas. - Pictorial review through cases from our center.

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Meningiomas are primary tumors of the central nervous system and stand as the most frequent extra-axial neoplasm, representing one third of all of them. The majority are benign and indolent lesions, with typical (grade 1) meningiomas accounting for around 90-95% of the total. However, there are more aggressive histological subtypes (WHO grades 2-3) with a higher risk of dissemination and recurrence. The aim of this text is to review the typical imaging features, the locations (both characteristic and less frequent) and, with special emphasis, the radiological signs that suggest atypical and anaplastic variants. Imaging techniques (CT and MRI) provide us with useful tools for the correct identification and characterization of meningiomas, which is essential for early diagnosis and proper management. In addition, the different subtypes are exemplified through the presentation of cases from our center.

NREE-137 OUT OF SIGHT, OUT OF MIND: AGENESIS AND HYPOPLASIA OF THE INTERNAL CAROTID ARTERY

Margrit E. Muller, MD (*Presenter*)
Lavinia Dias, MD (*Abstract Co-Author*)
Lara Quiche, MD (*Abstract Co-Author*)
Guilherme Swerts Pereira (*Abstract Co-Author*)
Lucas Da Silva Costa, MD (*Abstract Co-Author*)
Pedro Mecate Prada, MD (*Abstract Co-Author*)
Caio Nunes, MD (*Abstract Co-Author*)
Nicole Lambrakos, MD (*Abstract Co-Author*)
Mariana A. Rodrigues, MD (*Abstract Co-Author*)
Luis F. Godoy, MD (*Abstract Co-Author*)
Renata Bertanha, MD (*Abstract Co-Author*)
Breno A. Matos, MD (*Abstract Co-Author*)

TEACHING POINTS

- To review the embryology and pathophysiology of the internal carotid artery (ICA) agenesis and hypoplasia. - To review the clinical presentation and image assessment of the ICA agenesis and hypoplasia. - To recognize the imaging features of the ICA agenesis and hypoplasia, highlighting the key diagnostic features. - To recognize the complications associated with the ICA agenesis and hypoplasia, particularly its relation to ischemic and hemorrhagic stroke.

TABLE OF CONTENTS/OUTLINE

1. Definition and Pathophysiology - Embryological basis and classification of the ICA anomalies. 2. Clinical and Imaging Presentation - Symptoms, incidental findings, and potential complications. 3. Key Diagnostic Features - Imaging modalities and distinguishing criteria. 4. Perfusion assessment - Hemodynamic repercussions in the ICA agenesis and hypoplasia. 5. Teaching cases - Didactic case examples, including cases with adverse outcomes. 6. Take Home Messages 7. References

NREE-138 IMAGING THE OPERATED SPINE: KEY FINDINGS AND COMPLICATIONS FOR GENERAL RADIOLOGISTS

Silvia Revuelta Gomez, MD (*Presenter*)
Aranzazu Sanchez Gabin, MD (*Abstract Co-Author*)

Alejandra Somoano Marfull (*Abstract Co-Author*)
Rodrigo Sutil, MD (*Abstract Co-Author*)
Marina Arroyo Olmedo, MD (*Abstract Co-Author*)
Marta Drake Perez, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To describe the different types of spinal surgical procedures. 2. To illustrate the typical postoperative imaging findings in patients who have undergone spine surgery. 3. To highlight the key postoperative complications that can be detected through imaging.

TABLE OF CONTENTS/OUTLINE

1. Introduction Back pain is a prevalent reason for medical consultation. The use of imaging studies to detect potentially treatable pathologies has significantly increased, along with the rise in surgical procedures aimed at alleviating patient symptoms. The interpretation of postoperative findings can sometimes be challenging for general radiologists. Therefore, we aim to provide a basic overview of the main spine surgeries and their potential complications, supported by representative cases from our hospital. 2. Surgical procedures 2.1. CERVICAL SPINE 2.1.1. Anterior cervical discectomy and fusion (ACDF). 2.1.2. Corpectomy. 2.1.3. Odontoid fractures. 2.2. LUMBAR SPINE 2.2.1. Spinal fusion surgeries: anterior lumbar interbody fusion (ALIF) and direct lateral interbody fusion (DLIF)/oblique lumbar interbody fusion (OLIF). 2.2.2. Spinal simple decompressive surgeries (without fusion): discectomy, laminectomy/hemilaminectomy/facetectomy and interspinous device. 2.2.3. Special cases: combination of transpedicular screws and possible vertebroplasty (by interventional radiology). 3. Complications. 3.1. Implant-related complications: implant rupture, implant movement and malposition. 3.2. Adjacent level syndrome. 3.3. Pseudoarthrosis. 3.4. Postoperative collections: seroma/abscesses and hematoma. 3.5. Complications related to the procedure: CSF fistula. 4. Conclusions. 5. Bibliography.

NREE-139 WHAT THE EYES DON'T SEE, BUT FEEL: CAROTID-CAVERNOUS FISTULAS

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Renata Bertanha, MD (*Abstract Co-Author*)
Breno A. Matos, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review the pathophysiology and classification of carotid-cavernous fistulas (CCFs). - Identify key imaging features of CCFs on CTA, MRA, and DSA. - Highlight imaging techniques that aid in diagnosis, including early arterial-phase CT angiography, time-of-flight (TOF) MRA, venous-phase MRA, the time-resolved imaging of contrast kinetics (TRICKS) sequence, and arterial spin labeling (ASL) perfusion. - Discuss the imaging assessment of CCF-related complications. - Correlate imaging findings with clinical presentation to enhance early diagnosis and guide multidisciplinary management.

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Definition and Pathophysiology - Classification based on Barrow types and flow dynamics (high-flow vs. low-flow). Key Diagnostic Features - Role of CTA and MRA in detecting indirect and direct signs of CCFs. - DSA as the gold standard for confirmation, classification, and treatment planning. Classification and Hemodynamic Assessment - Importance of identifying flow direction and venous drainage patterns. - Hemodynamic implications for symptom severity and complication risk. Complication Assessment - Imaging evaluation of complications such as venous thrombosis, orbital congestion, and intracranial hypertension. Teaching cases - Pictorial review of didactic cases with multimodal imaging (CTA, MRA, DSA). - Examples demonstrating diagnostic challenges and emphasizing the value of combining imaging modalities. Take-home messages References

NREE-140 APPROACH TO MOTOR DISORDERS THROUGH PET. CAN I COMPLEMENT THE MRI?

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Pedro Dib Hoyos, MD (*Abstract Co-Author*)
Sebastian Pelaez SR, MD (*Abstract Co-Author*)
Valentina Munera Orozco, MD (*Abstract Co-Author*)

TEACHING POINTS

Movement disorders are often evaluated using MRI to identify structural, but PET-CT, can detect early stages of disease before anatomical changes, also helping with differential diagnosis where clinical features overlap. The diagnosis of Parkinson's disease (PD) through 18F-DOPA PET imaging, is capable of quantifying dopamine synthesis and storage deficiencies in the presynaptic striatal nerve terminals. PET primarily focus on assessing dopaminergic function, in the striatum, which includes the caudate nucleus and putamen. Also, a significant reduction in Dopamine Transporter Density, particularly in the putamen, and decline in presynaptic terminal function and loss of pigmented dopaminergic neurons using ligands that bind to neuromelanin in the substantia nigra, are the hallmarks of PD. In Atypical parkinsonisms (AP), 18F-FDG PET, PSP shows hypometabolism in frontal and midbrain regions; MSA shows decreased putamen, cerebellum and brainstem; DLB is characterized by occipital hypometabolism; and CBD by asymmetric alterations in the frontoparietal cortex and basal ganglia contralateral to the most clinically affected side. And, in Creutzfeldt-Jakob disease (CJD), PET-CT using FDG provides functional value, revealing patterns of hypometabolism that correlate with prion distribution in autopsies, especially in the thalamus and frontoparietal cortex. The combination of DWI and FDG-PET improves diagnostic sensitivity, especially in atypical presentations or when MRI is negative.

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Teaching pointsIntroductionParkinson DiseaseAtypical Parkinsonian SyndromesCreutzfeldt-JakobConclusions

NREE-141 SMALL PATIENTS, BIG CLUES: RECOGNIZING PEDIATRIC CNS CANCER PREDISPOSITION SYNDROMES ON IMAGING

Trisha Mukherjee (*Presenter*)
Alok I. Jaju, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Up to 15% of pediatric central nervous system (CNS) tumors are associated with an underlying cancer predisposition syndrome (CPS). 2. Early recognition is essential, enabling individualized screening, targeted therapies, radiation avoidance, and genetic counseling for family members. 3. While family history may be absent, certain tumor types, locations, and imaging features can suggest a syndromic diagnosis.

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1. This exhibit aims to familiarize radiologists with the imaging manifestations of both common and rare pediatric CPSs involving the CNS, including neoplastic and non-neoplastic findings. We also highlight key clinical features and management considerations. 2. The 2021 WHO classification of CNS tumors (WHO CNS5) identifies 19 relevant CPSs—8 newly added—underscoring the evolving recognition of genetic drivers in pediatric neuro-oncology. 3. We present illustrative cases from the following syndromes: NF1, NF2, schwannomatosis, von Hippel-Lindau, tuberous sclerosis, Li-Fraumeni, Cowden, constitutional mismatch repair deficiency (CMMRD), nevoid basal cell carcinoma syndrome (Gorlin syndrome), rhabdoid tumor predisposition syndrome, DICER1, familial retinoblastoma, BAP1 tumor predisposition syndrome, and ELP1-

medulloblastoma syndrome. 4. Emphasis is placed on tumor type, location, patient age, and characteristic imaging clues that should prompt genetic evaluation. 5. Syndrome-specific surveillance is discussed. 6. Radiologists play a central role in identifying CPSs and guiding timely diagnosis, surveillance, and family management.

NREE-142 ADVANCED BRAIN HEALTH IMAGING: PRACTICAL CASE-BASED PEARLS FOR THE GENERAL RADIOLOGIST

Cyrus A. Raji, MD, PhD (*Presenter*)
Somayeh Meysami (*Abstract Co-Author*)
Yosef G. Chodakiewitz, MD (*Abstract Co-Author*)
Sean S. London, MD (*Abstract Co-Author*)
Sam Hashemi, MSc (*Abstract Co-Author*)
Alex Exuzides (*Abstract Co-Author*)
Daniel J. Durand, MD (*Abstract Co-Author*)
Amar P. Patel, MD (*Abstract Co-Author*)

TEACHING POINTS

A brain MRI protocol combining volumetric T1 (Neuroreader®) and arterial spin labeling (ASL) perfusion can enhance evaluation of brain aging and cognitive decline when added to conventional sequences (FLAIR, SWI). Characteristic MRI patterns: Alzheimer's: Hippocampal and parietal atrophy with posterior cingulate and precuneus hypoperfusion. Parkinson's dementia: Loss of midbrain "swallow tail" sign with diffuse cortical hypoperfusion and spared hippocampi. Multiple sclerosis: Central vein sign, deep gray hypoperfusion, and preserved global volume in early/asymptomatic stages. Recognizing normal variants (e.g. pituitary ASL hotspot) and MR volumetry segmentation errors helps avoid misdiagnosis.

TABLE OF CONTENTS/OUTLINE

Introduction Brain health imaging overview and key MRI sequences: 3D T1, ASL, FLAIR, SWI. Normal Aging Brain Normal brain volumes and perfusion in a healthy older adult, with delineated precuneus anatomy on T1 and ASL. Alzheimer's Pattern Hippocampus, temporal and parietal atrophy; posterior cingulate and precuneus hypoperfusion. Parkinsonian Dementia Midbrain "swallow tail" sign loss on SWI, frontal and parietal hypoperfusion, spared hippocampal volume. Multiple Sclerosis Perivenular lesion with central vein sign; reduced caudate and thalamic perfusion; normal brain volume in early stages. Quality Control & Pitfalls Volumetry segmentation errors and ASL variants (e.g. pituitary bright signal on ASL) that can mimic pathology. Conclusion Integrating volumetric and perfusion imaging into routine practice improves early detection and differentiation of neurodegenerative diseases.

NREE-143 NOT EVERYTHING IS WHAT IT SEEMS: NEUROCYSTICERCOSIS AND ITS MIMICS - A PICTORIAL REVIEW OF CASES

Luiza Suman, MD (*Presenter*)
Gabriela Ramos Ribeiro, MD (*Abstract Co-Author*)
Vinicius Siessere Gugelmin, MD (*Abstract Co-Author*)
Tiago Bertoncini, MD (*Abstract Co-Author*)
Cilmario L. da Silva Junior, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Understand the life cycle and pathological features of neurocysticercosis. Identify the imaging characteristics of neurocysticercosis through its four stages: vesicular, colloidal vesicular, granular nodular, and calcified. Characterize lesion morphology, distribution, and associated features to help distinguish neurocysticercosis from its mimics.

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Neurocysticercosis (NCC) is the most common helminthic infection of the central nervous system (CNS) and a leading cause of acquired and preventable epilepsy in endemic regions, particularly in low-resource countries. It results from the ingestion of Taenia solium eggs, which hatch in the gut, enter the bloodstream, and reach the CNS. NCC commonly affects the cerebral parenchyma, but can also occur in extra-axial compartments. Most cases are asymptomatic, diagnosed incidentally by calcifications on neuroimaging. The diagnosis is made mainly through neuroimaging, especially magnetic resonance imaging (MRI) and computed tomography (CT). Imaging also helps to stage the disease: the vesicular stage shows a thin-walled cyst with a visible scolex; the colloidal stage presents a proteinaceous cyst with wall enhancement and edema due to inflammation; late stages show cyst shrinkage and granuloma formation. MRI is more sensitive than CT for detecting small parenchymal, intraventricular, and cisternal lesions. Main differential diagnoses include tuberculosis, tuberculoma, neurocryptococcosis, abscess, and metastasis. These lesions often present with peripheral enhancement, mimicking NCC. The goal of this presentation is to show the imaging findings of NCC and its mimics.

NREE-144 KEEP THEM STRAIGHT: A REVIEW OF OSSEOUS DESTRUCTIVE PATHOLOGIES OF THE SPINE

Tyler Morgan, MD (*Presenter*)
Sally J. Choi, MD (*Abstract Co-Author*)
Sonal Jha, MD (*Abstract Co-Author*)
Achint K. Singh, MD (*Abstract Co-Author*)
Manoj Kumar, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

This presentation focuses on classic appearances and differentiating features of multiple types of osseous destructive pathologies, as many of these have overlapping features making them tricky to differentiate, especially for trainees and junior faculty. Destructive spinal pathologies of metabolic, infectious, degenerative, primary tumor, and metastatic etiologies are discussed in this presentation. Though there have been prior published reviews of various spinal arthropathies and pathologies, this is the first to provide as extensive a review of the categories and etiologies responsible for specifically osseous destructive spinal findings.

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Outline: Metabolic: Dialysis-related spondyloarthropathy, Charcot spine, Hyperparathryoidism. Infectious: Discitis-osteomyelitis, Tuberculous spondylitis, Fungal Osteomyelitis. Degenerative: Intervertebral osteochondrosis, Schmorl Node. Primary tumor: Chordoma, Osteoblastoma, Aneurysmal Bone Cyst, Giant Cell Tumor, Langerhans Cell Histiocytosis. Metastatic: Multiple Myeloma, Lymphoma, Breast, Lung, Renal Cell Carcinoma

NREE-145 UNRAVELING THE IMAGING OF LANGERHANS CELL HISTIOCYTOSIS IN THE CENTRAL NERVOUS SYSTEM

Lara Mori, MD (*Presenter*)
Diogo G. Correa, MD (*Abstract Co-Author*)
Gabriela A. Ribas, MD (*Abstract Co-Author*)
Luciane De Oliveira (*Abstract Co-Author*)
Tomas Freddi, MD (*Abstract Co-Author*)
Celso Hygino, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Langerhans Cell Histiocytosis (LCH) is a rare neoplastic disorder characterized by monoclonal proliferation and tissue infiltration of pathological dendritic cells, often associated with abnormal MAPK pathway activation and BRAF V600E mutation. It affects different age groups, being more prevalent in children up to 3 years. Diagnosis relies on clinical, radiological and histopathological evaluation. LCH may involve several organs, especially the bones, skin and hypothalamic-pituitary axis. CNS involvement evaluation includes parenchymal and non-parenchymal structures including the craniofacial bones, hypothalamic-pituitary axis, and meninges. Lesions may present in tumoral or neurodegenerative forms, with symptoms varying by the affected region. Tumoral lesions usually affect craniofacial bones and hypothalamic-pituitary axis. On MRI, they are tipically hypointense on T1- and T2-weighted imaging, with contrast enhancement. Pituitary involvement may result in endocrinopathies,

especially diabetes insipidus, evidenced by findings such as pituitary stalk thickening and loss of neurohypophyseal T1 hypersignal. The neurodegenerative form manifests with progressive clinical, neurological and/or radiological deterioration, mainly involving the cerebellar nuclei.

TABLE OF CONTENTS/OUTLINE

Introduction: Definition, etiology, epidemiology, classification and histopathological findings of LCH; Imaging: Role of each imaging modality; Bone Presentation: Craniofacial and vertebral assessment, including differentials; Intracranial Presentation: Types and differential diagnoses; Conclusion: Imaging relevance and radiologist's role in diagnosis and prognosis.

NREE-146 ADVANCES IN SODIUM (^{23}NA) MRI AND CEST IMAGING FOR BRAIN TUMORS: METHODOLOGICAL INNOVATIONS AND EVOLVING CLINICAL UTILITY

Aashim Bhatia, MD, MS (*Presenter*)
Lina Chihoub (*Abstract Co-Author*)
Hannah Nguyen (*Abstract Co-Author*)
Apoorva Kotha, MBBS (*Abstract Co-Author*)
Luke Bloy, PhD (*Abstract Co-Author*)
Akinbanji Afolabi (*Abstract Co-Author*)
Mohammad Haris (*Abstract Co-Author*)
Blake Benyard (*Abstract Co-Author*)
Neil Wilson (*Abstract Co-Author*)
Em Triolo (*Abstract Co-Author*)
Fernando E. Boada, PhD (*Abstract Co-Author*)
Ravinder Reddy, PhD (*Abstract Co-Author*)
Timothy Roberts, PhD (*Abstract Co-Author*)

TEACHING POINTS

Conventional 1 H MRI (Diffusion weighted imaging, Fluid-Attenuated Inversion Recovery, post-contrast T1) remains the clinical gold standard for evaluating human brain tumors, but recent advances suggest that 23 Na MRI & advanced 1 H MRI such as chemical exchange saturation transfer (CEST) imaging can provide novel insights into tumor biology by quantifying sodium concentrations & metabolites elevated in brain tumors. Though historically limited by low signal to noise ratio, poor resolution, & long scan times, technological innovations have improved their clinical viability. They hold promise for more detailed characterization of tumor biology & treatment response. 1. Educate on potential role of 23 Na MRI & CEST in brain tumor evaluation 2. Describe technical advancements enabling their clinical use 3. Summarize literature demonstrating 23 Na MRI MRI & CEST in tumor characterization & monitoring 4. Present pediatric cases of 23 Na MRI MRI & CEST from Children’s Hospital of Philadelphia (CHOP)

TABLE OF CONTENTS/OUTLINE

Intro Limitations of 1 H imaging in pediatric brain tumors Fundamentals of 23 Na/CEST imaging 23 Na/CEST MRI background Biological relevance & imaging principles Historical technical barriers Imaging technique advancement Hardware Pulse sequence 23 Na MRI compartment differentiation techniques Figure 1: Technical advancements of 23 Na MRI at CHOP (flowchart) Brain tumor applications Evolution from feasibility to clinical utility (characterize & stratify tumors, monitor treatment response & progression) Figures 2-3: Literature on clinical studies of 23 Na & CEST imaging (tables) Figures 4-5: 23 Na MRI & CEST in pediatric cases at CHOP (images)

Abstract Archives of the RSNA, 2025

OBEE

OB/Gynecology Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

OBEE-1 MRI-BASED MORPHOLOGY OF OVARIAN CLEAR CELL CARCINOMAS

Nobuyuki Takeyama, MD (*Presenter*)
Yuki Tashiro, MD (*Abstract Co-Author*)
Jiro Munechika (*Abstract Co-Author*)
Yoshimitsu Ohgiya, MD (*Abstract Co-Author*)
Kota Watanabe, MD (*Abstract Co-Author*)

TEACHING POINTS

Ovarian clear cell carcinomas (CCCs) are pathologically characterized by cysts and glands lined with cuboidal, hobnail, or flattened cells containing clear or eosinophilic cytoplasm. While most patients are diagnosed at an early stage, advanced-stage CCC has a worse prognosis than serous or endometrioid carcinomas due to its relative insensitivity to platinum-based chemotherapeutic agents. When CCC is suspected preoperatively, gynecologic oncologists may make maximal efforts to achieve complete cytoreduction with no residual disease. MRI-based morphological patterns can be classified into seven types: an entirely solid mass with central edema exhibiting a renal cortico-medullary appearance; an entirely solid mass with central necrosis; a solid and cystic mass demonstrating a black sponge appearance; a solid and cystic mass with a broad-based, multifocal, or concentric growth pattern of the solid component containing internal cystic areas; a solid and cystic mass with a polypoid, focal, or eccentric growth pattern of the solid component containing internal cystic areas; an entirely cystic mass with multiple septations and a small solid component; and an entirely cystic mass with internal septations and small mural nodules. We will present cases focusing on the correlation between pathological features and MRI findings, which may facilitate preoperative identifications of CCC during image interpretation.

TABLE OF CONTENTS/OUTLINE

1. Etiology of ovarian CCCs and other epithelial carcinomas. 2. Pathology of CCC. 3. MRI findings of CCC. 4. Classification of 7 types of MRI-based morphological pattern. 5. Case-based review correlated between pathological and MRI findings. 6. Conclusion. 7. References.

OBEE-2 BUYER BEWARE: COMPLICATIONS OF CONTRACEPTION

Nabeal Aljabban, MD (*Presenter*)
Sepand Moalej, DO, BSc (*Abstract Co-Author*)
Emily Rooney, MD (*Abstract Co-Author*)
Gurinder Singh, MD (*Abstract Co-Author*)
Susan J. Frank, MD (*Abstract Co-Author*)
Monika Misra, MD (*Abstract Co-Author*)
Sharon Gordon, MD (*Abstract Co-Author*)
Barak Friedman, MD (*Abstract Co-Author*)
Rona J. Orentlicher Fine, MD (*Abstract Co-Author*)

TEACHING POINTS

Several contraceptives are commonly used in the United States, each with its own potential complications depending on the method. Intrauterine device (IUD)-proper positioning is critical to prevent complications. Malpositioning is common and can include partial or complete migration and expulsion. IUD arms may become embedded in the myometrium and lead to uterine perforation. Incorrect IUD placement can lead to IUP and raises the likelihood of ectopic pregnancy. Tubal Ligation/Essure-permanent contraceptive methods. Malposition can lead to unintended pregnancy or ectopic pregnancy. May become embedded in uterus or ovary resulting in perforation and peritoneal migration. Hydrosalpinx can also result. Oral contraceptive pills (OCP)-associated with increased risk of deep vein thrombosis (DVT), pulmonary emboli (PE), and hepatic adenomas. May elevate risk of stroke and myocardial infarction (MI) in those people with additional risk factors. Vasectomy-associated with postop hematoma/infection. Can form spermatoceles, tubular ectasia, sperm granuloma and “dancing mega sperm” which reflect obstructed sperm flow.

TABLE OF CONTENTS/OUTLINE

Overview of Female and Male Contraception. Summary of types and their frequency of use. Review common complications by contraceptive type including IUD, Permanent Methods such as Tubal Ligation, Essure and Vasectomy and Oral contraception. Review imaging evaluation of contraceptive complications including US, CT & MRI. Discuss clinical presentation and risk factors of complications. Evaluate various treatments, patient management and efficacy.

OBEE-3 MR IMAGING OF ABDOMINAL PAIN IN PREGNANT WOMEN: A PRACTICAL GUIDE OF COMMON OBSTETRIC AND NON-OBSTETRIC PATHOLOGIES

Roberta V. Ninkova, MD (*Presenter*)
Marco Gennarini (*Abstract Co-Author*)
Claudia Cutonilli, MD (*Abstract Co-Author*)
Federica Curti, MD (*Abstract Co-Author*)
Carlo Catalano, MD (*Abstract Co-Author*)
Lucia Manganaro, MD (*Abstract Co-Author*)

TEACHING POINTS

- MRI is a safe, non-ionizing modality for assessing abdominal pain during pregnancy, especially when ultrasound results are inconclusive. - Proper MRI protocols in pregnant patients avoid gadolinium and utilize rapid sequences like T2-weighted, T1 in-phase/out-of-phase, and diffusion-weighted imaging (DWI) to reduce fetal motion artifacts and optimize diagnostic yield. - Understanding both obstetric and non-obstetric causes of abdominal pain is essential . Obstetric causes include placental abruption, uterine rupture, and retained products of conception, while non-obstetric causes include appendicitis, bowel obstruction, ovarian torsion, and urinary tract complications. - Radiologists must differentiate pathological findings from normal anatomical and physiological changes of pregnancy , such as organ displacement, gestational hydronephrosis, and altered bowel motility, to prevent false positives. - Tailoring interpretation by trimester improves diagnostic accuracy and supports appropriate clinical management.

TABLE OF CONTENTS/OUTLINE

1. Introduction Clinical context and diagnostic challenges in pregnant women. 2. MRI Safety and Protocols Guidelines for non-contrast imaging and patient positioning. 3. Obstetric and Gynecologic Causes MRI features of uterine rupture, ovarian torsion, and more. 4. Gastrointestinal and Urinary Pathologies Imaging findings in appendicitis, bowel obstruction, and pyelonephritis. 5. Interpretative Tips and Pitfalls Avoiding confusion with normal pregnancy-related changes. 6. Conclusion Role of MRI in improving maternal and fetal outcomes.

OBEE-4 LOST IN TRANSIT: NAVIGATING EXTRA-TUBAL ECTOPIC PREGNANCIES

Gurinder Singh, MD (*Presenter*)
Emily Rooney, MD (*Abstract Co-Author*)
Nabeal Aljabban, MD (*Abstract Co-Author*)
Sepand Moalej, DO (*Abstract Co-Author*)
Jay G. Hochsztein, MD (*Abstract Co-Author*)
Kathryn D. Solomon, MD (*Abstract Co-Author*)
Sharon Gordon, MD (*Abstract Co-Author*)
Monika Misra, MD (*Abstract Co-Author*)
Barak Friedman, MD (*Abstract Co-Author*)
Rona J. Orentlicher Fine, MD (*Abstract Co-Author*)

TEACHING POINTS

Ectopic Pregnancy(EP)-Under 2% of all pregnancies, but medical emergency requiring rapid diagnosis to lower morbidity & mortality Up to 10% in extra-tubal sites: Interstitial: Implants in cornual portion of fallopian tube; eccentric sac with thin overlying myometrium. High bleeding risk, presents later than tubal EP. Need to differentiate with rudimentary horn EP and angular pregnancy (not EP) C-section Scar: implant in scar with thin overlying myometrium leads to rupture risk; measurements aid in diagnosis Cervical: implants in cervical wall; negative sliding sign on US. Positive fetal cardiac activity differentiates from early pregnancy loss Ovarian: implants in/on ovarian tissue. May mimic hemorrhagic cyst Abdominal: Rare, often caused by tubal rupture w/ reimplantation in abdominal cavity (ex. bowel, liver, and omentum). High risk of internal bleeding Rudimentary horn: Implant in communicating/non-communicating undeveloped uterine horn; late diagnosis with rupture risk Diagnostic Methods: US (mainstay) & MRI (problem-solving) Focus: Emphasis on subtle imaging differences, clinical signs & management

TABLE OF CONTENTS/OUTLINE

Overview of extra-tubal ectopic pregnancy (EP) Discuss diagnostic imaging features of each type emphasizing role of US & MRI Compare interstitial, angular & rudimentary horn pregnancies Discuss measurements of C-section Scar EP to aid diagnosis Differentiate cervical EP & early pregnancy loss Review risk factors, presentation, complications, prevention and prognosis Discuss management and compare treatment options

OBEE-5 POST-RADIOTHERAPY MRI IN CERVICAL CANCER: DISTINGUISHING EXPECTED FROM PATHOLOGIC FINDINGS

Igara Tavares, MD (*Presenter*)
Rita d. Matheus (*Abstract Co-Author*)

TEACHING POINTS

Cervical cancer is the fourth most commonly diagnosed malignancy in women worldwide and remains a leading cause of cancer-related mortality. Approximately 30% of patients are diagnosed with advanced disease, for which the standard therapeutic approach involves chemoradiotherapy, followed by intracavitary brachytherapy. Post-treatment magnetic resonance imaging (MRI) is generally performed 3-6 months after the completion of chemoradiotherapy. The restoration of the cervical stroma's low-signal intensity on T2-weighted imaging (T2WI) is indicative of a complete therapeutic response. However, post-treatment changes may persist for up to 9 months, complicating the differentiation between residual tumor and post-treatment edema, as both can present with intermediate signal intensities on T2WI. The use of diffusion-weighted imaging (DWI) becomes essential, as tumors typically show restricted diffusion, unlike edema. Post-radiotherapy complications can be classified into acute and chronic categories. Acute toxicities predominantly affect the pelvic organs, particularly the bladder and bowel and chronic complications are mainly attributed to fibrotic changes in irradiated tissues.

TABLE OF CONTENTS/OUTLINE

1. Overview of cervical cancer;2. Outlining the 2018 FIGO staging system;3. Detection of tumors in MRI;4. Differentiating residual tumor from post-radiotherapy edema;5. Other common findings (e.g., fatty marrow replacement);6. Acute complications (e.g., radiation proctitis);7. Chronic complications (e.g., cervical stenosis, fibrotic bladder, fistula formation, and insufficiency fractures).8. Summary of key concepts.

OBEE-6 ENDOMETRIOSIS AND CONGENITAL MüLLERIAN ANOMALIES: A CASE-BASED REVIEW

Nadia Rios, MD (*Presenter*)
Mariana c. Linares, MEd, MEd (*Abstract Co-Author*)
Lorena I. Arrieta (*Abstract Co-Author*)
Lilian Fazzion (*Abstract Co-Author*)
Virginia Robles (*Abstract Co-Author*)
LUCIANO GANZER (*Abstract Co-Author*)
MONICA BONIN (*Abstract Co-Author*)
Ezequiel Barbero (*Abstract Co-Author*)
Carolina Etel Torres (*Abstract Co-Author*)

TEACHING POINTS

1-The association between congenital Müllerian anomalies and endometriosis has been a debatable research topic in the last years. 2-Congenital uterine anomalies, resulting from malformations of Müllerian ducts during embryonic development, have a prevalence of: 5.5% in the general population 8% in women with infertility 13.3% in women with a history of miscarriage. 3-A strong positive association between non-obstructive Müllerian anomalies and endometriosis would support the embryonic remnants/ celomic metaplasia hypothesis. 4-Women with Congenital Uterine Anomalies and endometriosis are more likely to suffer from severe endometriosis and dysmenorrhea. 5- Three-dimensional (3D) TV US or MRI may help to visualize the external uterine fundal contour and internal indentation of the endometrial cavity, two key morphological characteristics in the diagnosis of congenital uterine anomalies. 6-MRI helps to characterize and allows assessment for ectopic ureters, abnormally positioned ovaries, or associated deep infiltrative endometriosis.

TABLE OF CONTENTS/OUTLINE

Title Introduction Objectives Clinical Presentation MR and TV US: Protocol and Report Considerations Case Reports with Discussion/s of Imaging in Each Treatment Conclusion References

OBEE-7 BEHIND THE SHADOWS: MRI INSIGHTS INTO T2 HYPOINTENSE OVARIAN MASSES AND ITS DIFFERENTIAL DIAGNOSIS

Helena Font, MD (*Presenter*)
Lledo Cabedo Esteve, MD (*Abstract Co-Author*)
Carlos Nicolau, MD (*Abstract Co-Author*)
Olatz Saenz De Argandona, MD (*Abstract Co-Author*)
Meritxell Munmany (*Abstract Co-Author*)
Adela Saco (*Abstract Co-Author*)
Carmen Sebastia Cerqueda, MD (*Abstract Co-Author*)

TEACHING POINTS

1)To review the MRI features of adnexal lesions that show low signal intensity on T2-weighted images, highlighting their histopathologic correlates. 2)To identify key imaging criteria that help differential diagnosis between benign, borderline, and malignant T2-hypointense adnexal masses. 3)To propose a structured, MRI-based diagnostic algorithm for accurate lesion characterization and appropriate clinical management. 4)To introduce the potential of radiomics as a complementary tool in pelvic MRI.

TABLE OF CONTENTS/OUTLINE

1) Introduction: Epidemiology of adnexal masses and diagnostic challenges. Role of MRI and T2-weighted sequences in the evaluation of adnexal lesions. Clinical relevance of identifying T2-hypointense lesions. Overview of O-RADS classification. 2) Anatomic and pathologic correlates: Review of normal pelvic and ovarian anatomy on MRI. How to differentiate a peritoneal from an extraperitoneal lesion. Pathologic correlates of T2-hypointensity. 3) MRI features and key differential diagnoses: Benign lesions (ovarian fibroma, fibrothecoma, endometrioma, hemorrhagic cysts, cystadenofibroma and others). Malignant or borderline lesions (brenner tumor, ovarian M1, malignant transformation of endometrioma, borderline serous cystadenomas and others). Mimics and other considerations. 4) MRI-Based Diagnostic Algorithm. 5)Role of Radiomics in Pelvic MRI: Potential in improving the identification of normal ovaries, distinguishing myomas from fibromas, and enhancing diagnostic precision in differentiating benign from malignant adnexal masses. 6) Conclusion.

OBEE-8 ENDOMETRIOSIS IN ADOLESCENTS A CASE-BASED REVIEW

Pamela I. Causa Andrieu, MD (*Presenter*)
Ana Villanueva, MD (*Abstract Co-Author*)
Nadia Rios, MD (*Abstract Co-Author*)
Mariana c. Linares, MEd, MEd (*Abstract Co-Author*)
Carolina R. Chacon, MD (*Abstract Co-Author*)
Ayelen Leao, MD (*Abstract Co-Author*)
Luciana P. Chamie, MD, PhD (*Abstract Co-Author*)
Liina Poder, MD (*Abstract Co-Author*)
Wendaline M. VanBuren, MD (*Abstract Co-Author*)
Marjan Attaran (*Abstract Co-Author*)
Myra K. Feldman, MD (*Abstract Co-Author*)

TEACHING POINTS

Endometriosis is highly prevalent in adolescents with chronic pelvic pain, but diagnosis is often delayed due to limited awareness among clinicians and the general public. Adolescents with endometriosis have unique clinical presentations, diagnostic approaches, disease phenotypes, and treatment options. Most frequently, it appears as mild deep disease which is often associated with superficial disease, with features of glandular activity (T1WI hyperintensity on MRI). Early active subtle lesions may be associated with more severe symptoms than bigger and more fibrotic lesions. Torus uterinus and uterosacral ligament are the most affected in <15 years. However, rectosigmoid lesions and anterior compartment involvement are rare. Endometrioma mainly occurs in = 18 years; the ovarian reserve should be assessed if a cystectomy is considered. Coexistence with adenomyosis (approximately 20%) and Mullerian anomalies (particularly the obstructive ones). Minimal literature on disease progression in adolescents. Initial approach is a transabdominal US and transvaginal if possible. Dedicated pelvic MRI with endovaginal gel (if possible) and IV contrast helps establish the diagnosis and guide treatment.

TABLE OF CONTENTS/OUTLINE

TitleDisclosuresLearning objectivesClinical presentation and diagnostic delayUS and MRI: protocol and report considerationsCase review with discussion of each case's imaging and managementTreatment considerationsConclusionReferences

OBEE-9 THE LAST CHAPTER OF PREGNANCY: WHAT ULTRASOUND TELLS US IN THE THIRD TRIMESTER

Roddie Moraes Neto, MD (*Presenter*)
Alex Dias, MD (*Abstract Co-Author*)
Dario Nascimento Ferreira Alves, MD (*Abstract Co-Author*)
Debora Mayumi Takamune, MD (*Abstract Co-Author*)
Enzo Calheiros, MD (*Abstract Co-Author*)
Leonardo Rosolen Iunes, MD (*Abstract Co-Author*)
Maria Vitoria Ludwig, MD (*Abstract Co-Author*)
Regiany Alessandra Garcia Jureidini, MD, MBA (*Abstract Co-Author*)
Giovanni G. Cerri, PhD (*Abstract Co-Author*)
Sergio Kobayashi, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the purpose of third-trimester ultrasound and how to perform it correctly while avoiding common pitfalls; Recognize and know how to identify the main fetal anomalies detectable in the third trimester; Know the applications and recommendations that can influence medical decision-making with the aid of third-trimester ultrasound

TABLE OF CONTENTS/OUTLINE

Introduction : Why perform obstetric ultrasound in the third trimester? How to perform obstetric ultrasound in the third trimester? Evidence related to third-trimester ultrasound; Examination Technique Standard fetal biometry to be evaluated; Common pitfalls in assessment and how to avoid them; Doppler in the third trimester: how to perform and interpret it; Fetal anomalies Head/brain; Heart; Urinary system; Thorax; Applications and Recommendations in Third-Trimester Ultrasound Placenta previa; Placenta accreta spectrum; Vasa previa; Amniotic fluid disorders; Fetal growth disorders (large for gestational age and small for gestational age); Case-based review ; Summary ; Take home messages

OBEE-10 ENDOMETRIOSIS UNPLUGGED: UNUSUAL LOCATIONS AND UNEXPECTED MANIFESTATIONS

Isabel Fonseca Buelga, MD (*Presenter*)
Alba Salgado Parente, MD (*Abstract Co-Author*)
Carmen Sebastia Cerqueda, MD (*Abstract Co-Author*)
Blanca Pano Brufau, MD (*Abstract Co-Author*)
Pamela I. Causa Andrieu, MD (*Abstract Co-Author*)
Vanessa Murad, MD (*Abstract Co-Author*)
Ana Villanueva, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review the pathophysiology and imaging features of endometriosis in atypical locations throughout the body, using multiple imaging modalities including ultrasound, CT, MRI, and PET. 2. To identify the imaging findings of atypical presentations of endometriosis, with the aim of reducing delayed or missed diagnoses. 3. To propose a systematic approach for evaluating nonspecific lesions in both premenopausal and postmenopausal women, in order to determine whether endometriosis should be considered as a potential diagnosis.

TABLE OF CONTENTS/OUTLINE

1. Background. Epidemiology and pathophysiology 2. Unusual Locations of endometriosis a. Intra-abdominal extrapelvic: GI and GU tract, peritoneum b. Thoracic: pericardium, diaphragm, pleura c. MSK: abdominal wall, cesarean section scar, episiotomy d. Neural involvement 3. Unusual Manifestations a. Malignant transformation

b. Infection c. Decidualization during pregnancy 4. Systematic Approach: What is the differential diagnosis of atypical presentations of endometriosis? 5. Conclusions and take home points 6. References

OBEE-11 IMAGING THE INVISIBLE: ULTRASOUND IN THE DIAGNOSIS AND MANAGEMENT OF UROGYNECOLOGIC SLING COMPLICATIONS

Viviane B. Scattolini, MD (*Presenter*)
Caio Nunes, MD (*Abstract Co-Author*)
Laura Macedo, MD (*Abstract Co-Author*)
Lara Quiche, MD (*Abstract Co-Author*)
Margrit E. Muller, MD (*Abstract Co-Author*)
Pedro Mecate Prada, MD (*Abstract Co-Author*)
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Guilherme Swerts Pereira (*Abstract Co-Author*)
Claudia C. da Silva, MD (*Abstract Co-Author*)
Isadora Calixto, MD (*Abstract Co-Author*)
Andrea G. Leite, MD (*Abstract Co-Author*)
Tatiana F. Guimaraes, MD (*Abstract Co-Author*)
Miguel J. Neto (*Abstract Co-Author*)
Marcelo R. Silva, MD (*Abstract Co-Author*)
Marcos R. Queiroz, MD, MBA (*Abstract Co-Author*)

TEACHING POINTS

This exhibit aims to: - Review the relevant pelvic anatomy and the types of mid-urethral slings (retropubic vs. transobturator). - Describe the ultrasound techniques used to assess sling positioning and functional integrity. - Identify common and uncommon complications of urogynecologic slings as seen on ultrasound. - Correlate sonographic findings with clinical outcomes and long-term management strategies.

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- Feminine pelvic anatomy relevant to sling placement - Overview of surgical techniques for sling insertion - Ultrasound evaluation methods: transperineal and transvaginal approaches - Normal sonographic appearance of slings - Key ultrasound parameters for sling assessment - Common and uncommon sling-related complications - Clinical relevance and management based on imaging findings - Representative clinical case studies.

OBEE-12 WOULD YOU HAVE SUSPECTED THIS? RARE GYN TUMORS AND MIMICKERS THAT BREAK THE RULES

Valesca B. Monteiro, MD (*Presenter*)
Pedro Naime B. Araujo I, MD (*Abstract Co-Author*)
Andrea d. Aranha, MD (*Abstract Co-Author*)

TEACHING POINTS

Not all pelvic tumors follow the typical rules of gynecologic oncology. This educational exhibit presents a series of rare and unexpected gynecologic malignancies—including melanoma, lymphoma, sarcoma, and metastasis—that defy common imaging patterns. Through a case-based format, radiologists will explore imaging clues that help distinguish these unusual entities, understand potential diagnostic pitfalls, and expand their differential diagnoses beyond the conventional. Recognizing these rare tumors can lead to earlier diagnosis, appropriate referral, and optimized patient outcomes.

TABLE OF CONTENTS/OUTLINE

* Introduction: The importance of recognizing rare gynecologic malignancies and their mimickers. * When the presentation defies expectations: clinical and imaging red flags. * Pattern recognition beyond the typical: how rare tumors break the rules. * Mimickers and misdiagnoses: what to avoid in interpretation. * Imaging strategies across modalities (MRI, CT, US): choosing the right tool. * Case-based quiz: can you spot what doesn't fit? * Diagnostic pearls and reporting tips for unusual GYN tumors. * Key pitfalls and how to avoid them. * Summary: expanding your differential in pelvic oncology

OBEE-13 UNVEILING THE HIDDEN: AN ICONOGRAPHIC EXPLORATION OF VAGINAL PATHOLOGIES THROUGH IMAGING

Luiza Suman, MD (*Presenter*)
Gabriela Ramos Ribeiro, MD (*Abstract Co-Author*)
Luana Silva (*Abstract Co-Author*)
Mayra V. Soares, MD (*Abstract Co-Author*)

TEACHING POINTS

•? ?Understand normal vaginal anatomy on MRI •? ?Review key MRI findings in congenital anomalies•? ?Recognize MRI features of common and rare benign and malignant vaginal lesions and their differential diagnoses

TABLE OF CONTENTS/OUTLINE

The vagina is a fibromuscular structure between the vulva and uterine cervix and can be affected by rare benign and malignant conditions. Accurate imaging characterization requires knowledge of vaginal anatomy. Among benign conditions, congenital anomalies resulting from Müllerian duct malformations—such as vaginal agenesis, seen in Mayer-Rokitansky-Küster-Hauser syndrome—are best evaluated by MRI.Inflammatory and infectious vaginal diseases are common. Vaginitis, often of infectious origin, can be challenging to characterize on imaging.Benign tumors include cystic and solid lesions such as Gartner duct cysts and leiomyomas. Malignant lesions may be primary or, more commonly, secondary to cervical or vulvar cancer.Primary vaginal cancer is rare, accounting for 1-2% of all gynecologic malignancies and 10% of vaginal malignancies. The most common subtype is squamous cell carcinoma (90%), followed by adenocarcinoma (8-10%). Lymphomas, sarcomas, and melanomas are exceedingly rare.Due to its superior soft tissue contrast, MRI is the modality of choice for evaluating these tumors. PET-CT is complementary for distant staging.

OBEE-14 TOO YOUNG FOR ENDOMETRIOSIS? THE POWER OF IMAGING IN EARLY DETECTION DURING ADOLESCENCE

Ana Carolina Gaetan Afonso, MD (*Presenter*)
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Arthur H. Godeiro, MD (*Abstract Co-Author*)
Yasmin Fattah, MD (*Abstract Co-Author*)
Lhuanna Maria Barbosa Teixeira, MD (*Abstract Co-Author*)
Sofia B. Maksoud, MD (*Abstract Co-Author*)
Marcela C. Lauar, MD (*Abstract Co-Author*)
Carolina L. Travassos (*Abstract Co-Author*)
Cinthia C. Barbisan, MD (*Abstract Co-Author*)

TEACHING POINTS

Endometriosis is a chronic inflammatory condition that may begin in the early years following menarche, yet it is frequently underdiagnosed in adolescents due to its nonspecific clinical presentation, such as acyclic pelvic pain. These vague symptoms often lead to misdiagnosis with other common conditions, including primary dysmenorrhea, irritable bowel syndrome, and recurrent urinary tract infections. In adolescents, lesions are typically superficial, making detection through conventional

imaging particularly challenging. Moreover, the psychosocial burden of endometriosis during adolescence is substantial, with a marked impact on quality of life. These factors highlight the critical need for radiologists to be trained in recognizing the subtle imaging features of early-stage disease to enable timely and accurate diagnosis.

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This study explores the key aspects of endometriosis in adolescence, using clinical cases that illustrate the diagnostic challenges and imaging findings characteristic of this age group. The pathophysiology, epidemiology, and clinical presentation of the disease in adolescents will be discussed, with emphasis on the distinct features when compared to the adult population. The review will also cover imaging aspects, focusing on the advantages and limitations of various modalities, including ultrasound and magnetic resonance imaging (MRI).

OBEE-15 SURFING THE PERITONEUM: A PICTORIAL ESSAY ON SUPERFICIAL ENDOMETRIOSIS

Izabela P. Franco, MD (*Presenter*)
Alice Cristina C. Brandao Salomao, MD (*Abstract Co-Author*)
Ana Paula C. Moura, MSc (*Abstract Co-Author*)
Isabelle Thomassin-Naggara, MD (*Abstract Co-Author*)
Anuradha S. Shenoy-Bhangle, MD (*Abstract Co-Author*)
Kristine S. Burk, MD (*Abstract Co-Author*)
Brunna C. Oliveira, MD, MSc (*Abstract Co-Author*)
Gabriela Lauar, MD (*Abstract Co-Author*)
Luciana G. Matteoni-Athayde, MD (*Abstract Co-Author*)
Cicilia F. Pontes Fernandez, MD (*Abstract Co-Author*)
Luciana P. Chamie, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Superficial endometriosis is the most common form of the disease, accounting for approximately 80% of all cases, yet it remains significantly underdiagnosed.Normal imaging does not exclude the diagnosis. Despite frequent false-negative imaging results, diagnostic accuracy can be improved through advanced knowledge of pelvic anatomy and the application of high-resolution magnetic resonance imaging (MRI) protocols and dedicated ultrasound(US). This strategy supports more accurate diagnosis and tailored treatment planning.Transvaginal US can detect subtle, nonspecific findings suggestive of superficial endometriosis, which gain diagnostic value when correlated with the patient's clinical history. MRI provides superior anatomical detail, particularly for hemorrhagic lesions.3D MRI sequences in T1- and T2-weighted images, combined with careful evaluation of peritoneal fluid and subtle peritoneal defects, can enhance the detection of lesions.Hormonal treatments may temporarily suppress disease visibility, posing challenges to accurate imaging diagnosis

TABLE OF CONTENTS/OUTLINE

Introduction 1.1 Definition and epidemiology of Superficial Endometriosis 1.2 Clinical Relevance Pathophysiology and Clinical Presentation 2.1 Peritoneal Involvement 2.2 Histological Features 2.1 Clinical implications and anatomical correlation Imaging Techniques and Findings 3.1 Ultrasonographic Features 3.2 MRI features and 3D Volumetric Sequences Diagnostic Challenges 4.1 Limitations of Imaging Methods 4.2 Effect of Hormonal Therapy Clinical Management and Implications 5.1 Diagnostic Algorithm 5.2 Implications for Fertility and Pain Management Teaching Points and Practical Considerations

OBEE-16 CESAREAN SCAR AND FIRST TRIMESTER PREGNANCY: LESSONS FROM INTER-DISCIPLINARY COLLABORATIVE CASE REVIEW

Deepashri Basavalingu, MD,MBBS (*Presenter*)
Garvit D. Khatri, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Cesarean delivery rates have continued to rise globally from 7% in 1990 to 21% in recent years. 2. Cesarean scar ectopic pregnancy occurs when an early pregnancy implants in the scar from previous cesarean delivery. Cesarean scar pregnancy presents significant risk of severe maternal morbidity and mortality as it can lead to complications including uterine dehiscence, uterine rupture, placenta accrete spectrum, hemorrhage, premature delivery and cesarean hysterectomy.3. Growing evidence that early first trimester transvaginal ultrasound screening may be indicated in patients with history of previous cesarean delivery to identify cesarean scar pregnancy.4. Cesarean scar pregnancy is a continuum of abnormal implantation ranging from partial implantation over cesarean scar to implantation within the scar niche.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Rising rates of cesarean delivery and cesarean scar ectopic pregnancies.2. Cesarean scar ectopic pregnancy: Definition, incidence and case examples demonstrating the continuum of cesarean scar implantation ranging from partial implantation to implantation within the niche. 3. Complications of cesarean scar ectopic pregnancy with case examples.4. Role of first trimester ultrasound in identifying cesarean scar pregnancy.5. Lessons learned from inter-disciplinary collaborative case review with case examples: a. Implantation over the cesarean scar versus within the scar niche. b. Ultrasound findings of cesarean scar implantation.c. Location of early placenta with respect to the cesarean scar.d. Early pregnancy loss and cesarean scar.6. Management of cesarean scar pregnancy. 7. Take home points.

OBEE-17 GLOWBUSTERS: CHASING THE INTRAMYOMETRIAL CYSTS

Leonela Panaccio (*Presenter*)
Paula Hernandez Garrigo (*Abstract Co-Author*)
Sofia Pividori, MD (*Abstract Co-Author*)
Bruno Miguel Manzanares, MD (*Abstract Co-Author*)
Silvia E. Gimenez, MS (*Abstract Co-Author*)
Diego Saez, MD (*Abstract Co-Author*)
Teresa A. Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

Ultrasound serves as the primary diagnostic method for assessment of uterine cystic lesions due its accessibility, non-invasiveness, and cost-effectiveness. Understanding the imaging characteristics of uterine cystic lesions is essential to differentiate benign conditions—such as accessory and cavitated uterine mass (ACUM), adenomyosis, or uterine fibroids with cystic degeneration—from more complex or malignant entities like uterine sarcomas. Endometrial stromal tumors (ESTs) primarily arise in the myometrium and/or endometrium but may occasionally be found in extrauterine locations such as the ovaries or peritoneal surfaces. Preoperative diagnosis of low-grade endometrial stromal sarcoma (LGESS) is challenging due to highly variable imaging findings, often leading to confusion with benign uterine masses, such as degenerative leiomyomas. Recognizing imaging patterns specific to each differential diagnosis and its mimics is crucial for appropriate diagnosis and management.

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Comprehensive Description of Imaging Findings in Intramyometrial Cysts. Comparative Analysis of Intramyometrial Cystic lesions: Ultrasound Characteristics with MRI Correlation. Role of Imaging in the Early Detection and Diagnosis of Intramyometrial Cystic Lesions. Pitfalls and Mimics: Case Examples.

OBEE-18 UNRAVELING THE SPECTRUM OF PLACENTA ACCRETA DISORDERS: WHAT EVERY RADIOLOGIST NEEDS TO KNOW

Khatya Gonzales de Holanda, BMedSc (*Presenter*)
Alessandro B. Alla, MD (*Abstract Co-Author*)
Daniella Martins, MD (*Abstract Co-Author*)
Atilio Teixeira, MD (*Abstract Co-Author*)
Flavia M. Augusto, MD (*Abstract Co-Author*)

TEACHING POINTS

Identify MRI features of placenta accreta spectrum (PAS) disorders: accreta, increta, and percreta. Recognize imaging signs that distinguish different degrees of placental invasion. Apply MRI to complement ultrasound, especially in complex or inconclusive cases. Understand the clinical impact of timely and accurate diagnosis on maternal outcomes.

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Introduction to PAS: Definition, prevalence, and clinical importance; relevance of early diagnosis. MRI Technique: Recommended sequences and protocols; value of multiplanar evaluation. Imaging Features by Type: MRI signs of accreta, increta, and percreta; correlation with depth of invasion. Key MRI Findings: T2-dark bands, abnormal placental vascularity, myometrial thinning, retroplacental interface loss, uterine contour changes, and bladder interface disruption. Diagnostic Pitfalls: Avoiding misinterpretation and artifacts; common challenges in assessment. Clinical Relevance: Role of imaging in planning delivery and surgical approach; importance of multidisciplinary coordination. Conclusion: Radiologists play a critical role in PAS diagnosis, and MRI is essential in comprehensive prenatal care.

OBEE-19 IMAGING AND STAGING OF UTERINE CANCER: PRACTICAL INSIGHTS FROM THE LATEST FIGO AND CLINICAL GUIDELINES

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TEACHING POINTS

Endometrial cancer (EC) is the second most prevalent gynecologic malignancy, with rising incidence and mortality, particularly among younger women. In 2023, over 66,000 new cases and 13,000 deaths were estimated in the U.S. The revised FIGO 2023 staging system represents a paradigm shift, integrating anatomical, pathological, and molecular features to better define prognosis and guide management. MRI remains essential preoperatively, offering key insights into prognostic factors such as myometrial invasion, cervical stromal involvement, and lymph node status. Histologically, EC subtypes include low-grade endometrioid carcinomas—considered non-aggressive—and high-grade tumors such as grade 3 endometrioid, serous, clear cell, carcinosarcomas, and others. Molecular profiling, introduced by The Cancer Genome Atlas (TCGA), categorizes tumors into four subtypes: POLEmut, MMRd, p53abn, and NSMP. These categories outperform histologic classification in prognostic stratification and are now incorporated into FIGO 2023. The updated system, supported by WHO and ESGO/ESTRO/ESP guidelines, allows for more precise sub-staging, refining treatment strategies and improving patient outcomes.

TABLE OF CONTENTS/OUTLINE

To review and illustrate the key imaging findings in uterine cancer staging and to demonstrate how recent updates in the FIGO classification and clinical protocols impact diagnostic interpretation and clinical decision-making in everyday radiologic practice.

OBEE-20 THE HIDDEN HIGHWAYS OF THE PELVIS: UNLOCKING FASCIAL ANATOMY TO GUIDE NERVE-SPARING SURGERY

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TEACHING POINTS

Neural endometriosis is clinically significant, causing visceral and somatic pain, such as bladder hyperactivity/sensitivity, incontinence, dysuria, rectal pain, as well as sciatica and gluteal pain, numbness, muscle weakness and rarely foot drop. Untreated cases may progress to chronic inflammation, fibrosis, adhesions, and permanent nerve damage. Surgical excision is the standard treatment, with nerve-sparing techniques improving postoperative function and quality of life. Nerve-sparing techniques aim to reduce iatrogenic injuries, using surgically developed 'virtual spaces' which provide access to deep neurovascular structures and enable safe mobilization and separation of pelvic tissues, minimizing tissue trauma. Comprehensive pelvic fascial anatomy knowledge is vital for nerve-sparing surgery, as pelvic fascia delimit the pelvic spaces and the nerves traverse between fascial sheets. Using standardized, intuitive terms improves communication between surgeons and radiologists, ensuring precise dissection and safer procedures.

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1- Female Pelvic Fascia Anatomy, including endopelvic fascia and its respective parietal, visceral and extraperitoneal subdivisions. 2- Female Pelvic avascular spaces, prevesical, and their anatomical landmarks. 3- Pelvic Neural Anatomy related to fascial planes are frequently involved in deep endometriosis. 4- Key Imaging Findings that radiologists should recognize to guide preoperative planning and help avoid complications. 5-Postoperative Imaging Appearances and potential complications associated with these procedures.

OBEE-21 A COMPREHENSIVE REVIEW OF CONDITIONS FOUND ON HYSTEROSALPINGOGRAM

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TEACHING POINTS

Hysterosalpingogram (HSG) is a commonly performed imaging study for the evaluation of subfertility and infertility. However, the breadth of normal and disease conditions may be unfamiliar to practicing radiologists. This educational exhibit aims to: 1. Describe the technical considerations for performing diagnostic HSG. 2. Illustrate the HSG appearance of normal anatomic features of the female reproductive tract. 3. Provide a comprehensive case-based review of Müllerian duct anomalies and uterine, tubal, and peritoneal conditions identifiable with HSG.

TABLE OF CONTENTS/OUTLINE

1. Technique: patient preparation, procedural timing, cervical identification, cannulation, and patient positioning. 2. Equipment: speculum, contrast, and catheters. 3. Normal anatomy and variants: female reproductive tract anatomy with HSG, flexion, version, and normal peritoneal findings. 4. Müllerian duct anomalies: arcuate, septate, unicornuate, didelphys, and hypoplasia. 5. Tubal Conditions: pelvic inflammatory disease (PID), salpingitis isthmica nodosa (SIN), tuberculosis, and tubal

polyps. 6. Uterine Conditions: fibroids, polyps, adhesions, intravasation, adenomyosis, and iatrogenic conditions. 7. Peritoneal Conditions: loculated peritoneal collections, ovarian enlargement, uterine enlargement, and pelvic floor disorders.

OBEE-22 BEYOND THE BASICS: ADVANCED PELVIC ANATOMY IN ENDOMETRIOSIS

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TEACHING POINTS

Endometriosis can infiltrate peritoneal and extraperitoneal spaces, pelvic nerves (both autonomic and somatic), fascias and vascular structures, which can be challenging for conventional image interpretation. Understanding pelvic anatomy is essential for accurately detecting and describing endometriotic lesions, as well as improving interdisciplinary communication and preoperative surgical planning. Understanding the complex anatomy of the parametrium and its adjacent avascular spaces, which are accessed during surgical dissection, is crucial for surgical planning, preventing complications and improving outcomes. Superficial endometriosis may appear as subtle peritoneal defects with associated extraperitoneal fluid, requiring careful evaluation and understanding of these spaces.

TABLE OF CONTENTS/OUTLINE

- Introduction - Pelvic anatomy and compartmentalization - Pelvic fascias - Extraperitoneal pelvic spaces - Pelvic nerves - Take home messages - References

OBEE-23 CHALLENGES IN MATERNAL IMAGING: UNVEILING PREGNANCY AND POSTPARTUM COMPLICATIONS THROUGH RADIOLOGY

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TEACHING POINTS

• Review MRI and CT features of pregnancy-related complications, from pre-conception through the postpartum period. • Highlight imaging manifestations of conditions that challenge radiologic assessment, including assisted reproduction complications, gynecologic emergencies, and postpartum disorders. • Provide practical diagnostic tips and emphasize the need for multidisciplinary collaboration in maternal care.

TABLE OF CONTENTS/OUTLINE

1. Physiologic Imaging Findings in Pregnancy and Postpartum: overview of normal MRI/CT appearances and imaging protocols during and after pregnancy.2. Complications of Assisted Reproduction: imaging features of ovarian hyperstimulation syndrome and oocyte retrieval-related issues.3. Maternal Emergencies During Pregnancy includes pelvic masses, adnexal torsion, red degeneration of fibroids, appendicitis, internal hernia, ureterolithiasis, bowel inflammation, and vascular complications.4. Postpartum Disorders: covers imaging of cesarean scar complications (dehiscence, hematoma, abscess, endometrial implants), ovarian vein thrombosis, puerperal hematoma, and hepatic adenoma rupture.5. Diagnostic Pearls and Management Considerations: practical guidance for accurate interpretation and early intervention, with a focus on teamwork across specialties.

OBEE-24 UTERINE SYNECHIAE: WHY RADIOLOGISTS SHOULD PAY ATTENTION—IMAGING INSIGHTS AND MANAGEMENT RELEVANCE

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TEACHING POINTS

1. Uterine synechiae are intrauterine adhesions (IUAs) that distort the endometrial cavity and impair endometrial function, significantly compromising fertility .2. They are commonly developed after intrauterine procedures, trauma, or infections. Clinical manifestations may include menstrual irregularities, infertility, and recurrent pregnancy loss. 3. This condition is frequently underdiagnosed; therefore, radiologists must be familiar with its imaging features across multiple modalities to enable early detection. 4. The location and depth of intrauterine adhesions are critical factors that must be clearly assessed through imaging, as they directly influence therapeutic planning and patient counseling. 5. Accordingly, developing a reproducible and standardized imaging language to describe the site, extent, and characteristics of IUAs across various modalities is essential to guide clinical decision-making and improve patient outcomes.

TABLE OF CONTENTS/OUTLINE

Overview of Uterine Synechiae: Pathophysiology and clinical implications. Updated Classification Systems: Adhesion grading based on site and depth of injury. Multimodality Imaging Approach: · 2D Transvaginal Ultrasound (TVUS) · 3D Ultrasound · Saline Infusion Sonohysterography (SIS) · Hysterosalpingography (HSG)· Magnetic Resonance Imaging (MRI). Imaging Pitfalls and Differential Diagnosis. Correlation with Hysteroscopic Findings. Case-Based Review: From imaging diagnosis to hysteroscopic confirmation. Summary: Key imaging features and management implications.

OBEE-25 NO, IT IS NOT JUST MENSTRUAL CRAMPS! IMAGING FEATURES OF TEENAGE ENDOMETRIOSIS

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TEACHING POINTS

1. Improve the knowledge of endometriosis in young patients focused on prevalence, clinical presentation, anatomy and imaging techniques using a didactic approach. 2. Highlight the importance of noninvasive diagnostic methods for early detection of endometriosis in adolescents and young adults, minimizing delays in diagnosis and improving patient outcomes. 3. Improve the understanding of imaging techniques, particularly the role of magnetic resonance imaging (MRI) as a key tool in detecting endometriotic lesions. 4. Describe biomarkers and clinical symptomatology that can be used as a support to imaging findings.

TABLE OF CONTENTS/OUTLINE

1. Definition and epidemiology of endometriosis in adolescents and young adults: importance of early diagnosis and challenges in noninvasive detection. 2. Imaging protocols for endometriosis in young patients: recommended MRI protocols and technical considerations for optimal evaluation, including the role of bowel preparation, sequence selection, and US complementation. 3. Clinical and imaging findings in young patients: common symptoms and differences from adult endometriosis presentations. 4. Noninvasive diagnostic methods focused on Magnetic Resonance Imaging (MRI) and ultrasound (US): utility in detecting deep infiltrating endometriosis. 5. Biomarkers and Laboratory Tests: current limitations and future perspectives in biomarker-based diagnosis. 6. Conclusions and "take home messages": consolidate the acquired knowledge.

OBEE-26 FROM PIXELS TO PATHOLOGY: DECODING ENDOMETRIAL CANCER SUBTYPES

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TEACHING POINTS

Endometrial tumors include multiple histologic subtypes with varying prognosis, metastatic potential, and MRI features. Accurate characterization requires evaluating T2 signal intensity, diffusion behavior and enhancement patterns. Imaging findings were reviewed from current literature and correlated with pathology. Epithelial tumors (endometrioid carcinoma) range from low-grade polypoid to high-grade infiltrative forms, with hypovascular enhancement. Serous and clear cell carcinomas show early myometrial invasion and intense, heterogeneous enhancement. Mesenchymal tumors vary by grade: low-grade endometrial stromal sarcoma shows subtle, worm-like myometrial infiltration; high-grade stromal sarcoma forms bulky, necrotic masses with extrauterine implants. Mixed tumors have distinct MRI patterns, for example adenosarcoma shows a "Swiss cheese" architecture. While ultrasound is commonly used, it lacks specificity. MRI more effectively assesses myometrial invasion, extrauterine spread, and suspicious lymph nodes, key for staging and treatment. Radiologic-pathologic correlation improves diagnostic accuracy and supports individualized treatment.

TABLE OF CONTENTS/OUTLINE

1. Introduction. Overview of Endometrial Tumor Types. Importance of MRI. 2. MRI Findings and Pathological Confirmation: i) Epithelial Tumors: Endometrioid Carcinoma. Serous Carcinoma. Clear Cell Carcinoma. Carcinosarcoma (Malignant Mixed Müllerian Tumor). ii) Mesenchymal Tumors: Low-Grade Endometrial Stromal Sarcoma. High-Grade Endometrial Stromal Sarcoma. Undifferentiated sarcoma. iii) Mixed Tumors: Adenosarcoma 3. Discussion: Pitfalls in MRI Interpretation.4. Summary: Table.5. Conclusion

OBEE-27 CT ROLE IN GYNECOLOGIC EMERGENCIES

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TEACHING POINTS

- Gynaecological emergencies often present with non-specific abdominal symptoms, requiring a high index of suspicion for accurate diagnosis. - CT can reveal critical gynaecological findings such as ovarian torsion, pelvic inflammatory disease, hemorrhagic follicles, and ovarian vein thrombosis. - Ovarian torsion should be suspected with ovarian edema and abnormal positioning, while tubo-ovarian complexes on CT suggest pelvic inflammatory disease. - Familiarity with gynaecological pathologies on urgent CT scans improves diagnostic accuracy, speeds up treatment, and enhances interdisciplinary collaboration, ultimately helping preserve reproductive health.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Epidemiology 3. CT technique 4. Description of the characteristic CT findings of different pathologies a. Ovarian torsion b. Pelvic inflammatory disease (PID) c. Hemorrhagic follicle d. Ovarian vein thrombosis e. Ectopic tubal pregnancy f. Endometritis g. Others 5. Differential diagnosis 6. Pitfalls 7. Conclusions

OBEE-28 SURGICAL FOOTPRINTS: CLINICAL RELEVANCE OF POSTOPERATIVE UTERINE IMAGING FINDINGS

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TEACHING POINTS

The rising average maternal age has increased the frequency of conservative uterine surgeries in scenarios where hysterectomy was previously standard. Radiologists must be aware of these procedures to accurately identify postoperative anatomy, detect complications, and recognize findings that may impact fertility or gestational outcomes.

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Uterine Zonal Anatomy: Normal appearance of the endometrium, junctional zone, and myometrium on MRI and ultrasound Surgical Procedures & Imaging Features: Endometriosis resection; use of hemostatic agents (e.g., oxidized cellulose) Myomectomy, adenomyomectomy, myometrectomy Cone biopsy, trachelectomy, supracervical/total hysterectomy Cesarean section and scar assessment Curettage and manual uterine aspiration (MUA) Hysteroscopic procedures (e.g., myomectomy, polypectomy, ablation) Postoperative Complications: Myometrial thinning, uterine rupture, perforation, fistulas Secondary adenomyosis Uterine niche Vaginal vault dehiscence Pelvic adhesions Infections Didactic Cases: Multimodal imaging of normal and abnormal postoperative findings Structured Reporting: Checklist of key elements to guide clinical decisions and avoid missed findings

OBEE-29 CONGENITAL PULMONARY MALFORMATIONS: PRENATAL MRI ROLE

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TEACHING POINTS

Congenital chest malformations (CCM) include a group of different entities in which making a correct diagnosis is essential MRI plays a key role in characterizing pulmonary malformations Usefulness in the diagnosis and treatment of such injuries, essential in the management of these patient Evaluates neoadjuvant therapy response on changes in FDG uptake

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1- Introduction a) General aspects b) Classification 2- Congenital diaphragmatic hernia (CDH) a) Epidemiological scenario b) Imaging findings c) Total fetal lung volume (TFLVo) and percentage of herniated liverd) Differential diagnosis e) Treatment3- Congenital pulmonary airway malformations (CPAM) a) Classification b) Key imaging findings. Macrocystic vs microcystic4- Bronchopulmonary sequestration (BPS) a) Classification b) Key imaging findings. Distinction between intralobar and extralobar5- Other congenital malformations a) Congenital pulmonary lymphangiectasiab) Bronchial atresia c) Bronchogenic cysts d) Congenital lobar emphysema 5- Conclusions

OBEE-30 OVARIAN SEX CORD-STROMAL TUMORS: RADIOLOGIC-PATHOLOGIC CORRELATION

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TEACHING POINTS

Ovarian sex cord-stromal tumors are a group of neoplasms originating from primitive sex cord and stromal cells, representing 7-8% of ovarian tumors. These tumors can occur in women of all ages, exhibiting diverse clinical manifestations. Unlike epithelial ovarian tumors, sex cord-stromal tumors often present early and have a favorable prognosis with surgical treatment. Although some sex cord-stromal tumors, like fibromas, have distinct imaging features, changes such as increased cellularity, necrosis, or degeneration can pose diagnostic challenges. Other rare subtypes are particularly more confusing due to varied morphology. The rarity of these tumors also lowers suspicion, increasing the likelihood of misdiagnosis as more common epithelial ovarian cancers. Our focus is on the imaging characteristics of ovarian sex cord-stromal tumors, comparing their features to other ovarian tumors. We'll explore ultrasound, CT, and MRI findings with radiologic-pathologic correlation.

TABLE OF CONTENTS/OUTLINE

1. Introduction including the incidence and recent WHO classification of ovarian sex cord-stromal tumors. 2. Case-based review focusing on radiologic-pathologic correlation of sex-cord stromal tumors, highlighting clinical manifestations, key pathologic features, and MRI characteristics. 3. Discussion for treatment planning and prognosis.

OBEE-31 KEY INSIGHTS AND PITFALLS IN MRI OF UTERINE AND CERVICAL LESIONS

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TEACHING POINTS

Uterine and cervical lesions are common in clinical practice, and MRI is pivotal for their evaluation due to its superior soft-tissue contrast and multiplanar capability. Recognizing diagnostic pearls and avoiding pitfalls is essential for optimal patient care.

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Key Considerations High-quality MRI protocols (T2/T1-weighted, DWI, dynamic contrast-enhanced) are critical. Challenges include anatomical variants, pathological changes, and intrinsic lesion features (size, degeneration, hemorrhage). Poorly angled images, small/extensive lesions, and overlapping conditions (adenomyosis, leiomyomas, endometriosis) complicate diagnosis. Atypical benign or inflammatory lesions may mimic malignancy. Objective Through a case series, this study highlights common pitfalls and clarifies key doubts in uterine/cervical lesion assessment, empowering radiologists to apply MRI pearls, avoid errors, and ensure precise, clinically impactful interpretations.

OBEE-32 ENDOMETRIAL OR CERVICAL CANCER? IMAGING CLUES AND DIAGNOSTIC CHALLENGES

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TEACHING POINTS

Magnetic resonance imaging (MRI) is the modality of choice for the initial evaluation of cervical and endometrial cancers , providing essential information on tumor location, size, depth of invasion, and nodal status for staging and treatment planning. Differentiating between these two entities can be challenging , especially in large pelvic tumors where anatomical landmarks are distorted. Morphologic features - such as tumor epicenter, shape, and pattern of spread - along with functional imaging (contrast enhancement and diffusion-weighted sequences) offer valuable clues to the tumors site of origin. Although histopathology remains definitive, radiologists play a key role in preoperative evaluation and management guidance.This education exhibit aims to highlight MRI features that help distinguish between cervical and endometrial cancer and to reinforce the importance of imaging in accurate staging and diagnosis.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Epidemiology of endometrial and cervical cancer and the importance of accurate diagnosis for treatment planning. 2. MRI protocol: Recommended MRI sequences and their diagnostic relevance. 3. Typical Imaging Features: Key MRI characteristics of primary cervical and endometrial cancers, including tumor location, shape, stromal invasion, and pattern of locoregional spread. 4. Challenging cases: Diagnostic pitfalls and examples of tumor with overlapping features or ambiguous origin. 5. Conclusion.

OBEE-33 ENDOMETRIOSIS SCREENING IN AN ENRICHED POPULATION: ASPIRATIONAL OR ACHIEVABLE?

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TEACHING POINTS

Why Consider Screening? High Prevalence: Endometriosis affects approximately 1 in 10 premenopausal women Significant Morbidity: It contributes to chronic pelvic pain, infertility, and reduced quality of life Prolonged Diagnostic Delays There is a multifactorial diagnostic delay by 7-10 years How Can We Screen? Current Tools Transvaginal ultrasound (TVUS) is the most commonly used imaging modality for evaluating female pelvic symptoms and presents an opportunity to detect endometriosis during routine imaging Enhanced Techniques Maneuvers like the sliding sign and posterior cul-de-sac imaging improve detection on TVUS (SRU Consensus Statement, 2024) Who Should Be Screened? Targeted Approach: Given the high specificity but lower sensitivity of current imaging modalities (TVUS and MRI), screening should be directed at pre- or perimenopausal women with clinical symptoms or examination findings suggestive of endometriosis

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A. Criteria for Effective Endometriosis Screening Disease related Screening test related Management related B. Framework for a Successful Screening Program Define the enriched population Promote awareness among patients, technologists, and radiologists Utilize TVUS as a primary screening tool Employ advanced imaging modalities (e.g., bowel-prepped TVUS and/or pelvic MRI) when needed Foster communication with referring clinicians through standardized templates C. Rationale for Screening High disease prevalence Unacceptable diagnostic delays Economic and emotional burden on patients and healthcare systems Improved outcomes with timely intervention Potential prevention of long-term complications, including malignant transformation

OBEE-34 IMPLANTATION MISSION: IMPOSSIBLE — WHEN BEING IN THE UTERUS IS NOT ENOUGH

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TEACHING POINTS

Always suspect an intrauterine ectopic pregnancy when the gestational sac is low, eccentric, or immobile. Evaluate vascularization with color Doppler: intense peritrophoblastic flow suggests active trophoblastic tissue. Use MRI when ultrasound findings are atypical or inconclusive. Avoid dilation and curettage (D&C) if there is any suspicion of an ectopic implantation within the uterus — the risk of life-threatening hemorrhage is high. Look for specific signs: Interstitial line sign ? Interstitial pregnancy Fixed sac below the internal os ? Cervical pregnancy Sac implanted in anterior lower segment scar ? Cesarean scar pregnancy Sac fully surrounded by myometrium, no endometrial connection ? Intramural pregnancy

TABLE OF CONTENTS/OUTLINE

Introduction Definition and relevance of ectopic uterine pregnancies Interstitial Pregnancy Ultrasound and MRI findings - surgical compatibility. Cervical Pregnancy Ultrasound and MRI characteristics - therapeutic implications. Pregnancy in Cesarean Section Scar Image presentation and treatment options. Intramural Pregnancy Ultrasound diagnosis and surgical considerations. Diagnostic Pitfalls Differentiation between ongoing miscarriage and other entities. Conclusions References and Acknowledgments

OBEE-35 SEEING THE WHOLE PICTURE: MUSCULOSKELETAL FINDINGS IN FEMALE PELVIC IMAGING

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TEACHING POINTS

With relative frequency, patients undergoing pelvic imaging exams present musculoskeletal findings that may raise diagnostic uncertainties and pose challenges for the abdominal radiologist. These findings can be physiological and act as potential pitfalls in image interpretation, such as perineural cysts. Alternatively, they may reflect underlying disease processes or previously undiagnosed symptomatic conditions, including infiltrative bone marrow lesions, avascular necrosis, osteomyelitis, and bursitis, among others.Given this scenario, the abdominal radiologist plays a crucial role in recognizing and accurately describing these findings, as they may significantly impact patient management and clinical decision-making.The primary objective of this exhibit is to review the most relevant musculoskeletal findings and pathologies that may be incidentally detected in pelvic imaging studies, aiming to provide practical diagnostic tips to aid radiologists in accurate identification and differentiation of these entities, thereby enhancing diagnostic confidence and avoiding common interpretative pitfalls.

TABLE OF CONTENTS/OUTLINE

Introduction; Objectives; Main musculoskeletal pathologies found on pelvic imaging exams illustrated by cases from our institutions; Diagnostic approach; Conclusion

OBEE-36 POST-RADIATION THERAPY CHANGES AND COMPLICATIONS IN CERVICAL CANCER

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TEACHING POINTS

Cervical cancer remains a significant global health issue, and radiation therapy plays a central role in its treatment , particularly in locally advanced stages. As survival rates improve, post-treatment imaging has become essential for assessing therapeutic response, detecting recurrence, and identifying complications. Magnetic resonance imaging (MRI) is the modality of choice for post-radiation follow-up due to its excellent soft tissue contrast and multiplanar capability. However, interpretation can be challenging. Radiation induces a spectrum of expected changes in pelvic organs - including the cervix, uterus, bladder, rectum, and bone marrow - that may mimic tumor recurrence or obscure early complications. This educational exhibits reviews the typical MRI appearances of the post-treatment pelvis and highlights common post-radiation complications such as fistulas, fibrosis and strictures. Differentiating expected post-therapy changes from true pathological findings is essential for accurate diagnosis, avoiding pitfalls, and guiding management.

TABLE OF CONTENTS/OUTLINE

1. Introduction: overview of cervical cancer, female pelvis anatomy, and the role of MRI in post-treatment follow-up. 2. MRI protocol key sequences for post-treatment pelvic MRI evaluation. 3. Expected Post-Radiation Findings typical imaging appearances of the cervix, uterus, bladder, rectum, and bone marrow. 3. Radiation-related complications common and uncommon findings such as fistulas, fibroses and strictures. 4. Tumor recurrence imaging clues suggestive of recurrence. 5. Conclusion practical tips to improve diagnostic confidence and avoid pitfalls.

OBEE-37 NAVIGATING THE NUANCES: A COMPARATIVE STUDY OF NORMAL AND ABNORMAL PREGNANCY LOCATIONS - A PICTORIAL REVIEW

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Ann Packard, MD (*Abstract Co-Author*)

TEACHING POINTS

1. First trimester ultrasound (US) is key in establishing pregnancy viability, number, and location. 2. Normal pregnancy implantation includes intrauterine and intrauterine eccentric variants 3. Locations of ectopic pregnancy implantation includes cervical ectopic, cesarean scar ectopic, intramural ectopic, interstitial ectopic, tubal ectopic, ovarian ectopic, and abdominal ectopic, which are sometimes mistaken for normal implantation or other pathologies.

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1. Review the indications for first trimester US including the importance of ß-hCG and pregnancy of unknown location. 2. Recognize the normal appearance of an intrauterine pregnancy (IUP) of the first trimester. 3. Review the non-ectopic locations for pregnancy implantation including intrauterine and eccentric variant IUP and helpful radiologic signs such as double decidual sac sign and intradecidual sign. 4. Review a common pitfall comparing and contrasting eccentric IUP and interstitial ectopic pregnancy. 5. Examination of a case of cesarean section scar ectopic and potential complications. 6. Comparison of ultrasound evaluation of adnexal ectopic pregnancy versus a corpus luteum.

OBEE-38 ENDOMETRIOSIS IMPOSTORS CLUB: WHO'S FOOLING RADIOLOGISTS?

Talessa Cometi De Oliveira, MD (*Presenter*)
Cristiane R. Costa (*Abstract Co-Author*)
Martin Horwarth, MD (*Abstract Co-Author*)
Cassia T. Guimaraes, MD (*Abstract Co-Author*)
Glaucy L. Neme, MD (*Abstract Co-Author*)

TEACHING POINTS

Not all T1-hyperintense or fibrotic lesions in the pelvis and abdomen represent endometriosis and recognizing key mimics is essential to avoid misdiagnosis. Correlating lesion morphology, signal intensity, location, and patient demographics is crucial to differentiate endometriosis from look-alike entities such as tumors, abscesses, and benign fibrous lesions. A systematic imaging approach, combined with clinical suspicion and knowledge of typical mimics, enhances diagnostic accuracy and prevents unnecessary surgical interventions.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Pelvic mimics of endometriosis 3. Abdominal wall and extraperitoneal mimics 4. Uncommon and surprising mimics 5. Take-home messages 6. References

OBEE-39 GYN CANCERS UNDER THE KNIFE: A RADIOLOGIC QUIZ FOR SURGICAL DECISION-MAKING

Andrea d. Aranha, MD (*Presenter*)
Valesca B. Monteiro, MD (*Abstract Co-Author*)
Pedro Naime B. Araujo I, MD (*Abstract Co-Author*)

TEACHING POINTS

Accurate imaging interpretation is essential for the surgical management of gynecologic malignancies. This educational exhibit uses a quiz-based format to highlight imaging features that directly impact surgical decisions in cancers of the endometrium, cervix, ovary, and vulva. Learners will identify key imaging questions surgeons need answered, recognize common diagnostic pitfalls, and understand the implications of FIGO staging updates and the expanding role of MRI and CT in preoperative planning.

TABLE OF CONTENTS/OUTLINE

Introduction. Overview of gynecologic oncology staging and surgical goals. Imaging questions that guide surgery by tumor site: *• Endometrium: depth of invasion, cervical stromal involvement *• Cervix: parametrial invasion, pelvic sidewall, vaginal extension *• Ovary: peritoneal disease, resectability criteria *• Vulva: tumor extension, urethral involvement. * Lymph node status and the new role of imaging in FIGO staging. * Quiz-based case review. *Imaging pitfalls and pearls. *Prognostic factors. Take-home messages.

OBEE-40 ROLE OF ULTRASOUND IN PREOPERATIVE ASSESSMENT AND SURGICALPLANNING OF ENDOMETRIOSIS

Eduardo A. Soares, MD (*Presenter*)

TEACHING POINTS

Transvaginal ultrasound (TVUS) is the preferred, minimally invasive imaging technique to detect and map endometriosis, with high sensitivity and specificity for ovarian and deep infiltrating lesions. Accurate preoperative TVUS enables identification of lesion location and extent, prediction of surgical complexity, and involvement of multidisciplinary teams (e.g., colorectal or urological surgeons when bowel or bladder are affected). Ultrasound-based staging systems and techniques like the sliding sign and posterior compartment assessment enhance detection of adhesions and deep lesions, improving surgical completeness and patient outcomes. Findings support personalized therapeutic planning, including risk counseling, fertility preservation, and referral to specialized centers.

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Importance of Preoperative Imaging Techniques and Diagnostic Accuracy Mapping and Staging of Ovarian and Deep Endometriosis Predicting Surgical Complexity and Team Planning Counseling and Individualized Management New Protocols and Consensus Guidelines

OBEE-41 DEEP PELVIC ENDOMETRIOSIS INDEX MAGNETIC RESONANCE IMAGING SCORE (DPEI): WHAT THE RADIOLOGIST NEEDS TO KNOW?

Ana Claudia Vincenzi Raduan Uski (*Presenter*)
Marilia P. Ferreira, MD (*Abstract Co-Author*)
Maria Helena N. Pedroso (*Abstract Co-Author*)
Marina M. Costa (*Abstract Co-Author*)
Virginia d. Goncalves, MD (*Abstract Co-Author*)
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Ananda P. Araujo, MD (*Abstract Co-Author*)
Filipe Chaves, BMedSc (*Abstract Co-Author*)
Lhuanna Maria Barbosa Teixeira, MD (*Abstract Co-Author*)
Gustavo Hoff Ussami (*Abstract Co-Author*)
Carolina P. Abud, MD (*Abstract Co-Author*)

TEACHING POINTS

Pelvic endometriosis is a chronic inflammatory gynecologic disorder that may lead to chronic pelvic pain, dysmenorrhea, dyspareunia, gastrointestinal or urinary dysfunction, and infertility. Magnetic resonance imaging (MRI) plays a pivotal role in detecting and assessing the extent of disease. The Deep Pelvic Endometriosis Index (dPEI) classification assists in surgical risk stratification. In brief, the pelvis is divided into nine anatomically defined compartments. One point is assigned for each deep endometriosis (DE) lesion identified per compartment, regardless of lesion size. An additional point is given if the lesion extends beyond the parietal fascia in the lateral compartment. Based on the final score, the disease is classified as mild, moderate, or severe.This review aims to familiarize radiologists with the routine application of the dPEI score, which demonstrates good accuracy and reproducibility, and supports preoperative planning and the prediction of potential postoperative complications.

TABLE OF CONTENTS/OUTLINE

Introduction;Objectives;Radiologic cases with clinical and/or surgical correlation;Conclusion / take home messageReferences

OBEE-42 PLACENTAL PATHOLOGY THROUGH LENS OF IMAGING DIAGNOSTIC INSIGHTS AND CLINICAL IMPLICATIONS

Flaminia Frezza, MD (*Presenter*)
Valentina Miceli, MD (*Abstract Co-Author*)
Marco Gennarini (*Abstract Co-Author*)
Sandrine Riccardi (*Abstract Co-Author*)
Roberta V. Ninkova, MD (*Abstract Co-Author*)
Chiara Amoroso (*Abstract Co-Author*)
Federica Curti, MD (*Abstract Co-Author*)
Claudia Cutonilli, MD (*Abstract Co-Author*)

TEACHING POINTS

• Recognize key MRI features of common and critical placental disorders, as Placenta Previa, Placenta Accreta Spectrum, Placental Abruption and Tumors• Appreciate the role of MRI in patients management • Placenta PreviaClassification based on distance from OCI (lateral, marginal and central partial or complete)Ultrasound is the gold standard for the diagnosis. • Placenta Accreta Spectrum Includes: accreta (adherence to myometrium), increta (invasion into myometrium), percreta (penetration beyond serosa) MRI evaluates depth of invasion and assist in the delivery planningContrast agent in same cases can be used.• Placental Abruption: In the majority of cases it can lead hemorrhage and compromise fetal blood supply.Classified as mild and sever.Ultrasound is the gold standard for diagnosis, as it can identify retroplacental hematoma. • Placental TumorsBenign, as chorioangioma and hydatidiform mole and malignant as the gestational trhophoblastic neoplasia (choriocarcinoma).

TABLE OF CONTENTS/OUTLINE

1. Introduction Overview of Common Placental Disorders Role of Radiology2. Placenta previa Classification Imaging Techniques and Diagnostic Criteria3. Placenta Accreta Key imaging Findings for Radiologists Implications for Delivery Planning and Management4. Placental Abruption Role of Ultrasound and MRI in Diagnosis5. Placental Tumors Benign Tumorso Malignant Tumors Imaging Features in the Hydatidiform Mole6. Conclusions Summary of Imaging's Role in Placental Disorders

OBEE-43 ENZIAN AND THE CHOCOLATE FACTORY. AN ENDOMETRIOSIS 2025 MUST

Sandra Victoria Servin Baltierra, MD (*Presenter*)
Yeni Fernandez de Lara Barrera, MD (*Abstract Co-Author*)
Maria Jose Becerril Barrientos, MD (*Abstract Co-Author*)

TEACHING POINTS

1.Highlight the endometriosis phenotypes; 2.Demonstrate the value of the ENZIAN system in describing deep endometriosis; 3.Detail the ENZIAN classification with numerous real cases with imaging and surgical correlation; 4.Establish the recommendations of laparoscopy (no longer the gold standard for diagnosis) in whose patients have negative imaging results and/or where empirical treatment has failed or has been inappropriate.

TABLE OF CONTENTS/OUTLINE

1.Introduction to endometriosis phenotypes; 2.Diagnostic paradigm shift; 3.ENZIAN Classification: A radiologist´s guide; 4.MRI Endometriosis Mapping Protocol; 5.Imaging Findings and ENZIAN correlation by case-based learning; 6.Pitfalls & mimics; 7.Multidisciplinary impact.

OBEE-44 MISSION IMPOSSIBLE. WHY CAN'T I GET PREGNANT? DECODING THE HIDDEN FINDINGS IN FEMALE INFERTILITY IMAGING

Sandra Victoria Servin Baltierra, MD (*Presenter*)
Omar A. Gamboa Abundis, MD (*Abstract Co-Author*)

TEACHING POINTS

1.Infertility is becoming a public health issue in developed countries; 2.Infertility in females is multifactorial in origin. The pelvic causes are: tubal, uterine and ovarian; 3.The imaging findings help direct subsequent patient care; 4.The selected imaging methods to assess this are hysterosalpingography, pelvis ultrasound, hysterographic ultrasound and pelvic magnetic resonance imaging; 5.Illustrated examples of each of the infertility imaging findings as fallopian tube abnormalities, endometriosis, intrauterine filling defects, uterine contour irregularities, mullerian duct anomalies, cervical and ovarian abnormalities; 6.Imaging methods represent the pathway to assess female infertility; 7.This pictorial review shows multiple imaging findings while evaluating female infertility.

TABLE OF CONTENTS/OUTLINE

1.Introduction to female infertility; 2.Imaging modalities and clinical utility; 3.Anatomical causes; 4.Imaging pathway for infertility; 5.Illustrated imaging findings; 6.Pitfalls and limitations; 7.Different imaging method findings correlation; 8.Take home messages.

OBEE-45 ABDOMINOPELVIC COMPLICATIONS OF GYNECOLOGIC MALIGNANCY: ESSENTIALS FOR RADIOLOGISTS

Sara Hassanzadeh, MD (*Presenter*)
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Elizabeth A. Sadowski, MD (*Abstract Co-Author*)
Atul B. Shinagare, MD (*Abstract Co-Author*)
Stephanie Nougaret, MD, PhD (*Abstract Co-Author*)
Benedetta Gui, MD (*Abstract Co-Author*)
Lucia Manganaro, MD (*Abstract Co-Author*)
Katherine E. Maturen, MD, MS (*Abstract Co-Author*)
Stefania Rizzo, MD, PhD (*Abstract Co-Author*)
Evis Sala, MD, PhD (*Abstract Co-Author*)
Pamela I. Causa Andrieu, MD (*Abstract Co-Author*)
Aradhana Venkatesan, MD (*Abstract Co-Author*)

TEACHING POINTS

?To recognize pre-therapy tumor-related abdominopelvic complications of gynecologic malignancy, including those related to: locoregional invasion, tumor rupture, hypercoagulability, and secondary infection ?To identify the post-therapy abdominopelvic complications encountered in gynecologic cancer patients, specific to treatment modality, and to distinguish these from expected post-treatment sequelae: oPost-operative complications (e.g., postoperative ileus, fistulas, lymphocele, wound infection) oPost radiation complications (e.g., radiation enteritis, bladder dysfunction, pelvic insufficiency fractures) oComplications following systemic chemotherapy? Cytotoxic chemotherapy? Targeted therapies (e.g., myelosuppression, neutropenic enterocolitis, bowel perforation, nephrotoxicity) oComplications of immunotherapy (e.g., colitis, enteritis, hepatitis, pancreatitis) ?CT is a first-line modality due to its accessibility and high accuracy. MRI is superior for fistulas, tumor recurrence, and radiation-related changes. US is helpful for hydronephrosis, lymphoceles, and pelvic collections. PET/CT aids in distinguishing recurrence from post-therapy effects.

TABLE OF CONTENTS/OUTLINE

Introduction Overview of gynecologic malignancies and their abdominopelvic complications Role of radiology Pre-treatment tumor-related Complications Post-therapy Complications Conclusion Summary of imaging insights and impact on patient care Methodology: Case-Based illustrative exhibit highlighting classic and uncommon complications and interpretive challenges.

OBEE-46 ROUND LIGAMENT OF UTERUS - A ROPE WALK !!

Aruna R. Patil, MD, FRCR (*Presenter*)
Harshita Ramamurthy (*Abstract Co-Author*)
Yashant Aswani, MD (*Abstract Co-Author*)

TEACHING POINTS

The round ligaments of the uterus are a pair of fibromuscular cord-like structures derived from the gubernaculum and serve as a secondary support system for the uterus. The round ligaments have varied clinical and surgical implications which are underestimated and underutilized in clinical practice. This exhibit will review: • Embryology of round ligaments and related structures • Surgical and Imaging anatomy of the round ligaments • Pathologies affecting the round ligaments • Imaging features of pertinent conditions

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The involvement of round ligaments by pathological processes is underestimated. They are involved in spreading diseases, as sites for primary neoplasms, and serve as landmarks in differentiating lesions. The exhibit aims to include: • Embyrology • Surgical anatomy • Surgical implications - plication, oophoropexy • Imaging anatomy - USG, CT, MR • Round ligaments as landmark - differentiate interstitial from angular pregnancy, true and pseudo broad ligament fibroids, ACUM, rudimentary horns, aid in diagnosis of unicornuate uterus, differentiate appendicular and tubo-ovarian abscess • Pathologies of Round ligaments: infection, endometriosis (with details on compartmentalisation and scoring systems), varices, benign tumors - leiomyoma, mesothelial cyst, lipoma, malignant tumors - leiomyosarcoma, secondary spread of endometrial, cervical, ovarian, gastric, and gallbladder carcinomas • Canal of Nuck pathologies - hydrocele (different types and imaging manifestations), hernias - infantile/ adult - ovarian and intestinal contents

OBEE-48 PATTERNS OF RECURRENCE FOR CERVICAL, ENDOMETRIAL AND OVARIAN CANCER: WHAT THE RADIOLOGIST NEEDS TO KNOW

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Ekta Maheshwari, MD (*Abstract Co-Author*)
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Evis Sala, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Overview: • Recognize common and atypical recurrence patterns for the top 3 most common gynecologic malignancies: cervical, endometrial and ovarian cancers. • Understand how histology and treatment impact recurrence patterns, using case-based examples. Cervical and Endometrial Cancer: • Recurrence is often local (cervix, vaginal apex) or locoregional (pelvic sidewall, pelvic/para-aortic nodes). • Histology and prior treatment influence recurrence pattern and salvage therapy. • Higher recurrence risk with advanced stage, adjacent organ invasion or nodal involvement. Ovarian Cancer: • Recurs in pelvis or peritoneal recesses, along pathways of normal peritoneal fluid flow. • Pattern varies with primary therapy: upfront cytoreduction vs. neoadjuvant chemo and interval debulking. • Maintenance therapy influences recurrence: bevacizumab linked to nodal, liver, lung recurrences; PARP inhibitors linked to peritoneal, nodal, hepatic recurrences. • Bevacizumab-related toxicity associated with extensive bowel involvement, muscularis invasion and rectovaginal tumor. • Oligometastatic recurrences: Evaluate organ/vascular involvement to assess suitability for secondary cytoreduction. Imaging: MRI and PET are vital to cervical and endometrial cancer recurrence detection; CT or MRI for ovarian cancer recurrence detection. PET aids in whole body staging and distinguishing recurrence from post-therapy changes.

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Introduction Overview of recurrence patterns Role of imaging Cervical Cancer Patterns of Recurrence Endometrial Cancer Patterns of Recurrence Ovarian Cancer Patterns of Recurrence Salvage Therapies and Imaging Considerations Reporting Essentials Conclusion

OBEE-49 SCAN AND UNDERSTAND: THE LANGUAGE OF EARLY PREGNANCY LOSS

Alejandra Cardona Del Valle, MD (*Presenter*)
Claudia M. Muns, MD (*Abstract Co-Author*)
Alejandro Gonzalez, BS (*Abstract Co-Author*)
Larry M. Alejandro Vargas, MD (*Abstract Co-Author*)
Karla Martin Ortiz (*Abstract Co-Author*)
Wilma Rodriguez-Mojica, MD (*Abstract Co-Author*)

TEACHING POINTS

Provide an anatomical review of the uterus and early pregnancy findings. Review how ultrasound plays a crucial role in differentiating between early pregnancy loss (EPL) types based on first-trimester findings. Explain how each type of EPL, and ectopic pregnancy presents unique ultrasound characteristics. Discuss the proper use of first-trimester ultrasound terminology and how it fosters clearer communication and reduces patient distress.

TABLE OF CONTENTS/OUTLINE

Introduction Objectives Anatomy Review Normal pregnancy findings Ultrasound Features of EPL Concerning for EPL Diagnostic EPL In progress EPL Incomplete EPL Complete EPL Ectopic pregnancy findings Preferred vs. Avoided Terminology Conclusion EPL, also referred to as miscarriage, is the loss of pregnancy during the first 13

weeks of pregnancy, and a complex and emotionally charged medical condition requiring precise and sensitive terminology. Accurate identification and description of EPL types are critical for proper diagnosis, management, and communication. This presentation focuses on standardizing first-trimester ultrasound terminology to avoid stigma and confusion. It also reviews ultrasound features of normal early pregnancy, different EPL types, and ectopic pregnancy to aid radiologists and clinicians in delivering accurate care.

OBEE-50 DIAGNOSTIC VALUE OF OPTIMIZED ADDITIONAL MRI SEQUENCES TO GET CLOSER TO THE TRUE NATURE OF GYNECOLOGIC DISEASES

Mayumi Takeuchi, MD, PhD (*Presenter*)
Kenji Matsuzaki, MD, PhD (*Abstract Co-Author*)
Masafumi Harada, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. MRI is a crucial problem-solving tool for diagnosing gynecologic disorders, however, routine protocols may not always provide sufficient diagnostic accuracy. This exhibit reviews case-based strategies for optimizing additional MRI sequences to characterize gynecologic diseases better. 2. Various advanced MRI techniques provide key insights: 1) 3D-T2WI: High spatial resolution and multiplanar capability reveal internal structures of pathologies and relationships with adjacent organs. 2) Reduced FOV DWI (FOCUS) /Multi-shot DWI (MUSE): High spatial resolution with minimal distortion enables precise assessment of tumor size and extent, enhances the detection of small malignant foci, and minimizes the T2 shine-through effect when combined with high b-value computed DWI. 3) Dynamic MRI: Highlights hypervascular features of malignancies, functional tumors, and gestational lesions. TIC analysis is helpful for risk stratification of tumors. 4) Contrast-enhanced (CE) Subtraction: Aids in evaluating malignant foci or clots in T1-high cysts such as endometrioma or mucinous cystadenoma. 5) Dixon Method: Useful for assessing both fat-rich and fat-poor pathologies. 6) (T2*-based) Susceptibility-WI (SWI): Sensitive to hemorrhagic necrosis in high-grade malignancies, hemosiderin deposits in endometriosis, and thrombus in adnexal torsion or red degeneration of leiomyomas. 7) MR Spectroscopy (MRS): Provides metabolic information, including proliferative activity, necrosis, mucin content, and anaerobic infection contributing to tissue-specific diagnosis.

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3D-T2WI; Reduced FOV DWI /Multi-shot DWI; Computed DWI; Dynamic MRI; CE subtraction; SWI; Dixon method; MRS

OBEE-51 INTERSTITIAL ECTOPIC PREGNANCY: DIAGNOSIS, DILEMMAS, DANGERS

Mindy M. Horrow, MD (*Presenter*)
Maria Grigovich, MD (*Abstract Co-Author*)
Shuchi K. Rodgers, MD (*Abstract Co-Author*)

TEACHING POINTS

1. IEP is an implantation in the interstitial fallopian tube which extends from the tubal ostium through the myometrial wall 2. IEP accounts for 2-5% of all ectopic pregnancies 3. IEP has a higher morbidity and mortality than tubal EP since the greater capacity of the interstitial tube to accommodate the sac and rich myometrial vascularity may result in a more advanced pregnancy that can rupture with catastrophic hemorrhage 4. Early eccentric IUPs can be mistaken for an IEP possibly resulting in mistreatment 5. Later IEPs can be mistaken for the common tubal EPs. 6. Signs for the diagnosis of IEP include claw sign, myometrial bar, interstitial line sign 7. Helpful techniques for the diagnosis of IEP: coronal reformat, cine clip, sliding sign

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1. Background a. Demographics b. Terminology c. Importance of differentiating interstitial ectopic pregnancy (IEP) from more common tubal ectopic pregnancy (EP) 2. Anatomy and appearance of interstitial fallopian tube a. On routine pelvic US with 3D, HSG and saline infusion sonohysterography with intracavitary CEUS b. With Essure device c. Interstitial hydrosalpinx 3. Diagnosis of IEP a. Interstitial line sign b. Thickness of overlying myometrium c. Myometrial bar d. Claw sign e. Techniques i. 3D coronal reformat, cine clip ii. Color Doppler: Vascularity arising from myometrium iii. Sliding technique 4. US appearances of IEP through 1st trimester a. Early b. Late 5. Ruptured IEP 6. How to differentiate IEP from other diagnoses with similar appearances a. Eccentric intrauterine pregnancy (IUP) vs early IEP b. Tubal EP vs later IEP c. IUP in uterus with Mullerian duct anomaly d. Subserosal myoma e. Eccentric corpus luteum 7. Treatment a. Surgical b. Medical c. Other

OBEE-52 DON'T LET YOUR DIAGNOSTIC SKILLS GO DOWN THE TUBES: A REVIEW OF FALLOPIAN TUBE PATHOLOGY

Erika Pianin, DO (*Presenter*)
Justin S. Alpert, MD (*Abstract Co-Author*)

TEACHING POINTS

The fallopian tubes play an integral role in female reproductive health and fertility, yet are frequently overlooked in imaging studies, primarily because they are difficult to visualize when normal. This can make identification of fallopian tube pathology particularly challenging. This educational exhibit aims to strengthen understanding of normal and abnormal appearances of the fallopian tubes, with the following teaching points: (a) Understand the anatomy and function of the fallopian tubes. (b) Understand the importance of recognizing fallopian tube pathology. (c) Gain familiarity with the imaging modalities commonly used in diagnosing fallopian tube pathologies. (d) Learn how to diagnose various fallopian tube pathologies using radiologic imaging.

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(a) Fallopian tube anatomy and function. (b) Importance of recognizing fallopian tube pathology in regards to reproductive and overall health. (c) Pertinent imaging modalities used to identify various fallopian tube pathologies. (d) Definition, common symptoms, and imaging findings of various fallopian tube pathologies, including: Hydrosalpinx and hematosalpinx, Tubal ectopic pregnancy, Salpingitis isthmica nodosa, Tubal occlusion, Tubal endometriosis, Pelvic inflammatory disease (tubo-ovarian abscess and pyosalpinx), Neoplasm (tubal leiomyoma and tubal carcinoma), Congenital anomalies (agenesis and unicornuate uterus). (e) Conclusion. (f) References.

OBEE-53 ENHANCED MYOMETRIAL VASCULARITY: WHAT, WHERE AND WHEN TO TREAT?

Maria Grigovich, MD (*Presenter*)
Anna S. McKenney, MD,PhD (*Abstract Co-Author*)
Mindy M. Horrow, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Enhanced myometrial vascularity is the presence of abundant tortuous myometrial vessels with high-velocity flow, observed during or after completion of a pregnancy at any gestational age. 2. The terms EMV and acquired AVM should not be used interchangeably as the management might differ. While the sonographic appearance of both entities is similar, early venous drainage is typical for AVM and absent in EMV. 3. In setting of bleeding, prior intervention and focal area of markedly increased EMV on US, MRA and DSA may be suggested for further evaluation. 4. EMV management is variable and depends on the degree of bleeding, presence of associated RPOC or ectopic pregnancy. 5. Number of conditions/lesions may mimic EMV.

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1. Controversy of the term "enhanced myometrial vascularity" (EMV) in literature 2. Proposed definition 3. Diagnostic ultrasound criteria 4. Peak systolic velocity as a potential predictor of bleeding risk and management 5. EMV and acquired arteriovenous malformation (AVM) - is there a difference? Role of MRI/MRA. 6. EMV in normal pregnancy/normal physiologic remodeling of placental bed 7. EMV associated with RPOC 8. EMV associated with uterine ectopic pregnancy (EP): - Cesarean section EP - Cervical EP - Interstitial EP 9. Differential diagnosis and mimics: - Gestational trophoblastic disease - Pseudoaneurysm - Fibroids/neoplasms - Adenomyosis - Endometritis - Varices 10. Management: - Expectant - Medical - IR embolization - Surgery 11. Conclusion and proposed terminology for radiology reports

OBEE-54 REPORTING NON-GYNECOLOGICAL PELVIC MASS: HOW TO DO IT

de Souza, MD, PhD (*Presenter*)
Patricia Leal, MD (*Abstract Co-Author*)
Caroline L. Ghezzi (*Abstract Co-Author*)
Ana Paula C. Moura, MSc (*Abstract Co-Author*)
Giuseppe D'Ippolito, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Provide a concise review of female pelvic anatomy.Outline a systematic approach for assessing non-gynecological pelvic lesions in women. Emphasize optimal imaging modality selection and precise lesion localization within pelvic compartments.Describe the characteristic imaging features of common non-gynecological pelvic tumors and key differential diagnoses.Correlate MRI findings with histopathological diagnoses to enhance diagnostic accuracy.

TABLE OF CONTENTS/OUTLINE

Introduction Accurate assessment of large pelvic lesions requires careful consideration of the anatomical positioning of pelvic organs within these compartments, as this spatial understanding is crucial for establishing or narrowing the differential diagnosis through imaging. Pelvic Compartments and Common Non-Gynecological Lesions Extraperitoneal Compartment Anterior Leiomyoma/Bladder cancer/Urethral diverticulum and fibroid/Posterior Rectal cancer/Teratoma/Myelolipoma/Tailgut cyst/Neurogenic tumors/ Bone tumors -Intraperitoneal Compartment Appendiceal mucocele/Pelvic abscess/Abdominal tuberculosis/Pseudomyxoma peritonei/ Peritoneal inclusion cyst/Lymphocele Conclusion : A structured approach to evaluating large pelvic masses is essential for radiologists to reach an accurate diagnosis. Recognizing compartmental anatomy and selecting the appropriate imaging modality are critical for narrowing the differential diagnosis and guiding clinical management. By focusing on specific imaging characteristics and their correlation with potential pathologies, clinicians can better inform treatment plans and patient outcomes.

OBEE-55 EXPLORING UNUSUAL SITES OF ENDOMETRIOSIS

Hideyuki Fukui, MD, PhD (*Presenter*)
Takahiro Tsuboyama, MD (*Abstract Co-Author*)
Hiromitsu Onishi, MD, PhD (*Abstract Co-Author*)
Takashi Ota, MD, PhD (*Abstract Co-Author*)
Toru Honda, MD (*Abstract Co-Author*)
Kengo Kiso (*Abstract Co-Author*)
K. Kaketaka (*Abstract Co-Author*)
Takumi Tanigaki, MD (*Abstract Co-Author*)
Eriko Yoshidome, MD (*Abstract Co-Author*)
Masatoshi Hori, MD, PhD (*Abstract Co-Author*)
Mitsuaki Tatsumi, MD, PhD (*Abstract Co-Author*)
Noriyuki Tomiyama, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

* Recognize the imaging features of endometriosis beyond common ovarian and pelvic locations* Understand the pathophysiological basis for the unusual anatomical distribution of extragenital endometriosis* Identify characteristic MRI and CT findings of endometriosis in various anatomical sites including thoracic, abdominal wall, urinary tract, gastrointestinal, and other rare locations* Learn the significance of specific imaging findings (T1/T2 signal characteristics, enhancement patterns) in the diagnosis of deep infiltrative endometriosis at unusual sites* Apply systematic reporting approaches for endometriosis to improve pre-operative planning and management

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1. Introduction and Anatomical Distribution of Endometriosis - Common and uncommon sites - Pathophysiological mechanisms 2. Gastrointestinal Endometriosis - Rectosigmoid colon (mushroom cap sign) - Small bowel and cecum - Appendix 3. Thoracic Endometriosis - Diaphragmatic endometriosis (right-sided predominance) - Pulmonary endometriosis 4. Abdominal Wall Endometriosis - Scar endometriosis - Umbilical endometriosis - Inguinal/round ligament endometriosis 5. Urinary Tract Endometriosis - Bladder endometriosis - Ureteral endometriosis (extrinsic vs. intrinsic) - Prevesical space 6. Other Rare Locations - Cervical endometriosis - Vaginal and vaginal vault endometriosis - Omental endometriosis 7. MRI Reporting Recommendations for Unusual Sites - Structured approach to evaluation - Key elements for surgical planning 8. Conclusion

OBEE-56 MISPLACED BUT NOT TO BE MISSED: NAVIGATING ECTOPIC PREGNANCY SUBTYPES, MIMICS, AND DIAGNOSTIC PITFALLS

Ziyu Xian, MD (*Presenter*)
Daniel Kowal, MD (*Abstract Co-Author*)

TEACHING POINTS

Ectopic pregnancy is a time-sensitive and potentially life-threatening diagnosis in which radiologists play a pivotal role in early detection. Imaging findings can be subtle, as the gestational sac may implant in various locations and mimic normal ovarian structures or other pathologies, posing significant diagnostic challenges. Accurate identification is essential, as a missed diagnosis may compromise a viable intrauterine pregnancy or lead to life-threatening complications such as rupture. This exhibit will review the spectrum of ectopic pregnancy subtypes, including cervical, cesarean scar, interstitial, tubal, ovarian, and abdominal ectopics. For each subtype, we will discuss characteristic locations, imaging features, and potential complications, using both ultrasound and MRI. Common mimics such as corpus luteum cysts, eccentrically located intrauterine pregnancies, and early pregnancy loss will be examined in context, with emphasis on imaging clues that help to distinguish them from true ectopic gestations. Less common mimics such as accessory and cavitated uterine masses will also be discussed, along with the appearance of ectopic pregnancy in the setting of Mullerian anomalies. Finally, we will highlight critical diagnostic pitfalls, including heterotopic pregnancy, to ensure this rare but life-threatening condition is not overlooked.

TABLE OF CONTENTS/OUTLINE

• Introduction• Epidemiology and risk factors • Imaging characteristics of each ectopic subtype and mimics (cervical, cesarean scar, interstitial, tubal, ovarian, abdominal)• Complications• Pitfalls• Management• Summary• References

OBEE-57 A WOLF IN SHEEP'S CLOTHING IN THE UTERINE CERVIX: ALL ABOUT CERVICAL ADENOCARCINOMA, GASTRIC-TYPE

Yumiko Oishi Tanaka, MD, PhD (*Presenter*)
Akiko Tonooka, MD (*Abstract Co-Author*)
Makiko Omi (*Abstract Co-Author*)
Tomohiro Chiba (*Abstract Co-Author*)
Hidetaka Nomura (*Abstract Co-Author*)
Hiroyuki Kanao (*Abstract Co-Author*)

TEACHING POINTS

1. To know the clinico-pathological characteristics of cervical adenocarcinoma, gastric type (GAS), including: i) multistep carcinogenesis from the lobular endocervical glandular hyperplasia (LEGH), ii) poor prognosis due to difficulty in early diagnosis and metastatic tendency. 2. To know the imaging characteristics of LEGH as a precursor of GAS, comparing its mimickers. 3. To know the variety of imaging characteristics of GAS.

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WHO classification of the epithelial tumors of the uterine cervix (Squamous cell vs adenocarcinoma, HPV-related vs HPV-independent, adenocarcinoma, NOS vs mucinous adenocarcinoma) - History of adenoma malignum to GAS (Detecting gastric-type mucin, establishment of histopathological disease entity of LEGH and GAS)-

Imaging characteristics of LEGH comparing its mimickers (Nabothian cysts, chronic cervicitis etc.)-Imaging characteristics of early detection of the carcinoma (Especially the role of DWI and dynamic contrast enhancement)- Imaging findings that suggests poor prognosis (Rapid growing, ill-defined margin, tendency of ovarian metastasis and intraperitoneal dissemination, high recurrence rate).

OBEE-58 BEYOND DELIVERY: RADIOLOGIC INSIGHTS INTO POSTPARTUM AND POST-CESAREAN COMPLICATIONS

Marta Mazuque Mancilla (*Presenter*)
Marta Vera Cartas, MD (*Abstract Co-Author*)
Eva Gimenez Comet, MD (*Abstract Co-Author*)
Alisa Trundaeva, MD (*Abstract Co-Author*)
Marta Bonfill Garcin (*Abstract Co-Author*)

TEACHING POINTS

1. Understand anatomical and physiological changes during pregnancy and postpartum. 2. Identify and categorize main postpartum complications based on radiologic findings. 3. Analyze the most appropriate imaging modalities for diagnosis.

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Pregnancy causes significant anatomical and physiological changes—such as hemodynamic shifts, hypercoagulability, hydronephrosis, and organ displacement—that often persist postpartum. Awareness of these changes is essential to avoid misinterpretation in imaging. Postpartum complications can be organized into five main categories, illustrated with institutional clinical cases: 1. Iatrogenic complications . Frequently related to C-section, including uterine bleeding, ureteral injuries, and retained surgical materials (e.g., gossypiboma). 2. Infectious complications . Infections such as endometritis are leading causes of maternal morbidity. 3. Thromboembolic complications . The postpartum hypercoagulable state predisposes to venous thrombosis, especially in the ovarian veins or as pulmonary embolism. 4. Hemodynamic changes . Elevated cardiac output can trigger events like intracranial hemorrhage or reversible cerebral vasoconstriction syndrome. 5. Miscellaneous and other . Includes conditions like spontaneous uterine rupture (in scarred uteri), retained products of conception, and coexisting non-obstetric pathologies. A precise radiologic diagnosis has significant clinical implications, as complications can be severe and rapidly progressive.

OBEE-59 FROM SPOKE WHEELS TO PEARL NECKLACES: ULTRASOUND OF NON-NEOPLASTIC CYSTIC ADNEXAL DISEASES

Emily Van Antwerp, DO (*Presenter*)
Daniel Kowal, MD (*Abstract Co-Author*)

TEACHING POINTS

Non-neoplastic cystic adnexal disease refers to cystic lesions arising from the ovary or surrounding adnexal structures that are not related to tumors or neoplasms. Patients may be asymptomatic or present with pelvic pain, menstrual irregularities, or infertility. Ultrasound is the first-line imaging modality, offering real-time, noninvasive assessment of disease morphology, vascularity, and other associated features. We delve into the ultrasound image characteristics and underlying pathophysiology of peritoneal inclusion cyst, ovarian hyperstimulation syndrome (OHSS), hyperreactio luteinalis, polycystic ovarian syndrome (PCOS), endometrioma, pyosalpinx/hydrosalpinx, tubo-ovarian abscess (TOA), and massive ovarian edema with peripheral follicles. Each entity has distinct sonographic features and underlying pathophysiology. For example, peritoneal inclusion cysts result from adhesions that entrap peritoneal fluid around a normal ovary, often producing a multiloculated, spider-on-a-web appearance. OHSS and hyperreactio luteinalis are both associated with markedly enlarged, multicystic ovaries with "spoke-wheel" configuration but differ in etiology, with OHSS typically iatrogenic following fertility treatment and hyperreactio luteinalis arising spontaneously during pregnancy. Accurate identification and differentiation of these lesions is essential to avoid unnecessary interventions and ensure appropriate management. Pitfalls will be reviewed as well.

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· Table of Contents · Introduction · Ultrasound imaging characteristics and pathophysiology of non-neoplastic adnexal diseases · Pitfalls and mimics · Summary · References

OBEE-60 DIAGNOSTIC CHALLENGE IN PLACENTAL DISORDERS: CASE-BASED CORRELATION BETWEEN US AND MRI FINDINGS

Noriko Tanio, MD (*Presenter*)

TEACHING POINTS

Placental disorders can lead to life-threatening conditions for both the mother and fetus due to complications such as massive hemorrhage. Therefore, accurate evaluation of placental disorders is essential for the management of pregnancy and delivery. Ultrasonography (US) is the first-line imaging modality for evaluating placental abnormalities, while magnetic resonance imaging (MRI) is often performed for further assessment. Familiarity with both US and MRI findings along with a thorough understanding of the risk factors associated with placenta accreta spectrum (PAS) disorders, is essential to enhance diagnostic accuracy and improve clinical outcomes.

TABLE OF CONTENTS/OUTLINE

1. Basics of the Placenta•Embryological and physiological features•Normal anatomy and size2. Ultrasound (US) and Magnetic Resonance Imaging (MRI) Findings •US and MRI findings of normal placenta and its variations•MRI indications, imaging protocols, and the role of MRI in evaluating placental disorders •Definition, risk factors, significance, and management of abnormal placentation3. Case-Based Review of US and MRI findings of Placental Disorders and their results •Abnormal placental location-Placenta previa (complete/partial/marginal placenta previa or low-lying placenta)•Placenta accreta and associated risk factors-Placenta accreta-Postoperative state-History of cesarean section-Uterine surgeries, such as myomectomy or adenomyomectomy -Other associative factors-Hemorrhagic complications in the mother and fetal ischemia during delivery associated with abnormal placenta -Vasa previa -Cesarean section due to coexisting uterine fibroids and adenomyosis

OBEE-61 MULTIMODAL IMAGING OF POSTPARTUM COMPLICATIONS: WHAT THE RADIOLOGIST NEEDS TO KNOW

Noriko Tanio, MD (*Presenter*)

TEACHING POINTS

Imaging is frequently required in the evaluation of postpartum complications, which includes life-threatening conditions. As radiologists play a crucial role in the timely diagnosis of these conditions, they should be familiar with key imaging findings associated with postpartum emergencies and diseases that impact daily life after childbirth. In this review, we categorize several important postpartum conditions and highlight the imaging features and diagnostic points .

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1.Basics of the Postpartum Period Etiology Pathophysiology Causes and risk factors Clinical significance 2.Imaging Features and Diagnostic Points •Severe bleeding(Postpartum hemorrhage) -Uterine atony Cervical Retroperitoneal hemorrhage -Retained products of conception (RPOC) -Obstetric disseminated intravascular coagulation (DIC) -Amniotic fluid embolism •Infections Postpartum pelvic infections •Pregnancy-Induced Hypertension -Thrombosis Cerebral venous sinus thrombosis (CVST) -Deep vein thrombosis Pulmonary embolism (PE) -Ovarian vein thrombosis -High Blood Pressure (Pre-eclampsia and Eclampsia) -Posterior reversible encephalopathy syndrome (PRES) -Reversible cerebral vasoconstriction syndrome (RCVS) -Cerebrovascular disease -Vascular permeability Pulmonary edema •Other Systemic Effects and Complications -Central nervous system -Cerebrovascular disease -Pituitary disorders (central diabetes insipidus and Sheehan syndrome) -Cardiovascular system -Heart failure/volume overload - Mammary gland Puerperal mastitis -Bone system Public symphysis, -diastasis/sacral osteomyelitis Transient osteoporosis during pregnancy -Insufficiency fracture

OBEE-62 THE PREGNANT BELLY: INTERPRETING PREGNANCY NIGHTMARES WITH MRI

Charis Bourgioti, MD (*Presenter*)
Marianna Konidari, MD (*Abstract Co-Author*)
Lia A. Moulopoulos, MD (*Abstract Co-Author*)

TEACHING POINTS

• Diagnosis and management of abdominal pathology in pregnant women is challenging; pregnancy related anatomical and physiological changes may induce symptoms like abdominal discomfort, vomiting or fatigue, mimicking variable abdominal diseases. • Many common and less common abdominal conditions may complicate pregnancy; discrimination between obstetrical and non-obstetrical causes as well as early identification of conditions which require surgical vs conservative treatment is pivotal for a successful maternal and fetal outcome. • Sonographic evaluation of the pregnant belly may be limited, especially in the third trimester, due to the enlarged gravid uterus and small field of view; MRI serves as a problem-solving tool in complex cases, especially when ultrasound findings are inconclusive. • Familiarity with the main MRI findings of different abdominal pathologies which may occur during pregnancy could help radiologists provide more accurate diagnoses, thus optimizing patient care.

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• Introduction to normal pregnancy-related anatomical and physiological changes • Familiarization with causes of abdominal pain during pregnancy including obstetric, gynecological, gastrointestinal, hepatobiliary, urinary or extra-abdominal pathologies • The use of MRI in diagnosis and management of abdominal pain during pregnancy: A routine or an adjunct assessment tool? • MRI protocols for evaluation of gravid population: Conventional protocols and special considerations • Case-based discussion of challenging life-threatening obstetrical and non-obstetrical pathologies related to abdominal pain with radiologic-pathologic correlation

OBEE-63 US AND MRI FINDINGS OF ENDOMETRIOSIS WITH DEEP EXTERNAL MYOMETRIAL INFILTRATION (DEMI) SUGGESTING SEVERE DISEASE

Sara Hassanzadeh, MD (*Presenter*)
Pamela I. Causa Andrieu, MD (*Abstract Co-Author*)
Brunna C. Oliveira, MD, MSc (*Abstract Co-Author*)
Izabela P. Franco, MD (*Abstract Co-Author*)
Luciana P. Chamie, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• DEMI refers to ectopic endometrial tissue extending into the external layer of the myometrium, which is facilitated by the rich vascularization and muscular composition of the myometrium. Most frequently, it affects the posterior myometrium. • DEMI prevalence is approximately 15% in Deep Endometriosis. • DEMI represents an important imaging indicator of severe disease, often accompanied by extensive pelvic adhesions, bilateral endometriomas, decreased ovarian reserve, and involvement of the viscus and shallow organs.• Recognizing DEMI on preoperative imaging is helpful in treatment planning, including surgical and fertility considerations.

TABLE OF CONTENTS/OUTLINE

1- Introduction• Overview of DEMI as a diagnostic entity and differentiation from related conditions such as internal adenomyosis. 2. Case-based review: • Typical TVUS and MRI findings • Compartmental evaluation strategy. • Clinical, Surgical, and Obstetrics Implications 3. Conclusions 4. Suggested literature

OBEE-64 REVIEW OF MÜLLERIAN DUCT ANOMALIES: COMBINED PERSPECTIVES FROM RADIOLOGY AND GYNECOLOGIC SURGERY

Molly Pantelic, MD, MS (*Presenter*)
Erica B. Stein, MD (*Abstract Co-Author*)
Kate McCracken, MD (*Abstract Co-Author*)
David Mortensen, MD (*Abstract Co-Author*)
Maria F. Ladino Torres, MD (*Abstract Co-Author*)
Michelle D. Sakala, MD (*Abstract Co-Author*)
Katherine E. Maturen, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

1. Müllerian duct anomalies (MDAs) comprise a wide spectrum of pathology, ranging from atresia to duplication. 2. Clinical presentations of MDAs vary widely; while many patients are asymptomatic, others may experience infertility, amenorrhea, or dysmenorrhea. 3. Ultrasound is the first-line diagnostic modality for MDAs in the pediatric population, while MRI is used for definitive characterization and preoperative planning. 4. MDAs are associated with renal anomalies. Imaging plays a key role in screening for concomitant renal abnormalities. 5. Treatment strategies are dependent on the patient's underlying anatomy, aimed at alleviating symptoms, managing comorbid anomalies, and optimizing fertility.

TABLE OF CONTENTS/OUTLINE

1. Introduction to MDAs a. Pathogenesis, pictorial review of embryogenesis b. Categorizing MDAs: disruption of organogenesis, fusion, or resorption. c. Clinical presentations 2. Imaging evaluation of MDAs a. Ultrasound b. MRI 3. Clinical considerations in diagnosis, treatment of MDAs a. Management of menstrual outflow obstruction, dysmenorrhea b. Contraception in MDAs c. Infertility and MDAs d. Associated renal anomalies 4. Case examples, highlighting important surgical considerations a. Müllerian agenesis (Mayer-Rokitansky-Küster-Hauser syndrome) b. Unicornuate uterus c. Accessory cavitated uterine mass d. Septate uterus e. Didelphys uterus f. Bicornuate uterus g. Obstructed hemivagina and ipsilateral renal anomaly (OHVIRA) 5. Conclusion with summary of key teaching points

OBEE-65 PELVIC VENOUS DISEASE: THE CENTRAL ROLE OF RADIOLOGISTS IN DIAGNOSIS, MANAGEMENT, AND INTERDISCIPLINARY COLLABORATION

Inbar Friedman (*Presenter*)
Tiffany Ni (*Abstract Co-Author*)
Andrew D. Brown, MD (*Abstract Co-Author*)

TEACHING POINTS

Learning Objectives 1. Define pelvic venous disease (PeVD) and its significance in chronic pelvicpain (CPP).2. Introduce the SVP classification system.3. Discuss non-invasive imaging modalities in PeVD.4. Highlight the role of interventional radiology in management. Teaching points summary PeVD is an often underdiagnosed cause of CPP, especially inpremenopausal parous women with varicosities.High suspicion is needed after ruling out other diagnoses.Vascular imaging is essential for evaluation.Refer to interventional radiology colleagues if medical managementfails or is not an option.

TABLE OF CONTENTS/OUTLINE

Learning ObjectivesWhat is Pelvic Venous Disease (PeVD)?A Difficult Diagnosis - table of disorders with similar symptomsSymptoms of PeVDThe Symptoms-Varices-Pathophysiology (SVP) ClassificationOverview of the SVP classification system of PeVDRole of Ultrasound in PeVD Diagnosis (Transabdominal ultrasound imaging of prominent left periuterine vein)Role of CT Imaging in PeVD Diagnosis (CT images)Role of MRI and Magnetic Resonance Venography (MRV) in PeVD DiagnosisDiagnostic Laparoscopy in PeVD (MRI images)Summary of key investigations for assessment of PeVDConservative Management of PeVDMedical Management of PeVDSurgical Management of PeVDEndovascular Embolization of PeVDCase Study: Endovascular Embolization of PeVD (images of endovascular embolization)Summary of key treatment strategies for PeVDConclusion

OBEE-66 A HEARTLESS APPROACH TO THE FETAL CHEST

Anne M. Kennedy, MBBCh (*Presenter*)
Mai Le, MD (*Abstract Co-Author*)
April M. Griffith, MD (*Abstract Co-Author*)
Susan Dalton (*Abstract Co-Author*)
Paula J. Woodward, MD (*Abstract Co-Author*)

TEACHING POINTS

The standard anatomic survey only requires documentation of cardiac structures. The detailed survey requires documentation of the diaphragm, lungs, and ribs. Many disease processes involve the fetal lungs, airways, pleura, mediastinum, esophagus, thoracic spine, and chest wall soft tissues. The first step in evaluation of an abnormal thoracic finding is to localize it anatomically; this narrows the differential diagnosis. Accurate diagnosis is critical for management planning especially in the era of fetal intervention and fetal surgery.

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Characterize the finding - Cystic, solid, mixed, feeding vessel, diffuse perfusion, avascular? Where is it? A mediastinal mass extends superior to inferior and displaces the lungs out and back. A lung mass displaces the mediastinum away from the lesion. Lung hypoplasia/aplasia causes mediastinal shift toward the abnormal side. Pleural fluid surrounds the lung, pericardial fluid displaces the lungs. Chest wall abnormalities include skin edema, excess fat deposition, lymphatic malformations, and sternal defects. Thoracic spine and rib abnormalities are important in differential diagnosis of perinatal lethal skeletal dysplasia. Fetal intervention : Thoracoamniotic shunts can be placed for tension hydrothorax or to drain large multicystic masses. FETO may be offered for diaphragmatic hernia. EXIT to ECMO and EXIT to resection may be considered for large masses.

OBEE-67 MAPPING DEEP INFILTRATING ENDOMETRIOSIS: MR FINDINGS, SURGICAL INSIGHTS AND WHAT GYNECOLOGISTS CARE TO KNOW

Mandeep S. Virk, MBBS, MD (*Presenter*)
Swathi Kisara, MD (*Abstract Co-Author*)
Sadina Shrestha, MD, MBBS (*Abstract Co-Author*)
Randa Jalloul (*Abstract Co-Author*)
Varaha Tammisetti, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize the importance of accurate pre-operative mapping of Deep Infiltrating endometriosis (DIE) for optimal patient care. Illustrate anatomic lexicon and MR findings of ENDOVALIRM 9-compartment-based approach to map Deep pelvic infiltrating endometriosis using the MR. Illustrate common and uncommon MRI findings of Deep Infiltrating Endometriosis.Understand how the MRI findings correlate with surgical findings and outcomes.Identify surgical implications of MR based mapping in each of the 9 compartments that include medial and lateral compartments and how this helps gynecologists prepare in terms of surgical planning and outcomes.

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Epidemiology, Pathogenesis and Histological phenotypes of Deep Infiltrating Endometriosis.Comparison, limitations and understanding of current scoring and mapping systems: Enzian, Revised American Society for Reproductive Medicine (rASRM), Deep Pelvic Endometriosis Index (dPEI) scoring system by ENDOVALIRM groupMR anatomic lexicon and MR findings of mapping deep pelvic infiltrating endometriosis in each of the 9 compartments including middle and lateral compartments using case based approach. Impact of MR based mapping on surgical implications and outcomes using case based approach and surgical correlation.Proposal of ENDO-QUAL to assess image quality of MR for mapping DIE.Future considerations and Conclusions.

OBEE-68 FROM CELLS TO CORTEX - MAPPING FETAL BRAIN MILESTONES THROUGH THE MRI PIXELS

Nitin P. Ghonge, MD, MBBS (*Presenter*)
Nidhi Goyal, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Fetal brain development progresses through three key milestones -proliferation, migration, and organization. These milestones follow specific timelines with recognizable MRI correlates. Neuronal Proliferation zones appear as T2 hypointense rim along ependymal surface of the lateral ventricles. Abnormal appearance of germinal matrix is an important predictor of abnormal brain development. Neuronal Migration produces 5-layered cerebrum visible on MRI. Abnormal telencephalic lamination is an important predictor of abnormal brain development. Neuronal Organization is reflected in the appearance of cortex and sulci. Abnormal sulcation and gyration is an important predictor of abnormal brain development. Fetal MRI allow critical insights into fetal brain maturation by mapping these milestones.

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Fetal brain development follows a highly organized sequence: neuronal proliferation, migration, and cortical organization. Fetal MRI enables mapping and evaluation of these stages. Neuronal proliferation [8-16 weeks], involves the generation of immature neurons in the germinal matrix. Persistence of these zones later in gestation may suggest delayed maturation. Neuronal migration[12-24 weeks], is seen as 5-layered cerebrum. Abnormalities may indicate conditions such as lissencephaly or heterotopia. Cortical organization [>24 weeks], involves the formation of gyral and sulcal patterns, in a predictable sequence. Delayed or abnormal sulcation patterns may point to cortical dysplasia. Radiologists should be aware of the appropriate MR imaging protocols and sequences. Correct interpretation and mapping of the brain development needs correlation with the gestational age.

OBEE-69 SKULL AND SPINE UNDER CONSTRUCTION: CRANIAL TO CAUDAL RADIOLOGIC JOURNEY AND INSIGHTS OF NEURAL TUBE DEFECTS

Ramya R. Yegurla, MBBS, MD (*Presenter*)
Bathula Venkata Durga Ashok, MBBS (*Abstract Co-Author*)
Anjali Vadakanti, MD (*Abstract Co-Author*)
Shreeya Devatha, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand embryological development of the neural tube and mechanisms underlying neural tube defects (NTDs) Appreciate the role of Antenatal ultrasound, MRI, in diagnosis, preoperative planning, and post-treatment follow-up Recognize imaging features of NTDs on prenatal and postnatal studies Differentiate common NTD subtypes (e.g., anencephaly, myelomeningocele, encephalocele, lipomyelomeningocele etc) Review current management strategies and multidisciplinary care implications for affected patients

TABLE OF CONTENTS/OUTLINE

Introduction & Embryology of Neural Tube Classification of NTDs: Cranial vs Caudal(Open vs closed) Defects Prenatal Imaging (Ultrasound, Fetal MRI) Postnatal Imaging and Diagnosis (MRI) Illustrative Cases with Multimodality Imaging Associated Anomalies and Syndromic Correlations Treatment, Prognosis & Follow-Up Imaging Summary and Learning Pearls

OBEE-70 THE VULVA: ANATOMY AND PATHOLOGIES ALL GU RADIOLOGISTS SHOULD KNOW

Colby Foster, MD (*Presenter*)
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Nikita Consul, MD (*Abstract Co-Author*)
Anum Aslam, MD (*Abstract Co-Author*)
Mishal Mendiratta-Lala, MD (*Abstract Co-Author*)

Hero K. Hussain, MD, FRCR (*Abstract Co-Author*)
Katherine E. Maturen, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

1. Define vulvar anatomy and outline female erectile tissue anatomy. 2. Differentiate female perineal pathologies based on anatomic location e.g. Bartholin vs Gartner vs Skene's gland cysts. 3. Demonstrate the diversity of vulvar pathologies including: benign and malignant lesions, infectious/inflammatory, and posttraumatic etiologies. 4. Recognize the role of MRI as the modality of choice for the vulva/perineum, while appreciating a multi-modality imaging approach in diagnosis. 5. Describe how MRI can locally stage squamous cell carcinoma and differentiate among other malignancies such as melanoma and mesenchymal tumors. 6. Differentiate disease processes that mimic vulvar pathologies.

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I. Introduction a. Exhibit goals: sharpen radiologists' anatomic knowledge and diagnostic skills to improve patient care b. Incidence/prevalence of general vulvar pathology categories c. Role of the radiologist in overall management of patients with vulvar pathologies II. Vulvar anatomy a. Defining the vulva, and vulvar anatomy at MRI b. Illustration comparing female and male erectile tissue III. Vulvar pathologies a. Congenital i. Lymphatic malformation ii. Hemangioma b. Infectious/Inflammatory i. Bartholin's abscess ii. Vulvar endometriosis iii. Vulvar varicosities c. Neoplastic i. Vulvar melanoma ii. Squamous cell carcinoma iii. Leiomyoma iv. Lipoma v. Metastases d. Traumatic/Iatrogenic i. Post-partum hematoma ii. Laceration e. Mimics i. Cystocele ii. Tailgut cyst f. Conclusions/Clinical Implications i. Importance of MRI in imaging the vulva ii. More robust education of vulvar anatomy and pathologies by radiologists can benefit the radiologic/gynecologic communities.

OBEE-71 THE UNEXPECTED WHEN YOU ARE EXPECTING: CAUSES OF ABDOMINAL PAIN IN PREGNANCY

Pouya Entezari, MD (*Presenter*)
Suzanne Czerniak (*Abstract Co-Author*)
Mahan Mathur, MD (*Abstract Co-Author*)

TEACHING POINTS

Acute abdominal and pelvic pain during pregnancy presents a unique diagnostic challenge. Many pathologies may mimic signs and symptoms attributed to maternal physiologic adaptations, physical examination findings can be confounded by the gravid uterus, and computed tomography (CT) is of limited utility in pregnant patients. Etiologies are variable and include obstetric-gynecologic disorders as well as other common entities such as gastrointestinal (including hepatobiliary), genitourinary, or even vascular causes. Prompt diagnosis plays a crucial role in appropriate treatment to ensure optimal maternal and fetal outcomes. This presentation will explore the depth and breadth of acute abdominopelvic pathologies during pregnancy. At the conclusion of the module, the learner should be able to do the following: • Elucidate common etiologies of abdominal and pelvic pain during pregnancy. • Describe appropriate imaging approaches to accurately diagnose pathologies during pregnancy. • Recognize the imaging appearance of a variety of causes of acute abdominal pain in the pregnant patient.

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• Challenges of accurate diagnosis in the pregnant patient. • Benefits/drawbacks of different imaging modalities during pregnancy. • Obstetric/gynecologic causes. • Gastrointestinal causes. • Genitourinary causes. • Vascular causes.

OBEE-72 FROM REPORT TO RESECTION: RADIOLOGIC ASSESSMENT OF ENDOMETRIOSIS GUIDING A PERSONALIZED SURGICAL APPROACH

Ishwariya Rajendran, FRCR (*Presenter*)
Janette Smith, MBBChir (*Abstract Co-Author*)
Amreen Shakur, MBBS (*Abstract Co-Author*)
Helen C. Addley, FRCR, BMBCh (*Abstract Co-Author*)
Susan Freeman, MRCP, FRCR (*Abstract Co-Author*)

TEACHING POINTS

MRI is considered highly accurate for assessing the extent of deep infiltrating endometriosis due to its superior soft tissue contrast. Structured imaging reports improve multidisciplinary communication and guide surgical planning. Radiologic evaluation should include lesion location, depth, and relationship to critical structures. Recognition of extrapelvic disease sites (e.g., small bowel, abdominal wall, diaphragm, pleura) is essential for accurate planning. Collaboration between radiologists and surgeons using a multidisciplinary approach improves outcomes involving appropriate teams (robotics, gynaecology, colorectal, and urology).

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Introduction: Overview of endometriosis. Surgical challenge in extensive disease. Imaging Modalities: MRI protocol. Role of ultrasound and multidisciplinary meeting. Radiologic Findings: Uterus, ovaries and tubes. Rectal, sigmoid and small bowel involvement. Pelvic sidewall and parametrial disease. Ureteric endometriosis (intrinsic vs. extrinsic). Bladder, appendix, and nerve involvement. Abdominal wall, diaphragmatic, and pleural disease. Structured Reporting: Standardised template with key descriptors. Surgical Implications with intra-operative/post-operative images. Fertility conserving- oocyte cryopreservation or fertility-sparing surgery. Imaging impact on type of bowel surgery- shave, discectomy or bowel resection. Decisions on ureterolysis, ureterostomy, nephrectomy or partial cystectomy. Role of imaging in nerve-sparing surgery. Preoperative identification of extrapelvic disease. Conclusion: Radiologist's role in providing improved outcomes through tailored, imaging-guided surgery

OBEE-73 DECODING FETAL BODY MRI: A TRAINING GUIDE FOR IDENTIFYING NORMAL AND PATHOLOGICAL ANATOMY

Luis Ramirez, MD (*Presenter*)
Guadalupe Castro Nolasco, MD (*Abstract Co-Author*)

TEACHING POINTS

Fetal MRI provides a valuable, complementary view of complex fetal anatomy when ultrasound findings are limited or inconclusive. This exhibit presents a structured, segmental approach beginning with renal and urinary evaluation, followed by thoracic, gastrointestinal, central nervous system, and limb assessments. Learners will gain confidence in identifying renal anomalies, bladder enlargement, pulmonary hypoplasia, cardiac axis deviations, abdominal wall defects, and brain abnormalities.

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Introduction The role of fetal MRI when sonographic evaluation is limited.Emphasis on a reproducible segmental assessment. Renal Evaluation Normal kidney location and laterality.Pelviectasis, duplication anomalies, agenesis. Bladder and Urinary Tract Bladder size and signal.Megacystis and bladder outlet obstruction. Thoracic Structures Lung signal, size, and homogeneity.Cardiac axis and mediastinal positioning.Pulmonary pathologies (e.g., CDH, CPAM, sequestration). Gastrointestinal System and Wall Defects Bowel dilatation, position, and stomach location.Omphalocele vs gastroschisis. Central Nervous System Ventricular size and midline structures.Posterior fossa and cortical development. Extremity Evaluation Limb presence, symmetry, and movement.Pathologies such as clubfoot. Clinical Integration Prognostic implications of imaging findings. Contribution to postnatal planning and counseling. Conclusion Reinforces a practical step-by-step MRI review of fetal anatomy. Educational utility for radiologists and multidisciplinary fetal care teams.

OBEE-74 INSIDE OUT: FETAL MRI IMAGING IN ABDOMINAL WALL DEFECTS - GASTROSCHISIS VS OMPHALOCELE AND BEYOND

Guadalupe Castro Nolasco, MD (*Presenter*)
Luis Ramirez, MD (*Abstract Co-Author*)
Valeria Morales, MD (*Abstract Co-Author*)
Genier Fabian Castano Lizarazo, MD (*Abstract Co-Author*)

TEACHING POINTS

Fetal MRI is a valuable adjunct to ultrasound in the evaluation of abdominal wall defects (AWDs), particularly in cases with equivocal findings or complex anatomy. Precise prenatal characterization of the fetal features can greatly affect the outcome. Differentiating gastroschisis from omphalocele and recognizing rare but severe conditions such as body-stalk anomaly or cloacal exstrophy, is critical for perinatal planning. MRI provides key diagnostic features including presence of a sac, umbilical cord insertion site, associated anomalies, and bowel signal/intensity characteristics. Understanding normal fetal bowel development on T1- and T2-weighted sequences aids in distinguishing physiological from pathological findings. Structured MRI assessment enhances interdisciplinary communication and improves counseling for expecting families.

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Introduction and Clinical Importance Overview of abdominal wall defects Role of MRI in prenatal diagnosis and management Normal Fetal Abdominal Wall and Bowel Development Physiological herniation timeline MRI features of normal bowel at different gestational ages Gastroschisis vs. Omphalocele Key distinguishing MRI features Clinical implications and prognosis Common diagnostic pitfalls Beyond the Basics: Rare and Complex AWDs Body-stalk anomaly Cloacal exstrophy Pentalogy of Cantrell Associated findings on MRI Case-Based Review and Teaching Pearls Illustrated examples with corresponding MRI images Structured approach for interpretation Conclusion Summary of take-home messages Impact of precise prenatal MRI on patient outcomes

OBEE-75 PELVIC GAS IN WOMEN: CT-BASED DIAGNOSTIC APPROACH TO INTRAUTERINE AND ADNEXAL AIR

EITO KOZAWA, MD, PhD (*Presenter*)
Kaiji Inoue, MD (*Abstract Co-Author*)
Keita Nagawa (*Abstract Co-Author*)

TEACHING POINTS

1. Gas in the uterus or adnexa detected on CT is an important imaging finding that may reflect a wide spectrum of pathologies, ranging from benign transient conditions to life-threatening infections or necrotic tumors. 2. CT can characterize gas patterns and associated findings such as enhancement, fluid collections, and fat stranding, allowing for etiologic classification into infectious, ischemic/necrotic, fistulous, and iatrogenic origins. 3. Familiarity with typical imaging appearances and key differentiating features is essential for accurate diagnosis, guiding clinical management, and avoiding misinterpretation in postpartum or postprocedural settings.

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1. Introduction- Importance of detecting pelvic gas on CT- Clinical implications and diagnostic pitfalls 2. Pathophysiologic Categories of Pelvic Gasa. Infectious gas formation (e.g., tubo-ovarian abscess, pyometra) b. Ischemic/necrotic gas (e.g., endometrial carcinoma with necrosis, carcinosarcoma) c. Fistulous entry of gas (e.g., colon-uterine fistula due to diverticulitis) d. Iatrogenic/postpartum air (e.g., after vaginal delivery, IUD insertion, hysteroscopy) 3. CT Imaging Features and Key Differentiators- Gas location (uterine cavity vs adnexal structures)- Enhancement pattern of adjacent tissue- Presence of associated findings (fluid collections, fistula tract, inflammation)- Clinical context (fever, discharge, post-procedure history) 4.Case-Based Imaging Review- Annotated CT examples illustrating each category- Emphasis on diagnostic clues and mimics 5.Summary and Practical Diagnostic Algorithm- Stepwise approach to interpreting intrauterine/adnexal gas on CT

OBEE-76 C-SECTION SCARS: NOT JUST A NICHE TOPIC

Komal A. Chughtai, MD (*Presenter*)
Jamal Mourad (*Abstract Co-Author*)
Quinn Baker, MD (*Abstract Co-Author*)
Scott W. Young, MD (*Abstract Co-Author*)
Kumaresan Sandrasegaran, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Focus on identifying, characterizing, and reporting uterine niches (isthmoceles) across imaging modalities 2. Step-by-step approach to include what the surgeon wants to know. 3. Provide case-based review of different subtypes of niches, their complications, and treatment approaches, including intraoperative photographs.

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Contents/Outline Uterine niches are increasingly encountered due to rising cesarean rates and are associated with complications such as abnormal bleeding, infertility, and cesarean scar ectopic pregnancy. This exhibit presents a structured, multimodality approach—featuring ultrasound, MRI, hysterosalpingography, sonohysterography, and CT—to evaluate niches and differentiate them from normal post-cesarean anatomy. A stepwise guide for radiologists outlines key preoperative findings required by surgeons, including niche dimensions, complexity, and internal contents. A case-based review demonstrates imaging characteristics of simple, complex, and branched niches, associated complications (e.g., endometriosis, retained products), and expected versus abnormal postoperative appearances. Management strategies are reviewed, emphasizing the impact of symptoms and fertility goals. Surgical options include hysteroscopic, laparoscopic, and vaginal repair, each with specific preoperative imaging considerations. Summary Uterine niches are under-recognized chronic complications of cesarean delivery. Radiologists play a pivotal role in guiding surgical planning through accurate, comprehensive imaging evaluation and reporting, ultimately supporting better clinical and reproductive outcomes.

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PDEE

Pediatric Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

PDEE-1 DIAGNOSTIC PEARLS: NEUROIMAGING FINDINGS IN PEDIATRIC NON-HERPETIC VIRAL ENCEPHALITIS REVISITED

Santiago Martinez-Correa, MD (*Presenter*)
Taisa M. Guarilha, MD (*Abstract Co-Author*)
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Luis T. Tibana, MD (*Abstract Co-Author*)
Maria Clara Piazza (*Abstract Co-Author*)
Patricia P. Rafful, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

- Provide an overview of the current understanding of non-Herpetic viral encephalitis in children - Describe the characteristic imaging features and patterns associated with each condition - Correlate imaging findings with clinical characteristics, highlighting the relationship between imaging and clinicopathologic processes

TABLE OF CONTENTS/OUTLINE

• Epidemiology and regional predilection of pediatric viral encephalopathy • Diagnostic approach • Categorize characteristic imaging findings of each of the following viral encephalopathies: 1. Influenza A: Acute necrotizing encephalopathy with symmetric lesions affecting bilateral thalami, brainstem and cerebellum 2. Influenza B: Cytotoxic edema in the middle cerebellar peduncles and dentate nuclei 3.Human Parechovirus: White matter "sunburst type" injury pattern 4. Enterovirus: Rhombencephalitis with involvement of the pontine tegmentum, medulla, midbrain, and dentate nuclei 5. Arboviruses: -Japanese encephalitis: thalamic and basal ganglia involvement -Easter Equine encephalitis: Basal ganglia involvement 6. Acute Cytomegalovirus: White matter injury often localized to the periventricular region 7. Dengue: Bilateral thalamic involvement associated with hemorrhagic changes 8. Measles: Acute disseminated encephalomyelitis (ADEM) vs. subacute sclerosing panencephalitis (SSPE) 9. Varicella-zoster: Cerebellitis and multifocal lesions 10. Epstein-Barr Virus: Widespread cortical and splenial lesions 11. HIV encephalopathy: Confluent periventricular white matter signal abnormality with volume loss vs multifocal lesions • Conclusion and take home points.

PDEE-2 IT COMES WITH BAGGAGE! ANCILLARY FINDINGS IN PEDIATRIC PULMONARY VENOUS OBSTRUCTION

Maria Segev, MD (*Presenter*)
Kenneth K. Cheung, FRCR, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Understand the distinct characteristics of pulmonary venous stenosis (PVO) in the pediatric population compared to adults and recognize the clinical scenarios that should prompt suspicion and investigation for this condition 2. Recognize secondary imaging findings that can support the diagnosis of PVO and increase suspicion during image interpretation 3. Understand the pathophysiology underlying the various imaging findings 4. Address the technical challenges in imaging PVO in children and understanding the unique strengths and limitations of each modality

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Why pediatric PVO differs and when to suspect it 3. Pathophysiology of underlying imaging findings 4. Plain radiograph findings 5. Computed tomography findings 6. Dual-energy CT findings 7. Magnetic resonance imaging findings 8. Optimizing PVO evaluation and follow-up

PDEE-3 NEURAL TUBE TO FETAL THERAPY: HOW MRI SHAPES DIAGNOSIS, INTERVENTION, AND PROGNOSIS

Luiz Rodrigues Santos, MD (*Presenter*)
Igor J N Leite, MD (*Abstract Co-Author*)
Karen Peixoto, MD (*Abstract Co-Author*)
Tatiana M. Fazecas, MD (*Abstract Co-Author*)
Pedro T. Castro (*Abstract Co-Author*)
Heron Werner JR, MD (*Abstract Co-Author*)

TEACHING POINTS

The radiologist must be familiar with the embryological development and normal anatomy of the fetal spine and posterior fossa, and should apply a systematic approach to assess critical features on every fetal MRI. Identifying the level and extent of the spinal defect, associated Chiari II malformation, ventriculomegaly, and supratentorial anomalies is essential, as these findings directly impact surgical eligibility and long-term neurological prognosis.Fetal surgery for myelomeningocele has emerged as a potential intervention to improve postnatal outcomes, but appropriate patient selection is crucial and relies heavily on accurate MRI interpretation. This presents a unique challenge for the multidisciplinary team, reinforcing the importance of the radiologist's role in therapeutic planning.This pictorial essay will provide a comprehensive overview of neural tube closure defects on fetal MRI, including myelomeningocele and other forms of spinal dysraphism, with pre- and post-operative imaging examples, and correlation with surgical criteria and postnatal outcomes. The objectives of this pictorial essay are: 1 - To review the embryology and normal anatomy of the fetal spine and posterior fossa; 2 - To identify key imaging features of open and closed neural tube defects on fetal MRI; 3 - To discuss the MRI criteria for fetal surgery candidacy and illustrate pre- and postnatal imaging findings.

TABLE OF CONTENTS/OUTLINE

- Cervical spine and posterior fossa anatomy;- Open and closed spinal dysraphisms;- Meningocele;- Myelomeningocele;- Myelocele;- Pre and posoperative findings in In utero repair;- Fetal MRI findings and prognostic correlation.

PDEE-4 MANY FACES OF ABDOMINAL INVOLVEMENT OF BURKITT'S LYMPHOMA IN CHILDREN

Irem Togrul, MD (*Presenter*)
H. Nursun Ozcan, MD (*Abstract Co-Author*)
Berna Oguz, MD (*Abstract Co-Author*)
Mithat Haliloglu, MD (*Abstract Co-Author*)

TEACHING POINTS

Burkitt's lymphoma is the most common form of non-Hodgkin's lymphoma in children. It has a rapid doubling time of about 24 hours, which makes it an aggressive type of cancer. Despite its aggressive nature, Burkitt's lymphoma responds very well to chemotherapy and early diagnosis is crucial to improving the prognosis of patients. It can be localized or disseminated and can involve various sites. The aim of this exhibit is to highlight the abdominal and pelvic radiological findings in Burkitt's lymphoma and help the reader recognize these early signs on imaging to make the correct diagnosis and improve the patient's outcome.

TABLE OF CONTENTS/OUTLINE

1. An overview of Burkitt's lymphoma 2. Clinical features of Burkitt's lymphoma 3. Imaging work-up 4. The spectrum of abdominal and pelvic involvement of Burkitt's lymphoma a. Gastrointestinal involvement (stomach, intestine) b. Intraabdominal solid organs (liver, spleen, kidney, pancreas, gallbladder) c. Mesenteric and retroperitoneal disease d. Gonadal involvement 5. Summary 6. Conclusion

PDEE-5 THIRD WINDOW ANOMALIES IN CHILDREN: A COMPREHENSIVE OVERVIEW

Melike Z. Akis, MD (*Presenter*)
Serhat Akis, MD (*Abstract Co-Author*)
Fatma C. Sarioglu, MD (*Abstract Co-Author*)
Handan Guleryuz (*Abstract Co-Author*)

TEACHING POINTS

Third-window anomalies are bony defects of the inner ear that allow abnormal communication with the middle ear and/or cranial cavity. Normally, the inner and middle ear interact via the oval (first) and round (second) windows. A third window causes dissipation of acoustic energy, resulting in mixed hearing loss. Radiologists are key in detecting these lesions on imaging to avoid unnecessary surgery. This exhibit showcases the full spectrum of pediatric third-window anomalies using CT cases from our institution, supported by original medical illustrations, to improve recognition and diagnostic confidence. Accurate assessment of third-window anomalies requires effective multiplanar reconstruction (MPR). The exhibit also aims to enhance radiology residents' skills in using MPR to detect subtle bony defects.

TABLE OF CONTENTS/OUTLINE

Normal anatomy of the inner ear - Knowledge of inner ear structures and familiarity with normal anatomy is essential for detecting subtle third-window changes. Classification of third-window anomalies - Lesions are classified by location and include bony dehiscences in the semicircular canals, vestibular aqueduct, and cochlea. • Semicircular canals: Dehiscences • Vestibule: Enlarged vestibular aqueduct; inner ear malformations causing a dehiscence between vestibule and non-vestibule sites • Cochlea: Cochlear dehiscences; inner ear malformations • Other rare defects Case-based approach - Each subtype of third-window anomaly is exemplified through pediatric CT cases, enabling step-by-step visual recognition of the entire lesion spectrum.

PDEE-6 FROM IMAGING TO DIAGNOSIS: A RADIOLOGIC GUIDE FOR NEONATAL FLUOROSCOPY AND BASIC PATHOLOGICAL CONDITIONS

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Rafael Maria Benjamin Echevarria, MD (*Abstract Co-Author*)
Randall S. Teh, MD (*Abstract Co-Author*)
Lourdjeanne Luces, MD (*Abstract Co-Author*)
Nathan David P. Concepcion, MD (*Abstract Co-Author*)

TEACHING POINTS

The neonatal period, defined as the first 28 days of life, represents a critical window marked by an inherent increased susceptibility to various congenital conditions. Fluoroscopy plays a vital role in evaluating structural and functional abnormalities during this period. However, there remains a lack of consensus on how to perform and interpret fluoroscopic studies solely for this population, which is notable for its physiological fragility and sensitivity to ionizing radiation. This exhibit aims to provide radiologists and trainees with a comprehensive, approach to performing neonatal fluoroscopy, with emphasis on procedural execution, patient safety, and diagnostic interpretation highlighting characteristic imaging features of common pathologies encountered in clinical practice. The objectives are: 1) Explain the physics and fundamental principles of fluoroscopy as applied to neonatal imaging, 2) Discuss strategies for radiation protection and dose minimization in neonates, 3) Outline the indications, contraindications, and protocols for key fluoroscopic procedures, 4) Detail proper patient preparation, positioning, and technical considerations for safe and effective imaging, 5) Demonstrate hallmark radiologic findings of common neonatal pathologies assessed by fluoroscopy.

TABLE OF CONTENTS/OUTLINE

I. Introduction on the Basic Principles of Fluoroscopy and application of ALARA principle in neonatal fluoroscopic studies II. Fluoroscopy Procedures and Basic Common Clinical Pathologies i. Airway Fluoroscopy ii. Esophagoram and Upper Gastrointestinal Series iii. Small Intestinal Series iv. Contrast Enema and Distal Colonogram v. Voiding Cystourethrography III. Conclusion

PDEE-7 SCALP SCRATCHES AND SKULL SURPRISES: WHAT'S HIDING BENEATH?

Caroline Rutten, MD (*Presenter*)
Daniel Schlam (*Abstract Co-Author*)
Anthea Lafreniere (*Abstract Co-Author*)
Samantha K. Gerrie, MD, FRCPC (*Abstract Co-Author*)
Elka Miller, MD, FRCPC (*Abstract Co-Author*)
Vivek B. Pai, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

Pediatric scalp and skull lesions encompass a broad spectrum of pathologies, ranging from common and benign to rare and potentially malignant. Accurate imaging evaluation is crucial for distinguishing between these lesions and guiding management.This poster provides a comprehensive review of the imaging characteristics of various scalp and skull lesions, highlighting key radiologic features that aid in differentiation and diagnosis.

TABLE OF CONTENTS/OUTLINE

Congenital/developmental lesions- Dermoid- Epidermoid- Meningocele- Encephalocele- Sinus pericraniiVascular lesions - Hemangioma- Arteriovenous malformationInflammatory/infectious - Lymph node- Tuberculosis- Osteomyelitis- Potts puffy tumorBenign scalp lesions - Neurofibroma- Schwannoma- Pigmented melanocytoma- Calcifying epithelioma- Lymphoma- Nodular fasciitis- CholesteatomaBenign skull lesions - Osteoma- Osteoblastoma- Ossifying fibroma- Meningioma- Langerhans cell histiocytosis- Rosai Dorfman- Intraosseous hemangiomaMalignant skull lesions - Ewing sarcoma- OsteosarcomaPost-traumatic - Growth fracture

PDEE-8 TINY LIVERS, BIG INSIGHTS: ELASTOGRAPHY IN PEDIATRIC HEPATIC IMAGING

Larissa Falkenstein, MD (*Presenter*)
Isadora Shiota (*Abstract Co-Author*)

Camila Gomes Barbosa, MD (*Abstract Co-Author*)
Amanda Alves Tavares, MD (*Abstract Co-Author*)
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Lisa Suzuki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Ultrasound remains a cornerstone imaging modality in pediatric practice, playing a crucial role in both the initial diagnosis and longitudinal monitoring of a wide range of clinical conditions. Among recent technological advancements, elastography has emerged as a promising technique, offering a noninvasive and quantitative approach to tissue characterization. This modality is gaining traction as a valuable adjunct to conventional ultrasound, with the potential to replace invasive procedures such as liver biopsies.This study aims to provide a comprehensive review of elastography techniques applied to liver assessment in the pediatric population, with an emphasis on identifying the available modalities, standardizing acquisition methodology, and critically analyzing the reference values considered normal in children. Additionally, the study seeks to illustrate the clinical applicability of elastography through the presentation of representative cases, highlighting its role in diagnosis, follow-up, and therapeutic decision-making across various clinical scenarios.

TABLE OF CONTENTS/OUTLINE

Review of elastography techniques: point SWE, 2D SWE and transient elastography; Imaging Diagnosis and normal values; Indications in pediatrics and confounders; Use and example in cases: Chronic liver disease, Biliary atresia, Cystic fibrosis-associated liver disease, liver transplantation, cholangiopathy, Metabolic dysfunction-associated fatty liver disease (MAFLD), Sinusoidal obstruction syndrome (SOS).

PDEE-9 PEDIATRIC SENSORINEURAL HEARING LOSS - WHAT A RADIOLOGIST NEEDS TO KNOW

Alka Gupta, MD (*Presenter*)
Saurabh Gupta, MD (*Abstract Co-Author*)
Mark Halverson, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Sensorineural hearing loss is a major cause of childhood disability. Early identification and determination of etiology are essential for ensuring early intervention.2. A comprehensive understanding of inner ear and vestibulocochlear nerve anatomy, along with systematic evaluation with a checklist is essential for detecting and describing an abnormality.3. Familiarity with varied etiologies of sensorineural hearing loss, their imaging characteristics is critical for deciding management and predicting outcome.

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Multimodality imaging with high resolution CT and MRI, now with added advantage of photon counting CT are essential for comprehensive diagnostic evaluation of sensorineural hearing loss and pre-operative assessment. Familiarity with anatomy and normal variants of the temporal bone and inner ear structures is essential for diagnosing congenital malformations and acquired abnormalities implicated in hearing impairment. Through this review, the authors will illustrate the imaging features of inner ear malformations and its classification utilizing different modalities including temporal bone CT, photon counting CT and brain MRI. This presentation will provide readers with a anatomic review of inner ear with emphasis on key anatomic structures including basal, middle and apical turns of cochlea, osseous spiral lamina/basilar membrane complex within the basal and middle turns, first and second ridges of interscalar septum, modiolus, cochlear aperture and vestibular aqueduct. Additional acquired pathologies of labyrinth, including traumatic, infectious/inflammation, autoimmune, neoplastic or drug induced will be included in this comprehensive review.

PDEE-10 FETAL MRI FOR GENITOURINARY ANOMALIES: KEY CONDITIONS, FINDINGS, AND DIAGNOSTIC VALUE

Mika Shapira Rootman, MD, PhD (*Presenter*)
Ron Beloosesky (*Abstract Co-Author*)
Goni Merhav (*Abstract Co-Author*)
RON BARDIN (*Abstract Co-Author*)
Shirley Pollack (*Abstract Co-Author*)
Sharon Perlman (*Abstract Co-Author*)

TEACHING POINTS

Enhanced Diagnostic Accuracy with MRI : Illustrate MRI's complementary role alongside prenatal ultrasound, particularly in complex scenarios. Functional Assessment Capabilities of MRI : Discuss the significance of diffusion-weighted imaging and ADC mapping in evaluating renal parenchyma. Review of Major Genitourinary Pathologies : Demonstrate MRI's capability to detail pathologies and correlate prenatal findings with postnatal outcomes when available.

TABLE OF CONTENTS/OUTLINE

• Introduction to MRI in Genitourinary Imaging Overview of Genitourinary Anatomy : Discuss the normal anatomy of the genitourinary system as visualized on fetal MRI. Technical Aspects of MRI : Explanation of MRI techniques relevant to fetal imaging, including diffusion-weighted imaging and ADC mapping, along with a discussion on the advantages of MRI over ultrasound in specific scenarios. • Major Abnormalities Discussed Urinary Tract Dilatation and Obstruction Conditions such as lower urinary tract obstruction, unilateral urinary tract obstruction. Other conditions like vesico-ureteric reflux. Megacystis, with emphasis on megacystis microcolon hypoperistalsis syndrome. Assessment of Cystic Renal Disease Assessment of Urinomas : A marker of urinary tract obstruction. Fusion Anomalies Renal Agenesis, Ectopic Kidney Mullerian Anomalies • Conclusion and Future Directions Summarize key insights and practical applications derived from the exhibit. Discuss potential advancements in MRI technology and their implications for prenatal diagnostics.

PDEE-11 THE BIG BRAIN THEORY: DIAGNOSING THE HEMISPHERE THAT WENT ROGUE

Anna C. Silva (*Presenter*)
Marcela Mazzetto Cavalcante, MD (*Abstract Co-Author*)
Cristian Lima Duarte, MD (*Abstract Co-Author*)
Caroline Pereira, MD (*Abstract Co-Author*)
Roberto Bastos, MD (*Abstract Co-Author*)
Matheus Luis Silva (*Abstract Co-Author*)

TEACHING POINTS

1. Characterize the morphological features of the pediatric brain via magnetic resonance imaging, we emphasis on supratentorial structures. 2. Present the characteristic imaging findings of hemimegalencephaly. 3. Recognize the pivotal role of MRI in the evaluation and differential diagnosis of major causes of pediatric cerebral hemispheric asymmetry. 4. Propose a logical diagnostic approach flowchart for cases of pediatric brain asymmetry. 5. Understand the significance of early detection of pediatric brain asymmetry in shaping tailored management and intervention protocols.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Embryology 3. Pathophysiology of hemimegalencephaly 4. Main differential diagnoses of pediatric cerebral hemispheric asymmetries, with MRI findings that aided in accurate diagnosis 4.1 Hemimegalencephaly 4.2 Physiological cerebral asymmetry 4.3 Cerebral edema 4.4 Schizencephaly 4.5 Trephine syndrome 4.6 Encephalomalacia 4.7 Unilateral craniosynostosis 4.8 Dyke-Davidoff-Masson (DDMS) 4.9 Sturge-Weber (SWS) 4.10 Rasmussen encephalitis 5. Proposed Diagnostic Approach Algorithm 6. Take home messages

PDEE-12 UNFOLDING THE PEDIATRIC PERITONEUM

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Larissa Falkenstein, MD (*Abstract Co-Author*)
Regina Tchicuata, MD (*Abstract Co-Author*)
Amanda Alves Tavares, MD (*Abstract Co-Author*)
Deborah Y. Otto (*Abstract Co-Author*)
Silvia Maria S. Rocha (*Abstract Co-Author*)
Lisa Suzuki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The peritoneum is a semipermeable membrane of mesodermal origin that lines the peritoneal cavity and its organs, contributing to their structural support, immune defense and sensory function. It comprises two layers — parietal and visceral —, the latter covering the organs and forming mesenteric folds and omenta through its continuity with the parietal layer. Although typically not visible under normal conditions, these layers are essential in the early detection of certain pathologies. In pediatric radiology, peritoneal diseases such as congenital anomalies, neoplasms, and inflammatory/infectious conditions, though uncommon, may be encountered. Awareness and understanding of these conditions are crucial for prompt and accurate diagnosis.

TABLE OF CONTENTS/OUTLINE

A review of the anatomy, embryology, and peritoneal function. Illustrative cases of congenital peritoneal diseases. Examples of neoplasms of the peritoneum, including primary and secondary tumors. Illustrative cases of Inflammatory/infectious involvement of the peritoneum.

PDEE-13 CYSTIC LUNG DISEASE IN CHILDREN: A PATTERN-BASED IMAGING AND HISTOPATHOLOGIC CORRELATION ACROSS DIVERSE ETIOLOGIES

Stephanie El Omeiri, MD (*Presenter*)
Ankita Chauhan, MD, MBBS (*Abstract Co-Author*)
Marcus Otavio Silva de Campos Meneses, MD (*Abstract Co-Author*)
Jenny Pogoriler, MD,PhD (*Abstract Co-Author*)
Joice C. Prodigios, MD (*Abstract Co-Author*)
Hansel J. Otero, MD (*Abstract Co-Author*)
David M. Biko, MD, MBA (*Abstract Co-Author*)
Jordan B. Rapp, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Overview the spectrum of cystic lung diseases in children encompassing congenital malformations, genetic syndromes, neoplastic, inflammatory, and infectious etiologies 2. Describe distinctive imaging appearances across this spectrum, with a pattern-based approach emphasizing CT features that aid in diagnosis and differentiation 3. Correlate radiologic findings with histopathologic characteristics and clinical context to guide accurate diagnosis, workup, and management

TABLE OF CONTENTS/OUTLINE

Introduction • Define cysts, bullae, cavities, and their distinguishing features • Highlight the importance of accurately diagnosing cystic lung disease in pediatric populations • Overview of imaging modalities, with emphasis on CT technique and pediatric-specific protocols Diagnostic Approach • Stepwise evaluation by age, clinical context, and imaging pattern • Indications for imaging, biopsy, and genetic testing Imaging and Histopathologic Patterns by Etiology o Congenital Lung Lesions: Congenital Pulmonary Airway Malformation (CPAM) o Neoplastic: Langerhans Cell Histiocytosis (LCH), Pleuropulmonary Blastoma (PPB) o Genetic/Syndromic: Birt-Hogg-Dubé (BHD), Lymphangioleiomyomatosis (LAM), Trisomy 21, Marfan syndrome o Infectious and post-infectious o Diffuse Lung Disease: Inborn errors of surfactant Differential Diagnosis Considerations and Mimics • Cystic fibrosis, bronchogenic cysts, pneumatoceles, and others • Radiologic clues to distinguish mimics from true parenchymal cystic pathology Conclusion Take-home points and future directions in imaging

PDEE-14 BEYOND THE MATRIX: IMAGING SPECTRUM OF PEDIATRIC CARTILAGINOUS TUMORS

Emilio Inarejos Clemente, MD (*Presenter*)
Maria Navallas, MD (*Abstract Co-Author*)
Jaime Isern-Kebschull, PhD, MD (*Abstract Co-Author*)
Enrique Ladera (*Abstract Co-Author*)
Ferran Torner, MD (*Abstract Co-Author*)
David Moreno Romo, MD,MD (*Abstract Co-Author*)
Ignasi Barber, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

After reviewing this exhibit, the learner should: - Understand the clinical and biological behavior of chondrogenic tumors in children - Describe the radiologic features of common benign and malignant cartilaginous tumors, with emphasis on radiography and MRI - Review current classification systems and their implications for diagnosis and management - Recognize atypical presentations and pitfalls in interpretation - Correlate radiologic findings with histopathology and, in some cases, arthroscopic appearances

TABLE OF CONTENTS/OUTLINE

1. Introduction to Pediatric Cartilaginous Tumors, including definition and spectrum 2. Epidemiology, clinical presentation, and natural history with key pathological features 3. Review of imaging techniques: - Radiography as first-line - MRI as the modality of choice for local staging and tissue characterization - Role of CT and bone scintigraphy in selected cases 4. Classification and staging: Review of WHO and Enneking classification systems, with focus on their radiologic correlation and implications for management: - Benign tumors: Enchondroma, paraosteal chondroma, osteochondroma, chondroblastoma, chondromyxoid fibroma, synovial chondromatosis - Malignant tumors: Chondrosarcoma, chondroid cordoma 5. Review of imaging findings, including radiography and conventional and advanced MRI techniques, such as DWI and DCE-MRI. Correlation with histopathology and arthroscopy 6. Diagnostic challenges and mimickers (infection, other benign tumors) and strategies to avoid misdiagnosis 7. Summary: key takeaways reinforcing the importance of an integrated clinical, radiologic, and pathologic approach in the evaluation of pediatric cartilaginous tumors.

PDEE-15 MAIN DIFFERENCES BETWEEN PEDIATRIC MEDIASTINAL MASSES: DIAGNOSTIC TIPS

Ana Lara Almeida Da Silva, MD (*Presenter*)
Luis Fernando Freitas De Sousa (*Abstract Co-Author*)
Rodrigo Ragazzini, PhD (*Abstract Co-Author*)

TEACHING POINTS

To highlight the main characteristics and to identify imaging features that help in the differential diagnosis of pediatric mediastinal masses.

TABLE OF CONTENTS/OUTLINE

Introduction Mediastinal masses in children have a varied embryological origin and may present similar symptoms. A rigorous assessment of the location of the tumor (anterior, middle or posterior mediastinum), its radiological characteristics and the patient's age are essential for an adequate diagnosis. In this summary, we will

highlight the main characteristics that help in the differential diagnosis of these masses. Findings and procedure details- Lymphoma (Hodgkin's and Non-Hodgkin's Lymphoma).- Tuberculosis- Germ cell tumors- Thoracic neuroblastoma

PDEE-16 DON'T JUMP TO EBSTEIN'S! NAVIGATING VARIED CAUSES OF NEONATAL AND INFANTILE CARDIOMEGALY

Maria Segev, MD (*Presenter*)
Kenneth K. Cheung, FRCR, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Recognize the importance of chest radiography: utilize it as an initial tool in the diagnostic workup for cardiomegaly. 2. Identify key radiographic features: note specific findings on chest radiographs that contribute to establishing a diagnosis. 3. Broaden the differential for right heart enlargement: remember that conditions beyond Ebstein's anomaly can cause increased right heart blood volume and result in structural changes. 4. Consider pseudocardiomegaly in your assessment: be aware that non-cardiac factors can mimic true cardiac enlargement on radiographs. 5. Review the diverse causes of cardiomyopathy: familiarize yourself with the various etiologies of neonatal and infantile cardiomyopathy.

TABLE OF CONTENTS/OUTLINE

Introduction Challenges in Assessing Heart Size on Chest Radiograph Influence of Thymus and Inspiration causing pseudocardiomegaly Advantages of Lateral View Causes of True Cardiomegaly in Neonates and Infants with examples and key radiographic features Structural Heart Disease: Cardiomyopathy High-Output Cardiac Failure Miscellaneous

PDEE-17 FROM IMAGING TO INTERVENTION: THE ROLE OF ULTRASONOGRAPHY IN URINARY TRACT INFECTIONS AND SURGICAL MANAGEMENT OF VESICOURETERAL REFLUX

Vitor C. Romano, MD (*Presenter*)
Rafaela F. Palhares, MD (*Abstract Co-Author*)
Renata M. Copetti, MD (*Abstract Co-Author*)
Natalia T. Lima (*Abstract Co-Author*)
Fabiana Gual, MD (*Abstract Co-Author*)
MARCIA W. MATSUOKA, MD (*Abstract Co-Author*)
Yoshino Tamaki Sameshima, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Ultrasound is the first-line imaging modality for postoperative assessment following surgical or endoscopic correction of vesicoureteral reflux (VUR). 2. Recognizing normal postoperative anatomy—such as submucosal ureteral tunnels and altered ureteral jet dynamics—is essential to avoid misinterpretation. 3. Key findings to evaluate include ureteral insertion site, presence of hydronephrosis, ureteral caliber, bladder wall changes, and ureteral jets on Doppler. 4. Understanding the surgical technique (e.g., Cohen, Lich-Gregoir, or Deflux injection) is crucial for proper interpretation and reporting.

TABLE OF CONTENTS/OUTLINE

1. Overview of VUR and Treatment Options - Surgical (ureteral reimplantation) vs. endoscopic (Deflux). 2. Ultrasound Technique & Protocols - Bladder filling, color Doppler, dynamic assessment. 3. Normal Postoperative Findings - Submucosal ureteral course, ureteral jets, bladder wall thickening. 4. Abnormal/Postoperative Complications - Persistent hydronephrosis, obstruction, Deflux migration, scarring. 5. Reporting Recommendations - Standardized descriptors, key structures to assess, correlation with clinical history.

PDEE-18 HAND RADIOGRAPHY IN PEDIATRICS: DECIPHERING FINGERPRINTS TO REVEAL DIAGNOSES

Oscar Felipe Gutierrez Arteaga (*Presenter*)
Maria L. Lorente, MD (*Abstract Co-Author*)
Francisco Garrido Enjamio, MD (*Abstract Co-Author*)
Marina Siesto Marcos, MD (*Abstract Co-Author*)

TEACHING POINTS

- To evaluate the diagnostic utility of hand radiography in the detection of congenital skeletal malformations, dysplasias and systemic diseases (hematologic and metabolic conditions).- To describe classic radiographic features associated with congenital and systemic diseases in pediatrics. - To provide a visual atlas of the most representative cases, useful for the radiologist.

TABLE OF CONTENTS/OUTLINE

1. Anatomic variants: 1.1. Ivory epiphyses.1.2. Pseudo-epiphyses. 1.3. Cone-shaped epiphyses.2. Congenital bone fusions.3. Disorders of Bone Remodeling (Osteoclast Dysfunction).3.1. Pyknodysostosis.3.2. Osteopetrosis. 4. Skeletal Dysplasias (Cartilage/Bone Growth Defects).4.1. Achondroplasia. 4.2. Chondrodysplasia punctata, brachytelephalangic subtype (CDP-BT).4.3. Hereditary Multiple Exostosis4.4. Ollier disease (multiple enchondromas). 4.5. McCune-Albright syndrome.4.6. Acrodysostosis. 4.7. Multiple epiphyseal dysplasia.5. Metabolic/Enzymatic Diseases.5.1. Mucopolysaccharidosis.6. Overgrowth Syndromes (Tissue Hyperplasia).6.1. Macrodystrophia lipomatosa. 6.2. Proteus syndrome. 7. Connective Tissue Disorders.7.1. Marfan syndrome.8. Endocrine Disorders (Hormonal Dysregulation).8.1. Pseudohypoparathyroidism/pseudopseudohypoparathyroidism. 9. Hematologic Diseases9.1. Thalassemia.9.2. Sickle cell disease.10. Autoimmune. 10.1. Juvenile idiopathic arthritis. 11. Genetic Syndromes.11.1. Turner syndrome.

PDEE-19 BEYOND THE MIDLINE: NAVIGATING THE SPECTRUM OF SEPTO-OPTIC DYSPLASIA

Ashvin Kumar (*Presenter*)
Rajath Ramegowda, MBBS, MD (*Abstract Co-Author*)
Sanjay P. Prabhu, MBBS, FRCR (*Abstract Co-Author*)

TEACHING POINTS

To review evolving nomenclature, imaging features, and MRI protocol optimization strategies for septo-optic dysplasia (SOD) across fetal, neonatal, and pediatric stages.

TABLE OF CONTENTS/OUTLINE

1. Introduction and Nomenclature Classic triad: optic nerve hypoplasia, hypothalamic-pituitary anomalies, midline brain abnormalities. Expanded definition: "SOD spectrum" to reflect broader phenotypic variability. 2. Etiology and Genetics Key genes: HESX1, SOX2/SOX3, OTX2, SHH . Consideration of environmental and vascular disruption factors. 3. Imaging Features Across Development Fetal/Neonatal Optic nerve hypoplasia, absent septum pellucidum, associated malformations. Ocular Pathway Optic nerve/chiasmal hypoplasia, achiasmia, retinal fiber anomalies. Pituitary Ranges from stalk thinning to agenesis, ectopic posterior pituitary, anterior hypoplasia. Midline Brain Callosal anomalies, septal agenesis, hypothalamic changes, falcine hypoplasia. Associated Findings Schizencephaly, polymicrogyria, olfactory bulb agenesis, Chiari I malformation. 4. Differential Diagnosis Isolated septal deficiency Holoprosencephaly spectrum Secondary septal loss from hydrocephalus 5. Optimized MRI Protocol Sagittal volumetric T1 (e.g., MPRAGE) High-res T2 axial/coronal (brain/orbits) Heavily T2 (CISS/FIESTA) for optic nerves DWI/DTI for tract evaluation Coronal T1 and sagittal T2 for pituitary/hypothalamus 6. Diagnostic Checklist Hypothalamic-pituitary axis Optic nerves/chiasm Midline structures (septum, corpus callosum) Associated cortical/anatomical anomalies

PDEE-20 A SYSTEMATIC APPROACH TO PEDIATRIC SCROTAL PATHOLOGIES: THE WHIRLPOOL AND BEYOND

William Pryor (*Presenter*)
Carolina V. Guimaraes, MD (*Abstract Co-Author*)
Lynn A. Fordham, MD (*Abstract Co-Author*)
Lane F. Donnelly, MD (*Abstract Co-Author*)
Rebecca N. Hansen, MD (*Abstract Co-Author*)
Marcelo S. Takahashi, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

1) Children can present with unique pediatric scrotal pathologies that radiologist should accurately diagnose. 2) Demonstrate how a systematic approach to image evaluation is key to accurate diagnosis and the role of other factors such as age, clinical history, lab values and histology. 3) Discuss the importance of imaging in guiding patient management, especially in the acute settings (testicular torsion vs appendage torsion vs epididymitis/orchitis OR presence or absence of testicular rupture in traumatic lesions) 4) Discuss important imaging features suggesting benign vs malignant, intra-testicular vs extra-testicular or emergent vs non-emergent cases and potential pitfalls.

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1) Introduction and presentation of a flow chart on how to approach pediatric scrotal pathologies systematically 2) Nonpalpable testis: A) Inguinal or retractile testis B) Cryptorchidism C) Intrauterine torsion 3) Painful Swelling A) Acute: I) Testicular Torsion: a) Complete vs Intermittent b) Testicular Infarct II) Torsed Appendix Testis III) Epididymitis/Orchitis IV) Testicular ischemia secondary to inguinal hernia B) Chronic: Varicocele 4) Painless Swelling: A) Hydrocele B) Inguinal Hernia C) Spermatic cord cyst and spermatocele D) Paratesticular Mass: Rhabdomyosarcoma, IgG4 related lesion, splenogonadal E) Intratesticular Lesion: Microlithiasis, TART, Dermoid/Epidermoid, F) Primary malignancy, lymphoma / leukemia 5) Trauma: A) Hematocele B) Hematoma C) Testicular Rupture 6) Scrotal Wall abnormalities: A) Infectious: cellulitis, abscess, necrotizing fasciitis B) Vascular malformation C) Acute idiopathic scrotal edema 7) Conclusion

PDEE-21 BONES, HORMONES, AND BEYOND: THE RADIOLOGIST'S GUIDE IN EARLY PUBERTAL DEVELOPMENT EVALUATION

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Fabio Yoshimura, MD (*Abstract Co-Author*)
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TEACHING POINTS

• To provide radiologists with a structured approach to imaging in early pubertal development, integrating clinical and hormonal data; • To review imaging protocols and findings in bone age assessment, pelvic ultrasound, and brain MRI in the pediatric population; • To distinguish imaging features of central vs. peripheral precocious puberty, including uncommon and incidental findings; • To discuss key differential diagnoses in early pubertal development, such as hypothalamic hamartoma, adrenal tumors, McCune-Albright syndrome, and normal variants; • To explore future directions in pediatric imaging, highlighting the role of artificial intelligence in bone age assessment and pattern recognition, advances in MR and ultrasound techniques, and the integration of imaging with clinical and hormonal data to enable more precise, personalized, and earlier diagnoses; • To reinforce the role of imaging in multidisciplinary decision-making and longitudinal follow-up in pediatric patients.

TABLE OF CONTENTS/OUTLINE

• Introduction • Overview of Normal Pubertal Physiology in Children • Imaging Techniques in Pediatrics • Typical and Atypical Imaging Patterns in Precocious Puberty • Central vs. Peripheral Causes: Radiologic Clues • Differential Diagnoses • Case-Based Review with Teaching Points • Future Perspectives: Artificial Intelligence, Evolving Imaging Modalities, and Multidisciplinary Integration

PDEE-22 HIDDEN HAZARDS: A RADIOLOGIC GUIDE TO PEDIATRIC FOREIGN BODY INGESTION AND ASPIRATION

Nagore Siles, MD (*Presenter*)
Lucia Riaza Martin, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To understand how to select and apply the appropriate imaging modality in cases of pediatric foreign body ingestion and aspiration. 2. To describe the characteristics and radiologic appearance of various foreign bodies, with emphasis on key warning signs of high-risk foreign bodies. 3. To recognize imaging patterns of airway obstruction and gastrointestinal complications to guide timely intervention.

TABLE OF CONTENTS/OUTLINE

1. Introduction: Epidemiology and Clinical Relevance. 2. Role of Imaging Techniques. 3. Airway Foreign Bodies. a) Imaging approach and findings. b) Management . 4. Gastrointestinal Foreign bodies with Special Considerations. a) Disk and Cylindrical Batteries. b) Coins. c) Magnets. d) Sharp objects. e) Radiolucent Foreign Bodies. f) With hazardous chemical composition. 5. Imaging Pitfalls.

PDEE-23 INVISIBLE THREADS: PEDIATRIC TUBERCULOSIS ACROSS THE SPECTRUM

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Tatiana M. Fazecas, MD (*Abstract Co-Author*)
Luiz Rodrigues Santos, MD (*Abstract Co-Author*)
Karen Peixoto, MD (*Abstract Co-Author*)
Pedro Daltro, MD (*Abstract Co-Author*)
Elazir Mota, BMedSc (*Abstract Co-Author*)
Heron Werner JR, MD (*Abstract Co-Author*)
Pedro T. Castro (*Abstract Co-Author*)
Luiz Lima, MD (*Abstract Co-Author*)
Nara Vedoveli (*Abstract Co-Author*)

TEACHING POINTS

Think Lymph First In children, nodal enlargement is the earliest and most consistent radiographic clue—look for hilar or mediastinal adenopathy even when the lung fields seem clear. Pattern Predicts Pathway Parenchymal consolidation without cavitation favors progressive primary TB, whereas innumerable uniform micronodules signal hematogenous (miliary) spread ; matching the pattern to the pathophysiology streamlines diagnosis and management. Age Drives Risk Infants and toddlers are at highest risk for rapid dissemination to the CNS, skeleton, and pleura—maintain a low threshold for brain MRI, spine radiographs, and ultrasound of large joints in this age group. Use Multimodality Wisely Start with chest radiography, escalate to HR-CT for subtle miliary disease or airway compression, and reserve MRI/US for CNS and musculoskeletal assessment—minimizing radiation while maximizing lesion characterization. Beware the Mimics Atypical infections, Langerhans-cell histiocytosis, and malignancy can imitate pediatric TB; key discriminators are lymph-node necrosis, "tree-in-bud" spread, and vertebral body collapse with a paraspinal abscess.

TABLE OF CONTENTS/OUTLINE

Scope & Learning Objectives Pathogenesis & Age-related Risk Factors Imaging Algorithms in Suspected Pediatric TB Primary Complex Progressive Primary Disease Complicated Progressive TB Miliary (Hematogenous) TB Extrapulmonary TB - CNS Extrapulmonary TB - Musculoskeletal Extrapulmonary TB - Pleural & Lymphatic Multimodality Pearls & Protocol Tips Treatment Response & Follow-Up Imaging Key Differential Diagnoses (Quick-look Table) Interactive Quiz / Audience Engagement Slides References & Suggested Reading

PDEE-24 PEDIATRIC RENAL TUMORS: A SYSTEMATIC APPROACH AND CASE REVIEW

Marcelo S. Takahashi, MD, PhD (*Presenter*)
Lane F. Donnelly, MD (*Abstract Co-Author*)
William Pryor (*Abstract Co-Author*)
Rebecca N. Hansen, MD (*Abstract Co-Author*)
Carolina V. Guimaraes, MD (*Abstract Co-Author*)
Forrest Wilke (*Abstract Co-Author*)
Lynn A. Fordham, MD (*Abstract Co-Author*)

TEACHING POINTS

Pediatric renal tumors, while relatively uncommon, are significant childhood malignancies where imaging is crucial for diagnosis, treatment planning, treatment response evaluation and surveillance. This educational exhibit will focus on: - Review the imaging findings for common, uncommon and rare pediatric tumors, relevant differential diagnosis and essential reporting elements. - Review the role of other clinical factors in both diagnosis, prognosis and management of pediatric renal tumor patients (age, comorbidities and genetic syndromes). - Review the main staging criteria used by European and north American groups.

TABLE OF CONTENTS/OUTLINE

Introduction to Pediatric Renal Tumors • Epidemiology and Significance Common and Key Pediatric Renal Tumors (with pathology correlation when available): • Wilms Tumor • Congenital Mesoblastic Nephroma • Clear Cell Sarcoma of the Kidney • Malignant Rhabdoid Tumor of the Kidney • Renal Cell Carcinoma Other Renal Masses and Mimics (with pathology correlation when available): • Nephrogenic rests/Nephroblastomatosis • Cystic Nephroma • Angiomyolipoma • Renal Lymphoma/Leukemia • Renal Abscess/Infection • Normal Variants Imaging Modalities and Protocols Staging, Surgical Planning, Treatment Response and Surveillance Advanced and Functional Imaging Techniques Diagnostic Challenges and Future Directions

PDEE-25 FOLLOWING THE CLUES: HOW RADIOLOGY HELPS US TRACE RICKETS ACROSS AGES

Ingrid Galvis, MD, MS (*Presenter*)
Camilo Perdomo, MD (*Abstract Co-Author*)
Jenny Vo-Phamhi, MS (*Abstract Co-Author*)
Ola F. Kvist, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Rickets is a pediatric metabolic bone disorder characterized by imaging features that change according to the patient's age and underlying cause. Some conditions may mimic rickets due to similar radiologic features; therefore, accurate recognition of hallmark radiographic signs is critical for timely diagnosis and appropriate management. Nutritional rickets remains the most prevalent cause, particularly among exclusively breastfed infants without adequate vitamin D supplementation. However, older children with rickets frequently have genetic and systemic causes, such as renal and phosphate metabolism disorders. Although radiographs remain the principal imaging modality for evaluation, MRI may provide enhanced diagnostic precision in challenging or unclear cases.

TABLE OF CONTENTS/OUTLINE

Introduction - Clinical relevance of rickets and its identification in specific pediatric populations Pathophysiology and Classification - Role of vitamin D, calcium, phosphate, and renal function in bone metabolism - Nutritional, hereditary, and systemic causes Core Imaging Features - Differences between active and healing rickets Age-Specific Imaging Patterns - Infants: nutritional rickets predominance - Toddlers and older children: systemic and genetic etiologies Radiologic Mimics of Rickets - Differentiating features and clinical context Advanced Imaging Considerations - Role of MRI in equivocal or complex cases Conclusion and Clinical Pearls - Integrating clinical, lab, and imaging data - Recognizing overlapping features, avoiding misdiagnosis - Age-tailored interpretation of radiologic findings

PDEE-26 HEADS UP: KEY HEAD AND NECK FETAL MRI ANATOMY AND ABNORMALITIES YOU CAN'T MISS

Ana Bucci, MD (*Presenter*)
Mariana R. Defreitas, MD (*Abstract Co-Author*)
Selima Siala, MD (*Abstract Co-Author*)
Carolina V. Guimaraes, MD (*Abstract Co-Author*)

TEACHING POINTS

1) It is important to know normal fetal anatomy and to follow a systematic approach of evaluation when reading fetal MRI 2) Many head and neck fetal pathologies can be subtle on imaging, yet they are clinically significant as they may indicate a syndromic diagnosis, influence the mode of delivery, and offer prognostic information to clinicians and families.

TABLE OF CONTENTS/OUTLINE

I. Introduction II. Approach to Head & Neck Anatomy A. Skull and Scalp 1) Normal morphology and proportions 2) Scalp integrity 3) Masses B. Face 1) Nasal bone 2) Nasal passages and choana 3) Ocular globes 4) Jaw 5) Palate/ lip 6) Airway 7) Masses C. Ear 1) Pinna 2) Middle ear 3) Inner ear D. Neck 1) Neck symmetry 2) Airway 3) Vascular anatomy 4) Normal thyroid 5) Masses III. Abnormalities Not to Miss A. Skull/Scalp 1) Craniosynostosis 2) Chiari II 3) Aplasia Cutis 4) Masses: Encephaloceles, Atretic Parietal Cephalocele, Dermoid Cyst, Sinus Pericranii, Lipoma, Hemangioma, Lymphatic malformation, Malignancies 5) Skull base mass: Ethmoid Cephalocele B. Facial 1) Orbital: microphthalmia, anophthalmia, persistent vasculature, coloboma 2) Nasal abnormalities 3) Micrognathia: Inferior Facial Angle and Jaw Index measurements 4) Cleft lip and palate 5) Facial mass: Congenital Epulis, Epignathus, Lipoma C. Ear 1) Microtia/Anotia 2) Low-lying ears 3) Inner ear abnormalities D. Neck 1) Lymphatic malformation 2) Teratoma 3) Goiter 4) Congenital Hemangioma 5) Cysts: Thymic, Dermoid, Duplication, Thyroglossal, Branchial Cleft IV. Conclusion Comprehensive evaluation of fetal head and neck is essential for detecting abnormalities that can significantly affect fetal morbidity, survival, delivery planning, and the need for surgical intervention.

PDEE-27 COMPREHENSIVE REVIEW OF NONSYNDROMIC AND SYNDROMIC CRANIOSYNOSTOSES

Kevin Hu, BA (*Presenter*)
Shannon Chu (*Abstract Co-Author*)
Kevin Thomas, BS (*Abstract Co-Author*)
Markus Lammle, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Review the various types of nonsyndromic and syndromic craniosynostoses and their characteristic anatomic presentations. 2. Discuss the clinical features, clinical associations, and imaging findings on head CT and 3D reconstruction. 3. Describe surgical treatment approaches and postoperative outcomes in patients with craniosynostoses.

TABLE OF CONTENTS/OUTLINE

1. Review normal anatomy of the newborn skull. 2.Various nonsyndromic and syndromic craniosynostoses: their associated clinical features and 3D reconstruction of head CT. 2a. Nonsyndromic craniosynostoses: scaphocephaly, trigonocephaly, brachycephaly, anterior plagiocephaly, and posterior plagiocephaly. 2b. Syndromic craniosynostoses: Crouzon, Apert, Pfeiffer, and Muenke syndromes. 3. Case presentations of patients with various craniosynostoses: relevant history, operative management, and surgical outcomes. 4. Summary

PDEE-28 CONDITIONS INVOLVING THE DENTATE NUCLEUS IN THE PEDIATRIC POPULATION

Vivek B. Pai, MBBS, MD (*Presenter*)
Caroline Rutten, MD (*Abstract Co-Author*)
Moath Alsaiady, MBBS (*Abstract Co-Author*)
Christopher G. Filippi, MD (*Abstract Co-Author*)
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Pradeep Krishnan, MD (*Abstract Co-Author*)
Helen M. Branson, MBBS, FRCR (*Abstract Co-Author*)

TEACHING POINTS

The dentate nucleus (DN) is the largest of the deep cerebellar nuclei. It is involved in planning, initiating, and modifying various voluntary movements while playing a key role in cognition. The DN may be involved in a wide range of diseases, the knowledge of which helps identify or narrow down a diagnosis, thus guiding further investigations and management.

TABLE OF CONTENTS/OUTLINE

1. Artistic renditions of the anatomy and connections of the DN.2. Pictorial essay of the DN pathologies, broadly divided into the following subgroups:A. Vascular: Hypoxic ischemic encephalopathyB. Leukodystrophy: Krabbe disease, Alexander disease, Canavan disease, Megalencephalic leukoencephalopathy with subcortical cystsC. Metabolic: Glutaric aciduria, L-2-hydroxy glutaric aciduria, Leigh syndrome, Maple syrup urine disease, Cockayne, MucopolysaccharidosesD. Toxic: Vigabatrin-associated brain abnormalities, Gadolinium deposition, Isoniazid toxicityE. Neurodegenerative: Pantothenate kinase-associated neurodegeneration (PKAN), Aceruloplasminemia, Giant axonal neuropathy, Membrane-bound O-acyltransferase 7 (MBOAT7)F. Inflammatory: Langerhans cell histiocytosis, Multiple sclerosis, Myelin oligodendrocyte glycoprotein antibody disease (MOGAD)G. Phacomatoses: Neurofibromatosis type 1

PDEE-29 IMAGING OF PEDIATRIC SKULL BASE MASSES

Vivek B. Pai, MBBS, MD (*Presenter*)
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Caroline Rutten, MD (*Abstract Co-Author*)
Manohar M. Shroff, MD, FRCPC (*Abstract Co-Author*)
Birgit B. Ertl-Wagner, MD, PhD (*Abstract Co-Author*)
Elka Miller, MD, FRCPC (*Abstract Co-Author*)

TEACHING POINTS

Lesions of the skull base are common in clinical pediatric neuroradiology. These are often difficult to treat due to the complexity of their location, constraints of the developing skull and the small habitus. Radiology plays a key role in detection, characterization and estimation of extent of these lesions to enable a better surgical approach and prognostication.

TABLE OF CONTENTS/OUTLINE

1. Review the embryology of the skull and anatomy of the skull base.2. Describe imaging features of pediatric skull base massesa. Development: Fronto-nasal dysplasia, nasal glioma, cephalocele, dermoidb. Non-neoplastic bone lesions: Fibrous dysplasia, Langerhans cell histiocytosis, aneurysmal bone cystc. Neoplastic bone lesions: Osteosarcoma, metastasis (neuroblastoma, leukemia)d. Dural lesions: Meningioma (NF-2)e. Neurogenic lesions: Schwannoma, neurofibromaf Sellar masses: Macroadenoma, craniopharyngioma, Rathke's cystg. Notochordal origin: Ecchordosis physaliphora, chordomah. Sinonasal / nasopharyngeal lesions: Juvenile Nasopharyngeal Angiofibroma, Squamous cell carcinoma, lymphoma, rhabdomyosarcomai. Vascular origin: Paraganglioma, hemangioma (PHACES)j Miscellaneous: Infection, cholesteatoma

PDEE-30 PRECISION MEDICINE DRIVEN BY GENETICS ADVANCES AND MOLECULAR SIGNALING PATHWAYS: WHAT A PEDIATRIC RADIOLOGIST NEEDS TO KNOW?

Govind B. Chavhan, MD (*Presenter*)
Diana Veiga Canuto, PhD, MD (*Abstract Co-Author*)

TEACHING POINTS

1. New advances and understanding in genetics combined with ability of AI to analyze and process large amount of data is driving the clinical practice towards precision medicine. 2. Learning the basic concepts of precision medicine, genetics and molecular pathways can help radiologists to have a better understanding of diseases and their imaging characteristics, and help decide imaging workup and screening protocols. 3. In this primer, we aim to provide basic concepts and terminology in genetics, precision medicine and molecular pathways to familiarize radiologists with different types of genetic testing and to understand the impact of these concepts in different groups of pediatric diseases including cancers and cancer predisposition syndromes, skeletal dysplasia, vascular anomalies and others.

TABLE OF CONTENTS/OUTLINE

Introduction Basic concepts and terminology in genetics : Gene expression and regulation: from DNA to mRNA to amino acids to protein Gene inheritance, transmission and genetic imprinting Genetic dominance: genotype-phenotype relationships, phenotype variability Genetic mutations Genes and diseases. Genetic testing Molecular test (target single variant, single gene, gene panel, whole genome sequence) Chromosomal microarray Gene expression test Biochemical tests Concept of Precision Medicine and role of radiologist Genetics in cancer predisposition syndromes Tumor suppressor genes Proto oncogenes Radiological screening in cancer predisposition syndromes. Genetics in skeletal dysplasia Skeletal dysplasia panel Implications on imaging Genetics in vascular malformations RAS/ MEK/ERK and PI3 kinase/mTOR signaling pathway Summary

PDEE-31 A LEGG UP ON PERTHES: COMPLETE RADIOLOGIST GUIDE

Daisy T. Kase (*Presenter*)
Adriano Magna, MD (*Abstract Co-Author*)
Leonardo Kazunori Tsuji, MD (*Abstract Co-Author*)
Lucas R. Medeiros (*Abstract Co-Author*)
Lucas K. Miyahara, MD (*Abstract Co-Author*)
Andre Y. Aihara, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

• Overview of Legg-Calve-Perthes disease including clinical and imaging findings in a multimodality approach. • Recognize the imaging appearances and complications of LCPD and their prognosis and treatment implications. • To present a radiologist guide of LCPD disease, including a structural MRI report, identifying imaging findings that can help orthopedists to predict outcomes and complications.

TABLE OF CONTENTS/OUTLINE

Introduction and overview of Legg-Calve-Perthes, including epidemiology, pathophysiology and clinical manifestation. Typical imaging findings of necrotic and revascularization phases in a multimodality approach. Complementary MRI sequences: how contrast-enhanced MRI and diffusion-weighted MRI may quantify the severity of ischemic lesion of the femoral head to improve the treatment guidance. Highlight the imaging findings related to poor prognosis that must be reported. Demonstrating with didactic cases LCPD complications and follow-up evaluation. Association between the Stulberg classification and the corresponding treatment. Elaborating a structural MRI report for early and late phases of the disease. Differential Diagnosis of Legg-Calvé-Perthes, like septic arthritis, transient synovitis of the hip and epiphyseal dysplasia, highlighting its difference on imaging findings, preventing misdiagnosis.

PDEE-32 THROUGH THE ULTRASOUND WAVES: A PEDIATRIC ATLAS OF RENAL PARENCHYMA FROM NORMAL TO PATHOLOGY

Laith E. Abandeh, MD (*Presenter*)

TEACHING POINTS

To emphasize the importance of comprehensive renal ultrasound technique tailored to pediatric patients. To distinguish normal variants from true renal pathology. To identify and differentiate common sonographic features of pediatric renal parenchymal diseases. To enhance diagnostic confidence by correlating sonographic findings with clinical scenarios and adjunct imaging when needed. To appreciate the role of sonography in the longitudinal follow-up of renal pathologies and congenital anomalies. To highlight common pitfalls and technical artifacts in pediatric renal ultrasound interpretation and strategies to avoid them.

TABLE OF CONTENTS/OUTLINE

Learning Objectives Background Ultrasound Technique and Optimization Probe Selection: Convex vs Linear Focal Zone and Magnification Dynamic Scanning Tips Normal Anatomy and Variants Normal Pediatric Renal Sonographic Appearance Normal Variants Mimicking Pathology Junctional Parenchymal Defect Fetal Lobulation Column of Bertin Dromedary Hump Persistent Fetal Echogenicity Transient Pyramidal Echogenicity Prominent Medullary Pyramids Sinus Lipomatosis Cortical-Medullary Band Incomplete Duplex System Pseudolesions from Bowel Gas or Ribs Congenital and Pathologic Renal Parenchymal Conditions Syndromic Associations Zellweger, Joubert, Tuberous SclerosisDenys-Drash, DiGeorge, TurnerBardet-Biedl, Meckel-Gruber, VACTERLAlport, Nephronophthisis, Schinzel-GiedionTrisomy 13, 18Beckwith-Wiedemann, Williams, Lowe Syndrome Pitfalls Summary Summary Table: Variants vs. PathologySyndromic Associations Quick GuideTechnical Checklist for Optimal Renal UltrasoundReferences

PDEE-33 CRANIOVERTEBRAL JUNCTION ABNORMALITIES IN CHILDREN: WHAT THE RADIOLOGIST NEEDS TO KNOW

Ryoko Asahara, MD (*Presenter*)
Yuko Tsujioka, MD, PhD (*Abstract Co-Author*)
Mikako Enokizono, MD, PhD (*Abstract Co-Author*)
Tatsuo Kono, MD (*Abstract Co-Author*)

TEACHING POINTS

Craniovertebral junction (CVJ) abnormalities in pediatric patients encompass a broad spectrum of etiologies. Although often asymptomatic, CVJ abnormalities carry significant risks, such as severe neurological sequelae and sudden death, making it essential to recognize conditions associated with these abnormalities. CVJ abnormalities may present with mild symptoms, such as neck pain, torticollis, or restricted neck movement, and may also lead to the discovery of previously undiagnosed systemic diseases. Radiologists play a vital role in ensuring comprehensive evaluation of the CVJ, and active imaging assessment with attention to age-appropriate developmental landmarks is required. In this educational presentation, learners will understand: (1) the etiology, clinical features, and imaging findings of pediatric CVJ abnormalities; (2) the association between CVJ abnormalities and underlying conditions; and (3) the appropriate timing and imaging protocols for radiological intervention in the comprehensive evaluation of pediatric CVJ lesions.

TABLE OF CONTENTS/OUTLINE

Introduction - Anatomy - Congenital malformations (Chiari malformation, Atlantooccipital assimilation/subluxation, Os odontoideum, Basilar invagination, Klippel-Feil malformation, Chromosome 22q11.2 microdeletion syndrome) - Inflammatory diseases (Juvenile idiopathic arthritis, Kawasaki disease, Retropharyngeal inflammation) - Skeletal dysplasias (Achondroplasia, Spondyloepiphyseal dysplasia, Mucopolysaccharidosis, Chondrodysplasia puncata, Osteogenesis imperfecta) - Neoplasms (Langerhans Cell Histiocytosis, Chordoma, Osteoblastoma, Ewing sarcoma) - Trauma

PDEE-34 RADIATION-DOSE OPTIMIZATION IN PEDIATRIC CT FOR CONGENITAL HEART DISEASE: PRINCIPLES, TECHNOLOGIES, AND PROTOCOL IMPLEMENTATION

Takanori Masuda, PhD (*Presenter*)
Yoshinori Funama, PhD (*Abstract Co-Author*)
Takeshi Nakaura, MD (*Abstract Co-Author*)
Atsushi Ono (*Abstract Co-Author*)
Kazuo Awai, MD (*Abstract Co-Author*)

TEACHING POINTS

Children with congenital heart disease, being both highly radiosensitive and subject to frequent follow-up imaging, require rigorously justified examinations and pediatric-optimized low-dose CT protocols with cumulative dose tracking to minimize lifetime radiation risk. Pediatric CT dose is minimized by strict clinical justification; size-specific low-kVp protocols with real-time tube-current/voltage modulation; high-pitch or prospectively triggered acquisition and tight collimation; iterative or deep-learning reconstruction; precise centring without unnecessary shielding; continuous dose tracking (CTDI_{vol}, DLP, SSDE); and ongoing ALARA-focused, multidisciplinary education.

TABLE OF CONTENTS/OUTLINE

- Fundamentals of Radiation Dose in Pediatric CT - Biological sensitivity of children - Dose metrics (CTDI, DLP, SSDE, effective dose) - Regulatory and guideline frameworks (Image Gently, ICRP 138) Dose-Reduction Technologies and Techniques - Automatic tube current modulation (ATCM) - Automatic tube voltage selection (ATVS) - Low-kVp protocols with iodine optimisation - High-pitch spiral & prospective ECG triggering - Iterative and deep-learning reconstructions - Dynamic bow-tie filtration and couch-height compensation

PDEE-35 ONE LUNG, ONE CLUE: DIAGNOSTIC APPROACH TO UNILATERAL WHITE LUNG IN PEDIATRICS

Vilma J. Varela George SR, MEd (*Presenter*)
Laura L. Sosa Munoz, MEd (*Abstract Co-Author*)
Sofia Arizaga, MD (*Abstract Co-Author*)

TEACHING POINTS

Complete opacification of a hemithorax indicates the presence of a significant disease, as there shall be loss of physiological functions on the involved side. The differential diagnosis of opaque hemithorax may include congenital anomalies, inflammatory and neoplastic disorders, and even postsurgical cause. Lung agenesis is a rare congenital abnormality that is defined as the absence of lung tissue along with the absence of bronchi. It is a rare phenomenon with the incidence from one report of 1.22 cases per 100,000 live births. Primary lung tumors in children are rare, with a narrow range of diagnostic considerations. However, the overlapping imaging appearances of these tumors necessitate attention to key discriminating imaging and pathologic features. In the neonate and infant, the important considerations include pleuropulmonary blastoma, infantile fibrosarcoma, and fetal lung interstitial tumor.

TABLE OF CONTENTS/OUTLINE

1.Systematic Approach 1.1 Acronym: "A-B-C-D-E" 2. Pattern of mediastinal involvement 2.1 Displacement of the mediastinum to the same opaque side. 2.1 .1. Pulmonary agenesia. 2.1.2Congenital pulmonary hypoplasia. 2.1.3 Congenital pulmonary airway malformation 3. Displacement of the mediastinum to the contralateral side 3.1 Large lung or pleural tumor 3.1.1 Mediastinal germ cell tumor 3.1.2 Fusiform rhabdomyosarcoma of the posterior thoracic wall. 3.1.3 Pleuropulmonary blastoma 3.2 Pneumonia complicated by extensive empyema 4. No evident mediastinal displacement to the contralateral side 4.1 Extensive pneumonia (complete consolidation of one lung) 4.2 Diaphragmatic hernia (Morgagni). 4.3 Diffuse alveolar hemorrhage.

PDEE-37 SOLVING THE PUZZLE: IMAGING EVALUATION OF PEDIATRIC RENAL MASSES: A GUIDE FOR THE RADIOLOGY RESIDENT

Sofia Arizaga, MD (*Presenter*)
Vilma J. Varela George SR, MEd (*Abstract Co-Author*)
Arnoldo Hernandez Frausto, MD (*Abstract Co-Author*)
Sara A. Solorzano-Morales, MD (*Abstract Co-Author*)
Marco Antonio Sarmiento, MD (*Abstract Co-Author*)
Isabel Beristain, MD (*Abstract Co-Author*)

TEACHING POINTS

- To Identify the different features of benign renal tumors children and adolescents.- To Identify the different features of malignant renal tumors children and adolescents.

TABLE OF CONTENTS/OUTLINE

- Introduction- To review the different benign renal masses in children: cystic nephroma, mesoblastic nephroma and angiomyolipoma.- To evaluate the different benign renal masses in children: Wilms tumor, nephrobastomatosis, rhabdoid tumor, clear cell sarcoma, renal cell carcinoma and lymphoma.- To make accurate differential diagnosis with the different renal lesiones.- To evaluate the renal masses with different imaging modalities- Cases.- Summary.- Take home points.

PDEE-38 PEDIATRIC ISCHEMIC STROKE

Cesar Gabriel Rocha Da Costa Paloschi, MD (*Presenter*)
Isabela D. Alves, MD (*Abstract Co-Author*)
Jose Eduardo Mourao Morais, MD (*Abstract Co-Author*)
Camila T. Amancio (*Abstract Co-Author*)
Marcos F. Docema, MD, PhD (*Abstract Co-Author*)
Daniel Delgado (*Abstract Co-Author*)
Cesar Augusto P. Alves SR, MD, PhD (*Abstract Co-Author*)
Hae W. Lee, MD, PhD (*Abstract Co-Author*)
Claudia D. Leite, MD, PhD (*Abstract Co-Author*)
Maria Martin, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

This educational exhibition provides a comprehensive overview of the imaging evaluation of pediatric patients with ischemic stroke. Specific imaging patterns, differential diagnoses, and potential pitfalls in imaging interpretation will be addressed, as well as etiology categorization, classification grading systems, and treatment modalities, aiming at a broad review of the subject. The purpose of this exhibition is to:- Present multiples etiologies of pediatric arterial stroke;- Present classical imaging findings;- Highlight points of interest regarding treatment and rapid identification of complications.

TABLE OF CONTENTS/OUTLINE

Definition and imaging indication in pediatric stroke. • Overview of the classic definition and urgent brain imaging criteria in pediatric stroke.Ischemic stroke: main etiologies • Highlight main etiologies of pediatric stroke. Genetic causes • Imaging findings of the main genetic causes of ischemic stroke. Perfusion deficit study • Comprehensive evaluation of cerebral perfusion in children with suspected strokeManagement • Explore the therapeutic window and treatment modalities of ischemic stroke in the pediatric population.

PDEE-39 "CRACKING THE CODE": PEDIATRIC JAW LESIONS MADE SIMPLE FOR RADIOLOGISTS

Mario Ruben Paz Campos, MD (*Presenter*)
Arturo Gross, MD (*Abstract Co-Author*)
Michelle Estefania Gonzalez Cordova, MD (*Abstract Co-Author*)
Rocio Gutierrez Rodriguez, MD (*Abstract Co-Author*)
Elena Garcia, MD (*Abstract Co-Author*)

TEACHING POINTS

To review the most common pediatric jaw lesions, emphasizing their characteristic imaging features and clinical relevance. To develop a simple, systematic approach for the evaluation and description of pediatric jaw lesions, facilitating accurate and efficient diagnosis.

TABLE OF CONTENTS/OUTLINE

Pediatric jaw lesions pose unique challenges due to active growth plates, developing teeth, and bone remodeling. These factors blur distinctions between normal variants, benign processes, and aggressive pathology. Though most lesions are benign and nonodontogenic, imaging features often overlap infections, inflammation, and malignancy, requiring systematic evaluation. Radiologists refine the differential using lesion margins, location, and tooth displacement. Imaging guides biopsy decisions and helps preserve function and aesthetics through timely intervention. A structured approach starts with age, history, and lesion position relative to teeth and the inferior alveolar canal—odontogenic lesions lie above, nonodontogenic below. Key imaging traits include density, borders, locularity, growth pattern, and adjacent effects. Benign lesions show well-defined margins, narrow transition zones, cortical remodeling, and directional root resorption. Malignant lesions demonstrate ill-defined margins, wide zones, cortical destruction, soft tissue invasion, and nondirectional resorption. Aggressive infections can mimic malignancy with similar invasive features. This work reviews common odontogenic and nonodontogenic lesions, both cystic and tumoral, applying radiologic patterns to streamline interpretation and expedite accurate diagnosis in clinical practice.

PDEE-40 ECHOES OF PRESSURE: THE ROLE OF ULTRASOUND IN MANAGING INTRACRANIAL HYPERTENSION IN NEONATES AND INFANTS

Vitor C. Romano, MD (*Presenter*)
MARCIA W. MATSUOKA, MD (*Abstract Co-Author*)
Renata M. Copetti, MD (*Abstract Co-Author*)
Fabiana Gual, MD (*Abstract Co-Author*)
Natalia T. Lima (*Abstract Co-Author*)
Rafaela F. Palhares, MD (*Abstract Co-Author*)
Yoshino Tamaki Sameshima, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Ultrasound is a non-invasive, bedside technique that enables real-time monitoring of intracranial pressure through transfontanelar assessment of the brain and optic nerve sheath measurements. 2. Ventricular-Hemisphere Index (VHI) can help identify hydrocephalus and other intracranial conditions. An elevated VHI suggests

abnormal ventricular enlargement, which can be a marker of intracranial pressure (ICP) elevation. 3. Doppler Ultrasound for Cerebral Hemodynamics: Doppler ultrasound of the cerebral arteries can reflect changes in ICP. The Resistive Index (RI) can give insights of the intracranial pressure and blood flow repercussions. 4. Thickening of the optic nerve sheath can be used as a marker of increased ICP. 5. The ability to perform ultrasound in postoperative settings (e.g., after surgery for craniosynostosis or neuroglial tumors) makes this a vital tool for detecting complications related to intracranial hypertension.6. The combination of optic nerve sheath measurement and Doppler ultrasound aids in decision-making processes, such as when to initiate or adjust interventions like ventriculoperitoneal shunting or pharmacological management.

TABLE OF CONTENTS/OUTLINE

1. Introduction to Intracranial Hypertension in Neonates and Infants 2. The Role of Ultrasound in Managing Intracranial Hypertension 3. Ultrasound Technique and Methodology 4. Key Findings and Data 5. Clinical Applications and Case Studies 6. Discussion and Teaching Points 7. Conclusion and Future Directions

PDEE-41 UNLOCKING THE MYSTERIES OF PAEDIATRIC ESOPHAGEAL PATHOLOGIES: ESSENTIAL INSIGHTS FOR RADIOLOGISTS

Taruna Yadav, MD (*Presenter*)
Manav Shah, MBBS (*Abstract Co-Author*)
Pawan K. Garg, MD (*Abstract Co-Author*)
Rengarajan Rajagopal, MBBS (*Abstract Co-Author*)
Binit Sureka, MBBS, MD (*Abstract Co-Author*)
Pushpinder S. Khera (*Abstract Co-Author*)

TEACHING POINTS

1. To learn about the imaging clues to identify esophageal pathologies from the fetal stage to childhood.2. To study the role of barium swallow and CT/MRI for the assessment of various pediatric esophageal pathologies.3. Using state of the art cases, to learn about myriad of pediatric esophageal abnormalities for early detection, management and their follow up (whenever available). 4. Syndromic associations with esophageal disorders.

TABLE OF CONTENTS/OUTLINE

1. Introduction to embryology, developmental considerations and pathologies of fetal and pediatric esophagus.2. To learn the role of different radiological investigations along with advantages/disadvantages of various imaging modalities in evaluation of pediatric esophagus.3. Depiction of imaging features of various esophageal pathologies (congenital - atresia with and without fistula/short esophagus with and without CDH and acquired - foreign bodies with and without perforation and mediastinitis, fungal infection, inflammation, congenital and acquired strictures with balloon dilation, achalasia, duplication cyst, neoplasms) in children.4. Few syndromic associations of esphageal disorders (VACTERL, down syndrome - GERD and motility disorder, congenital short esophagus, Allgrove syndrome).5. Conclusion.

PDEE-42 PEDIATRIC URINARY TRACT DILATION: A GUIDE FOR RADIOLOGISTS

Luisa L. Faria, MD (*Presenter*)
Ana Paula Martins Nascimento (*Abstract Co-Author*)
Amanda Campos (*Abstract Co-Author*)
Jackson Borges Sarmento (*Abstract Co-Author*)
Camilla Calil (*Abstract Co-Author*)
Tales Alvarenga (*Abstract Co-Author*)

TEACHING POINTS

The evaluation of urinary tract dilation in children is part of the radiologist's daily routine and is becoming increasingly frequent with the increase in the number of obstetric ultrasounds performed during prenatal care. However, most dilations observed in the prenatal period will resolve spontaneously, without the need for additional imaging evaluation. Therefore, it is crucial for the radiologist to distinguish and adequately report what is normal, what is abnormal, and when to trigger additional imaging evaluation. Effective communication with neonatologists and specialist pediatricians is also essential so that the findings are correctly understood and unnecessary examinations are avoided. The objective of this presentation is to review the radiological evaluation of urinary tract dilation in the pediatric population through selected cases, rich in images with high educational content, focusing on appropriate reporting, adequate classification of findings, and prevention of the most frequent errors.

TABLE OF CONTENTS/OUTLINE

(1) Radiology of the kidneys and urinary tract: what is normal in newborns, infants and children?(2) How to evaluate a child's urinary system through ultrasound?(3) Case-based approach to UTD classification system: how to use it and how to avoid the most common mistakes?(4) Differential diagnoses of urinary tract dilation that every radiologist should be familiar with.(5) Guiding the next steps: what are the roles of other imaging methods (fluoroscopy, computed tomography, magnetic resonance imaging and nuclear medicine)?

PDEE-43 FETAL MRI: STEP-BY-STEP ASSESSMENT OF CORTICAL DEVELOPMENT MALFORMATIONS

Patricia Oliveira-Szejnfeld, MD (*Presenter*)
Mariana Cerdeira Machado, MD (*Abstract Co-Author*)
Marcos V. Camargo, MD (*Abstract Co-Author*)
Caroline Victorino Felix De Lima, MD (*Abstract Co-Author*)
Adriana De Oliveira, MD (*Abstract Co-Author*)
Luciane De Oliveira (*Abstract Co-Author*)
Fernanda Tovar-Moll, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

Demonstrate the protocol for proper image acquisition in fetal MRI and the sequences required to analyze cortical development. Study the current classification of MDC based on the disturbance of one of the three phases of cortical development: proliferation, migration, or organization.Illustrate the morphological aspects of the fetal cortex malformations in a fetal MRI. Recognize the early signs of cortical development abnormalities between 22 and 28 gestational weeks through fetal MRI. Be careful to assess the abnormalities of the infratentorial structures! These guide the genetic diagnosis in many cases.

TABLE OF CONTENTS/OUTLINE

To demonstrate the morphological aspects of the fetal cerebral cortex in malformations of cortical development (MCD) using fetal MRI, we will briefly discuss cortical development (neuronal proliferation, migration, and organization) and explore anatomic landmarks and normal cortical morphology from 22 to 34 gestational weeks.We will conduct a thorough literature review, including radiological diagnosis consensus of CMD in the postnatal period and the currently accepted classification, notions of embryological processes, and potential limits and challenges when extrapolated for the evaluation of imaging findings in fetal MRI.

PDEE-44 CONGENITAL HEART DISEASE MADE EASY: CARDIAC CT-BASED APPROACH OF SEGMENTAL SEQUENTIAL ANALYSIS

Harold Goerne, MD (*Presenter*)
Prabhakar Rajiah, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

1. To understand the segmental sequential analysis for congenital heart disease (CHD)2. To apply this method systematically using cardiac CT angiography3. To identify and categorize simple and complex congenital cardiac anomalies based on atrial, ventricular, and great vessel relationships

TABLE OF CONTENTS/OUTLINE

• Introduction• Importance of structured approaches in CHD imaging• Previous segmental approaches- Van Praagh• Segmental Sequential Analysis overview- Anderson's approach• Review of segmental sequential analysis using illustrative case examples- Venoatrial connections- Atrial arrangement- Atrioventricular valves- Atrioventricular connections- Ventriclular topology- Ventriculoarterial connections- Great arterial relations- Infundibular morphology- Associated malformations• Integration into structured reporting templates• Role in surgical planning and follow-up• Conclusion

PDEE-45 PEDIATRIC CARDIAC THERAPEUTIC AND MONITORING DEVICES: WHAT ARE THEY? WHERE ARE THEY? AND HOW DID THEY GET THERE?

Ankita Chauhan, MD, MBBS (*Presenter*)
Jordan B. Rapp, MD (*Abstract Co-Author*)
David M. Biko, MD, MBA (*Abstract Co-Author*)
Ammie M. White, MD (*Abstract Co-Author*)
Hansel J. Otero, MD (*Abstract Co-Author*)
Erica Riedesel, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Discuss therapeutic and monitoring cardiac devices in the pediatric age group.2. Illustrate the normal and abnormal imaging appearances of cardiovascular devices in children.3. Understand the radiologist's role in initial assessment and follow-up of the cardiovascular devices.

TABLE OF CONTENTS/OUTLINE

Goals and objectives Background information • Radiographic Anatomy, normal and abnormal• Indication for surgery and device placements• Radiologist's role in determining initial device positioning and surveillance Discussion of devices• Pacemaker devices (e.g. epicardial pacing wires, lead fracture, malposition of leads, abandoned leads) • Implantable cardioverter-defibrillators (ICDs) • Left ventricular assist device (e.g. Berlin cannulas) • Prosthetic valves (mitral, tricuspid, aortic, and pulmonary) • Closure devices (e.g. ductus occlusion and atrial septal defect closure) • Vascular stents (e.g. aortic, pulmonary arterial stents, ductus arteriosus) • Postsurgical support devices (e.g. mediastinal drains and intracardiac catheters)• Catheters (e.g. Port-a-Cath and Swan-Ganz) • Cardiovascular surgical clips and embolization coils Conclusion: Radiologists should be familiar with the radiographic appearances of the therapeutic and monitoring pediatric cardiovascular devices and how they correlate with cross-sectional imaging. Knowledge of normal appearance will help detect abnormalities in a timely manner and avoid potential complications.

PDEE-46 PHOTON-COUNTING DETECTOR CT: THE SCIENCE AND CRAFT OF PEDIATRIC PROTOCOLING IN THE NEW AGE OF CT

Anushree M. Burade, MBBS (*Presenter*)
Seyedehelaheh Hosseini, MD (*Abstract Co-Author*)
Javier Contreras Yametti, MD (*Abstract Co-Author*)
Chelsea Dunning, PhD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)
Michael S. Gee, MD, PhD (*Abstract Co-Author*)
Pallavi Sagar, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Understand multivendor photon-counting detector CT technology (PCD-CT) and the key differences from energy-integrating detector CT scanners (EID-CT)2. Learn unique scan acquisition and reconstruction factors of PCD-CT: their impact on diagnostic quality and radiation dose3. Analyze pediatric-specific PCD-CT applications and diagnostic applications: Fitting pediatric clinical needs to pediatric acquisition protocols4. Balancing multi-resolution aspects of pediatric PCD-CT: Finding the right mix of spatial, spectral, and temporal resolution

TABLE OF CONTENTS/OUTLINE

. Counting photons: pediatric-friendly overview of the differences between EID-CT and PCD-CT technologies2. Distributing photons: radiologist-friendly explanation of PCD-CT-specific scan and reconstruction factors3. Baby-fitting photons: Crafting evidence- and need-based PCD-CT protocols for children4. Making each photon count: Getting pediatric task-specific image types from spectral and spatial resolution.5. Understanding applications of pediatric PCD-CT6. Mitigating limitations of pediatric PCD-CT: Understanding that too many or too thin images do not always equal too much diagnostic information!

PDEE-47 RINGS AND SLINGS: THE ROLE OF MDCT IN EVALUATING CONGENITAL VASCULAR ANOMALIES

Uffan Zafar, MD (*Presenter*)
Zohaib Mallick, MBBS (*Abstract Co-Author*)
Naila Nadeem, MBBS (*Abstract Co-Author*)
Muhammad Abdullah (*Abstract Co-Author*)

TEACHING POINTS

This case-based educational exhibit demonstrates how multidetector CT (MDCT) is pivotal for diagnosing congenital vascular rings and slings. Participants will learn pediatric and adult MDCT protocols, post-processing techniques (MinIP, MIP, VRT, MDCTA), and evidence-based imaging guidelines. Through illustrative cases, we'll review clinical presentations, study planning, key imaging findings, interpretive pitfalls, and reporting pearls that guide management and surgical planning.

TABLE OF CONTENTS/OUTLINE

What Are "Rings" and "Slings," and How Do They Come to Be? 1.1. Embryologic origins of double aortic arch, right aortic arch with aberrant subclavian 1.2. Pulmonary artery sling and associated anomalies 1.3. Pathophysiology of tracheoesophageal compression Clinical Presentation & Initial Workup Ideal Imaging Strategies for Vascular Structures Introduction to MDCT Protocols & Guidelines Key Imaging Findings on MDCT 5.1. Double aortic arch: characteristic "ring" encircling trachea/esophagus 5.2. Right aortic arch with aberrant left subclavian: Kommerell's diverticulum 5.3. Pulmonary artery sling: aberrant left pulmonary artery course MDCT Post-Processing Techniques Case-Based Discussions Case 1 Neonatal Double Aortic Arch Presenting with Stridor Case 2 Known case of TOF presenting with respiratory distress Case 3 Teenager with Dysphagia due to Aberrant Right Subclavian Artery Review of Complications & Surgical Planning Reporting Templates & Pearls Future Directions & Emerging Applications Conclusion and Take-Home Messages

PDEE-48 NAVIGATING PEDIATRIC PULMONARY NODULES: CURRENT STATE OF KNOWLEDGE AND FUTURE DIRECTIONS

Aki Tanimoto, MD (*Presenter*)
Andrew T. Trout, MD (*Abstract Co-Author*)
Jonathan R. Dillman, MD, MSc (*Abstract Co-Author*)
Andrew Schapiro, MD (*Abstract Co-Author*)

TEACHING POINTS

Pulmonary nodules are frequently detected in patients with and without malignancy. While small pulmonary nodules detected in patients without malignancy are typically of little clinical significance, small pulmonary nodules in children with malignancy are clinically relevant as possible metastatic foci. As the lung is one of the most common sites of metastatic disease, the accurate detection of nodules is crucial for correct staging and therapy optimization. While the detection and characterization of pulmonary nodules is essential in pediatric cancer patients, this task can be challenging and time-consuming for radiologists to perform, in part due to the small size of some metastatic foci. Computer-aided detection systems and deep learning algorithms have been shown to improve sensitivity for nodule detection in adult patients, and recent research has investigated the use of these applications in children. This educational exhibit aims to provide a comprehensive review of the literature surrounding pediatric pulmonary nodules, summarizing the current state of knowledge and future directions for research.

TABLE OF CONTENTS/OUTLINE

This educational exhibit will review: • The definition and potential causes of a pulmonary nodule • Imaging modalities for evaluation of pulmonary nodules • Imaging features of pulmonary nodules in healthy children and children with cancer • Imaging features of primary pediatric pulmonary malignancy • Use of artificial intelligence (AI) for evaluation of pediatric pulmonary nodules

PDEE-49 NEUROIMAGING FINDINGS IN PEDIATRIC COCCIDIOIDOMYCOSIS: FROM HYPHAE TO MRI

Ana Geraldo, MD,MSc (*Presenter*)
Marine Moeremans (*Abstract Co-Author*)
Bruno P. Soares, MD (*Abstract Co-Author*)
Mark Halverson, MD (*Abstract Co-Author*)
Hisham Dahmoush, MBBCh (*Abstract Co-Author*)

TEACHING POINTS

1. Coccidioides species are endemic to the Southwestern region of the USA2. Symptomatic patients present with primary (flu-like) and/or secondary/disseminated infection3. Pediatric cases (~10%) are associated with a higher rate of dissemination (usually affecting the bone) and mortality4. CNS involvement may also occur and represents the most serious complication5. Imaging of the spine, brain and head and neck structures plays a pivotal role in suggesting the diagnosis as well as in excluding complications, guiding biopsy and evaluating treatment response6. The most common neuroimaging patterns of pediatric Coccidioidomycosis are a TB-like osteomyelitis of the spine/craniofacial bones or a TB-like basal cistern meningitis which may be complicated by vasculitis, infarcts, and/or hydrocephalus as well as spinal extension7. Other possible neuroimaging findings in children include conglomerate of cervical lymphadenopathy, retinitis, brain abscess/empyema, multiple small parenchymal and/or sulcal contrast-enhancing lesions

TABLE OF CONTENTS/OUTLINE

1. Overview of endemic mycosis in the USA2. Mycology, epidemiology, pathogenesis and clinical presentation of Coccidioidis species3. Role of neuroimaging in the diagnosis of Coccidioidomycosis4. Pictorial review of the characteristic neuroimaging findings of Coccidioidomycosis infection in children involving the brain, head and neck and spine (from 13 confirmed cases from a tertiary pediatric center based on an endemic region) and tips for suggesting the diagnosis5. Systematization of the most common neuroimaging patterns of pediatric Coccidioidomycosis and comparison with the adult population6. Key-points7. Conclusion

PDEE-50 IMAGING DIAGNOSIS IN CANCER PREDISPOSITION SYNDROMES IN CHILDHOOD

Paula Romero, MD (*Presenter*)

TEACHING POINTS

Cancer predisposition syndromes in childhood are increasingly recognized and carry significant clinical and imaging implications. Early identification of these syndromes enables tailored surveillance and early tumor detection, improving prognosis. Imaging, particularly ultrasound and whole-body MRI, plays a central role in screening and monitoring these high-risk patients.

TABLE OF CONTENTS/OUTLINE

Introduction to Pediatric Cancer Predisposition Syndromes Definition and epidemiology Importance of early identification Genetic Mechanisms and Molecular Basis Germline vs. mosaic mutations Tumor suppressor genes vs. proto-oncogene involvement Overview of Major Syndromes Neurofibromatosis type 1 Down syndrome Li-Fraumeni syndrome Gorlin syndrome Beckwith-Wiedemann syndrome Fanconi anemia Other mutations: MEN 2A/2B, DICER1, APC, SMARCB1, RB Role of Radiology in Surveillance and Diagnosis Imaging indications and protocols Use of ultrasound and whole-body MRI Institutional Experience and Case Examples Imaging features and clinical evolution of selected cases Current Guidelines and Follow-up Strategies Recommendations for imaging-based surveillance Summary of national and international protocols Conclusions and Clinical Implications Key imaging findings Role of radiologists in multidisciplinary care

PDEE-51 LOOK DOWN! WHEN PEDIATRIC BODY IMAGING HOLDS THE KEY TO NEUROLOGIC DIAGNOSIS

Caroline Rutten, MD (*Presenter*)
Kevin K. Fung, MBBS, FRCR (*Abstract Co-Author*)
Govind B. Chavhan, MD (*Abstract Co-Author*)
Elka Miller, MD, FRCPC (*Abstract Co-Author*)
Helen M. Branson, MBBS, FRCR (*Abstract Co-Author*)
Birgit B. Ertl-Wagner, MD, PhD (*Abstract Co-Author*)
Vivek B. Pai, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

In an era of increasing subspecialization, pediatric radiologists often focus on specific organ systems. However, many genetic and multisystemic diseases affect both the brain and body, with certain body pathologies being the cause of secondary neurological manifestations. Recognizing body imaging findings can provide key diagnostic clues to neurological disorders.This poster highlights cases where body imaging findings provide important clues for neurological diseases, emphasizing the importance of a holistic, cross-specialty approach in pediatric radiology.

TABLE OF CONTENTS/OUTLINE

- IDH mutant astrocytoma and Ollier disease- Pituitary thickening and lytic lesions in Langerhans cell histiocytosis- Macrocephaly and skeletal findings in Hurler syndrome- Optic pathway glioma and congenital pseudarthrosis in neurofibromatosis type 1- Cervical spine stenosis and other skeletal findings in chondrodysplasia punctata- Speckled brain lesions and skin lesions in incontinenta pigmenti- Fibrous dysplasia and Leydig cell hyperplasia in McCune Albright syndrome- Anti-NMDA receptor encephalitis and ovarian teratoma- Brain findings and acute liver failure in Wilson's disease- Intracranial caseating granulomas in miliary tuberculosis- Hemangioblastoma and pancreatic lesions in Von Hippel-Lindau disease- Leukodystrophy and gallbladder findings in metachromic leukodystrophy- Skull metastasis and adrenal mass in metastatic neuroblastoma- Opsoclonus-myoclonus syndrome with neuroblastoma- Septic embolic infarcts in endocarditis- Intracranial arteriopathy and supravalvular stenosis in Williams syndrome

PDEE-52 UNVEILING THE LEGACY OF SKELETAL DYSPLASIAS IN PRE-COLUMBIAN CERAMICS

Amalia P. Ojeda, MD (*Presenter*)
Tatiana Rodriguez Ojeda (*Abstract Co-Author*)
Laura Rodriguez Alba, MD (*Abstract Co-Author*)
Hugo Sotomayor Tribin (*Abstract Co-Author*)

TEACHING POINTS

Pre-Columbian ceramics dating between 400 BCE and 400 CE exhibit morphological traits of skeletal dysplasias including achondroplasia, Morquio disease, congenital femoral deficiency, hemimelia, and Mermaid Syndrome.Several practices in indigenous societies regarding individuals with skeletal dysplasias were identified, ranging from infanticide to the use of their worldviews and the assignment of specific tasks based on their abilities. Dwarfs were associated with sexuality and vitality due to their ability to generate life. They were considered protectors of Mother Earth and masters of the animals. They were respected and honored with offerings.The integration of radiology and archaeological studies provides a bridge between the past and modern scientific tools to understand the physical and cultural diversity of ancient societies.The morphological findings of the pre-Columbian ceramics match the radiological findings of contemporary patients diagnosed with skeletal dysplasias. This suggests that these conditions were recognized and represented in pre-Columbian cultures, opening new avenues for investigating the social, cultural, and medical perceptions of bone anomalies in ancient times

TABLE OF CONTENTS/OUTLINE

Introduction, Objectives, Materials and Method, History of Archaeo-medicine,Timeline of Archaeoradiology, Indigenous Culture, Dwarfism and Pre-Columbian Cultural Beliefs, Radiological Approach to Skeletal Dysplasias, Cases Morquio Disease, Achondroplasia, Spondylometaphyseal Dysplasia Type Kozlowsk, Congenital Femoral Deficiency, Tibial Hemimelia and Sirenomelia, Results and Conclusions

PDEE-53 FROM FULL-SPINE X-RAY TO HERITABLE CONNECTIVE TISSUE DISORDERS: WHEN PEDIATRIC SCOLIOSIS IS MORE THAN JUST A CURVE

Clara De Arriba Heras, MD (*Presenter*)
Claudia Moreno, MD (*Abstract Co-Author*)
Audena Maria Garcia Kempf, MD (*Abstract Co-Author*)
Ignacio Cavaller, MD (*Abstract Co-Author*)
Irene Navas Fdez-Silgado, MD (*Abstract Co-Author*)
Raquel Sanz de Lucas, MD (*Abstract Co-Author*)
Maria Pont, MD (*Abstract Co-Author*)
Carmen Gallego, MD (*Abstract Co-Author*)

TEACHING POINTS

- Recognize the radiologist's critical role in early identification, characterization, and follow-up of Heritable Connective Tissue Disorders (HCTDs) in pediatric scoliosis. - Detect imaging findings on full-spine radiographs that may raise suspicion for an underlying HCTD, and correlate with radiologic clues across other imaging and clinical referrals to guide differential diagnosis. - Illustrative cases from our institutional database highlight imaging features that aid in distinguishing among different HCTDs.

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Introduction: HCTDs is a wide and heterogeneous group of syndromes with genetic variability, multisystemic involvement and significant phenotypic overlap; it can present with scoliosis, as well as many other comorbidities. Diagnosing the precise mutation is challenging but crucial for management and counseling. Clinical and imaging findings can guide genetic testing. Pediatric radiologists play a pivotal role in detecting suspicious signs, assessing multisystem involvement, and monitoring musculoskeletal and cardiovascular conditions. 1. When to suspect HCTDs on Full-Spine Radiographs - Checklist: early-onset/progressive scoliosis, spondylolysis, spondylolisthesis, acetabular protrusion, pectus deformities, vascular anomalies, and more. 2. In the setting of a scoliosis with concerning features: look for more - There may be additional clues in previous radiological or clinical records. 3. Case-Based Learning of HCTDs - Marfan Syndrome, Ehlers-Danlos Syndrome, Loeys-Dietz Syndrome, Shprintzen-Goldberg Syndrome, Arterial Tortuosity Syndrome, and Osteogenesis Imperfecta.

PDEE-54 MASTERING PEDIATRIC NEUROMETABOLIC IMAGING: A PATTERN-BASED APPROACH TO 25 ESSENTIAL DISORDERS FOR TRAINEES

Vinay V. Kandula, MBBS (*Presenter*)
Yashasvi Shukla (*Abstract Co-Author*)
Rithika Sriram, MBBS (*Abstract Co-Author*)
Rupali Jain, MD,MBBS (*Abstract Co-Author*)
Arnav Shah (*Abstract Co-Author*)

TEACHING POINTS

Neurometabolic disorders represent a complex and challenging group of conditions often encountered in pediatric neuroradiology. Early and accurate diagnosis is critical, and neuroimaging, particularly MRI, plays a pivotal role. This exhibit aims to provide radiology trainees with a practical, pattern-based approach to recognizing the imaging findings of 25 essential inherited neurometabolic diseases. Familiarity with characteristic imaging patterns, distribution of abnormalities, specific radiological signs, and key MRS findings is essential for diagnosing inherited neurometabolic disorders.

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We present a curated selection of 25 "must-know" neurometabolic disorders for trainees, including conditions such as Maple Syrup Urine Disease (MSUD), Nonketotic Hyperglycinemia (NKH), Urea Cycle Disorders (UCD), Canavan Disease, Zellweger Spectrum Disorders, Pantothenate kinase-associated neurodegeneration (PKAN), leukodystrophies [Metachromatic (MLD), Krabbe, Adreno (ALD), Alexander, vanishing white matter (VWM), Pelizaeus-Merzbacher disease (PMD), Hypomyelination with Atrophy of the Basal Ganglia and Cerebellum (H-ABC), Leukoencephalopathy with brainstem and spinal cord involvement and lactate elevation (LBSL), Megalencephalic leukoencephalopathy with subcortical cysts (MLC)], mitochondrial disorders (Leigh syndrome, MELAS, MERRF), Tay-Sachs, Pseudohypoparathyroidism (PHP) and others. Utilizing a case-based format, we systematically review the characteristic imaging findings on conventional MRI and MR Spectroscopy (MRS) in narrowing the differential diagnosis. Emphasis is placed on pattern recognition.

PDEE-55 THE GREAT PRETENDERS: DISTINGUISHING TUMORS AND NON-NEOPLASTIC MIMICS IN PEDIATRIC NEUROIMAGING

Vinay V. Kandula, MBBS (*Presenter*)
Yashasvi Shukla (*Abstract Co-Author*)
Rithika Sriram, MBBS (*Abstract Co-Author*)
Rupali Jain, MD,MBBS (*Abstract Co-Author*)
Arnav Shah (*Abstract Co-Author*)

TEACHING POINTS

Accurate characterization of intracranial and spinal lesions in children is critical for guiding appropriate management, which differs vastly between neoplastic and non-neoplastic conditions. However, significant overlap exists in imaging appearances, leading to diagnostic challenges. This exhibit aims to illustrate these diagnostic pitfalls using a case-based approach, highlighting key imaging features that aid in differentiating pediatric tumors from their mimics and vice versa.

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We retrospectively reviewed challenging pediatric neuroimaging cases from our institutional archives. Cases were selected to represent two main categories: Pathologies Mimicking Tumors Examples include Lhermitte-Duclos disease (dysplastic cerebellar gangliocytoma), posterior fossa epidermoid/dermoid/teratoma cysts, tuber cinereum hamartoma, 3rd ventricular cavernoma, tumefactive MS, CNS sarcoidosis, lymphocytic hypophysitis, tumefactive perivascular spaces, post-radiation cavernomas of the spine, MOGAD lesions, NF1 associated spinal cord spongiform changes, and cerebellar AVF. Tumors Mimicking Other Pathologies Examples include DNET mimicking neurocysticercosis, gastric cancer metastases presenting atypically, glioneuronal tumors causing raised intracranial pressure without obvious mass, multinodular and vacuolating neuronal tumor (MVNT), infiltrating low-grade astrocytoma, basal ganglia germinoma, astroblastoma mimicking intracerebral hematoma, diffuse midline glioma/diffuse pediatric high-grade glioma with infiltrative patterns, and medulloblastoma presenting with symmetric cerebellar or brainstem involvement.

PDEE-56 PEDIATRIC PARAMEDIASTINAL MASSES: A RADIOLOGIC GUIDE

Achala Donuru, MD (*Presenter*)
Yashasvi Shukla (*Abstract Co-Author*)
Rupali Jain, MD,MBBS (*Abstract Co-Author*)
Vinay V. Kandula, MBBS (*Abstract Co-Author*)

TEACHING POINTS

Paramediastinal masses in children encompass a wide range of pathologies, creating a diagnostic challenge for radiologists. This exhibit provides a comprehensive pictorial review of common and uncommon paramediastinal lesions, highlighting key imaging features for accurate diagnosis. Cases will illustrate characteristic findings

of neuroblastoma, schwannoma, duplication cyst, leukemia/lymphoma, hematoma, extramedullary hematopoiesis, and other relevant entities. Each case will emphasize clinical presentation, multi-modality imaging characteristics (CT, MRI, and potentially PET), and pathological correlation where available. This exhibit aims to enhance radiologists' ability to confidently differentiate these lesions, enabling timely and appropriate management.

TABLE OF CONTENTS/OUTLINE

Introduction Definition and overview of paramediastinal masses in children Importance of accurate diagnosis for appropriate management Imaging Modalities Strengths and weaknesses of radiography, CT, MRI, ultrasound, and PET/CT in evaluating paramediastinal masses Case Presentations Neuroblastoma, Schwannoma, Duplication Cyst (Esophageal and Bronchogenic), Leukemia/Lymphoma, Hematoma, Extramedullary Hematopoiesis, Teratoma Origin, imaging characteristics, and clinical presentation Illustrative cases with multi-modality imaging and pathology correlation Conclusion Summary of key teaching points Algorithm or decision tree for approaching paramediastinal masses in children Importance of multidisciplinary collaboration for optimal patient care

PDEE-57 PEDIATRIC MUSCULOSKELETAL SPORTS INJURIES: A HEAD-TO-TOE APPROACH

Emily Cao (*Presenter*)
Rebekah Julie Park (*Abstract Co-Author*)
Muhayman Sadiq, MBBS (*Abstract Co-Author*)
Saagar Patel, MD (*Abstract Co-Author*)
Manickam Kumaravel, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

1. Appreciate unique anatomic considerations in pediatric musculoskeletal sports injuries, including the impact of skeletal immaturity, growth plates, and biomechanical factors. 2. Outline key imaging findings of common pediatric sports injuries across different anatomical regions and their clinical significance. 3. Review the roles of radiographs, CT, MRI, and ultrasound when evaluating such injuries. 4. Discuss key imaging pitfalls and tips to avoid them. 5. Provide a structured approach to reporting injuries to ensure key findings are effectively communicated.

TABLE OF CONTENTS/OUTLINE

1. Introduction. a. Outline unique pediatric anatomical considerations, including the impact of open growth plates and skeletal immaturity. 2. Upper Extremity Injuries. a. Coracoid Stress Injury. b. Labral and Cartilage Injury. c. Little League Shoulder. d. Periostitis. e. Serratus Anterior injury. f. Avulsion fracture of the humeral lesser tuberosity. g. Little League Elbow. h. UCL Elbow Injury. i. Elbow OCD (Osteochondritis Dissecans). j. Scaphoid Injury/Wrist Bone Edema. k. Gymnast's Wrist. 3. Pelvic and Lower Extremity Injuries. a. Slipped Capital Femoral Epiphysis. b. Hip Labrum Injury. c. Rectus Femoris Avulsion. d. Patellar Dislocation. e. Patellar Avulsion Fracture. f. Knee OCD. g. Osgood-Schlatter Disease. h. Tibial Stress Edema. i. Spondylosis. j. Pelvic Apophysitis. 4. Ankle and Foot Injuries. a. Ankle OCD. b. Navicular Stress Reaction. c. Sever's Disease. d. Sesamoiditis. 5. Clinical implications. a. Indications for surgical management, and post-operative imaging appearance. b. Key imaging pitfalls and techniques to avoid them. 6. Conclusion. a. Key takeaways. 7. References.

PDEE-58 BRIGHT BUT MISPLACED: THE ECTOPIC NEUROHYPOPHYSIS ON PEDIATRIC MRI

Karine Coelho Rodrigues, MD (*Presenter*)
Ingrid Eckert, MD (*Abstract Co-Author*)
Vitoria Lima Beltrao Vieira de Melo, MD (*Abstract Co-Author*)
Jose Alberto Moraes Neto, MD (*Abstract Co-Author*)
Jose Flavio De Oliveira Neto (*Abstract Co-Author*)
Soraya Monteiro (*Abstract Co-Author*)

TEACHING POINTS

Ectopic neurohypophysis (ENH) denotes a developmental malformation where the neurohypophysis is abnormally positioned, most often situated at the level of the median eminence or infundibular recess. It is frequently associated with interruption of the pituitary stalk and hypoplasia of the anterior pituitary lobe. MRI is the preferred imaging method for identifying these alterations, especially in pediatric patients with isolated growth hormone deficiency.This exhibit aims to: Demonstrate the principal MRI signs that support the diagnosis of ectopic neurohypophysis; Review the typical anatomy and embryologic development of the hypothalamic-pituitary axis; Discuss clinical and anatomical associations observed in patients with ENH; Highlight potential diagnostic pitfalls and differential diagnoses relevant to radiologic interpretation.

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Anatomical and embryological overview of the hypothalamic-pituitary axis correlating with imaging features of normal and ectopic neurohypophysis on sagittal T1 MRI; Series of pediatric cases with different clinical presentations and hormonal correlation in patients with ENH, highlighting the imaging characteristics for diagnosis; Differential diagnosis and interpretation pitfalls, teaching pearls to improve early recognition and avoid misdiagnosis.

PDEE-59 NEONATAL HEAD ULTRASOUND EMERGENCIES: WHAT THE ON-CALL RADIOLOGIST SHOULD KNOW

Hunter R. Carlock, MD (*Presenter*)
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TEACHING POINTS

Neonatal head ultrasound is an inexpensive imaging modality for assessment of intracranial abnormalities. This can be performed at the bedside without radiation or sedation, which has the advantage over CT or MRI. Limitations of neonatal head ultrasound include varying patient anatomy (relying on adequate windows), user variation, and lack of familiarity for some radiologists - particularly non-pediatric subspecialty trained. While neonatal head ultrasounds are commonly used for screening premature infants for germinal matrix hemorrhages, evaluation for other etiologies is often performed including infarction, trauma, infection, and developmental anomalies. Through this educational exhibit, we intend to provide an overview of imaging techniques of neonatal head ultrasound and normal anatomy/embryology along with various pathologies that can be seen including infection, cerebrovascular injuries, and developmental anomalies. Teaching Objectives 1. Discuss imaging techniques and normal anatomy for neonatal head ultrasound. 2. Review cerebrovascular pathology including germinal matrix hemorrhage, other intra- and extra-axial hemorrhage, and infarcts. 3. Review infectious pathology including meningitis, abscess, and ventriculitis. 4. Review embryology and development anomalies that can be seen on neonatal head ultrasounds. 5. Describe other findings that may mimic disease such as artifact and variant anatomy.

TABLE OF CONTENTS/OUTLINE

1. Introduction/Background 2. Neonatal head ultrasound techniques and normal anatomy 3. Intracranial hemorrhages 4. Cerebral infarcts 5. Intracranial infection 6. Developmental Anomalies 7. Other findings 8. Closing points

PDEE-60 IMAGING FEATURES OF PEDIATRIC AORTIC DISEASE

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TEACHING POINTS

Thoracic aortic pathology in pediatric and adult populations requires precise imaging for diagnosis, surgical planning, and post-treatment surveillance.This educational review focuses on optimized computed tomography (CT) and magnetic resonance imaging (MRI) protocols specifically tailored for the assessment of aortic diseases in the pediatric population. Key imaging techniques, including multiplanar and 3D reconstructions, are highlighted for their diagnostic value in identifying common and complex entities. The main imaging findings for each pathology are discussed, emphasizing protocol adjustments tailored to children to maximize diagnostic yield while minimizing risks. This overview aims to provide radiologists with practical guidance for selecting and implementing advanced imaging strategies in pediatric aortic disease. With this exhibit we will:

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- Discuss strategies for protocol optimization in CT angiography and MRI, emphasizing techniques to reduce radiation and contrast doses and shorten acquisition times. These adjustments enable high-quality imaging while minimizing risks, and in some cases, allow for optimal studies without the need for sedation.- Review of the key imaging findings of congenital aortic malformations (coarctation, hypoplasia, vascular rings, etc).- Review the key imaging findings of aortopathies, classifying them as congenital and non congenital: - Congenital (connective tissue disorders such as Marfan syndrome, Loeys-Dietz, or Ehlers-Danlos, middle aortic syndrome, etc.). - Non-congenital (Takayasu arteritis).

PDEE-61 APOPHYSEAL INJURIES IN YOUNG ATHLETES: IMAGING CLUES FROM DIAGNOSIS TO HEALING

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TEACHING POINTS

- Present the anatomical features and normal anatomical variants of ossification centers in pediatric and adolescent athletes. - Review the pathophysiological mechanisms and clinical correlation of apophyseal injuries. - Illustrate the radiological spectrum of apophyseal injuries, ranging from apophysitis to avulsion fractures. - Differentiate apophyseal injuries from their main radiological mimics. - Demonstrate the expected imaging findings during the healing process following conservative and surgical treatment, and their correlation with return-to-play (RTP) timelines.

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1. Anatomical characteristics and normal variants of ossification nuclei in children and young athletes. 2. Pathophysiology and clinical correlation of apophyseal injuries. 3. Imaging spectrum of apophyseal injuries, from apophysitis to avulsion fractures , highlighting key imaging features to avoid misinterpretation . 4. Differential diagnosis, with emphasis on r adiological mimics of apophyseal injuries. 5. Healing process and imaging-based risk assessment for clinical Return to Play (RTP) decisions.

PDEE-62 PEDIATRIC LIVER TRANSPLANT: INDICATIONS AND FOCUS ON ANATOMIC ASSESSMENT. A REPORT FROM THE PEDIATRIC LIRADS WORKING GROUP

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Mitchell Rees, MD (*Abstract Co-Author*)
Gary R. Schooler, MD (*Abstract Co-Author*)
Judy H. Squires, MD (*Abstract Co-Author*)
Alex Towbin, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Indications for pediatric liver transplant differ from those in adults. 2. Knowledge and reporting of critical anatomy, including sectional anatomy, vascular and volumetric assessment is essential to guide split and whole liver transplant. 3. Liver transplant is the only treatment option for unresectable liver malignancies in children and the anatomic definitions of PRETEXT group assignment and annotation factors are essential for reporting.

TABLE OF CONTENTS/OUTLINE

• Brief review of several pediatric liver pathologies requiring resection or transplant o Neoplasms o Cholestatic syndromes o Metabolic disease • Presurgical imaging modalities o Complementary role of sonography, CT and MRI for liver transplant planning • Tumor staging (PRETEXT/POSTTEXT) o Anatomic definitions of liver sections o Annotation factors with a focus on challenges identifying vascular involvement • Recipient anatomic assessment o Native liver volume and size of patient o Impact of prior surgeries (e.g. Kasai) o Risk prohibitive characteristics for transplant (i.e. extent of vascular tumor involvement, tumor type, institutional practice patterns) • Living donor anatomic assessment with attention to relevant anatomy and important information for reporting o Segmentation, liver volumes o Variant anatomy: venous, arterial, biliary • A brief review of complications after resection/transplant relating to anatomy o Biliary: leak, strictures, excluded system/orphan ducts o Vascular: stenosis, thrombosis

PDEE-63 NONINVASIVE 4D MRI ASSESSMENT OF FETAL FORAMEN OVALE FLOW WITH DOPPLER ULTRASOUND GATING

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Sungho Park, MD (*Abstract Co-Author*)
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TEACHING POINTS

Doppler ultrasound (DUS)-gated 4D flow MRI enables in vivo visualization of fetal foramen ovale (FO) shunting without sedation, contrast, or retrospective synchronization. This technique enhances physiologic assessment of fetal intracardiac flow using standard clinical MRI equipment. Physiologic gating and online image reconstruction provide a framework for broader clinical implementation in fetal cardiovascular imaging. This exhibit will a. Describe the technical approach of DUS-gated 4D flow MRI for fetal cardiac evaluation b. Demonstrate direct visualization of right-to-left atrial shunting via the foramen ovale c. Review the clinical and physiologic relevance of FO flow in fetal circulation d. Compare this approach with existing fetal echocardiography and MRI techniques e. Discuss future directions, including potential for flow quantification and clinical translation

TABLE OF CONTENTS/OUTLINE

Background Fetal circulation and the functional role of the foramen ovale Imaging Methods a. MRI hardware and acquisition sequence b. Doppler ultrasound gating setup c. Online image reconstruction and offline post-processing Case Presentation a. Clinical background and fetal status b. Acquisition parameters and gating signals c. Visualization of FO-directed blood flow Discussion a. Technical advantages and disadvantages over traditional methods b. Comparison with prior 4D flow techniques in fetal imaging c. Limitations and future applications (including flow quantification potential) Conclusion Feasibility and clinical relevance of noninvasive intracardiac fetal flow assessment using physiologic gating

PDEE-64 PEDIATRIC ACCIDENTAL HEAD TRAUMA: WHAT THE ON-CALL RESIDENT MUST KNOW

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Alejandra I. Castillo Cervantes, MD (*Abstract Co-Author*)
Daniel Chavez, MD (*Abstract Co-Author*)
Erwin J. Narvaez Garcia, MD (*Abstract Co-Author*)
Guillermo Elizondo-Riojas, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Understand key anatomical differences between pediatric and adult skulls that influence trauma patterns. Identify critical imaging features of common intra-axial, extra-axial, and skull injuries in pediatric head trauma. Apply age-appropriate imaging strategies and modality selection in the radiologic assessment of pediatric TBI.

TABLE OF CONTENTS/OUTLINE

Teaching Points - Core educational objectives of the exhibit. Introduction - Epidemiology, relevance, and clinical context of pediatric head trauma. Pathophysiology - Mechanisms of injury. Anatomical Differences - Key skull and brain distinctions between children and adults. Imaging Modalities - Role of CT, MRI, and ultrasound in pediatric head trauma. Skull Fractures and Scalp Injuries - Linear, depressed (“ping pong”), diastatic, complex ("burst") fractures, and soft tissue/subgaleal injuries. Extra-axial Injuries - Subdural, epidural, and subarachnoid hemorrhages. Intra-axial Injuries - Intraparenchymal hematoma and diffuse axonal injury (DAI). Uncommon Mechanisms - Penetrating trauma and atypical causes (e.g., arrows, pencils, firearms). Complications and Differential Diagnosis - Sequelae, mimics, and clinical-radiologic pitfalls. Take-Home Messages - Final summary of key radiologic concepts for the on-call resident.

PDEE-65 PEDIATRIC STROKE CLASSIFICATION: ARTERIOPATHY, CARDIOEMBOLISM AND BEYOND

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Alexandra M. Foust, DO (*Abstract Co-Author*)
Laura L. Hayes, MD (*Abstract Co-Author*)
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TEACHING POINTS

1. CASCADE is a consensus-based anatomic classification system, providing uniform nomenclature for childhood arterial ischemic stroke. 2. In children with arterial ischemic stroke, most cases of small vessel arteriopathy (SVA) are diagnosed based on infarct characteristics (MRI) and clinical data. 3. There is no true ‘gold standard’ for the diagnosis of most childhood arteriopathies, and the distinction between arteriopathy and thromboembolism is not always clear. 4. In children with stroke and large vessel occlusion, arteriopathy is more likely than cardioembolism when there is no cardiac disease, and thrombus is accompanied by arterial stenosis or irregularity. 5. Strong vessel wall enhancement may be associated with progressive arteriopathy, but this is controversial. 6. Perfusion failure may trigger stroke in children with steno-occlusive arteriopathy and limited cerebrovascular reserve, even in the absence of thrombotic arterial occlusion. 7. One of the limitations of CASCADE is the variable sensitivity of different modalities (e.g., to stenoses and basal collaterals).

TABLE OF CONTENTS/OUTLINE

1. Introduction: Pediatric stroke and the importance of stroke classification. 2. Childhood AIS (arterial ischemic stroke) Standardized Classification And Diagnostic Evaluation - CASCADE: Description of the CASCADE system, including strengths and limitations. 3. Cases: Application of the CASCADE criteria in clinical practice - Small vessel arteriopathy of childhood. Unilateral focal cerebral arteriopathy. Bilateral cerebral arteriopathy. Aortic/cervical arteriopathy. Cardio-embolic. Other (including cryptogenic). Multifactorial. 4. Prognostic value of the CASCADE system 5. Conclusions

PDEE-66 A RADIOLOGIST'S GUIDE TO CLEFT LIP AND PALATE CT REPORTING- WHAT THE CRANIOFACIAL TEAM WANTS TO KNOW

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TEACHING POINTS

1. Neuro/pediatric radiologists are underutilized, but important members of craniofacial teams. 2. Familiarity with the embryology and anatomy of cleft lip and palate improves understanding and interpretation of maxillofacial CT in cleft patients. 3. Understanding of expected cleft related surgical changes improves accuracy in identifying complications (i.e. oronasal fistula, failed bone graft incorporation or resorption, hardware failure or infection).

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Cleft lip and/or palate is a common congenital malformation of the head and neck with an incidence of approximately 0.33 per 1,000 live births. Affected patients undergo staged repairs over the course of childhood, often customized to the individual patient’s needs by a dedicated craniofacial team. A team-based approach to these complex patients has been shown to improve patient outcomes and streamline patient care leading to improved efficiency and cost savings. The role of the neuro/pediatric radiologist is often under-utilized on these teams, however can prove invaluable for initial diagnosis, surgical planning, and post-treatment monitoring and surveillance. This education exhibit will first review pertinent embryology and nomenclature related to cleft lip and palate, highlighting related maxillofacial anatomy abnormalities where appropriate. Subsequently, the stages (and timing) of surgical repair and expected imaging findings will be discussed, with attention to areas where the radiologist can “add value” in reports. Finally, imaging findings that may be encountered related to treatment failure/complication (oronasal fistula, failed graft incorporation) will be discussed through case-based examples.

PDEE-67 IMAGING DIAGNOSIS FOR FETAL AND NEONATAL EMERGENCY ABDOMINAL DISEASES

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Yuko Nakamura, MD, PhD (*Abstract Co-Author*)
Kazuo Awai, MD (*Abstract Co-Author*)

TEACHING POINTS

Ultrasonography (US) and plain radiography are the first-choice imaging methods for neonatal emergency abdominal imaging. Many emergency abdominal diseases are diagnosable by US and plain radiography. The demand for diagnostic fetal imaging studies is increasing because they can detect emergency abdominal anomalies early.We present US and plain radiography findings made in major emergency abdominal diseases in neonates as well as MRI results for fetuses that every radiologist should know.

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(1) US and Plain radiography findings in neonates- Gastrointestinal diseasesmidgut volvulus, hypertrophic pyloric stenosis, necrotizing enteritis, focal intestinal perforation- Hepatobiliary system diseases- biliary atresia, congenital biliary dilatation(2) MRI findings in fetuses- Gastrointestinal obstruction- duodenal atresia, jejuno-ileal atresia, meconium peritonitis, anorectal anomaly- Abdominal wall defects- omphalocele, gastroschisisDiagnostic US-, plain radiography-, and MRI findings that are important when fetal- or neonatal emergency abdominal anomalies are suspected.

PDEE-68 PEDIATRIC MUSCULOSKELETAL INFECTION: A RADIOLOGICAL EVALUATION TO AVOID MISINTERPRETATION

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Maria Navallas, MD (*Abstract Co-Author*)
Enrique Ladera (*Abstract Co-Author*)
Ignasi Barber, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

After reviewing this exhibit, the learner should Understand the pathophysiology of pediatric MSK infections and their impact on imaging appearances. Describe the imaging techniques, with emphasis on US and advanced MRI techniques. Recognize classical imaging findings of osteomyelitis, septic arthritis, and soft tissue infections. Describe the role and added value of advanced MRI techniques (DWI and DCE MRI), in challenging cases. Identify mimickers of MSK infection and discuss key imaging features that help differentiate them.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Common infections (osteomyelitis, septic arthritis, pyomyositis). 3. Pathophysiology and Impact on Imaging: Discussion of infection pathways and their influence on radiological findings. 4. Imaging Techniques and Findings - Classical techniques: x-rays, US, CT, MRI and nuclear medicine.- Advanced techniques: DWI and DCE-MRI. 5. Classical Imaging Findings of osteomyelitis, septic arthritis ans soft tissue infections, with its potential complications. 6. Role of Advanced MRI Techniques to Avoid Misinterpretation - DWI: detection of abscess and differentiating infection from sterile inflammation or tumors by using ADC as a biomarker.- DCE MRI: evaluation of perfusion patterns to distinguish infection from neoplastic processes (time intensity curves) and for therapy monitoring. 7. Mimickers of Infection - Neoplastic: Ewing sarcoma, LCH, leukemia. - Inflammatory: CNO, JIA, transient synovitis.- Others: stress fracture, bone infarcts. 8. Summary: key points reinforcing the importance of integrating clinical, laboratory, and imaging findings for accurate diagnosis.

PDEE-69 DON'T MISFLAG THE IFAG: ULTRASOUND IN THE DIAGNOSIS OF IDIOPATHIC FACIAL ASEPTIC GRANULOMA

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Silvia Revuelta Gomez, MD (*Abstract Co-Author*)
Aranzazu Sanchez Gabin, MD (*Abstract Co-Author*)
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Alexandra de Diego Diez (*Abstract Co-Author*)
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Elena A. Gallardo, MD,PhD (*Abstract Co-Author*)

TEACHING POINTS

- Highlight the clinical and ultrasonographic features of idiopathic facial aseptic granuloma (IFAG). - To propose a differential diagnosis with other skin lesions that can be confused with idiopathic facial aseptic granuloma. - To show images from our institution illustrative of this dermatologic condition.

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Idiopathic facial aseptic granuloma (IFAG) is a self-limiting inflammatory process, typical of pediatric age, which manifests as a cutaneous nodule in the facial region, typically in the malar area.IFAG is a recently described entity with few cases published in the literature. However, its incidence is thought to be relatively high and it is largely underdiagnosed.Histologically it shows an inflammatory infiltrate with the presence of multinucleated gigantic cells.High-frequency probe ultrasound is a very useful tool for diagnosis due to its image resolution, availability and safety. The imaging findings, together with the clinical presentation, make it possible to reach a certain diagnosis without the need for biopsy.On ultrasound a solid, ovoid intradermal lesion with a hypoechogenic appearance, with well delimited borders, without capsule or calcific deposits is observed. Generally, there is no intralesional Doppler flow except in the case of complications. Doppler also allows inferring the time of evolution of the nodule, since the perile-sional flow disappears in the resolution phase.The differential diagnosis includes cutaneous abscesses, epidermoid cyst, pilomatrixoma and pyogenic granuloma among others.

PDEE-70 MOVE, TWIST, KINK, RELAX: A MULTIMODALITY GUIDE TO PEDIATRIC ORGAN HYPERMOBILITY

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Hotaka Doi (*Abstract Co-Author*)
Shunsuke Taniguchi (*Abstract Co-Author*)
Minako Wada (*Abstract Co-Author*)
Ippei Morisawa (*Abstract Co-Author*)
Toshihiro Tanaka, MD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit aims to Classify organ motion into four dynamic patterns—Move (wander), Twist (torsion), Kink, Relax (laxity)—on dynamic ultrasound. Correlate these sonographic signs with CT/MRI findings and propose an imaging algorithm that prioritises emergencies and identifies underlying connective-tissue phenotypes.

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Pediatric organ hypermobility represents a spectrum of motion anomalies produced by lax or variant ligaments, redundant mesenteries, and heritable connective-tissue disorders. Unrecognised hypermobility can lead to acute ischemia, obstructive crises, or delayed diagnosis of systemic disease. Real-time ultrasound “freezes” the critical movement, while CT and MRI provide the anatomic road-map required for surgical decision-making and genetics referral. Move (Wander) Wandering thymus on phonation, Mobile cecum, Abdominal undescended testis, Organo-axial gastric volvulus Twist (Torsion) Intermittent intravaginal testicular torsion (Bell-Clapper), Ovarian torsion, Mid-gut volvulus (SMA/SMV whirlpool), Torsed wandering spleen Kink (Kink / Dynamic Compression) Iliac-artery endofibrosis in athletes, Nutcracker phenomenon, Median arcuate ligament syndrome (MALS)—celiac-artery indentation, Tracheobronchomalacia—expiratory airway collapse Relax (Heritable Connective-Tissue Laxity) Nail-Patella syndrome ,Down syndrome, Marfan syndrome, Ehlers-Danlos spectrum This pictorial review unifies multisystem pediatric hypermobility within a four-pattern, multimodality framework, streamlining differential diagnosis, expediting treatment of torsion/volvulus, and uncovering genetic disorders before complications arise.

PDEE-71 IMAGING OF ABDOMINAL AND PELVIC TUMORS IN THE NEONATE AND YOUNG INFANT

Diana Veiga Canuto, PhD, MD (*Presenter*)
Roberto Llorens Salvador (*Abstract Co-Author*)
Oscar M. Navarro, MD (*Abstract Co-Author*)

TEACHING POINTS

Neonatal and congenital tumors present unique diagnostic challenges; understanding their peculiarities in behavior, prognosis an associations with other congenital anomalies is key for an appropriate approach. Accurate imaging characterization, integrated with age, location, clinical and laboratory findings, is essential for differentiating neoplasms from non-neoplastic entities

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INTRODUCTION Terminology Epidemiology Challenges of tumor behavior Associations with congenital anomalies DIAGNOSTIC APPROACH Role of imaging Diagnostic approach based on prenatal vs postnatal detection, location, appearance, clinical and laboratory findings ABDOMINAL MASSES LIVER Age distribution Differential diagnosis solitary lesions: Congenital hemangioma vs hepatoblastoma, Mesenchymal hamartoma Other liver lesions: vascular anomalies, umbilical venous line-related complications Differential diagnosis of multiple liver lesions: Neuroblastoma metastases vs infantile hemangiomas, Multifocal hepatoblastoma SUPRARENAL Normal adrenal gland in fetus and neonates Adrenal masses Neuroblastoma vs hemorrhage Other suprarenal region lesions: Intraabdominal extralobar bronchopulmonary sequestration, Enteric duplication cyst, Upper pole renal malformations RENAL Mesoblastic nephroma and subtypes Neonatal Wilms tumor: predisposing genetic conditions, nephrogenic rests, bilateral tumors Rhabdoid renal tumor Renal pseudomasses Column of Bertin Pyelonephritis Multicystic dysplastic kidney OTHER ABDOMINAL CYSTIC LESIONS Choledocal cyst Antenatal ovarian torsion Meconium peritonitis Enteric duplication cyst PELVIC LESIONS Sacrococcygeal teratoma CONCLUSION

PDEE-72 DOUBLE-EDGED SWORD EFFECT OF CANCER THERAPY: SECOND MALIGNANT NEOPLASMS (SMNS) IN PEDIATRIC CANCER SURVIVORS

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Sireesha Yedururi, MBBS (*Abstract Co-Author*)
Ishan Arora (*Abstract Co-Author*)
Cynthia Herzog (*Abstract Co-Author*)
Priya R. Bhosale, MD (*Abstract Co-Author*)

TEACHING POINTS

1) The cancer mortality rate in the pediatric population has rapidly declined with the advent of modern therapies in oncology; however, long term effects of treatment pose significant challenges. 2) One of the most dreaded complications of cancer therapy is the risk of second malignant neoplasms (SMNs), which are histologically different primary neoplasms that occur at least two months after the end of prior cancer treatment. 3) Risk factors for SMNs can be divided into therapy-related factors (chemotherapy, radiation, stem-cell transplant), patient characteristics (genetic predisposition, age), and environmental/behavioral factors. 4) Treatment protocols should be tailored by considering data on treatment outcomes, toxicities, cumulative doses, and genetic predispositions to reduce SMN risks without compromising the efficacy of primary therapy. 5) Vigilant, potentially lifelong surveillance should also be emphasized, and radiologists must remain aware to ensure timely diagnosis and management of these cases.

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A) Introduction. B) Epidemiology, etio-pathogenesis, clinical findings and pathology of SMNs in pediatric cancer survivors. C) Classification with multimodality cross-sectional imaging illustrations: 1) Therapy related SMNs a) Chemotherapy-related SMNs b) Radiation-related SMNs c) Stem cells transplant related SMNs 2) SMNs due to genetic or hereditary predisposition (e.g. RB1, TP53, BRCA1/2, NF1, MLH1, MSH2, MSH6, and DICER1 mutations). D) Strategies to mitigate risk of SMNs (e.g. chemotherapy modifications, alternating therapies, radiation adjustments, advancing radiation delivery). E) Surveillance and screening. F) Conclusion.

PDEE-73 MIND THE LIMP: KEY INSIGHTS IN PEDIATRIC HIP IMAGING FROM PRACTICAL TIPS TO EMERGING DIAGNOSES

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Yoshino Tamaki Sameshima, MD (*Abstract Co-Author*)
Diogo G. Leao Edelmuth, MD (*Abstract Co-Author*)
Durval D. Santos, MD (*Abstract Co-Author*)
Laercio A. Rosemberg, MD, PhD (*Abstract Co-Author*)
Adham A. Castro, MD (*Abstract Co-Author*)
Vitor T. Paula, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review the anatomy applied to imaging exams with the particularities in childhood. 2. To discuss and illustrate the most common paediatric hip and proximal lower limb pathologies and their presentation in the different imaging modalities. 3. To discuss updates in the pathophysiology and imaging propaedeutics of paediatric hip diseases. 4. To discuss and propose structured reporting templates highlighting the essential findings for each pediatric hip disorder. 5. To discuss the most common hip and proximal lower limb diseases in childhood, including: Congenital disorders: Developmental dysplasia of the hip, congenital short femur, proximal femoral focal deficiency Development disorders: Legg-Calvé-Perthes disease, coxa valga and vara, femoroacetabular impingement Infectious disorders: Transient synovitis, septic arthritis Mechanical disorders: Slipped Capital femoral epiphysis, avulsion fracture, stress fracture, apophyseal injury, acetabular labral tear, athletic pubalgia Tumors: benign and malignant: Osteoid osteoma, osteochondromas, osteosarcoma, Ewing sarcoma, leukemia

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Introduction: Overview of hip and proximal lower limb anatomy in children. Main hip and proximal lower limb pathologies in children. Emerging perspectives in the diagnosis of pediatric hip disorders. Imaging: Multimodality imaging techniques, such as plain radiography (XR), magnetic resonance imaging (MRI) and ultrasonography (US) Imaging evaluation: Importance of imaging in diagnosis of diseases affecting the hip and proximal lower limb in children. Structured reporting templates highlighting the essential findings for each pediatric hip disorder.

PDEE-74 CHOLESTEATOMA IN THE PEDIATRIC POPULATION; WHAT THE SURGEON WANTS TO KNOW

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Adrian James (*Abstract Co-Author*)
Caroline Rutten, MD (*Abstract Co-Author*)
Manohar M. Shroff, MD, FRCPC (*Abstract Co-Author*)
Birgit B. Ertl-Wagner, MD, PhD (*Abstract Co-Author*)
Vivek B. Pai, MBBS, MD (*Abstract Co-Author*)

TEACHING POINTS

1. When reporting findings in the setting of cholesteatoma, knowledge of key anatomical landmarks and variants can inform surgical management. 2. Careful description of facial recess, anterior epitympanic recess, sinus tympani, mastoid antrum, and mastoid air cells is important as it is challenging to remove disease from these areas increasing the risk of recurrence. 3. The level of the lateral dura is relevant in informing the surgical approach. The location of the sinodural plate and whether there is involvement/erosions by disease is useful for safe intraoperative navigation. 4. Anatomical variants including a low lying tegmen or a high/dehiscent jugular bulb are important to highlight. 5.Multiple pathologies can mimic cholesteatoma including mastoiditis, cholesterol granuloma, and teratoma. 6. Potential complications related to cholesteatoma including Labyrinthine fistulisation, otomastoiditis, and CSF leakage are important to recognize.

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1. Review the imaging technique including standard CT, MRI, and photon counting CT 2. Present an approach to cholesteatoma. 3. Review relevant anatomy and key structures. 4. Review specific findings that are relevant for surgical management and planning. 5. Discuss pathologies that can mimic cholesteatoma.

PDEE-75 CHILDHOOD TUMORS AND OTHER CONDITIONS ASSOCIATED WITH DICER1 SYNDROME: AN IMAGING REVIEW

Jessie Huang (*Presenter*)
Shehanaz K. Ellika, MBBS, MD (*Abstract Co-Author*)
Apeksha Chaturvedi, MD (*Abstract Co-Author*)

TEACHING POINTS

1. DICER1 syndrome is a rare genetic condition associated with hereditary cancers that commonly affect infants and young children. Tumors arise due to germline mutations in the DICER1 gene, affecting processing of microRNA. 2. Associated tumors include pleuropulmonary blastoma, ovarian Sertoli-Leydig cell tumor, embryonal rhabdomyosarcomas, pineoblastoma, cystic nephroma, and multinodular goiter. 3. US, CT, MRI, and fluorodeoxyglucose PET/CT and PET/MRI play an important role in initially identifying and evaluating these diverse tumors in addition to surveilling carriers with known variants.

TABLE OF CONTENTS/OUTLINE

1. Introduction and Genetics 2. WHO Classification of the Associated Tumors 3. DICER1 Syndrome and Surveillance 4. Clinical and Imaging Features with Pathologic Correlation a) Pleuropulmonary blastomas b) Embryonal rhabdomyosarcomas c) Ovarian tumors d) Renal tumors d) Thyroid conditions 2) Pineoblastoma f) Genetically related conditions 5. Conclusion

PDEE-76 PEDIATRIC BOWEL OBSTRUCTION IN CHILDREN BEYOND THE NEONATAL PERIOD: RECOGNIZING THE URGENT AND THE UNEXPECTED

Silvia Revuelta Gomez, MD (*Presenter*)
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Aranzazu Sanchez Gabin, MD (*Abstract Co-Author*)
Marta Pelaz Esteban (*Abstract Co-Author*)
Vanesa Gomez Dermit (*Abstract Co-Author*)
Carmen Gonzalez-Carrero Sixto, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To review the various etiologies of bowel obstruction and their underlying pathophysiological mechanisms. 2. To describe the hallmark imaging findings. 3. To assess whether additional imaging is required based on basic radiograph and ultrasound (US) results: guidelines for optimizing the computed tomography (CT) protocol.

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1. Introduction. 2. Imaging techniques. Pediatric bowel obstruction can be a challenging diagnosis and often manifests with nonspecific symptoms such as abdominal pain, distention, and vomiting. Imaging techniques are necessary to identify the cause, location, and severity of the obstruction. 2.1. Conventional radiography. 2.2. US. 2.3. CT protocol. 3. Causes of bowel obstruction. Bowel obstruction in older children can be due to a variety of congenital and acquired causes, often different from the causes of bowel obstruction in neonates or adults. To present the topic in a practical way, cases from our hospital will be used as an example of the different pathologies. 3.1. Malrotation and midgut volvulus. 3.2. Appendicitis. 3.3. Intussusception. 3.4. Meckel diverticulum. 3.5. Sigmoid volvulus. 3.6. Internal hernia. 3.7. Inflammatory bowel disease. 3.8. Gastrointestinal duplication cysts. 3.9. Ingested foreign body. 3.10. Distal intestinal obstruction syndrome. 4. Conclusion. A clear knowledge of the common causes of pediatric bowel obstruction, an understanding of the appropriate choice of imaging modality and recognition of the key imaging features can lead to early diagnosis and appropriate treatment, optimizing the management of children with this condition. 5. Bibliography.

PDEE-77 ADVANCING PEDIATRIC INTERVENTIONAL ONCOLOGY - CAN WE OFFER MORE THAN BIOPSIES?

Kevin K. Fung, MBBS, FRCR (*Presenter*)
Prakash Muthusami, MBBS, MD (*Abstract Co-Author*)
Premal A. Patel, MBBS, FRCR (*Abstract Co-Author*)
Fernando Gomez Munoz (*Abstract Co-Author*)
Kishore Minhas, FRCR,MBChB (*Abstract Co-Author*)
Raja Shaikh, MD (*Abstract Co-Author*)
Anne Gill, MD (*Abstract Co-Author*)
C. Matthew Hawkins, MD, MBA (*Abstract Co-Author*)
Michael J. Temple, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Interventional radiologists should be aware of the important differences between pediatric and adult neoplasms in terms of tumor biology, natural history of disease, treatment options and follow-up strategies. Pediatric-specific technical modifications should be made. 2. Compared to adults, a significantly larger amount of tissue is required for molecular profiling and risk stratification for pediatric tumors, e.g. the N-myc status in neuroblastoma and CTTNB1 in hepatoblastoma. 3. Endovascular interventions have improved outcome in specific tumors types, e.g. intra-arterial chemotherapy has improved globe salvage rate in advanced retinoblastoma to 70 - 80%; trans-arterial radioembolization can downstage hepatoblastoma to bridge to surgical resection or liver transplantation; bland embolization is a life-saving measure for ruptured tumor. 4. Percutaneous thermal or non-thermal ablation can be an effective treatment in many benign and malignant pediatric tumors, including desmoid fibromatosis, primary liver tumors or metastatic lesions to lungs, liver, soft tissue and bones. 5. Image-guided interventions can improve the child's quality of life by symptomatic palliation. Indwelling tunneled catheter can alleviate dyspnea and discomfort from malignant effusion and allow home care. Cryoablation is an opioid-free alternative for durable pain control, especially in patients with bone metastases.

TABLE OF CONTENTS/OUTLINE

1. Introduction; 2. Biopsy recommendation with reference to Children's Oncology Group; 3. Endovascular and ablative therapies for different tumors; 4. Palliative interventions; 5. Complications and preventive measures

PDEE-78 CANCER PREDISPOSITION SYNDROMES IN CHILDREN - WHO, WHEN AND HOW TO SCREEN?

Kevin K. Fung, MBBS, FRCR (*Presenter*)
Caroline Rutten, MD (*Abstract Co-Author*)
Vivek B. Pai, MBBS, MD (*Abstract Co-Author*)
Yin Ting Chiu (*Abstract Co-Author*)
Elaine Y. Kan, MBChB (*Abstract Co-Author*)
Eman E. Marie, MD, MSc (*Abstract Co-Author*)
David Malkin (*Abstract Co-Author*)
Andrea S. Doria, MD, PhD (*Abstract Co-Author*)
Mary-Louise C. Greer, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Although rare, at least 15-20% of pediatric cancer patients harbor a germline pathogenic variant related to cancer predisposition syndrome (CPS). In general, screening is recommended when there is an age-specific 5% or greater chance of developing childhood cancer. 2. Clinical features suggestive of CPS include: 1) family

history of same or related cancer; 2) bilateral, multifocal or multiple cancers; 3) tumor being diagnosed at an earlier age than usual; 4) physical findings or tumor type associated with specific CPS. 3. Surveillance imaging in pediatric CPS aims to detect primary malignancy in asymptomatic children and secondary neoplasm in those with a known cancer. Screening protocols continue to evolve, guided by evidence and expert opinion, with modality and timing determined by tumor type, age of onset and interval of tumor occurrence. 4. Whole-body MRI (WBMRI) is recommended in a subset of CPS, including Li-Fraumeni syndrome, neurofibromatosis type I & II, constitutional mismatch repair deficiency, hereditary paraganglioma and pheochromocytoma syndrome, rhabdoid tumor predisposition syndrome, and more recently, enchondromatosis & hereditary multifocal osteochondromatosis. 5. Optimization of WBMRI scan acquisition supplemented by regional MRI as warranted, and use of standardized reporting terminology can help reduce false positive results, which can lead to unnecessary investigations, higher healthcare cost and patient/parental anxiety.

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1. Common types of pediatric CPS; 2.Updates in pediatric CPS screening; 3.WBMRI in CPS (a. Role, b. scan optimization, c. strategies to reduce false negative and positive results); 4.Tips for a successful CPS screening program

PDEE-79 LOOKING AT LITTLE BUMPS AND LUMPS: IMAGING OF SUPERFICIAL SOFT TISSUE LESIONS IN PEDIATRICS

Noah M. Seymore, MD (*Presenter*)
Houman Alizadeh, MD (*Abstract Co-Author*)
Azadeh Eslambolchi, MD (*Abstract Co-Author*)
Maria R. Ponisio, MD (*Abstract Co-Author*)

TEACHING POINTS

Palpable superficial “lumps and bumps” are an extremely common reason for presentation of pediatric patients and can be a cause of significant anxiety for parents. While the majority of these lesions are benign and many can be clinically identified via history and exam, a considerable number require further evaluation with imaging to solidify the diagnosis or narrow the differential. High-resolution ultrasound is the first step of imaging evaluation due to its accessibility, lack of ionizing radiation, and ability to provide detailed information of lesion composition, and will reliably identify or narrow the differential in most cases. Lesions that can be reliably characterized via ultrasound include causes of scalp swelling in the newborn, inclusion cysts, ganglion cysts, and vascular lesions (such as hemangiomas or vascular malformations), among many other causes. When ultrasound characteristics are nonspecific or difficult to categorize or history and exam are not reassuring of benign features, further evaluation with MRI, CT, or tissue sampling may be pursued to evaluate for rare but more aggressive or malignant pathologies, or to further characterize lesions that may require intervention such as vascular malformations. Recognizing diagnostic sonographic features and integrating them with clinical data are valuable skills to provide patient and parent relief and guide the appropriate use for more invasive and expensive testing.

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Please refer to Teaching Points.

PDEE-80 LET'S GET PHYSEAL - MUSCULOSKELETAL PATHOLOGY IN THE ACTIVE ADOLESCENT

Jamie Jacobs, DO (*Presenter*)
Melkamu D. Adeb, MD (*Abstract Co-Author*)
Eric P. Eutsler, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Recognize the most common musculoskeletal pathologies in active adolescents and which sports they are associated with 2. Understand the mechanism of these injuries 3. Understand the preferred imaging modality for accurate diagnosis 4. Identify the imaging findings characteristic of each pathology 5. Recognize commonly associated injuries and complications 6. Understand preferred treatments and indications

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I. Introduction II. Learning Objectives III. Pathologies A. Bennett Lesion B. Little Leaguer's Shoulder C. Little Leaguer's Elbow D. Gymnast's Wrist E. Osteochondritis Dissecans F. Jumper's Knee G. Panner Disease H. Lateral Patellar Dislocation I. Distal Femoral Stress Injury J. Tibia Tubercle Avulsion Fracture K. Adolescent Transitional Ankle Fractures L. Sever Disease M. Muscle Tears N. Athletic Pubalgia O. Pelvic Avulsion Fractures 1. Iliac Crest 2. Anterior Superior Iliac Spine 3. Anterior Inferior Iliac Spine 4. Greater Trochanter 5. Lesser Trochanter 6. Ischial Tuberosity 7. Pubic Ramus IV. References

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PHEE

Physics Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

PHEE-1 UNTAPPED POTENTIAL: ADDING VALUE THROUGH IMAGE-BASED OPPORTUNISTIC IMAGING

Matthew H. Lee, MD (*Presenter*)
John W. Garrett, PhD (*Abstract Co-Author*)
Joshua D. Warner, MD,PhD (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)

TEACHING POINTS

1. Opportunistic screening is the purposeful practice of leveraging imaging data unrelated to the clinical indication for patient benefit. 2. Opportunistic screening is a cost-saving and clinically effective approach to cardiometabolic screening compared with strategies that ignore these data. 3. AI tools can be applied to existing imaging examinations without the need for additional specialized testing, cost, radiation exposure, or time. 4. Successful clinical implementation of image-based opportunistic screening will require buy-in from the various stakeholders (patients, radiologists, and ordering providers). 5. Opportunistic screening has potential for improved personalized risk assessment and population/public health impact.

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1. Overview of imaging based opportunistic screening efforts.-Describe the origins and purpose of imaging based opportunistic screening. 2. Review early applications of image-based opportunistic screening. -Opportunistic screening can be done with any modality, but CT has received the most attention. 3. Discuss AI applications to opportunistic screening. -AI tools can be prospectively or retrospectively applied to existing data. 4. Examine the role of opportunistic imaging in public health. 5. Describe novel applications of opportunistic screening for risk modeling with examples. -CT biological age, MRI age, cardiovascular risk, metabolic syndrome, fibrosis, fragility fracture risk. -Early experiences with opportunistic screening programs. 6. Discuss ethical considerations for successful implementation of opportunistic screening. 7. Future directions -Describe future applications and barriers to opportunistic screening.

PHEE-2 HOW U-NET CAN IMPROVE BLOOD VESSEL SEGMENTATION BY EMPLOYING ADDITIONAL LOSS FUNCTION?

Kensaku Mori, PhD (*Presenter*)
Masahiro Oda, PhD (*Abstract Co-Author*)
Yuichiro Hayashi, PhD (*Abstract Co-Author*)

TEACHING POINTS

- To understand what a fully convolutional neural network is - To understand how FCNs work for multi-organ information from 3D CT images - To understand how distance information is essential in multi-organ segmentation - To understand how distance information-embed loss function improves multi-organ segmentation using FCNs

TABLE OF CONTENTS/OUTLINE

Introduction - The importance of medical image segmentation in computer-aided diagnosis systems. - The various applications of multi-organ segmentation in different body areas. - The use of Fully Convolutional Networks (FCNs) for organ segmentation from medical images, including CT images. FCNs and loss function - The significance of loss function design for achieving improved segmentation performance. - The critical role of embedding auxiliary information into the loss function to enhance segmentation performance. - The potential of distance information on organ boundaries to increase segmentation accuracy. Multi-organ segmentation using new loss function - Training FCNs, including U-net and V-net with newly designed loss functions, using 300 cases of 3D abdominal CT images and testing with 100 cases of 3D images. - The distance information-embedded loss function achieves higher segmentation accuracy in both U-net and V-net. - Presentation of segmentation results by U-net and V-net with the new loss function. - Successful segmentation of thin organs, including blood vessels, by introducing new information criteria. Discussion - Designing loss functions with consideration for target organs is essential. - Multi-organ segmentation serves as a crucial component in computer-aided diagnosis systems.

PHEE-3 EMERGING APPLICATIONS OF VISION-LANGUAGE MODELS IN CT RADIOLOGY: AGENTIC ASSISTANCE FOR REPORT GENERATION

Kensaku Mori, PhD (*Presenter*)
Masahiro Oda, PhD (*Abstract Co-Author*)
Yuichiro Hayashi, PhD (*Abstract Co-Author*)

TEACHING POINTS

- To understand what the vision language (VLM) model is - To understand what a large-language model (LLM) is - To understand how VLM works - To understand how VLM generates radiology findings report - To understand how agentic VLM can help radiologists write radiology reports - To understand what problems remain in using VLM in the radiology area

TABLE OF CONTENTS/OUTLINE

Introduction - What is a vision-language model (VLM) that combines visual understanding with natural language processing? - What kind of VLMs are proposed, including CLIP, BioMed CLIP, CT2Rep, or LLaVA? - What is a large language model (LLM)? - How is LLM trained and combined with LLM?- What kind of applications are expected in the radiology VLM area? Methods - What is the core technology behind VLM? - What are the tokenizers of text and image information? - Mechanism of CLIP and its application to the biomedical area - Mechanism of CT2Rep for CT diagnostic report generation - Mechanism of LLaVA and its application to the radiology area - How does VLM for follow-up CT scan work for report generation? - How are VLM models trained on a supercomputer platform? Demonstration - Demonstration of VLM models for follow-up CT volume scan reading - Demonstration of agentic assistance for radiological report generation - Demonstration of the hallucination occurrence of VLMs Discussion - Future direction of VLM for agentic assistance of CT image report writing in the radiology area - Contribution to workload reduction to radiologists and junior radiologists' performance enhancement - Hallucination mitigation, regulation, and integration into PACS workflows

PHEE-4 APPLICATION OF HYDROXYAPATITE IMAGING TO QUANTITATIVE CORONARY PLAQUE EVALUATION: A NEW APPROACH TO USE INFORMATION FROM PHOTON COUNTING CT

Mana Mitani, BSc, RT (*Presenter*)
Takashi Asahara, PhD (*Abstract Co-Author*)
Yusuke Morimitsu (*Abstract Co-Author*)
Noriaki Akagi, RT (*Abstract Co-Author*)
Tomohiro Inoue (*Abstract Co-Author*)
Toru Miyoshi (*Abstract Co-Author*)
Mitsugi Honda (*Abstract Co-Author*)
Toshihiro Iguchi, MD (*Abstract Co-Author*)
Natsumi Kimoto, PhD (*Abstract Co-Author*)
Rina Nishigami (*Abstract Co-Author*)
Hiroaki Hayashi, PhD (*Abstract Co-Author*)

TEACHING POINTS

[1] Hydroxyapatite (HAP) image generated by photon-counting CT (PC-CT) enables quantitative evaluation of coronary calcified plaques. [2] Virtual monoenergetic images (VMIs) can generate HAP images, which can be produced by solving equations based on the radiation physics. [3] Analysis of several clinical images suggested that HAP imaging allows for a more detailed quantitative analysis of plaques.

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[1] The Agatston score, which can be applied to coronary CT images, has been widely used for cardiovascular risk assessment. In this presentation, we will show that our HAP density images generated using PC-CT have the potential to enable a more detailed quantitative assessment. [2] A procedure to generate HAP density images from VMI images was presented, which could be performed with an in-house program. [3] The optimal VMI combination (70 keV & 100 keV) was determined by a phantom experiment. Our algorithm has an accuracy of ±10% in HAP quantification. [4] Our method was applied to patient analysis. Although patients have similar conventional Agatston scores, they indicated different densities in the HAP image. [5] A flow chart for risk assessment of heart disease using photon-counting CT was proposed. In addition to conventional qualitative assessment, quantitative assessment using "HAP images" is available.

PHEE-5 ADVANCING CT IMAGE QUALITY ASSESSMENT WITH DEEP LEARNING: FROM TRADITIONAL METRICS TO CLINICALLY INFORMED AI EVALUATION

Jie Zhang, PhD (*Presenter*)
Gary Y. Ge, PhD (*Abstract Co-Author*)
Abdullah-Al-Zubaer Imran, PHD (*Abstract Co-Author*)

TEACHING POINTS

Understand the evolution from traditional CT image quality metrics to deep learning-based approaches. Learn how AI-driven metrics align better with clinical interpretation and diagnostic needs. Explore emerging clinical applications, including QA automation and protocol optimization.

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As CT technology advances, so does the need for robust and clinically meaningful image quality evaluation. Traditional image quality metrics, such as image noise, have long served as technical standards. However, they often fall short of capturing the diagnostic utility of an image as perceived by human observers or as required in specific clinical scenarios. Recent innovations in deep learning (DL) provide new avenues to bridge this gap by incorporating context-aware and perceptually informed evaluations. This education exhibit is organized into four key sections: Traditional Metrics : Subjective (reader studies, VGA) and objective (SNR, CNR, NPS, MTF, SSIM) Perceptual Metrics : PIQE, NIQE, BRISQUE, and task-based assessments (e.g., CHO) DL-Based Metrics : Tools like LPIPS, DISTS, and models trained on radiologist scoring or diagnostic performance Clinical Applications : DL metrics for protocol tuning, iterative reconstruction, automated QA, and scanner harmonization Deep learning-based CT image quality metrics represent a promising frontier in radiologic quality assurance. By aligning technical evaluations with clinical interpretability, these methods can improve diagnostic consistency, optimize acquisition protocols, and streamline imaging workflows. As these models mature, they are poised to become integral to both research and real-world clinical practice.

PHEE-6 TRANSCATHETER AORTIC VALVE IMPLANTATION: RADIATION DOSE RECEIVED BY PATIENTS AND PHYSICIANS

Masahiro Sota, MSc, RT (*Presenter*)
Koichi Chida, PhD (*Abstract Co-Author*)

TEACHING POINTS

- To understand the need for reducing the radiation dose to the physician in transcatheter aortic valve implantation (TAVI). - To emphasize the importance of managing/monitoring the radiation dose in TAVI. - To understand the utility of TAVI in patient with aortic valve stenosis. - To understand that the virtual 3D-CT pre-operative planning was very helpful when choosing an interventional strategy.

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- The physician doses, dose area product (DAP), fluoroscopic time, air-kerma (AK), and number of acquisitions were investigated in numerous TAVI. - In chronological order, the physician radiation dose during TAVI was evaluated using real-time monitoring system. - Reducing the radiation dose in TAVI. - Comparison of the radiation dose in TAVI: Self-Expandable valve vs. Balloon-Expandable valve, Physician (operator) vs. Anesthesiologist vs. Radiologic technologist. Outline : TAVI is newly effective procedure. Patients were assessed using, transesophageal echocardiography, multidetector CT, and angiography of the aortic root and ilio-femoral vessels for detailed assessment of the aortic valve as well as aortic root anatomy. We explored the radiation doses delivered during TAVI. Radiation exposure during TAVI cannot be ignored. The radiation dose during TAVI increase with procedural complexity. Generally, the methods for reducing/optimizing the radiation dose in TAVI will be the same as those typical for interventional radiology. Additionally, 3D virtual pre-operative planning for TAVI using 3D-CT provided significant help with regard to the interventional strategy. Thus, it can be a helpful way to reduce/optimize the radiation dose in TAVI.

PHEE-7 PITFALLS AND LIMITATIONS OF AI IN THORACIC IMAGING: LESSONS FROM REAL-WORLD IMPLEMENTATION

Seonhye Chae (*Presenter*)
Taehee Lee, MD (*Abstract Co-Author*)
Hongseok Ko, MD (*Abstract Co-Author*)

TEACHING POINTS

Identify key limitations of AI in chest radiography: high false positive rates, suboptimal performance in diffuse lung diseases and bone lesions, improved outcomes in AP views and interval change detection, and limited applicability in pediatric imaging. Recognize potential pitfalls in AI-assisted CT nodule detection, such as overreferral of benign lesions and increased healthcare costs. Understand technical constraints in current thoracic imaging AI systems, including information loss due to bit-depth reduction and the lack of machine-readable data utilization. Explore strategies to optimize AI performance through effective implementation, provider education, and imaging protocol refinement. Anticipate future developments aimed at overcoming current barriers, including standardized machine-readable data and collaborative radiologist-AI workflows.

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Introduction: Current Landscape of AI in Thoracic Imaging Adoption trends and clinical applications Regulatory environment Chest Radiography AI Limitations False positive burden Performance gaps in diffuse lung diseases and osseous lesions Projection-specific performance challenges (PA vs. AP) Limitations in detecting interval

changes Challenges in pediatric imaging CT Imaging AI Limitations Over-referral of benign nodules Errors in quantitative pattern recognition Technical Obstacles Human vs. machine-readable imaging data Impact of bit-depth reduction (in CXR) Biases in training datasets Implementation Strategies and Future Directions AI Integration into clinical workflows Educational needs for interpreting providers Development of collaborative radiologist-AI interpretation models

PHEE-8 UNDERSTANDING IODINATED CONTRAST MEDIA: PRINCIPLES, PROTOCOLS, AND SAFETY IN CT EXAMINATIONS

Toru Higaki, PhD (*Presenter*)
Yuko Nakamura, MD, PhD (*Abstract Co-Author*)
Fuminari Tatsugami, MD (*Abstract Co-Author*)
Wataru Fukumoto, MD, PhD (*Abstract Co-Author*)
Kazuo Awai, MD (*Abstract Co-Author*)

TEACHING POINTS

This presentation offers a comprehensive explanation of contrast-enhanced CT examinations, covering a wide range of topics from both technical and clinical perspectives. It begins with an overview of the physicochemical properties of iodine contrast medium, followed by detailed discussions on administration techniques and the pharmacokinetics of contrast agents within the body. The principles underlying contrast enhancement and the methodology for simulating enhancement patterns are also addressed. Furthermore, the presentation explores how to determine optimal contrast protocols tailored to clinical objectives. Finally, it examines the potential adverse reactions associated with iodine contrast medium, including both immediate and delayed responses, thereby providing a well-rounded understanding essential for safe and effective CT imaging.

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1. Physicochemical Properties of Iodine Contrast Medium 2. Methods of Iodine Contrast Medium Administration 3. Pharmacokinetics and Contrast Enhancement Simulation 4. Theoretical Basis of Contrast Enhancement 5. Determining Optimal Contrast Protocols 6. Adverse Reactions to Iodine Contrast Medium 6.1 Immediate Adverse Reactions 6.2 Delayed Adverse Reactions

PHEE-9 A PRACTICAL GUIDE TO SELECTING THE RIGHT TECHNOLOGY FOR METAL ARTIFACT REDUCTION ON PHOTON-COUNTING-DETECTOR AND ENERGY-INTEGRATING-DETECTOR CT

Joseph R. Swicklik, RT, BS (*Presenter*)
Michael R. Bruesewitz, RT (*Abstract Co-Author*)
Felix E. Diehn, MD (*Abstract Co-Author*)
Ian T. Mark, MD (*Abstract Co-Author*)
Francis I. Baffour, MD (*Abstract Co-Author*)
Joel G. Fletcher, MD (*Abstract Co-Author*)
Cynthia H. McCollough, PhD (*Abstract Co-Author*)
Lifeng Yu, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. Multiple options exist on photon-counting-detector (PCD)-CT and energy-integrating-detector (EID)-CT for metal artifact reduction (MAR), including iterative MAR (iMAR) software, virtual monochromatic imaging (VMI) at high energy, Threshold high images acquired at high tube voltage with Sn filter, and combined iMAR+high keV. Which technology to choose for reducing metal artifacts depends on specific task and availability of scanner technology. 2. On PCD-CT, no significant difference between standard resolution (SR) and ultra-high-resolution (UHR) mode for MAR was identified across different methods. 3. On PCD-CT, high threshold energy "H" acquired at high tube voltage with Sn filter can reduce metal artifact compared to routine threshold low images, but still suboptimal in comparison with iMAR+high keV. 4. VMI at 90 keV is a good tradeoff between artifact reduction and bone contrast for bones; VMI at 110 keV is a good tradeoff for soft tissue. 5. No clear advantages on MAR were shown for PCD-CT over EID-CT in a phantom experiment.

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1. Describe the 4 options for metal artifact reduction on PCD-CT and EID-CT: a. Iterative MAR (iMAR) software b. Virtual monochromatic imaging (VMI) at high keV c. Threshold high images acquired at high tube voltage with Sn filter (e.g., "H" at 140Sn) d. Combined iMAR and high keV 2. Provide a comparison among these options on PCD-CT, considering both standard resolution (SR) and ultra-high-resolution (UHR) modes and threshold high images. 3. Provide a comparison between PCD-CT and EID-CT for these options. 4. Provide a practical guide on how to choose the right technology for MAR.

PHEE-10 PHOTON COUNTING TECHNIQUE ENABLES NOVEL QUANTITATIVE X-RAY IMAGING: BREAKING THROUGH CHALLENGES IN CLINICAL APPLICATION

Natsumi Kimoto, PhD (*Presenter*)
Rina Nishigami (*Abstract Co-Author*)
Takashi Asahara, PhD (*Abstract Co-Author*)
Daiki Kobayashi, MD (*Abstract Co-Author*)
Sota Goto (*Abstract Co-Author*)
Yuki Kanazawa, PhD (*Abstract Co-Author*)
Akitoshi Katsumata, DDS, PhD (*Abstract Co-Author*)
Shuichiro Yamamoto (*Abstract Co-Author*)
Hiroaki Hayashi, PhD (*Abstract Co-Author*)

TEACHING POINTS

[1] The analysis of X-ray attenuation information obtained from energy-resolving photon counting detectors (ERPCDs) makes it possible to perform quantitative X-ray image diagnosis. [2] Comprehensively solving distortion factors such as beam hardening, detector response function, and counting loss enables the clinical use of quantitative images.

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[1] Compared to conventional energy-integrating detectors, in which information on X-ray energy is lost, ERPCDs allow the analysis of X-ray attenuation for each X-ray energy, which is promising for novel quantitative X-ray imaging. [2] Although the advantages of ERPCD, such as high spatial resolution and low radiation dose, are widely known, quantitative imaging is also attractive. Accurate quantitative images will be obtained only when spectrum distortion factors such as beam hardening, detector response, and count loss are completely solved. [3] Counting loss caused by pulse pile-up and dead time should be solved. Since it relates to the shape of the energy spectrum, the correction should take into account both X-ray penetration in the objects having various effective atomic numbers (Z eff s) and the detector response. [4] We proposed a novel Z eff determination algorithm with counting loss correction. The novelty is to perform an appropriate counting loss correction with considering the object's Z eff . [5] Experimental verification was performed. The counting loss correction is essential for precise quantitative analysis using ERPCD.

PHEE-11 OPTIMIZING CT IMAGE QUALITY IN THE HEAD: BASICS AND BEYOND

William F. Sensakovic, PhD (*Presenter*)
Joseph Ausmus (*Abstract Co-Author*)
Emily M. James, MD (*Abstract Co-Author*)
Robert G. Paden, MS (*Abstract Co-Author*)
Justin Cramer, MD (*Abstract Co-Author*)

TEACHING POINTS

1) Apply adjustments of basic CT parameters to optimize image quality 2) Understand the role advanced parameters may play in image quality 3) Examine advantages and disadvantages of photon counting and deep learning 4) Understand artifacts associated with newer postprocessing algorithms and strategies for mitigation

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1) The basics of acquisition 1.1) Acquisition: mA, kV, positioning, and pitch 1.1.1) Contrast, Spatial Resolution, Temporal Resolution, and Noise 1.1.2) Artifacts 1.2) Reconstruction: Iterative reconstruction strength, matrix size, and reconstruction filter/kernel 1.2.1) Contrast, Spatial Resolution, Temporal Resolution, and Noise 1.2.2) Artifacts2) Beyond the basics 2.1) Under the hood parameters: Getting vendor specific 2.1.1) Examples 2.2) Photon counting 2.2.1) Unique considerations 2.2.2) Examples of the good 2.2.3) Examples of the bad 2.3) Deep learning reconstruction 2.3.1) Advantages 2.3.2) Disadvantages 2.3.3) Artifacts

PHEE-12 CREATING PHANTOMS FOR DUAL-ENERGY CT: MORE THAN THE EYE CAN SEE?

Nina Hagen, BSc (*Presenter*)
Robin Duteweert (*Abstract Co-Author*)
Laura Deden, MSc (*Abstract Co-Author*)
Carla Meeuwis (*Abstract Co-Author*)
Niels R. Van der Werf, MS (*Abstract Co-Author*)
Ioannis Sechopoulos, PhD (*Abstract Co-Author*)

TEACHING POINTS

Spectral data from dual or multi-energy computed tomography (MECT) is becoming more widely available. With different vendors offering different MECT techniques, it is important to perform cross-vendor comparisons with a validated phantom, as indicated by the AAPM Task Group Report 299. Although various CT phantoms are commercially available, not all phantoms are appropriate for MECT applications. During our in-house study, we compared a breast phantom to clinical data. Although at first the conventional reconstructions show similar images, spectral analysis showed inconsistencies within the iodine concentrations/inserts in the phantom. This educational exhibit will outline theoretical properties and common pitfalls when using phantoms for MECT studies, and will substantiate these points with an in-house study.

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1) Physics of MECT and the energy attenuation for different human tissues, tissue differentiation and quantification of iodine concentration; 2) Mimicking attenuation properties of human tissues in a phantom: example of a breast phantom; 3) Validation process of a MECT-reliable phantom; 4) What to keep in mind when designing a phantom used for MECT? 5) In-house study: cross-vendor comparison of MECT of a breast phantom.

PHEE-13 INTO THE INVISIBLE: WHERE CONVENTIONAL DOPPLER REACHES ITS LIMITS, MICROVASCULAR DOPPLER SHINES

Nadine Santos, MD (*Presenter*)
Matheus Fritzen, MD (*Abstract Co-Author*)
Rudolph Octaviano Kogima, MD (*Abstract Co-Author*)
Julia D. Zavariz, MD (*Abstract Co-Author*)
Lucca Faria, MD (*Abstract Co-Author*)
Peter C. Francolin (*Abstract Co-Author*)
Mateus Esmeraldo, MD (*Abstract Co-Author*)
Andrea Cavalanti, MD (*Abstract Co-Author*)
Maria Cristina Chammas, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Microvascular Doppler ultrasound techniques—such as SMI, MVI, and UMA—overcome the limitations of conventional Doppler by preserving low-velocity flow signals while effectively filtering out tissue motion artifacts. These advanced technologies enhance the visualization of small-caliber vessels and microvascular flow, contributing to improved diagnostic accuracy across a wide range of clinical scenarios. This exhibit highlights the practical applications of microvascular Doppler. To illustrate how microvascular Doppler improves detection of slow-flow and small-vessel signals; To compare conventional, microvascular Doppler, and B-flow imaging performance in real clinical cases; To demonstrate the added diagnostic value across multiple organs and pathologies; To discuss practical considerations and limitations in applying microvascular Doppler.

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Introduction: Physics behind conventional vs. microvascular Doppler; Commercial technologies and their principles (SMI, MVI, UMA, etc.). Post-transplant monitoring cases. Inflammatory conditions. Tumor vascular assessment. Protocol Optimization: Settings for high-resolution imaging. Summary: Clinical relevance and future perspectives.

PHEE-14 HYPERPOLARIZED XENON AND CARBON-13 MAGNETIC RESONANCE IMAGING: WHAT IS IT, HOW CAN WE USE IT IN CLINICAL RESEARCH?

James Grist (*Presenter*)
Stefan Neubauer (*Abstract Co-Author*)
Damian Tyler (*Abstract Co-Author*)
Fergus V. Gleeson, FRCR,MBBS (*Abstract Co-Author*)

TEACHING POINTS

• An introduction to the physics and theory of hyperpolarized xenon and carbon-13 magnetic resonance imaging will be provided.• Current hardware and software requirements for their incorporation into clinical research will be presented.• The emerging utility of each technique will be covered.• Clinical challenges and potential pitfalls of each technique will be reviewed.• Future directions and opportunities for the technologies will be discussed.

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This exhibit will focus on emerging technologies: hyperpolarized xenon and carbon-13 MRI. It will provide a comprehensive overview of the current status of both technologies in clinical research. Firstly, the exhibit will cover the necessary theory to understand each technique, including MR physics, lung function, and metabolism (Figure 1). After this, the current methods and hardware requirements, such as broadband amplifiers and specialist coils, for clinical data collection and analysis will be presented. This will include common MRI sequences used in research studies, and image post-processing techniques for kinetic modelling, including consensus recommendations (Figure 2). Next, the current literature demonstrating potential clinical utility of each method will be discussed, including latest clinical trial results assessing acute response to therapy and early diagnosis (Figure 3). Subsequently, limitations and pitfalls of each technique, such as scanner sequence calibration errors and confounding physiological processes such as perfusion, will be considered (Figure 4). Finally, the future directions of travel for the technologies, such as clinical adoption and next generation studies, will be presented (Figure 5).

PHEE-15 THE BREAST IMAGING RADIOLOGIST WANTS TO READ FROM HOME - NOW WHAT?

Ingrid Reiser, PhD (*Presenter*)
Katie Hulme, MS (*Abstract Co-Author*)
David A. Scaduto, PhD (*Abstract Co-Author*)
Adrian A. Sanchez, MD, PhD (*Abstract Co-Author*)
Steven Lafontaine, MS (*Abstract Co-Author*)

Karli McMahan, BS (*Abstract Co-Author*)
Laura B. Shepardson, MD (*Abstract Co-Author*)

TEACHING POINTS

• Mammography workstations are subject to unique requirements relative to standard radiology workstations, and thus clear communication between Informatics, Medical Physicists, Radiologists, and Quality Control Technologists is essential. • Deploying mammography stations to radiologist homes poses additional logistical and regulatory complexities, particularly if the station is located out of state, reads for multiple institutions, or reads for units on different QC manuals. • Traditional delegation of QC responsibilities must be reassessed in the home environment, with radiologists assuming tasks formerly completed by the technologist. • Completion and documentation of QC for home workstations is one of the most common weak points for regulatory compliance; anticipating reasons for non-compliance can help with the development of solutions to prospectively address them. • Clear guidance and accountability regarding the home reading environment - such as network connectivity, speed, desk space, and reading conditions - prior to workstation deployment can help prevent many common issues.

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1. Introduction: (a) Considerations and requirements (b) Getting set up (c) Maintaining compliance (d) Preventing problems and pitfalls. 2. Case-based tutorials: Scenario 1 - Deploying home workstations for occasional work from home. Scenario 2 - Starting to read for an additional practice. Scenario 3 - Reading from vacation home in different state, with moonlighting for multiple practices. 3 . Resources (a) Radiologists home readiness questionnaire and attestation; (b) Ongoing compliance checklist; (c) When is a physicist needed?

PHEE-16 TROUBLESHOOTING TIPS FOR OVERCOMING ARTIFACTS IN CURRENT CLINICAL CT: WHAT THE RADIOLOGIST AND RADIOLOGY TECHNOLOGIST NEED TO KNOW

Shingo Harashima (*Presenter*)
Haruhiko Machida, MD (*Abstract Co-Author*)
Rika Fukui (*Abstract Co-Author*)
Toshiya Kariyasu (*Abstract Co-Author*)
Makiko Nishikawa, MD (*Abstract Co-Author*)
Hidenori Yamaguchi (*Abstract Co-Author*)
Etsuko Tate, MD (*Abstract Co-Author*)
Wakana Samejima (*Abstract Co-Author*)
Yuta Hirose, MSc (*Abstract Co-Author*)
Isao Tanaka (*Abstract Co-Author*)
Yun SHEN (*Abstract Co-Author*)

TEACHING POINTS

1. To review image appearance & related factors of CT artifacts. 2. To introduce current imaging technologies & operator-dependent techniques for overcoming artifacts. 3. To illustrate troubleshooting tips for clinically overcoming artifacts.

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1. Image appearance & related factors: a) Beam-hardening (BH) artifact: high-attenuating materials, congested contrast media (CM), b) Metallic artifact: metallic implants, c) Motion artifact: respiration, cardiac pulsation, d) Blooming artifact: high-attenuating materials, e) Others: oil-painting texture caused by iterative reconstruction (IR), pseudoenhancement; 2. Imaging technologies & operator-dependent techniques: a) Imaging technologies: fast pitch & rotation speed/ECG-gated scan/high-kV scan/high-resolution scan & reconstruction kernel/gantry tilt/virtual monochromatic image (VMI)/material decomposition image (MDI)/motion correction algorithm (MCA)/metallic artifact reduction software (MARS)/IR/deep-learning reconstruction (DLR), b) Operator-dependent techniques: adequate patient positioning/breathold instruction/CM injection technique/ß-blocker premedication; 3. Troubleshooting tips: a) BH artifact vs. high-kV scan/high-keV VMI/gantry tilt, adequate patient positioning/CM injection technique, b) Metallic artifact vs. high-kV scan/gantry tilt/high-keV VMI/MDI/MARS, c) Motion artifact vs. fast pitch & rotation speed/ECG-gated scan/MCA/breathold instruction/ß-blocker premedication, d) Blooming artifact vs. high-resolution scan & reconstruction kernel, e) Oil-painting texture vs. DLR, f) Pseudoenhancement vs. high-resolution scan & reconstruction kernel/VMI/MDI.

PHEE-17 WHAT IS VISION FOUNDATION MODEL AND HOW IT USED TO DEVELOP CAD

Masahiro Oda, PhD (*Presenter*)
Hirotsugu Takabatake, MD,PhD (*Abstract Co-Author*)
Masaki Mori, MD (*Abstract Co-Author*)
Hiroshi Natori, MD, PhD (*Abstract Co-Author*)
Kensaku Mori, PhD (*Abstract Co-Author*)

TEACHING POINTS

The purposes of our exhibit are: 1. To learn what vision foundation model is and how it is different from conventional AI models 2. To learn how vision foundation model changes AI development 3. To learn how vision foundation models are used to develop CAD systems 4. To learn applications of foundation model in CAD

TABLE OF CONTENTS/OUTLINE

Vision Foundation Model - What is vision foundation model - Difference between vision foundation models and conventional AI models - Advantages of using vision foundation models in AI development: develop high performance AI even from small dataset, significantly reduces load on AI development How to Develop Vision Foundation Model - How to train vision foundation models: self-supervised learning (annotations are not necessary) is used while conventional AIs are trained using supervised learning (annotations are necessary) - Training method: masked autoencoder, contrastive learning Applications of Vision Foundation Model - Image-based CAD development : Foundation models are applicable to develop AI CADs in many applications - Image-and-language-based CAD development : Vision-language AI models are commonly developed using both vision foundation model and language foundation model Application of Vision Foundation Model in CAD - CAD system development for many applications - Radiology report generation assistance based on image - Automated disease assessment - Improve explainability of AI by text explanation

PHEE-18 DUAL-ENERGY CT IODINE OVERLAY MAPS TO IDENTIFY SILICONE FILLERS AND IMPLANTS

Olga Sliwicka, MD, PhD (*Presenter*)
Khanin Khanungwanitkul, MD (*Abstract Co-Author*)
Fides Schwartz, MD (*Abstract Co-Author*)
Aaron D. Sodickson, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

DECT characterizing silicone fillers and implants may assist in identifying complications such as migration, granulomas, infection/fluid collectionSilicone mimics iodine and color-codes on DECT iodine overlay images but disappears on VNC, unlike calciumExtent of silicone implant rupture can be visualized on DE iodine overlay

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Purpose: To familiarize radiologists with imaging of silicone-based medical products (polydimethylsiloxane (PDMS)) used in reconstructive/cosmetic procedures. To emphasize role of Dual-Energy-CT (DECT) with iodine overlay and virtual-non-contrast(VNC) reconstructions to differentiate silicone from pathology 1.Introduction: Overview of silicone-based products in medical practice-cosmetic/reconstructive surgery 2.Silicone-Based Medical Products: Silicone Gel: Semi-solid crosslinked PDMS used in breast implants, soft-tissue fillers—soft, cohesive, and widely applied Silicone Elastomer: Vulcanized silicone used for outer shells and solid implants(chin, cheek, jaw, nasal, pectus excavatum, ear, calf, testicular) Silicone Oil: Used in ophthalmology for retinal detachment repair; historically in soft-tissue augmentation Saline-filled implants with silicone sheath 3.Principles of DECT, iodine overlay and VNC in clinical evaluation 4.Key Imaging Findings: Silicone vs native soft tissue. Spectral signatures

on DECT 5.Case Examples of soft (breast, gluteal), and solid implants (penile, testicular); where DECT aids interpretation (granulomas, implant rupture, infection/fluid collection) 6.Clinical Impact: Potentially improved accuracy in distinguishing silicone materials and complications

PHEE-19 CLINICAL PRACTICE OF DIXON METHOD IN BREAST MRI: UNDERSTANDING THE BENEFITS AND ARTIFACTS

Huimin Wu, PhD (*Presenter*)

TEACHING POINTS

To understand the advantages of DIXON method over traditional fat suppression techniques (e.g., CHESS, STIR, SPIR, SPAIR) in breast MRI protocol To recognize global or local water/fat swap artifacts associated with DIXON method. To analyze the cause of DIXON artifacts under different scenarios and properly select alternative techniques.

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1. Fat suppression is an essential part of clinical breast MRI protocol. a. Lesions that are bright on T2 weighted images could be masked by bright fat. b. Fat is bright on T1 weighted images that could mask enhancing lesions in dynamic contrast enhanced (DCE) scan. 2. Why is fat suppression challenging in breast MRI? a. Sensitivity to B0 and B1 field inhomogeneity b. Consideration of scan time penalty in dynamic CE sequence c. Comparison of major fat suppression techniques 3. Review of DIXON methods. a. How does DIXON work to separate water and fat? b. Improved sensitivity to B0 and B1 field inhomogeneity c. SNR benefits d. Time efficiency 4. Water/fat swap artifacts of DIXON method a. Global swap b. Local swap happened on one side of the breast c. Local swap happened in the heart and surrounding structures d. Local swap artifacts that is lesion-mimicking e. Breast implants add additional challenges to DIXON 5. What to do when DIXON artifacts happen a. T2W scan: i. Shimming and frequency tuning ii. Scan each side of the breasts separately iii. Switch to STIR b. T1W DCE scan: i. Subtraction of in-phase series ii. Switch to SPIR/SPAIR 6. Looking ahead to emerging techniques such as deep learning

PHEE-20 PHOTON-COUNTING CT: CLINICAL APPLICATIONS ACROSS MUSCULOSKELETAL, CARDIAC, AND NEURO IMAGING

Tricia Ng, MBBS (*Presenter*)
Kang Ren Yong, MBBS (*Abstract Co-Author*)
Srujana Ganti, MBChB, FRCR (*Abstract Co-Author*)
Phey Ming Yeap, MBChB, FRCR (*Abstract Co-Author*)
Mohammad T. Bin Mohamed Shah, MD (*Abstract Co-Author*)
Parag R. Salkade, FRCR,MMed (*Abstract Co-Author*)
Chi Long Ho, MD, FRCR (*Abstract Co-Author*)

TEACHING POINTS

Photon-counting CT (PCCT) represents a next-generation imaging technology using direct-conversion detectors that count individual x-ray photons and assign energy values. Compared to conventional CT, PCCT offers improved spatial resolution, reduced artifacts, and inherent spectral imaging without additional radiation dose. This exhibit highlights its clinical advantages across musculoskeletal, cardiac, and neuroimaging subspecialties, using side-by-side comparisons with conventional CT.

TABLE OF CONTENTS/OUTLINE

1) Musculoskeletal Imaging: - Reduction of beam-hardening and streak artifacts near metallic implants - Visualization of bone-implant interfaces - Potential role in bone marrow edema detection 2) Cardiac Imaging: - Improved delineation of coronary arteries and stents - Reduced blooming from coronary calcium - High-pitch, single-heartbeat acquisition with motion artifact reduction 3) Neuroradiology: - High-resolution imaging of temporal bone structures - Reduced beam-hardening from dense bone - Improved visualization of fine anatomic detail (e.g., cochlea, ossicles) This educational exhibit provides radiologists an overview of PCCT’s practical advantages and pictorial comparisons that underscore its transformative potential in diagnostic imaging.

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ROEE

Radiation Oncology Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

ROEE-2 LUGANO PROTOCOL ON CT AND MRI: EVERYTHING THE RADIOLOGIST NEEDS TO KNOW

Lucas Da Silva Costa, MD (*Presenter*)
Caio Nunes, MD (*Abstract Co-Author*)
Lara Quiche, MD (*Abstract Co-Author*)
Margrit E. Muller, MD (*Abstract Co-Author*)
Guilherme Swerts Pereira (*Abstract Co-Author*)
Pedro Mecate Prada, MD (*Abstract Co-Author*)
Fernando M. Coelho, MD, PhD (*Abstract Co-Author*)
Rodrigo C. Chate, MD (*Abstract Co-Author*)
Thais Mussi, MD, PhD (*Abstract Co-Author*)
Bruna M. Loureiro, MD (*Abstract Co-Author*)
Murilo M. Silva, MD (*Abstract Co-Author*)

TEACHING POINTS

- Review the fundamental principles of the Lugano Classification used for lymphoma evaluation, including staging and treatment response assessment. - Understand the imaging workflow and define the role of each modality — particularly CT and PET/CT — according to the metabolic profile of the lymphoma. - Identify typical imaging features and measurement strategies used in the assessment of target and non-target lesions, including splenic involvement. - Recognize the relevance of integrating clinical context and selecting the appropriate imaging approach based on the FDG avidity of the disease. - Present a structured and practical reporting framework to support radiologic staging and follow-up in alignment with the Lugano guidelines.

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INTRODUCTION Understanding what the Lugano Classification is and how to apply it. HOW TO IDENTIFY TARGET LESIONS Presenting the criteria that define target lesions and the importance of computed tomography for lymphoma staging. MEASURING TARGET LESIONS Presenting the standard methodology for measuring target lesions and the importance of product calculation for treatment response assessment. SPLENIC MEASUREMENT Understanding the specific aspects of splenic measurement and the criteria evaluated during restaging. IDENTIFYING AND DESCRIBING NON-TARGET LESIONS Understanding the concept and assessment of non-target lesions.

ROEE-3 CHILDHOOD EXPOSURE TO DIAGNOSTIC X-RAY IONIZING RADIATION AND LEUKEMIA RISK: A RAPID SYSTEMATIC REVIEW OF LITERATURE AND META-ANALYSIS

Guilherme Oberto Rodrigues (*Presenter*)

TEACHING POINTS

IntroductionLeukemia is the most common cancer in children, and many studies have suggested a possible causal relationship with childhood exposure to x-ray ionizing radiation.ObjectiveTo assess the risk of developing leukemia in pediatric patients exposed to diagnostic x-ray ionizing radiation.Methods: A systematic review of the literature was conducted. Electronic databases searched included PubMed, EMBASE, Web of Science. We included peer-reviewed publications of cohort and case-control studies involving pediatric patients exposed to diagnostic x-ray ionizing radiation, evaluating the risk of these patients developing leukemia.Two reviewers analyzed the selected abstracts and full-text articles,performed data extraction,and evaluated the methodological quality of the selected articles.The methodological quality was assessed according to the Newcastle- Ottawa Scale. A meta-analysis was conducted using RevMan.ResultsOut of the 330 citations screened, 8 publications were included, representing 6,721 cases and 12,730 controls.All studies were designed as case-control.Age varied from 0 to 14 years,with a predominance of boys.The studies presented good methodological quality, but the results from individual studies were controversial.The summary of results demonstrated significant positive associations for being exposed to one or more, and three or more x-rays and the subsequent development of leukemia. No significant association was identified when considering four or more x-rays.

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ConclusionIdentified a positive association between postnatal exposure to one or more, and three or more x-rays and the development of leukemia.

ROEE-4 MULTIORGAN MUCINOUS NEOPLASMS: A RADIOLOGIC REVIEW OF DIAGNOSTIC PATTERNS AND IMAGING BIOMARKERS

Michelle Narvaez (*Presenter*)
Christian A. Armijos, MD (*Abstract Co-Author*)
Gloria E. Zamora, MD (*Abstract Co-Author*)

TEACHING POINTS

Mucinous neoplasms exhibit distinctive imaging features due to their high extracellular mucin content, which influences signal intensity and attenuation across modalities. Characteristic imaging patterns can aid early diagnosis, especially when correlated with clinical and anatomical context. Cross-sectional imaging plays a pivotal role in detecting, staging, and guiding management of mucinous tumors in the pancreas, liver, ovary, colon and kidney. Recognition of organ-specific differences in appearance is crucial to avoid misdiagnosis, especially in borderline or deceptively benign presentations.

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1. Introduction Definition and pathological basis of mucinous tumors 2. Imaging Characteristics of Mucinous Content CT: hypoattenuating regions, calcifications MRI: high T2 signal, variable T1 signal, diffusion behavior US: anechoic to hypoechoic patterns PET-CT: challenges in mucinous lesions (low FDG uptake) 3. Organ-Based Review 3.1 Pancreas and Liver IPMN, IPMN-B and MCN: morphology, ductal communication, enhancement patterns. 3.2 Ovary Benign vs borderline vs malignant mucinous tumors 3.3 Colorectal Mucinous colorectal cancer and peritoneal spread 3.5 Kidney Mucinous Tubular and Spindle cell carcinoma (MTSCC), a well demarcate, exophytic or parenchymal masses. 4. Differential Diagnosis and Pitfalls Overlap with non-mucinous cystic tumors Inflammatory and infectious mimics Underrecognition

due to benign appearance 5. Multimodality Imaging Strategy How to integrate US, CT, MRI and PET-CT. 6. Conclusion Summary of key patterns. The importance of radiologist familiarity with mucinous tumors

ROEE-5 RADIOLOGIC EVALUATION OF LATTICE RADIATION THERAPY IN BODY SOFT TISSUE SARCOMAS: MAPPING MORPHOLOGIC RESPONSE

Daniel Selva, MD (*Presenter*)
Katka Majerkakova (*Abstract Co-Author*)
Nicolas Martinez, MD (*Abstract Co-Author*)
Xenia Codo, BDS (*Abstract Co-Author*)
Silvia Bague (*Abstract Co-Author*)
Jose Gonzalez (*Abstract Co-Author*)
Juan Carlos Pernas, MD (*Abstract Co-Author*)
Diana Hernandez (*Abstract Co-Author*)

TEACHING POINTS

Spatially fractionated LATTICE radiation therapy (LRT) delivers high radiation doses to specific intratumoral subvolumes while sparing surrounding healthy tissues, offering a promising treatment alternative for large, inoperable high-grade soft tissue sarcomas where conventional therapies are often limited or ineffective. Imaging, particularly contrast-enhanced CT and MRI, plays a central role throughout the LRT workflow—from initial patient selection and detailed treatment planning to monitoring therapeutic response and guiding follow-up strategies. Radiologists must look beyond traditional size-based response criteria and identify imaging biomarkers such as central necrosis, intratumoral calcifications, and changes in CT attenuation (Hounsfield units), which may provide earlier and more accurate indicators of treatment efficacy.

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Introduce the clinical rationale, technical principles, and therapeutic potential of LATTICE radiation therapy, illustrated through a 14-patient case series of high-grade soft tissue sarcomas. Emphasize key radiological findings observed after LRT, including reductions in CT density, development of central necrosis, appearance of intratumoral calcifications, and progressive fibrosis—features that may precede or occur independently of size changes. Discuss the limitations of conventional response criteria based solely on tumor size, and propose integrating structural and functional imaging parameters into more comprehensive assessment strategies. Selected cases highlight the heterogeneity of imaging response and the role of radiologists in guiding clinical decisions.

ROEE-6 CT/MR ASSESSMENT IN RADIATION THERAPY FOR PROSTATE CANCER USING A PERIRECTAL HYDROGEL SPACER: WHAT RADIATION ONCOLOGISTS AND RADIOLOGISTS NEED TO KNOW

Etsuko Tate, MD (*Presenter*)
Haruhiko Machida, MD (*Abstract Co-Author*)
Hiromasa Kurosaki (*Abstract Co-Author*)
Kenta HIRAYAMA (*Abstract Co-Author*)
Toshiya Kariyasu (*Abstract Co-Author*)
Rika Fukui (*Abstract Co-Author*)
Shingo Harashima (*Abstract Co-Author*)
Wakana Samejima (*Abstract Co-Author*)
Yuta Hirose, MSc (*Abstract Co-Author*)
Yukihiro Hama, MD, PhD (*Abstract Co-Author*)
Yun Shen, PhD (*Abstract Co-Author*)

TEACHING POINTS

1. To introduce evolution of radiation therapy (RT) for prostate cancer and clinical role of a perirectal hydrogel spacer (PHS). 2. To describe CT/MR assessment for the RT planning with PHS. 3. To illustrate CT/MR assessment during/after the RT with PHS.

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1. Evolution of RT & clinical role of PHS: a) Evolution of RT: two-dimensional RT, three-dimensional conformal RT, intensity-modulated RT (IMRT), image-guided RT (IGRT); b) Clinical role of PHS: physical separation between the prostate and rectum to reduce rectal radiation dose/toxicity, visibility by CT/MR as water density/signal intensity. 2. CT/MR assessment for RT planning: a) CT/MR scan technique: a flat couch top, patient immobilization, reproducible bladder distension, rectal emptying, field of view encompassing the outer body contour, thin-slice (e.g., 2-3 mm) axial section; for CT , metallic artifact reduction (e.g., hip prostheses); for MR , mainly T2-weighted sequences, additional sagittal section for PHS verification; b) CT/MR image fusion& contouring: organ-at-risk (OAR) assessment, anatomical contouring of the entire prostate as clinical target volume (CTV). 3. CT/MR assessment during/after RT: a) Daily checkpoints in IGRT: planning target volume (PTV) & rectum-prostate separation/PHS verification, rectal gas assessment for rectal enema indication; b) Temporal change after PHS placement: maintained PHS volume for at least 11 weeks by our clinical data; c) CT/MR-assessable PHS-related complications: rectal wall infiltration by PHS, rectal erosion/fistula formation; prostate subcapsular infiltration by PHS, perineal abscess; PHS migration into the venous plexus/pulmonary artery; bladder stone formation.

ROEE-7 BLADDER NEOPLASIA: FAR BEYOND UROTHELIAL HISTOLOGY

Andre De Freitas Secaf, MD (*Presenter*)
Yan V. Natal Gouvea, MD (*Abstract Co-Author*)
Eduarda Paro (*Abstract Co-Author*)
Francisco Jose De Queiroz Thome (*Abstract Co-Author*)
Pamela Grazielle Correa De Oliveira (*Abstract Co-Author*)
David F. Vieira, MD (*Abstract Co-Author*)
Cecilia V. Torres, MD (*Abstract Co-Author*)
Gabriel L. Gouvea, MD (*Abstract Co-Author*)
Jorge Elias JR, MD, PhD (*Abstract Co-Author*)
Valdair F. Muglia, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Urothelial carcinoma (UC) is the most common histologic type of bladder cancer. Urothelial cells, being pluripotent, have the ability to differentiate into a variety of histologic variants. Approximately 80% of UC cases present with conventional pure urothelial histology, while the remaining 20% involve differentiated histologic variants. These variants have garnered increasing interest, as some are associated with poorer prognoses, impacting disease progression and requiring distinct therapeutic approaches.

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Magnetic resonance imaging (MRI) is the most effective tool for soft tissue characterization, allowing detailed evaluation of the bladder wall, perivesical region, and pelvic organs. It offers significant advantages in the staging of bladder tumors. While urothelial carcinoma is the most common histologic type of bladder neoplasia, other types may also affect the bladder, often presenting with distinct features that can influence prognosis and treatment decisions. The main histologic variants of urothelial carcinoma include: pure (conventional), papillary, plasmacytoid, sarcomatoid, clear cell, lipid-rich cell, giant cell, micropapillary, squamous differentiation, and glandular differentiation.The aim of this study is to review bladder lesions that present histology other than the conventional urothelial form, with emphasis on the imaging characteristics observed, especially on magnetic resonance imaging (MRI).Radiologists should be familiar with the imaging characteristics of these less common and rare bladder lesions, as their management and prognosis may differ significantly from those of the most prevalent subtype—pure urothelial carcinoma.

Abstract Archives of the RSNA, 2025

VAEE

Vascular Imaging Education Exhibits

Thursday, Dec. 4 9:00AM - 6:00PM Room: LEARNING CENTER

Sub-Events

VAEE-1 CT ANGIOGRAPHY OF CONGENITAL AORTIC AND AORTIC VALVE ANOMALIES IN ADULTS: A RADIOLOGIST´S GUIDE

Lhuanna Maria Barbosa Teixeira, MD (*Presenter*)
Rhillary S. Sa, MD (*Abstract Co-Author*)
Camila P. Reifegerste, MD (*Abstract Co-Author*)
Bruna B. Libanio, MD (*Abstract Co-Author*)
Cintia Melo (*Abstract Co-Author*)
Augusto K. Medeiros, MD (*Abstract Co-Author*)

TEACHING POINTS

Congenital anomalies of the aorta and aortic valve are frequently diagnosed in childhood, but many cases persist undetected into adulthood—often discovered during imaging for unrelated symptoms. It is essential for radiologists to recognize the major anatomic variants and congenital malformations that can have significant clinical implications, including vascular rings, valvular dysfunction, or progressive aortopathy. The purpose of this article is to:• Highlight the characteristic CT angiographic findings of congenital anomalies of the aorta and aortic valve in adults.• Discuss the embryologic and anatomic basis of these anomalies to aid in image interpretation.• Emphasize the role of computed tomographic angiography in classification, detection of complications and surgical planning.• Provide actionable teaching points for accurate diagnosis and reporting.

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1. Introduction; 2. Embriology; 3. Aortic Arch Variants; 4. Aortic Coarctation; 5. Aortic valve anomalies; 6. Imaging Approach and Pitfalls; 7. Take-Home Messages.

VAEE-2 MORE THAN JUST PIPES: ABDOMINOPELVIC VENOUS PATHOLOGY WITH RAD-PATH CORRELATION

David Mortensen, MD (*Presenter*)
Erica B. Stein, MD (*Abstract Co-Author*)
Aaron M. Udager, MD, PhD (*Abstract Co-Author*)
Benjamin Mervak, MD (*Abstract Co-Author*)
Molly Pantelic, MD, MS (*Abstract Co-Author*)
Reve Chahine, MD, FRCR (*Abstract Co-Author*)
Katherine E. Maturen, MD, MS (*Abstract Co-Author*)

TEACHING POINTS

1. It matters what’s in the vein: sterile or infected thrombus, benign or malignant tumor - all have different management implications. 2. Prepared radiologists can often distinguish these based on imaging features. 3. Septic thrombophlebitis, and specifically pylephlebitis, are feared sequelae of abdominopelvic infection with a high rate of mortality, up to 25%. Inflammatory changes are often distinctive. 4. Renal cell carcinoma, hepatocellular carcinoma, and adrenocortical carcinoma have a predilection for venous invasion, and these thrombi will usually enhance. Extent and location are critical to surgical technique. 5. Venous leiomyosarcoma is a rare primary tumor of smooth muscle origin that can arise from the wall of any vein, most commonly the IVC. Surgical treatment requires interposition grafts. 6. Intravenous leiomyomatosis is a rare, benign pathology that is locally aggressive, but can often be treated surgically, leaving veins intact. 7. Renal angiomyolipomas occasionally invade the renal veins and IVC and characteristically show evidence of intraluminal fat.

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1. Anatomical overview of venous histology and anatomy a. Radiologic and histologic examples of normal and abnormal 2. Case examples a. Multiplanar, multimodality imaging of various venous pathologies with corresponding pathology b. Benign pathologies: bland thrombus, infected thrombus, fatty thrombus c. Neoplastic pathologies: tumor thrombus, leiomyosarcoma, intravenous leiomyomatosis 3. Discuss how understanding of radiology-pathology correlation can enhance understanding of disease state and clinical course 4. Summary of key concepts

VAEE-3 BEYOND THE GROIN: CT ASSESSMENT OF FEMORAL VASCULAR ACCESS-SITE COMPLICATIONS AFTER CARDIAC CATHETERIZATION

Andres Guillermo Tarra Romero, MD (*Presenter*)
Jhan Fonseca, MD (*Abstract Co-Author*)
Hugo Torres Rodriguez, MD (*Abstract Co-Author*)

TEACHING POINTS

CT is the modality of choice for assessing suspected femoral access-site complications after cardiac catheterization, providing accurate anatomical detail of vascular and perivascular structures. Pseudoaneurysms appear as contrast-filled, saccular outpouchings communicating with the femoral artery via a narrow neck, best visualized on arterial phase imaging and multiplanar reformats. Arteriovenous fistulas are identified as abnormal early venous opacification or direct communication between femoral artery and vein. Active bleeding is seen as extravasation of contrast outside the vascular structures, often increasing in size or density between arterial and venous phases. Multiplanar and 3D reconstructions improve detection and characterization of vascular complications, enhancing communication with the referring team. In patients with a history of surgical intervention or physical trauma, a post-traumatic aneurysm of the great saphenous vein should be considered as a potential cause of a non-pulsatile subcutaneous mass.

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Introduction Epidemiology Normal Anatomy CT Angiography Technique Key Imaging Findings: What to Report Complications • Cellulitis • Hematoma • Active Extravasation • Cutaneous Fistula • Pseudoaneurysm • Arteriovenous Fistula • Venous Aneurysms • Cavo-mesenteric Fistula Take-Home Messages Conclusions References

VAEE-4 ENHANCING POST-ENDOVASCULAR AORTIC REPAIR ENDOLEAK DIAGNOSIS: CT IMAGING TIPS USING CUTTING-EDGE TECHNOLOGIES AND KEY INTERPRETATION POINTS

Takatoshi Higashigawa, MD (*Presenter*)
Yasutaka Ichikawa, MD (*Abstract Co-Author*)
Yuki Yamaoka (*Abstract Co-Author*)
Hiroaki Kato, MD, PhD (*Abstract Co-Author*)
Noriyuki Kato (*Abstract Co-Author*)
Hajime Sakuma, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

This exhibit provides a comprehensive overview of advanced CT imaging techniques to improve the detection and characterization of endoleaks after endovascular aortic repair. Specifically, we highlight: 1) The utility of low-keV virtual monochromatic imaging (VMI) combined with deep learning image reconstruction (DLIR) to enhance endoleak conspicuity. 2) The role of photon-counting detector CT (PCD-CT) in providing high-quality iodine maps. 3) Strategies to optimize image quality and reduce artifacts for precise diagnosis. 4) Key interpretation points that bridge imaging findings with clinical decision-making for endoleaks

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1) DLIR vs. hybrid iterative reconstruction (HIR): DLIR significantly reduces image noise compared to conventional HIR. DLIR is particularly beneficial at low keV VMI, where image noise increases dramatically. 2) Low-keV VMI for improved contrast enhancement: Lower energy VMI increases iodine contrast. Combined with DLIR, this approach allows clearer visualization of subtle endoleaks. 3) Metal artifact reduction with iodine maps (PCD-CT): PCD-CT-derived iodine maps reduce metallic artifacts caused by stent grafts, aiding in the differentiation of true endoleaks from pseudoenhancement or beam-hardening artifacts. 4) Key points in CT interpretation of endoleaks: Important interpretation points for diagnosing endoleaks on CT —considering treatment strategy— will be presented in a clear and accessible manner. 5) Conclusion: Advanced CT techniques, including low-keV VMI with DLIR and PCD-CT iodine mapping, enhance the accuracy of endoleak diagnosis. Applying key interpretation points further supports appropriate clinical decision-making.

VAEE-5 CLINICAL APPLICATIONS OF UPRIGHT MDCT IN CARDIOVASCULAR IMAGING

Yoshitake Yamada, MD, PhD (*Presenter*)
Minoru Yamada, RT (*Abstract Co-Author*)
Yoichi Yokoyama, MD (*Abstract Co-Author*)
Ryoma Fukuoka (*Abstract Co-Author*)
Orito Ikeda (*Abstract Co-Author*)
Fumiko Yagi, MD (*Abstract Co-Author*)
Yuki Iwaita (*Abstract Co-Author*)
Mohammed Alshahri (*Abstract Co-Author*)
Takehiro Nakahara (*Abstract Co-Author*)
Masahiro Jinzaki, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

The objectives of this exhibit are: (1) To explain the development, technological background, and features of upright multi-detector computed tomography (MDCT), including 320-detector upright CT and multi-position MDCT for whole-body imaging. (2) To describe posture-induced anatomical changes in the heart and vascular system due to gravitational effects. (3) To demonstrate the clinical applications and diagnostic value of upright MDCT in cardiovascular diseases through representative clinical cases.

TABLE OF CONTENTS/OUTLINE

(1) Development and advantages of upright MDCT for whole-body imaging (2) Technical performance of upright MDCT: Physical characteristics, workflow efficiency, safety, and remote operability during infectious disease pandemics (3) Influence of gravity on systemic vascular structures: Aiming to elucidate the principles and dynamics of "phlebology" (4) Clinical applications of upright MDCT, including: •Noninvasive estimation of right atrial pressure and pulmonary arterial wedge pressure (PAWP) compared with right heart catheterization •Evaluation of posture-related worsening of cardiopulmonary symptoms in various diseases •Preoperative assessment of graft vessels in coronary artery bypass grafting (CABG) (5) Limitations (6) Summary and Conclusion

VAEE-6 HEMODYNAMIC QUANTITATIVE ANALYSIS OF FEMOROPOPLITEAL ARTERY WITH 4D FLOW MRI

Xueyan Zhang (*Presenter*)

TEACHING POINTS

1) To show the femoropopliteal artery on time-resolved three-dimensional phase contrast magnetic resonance imaging (4D-flow MRI). 2) Using the 4D flow MRI to measure the hemodynamic parameters of the femoropopliteal artery. This non-invasive measurement technique provides the possibility to derive comprehensive information about the occlusion of the femoropopliteal artery.

TABLE OF CONTENTS/OUTLINE

1. The principle and characteristics of the 4D flow MRI 2. An initial three-plane localizing scan was followed by a 2D phase contrast (PC) MRI and 4D flow scans. a) For optimization of the velocity encoding (VENC) setting, the 2D PC MRI was designed to estimate the maximum flow velocity. The 2D PC MRI labeling plane was positioned perpendicular to the target artery in the coronal and sagittal images. b) After the 2D PC MRI sequence has been scanned, the next step is blood flow velocity analysis. The maximum flow velocity value of target vessel was obtained from the velocity-time curve. c) For the 4D flow acquisition, the velocity encoding (VENC) setting was set to 120% of the maximum flow velocity value of the target vessel. 3. Upon scan completion, the 4D flow MRI images were exported offline for hemodynamic quantitative analysis. a) Different blood flow patterns of femoropopliteal artery. b) The wall shear stress (WSS) distribution map with different orientations and alteration trend of WSS over one cardiac cycle. c) The energy loss and pressure difference of blood flow.

VAEE-7 VENOUS CONTRAST MIXING ON CT: A CLOSER LOOK TO AVOID MISDIAGNOSIS

Burak Kaplan, MD (*Presenter*)
Niharika Praveen, MBBS (*Abstract Co-Author*)
Mounika Pusa (*Abstract Co-Author*)
Aditi Bhanushali (*Abstract Co-Author*)
Yajurvendrasinh Chudasama (*Abstract Co-Author*)
Philip A. Araoz, MD (*Abstract Co-Author*)

TEACHING POINTS

Recognize venous contrast mixing patterns that can mimic thrombosis. Understand the importance of assessing vessel continuity and contrast dynamics in multiple planes.

TABLE OF CONTENTS/OUTLINE

Introduction Venous structures can exhibit a wide range of contrast enhancement patterns on CT imaging, particularly during early or mixed phases of contrast administration. These physiologic variations in venous opacification can mimic true vascular pathologies such as thrombosis or stenosis. Misinterpretation of these findings can lead to unnecessary further workup or inappropriate treatment. Therefore, distinguishing physiologic venous contrast mixing from true pathology is essential for accurate diagnosis. This presentation includes illustrative cases demonstrating commonly encountered sites of contrast mixing artifacts, including the

inferior mesenteric vein, renal veins, internal jugular vein, left brachiocephalic vein, and gastroepiploic vein. It also outlines practical diagnostic strategies, such as assessing vessel continuity, using multiplanar reconstructions, and correlating imaging findings with clinical and procedural context. Case Presentations Inferior Mesenteric Vein mixing with the Splenic Vein Renal veins mixing into the Inferior Vena Cava Internal Jugular Vein contrast mixing after right-arm injection Left Brachiocephalic Vein mixing from Internal Jugular and Subclavian veins Gastroepiploic Vein mixing with the Superior Mesenteric Vein Diagnostic Strategies Importance of evaluating vessel continuity, using multiplanar reformats, and correlating with clinical context.

VAEE-8 STATE-OF-THE-ART IMAGING AND MANAGEMENT OF ENDOLEAKS

Joel M. Davies, MBChB (*Presenter*)
Saeed Khayyat, MBBS (*Abstract Co-Author*)
Drew Maclean, MBChB, MRCS (*Abstract Co-Author*)
Chris R. Williams, MBBCh, MRCS (*Abstract Co-Author*)
Wiliam R. Thomas (*Abstract Co-Author*)
Ghali Salahia, MD (*Abstract Co-Author*)
Richard D. White, MBChB, FRCR (*Abstract Co-Author*)

TEACHING POINTS

1) Demonstrate the importance of recognising and appropriately categorising endoleak following EVAR.2) Highlight the pros and cons of various imaging modalities used for the detection of endoleaks after EVAR, including advanced ultrasound techniques, multiphase CT and MRI as well as conventional plain radiographs and angiography.3) Categorise endoleaks which develop following both standard EVAR and fenestrated / branched EVAR, with discussion of risk factors for their development and the evidence for preventative measures for each type.4) Illustrate the spectrum of endoleaks following EVAR using schematic illustrations and case examples from a tertiary vascular centre, with treatment rationale discussed.

TABLE OF CONTENTS/OUTLINE

1) Imaging modalities 2) Follow-up strategies 3) Endoleaks a. Type I b. Type II c. Type III d. Type IV e. Type V f. Additional endoleak considerations following fenestrated / branched EVAR g. Special scenarios: i. Endoleak in the context of AV fistula ii. Surgical “endoleak”

VAEE-9 MYCOTIC AORTIC ANEURYSMS FROM EARLY SIGNS TO RUPTURE: AN EVOLUTION OVER TIME

Tushar Kumar, MBBS, MD (*Presenter*)
Nandakumar Patnam Gopal Chetty, MD (*Abstract Co-Author*)
Madhvi Yadav, MBBS (*Abstract Co-Author*)
Rajat Bhargava, MD, MBBS (*Abstract Co-Author*)

TEACHING POINTS

1. Awareness of pathophysiology, clinical features and laboratory tests are key to suspect mycotic aortitis. 2. Indistinct aortic wall and periaortic soft tissue in the clinical setting of pain should be viewed with concern. 3. Venous phase CT is insensitive for diagnosis of small pseudoaneurysm, and urgent CTA should be performed. 4. Rapid progress of pseudoaneurysm is a sign of infectious etiology, hence close clinical and imaging follow up is required.

TABLE OF CONTENTS/OUTLINE

1. Aortic mycotic aneurysm: a) Definition b) Epidemiology c) Etiology d) Pathophysiology e) Clinical features; 2. CT imaging findings of aortic mycotic aneurysm: a) Early CT findings b) Temporal evolution c) Case based review; 3. Differential diagnosis: a) Intramural hematoma b) Impending aortic aneurysm rupture c) Inflammatory aortitis/vasculitis d) Penetrating atherosclerotic ulcer; 4. Complications; 5. Management and prognosis.

VAEE-10 RED FLAGS IN THE VEINS! WHEN THROMBOSIS TELLS A DIFFERENT STORY: IMAGING CLUES TO IDENTIFY VENOUS TUMOR THROMBUS IN ABDOMINOPELVIC MALIGNANCIES

Delfina Linares, MD (*Presenter*)
Maria S. Fernandez Castillo Odena, MD (*Abstract Co-Author*)
Federico G. Diaz Telli, MD (*Abstract Co-Author*)
Miriana E. Mariussi, MD (*Abstract Co-Author*)
Juan P. Perotti, MD (*Abstract Co-Author*)
Antonella Pierina Ruiz (*Abstract Co-Author*)
Inaki Eztala, MD (*Abstract Co-Author*)

TEACHING POINTS

Understand the pathophysiologic mechanisms of venous tumor thrombus formation in abdominopelvic malignancies. - Identify key imaging features that differentiate tumor thrombus from bland thrombus across CT, MRI, and ultrasound. - Recognize the typical imaging appearance of tumor thrombus according to the affected venous territory and the organ of origin. - Review common and uncommon abdominopelvic tumors associated with venous invasion, including renal, hepatic, adrenal, pancreatic, and rectal malignancies. - Recognize imaging mimics and artifacts that may simulate venous tumor thrombus. - Appreciate the clinical and prognostic significance of venous tumor thrombus in staging and therapeutic decision-making.

TABLE OF CONTENTS/OUTLINE

Introduction Definition and clinical importance of tumor thrombus Epidemiology and diagnostic impact Pathophysiology of Tumor Venous Invasion Mechanisms of direct and indirect invasion Role of angiogenesis and metastatic cascade Imaging Modalities and Diagnostic Criteria CT, MRI, and ultrasound features How to differentiate tumor thrombus vs bland thrombus Role of diffusion and enhancement patterns Anatomical and Case-Based Review Inferior Vena Cava Portal Venous System Splanchnic and Mesenteric Veins Pelvic Venous Involvement Pitfalls and Mimics Flow artifacts Bland thrombus Cavernous transformation Pseudolesions (e.g., pseudolipoma) Clinical Implications Impact on staging and treatment Surgical planning and contraindications Conclusion

VAEE-12 DEMYSTIFYING THE CIRCUIT: A RADIOLOGIC GUIDE TO ECMO IMAGING

Samuel Castillo, MD (*Presenter*)
Mariana Madrid, MD (*Abstract Co-Author*)
Regina De La Mora Cervantes, MD (*Abstract Co-Author*)
Genier Fabian Castano Lizarazo, MD (*Abstract Co-Author*)

TEACHING POINTS

- Differentiate ECMO cannulation strategies (veno-arterial, veno-venous, and veno-pulmonary) including both peripheral and central variants. - Recognize CTA flow-relate artifacts (e.g., watershed zones, mixing artifacts) that may mimic thromboembolism, dissection, or vascular occlusion. - Apply tailored CTA protocols by adjusting ECMO flow rates, contrast injection sites, and acquisition phases to improve diagnostic accuracy. - Present real clinical cases where ECMO-related artifacts mimic pathology, highlighting key diagnostic pitfalls.

TABLE OF CONTENTS/OUTLINE

1. Introduction to ECMO cannulation Overview of cannulation, indications, and ECMO circuit components. 2. Cannulation strategies Imaging-based analysis of ECMO cannulation approaches, highlighting central vs peripheral access through clinical case examples. 3. CTA Protocol Optimization: a. Contrast injection approaches (peripheral, central, or ECMO circuit). b. Bolus tracking, test bolus and phase timing techniques. c. ECMO circuit adjustments to enhance image acquisition. d. Special considerations for pulmonary, aortic, and cerebral vascular evaluations. 4. Artifacts and Diagnostic Pitfalls: a. Aortic and cardiac artifacts. b. Lower extremities

evaluation. c. Abdominal imaging challenges. d. Head and neck vascular pitfalls. 5. Conclusion A thorough understanding of ECMO cannulation techniques and protocol adjustments—and their importance in avoiding misinterpretation.

VAEE-13 UNMASKING VASCULAR CRISES: THE PIVOTAL ROLE OF CT ANGIOGRAPHY IN LOWER LIMB EMERGENCIES

Victor Costa, MD (*Presenter*)
Alexandre M. Pereira, MD (*Abstract Co-Author*)
Giovanni G. Cerri, PhD (*Abstract Co-Author*)
Daniel L. Cardoso, MD (*Abstract Co-Author*)
Mariana Costa, MD (*Abstract Co-Author*)
Thiago Vieira, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Understand that emergencies in lower limb computed tomography angiography (CTA) primarily involve acute vascular conditions with high risk of limb loss and systemic complications, necessitating rapid diagnosis and immediate intervention.Recognize the need to categorize lower limb vascular emergencies into traumatic injuries and non-traumatic injuries, which include ischemic and hemorrhagic types.Know the main benefits of CT angiography like detailed information of the entire vascular bed; offers fast, non-invasive imaging; achieves isotropic submillimetric resolution for precise anatomical assessment.

TABLE OF CONTENTS/OUTLINE

1 - Introduction: an overview of the vascular emergencies;2 - Arterial tromboembolism: main features and what the the imaging studyneed to include;3 - Key findings of chronic peripheral occlusive arterial disease;4 - Aneyrism rupture: Key findings and therapeutic decisions;5 - The speed and accuracy of CT angiography in trauma.

VAEE-14 IGG4-RELATED CARDIOVASCULAR DISEASE (IGG4-CVD): CASE PRESENTATIONS AND DIFFERENTIAL DIAGNOSES

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Kentaro Ohara (*Abstract Co-Author*)
Tomoro Morikawa, MD (*Abstract Co-Author*)
Takaaki Hosokawa (*Abstract Co-Author*)
Tomohisa Okada (*Abstract Co-Author*)
Kazuki Yoshida, MD, PhD (*Abstract Co-Author*)
Yuki Tanabe (*Abstract Co-Author*)
Naoto Kawaguchi, MD (*Abstract Co-Author*)
Teruhito Kido, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

IgG4-related disease is the systematic disease characterized by tissue infiltration of IgG4-positive plasma cells and perivascular fibrosis. It can involve extensive organ involvement; pancreas, bile duct, gallbladder, salivary glands and even aorta and coronary arteries. Cardiovascular involvement, observed in up to 41% of patients with IgG4-RD, may result in life-threatening complications such as aortic dissection or coronary artery occlusion, and has been associated with sudden death. Given the risks associated with cardiovascular biopsy, radiologists should have a thorough understanding of its imaging manifestations.

TABLE OF CONTENTS/OUTLINE

Slide1: Teaching point. Slide2:the case of IgG4-CVD?. Slide3:the case of IgG4-CVD?. Slide4:Differential diagnosis (Takayasu's Disease, Giant Cell Arteritis). Slide4:Differential diagnosis (Malignant lymphoma).

VAEE-15 ACUTE AORTIC DISEASES

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Mariana Costa, MD (*Abstract Co-Author*)
Fabiana Campos, MD (*Abstract Co-Author*)
Rafael R. Santos Ferreira, MD (*Abstract Co-Author*)
Enzo Calheiros, MD (*Abstract Co-Author*)
Davi D. Romao, MD (*Abstract Co-Author*)
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Alexandre M. Pereira, MD (*Abstract Co-Author*)
Thiago Vieira, MD, PhD (*Abstract Co-Author*)

TEACHING POINTS

Acute Aortic Syndrome (AAS) represents a group of life-threatening conditions involvingthe aorta, characterized by a sudden onset and rapid progression. Early recognition and prompt intervention are critical to improve outcomes and reduce mortality. The three principal entities classified as AAS are: aortic dissection, penetrating atherosclerotic ulcer and intramural hematoma. Other acute aortic diseases include aortic aneurysm rupture and traumatic aortic injury. This educational exhibition provides a comprehensive overview of the imaging evaluation of the main acute aortic diseases. Specific imaging patterns, differential diagnoses, and potential pitfalls in imaging interpretation will be addressed, as well as etiology categorization, classification grading systems and treatment modalities, aiming at a broad review of the theme. The purpose of this exhibition is to:- Present multiples etiologies of acute aortic diseases.. - Present classical imaging findings- Highlight points of interest regarding treatment and rapid identification these life threatening conditions

TABLE OF CONTENTS/OUTLINE

Definition of Acute Aortic Syndrome, as well as other acute aortic diseases.Aortic dissection classification and what should we report in the main imaging modalities.Aortic dissection case in a 51 years old malePenetrating atherosclerotic ulcer and intramural hematoma imaging findings. Aortic aneurysm classification, primary and secondary signs of rupture.

VAEE-16 IMAGING EVALUATION OF SYSTEMIC VEINS

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Anushri Parakh, MBBS, MD (*Abstract Co-Author*)
Sadia Sultana, MRCP,FRCR (*Abstract Co-Author*)
Vinit Baliyan, MD,MBBS (*Abstract Co-Author*)
Sandeep S. Hedgire, MD (*Abstract Co-Author*)

TEACHING POINTS

· To foster a comprehensive understanding of the anatomy of systemic veins to provide a foundation for recognizing normal venous anatomy. · Venous conditions extend beyond thrombosis, and these may be overlooked if a radiologist is unaware of the disease spectrum. · Assessing asymmetry as well as utilizing multiplanar imaging can be the key in diagnosing certain conditions. · Special emphasis on underscoring the key imaging figures associated with each abnormality, enabling confident identification and interpretation of these findings across various imaging modalities (ultrasound, CT, and MR).

TABLE OF CONTENTS/OUTLINE

• Conventional venous anatomy as well as congenital anomalies. • Pictorial examples of venous thromboses, and review importance of multiphase, prior imaging, and multiplanar imaging for accurate diagnoses. • Illustrate common and uncommon venous primary and secondary pathologies (inflammatory, compression syndromes, iatrogenic, and tumor)

VAEE-17 NAVIGATING THE NARROWS: A MULTIMODALITY JOURNEY THROUGH THORACIC OUTLET SYNDROME

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Felipe L'Hotellier (*Abstract Co-Author*)
Igor R. Oliveira, MD (*Abstract Co-Author*)
Andre P. Romualdo (*Abstract Co-Author*)
Andrei S. Albuquerque, MD (*Abstract Co-Author*)

TEACHING POINTS

Review the anatomy of the spaces involved in thoracic outlet syndrome. Doppler ultrasound technique with different provocative maneuvers for dynamic assessment during the examination. Technical protocols for image acquisition in CT angiography and MR angiography. Case-based approach to imaging findings in each modality, with clinical correlation. Review of fundamental information essential for the radiologist’s report.

TABLE OF CONTENTS/OUTLINE

Introduction with the main causes of thoracic outlet syndrome. Detailed anatomical review of the scalene triangle, costoclavicular space, and subcoracoid spaces. Doppler ultrasound technique. CT angiography protocol. MRI angiography protocol (with and without contrast). Review of the affected anatomical spaces. Diagnostic criteria. Use of provocative maneuvers to identify dynamic vascular compressions and differentiate between fixed and positional stenoses. Case-based review of imaging findings. Post-treatment evaluation and complications. Multimodality reporting guidelines. Conclusion.

VAEE-18 OUTSIDE THE LUMEN: A RADIOLOGIST'S GUIDE TO PERIVASCULAR DISEASES

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Igor R. Oliveira, MD (*Abstract Co-Author*)
Alan D. Hummel (*Abstract Co-Author*)
Andrei S. Albuquerque, MD (*Abstract Co-Author*)

TEACHING POINTS

• Diagnostic approach algorithm to access perivascular diseases • Review of perivascular acute and chronic fluid collections • Review of neoplasms and masses that presente with vascular encasing or dissemination • Review common and uncommon inflamattory diseases with perivascular envolvement • Case based review the main computed tomography findings of the differential diagnoses of perivascular diseases.

TABLE OF CONTENTS/OUTLINE

• Introduction • CTA and MRA technique to access the perivascular space • Imaging findings based algorithm • Perivascular acute and chronic collection • Neoplasms and masses • Primary vacular inflamatory disorders • Inflamatory diseases with perivascular involvement • Definition of perivascular collections • Reporting tips • Conclusion

VAEE-20 MAKING THE TINY VISIBLE: INSTITUTIONAL EXPERIENCE WITH CENTRAL AND PERIPHERAL MR LYMPHANGIOGRAPHY

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Gabriel Figueiredo, MD (*Abstract Co-Author*)
Tomas M. Lacerda, MD (*Abstract Co-Author*)
Lucas T. Amaral, MD (*Abstract Co-Author*)
Renata Emy Ogawa, MD (*Abstract Co-Author*)
Adriano Tachibana, MD, MBA (*Abstract Co-Author*)
Murilo M. Silva, MD (*Abstract Co-Author*)
Marcelo A. Rocha, MD (*Abstract Co-Author*)

TEACHING POINTS

- Highlights clinical applications, protocols, and diagnostic patterns of both central and peripheral Lymphangiography by Magnetic Resonance Imaging (MRL), based on institutional experience. -Emphasizes the technique’s role in identifying lymphatic leaks, obstructions, lymphatic malformations, lymphedema, preoperative mapping of peripheral venous lymphatic anastomosis microsurgery, and its advantages over traditional methods.

TABLE OF CONTENTS/OUTLINE

Overview of central and peripheral lymphatic anatomy Protocol and imaging parameters for MRL Technique for intranodal and interdigital contrast administration Clinical applications of central MRL: detection of leaks, obstructions, and malformations Clinical applications of peripheral MRL: lymphedema assessment and surgical planning Comparison with complementary modalities (e.g., lymphoscintigraphy) Suggested structured report template for MRL studies

VAEE-22 POPLITEAL ARTERY ENTRAPMENT SYNDROME. A REVIEW BASED ON OUR EXPERIENCE: 2013-2025

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Ester Carballo, MD (*Abstract Co-Author*)
Lorena Martinez Fontanet, MD (*Abstract Co-Author*)
Marco Leyva Vasquez Caicedo (*Abstract Co-Author*)
Ana M. Fernandez Tamayo, MD (*Abstract Co-Author*)
Javier E. Armijo, MD (*Abstract Co-Author*)
Jose Mendez Montero (*Abstract Co-Author*)

TEACHING POINTS

To review popliteal artery entrapment syndrome (PAES), epidemiological and clinical aspects, differential diagnosis and treatment possibilities. To describe PAES subtypes and imaging findings, as well as the main angiographic techniques used in its diagnostic process, based on our cohort of patients from 2013 to 2025.

TABLE OF CONTENTS/OUTLINE

• Introduction . PAES is an infrequent but debilitating condition typically seen in young adults, in which PA is compressed by surrounding structures in the popliteal fossa. As chronic arterial compression may lead to irreversible vascular damage, early diagnosis is essential. Symptoms reported are exertional calf pain, intermittent claudication, etc. • Differential diagnosis . Main differential diagnosis includes chronic popliteal artery thrombosis, chronic exertional compartment syndrome, adventitial cyst, etc. • Imaging techniques . Angio-CT, angio-MR, and conventional angiography can be used in the diagnosis of PAES, being mandatory to include both static and dynamic acquisition with active plantarflexion. • Classification . PAES is categorized as anatomical (APAES), when structural anomalies are present in the popliteal fossa, and as functional when it is secondary to hypertrophy of the gastrocnemius muscle. At the same time, it’s divided into six subtypes: 1 to 5 constitute APAES and type 6 is functional. At our center, 10 confirmed cases of PAES were identified from 01/01/23 and 01/04/25, most of whom were men (n=6), with a mean age of 32 years. 5

patients were diagnosed with APAES, while the remaining cases were classified as type 6 • Treatment . It depends on the subtype and symptoms (conservative measure, botulinum toxin injection, surgical intervention).

VAEE-23 INDUCTIVE ANALYSIS OF FACTORS INFLUENCING THE DIAMETER OF THE INFERIOR VENA CAVA

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Rodrigo S. Loto, MD (*Abstract Co-Author*)
Victorio Del Casale, MD (*Abstract Co-Author*)
Luciano B. Lovotti, MD (*Abstract Co-Author*)
Roberto E. Elias, MD (*Abstract Co-Author*)
Leandro J. Pacini (*Abstract Co-Author*)

TEACHING POINTS

-Review the anatomy and pathologies affecting the inferior vena cava.-Review the pathophysiology and radiological characteristics of common and uncommon diseases.-Main determinants affecting the inferior vena cava diameter.

TABLE OF CONTENTS/OUTLINE

The inferior vena cava (IVC) is a dynamic vascular structure whose diameter can vary significantly based on physiological and pathological conditions. Accurate interpretation of IVC size and collapsibility is essential in multiple clinical scenarios, including fluid status assessment, right heart function evaluation, and critical care management. This educational exhibit provides a comprehensive overview of the main determinants that influence IVC diameter, categorized into six domains: thoracic pressure, cardiac function, abdominal pressure, parietal compliance, blood volume, and anatomical variants. Additionally, a broad spectrum of miscellaneous conditions —such as pulmonary embolism, pericardial effusion, ARDS, abdominal compartment syndrome, and vascular interventions—is addressed for their impact on IVC morphology as seen on imaging. The content is supported by schematic illustrations and selected imaging examples that clarify the effects of these factors on IVC appearance. The aim is to enhance the radiologist's ability to recognize normal variability and distinguish it from true pathological changes. Understanding these determinants is key to avoiding misinterpretation and improving diagnostic confidence in both routine and emergency settings. By the end of this exhibit, viewers will be equipped with practical knowledge to assess the IVC as a reliable marker in systemic and cardiovascular evaluation.

VAEE-24 DIAGNOSTIC IMAGING KEYS AND APPROACH TO ENDOVASCULAR MANAGEMENT IN ACUTE AORTIC SYNDROMES

Jorge Guisandez (*Presenter*)
Gonzalo Garzon Moll (*Abstract Co-Author*)
Milagros Marti de Gracia, MD, PhD (*Abstract Co-Author*)
Teresa de Jesus Hernandez Cabrero (*Abstract Co-Author*)

TEACHING POINTS

Acute aortic syndrome (AAS) comprises dynamic entities like acute aortic dissection (AAD), intramural hematoma (IMH), and penetrating aortic ulcer (PAU), all involving weakened aortic wall integrity and predisposition to rupture. Angio-CT is the preferred method for urgent AAS diagnosis; cardiac gating enhances accuracy. Transesophageal echocardiography (TEE) supports endovascular procedures by confirming access to the true lumen and evaluating entry tear closure, though it only visualizes the thoracic aorta. Stanford type A AAS requires surgery due to high complication risks. Uncomplicated Stanford type B cases are treated conservatively, while complications such as persistent pain, malperfusion syndrome, and progression warrant endovascular intervention. Mural thrombus and IMH may appear crescent-shaped, but thrombus has irregular borders within intimal calcification, while IMH shows smooth borders outside it. In AAD, signs like cobweb, beak, windsock, Mercedes-Benz help differentiate true and false lumens. The true lumen is typically smaller, more attenuated, and bordered by calcifications; tracing from the aortic root aids uncertain cases. Favorable aortic remodeling after TEVAR, is more frequent in acute/subacute dissections (<90 days); chronic ones carry higher risk of distal aneurysm.

TABLE OF CONTENTS/OUTLINE

This exhibit will present the imaging hallmarks of each AAS entity using angio-CT and TEE. Imaging criteria guiding treatment decisions will be discussed, including indications for TEVAR. Case-based examples from a tertiary care center will illustrate typical and atypical presentations, diagnostic pitfalls, and post-treatment imaging follow-up.

VAEE-25 CHALLENGING VISCERAL ARTERY PATHOLOGIES: WHAT NOT TO MISS ON CT ANGIOGRAPHY

Manuel Rafael Lopez De La Torre Carretero, MD (*Presenter*)
Carmen Mbongo, MD (*Abstract Co-Author*)
Daniel A. Zambrano Andrade, MD (*Abstract Co-Author*)
Adolfo Manuel Delgado Brito, MD (*Abstract Co-Author*)
Miguel Barrio Piqueras I, MD (*Abstract Co-Author*)
Isabel Vivas Perez, MD (*Abstract Co-Author*)

TEACHING POINTS

- To review uncommon and diagnostically challenging visceral artery pathologies. - To highlight key CT angiography technical considerations and imaging findings, including how to perform high quality studies and avoid interpretation errors. - To provide case-based learning through real clinical scenarios.

TABLE OF CONTENTS/OUTLINE

CT Angiography Essentials Protocol tips: Acquisition and reconstruction technique and tips, contrast timing. Post-processing techniques: MPR, MIP, VRT, CPR. Case-Based Review Visceral artery dissections: real vs pseudo-lesions. Splanchnic aneurysms and pseudoaneurysms: subtle clues. When invasive treatment is crucial Segmental arterial mediolysis. Compressive vascular syndromes: Diagnostic tips, treatment and follow-up imaging. Incidental thrombosis: red flags in oncology patients. Iatrogenic vascular injuries: what to expect after intervention. Anatomical variants: normal structures simulating disease. Diagnostic Toolbox Key imaging signs. Common traps and how to avoid them. Use of indirect signs (fat stranding, ischaemia). Summary & Take-Home Messages Case-based insights. Reporting tips.

VAEE-26 UNMASKING THE HIDDEN: EXPLORING THE ANEURYSMAL SPECTRUM OF THORACIC VEINS THROUGH IMAGING

Andita D. Hidayati, MD (*Presenter*)
Daniel Vargas, MD (*Abstract Co-Author*)
Daniel Ocazionez-Trujillo, MD (*Abstract Co-Author*)
Ameya J. Baxi, MBBS,DMRD (*Abstract Co-Author*)
Vijay K. Aggarwal, MBBS (*Abstract Co-Author*)
Carlos S. Restrepo, MD (*Abstract Co-Author*)

TEACHING POINTS

Raise radiologist awareness and recognize the Spectrum Thoracic venous aneurysms can occur in multiple venous territories—SVC, innominate veins, azygos/hemiazygos, IVC, and pulmonary veins—each with distinct anatomical and clinical implications. Know the Imaging Clues Cross-sectional imaging (especially CT and MRI) is key to identifying aneurysmal dilatation, distinguishing it from solid or cystic mediastinal masses, and detecting complications such as thrombosis or mass effect. Don't Miss the Associations Be aware of associated anomalies like cystic hygroma, persistent left SVC, congenital heart disease (TAPVR, ASD), and syndromes like Osler-Weber-Rendu—which may point to underlying vascular malformations or systemic conditions.

TABLE OF CONTENTS/OUTLINE

- Introduction - Normal thoracic venous anatomy and epidemiology of venous aneurysms - Case-based review of types thoracic venous aneurysms with imaging approach by location: innominate vein, SVC, IVC, and pulmonary venous aneurysms, aneurysms - Common clinical associations and potential complications - Clinical implications and guidance for optimal reporting - Management

VAEE-27 MESENTERIC ISCHEMIA: FROM ACUTE EMERGENCIES TO CHRONIC CONDITIONS

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Montilla Jose (*Abstract Co-Author*)
Agustina Vicente Bartulos, MD (*Abstract Co-Author*)
Esther Garcia Casado (*Abstract Co-Author*)
Claudia Viescas Huerta, MD (*Abstract Co-Author*)
Diego Alejandro Garcia Paredes, MD (*Abstract Co-Author*)
Isabel Fonseca Buelga, MD (*Abstract Co-Author*)

TEACHING POINTS

1. To provide a comprehensive overview of mesenteric ischemia, highlighting both acute and chronic forms. 2. To describe the clinical and imaging features of different types of acute mesenteric ischemia, including arterial occlusive (embolic, thrombotic), non-occlusive, and veno-occlusive ischemia. 3. To discuss chronic mesenteric ischemia, its diagnostic challenges and its treatment. 4. To illustrate the imaging findings through case from our hospital.

TABLE OF CONTENTS/OUTLINE

1. Definitions: Acute Mesenteric Ischemia, Chronic Mesenteric Ischemia. 2. Anatomy: abdominal arterial and venous anatomy. 3. Embolic Acute Mesenteric Ischemia: definition, clinical presentation, imaging findings. 4. Arterial Occlusive Acute Mesenteric Ischemia: definition, clinical presentation, imaging findings. 5. Non-occlusive Mesenteric Ischemia (NOMI): definition, clinical presentation, imaging findings. 6. Venous Acute Mesenteric Ischemia: definition, clinical presentation, imaging findings. 7. Chronic Mesenteric Ischemia (CMI): definition, clinical presentation, imaging findings, treatment. 8. Conclusion. 9. References.

VAEE-28 ARTERIAL ARM-AGEDDON: CASE-BASED IMAGING REVIEW OF UPPER EXTREMITY ARTERIAL DISEASES

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Margaret H. Lee, MD (*Abstract Co-Author*)
Brian D. Quinn, MD (*Abstract Co-Author*)
Richard A. Reed, MD (*Abstract Co-Author*)
Aram J. Lee, MD (*Abstract Co-Author*)
Thomas Le (*Abstract Co-Author*)
Miriam Thomas, MD (*Abstract Co-Author*)
Karoly Viragh, MD (*Abstract Co-Author*)

TEACHING POINTS

Arterial imaging of the upper extremities is less commonly performed than of the lower extremities, torso, or head/neck. Although there are many similarities in arterial anatomy, pathology and imaging techniques, important differences exist. The goal of the current educational exhibit is to (1) describe the clinically relevant upper extremity normal and variant anatomy; (2) discuss the relevant multimodality imaging technical considerations with emphasis on differences compared to other body parts; (3) provide a case-based, image-rich, multimodality review of the major arterial pathologies with interventional radiologic considerations and clinico-pathologic correlation where available. In addition, interactive (board-exam type) pointers will be included to emphasize major learning points.

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1. Anatomy - arterial normal and variant anatomy (high origin of radial/ulnar branches, duplicated segments, fetal remnants, palmar arch variants). 2. Technique - CT/MR/US/catheter angiography pearls and pitfalls (optimal positioning vs maneuvers to diagnose thoracic outlet obstruction or steal; optimal CT enhancement by contrast bolus shape/timing/radiation variations; contrast vs non-contrast MRA techniques; sonographic waveforms; arterial access considerations). 3. Pathology - Illustrative cases include trauma (iatrogenic vs non-iatrogenic - including hypothenar hammer syndrome), atherosclerosis and thromboembolism (including limb ischemia), vasculitis (including Raynaud syndrome), steal syndromes, thoracic outlet obstruction, as well as their manifestations (spasm, compression, aneurysm/pseudoaneurysm, dissection, rupture, occlusion, AV fistula).

VAEE-29 HOW TO CREATE HIGH-QUALITY ANGIOGRAPHIES OF THE PERIPHERAL RUNOFF USING THE PHOTON COUNTING DETECTOR CT: TIPS, TRICKS AND PITFALLS OF PROTOCOL SELECTION AND POST-PROCESSING

Philipp Gruschwitz, MD (*Presenter*)
Henner Huflage, MD (*Abstract Co-Author*)
Kristina Krompass, MD (*Abstract Co-Author*)
Jan-Lucca Hennes, MD (*Abstract Co-Author*)
Viktor Hartung (*Abstract Co-Author*)
Jan P. Grunz, MD (*Abstract Co-Author*)

TEACHING POINTS

This Educational is intended to summarize possible adaptations of scan protocols, image reconstruction settings and post-processing applications leading to image optimization of CT angiography using photon-counting CT (PCD-CT) and possibilities to upgrade suboptimal images to a diagnostic quality. The aim is to summarize the most relevant adjustment screws to improve peripheral PDC-CT angiography in clinical routine.

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The following modifiers and their influences will be explained: a) pitch factor; tube voltage and tube current settings b) PCD-CT scan mode (standard resolution vs. ultra-high resolution), collimation c) reconstruction kernel, slice thickness and pixel matrix d) "intrinsic" spectral imaging (PCD-CT) and virtual image reconstruction • virtual monoenergetic imaging for contrast agent reduction or correction of a lack of contrast • virtual native for bleeding detection or repeated administration of contrast agent • virtual calcium-free imaging for severe arteriosclerotic arteries e) quantum iterative reconstruction for optimization of contrast-to-noise ratio The influence of these parameters and the applied radiation dose on the measurable image quality parameters, in particular contrast-to-noise ratio and image noise, will be explained in more detail and illustrated with representative image comparisons.

VAEE-30 NAVIGATING THE WAVES OF TEMPORAL ARTERY DOPPLER: A RESIDENT'S GUIDE TO DIAGNOSING GIANT CELL ARTERITIS

Andres Guillermo Tarra Romero, MD (*Presenter*)
Laura M. Garcia Ramirez, BMedSc, BMedSc (*Abstract Co-Author*)
Jhan Fonseca, MD (*Abstract Co-Author*)
Julian Rodriguez Cely, MD (*Abstract Co-Author*)

TEACHING POINTS

Doppler ultrasound of the temporal arteries is recommended as the first-line imaging modality in patients with suspected temporal arteritis and cranial symptoms. Both superficial temporal arteries should be thoroughly examined in transverse and longitudinal planes, including their frontal and parietal branches. Spectral Doppler allows confirmation that the evaluated vessel is an artery rather than a vein. The persistence of a hypoechoic halo, despite compression of the temporal artery with the ultrasound probe—known as the compression sign—is a highly specific finding for giant cell arteritis (GCA). Temporal artery biopsy is considered the gold standard for

diagnosing GCA in suspected cases. In patients with a high clinical suspicion of GCA and a positive imaging test, the diagnosis can be established without the need for additional tests or biopsy.

TABLE OF CONTENTS/OUTLINE

Tabla de contenido. • Introduction. • Epidemiology. • Functional Anatomy. • Clinical approach. • Image Acquisition Protocol: Step-by-Step Ultrasound Approach. • Ultrasound Findings in Giant Cell Arteritis. • Advantages and Limitations of the Temporal Artery Doppler. • Take Home Messages. • Conclusions • Bibliography

VAEE-31 ULTRASOUND DIAGNOSTIC IMAGING IN LIPEDEMA: A GUIDE FOR THE RADIOLOGIST

Cibelle Melo, MD (*Presenter*)
Luara Boson, MD (*Abstract Co-Author*)
Estevao Vargas (*Abstract Co-Author*)
Thiago Lopes (*Abstract Co-Author*)

TEACHING POINTS

Lipedema is a chronic disorder characterized by symmetrical enlargement of painful, nodular, and fibrous adipose tissue, predominantly affecting the limbs while sparing the hands and feet. It is estimated to affect up to 10% of the female population, although its etiology remains unclear. Diagnosis is typically clinical, based on history and physical examination. However, ultrasound imaging of adipose tissue is a simple, reproducible method that assists in evaluating disease severity and monitoring progression or therapeutic response over time. Amato et al. established ultrasound thickness cut-off values for the diagnosis of lipedema in the lower limbs: 11.7 mm for the pretibial region, 17.9 mm for the thigh, and 8.4 mm for the lateral leg. The supramalleolar threshold was 7.1 mm, though diagnostic accuracy was lower at this site. Marshall et al. proposed an ultrasound-based classification for lipedema severity by measuring dermis and subcutaneous tissue thickness 6-8 cm above the medial malleolus: 12 to 15 mm, lipohyperplasia or mild lipedema; 15 to 20 mm, moderate lipedema; > 20 mm, indisputable lipedema; and > 30 mm, severe lipedema. In contrast, normal individuals typically measure approximately 2.1 mm at this location. This exhibit aims to present a practical ultrasound protocol for assessing lipedema, supported by representative imaging cases.

TABLE OF CONTENTS/OUTLINE

1. Overview of lipedema. 2. Ultrasound assessment protocol and key imaging findings. 3. Educational content with annotated images and flowcharts based on literature review. 4. Take-home messages.

VAEE-32 SPOTLIGHT ON IVC LEIOMYOSARCOMA: DIAGNOSTIC VALUE OF ADVANCED CT IMAGING

Zahra Rahmatullah, MD (*Presenter*)
Mohammad Yasrab (*Abstract Co-Author*)
Linda C. Chu, MD (*Abstract Co-Author*)
Satomi Kawamoto, MD (*Abstract Co-Author*)
Elliot K. Fishman, MD (*Abstract Co-Author*)

TEACHING POINTS

Leiomyosarcoma is a rare primary tumor of the inferior vena cava (IVC). An IVC leiomyosarcoma is challenging to diagnose on imaging as it can be confused with a thrombus, other primary IVC tumors, retroperitoneal masses, lymphomas, renal, adrenal or hepatic carcinomas. CT is pivotal in assessing its origin, invasion, metastasis and for surgical planning. Detection is dependent on scan protocols and both 2D CT (non-contrast, arterial and venous phase) and 3D CT imaging (volume rendering, maximum intensity projection, cinematic rendering) can help reach the diagnosis through various specific features. Early detection is critical due to potential for metastasis and poor prognosis.

TABLE OF CONTENTS/OUTLINE

Demographics and presentations of IVC leiomyosarcomas. Multiple case studies highlighting the various imaging characteristics of IVC leiomyosarcomas. How various CT techniques, including 2D and 3D imaging, can aid in distinguishing IVC leiomyosarcomas from other tumors with the help of case examples. Use of various CT techniques to follow and plan treatment for IVC leiomyosarcomas. Challenges when using CT to diagnose and follow IVC leiomyosarcomas.

VAEE-33 IMPORTANCE OF INVASIVE DIAGNOSIS IN THE PREPARATION OF PATIENTS FOR ANKLE RECONSTRUCTIVE SURGERY

Antonio Pulido Bonillo, MD (*Presenter*)

TEACHING POINTS

- Review the diagnostic utility of arteriography in the preoperative assessment of ankle reconstructive surgeries. - Illustrated anatomical analysis of the vascular supply to the tibiotalar joint and associated structures. - Descriptive review of lower limb angiographic examinations performed at our hospital under this indication.

TABLE OF CONTENTS/OUTLINE

Total ankle arthroplasty has experienced significant growth in recent years, driven by advancements in implant design that have improved durability and facilitated its adoption in a greater number of centers. Proper preoperative evaluation is essential to optimize outcomes and select ideal candidates for the procedure. In this context, diagnostic arteriography has become a key tool in surgical planning, as peripheral arterial disease has been identified as an independent risk factor for postoperative complications, including acute infection, the need for surgical debridement, and implant failure. Early detection of vascular abnormalities through invasive studies allows for the implementation of strategies to mitigate these risks. Moreover, the tibiotalar joint presents unique vascular characteristics that can be assessed through selective arteriography of the lower limb arteries. The talus, in particular, relies on a tripartite blood supply, whose preservation is essential to prevent complications that may compromise implant integration and affect the functional outcome of the prosthesis.

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M2-SPBR

Breast Imaging Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPBR-1 PREDICTIVE CAPACITY OF DKI-BASED HABITAT ANALYSIS FOR LYMPH NODE METASTASIS IN BREAST CANCER PATIENTS: A PRELIMINARY STUDY

Ziyi Mao (*Presenter*)
Hui Liu (*Abstract Co-Author*)
Haifa Liu (*Abstract Co-Author*)
Mengzhu Wang (*Abstract Co-Author*)
Yang Song (*Abstract Co-Author*)

PURPOSE

The aim of this study was to investigate the performance of first-order radiomics features derived from DKI-based habitat analysis in predicting the status of lymph node metastasis.

METHODS AND MATERIALS

This study included 45 patients with invasive ductal carcinoma of the breast, comprising 30 cases without lymph node metastasis (LNM) and 15 cases with LNM. All patients underwent 3.0T breast MRI with diffusion kurtosis imaging (DKI) using a single-shot spin-echo echo-planar imaging sequence (6 b-values: 0, 1200, 1600, 2000, 2400, and 3000 s/mm 2 ; repetition time (TR)/echo time (TE) = 6000/61 ms; field of view (FOV) = 340 × 180 mm 2 ; matrix size = 128 × 128). Mean diffusivity (MD) and mean kurtosis (MK) were calculated using the vendor-specific software (version 1.4.0). Volumes of interest (VOIs) were manually delineated on baseline b0 images using 3D Slicer (version 5.2.2). These three metrics of DKI were located in each voxel, and a consensus clustering (K-means) algorithm was applied to divide the tumor into subregions with different structural complexity and diffusion levels: subregion 1(MK moderate MD moderate), subregion 2(MK moderate MD high), subregion 3(MK high MD moderate), and subregion 4(MK low MD low). First-order radiomics features of these four subregions were then extracted using an in-house developed software and analyzed using Mann-Whitney U test, with significant features ($p < 0.05$) used to develop a logistic regression predictive model. The predictive performance was evaluated using the area under the receiver operating characteristic curve (AUC) and the calibration curve.

RESULTS

Significant features existed in MK moderate MD moderate and MK moderate MD high subregions between the two groups ($p < 0.05$). The logistic regression model demonstrated robust predictive performance, achieving an AUC of 0.856 (95% CI: 0.733-0.978), accuracy of 82.2%, sensitivity of 86.7%, specificity of 80.0% and F1-score of 76.5%. The calibration curve of the model exhibited satisfactory consistency between predicted and observed outcomes, supported by a Brier Score of 0.129 and a Hosmer-Lemeshow (HL) test statistic of 0.564 (? 2 =6.75, df=8).

CONCLUSION

This study shows that a DKI-MRI-based predictive model, leveraging radiomics features from MK moderate MD moderate and MK moderate MD high subregions, accurately discriminates lymph node metastasis in breast cancer, indicating its promise as a non-invasive diagnostic tool.

CLINICAL RELEVANCE/APPLICATION

This approach has substantial potential in clinical applications, aiding in early identification of metastatic risk and guiding personalized treatment strategies.

M2-SPBR-2 THE VALUE OF BREAST ULTRAFAST DCE-MRI IN DIAGNOSING AXILLARY LYMPH NODE METASTASIS IN MASS-TYPE INVASIVE DUCTAL CARCINOMA OF THE BREAST

Lijia Wang (*Presenter*)
Yang Li (*Abstract Co-Author*)
Qian Xu (*Abstract Co-Author*)
Feng Hui (*Abstract Co-Author*)
Haiyun Wang (*Abstract Co-Author*)
Wang Mengzhu (*Abstract Co-Author*)
Qi Wang, BSc (*Abstract Co-Author*)

PURPOSE

This study aimed to explore the relationship between preoperative ultrafast dynamic contrast-enhanced magnetic resonance imaging (UF-DCE MRI) parameters and axillary lymph node (ALN) metastasis in patients with mass-type invasive ductal carcinoma (IDC) of the breast. In addition, the study aimed to construct a nomogram model for predicting ALN metastasis.

METHODS AND MATERIALS

Preoperative UF-DCE MRI images and medical records of 96 IDC patients (38 with ALN metastasis, 58 without) confirmed by pathology were retrospectively analyzed. Conventional MRI features, UF-DCE MRI parameters, DCE parameters, and clinical features were evaluated. ROC curves and nomograms were constructed for univariate parameters and combined diagnostic efficacy.

RESULTS

Time to enhancement , time to peak after enhancement (TTP), and time to center of max. slope were significantly lower in the metastasis group (all p -values < 0.05). The tumor length was significantly smaller in the non-metastasis group ($p < 0.001$). TTP had the best diagnostic efficacy for lymph node metastasis, with an area under the curve (AUC) of 0.865 (CI: 0.794-0.937). A combined predictive model was constructed using Logistic regression with TTP, ADC value, and size, with an AUC of 0.919 (CI: 0.864-0.974). The nomogram indicated that metastasis probability = e score /1+e score , with a score = 0.70 * size - 2.49 * ADC - 0.03 * TTP + 3.78.

CONCLUSION

Multiple UF-DCE MRI parameters TTE, TTP, TMS could predict ALN metastasis in patients with mass-like IDC before surgery.The nomogram model combined with clinical and UF-DCE MRI parameters could better assist clinicians in making personalized treatment plans for patients.

CLINICAL RELEVANCE/APPLICATION

Preoperative multiparametric UF-DCE MRI could support the prediction of axillary lymph node metastasis in breast cancer, and combining the clinical features could help assess the risk of lymph node metastasis in breast cancer.

M2-SPBR-3 IMPROVED 3-YEAR BREAST CANCER RISK PREDICTION BY COMBINING ANATOMICAL NOISE POWER EXPONENT AND MIRAI: A LARGE CLINICAL STUDY

Yile Fang, PhD (*Presenter*)
Jiefei Wei (*Abstract Co-Author*)
Nathaniel D. Mercaldo (*Abstract Co-Author*)
Leslie Lamb, MD, MSc (*Abstract Co-Author*)
Kai Yang, PhD (*Abstract Co-Author*)

PURPOSE

Recent studies have shown breast parenchymal texture may reflect tissue-level risk for breast cancer. MIRAI is a deep learning (DL) model trained on screening mammograms to assess future breast cancer risk. This study aims to validate the anatomical noise power exponent (ß), derived from mammographic breast tissue texture, as an independent, quantitative biomarker for breast cancer risk and assess its incremental value when combined with MIRAI using a large clinical dataset.

METHODS AND MATERIALS

This study selected patients undergoing bilateral screening mammography at two sites (Oxford and Imperial) from the UK OPTIMAM mammography image database (OMI-DB). We included examinations that had the standard four-view 2D mammographic images and confirmed cancer status after 3 years. Women were included in the control group if they remained cancer-free for at least 3 years after screening, while into the target group with a confirmed breast cancer diagnosis within three years of screening. After quality control, the final cohort included 7,540 women (1,885 with cancer, 5,655 age-matched healthy control) with a total of 30,328 screening mammograms. A novel algorithm automatically segmented breast tissue regions and computed the anatomical noise power exponent ß, for each image as a single-value breast parenchyma descriptor. Each woman's 3-year cancer risk score was calculated via the MIRAI model. Six mathematical models were explored to combine MIRAI scores with ß, including logistic regressions and optimized weighted sums. Discriminative performance was assessed using odds ratios (OR)and receiver operator curve (ROC) analysis.

RESULTS

ß was significantly higher ($p<0.01$) for the cancer group (0.3088 ± 0.0057) as compared to the control group (0.3007 ± 0.0055). For every 0.1-unit increase in ß, the odds of breast cancer increased by 13.4% (OR=1.134, 95% CI: 1.110-1.158, $p <0.01$). ROC analysis yielded area-under-the-curve (AUC) values of 0.700 (95% CI: 0.687-0.714) for MIRAI alone. Among combination methods, the optimized weighted sum model (weight factor: 0.05) yielded the highest AUC (0.704, 95% CI: 0.691-0.718). These findings hold across clinical cancer subgroups, highlighting ß's potential as a robust, image-based cancer risk biomarker.

CONCLUSION

ß independently discriminates future breast cancer cases from controls and enhances 3-year breast cancer risk prediction when combined with MIRAI scores. The optimized weighted sum model provided the best predictive performance.

CLINICAL RELEVANCE/APPLICATION

Incorporating ß into existing DL-based risk prediction models like MIRAI can improve the accuracy of image-based breast cancer risk assessment, potentially leading to better patient stratification and targeted screening strategies.

M2-SPBR-4 USE OF AI CAD TO TRIAGE REAL-TIME VS OFFLINE READING OF SCREENING MAMMOGRAMS WITH SUBSEQUENT SAME-DAY AUTOMATED SCREENING BREAST ULTRASOUND (AUS)

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Jessica K. Peterson, MD (*Abstract Co-Author*)
Diamond Brunt (*Abstract Co-Author*)
Tuqa Asedi (*Abstract Co-Author*)
Lauren Clark, MS (*Abstract Co-Author*)
Lindsay Miner, MD (*Abstract Co-Author*)
Hannah L. Singhal, MD (*Abstract Co-Author*)

PURPOSE

To project how transitioning from full offline interpretation to AI CAD-driven triage of real-time vs offline interpretation of screening mammograms scheduled for subsequent same-day AUS would affect radiologist workflow in an academic breast imaging department.

METHODS AND MATERIALS

This retrospective review analyzed screening mammograms with same-day AUS from a single academic institution from 12/1/2023-11/30/2024. At the time of interpretation, nearly all exams were read offline. Screening mammogram BI-RADS assessment and AI CAD Transpara exam score (1-10) were collected. Exams were divided into projected real-time versus offline reading using differing Transpara exam score cutoffs, with scores less than the cutoff assigned to offline reading.

RESULTS

Among the 1,499 screening mammograms, 41 (2.7%) were assigned BI-RADS 0 assessment, requiring additional imaging evaluation, also known as a callback. Using a Transpara exam score cutoff of 8, 987 (65.8%) exams remained as offline interpretation. This would result in 15 (36.6%) callbacks not identified until after AUS was performed. Of the 512 (34.2%) mammograms transitioned to real-time interpretation, 26 (63.4%) callbacks would have been identified prior to performing AUS. Using a Transpara exam score cutoff of 9, 1,177 (78.5%) exams continued as offline interpretation, resulting in 22 (53.7%) callbacks needing diagnostic workup after AUS was performed. Of the 322 (21.5%) exams converted to real-time interpretation, 19 (46.3%) callbacks would have been identified prior to AUS. Using a Transpara exam score cutoff of 10, 1,337 (89.2%) exams stayed as offline interpretation, with 25 (61.0%) callbacks requiring further evaluation after AUS. Of the 162 (10.8%) exams changed to real-time interpretation, 16 (39.0%) callbacks would be identified prior to AUS.

CONCLUSION

Applying differing AI CAD score cutoffs results in variable degrees of real-time versus offline interpretation, with the lowest exam score cutoff resulting in the highest real-time interpretation rate and subsequent greatest number of callbacks identified prospectively. The cutoff for real-time versus offline interpretation could be customized to fit varying practice preferences.

CLINICAL RELEVANCE/APPLICATION

AI CAD can help prospectively triage screening mammograms needing real-time interpretation, to identify patients needing further evaluation before performing same-day AUS, ensuring proper exam utilization.

M2-SPBR-6 MULTIMODAL DEEP LEARNING TO PREDICT RISK OF FUTURE BREAST CANCER BASED ON SCREENING MRI FEATURES IN WOMEN WITH DENSE BREASTS

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Wesley Surento (*Abstract Co-Author*)
Yu-Tzu Kuo (*Abstract Co-Author*)
Isabella Li (*Abstract Co-Author*)
Daniel S. Hippe, MS (*Abstract Co-Author*)
Felipe Oviedo, PhD (*Abstract Co-Author*)
Habib Rahbar, MD (*Abstract Co-Author*)
Savannah C. Partridge, PhD (*Abstract Co-Author*)

PURPOSE

Breast cancer risk prediction models can help optimize screening strategies for earlier detection. Mammographic density is a widely accepted imaging marker that helps increase performance of risk models, but is non-specific since approximately half of US screening-aged women have dense breasts. Background parenchymal enhancement (BPE) on MRI is an emerging risk marker that may further refine risk stratification. Many state-of-the-art risk prediction models either utilize only image data or non-image clinical data. Combining multimodal data can improve model performance. This study aimed to refine the prior classification model into a multimodal risk prediction model utilizing both breast MR images and clinical data in women with dense breasts.

METHODS AND MATERIALS

After IRB approval, we retrospectively identified women with mammographically dense breasts who underwent high risk screening with breast MRI at our medical center (2005 to 2015), excluding those with prior breast cancer or contemporaneous breast cancer (diagnosed =12 months after MRI). Clinical data and cancer outcomes were extracted from the medical record and regional SEER cancer registry. Multimodal deep learning models to predict 5-year risk of breast cancer were constructed using three fusion strategies: probability, feature, and learned feature fusion. Deep learning model training data included subtraction maximum intensity projection (MIP) images from DCE-MRI, age, BPE, and density. We developed the model using grouped 5-fold cross validation and report mean performance across folds.

RESULTS

We identified 706 women (mean age 46 ± 11 years) with dense breasts who underwent screening MRI and met criteria for final analysis, of which 31 (4.4%) developed breast cancer (median 2.5 years after MRI, range 1 to 5 years). Multimodal deep learning with learned-feature-fusion-concatenation and feature-fusion strategies both achieved higher AUCs than the probability-fusion strategy (AUC 0.71, 0.70 and 0.56, respectively) for predicting 5-year risk of breast cancer. Deep learning models based on images only or clinical data only achieved lower performance than the top two fusion strategies (AUC 0.65 and 0.58, respectively).

CONCLUSION

Our results demonstrate that fusing of images and clinical data can boost risk model performance compared with using only one feature type in women with dense breasts. Different fusion strategies can also affect model performance, and the best strategy depends on characteristics of the dataset.

CLINICAL RELEVANCE/APPLICATION

This multimodal deep learning model could be deployed in clinical settings to complement traditional risk models that do not include MRI and aid physicians in assessing a patient's risk of developing a future breast cancer.

M2-SPBR-7 ACCESSING AI MAMMOGRAPHY REPORTS IMPACTS PATIENT FOLLOW-UP BEHAVIORS: THE UNINTENDED CONSEQUENCES OF INCLUDING AI IN PATIENT PORTALS

Elizabeth Song (*Presenter*)
Michael H. Bernstein, PhD (*Abstract Co-Author*)
Elizabeth H. Dibble, MD (*Abstract Co-Author*)
Ana P. Lourenco, MD (*Abstract Co-Author*)
Grayson L. Baird, PhD, MS (*Abstract Co-Author*)

PURPOSE

To investigate how follow-up behaviors are impacted by providing contextual information about an AI-interpreted imaging report in the patient portal regarding a hypothetical screening mammogram.

METHODS AND MATERIALS

English-speaking US women with 1+ prior mammogram were recruited via Prolific and randomized to one of thirteen conditions. All participants were shown a vignette asking them to imagine receiving a BI-RADS 1 (Negative) radiologist report from their patient portal. Participants in twelve conditions also received an AI report with one of four AI abnormality scores (not flagged: 0, 29; flagged: 31, 50) and 0-2 accompanying features (nothing; a only; a & b): (a) an abnormality cutoff threshold; (b) the AI tool's False Discovery Rate (FDR) or False Omission Rate (FOR). Participants indicated whether they would consider a lawsuit if a one-year follow-up found evidence of Stage 3 breast cancer. Secondary outcomes included hypothetical decisions regarding follow-up (e.g., second opinions), concern for breast cancer, and desire for additional imaging.

RESULTS

Participants (n=1,623) were more likely to consider a lawsuit when AI was (versus was not) provided, especially when AI abnormality scores were higher, $p<0.05$. However, for most AI abnormality scores, providing the cutoff threshold and FDR/FOR reduced lawsuit consideration relative to the AI abnormality score alone. Concern for breast cancer, desire for additional imaging, and follow-up requests (same radiologist, different radiologist, and ordering physician) increased as the AI abnormality score increased, though this was also often mitigated by providing the FDR (and sometimes FOR).

CONCLUSION

Disclosing AI feedback used for medical decision-making will impact patients' perceptions and behaviors pertaining to malpractice and follow-up.

CLINICAL RELEVANCE/APPLICATION

Best practices are needed to engage and inform patients about the application of AI tools in their care while minimizing its unintended consequences.

M2-SPBR-8 NAVIGATING THE DEBATE: INSIGHTS AND STRATEGIES ON REMOTE DIAGNOSTIC BREAST IMAGING FROM U.S. BREAST RADIOLOGISTS

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Brian N. Dontchos, MD (*Abstract Co-Author*)
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Jay R. Parikh, MD, FRCPC (*Abstract Co-Author*)
Hannah Milch, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the benefits and challenges of remote diagnostic breast imaging and propose strategies to optimize its use for radiologists, technologists, and patients.

METHODS AND MATERIALS

As part of a larger 43-question survey on remote breast imaging, breast radiologists with experience or knowledge of remote diagnostic breast imaging answered 11 multiple-choice and free-response questions. The survey was distributed to Society of Breast Imaging members (July 6-August 2, 2023). Descriptive statistics were used for multiple-choice responses, while free responses were systematically coded based on the thematic similarities.

RESULTS

Among 424 respondents (response rate: 13%, 424/3244), 40% (169/424) had experience with remote diagnostics. Of those with experience, most believed patients were either unaware of an in-person alternative (32%, 54/169) or preferred in-person exams (15%, 25/169). The majority (60%, 101/169) felt less effective at establishing patient rapport remotely, citing video calls (41%, 36/88) as the best communication method (Note: denominators vary due to skipped questions). Nearly half (48%, 81/169) felt remote work weakened rapport with technologists, suggesting strategies such as frequent communication (30%, 28/93), periodic in-person interactions (24%, 22/93), and strong communication skills (23%, 21/93). Most (63%, 74/117) relied on technologists to report physical exam findings, and when real-time scanning was needed, 53% (61/116) had patients return when a radiologist was on-site. Despite concerns—some calling it “malpractice” or “substandard care”—others saw remote diagnostics as valuable for improving patient access to fellowship-trained breast radiologists.

CONCLUSION

Remote diagnostic breast imaging remains controversial; while some radiologists view it as a valuable tool to expand access to fellowship-trained breast radiologists, others raise concerns about patient care quality, liability risks, and reduced effectiveness in building patient and technologist rapport. Respondents recommended strategies to optimize remote breast imaging, including frequent communication with technologists, periodic in-person interactions, strong interpersonal skills, and having patients return for real-time scanning when needed. Standardized guidelines incorporating these elements may improve outcomes for radiologists, technologists, and patients.

CLINICAL RELEVANCE/APPLICATION

Remote diagnostic breast imaging can expand access to specialized care but presents challenges in communication and clinical assessment. Enhanced training for technologists and strong collaborations between technologists and breast radiologists can optimize patient care in the setting of remote reading.
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Nov. 30 – Dec. 4
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M2-SPCA

Cardiac Imaging Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPCA-1 ASSOCIATION OF LEFT VENTRICULAR MYOCARDIAL STRAIN DERIVED FROM CARDIAC COMPUTED TOMOGRAPHY WITH ADVERSE CARDIAC EVENTS IN PATIENTS WITH SEVERE AORTIC STENOSIS

Jing Yi Xing (*Presenter*)
Hidenobu Takagi, MD, PhD (*Abstract Co-Author*)
Hideki Ota, PhD (*Abstract Co-Author*)
Kiyotaka Hao (*Abstract Co-Author*)
Jun Takahashi (*Abstract Co-Author*)
Kei Takase, MD, PhD (*Abstract Co-Author*)

PURPOSE

Severe aortic stenosis alters cardiac wall stress and structure, leading to left ventricular dysfunction, and increased mortality. Strain imaging quantifies myocardial deformation and aids in clinical assessment. This study evaluates the prognostic value of CT-derived left ventricular myocardial strain for risk stratification in patients with severe aortic stenosis.

METHODS AND MATERIALS

This single-center retrospective study included patients with severe aortic stenosis who underwent cardiac CT to assess TAVR eligibility from 2014 to 2023. Exclusion criteria were no valve replacement, missing baseline data, or incomplete CT images. All cardiac CT images were reconstructed at 10% intervals of the RR interval throughout the cardiac cycle (0-90%). CT strain was analyzed using research software (Ziostation REVORAS ver. 5.3.0.0; Ziosoft Inc. Tokyo, Japan). Left ventricular epi- and endo-myocardium were automatically segmented and manually corrected as needed. Myocardial strain was calculated using the feature-trucking method. Global radial (GRS) and circumferential strain (GCS) were calculated as the average of five short-axis plane from the base to the apex. Global longitudinal (GLS) was calculated as the average of long 2-, 3-, and 4-chamber views. The primary endpoint was major adverse cardiac events (MACE), defined as a composite of cardiovascular (CV) death or hospitalization due to heart failure (HF). Secondary endpoints were CV death and HF hospitalization. Cutoff values for peak GRS, GCS, and GLS to discriminate MACE, based on the Youden index, were 28.4%, -15.0%, and -10.3%, respectively.

RESULTS

A total of 324 patients (mean age 83 ± 6 years, 104 [32%] male) were included. During a median follow-up of 1.3 years, 53 MACEs were observed. Reduced peak GLS was associated with MACE (hazard ratio [HR], 2.3; 95% confidence interval [CI], 1.3-4.1; p = 0.003), while GRS (HR 0.89 [95% CI 0.5-1.6]; p = 0.70) and GCS (HR 0.96 [95% CI 0.5-1.6]; p = 0.90) were not. After adjusting for age, sex, STS risk score, left ventricular ejection fraction, presence of coronary artery disease, and history of myocardial infarction, these results remained (HR [95% CI] of GLS, 2.2 [1.1-4.6]; GRS, 0.67 [0.3-1.3], and GCS, 0.71 [0.3-1.3], respectively). The association between peak GLS and MACE was primary driven by HF hospitalization (adjusted HR 2.5 [95% CI 1.1-6.2]), not CV death (adjusted HR 1.4 [95% CI 0.4-4.8]).

CONCLUSION

CT-derived GLS independently predicts heart failure events in patients with severe aortic stenosis, offering incremental prognostic value beyond traditional biomarkers.

CLINICAL RELEVANCE/APPLICATION

GLS from routine pre-TAVR cardiac CT may serve as a non-invasive biomarker for risk stratification and guide early clinical decision-making.

M2-SPCA-2 A LASSO-BASED MODEL FOR PREDICTING LATE RECURRENCE AFTER ATRIAL FIBRILLATION ABLATION AND ITS CLINICAL UTILITY

Xiaoyan Lei (*Presenter*)
Kehui Liu (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)
Xiaohua Zhang (*Abstract Co-Author*)
Shikuan Li (*Abstract Co-Author*)
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PURPOSE

Late recurrence (LR) following atrial fibrillation (AF) ablation compromises long-term therapeutic success. This study aimed to develop a straightforward, clinically applicable model utilizing pre-ablation clinical and laboratory data to identify individuals at elevated risk of LR and inform personalized follow-up strategies.

METHODS AND MATERIALS

A retrospective analysis was conducted on 168 patients (73.2% male) who underwent radiofrequency ablation for AF between January 2020 and October 2024. Data collected included demographic factors (e.g., age, BMI), comorbidities, and laboratory indicators (e.g., NT-proBNP, HbA1c, CRP). LR was defined as atrial arrhythmia lasting =30 seconds and occurring beyond 90 days post-procedure. Participants were randomly divided into training and testing cohorts in a 7:3 ratio. Initial variable screening involved Mann-Whitney U and chi-square tests, followed by univariate logistic regression. Key predictors were selected through least absolute shrinkage and selection operator (LASSO) regression. Model performance was assessed via receiver operating characteristic (ROC) analysis and decision curve analysis (DCA).

RESULTS

Out of the total cohort, 56 patients (33.3%) experienced LR. The final model incorporated three predictors: early recurrence post-ablation, HbA1c =6.0 %, and BMI >25 kg/m². The model achieved robust discriminative ability, with an AUC of 0.809 (95% CI: 0.723-0.888) in the training set, and an AUC of 0.824 (95% CI: 0.695-0.941) in the testing set. Sensitivity and specificity were 89.7% and 61.5% in training, and 76.5% and 82.4% in testing, respectively. Optimal cutoff points were 0.272 and

0.313, yielding Youden indices of 0.513 and 0.588. DCA demonstrated clear clinical benefit when predicted LR risk fell between 15% and 35%, with the model potentially reducing unnecessary interventions by up to 70.6% in the test cohort while preserving the identification of high-risk patients.

CONCLUSION

A concise, three-variable model incorporating early recurrence, elevated HbA1c, and increased BMI effectively forecasts late recurrence after AF ablation. It presents a practical framework for risk stratification and tailored follow-up. Future validation through prospective, multicenter research is warranted, with potential for model enhancement via integration of imaging or novel biomarkers.

CLINICAL RELEVANCE/APPLICATION

This model underscores the value of metabolic assessment and early recurrence detection in post-ablation care, offering a data-driven approach to improve long-term outcomes in AF patients.

M2-SPCA-3 FEASIBILITY OF 2D-MULTISEGMENT LATE GADOLINIUM ENHANCEMENT COMBINED WITH ARTIFICIAL INTELLIGENCE RECONSTRUCTION DEEP LEARNING NOISE REDUCTION ALGORITHM

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Tsuyoshi Sugawara (*Abstract Co-Author*)
Jumpei Fujiwara, MD (*Abstract Co-Author*)
Jun Obara, MD (*Abstract Co-Author*)
Kunihiro Yoshioka, MD (*Abstract Co-Author*)

PURPOSE

Although 2D-single segmented late gadolinium enhancement sequences (2D-SSLGE) in which each myocardial slice is acquired during multiple heart beats and within a single breath-hold are considered the gold standard for LGE acquisition, they are time consuming. In 2D-multi segmented LGE sequences (2D-MSLGE), each slice is acquired in a single heart beat and the entire left ventricular stack is acquired in a few breath-holds. Recently, an artificial intelligence reconstruction deep learning noise reduction (NR) tool was developed in order to improve image quality and reduce scan time. The purpose of study is to assess the feasibility and comparison of 2D-MSLGE reconstructed with NR versus 2D-SSLGE reconstructed with NR.

METHODS AND MATERIALS

Between September 2023 and November 2024, a total of 60 patients (39 [65%] men, mean age 58 ± 17 years, body surface area 1.7 ± 0.2 m 2) with suspected cardiomyopathy at Iwate Medical University Hospital were prospectively enrolled. LGE imaging was performed using a 1.5 T scanner (SIGNA Artist, GE HealthCare) 10 min after the injection of contrast agent. 2D-MSLGE reconstructed with NR was performed just before 2D-SSLGE reconstructed with NR. Subjective overall image quality was evaluated using a 5-point Likert scale (1, poor, 2, fair, 3, moderate, 4, good, 5 excellent) that overall image impression. The visibility of artifacts (1, severe image artifacts, 2, moderate to severe image artifacts, 3, moderate image artifacts, 4, mild image artifacts, 5, no image artifacts) was also scored. LGE mass was manually quantified using a semi-automated greyscale thresholding using a cut off value of 5 standard deviations.

RESULTS

The median actual time of acquisition of 2D-MSLGE reconstructed with NR (112 ± 44 s) was significantly reduced compared with 2D-SSLGE (515 ± 145 s, p = 0.001). Overall image quality of 2D-MSLGE reconstructed with NR (3.1 ± 0.6) was non-inferior compared with 2D-SSLGE reconstructed with NR (3.2 ± 0.8, p = 0.106). Image noise was significantly reduced in 2D-MSLGE reconstructed with NR (3.4 ± 0.6) compared with 2D-SSLGE reconstructed with NR (3.0 ± 0.8, p = 0.002). There was no significant difference for LGE mass between 2D-MSLGE reconstructed with NR (17.0 ± 10.6 %) and 2D-SSLGE reconstructed with NR (17.4 ± 11.2 %, p = 0.155).

CONCLUSION

The use of 2D-MSLGE reconstructed with NR would provide shorter scan times and accurate LGE in clinical settings.

CLINICAL RELEVANCE/APPLICATION

The application of NR reconstruction may represent a reliable approach to reach a robust diagnostic performance with 2D-MSLGE compared to standard 2D-SSLGE.

M2-SPCA-5 CLINICAL APPLICATION STUDY OF ECGLESS TECHNOLOGY IN CORONARY COMPUTED TOMOGRAPHY ANGIOGRAPHY

Yongwei Zhao (*Presenter*)

PURPOSE

To evaluate the clinical application value of ECGless technology in coronary computed tomography angiography (CCTA) and explore the feasibility of its widespread adoption.

METHODS AND MATERIALS

A randomized controlled trial was conducted, enrolling 30 patients with suspected coronary artery disease who were randomly divided into an ECGless group (n=15) and a conventional ECG-gated group (using prospective ECG-gated tube current modulation technique) (n=15). Both groups received iodinated contrast medium (Iopromide, 370 mgI/mL) administered at a flow rate of 5.0 mL/s with a total volume of 40-60 mL, followed by a 30 mL saline flush. Image quality was evaluated using a double-blind method, comparing subjective vascular segment scores, objective signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and dose-length product (DLP) converted to effective dose (ED).

RESULTS

No significant difference in BMI or heart rate were observed between the non-ECG-gated group and the conventional ECG-gated group (both P >0.05). Subjective evaluation of 15 vascular segments revealed significantly higher scores in the ECGless group compared to the conventional ECG-gated group (4.36±0.65 vs. 3.72±0.12, P<0.05). Objective analysis demonstrated significant improvements in the ECGless group for SNR in the left anterior descending artery (LAD) (16.99±11.2 vs. 10.9±3.2) and CNR in both the LAD (58.31±23.8 vs. 33±14.2) and left circumflex artery (LCX) (58.31±23.8 vs. 33±14.1) (all P<0.05). Although the effective dose in the ECGless group was slightly higher than that in the conventional ECG-gated group (4.16 mSv ± 0.74 vs. 2.9 ± 1 mSv), the difference was not statistically significant (P=0.65).

CONCLUSION

ECGless technology achieves high-quality coronary imaging during free breathing without ECG monitoring, controls radiation exposure, and streamlines workflows, showing particular promise for critically ill patients.

CLINICAL RELEVANCE/APPLICATION

The ECGless technology eliminates the need for ECG monitoring, overcoming the reliance of conventional coronary CT imaging on stable heart rates and breath-holding compliance. This innovation is particularly advantageous for critically ill patients (e.g., those with acute chest pain, heart failure, or inability to follow breathing instructions), enabling rapid acquisition of high-quality coronary images during free breathing. By streamlining workflows (avoiding electrode placement and ECG synchronization) and minimizing repeat scans due to motion artifacts, it accelerates diagnostic evaluation for urgent clinical decisions . Additionally, it reduces clinical risks and healthcare costs in critically ill populations while maintaining diagnostic reliability.

M2-SPCA-6 MYOCARDIAL FIBROSIS PREDICTS SUDDEN CARDIAC DEATH IN PATIENTS WITH HYPERTROPHIC CARDIOMYOPATHY AFTER CARDIAC ELECTRONIC DEVICE IMPLANTATION:INSIGHTS FROMCARDIOVASCULAR MAGNETIC RESONANCE IMAGING

Xinqiao Lian (*Presenter*)
Bingqi Fu (*Abstract Co-Author*)
Minjie Minjie, PhD (*Abstract Co-Author*)

PURPOSE

We aimed to determine whether the location, pattern, and quantification of myocardial fibrosis predicts sudden cardiac death (SCD) in Hypertrophic cardiomyopathy (HCM) patients after cardiac implantable electronic device (CIED) implantation.

METHODS AND MATERIALS

This study included HCM patients who completed cardiovascular magnetic resonance (CMR) and received CIED between June 2017 and January 2023, and followed up until January 2025. The primary outcome was SCD or SCD-equivalent events, defined as the composite of SCD, resuscitated cardiac arrest, sustained ventricular tachycardia or ventricular & 7;brillation, or appropriate ICD therapy (shock or anti-tachycardia pacing).

RESULTS

Eighty-eight patients were included (age 52.3 ± 15.3 years; 67.0% male). Over a median follow-up period of 38.1 months, 27 (30.6%) SCD events were recorded. Through multivariate Cox regression analyses, inferior wall involvement, transmural pattern of fibrosis, total fibrosis (TF), and gray zone fibrosis (GZF) were all significantly associated with SCD risk. Stepwise regression analyses identified the transmural fibrosis pattern (HR = 2.87, 95% CI: 1.10-7.46, P = 0.031) and gray zone fibrosis =18.91% (GZF 5SD =18.91%; HR = 2.89, 95% CI: 1.16-7.17, P = 0.022) as independent predictors of SCD risk. Incorporating both transmural fibrosis and GZF 5SD =18.91% into the HCM 5-year SCD risk model significantly improved predictive performance (AUC = 0.76, 95% CI: 0.62-0.90, P = 0.017; NRI = 0.72, P = 0.004; IDI = 0.08, P < 0.001).

CONCLUSION

Myocardial fibrosis with transmural pattern, and elevated GZF 5SD are potential predictors of SCD in HCM patients after CIED implantation and provide additional value to existing risk scoring system.

CLINICAL RELEVANCE/APPLICATION

HCM patients face increased risk of SCD, and myocardial fibrosis is predictive of ventricular arrhythmias. ICD can prevent SCD effectively, however, it was noted that only a small fraction of patients receiving ICD for primary prevention actually benefit from the device over its operational lifespan, while facing a high risk of receiving device-related complications, and inappropriate shock. Therefore, there remains a need to optimize SCD prediction. Through this retrospective cohort study of HCM patients with CIED implantation, we found that transmural fibrosis and gray zone fibrosis =18.91% are independent predictors of SCD risk. Incorporating both these two predictors into the HCM 5-year SCD risk model significantly improved predictive performance. This study provides new evidence to support a fibrosis phenotype-guided approach for refining ICD implantation strategies in HCM patients.

M2-SPCA-7 PROGNOSTIC UTILITY OF CORONARY CALCIFICATION IN THE CONSIDERATION OF UNDERLYING NON-CALCIFIED PLAQUE BURDEN

Parth Patel (*Presenter*)
Tyler Coombes (*Abstract Co-Author*)
Yashaswi Joshi (*Abstract Co-Author*)
Alexander R. van Rosendael, MD (*Abstract Co-Author*)
Ibrahim Danad (*Abstract Co-Author*)
Jisuk Park (*Abstract Co-Author*)
Kashif Shaikh (*Abstract Co-Author*)

PURPOSE

Coronary artery calcium (CAC) scoring is the backbone of cardiovascular (CV) risk assessment. Concurrently, calcium density is inversely related to adverse CV events, and non-calcified plaque volume (NCPV) has a strong link with adverse CV events and is the modifiable component of atherosclerosis. Novel AI-enabled quantitative computed tomography (AI-QCT) allows for more accurate quantification of NCPV. Treatments for coronary artery disease (CAD) transform plaque by increasing calcified plaque (CP) density and promoting stability, thus CAC based models may create opportunity for overestimation of risk for future CV events, while also underestimating risk when CAC is low or 0 and NCPV is high. Our primary aim is to assess the added prognostic value of CAC when the NCPV is known.

METHODS AND MATERIALS

A post-hoc analysis of patients with CAC scores and NCPV % by AI-QCT from the CONFIRM2 registry undergoing a clinically indicated coronary CT angiography. The primary endpoint was composite MACE (adjudicated death, myocardial infarction, cerebrovascular accident, site-reported congestive heart failure, unstable angina, or 90-day revascularization within a 3-year period). Secondary endpoints included all-cause death and myocardial infarction (MI).

RESULTS

2,394 patients (median age 58 years, 49.7% female) were evaluated. Risk factors for CAD included hypertension, hyperlipidemia, and smoking in 51%, 43.7%, and 15.7% of patients, respectively. Statin use was present in 37.8%. Regarding CAC scoring, 41.7% scored 0, 30.8% scored 1-99, 13.5% scored 100-299, 10.7% scored 300-999, and 3.2% scored =1000. MACE occurred in 121 patients (5%). MACE occurred at increasing rates of CAC scores, with 21 events occurring in those with a CAC of 0. NCPV demonstrated a linear relationship in events with increasing NCPV%, with the largest predictor of future events being a NCPV of >7.5%; these findings were consistent after adjusting for additional risk factors including age, sex, diabetes, hypertension, smoking, and hyperlipidemia (HR 7.8 (95% CI 4.12-14.76, p = 0.008) of MACE compared to all CAC categories (HR 1.03 up to 1.33 across all CAC category ranges). When utilizing the NCPV model, the addition of the CAC score did not improve the area under the operating curve (AUC) (p=0.061); however, when utilizing the CAC score based-model, addition of NCPV showed superiority and improved AUC compared to the CAC-only model (p=0.0002).

CONCLUSION

NCPV has independent prognostic utility when considered alongside CP burden and is a better predictor of MACE than CAC alone.

CLINICAL RELEVANCE/APPLICATION

NCPV improves risk prediction independent of CAC scores. When considering CV risk based on a CAC score, addition of NCPV could further guide treatment strategies.

M2-SPCA-8 4D CARDIAC QUANTITATIVE SUSCEPTIBILITY MAPPING WITH IMPROVED TEMPORAL-DIRECTION REGULARIZED RECONSTRUCTION

Dave Tailor (*Presenter*)
Gowtham Baskar (*Abstract Co-Author*)
Myat Pwint Thein (*Abstract Co-Author*)
Martin R. Prince, MD, PhD (*Abstract Co-Author*)
Yi Wang, PhD (*Abstract Co-Author*)
Alexey Dimov, PhD (*Abstract Co-Author*)
Keigo Kawaji, PhD (*Abstract Co-Author*)

PURPOSE

To implement and evaluate a 4D cardiac QSM framework that incorporates temporal regularization for phase-resolved susceptibility mapping, enabling physiologically accurate quantification of myocardial tissue magnetic properties.

METHODS AND MATERIALS

Cardiac QSM data from N=10 swine were acquired on a 3.0T Philips Ingenia system using a free-breathing, ECG-gated 4D multi-echo SPGR sequence (TR/TE = 16-20/2.1 ms, ?TE = 1.9 ms, 6-8 echoes, 1.25×1.25×5 mm resolution, 40 slices, CS-SENSE R = 3.5, 8-11 phases). Each dataset (7-11 phases, ~7 echoes/phase) underwent phase correction, noise normalization, IDEAL-based fat-water separation, and background field removal. Custom extraction of echo times and magnitude-phase pairs enabled 4D stacking. Local field maps (RDFs) were reconstructed via (i) 3D MEDI per phase and (ii) 4D MEDI with temporal continuity and sparsity constraints. Zero referencing used longissimus dorsi ROIs. RV/LV susceptibility was quantified from QSM-mDIXON overlays; heatmaps aided visualization.

RESULTS

Zero-referencing across N=10 subjects using longissimus dorsi ROIs demonstrated low inter-phase susceptibility variance (0.0001-0.002 ppm for 3D; 0.0004-0.002 ppm for 4D), confirming stability of the reference region. Mean and variance differences between 3D and 4D reconstructions were statistically non-significant (P=0.3-0.5), validating consistency across methods. Shapiro-Wilk tests confirmed normality for 4D reconstructions (W=0.96, p=0.7). RV/LV myocardial susceptibility quantification showed mean values of 0.131 ppm (RV) and 0.0082 ppm (LV) for 3D, and 0.149 ppm (RV) and -0.0026 ppm (LV) for 4D. The RV-LV difference increased from 0.123 ppm (3D) to 0.151 ppm (4D), surpassing previously reported QSM benchmarks (0.12 ppm). A paired t-test yielded a statistically significant enhancement of RV-LV susceptibility contrast with 4D temporal regularization (P=0.04). Visual inspections of QSM-mDIXON overlays confirmed anatomical accuracy of ROI delineations. Mean RV/LV values were extracted using a Python tool; t-tests compared reconstruction methods.

CONCLUSION

Temporally-regularized 4D cardiac QSM improved myocardial muscle delineation, yielding greater RV-LV contrast and consistent zero referencing compared to 3D. These results demonstrate its feasibility for quantitative cardiac muscle tissue and ventricular oxygenation assessment.

CLINICAL RELEVANCE/APPLICATION

4D temporally-regularized cardiac QSM enables non-invasive, quantitative assessment of myocardial oxygenation, supporting its potential as a biomarker for cardiac function and ischemic evaluation.4o

M2-SPCA-11 CARDIAC MAGNETIC RESONANCE STRAIN TRAJECTORY CHANGES IN LATE GADOLINIUM ENHANCEMENT NEGATIVE POPULATION OF DUCHENNE MUSCULAR DYSTROPHY AND ITS PREDICTIVE VALUE FOR THE OCCURRENCE OF LGE:A LONGITUDINAL STUDY

Ting Xu (*Presenter*)
Ziqi Zhou, MD,BMBCh (*Abstract Co-Author*)
Huayan Xu (*Abstract Co-Author*)

PURPOSE

Duchenne muscular dystrophy (DMD) is a common X-linked recessive muscle degenerative disease that leads to progressive cardiac complications, particularly myocardial fibrosis. Myocardial strain can sensitively reflect myocardial structural and functional abnormalities. This study aims to evaluate dynamic changes in myocardial strain and their predictive value for the occurrence of late gadolinium enhancement (LGE) in patients with DMD.

METHODS AND MATERIALS

This study retrospectively collected longitudinal data of DMD patients from August 2019 to December 2024, including cardiac magnetic resonance (CMR) parameters of DMD patients at baseline and at 1, 2, 3, and 4 years. Nonlinear mixed effects model and least square method were used to analyze and compare the changes of myocardial strain parameters in different subgroups. Cox proportional hazard model and survival curve were used to analyze the predictive value of myocardial strain parameters for LGE.

RESULTS

A total of 140 participants underwent multiple CMR examinations and were included in the analysis. Among them, 40 subjects (28.6%) had LGE. Rate of decline in basal radial strain (BRS) and basal circumferential strain (BCS) was faster in LGE+ than LGE- subjects (P<0.05), while other CMR and strain parameters were not significantly different. Patients with BRS lower than 36.81% were more likely to develop myocardial fibrosis.

CONCLUSION

LGE in DMD is related to the rate change of basal radial and circumferential strain. Early dynamic monitoring of radial strain, can be used to stratify the risk and timely intervene in DMD patients. By delaying the rate of strain reduction, the occurrence of myocardial fibrosis in this patient population may be reduced.

CLINICAL RELEVANCE/APPLICATION

The dynamic monitoring of myocardial strain can serve as a non-invasive early assessment tool for DMD patients, aiding in the identification of high-risk individuals who may develop myocardial fibrosis. Through early intervention, it is possible to delay the progression of myocardial fibrosis and the decline in cardiac function.

M2-SPCA-12 INCREMENTAL DIAGNOSTIC VALUE OF CT MYOCARDIAL PERFUSION AND CT-FFR FOR HEMODYNAMIC RELEVANCE OF CORONARY ARTERY DISEASE: A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS

Shan Huang, MD (*Presenter*)
Lu Zhang, MD (*Abstract Co-Author*)
Xinyuan Zhang (*Abstract Co-Author*)
Ran Sun (*Abstract Co-Author*)

PURPOSE

To compare the diagnostic performance of integrated coronary computed tomography angiography (CCTA) combined with CT-derived fractional flow reserve (CT-FFR) versus CCTA plus CT myocardial perfusion (CTP), as well as the combined use of CCTA, CT-FFR, and CTP for detecting hemodynamically significant coronary artery disease (CAD), using invasive angiography-derived fractional flow reserve (FFR) as the reference standard.

METHODS AND MATERIALS

A comprehensive literature search was conducted to identify studies published before March 31, 2025. Two reviewers independently screened and selected studies that compared the diagnostic performance of CCTA + CT-FFR, CCTA + CTP, and CCTA + CT-FFR + CTP for detecting hemodynamically relevant CAD, with invasive FFR as the reference standard. Data on true positives, false positives, false negatives, and true negatives were extracted to assess diagnostic accuracy. Pooled sensitivity, specificity, diagnostic odds ratios (DORs), and 95% confidence intervals (CIs) were calculated using a Bayesian network meta-analysis ANOVA model. Summary receiver operating characteristic (SROC) curves were constructed to compare the area under the curve (AUC) across modalities. Statistical analyses were performed using R Studio (v4.4.2) and STATA (MP v18.0).

RESULTS

A total of 19 studies with 1550 patients and 3959 vessels were finally included. A network plot illustrating direct comparisons among modalities is shown. Bayesian network meta-analysis revealed that the combination of CCTA + CTP + CT-FFR achieved the highest specificity (0.90 [0.85-0.93]), DOR (44.80 [20.54-83.57]), and superiority index (3.05 [1.00-5.00]). CCTA alone ranked highest in sensitivity (0.91 [0.86-0.94]), followed by CCTA + CT-FFR (0.84 [0.76-0.90]), CCTA + CTP + CT-FFR (0.82 [0.73-0.89]), and CCTA + CTP (0.80 [0.73-0.85]). The SROC analysis demonstrated that CCTA + CT-FFR + CTP yielded the highest AUC. Compared to CCTA alone, the addition of CTP, CT-FFR, or both increased specificity by 1.42-, 1.32-, and 1.5-fold, respectively, and improved overall diagnostic accuracy by 1.19-, 1.16-, and 1.25-fold.

CONCLUSION

The integration of CCTA with both CT-FFR and CTP demonstrated superior diagnostic performance for detecting hemodynamically significant CAD, as validated by invasive FFR. While CCTA alone exhibited high sensitivity, the addition of CT-FFR and/or CTP significantly enhanced specificity and overall diagnostic accuracy for functionally relevant CAD.

CLINICAL RELEVANCE/APPLICATION

Combining CCTA, CT-FFR, and CTP into a unified diagnostic strategy improves the identification of hemodynamically significant CAD, potentially reducing unnecessary invasive procedures and optimizing patient management.

M2-SPCA-13 ACCELERATED CARDIAC MRI WITH AI: A PARADIGM SHIFT IN IMAGING SPEED AND PATIENT TOLERANCE

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Macarena De Zan (*Abstract Co-Author*)
Enrique Sodor (*Abstract Co-Author*)
Carlos Capunay, MD (*Abstract Co-Author*)

PURPOSE

Artificial Intelligence (AI) in Cardiac Magnetic Resonance (CMR) through deep learning (DL)-based reconstruction, enables higher k-space under-sampling, allowing for acceleration rates of up to 12 times and scan time reductions of up to 83%. The aim of this study is to evaluate the impact of AI-driven deep learning (DL) reconstruction in CMR by comparing it to conventional balanced steady-state free precession (bSSFP) sequences in terms of scan duration, image quality, and patient experience.

METHODS AND MATERIALS

A total of 18 patients (12 men, mean age 46 years) underwent CMR on a 3T scanner using DL-based acceleration. The study included functional short-axis imaging of the whole heart and 2-, 3- and 4-chamber views, acquired with both AI-enhanced and conventional (C) sequences. Acquisition time, image quality, and functional parameters were compared. Image quality was assessed by two independent observers using a 5-point Likert scale. Interobserver agreement was measured using kappa coefficient (?). A control group of 18 patients undergoing conventional CMR was included to assess patient experience.

RESULTS

The most common clinical indications for CMR were suspected hemochromatosis, pectus excavatum, cardiomyopathy, atypical chest pain, and arrhythmia. Of the 18 patients, 10 had normal findings, while diagnoses included hypertrophic cardiomyopathy (n=3), paradoxical septal motion (n=3), hypertrabeculation (n=1), and adaptive myocardial changes due to athletic training (n=3). Scan time was significantly reduced with AI compared to conventional sequences. The mean acquisition time for functional imaging was 51 seconds with AI vs. 2 minutes 11 seconds with C sequences. The total scan time including breath-holds was 3 minutes with AI vs. 7 minutes with C imaging. Image quality was slightly higher with AI (mean Likert score: 4.1 vs. 3.9, $p > 0.05$). No significant differences were found between AI and C sequences in biventricular volumetric and functional parameters ($p > 0.05$), with excellent interobserver agreement (? = 0.9). Patient experience ratings strongly favored AI-driven imaging. In the AI group, 88% of patients rated the exam duration as short and 12% as very short. In contrast, 83% of the control group found the exam prolonged, while 16% rated it as normal.

CONCLUSION

AI-powered CMR enables faster acquisitions while maintaining diagnostic integrity and image quality. The substantial reduction in scan times significantly enhances patient experience, making CMR more feasible for non-cooperative patients or those with limited breath-hold capacity.

CLINICAL RELEVANCE/APPLICATION

As AI-driven imaging continues to evolve, it is expected to further improve workflow efficiency and broaden the clinical utility of cardiac MRI.

M2-SPCA-15 ASSOCIATION OF MAXIMUM PRINCIPAL STRAIN DERIVED FROM COMPUTED TOMOGRAPHY WITH ADVERSE CARDIAC EVENTS IN PATIENTS WITH SEVERE AORTIC STENOSIS

Jing Yi Xing (*Presenter*)
Hidenobu Takagi, MD, PhD (*Abstract Co-Author*)
Hideki Ota, PhD (*Abstract Co-Author*)
Kiyotaka Hao (*Abstract Co-Author*)
Jun Takahashi (*Abstract Co-Author*)
Kei Takase, MD, PhD (*Abstract Co-Author*)

PURPOSE

Three-dimensional maximum principal strain (MPS) represents a scalar metric derived from 3D strain tensor analysis, reflecting the largest local myocardial deformation in any direction. The aim of this study was to investigate the association between computed tomography (CT)-derived left ventricular (LV) MPS and adverse cardiac events.

METHODS AND MATERIALS

This was a single center, retrospective study, and included patients with severe aortic stenosis (AS) who underwent cardiac CT to assess eligibility for transcatheter aortic valve replacement between 2014 and 2023. Patients were excluded for incomplete transthoracic echocardiography or CT images, missing baseline clinical data, technical failure during imaging, or not undergone aortic valve replacement. All cardiac CT image data set were reconstructed at 10% intervals of the RR interval throughout the cardiac cycle (0-90%). MPS was analyzed using a prototype version of the software (Ziostation 2, Ziosoft Inc. Tokyo, Japan), Epi- and endo-myocardium of the left ventricle were automatically delineated and manually corrected if needed. LV segmental MPS was analyzed based on the 16-segment model, and global MPS was calculated as the average across all segments per patient. The optimal cutoff value of global peak LV MPS for discriminating MACE was derived using the Youden index. Patients were categorized into preserved (MPS =0.295) and reduced (MPS <0.295) myocardial strain groups based on MPS values. Primary endpoint was major adverse cardiac events (MACE) defined as a composite of cardiovascular (CV) death or hospitalization due to heart failure (HF). Secondary endpoints were each CV death or HF hospitalization.

RESULTS

A total of 331 eligible patients (mean age 83 ± 6 years, 108 [33%] male) were included. During a median follow-up of 1.3 years, 53 MACEs were observed. Reduced global peak MPS showed higher risk of MACE (hazard ratio [HR], 4.1 [95% confidence interval {CI}: 2.3-7.0, $p <0.001$), CV death (HR, 3.3 [95% CI: 1.3-8.4], $p = 0.01$), and HF hospitalization (HR 4.0 [95% CI: 2.0-8.3], $p <0.001$) compared with preserved MPS. After adjusting age, sex, LV ejection fraction, STS score, and history of myocardial infarction, reduced global peak MPS remained associated with MACE (HR: 4.0 [95% CI: 1.9-8.5], $p <0.001$), CV death (HR: 4.1 [95% CI: 1.2-13.3], $p =0.02$), and HF hospitalization (HR: 3.6; 95% CI: 1.5-9.0, $p = 0.01$).

CONCLUSION

Global peak LV MPS has prognostic value for adverse cardiac events after aortic valve replacement in patients with severe aortic stenosis.

CLINICAL RELEVANCE/APPLICATION

CT-derived MPS holds promise as a biomarker for stratifying adverse cardiac events in patients with severe AS who undergo aortic valve replacement. It may enhance risk assessment and guide patient management.
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M2-SPCH

Chest Imaging Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPCH-1 MACROVASCULAR BIOMARKERS FOR PERSONALIZED PREDICTION OF CHEMOTHERAPY RESPONSE IN LUNG CANCER

Xin Meng (*Presenter*)
Lucy Pu (*Abstract Co-Author*)
Emrah Duman, MD (*Abstract Co-Author*)
Jiantao Pu, PhD (*Abstract Co-Author*)
David Wilson (*Abstract Co-Author*)

PURPOSE

To evaluate whether individualized macrovascular features from pre-treatment CT scans can serve as novel imaging biomarkers for predicting response to neoadjuvant chemotherapy (NACT) in patients with non-small cell lung cancer (NSCLC), with the ultimate goal of supporting precision treatment planning.

METHODS AND MATERIALS

This retrospective study included 84 patients with NSCLC who underwent CT imaging before and after NACT. Advanced AI-based algorithms were employed to segment and quantify tumors and their surrounding macrovasculature. Tumor characteristics assessed included volume, mean and maximum diameter, solidness, and shape irregularity. Macrovascular metrics included vessel volume, number, and tortuosity, each normalized by tumor size to isolate vascular contributions. Treatment response was defined as a =30% reduction in mean tumor diameter, aligning with RECIST 1.1 criteria and optimized for robust, automated measurement. Univariate logistic regression was used to evaluate associations between imaging features and response to NACT. Multivariable models integrated tumor and vascular features. Predictive performance was assessed using the area under the curve (AUC), with 5-fold cross-validation to ensure generalizability.

RESULTS

Among the vascular features, vessel volume emerged as a significant predictor of partial response ($p = 0.013$). Vessel number and tortuosity also demonstrated predictive value, albeit with lower statistical significance. The AUCs were: vessel volume 0.70 (95% CI: 0.59-0.82), vessel number 0.65 (CI: 0.54-0.77), and tortuosity 0.62 (CI: 0.50-0.74). A combined vascular model improved the AUC to 0.77. Tumor features alone achieved an AUC of 0.72, while integration of tumor and vascular features significantly boosted predictive performance to an AUC of 0.81 (95% CI: 0.70-0.89, $p < 0.01$). Although clinical covariates (e.g., gender, lesion type, time interval between pre-NACT and post-NACT within each lesion) were modestly associated with response, they were less predictive than imaging-derived biomarkers.

CONCLUSION

Quantitative macrovascular features extracted from routine pre-treatment CT scans, especially vessel volume and tortuosity, provide meaningful, individualized biomarkers for predicting response to NACT in NSCLC. Their combination with tumor morphology enhances predictive accuracy and holds strong potential for guiding personalized treatment decisions.

CLINICAL RELEVANCE/APPLICATION

Integrating CT-derived macrovascular biomarkers with tumor features offers a non-invasive approach to predict chemotherapy response in NSCLC, helping clinicians tailor treatment plans and avoid unnecessary toxicity in non-responders.

M2-SPCH-3 3D REGION-GROWING NNU-NET OUTPERFORMS 2D MODELS IN AUTOMATED DETECTION AND CLOT-VOLUME QUANTIFICATION OF ACUTE PE

Angela Ammirabile, MD (*Presenter*)
Ezio Lanza, MD (*Abstract Co-Author*)
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Riccardo Levi (*Abstract Co-Author*)
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PURPOSE

To identify the optimal nnU-Net model configuration for automated detection and volumetric quantification of acute pulmonary embolism (PE) on CTPA, by comparing 2D, 2D + region-growing, and 3D + region-growing architectures.

METHODS AND MATERIALS

We retrospectively curated 9,715 CTPA studies from 2015-2024 at our center, isolating 1,151 exams with clot volume > 800 µL. Two radiologists confirmed 874 PE-positive and 339 PE-negative cases. From these, 437 studies (195 central PE, 158 peripheral PE, 84 negative) formed the training set. Three nnU-Net models were trained: Model A 2D segmentation Model B 2D + 5-pixel region-growing Model C 3D + 5-pixel region-growing All models were tested on the external RSPECT-RSNA dataset. Performance metrics (accuracy, sensitivity, specificity, AUROC) were computed at two thresholds: (1) ROC-derived optimal cutoff; (2) any detectable thrombus. Secondary analyses assessed correlations between predicted blood clot volume (BCV), survival, and major adverse cardiovascular/cerebrovascular events (MACE)

RESULTS

At ROC-optimal cutoffs, Model C outperformed Model A/B: internal accuracy 87.2% (sensitivity 94.4%, specificity 75.3%, AUROC 0.909) versus A 70.9%/0.784 and B 70.8%/0.816; external accuracy 82.3% (sensitivity 41.9%, specificity 98.5%, AUROC 0.868) versus A 79.0%/0.843 and B 78.0%/0.846. With zero-threshold, sensitivity rose (A 91.8%, B 92.0%, C 83.6%) but specificity fell (A 44.3%, B 46.1%, C 77.9%). No significant correlation was found between BCV (continuous or > 800 µL) and survival, MACE, or stroke ($p > 0.05$). An inverse correlation emerged between tumor presence and survival ($r = -0.258$; $p < 0.0001$).

CONCLUSION

A 3D nnU-Net augmented with region-growing (Model C) delivers superior accuracy and AUROC for acute PE detection and volumetry compared to 2D configurations. Threshold selection mediates a trade-off between sensitivity and specificity, with zero-threshold favoring high sensitivity. BCV alone did not predict clinical outcomes in this cohort.

CLINICAL RELEVANCE/APPLICATION

In the quest to achieve—or even surpass—expert radiologist accuracy in PE detection and quantification, developers should prioritize a 3D nnU-Net architecture with region-growing, as it demonstrated the highest diagnostic performance and is thus the most accurate configuration for clinical-grade AI tools.

M2-SPCH-4 DEVELOPMENT AND VALIDATION OF AUTOMATIC DETECTION MODEL OF ESOPHAGEAL FOREIGN BODIES BASED ON CT IMAGES: A MULTICENTER STUDY

Ouyang Zhiqiang, MD (*Presenter*)

PURPOSE

An automatic detection model of esophageal foreign bodies in CT images based on deep learning is developed to solve the problems of low detection rate of tiny foreign bodies and transparent foreign bodies and insufficient prediction ability of complications by traditional methods.

METHODS AND MATERIALS

A total of 1495 patients with suspected esophageal foreign bodies were enrolled in 4 medical centers in China (2020-2025). Based on their plain CT images of neck and chest, the improved 3D U-Net architecture is adopted, and the multi-scale feature fusion module and attention mechanism are integrated to realize the automatic segmentation of esophagus and the dual-path analysis of foreign body density, spatial location and complications. The labeling of training set includes the location, shape, volume and complications (perforation and mediastinal inflammation) of foreign bodies. The internal verification is cross-contrast (model vs. traditional threshold method vs. primary doctors reading films), and the external verification is carried out in two independent medical institutions. At the same time, the prediction efficiency of the model for complications such as esophageal perforation and mediastinal abscess is evaluated.

RESULTS

Detection efficiency: The sensitivity of the model to sharp foreign bodies is 94.2%(95%CI:91.5-96.3%), and the specificity is 92.7% (89.8-94.9%), which is significantly better than the traditional threshold method (76.4%) and the primary physician (82.3%). The accuracy rate was 91.4% when the foreign body volume was more than 2 cm, and decreased to 83.6% when it was less than <0.5cm³, but it was still higher than that of the artificial group (71.2%). Prediction of complications: AUC of esophageal perforation was 0.891 (detection rate was 87.9%) and AUC of mediastinal inflammation was 0.832 (79.3%), which was better than the simple imaging evaluation reported in the literature.

CONCLUSION

Generally speaking, CT image analysis based on deep learning can significantly improve the diagnostic efficiency of esophageal foreign bodies, reduce the missed diagnosis rate (especially for tiny foreign bodies and transparent foreign bodies), and have the ability to dynamically predict the risk of complications.

CLINICAL RELEVANCE/APPLICATION

Primary medical application: the model can replace inexperienced doctors to read films in resource-limited scenes, reducing the utilization rate of invasive examinations such as endoscopy.Optimization of emergency intervention: by predicting the risk of complications (such as perforation and aortic fistula), we can assist in formulating graded treatment plans and reduce the incidence of operation-related esophageal fistula.

M2-SPCH-7 OPPORTUNISTIC SCREENING OF FRAILTY FROM CHEST RADIOGRAPHS AND PREDICTING SURVIVALS IN ELDERLY

Namkug Kim, PhD (*Presenter*)
Seungjoo Park (*Abstract Co-Author*)
Ki Duk Kim, MD (*Abstract Co-Author*)
Sangah Park (*Abstract Co-Author*)
Sunghwan Ji (*Abstract Co-Author*)

PURPOSE

To develop and validate an Inception-v3 deep learning model for age regression and frailty classification using chest X-rays from a tertiary hospital cohort and evaluate the model’s clinical utility by applying it to survival analysis in an independent health screening population.

METHODS AND MATERIALS

We retrospectively collected 99,485 posterior-anterior chest X-rays (PA CXR) from 68,341 patients aged =50 years with Clinical Frailty Scale (CFS) records at a tertiary hospital. The dataset was randomly split 8:2 for training and test; the training set was further divided 7:3 for training and validation. An Inception-v3 model was first trained for age regression, then fine-tuned for binary frailty classification using 1,359 chest X-rays from patients who underwent comprehensive geriatric assessment. External validation used a separate health screening cohort of 5,932 individuals aged =65 screened between 2014 and 2018 at the same center but from a distinct population. All-cause mortality was ascertained using National Health Insurance eligibility status. Frailty status in the screening cohort was assigned by the fine-tuned model. Cox regression adjusted for age and sex was used to estimate hazard ratios (HRs) with 95% confidence intervals (CIs).

RESULTS

The age regression model achieved a mean absolute error (MAE) of 4.23 ± 5.32 and a root mean square error (RMSE) of 5.38 on the test set, which was obtained from the 8:2 split of the original dataset. The frailty classification model showed an accuracy of 0.763 and an area under the curve (AUC) of 0.763.A total of 173 patients were grouped as frail and 417 participants died during a median follow-up of 8.7 years. CXR predicted frailty was associated with higher mortality according to the Kaplan-Meier curves. Frail group showed higher all-cause mortality (HR: 1.84, 95% CI: 1.29-2.61, P -value<0.001) even after the adjustment for age and sex. Age per year (HR: 1.15, 95% CI: 1.13-1.17, P -value<0.001) and male sex (HR: 1.66, 95% CI: 1.35-2.05, P -value<0.001) were also associated with higher mortality.

CONCLUSION

A deep learning model using PA CXR demonstrated robust performance in both age and frailty prediction. When applied to an external health screening cohort, the model effectively stratified patients into frail and non-frail groups, revealing significant differences in survival probability between the groups.

CLINICAL RELEVANCE/APPLICATION

Deep learning predicted frailty from CXR was associated with higher mortality in the elderly. These findings suggest that opportunistic screening of frailty from routine CXR may provide valuable prognostic information for mortality and patients who needs close observation.

M2-SPCH-9 AN AI-BASED SYSTEM FOR AUTOMATIC EVALUATION OF THE TECHNICAL QUALITY OF CHEST X-RAY IMAGES

Ali Akhavi Milani (*Presenter*)

PURPOSE

To develop an AI-based system capable of automatically evaluating the technical quality of chest X-ray (CXR) images upon acquisition and provide feedback to radiographers to enable corrective measures.

METHODS AND MATERIALS

We developed a deep learning model using a convolutional neural network (CNN) architecture trained on a curated dataset of labeled CXR images. The quality control criteria included positioning, exposure, inspiration level, and presence of artifacts. This project involved the evaluation of 4,000 CXR images acquired in the [blinded] imaging center in Tabriz, Iran. The images were assessed by two experienced radiologists, each with more than 10 years of experience in reading chest X-rays. The radiologists labeled the images with categorical and numerical labels for quality control attributes. A convolutional neural network (CNN) was then trained on these labeled images to detect and classify the mentioned quality attributes. The model's performance was evaluated using accuracy, precision, and area under the curve (AUC) metrics.

RESULTS

The AI system demonstrated moderate to high performance across multiple quality metrics, achieving an AUC of 0.86 for detecting improper positioning, 0.94 for improper exposure, 0.88 for poor inspiratory effort, and 0.86 for identifying motion artifacts.

CONCLUSION

Our AI-driven CXR quality assessment tool offers an accurate, and scalable solution for quality control in radiography.

CLINICAL RELEVANCE/APPLICATION

By automatically assisting the quality of CXR images, it is possible to improve diagnostic reliability, reduce repeat imaging, and enhance workflow efficiency.

M2-SPCH-10 THYMIC EPITHELIAL TUMORS: DISCRIMINATIVE AND PROGNOSTIC CT FEATURES

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Margaret Lin, MD (*Abstract Co-Author*)
Tomonori Chikasue (*Abstract Co-Author*)
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Jun Akiba (*Abstract Co-Author*)
Gerald Berry, MD (*Abstract Co-Author*)
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PURPOSE

To identify features of thymic epithelial tumors (TET) on computed tomography (CT) that can differentiate between histologic subtypes and predict outcome.

METHODS AND MATERIALS

This retrospective study enrolled 240 consecutive patients with pathologically-proven TET and pretreatment CT scans at two institutions located in Japan and the United States. CT scans were independently reviewed by two fellowship-trained chest radiologists blinded to clinical and pathologic data. Twelve CT features of tumors were assessed including margin, attenuation, contrast-enhancement ratio, mediastinal location, presence of vascular invasion, and metastatic disease. Interobserver agreement was calculated using kappa statistics. Logistic regression was used to identify CT discriminators of histologic subtypes and a weighting score model was constructed using partial regression coefficients (ß) of significant features. Recurrence-free survival (RFS) was evaluated using Kaplan-Meier and Cox regression analyses.

RESULTS

The study population consisted of 105 male and 135 female patients with a median age of 64 years (IQR: 52.8-70.0) and a median follow-up period of 46 months (IQR: 22-74). TET cases consisted of 122 low-risk thymomas (type A, AB, B1, and micronodular), 79 high-risk thymomas (B2 and B3), and 39 thymic carcinomas, including neuroendocrine neoplasms. Interobserver agreement in evaluation of CT features was substantial with a mean kappa of 0.61 (range, 0.38-0.93). On multivariate analysis, non-smooth margins (ß = 2.1, p = 0.04), heterogeneous attenuation (ß = 1.1, p = 0.04), and visceral compartment involvement (ß = 2.3, p < 0.001) were found to be independent predictors of thymic carcinoma with an AUC of 0.79 (95% CI: 0.71-0.87). Kaplan-Meier analysis showed that tumors with an epicenter in midline and those located above the aortic arch were associated with significantly lower RFS (p = 0.006 and p < 0.001, respectively). Tumor location above the aortic arch was found to be an independent negative predictor of RFS (hazard ratio = 4.9, p = 0.002).

CONCLUSION

A simple and reproducible CT model incorporating three specific imaging features can be used to effectively discriminate between thymic carcinoma and thymoma. Determination of the mediastinal location of TET can also provide prognostic information.

CLINICAL RELEVANCE/APPLICATION

This CT-based model can be used as a practical tool to aid in TET histologic subtype classification and prediction of survival. Our study is the first to identify tumor location above the level of the aortic arch as a useful imaging biomarker in prediction of TET recurrence.

M2-SPCH-12 ENHANCING PREOPERATIVE PREDICTION OF LYMPH NODE METASTASIS IN CT1 SOLID NSCLC WITH CT-BASED RADIOMICS

Fan Liu (*Presenter*)
LU XIAO YAN (*Abstract Co-Author*)
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Yicai Zhang (*Abstract Co-Author*)
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Huaxin Li (*Abstract Co-Author*)
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Ying Liu (*Abstract Co-Author*)

PURPOSE

This study aimed to develop and validate a contrast-enhanced computed tomography (CECT)-derived standardized radiomics model for predicting lymph node metastasis (LNM) in cT1 solid NSCLC, while systematically comparing its diagnostic performance against alternative radiomics approaches, clinical model, and standalone radiological evaluation of lymph node status.

METHODS AND MATERIALS

A total of 686 NSCLC patients from two hospitals were retrospectively enrolled and allocated into training, internal validation, and external validation cohorts. Radiomics features were extracted from three distinct volumes of interest (VOIs), comprising two tumor-associated VOIs (one delineating the entire tumor on plain CT and another on CECT), along with a VOI capturing the descending aorta across five consecutive axial slices on CECT at the left pulmonary artery trunk level. Standardized radiomics features were obtained by calculating the ratio of radiomics features between tumor region and the descending aortic region. All radiomic features were normalized using the z-score method, followed by further feature selection utilizing the Recursive Feature Elimination (RFE) algorithm. Three radiomics models (Plain CT radiomics model, CECT radiomics model and standardized CECT radiomics model) along with a clinical model were developed through logistic regression analysis employing tenfold cross-validation. Model performance was evaluated by area under curve (AUC), accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

RESULTS

The standardized CECT radiomics model demonstrated superior predictive performance for LNM when compared to both CECT and Plain CT radiomics models across all cohorts, and the clinical-radiomics model integrating CEA with standardized CECT radiomics signature outperformed clinical model and imaging-based lymph node assessments, with AUCs of 0.783 (95% CI, 0.735-0.832), 0.772 (95% CI, 0.691-0.854), and 0.802 (95% CI, 0.701-0.904), in the training, internal validation, and external validation cohorts, respectively.

CONCLUSION

The standardized CECT radiomics model effectively predicts preoperative LNM in cT1-stage solid NSCLC patients, offering potential to guide clinical decision-making and facilitate personalized therapeutic strategies.

CLINICAL RELEVANCE/APPLICATION

The clinical-radiomics model surpassed conventional radiological interpretation paradigms and traditional clinical model in diagnostic performance, establishing a robust quantitative methodology for non-invasive preoperative stratification of patients with high-risk LNM.

M2-SPCH-13 CT ANGIOGRAPHIC ASSESSMENT OF PULMONARY EMBOLISM: IS THE RELATIONSHIP BETWEEN PULMONARY OBSTRUCTION INDEX AND PULMONARY VEIN METRICS A PROGNOSTIC FACTOR

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PURPOSE

In this study, we aimed to evaluate the associations between the pulmonary artery obstruction index (PAOI) and pulmonary vein (PV) metrics on Computed Tomography Pulmonary Angiogram (CTPA) in patients with pulmonary thromboembolism (PE) and their potential role in predicting hemodynamic compromise and short-term outcomes in patient affected with acute pulmonary thromboembolism.

METHODS AND MATERIALS

This retrospective, single-center study included adults with CTPA-confirmed PE between January 2022 and 2024. Two blinded thoracic radiologists measured the PAOI, PV diameter, and cardiac metrics. Statistical analyses included nonparametric tests, Spearman correlation, and multivariable logistic regression, with significance at $p < 0.05$.

RESULTS

A total of 250 participants (median age 59.5 years (62 men, 68 women) in PE patients and 64.0 years (57 men, 63 women) in controls) were evaluated. The right and left PAOIs were significantly greater in the PE patients than in the controls ($P<0.0001$). The right superior and inferior PVs were narrower in patients ($P=0.005$ and $P=0.015$, respectively), whereas the left PV diameters did not differ significantly ($P>0.3$). The left pulmonary artery diameter was modestly greater in these patients ($P=0.011$). According to the subgroup analysis, the PAOI values and PV diameters varied significantly with the embolus distribution ($P<0.004$). In the unilateral PE group, the ipsilateral veins were significantly smaller than those in the contralateral and control groups ($P<0.0001$). The right superior PV diameter was reduced in nonsurvivors ($P=0.013$) but was not independently associated with short-term mortality after adjustment ($P=0.22$)

CONCLUSION

In acute PE, PAOI is significantly associated with a reduced ipsilateral PV diameter, particularly on the right side. Although PV metrics cannot predict short-term mortality independently, they may be valuable in composite risk model.

CLINICAL RELEVANCE/APPLICATION

This study offers strong evidence that embolic obstruction leads to a measurable reduction in the PV caliber on the affected side, but the contralateral veins remained comparable to controls. This suggests that PV narrowing was specific to the obstructed lung rather than reflecting a global or systemic process. The strength of negative correlation between PAOI and ipsilateral PV diameter suggests that clot burden and venous remodeling occur along a continuum, offering potential clinical value in semi quantitative imaging assessments. Smaller right SPV diameters may flag higher-risk patients initially. They are not independent predictors of death but has potential role in composite risk models.

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M2-SPER

Emergency Radiology Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPER-1 COST-EFFECTIVENESS OF CT PERFUSION, LOW-FIELD MRI, AND OBSERVATION OR TRANSPORT TO HIGH-FIELD MRI FOR EVALUATION OF PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT WITH DIZZINESS

Kyle Tegtmeyer, MD (*Presenter*)
Ramtin Hajibeygi (*Abstract Co-Author*)
Mobina Fathi (*Abstract Co-Author*)
Amirali Aali (*Abstract Co-Author*)
Long H. Tu, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the cost-effectiveness of alternative neuroimaging strategies, CT perfusion (CTP), low-field portable MRI, and observation or transport to high-field MRI, for assessing dizziness in emergency department (ED) patients when immediate access to high-field MRI is unavailable.

METHODS AND MATERIALS

A Markov decision-analytic model was developed using a healthcare system perspective to simulate lifetime costs and quality-adjusted life years (QALYs) for six imaging strategies: non-contrast head CT, head and neck CTA, CT perfusion added to CT and CTA, low-field portable MRI, observation for high-field MRI, and interfacility transport for high-field MRI. The model incorporated differential costs, diagnostic sensitivities, and long-term stroke outcomes. Deterministic and probabilistic sensitivity analyses assessed the robustness of findings, with results expressed as incremental cost-effectiveness ratios (ICERs).

RESULTS

Observation for high-field MRI was the most cost-effective strategy, yielding an incremental gain of 0.42 QALYs at an incremental cost of US$13,783 compared to non-contrast head CT. CT perfusion added minimal incremental QALYs (0.02) at an additional cost of US$1,052, thus dominated by extension. Portable MRI ranked third in cost-effectiveness, outperforming CTA and CT alone but less effective than observation or transport to high-field MRI. Sensitivity analyses consistently supported these results across various parameter adjustments, with the best-case analysis confirming observation for high-field MRI as consistently cost-effective even under the most favorable conditions for alternative strategies.

CONCLUSION

Admission for observation with subsequent high-field MRI provides superior cost-effectiveness by enhancing stroke detection and guiding secondary preventive measures in patients presenting with dizziness. CT perfusion and portable MRI are viable alternatives if high-field MRI is inaccessible.

CLINICAL RELEVANCE/APPLICATION

Optimizing neuroimaging strategies in the ED for dizziness improves long-term patient outcomes, reduces stroke-related morbidity, and efficiently utilizes healthcare resources, particularly in settings lacking immediate MRI access.

M2-SPER-2 EVALUATION OF SECOND-GENERATION RECONSTRUCTION ALGORITHMS TO IMPROVE GRAY-WHITE MATTER DIFFERENTIATION ON NON-CONTRAST HEAD CT STUDIES

Kyobin Hwang (*Presenter*)
Ian Anderson, BSc, MD (*Abstract Co-Author*)
Asutosh Sahu, MBBS, MD (*Abstract Co-Author*)
Akhil P. Nair (*Abstract Co-Author*)
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Joel Kosowan, MD (*Abstract Co-Author*)
Shobhit Mathur, MD (*Abstract Co-Author*)

PURPOSE

Different reconstruction algorithms have been developed to render the gray-white matter interface more conspicuous to increase detection of subtle findings. We performed this study to compare the second-generation “Enhanced Boundary” (EB) algorithm and first-generation “Enhanced Contrast” (EC) in non-contrast head CTs performed for acute stroke.

METHODS AND MATERIALS

Sixty consecutive code stroke patients were included in this study, including 30 patients positive and 30 patients negative for acute ischemic stroke. All patients were imaged with a non-contrast head CT performed as part of an acute stroke protocol study. Images were retrospectively reconstructed using a vendor provided first-generation EC algorithm (EC3) as well as three strengths of the second-generation EB algorithm (EB1, EB2, EB3). Two blinded radiologists independently compared the images, subjectively grading the gray-white matter differentiation (in the posterior fossa, the deep gray matter, and the supra-tentorial cortical-subcortical interface) as well as noise, image texture, changes in beam-hardening artifact, and diagnostic confidence in detecting gray-white matter differentiation loss, hyperdense intracranial arteries and hemorrhage. All scoring was based on a 5-point Likert scale. Contrast to noise ratio (CNR) measurements were performed on a subset of the cohort. ASPECTS (Alberta Stroke Program Early CT Score) was also noted. Kappa test was used to test inter-observer agreement and image quality parameters were compared using Kruskal-Wallis, Friedman and Wilcoxon signed-rank tests.

RESULTS

EB3 algorithm was found to have subjectively improved gray-white matter differentiation compared to EC3, EB1 and EB2 ($p<0.05$). There was no statistically significant difference in subjective noise, beam hardening artifact, or image texture. Quantitative analysis of CNR showed no noise penalty. Diagnostic confidence in detecting stroke, hemorrhage and hyperdense intracranial arteries and ASPECTS were similar across all reconstruction methods and strengths.

CONCLUSION

Second-generation reconstruction algorithm provides subjectively improved gray-white matter differentiation without negative impact on noise, artifact, or image texture.

CLINICAL RELEVANCE/APPLICATION

Improvement in gray-white matter differentiation on head CTs using second-generation reconstruction algorithm (EB3) without noise penalty is a promising advancement for imaging in acute stroke.

M2-SPER-3 EXTRAVASCULAR BLOOD VOLUMES AS MEASURED ON ADMISSION WHOLE BODY CT FOR MULTI-SYSTEM TRAUMA CORRELATES WITH BLOOD TRANSFUSION REQUIREMENTS DURING RESUSCITATION

Rebeca Santos (*Presenter*)
Greg Gaski, MD (*Abstract Co-Author*)
Todd McKinley, MD (*Abstract Co-Author*)
Katherine Frey (*Abstract Co-Author*)
Scott D. Steenburg, MD (*Abstract Co-Author*)

PURPOSE

To determine the relationship between extravascular blood product volumes as measured on admission whole body CT and blood transfusion requirements.

METHODS AND MATERIALS

Data were extracted from the PRECISE study database, which was a large, prospective multi-center trial comprised of trauma centers participating in the Major Extremity Trauma and Rehabilitation Consortium (METRC). Extravascular blood products were measured on deidentified admission whole body CT (WBCT) scans using a semi-automated 3-dimensional annotation tool. The extravascular blood volumes on two patient populations, those who received blood transfusions and those who did not, were compared using unpaired t-tests. P-values were calculated to determine the correlation of each patient's transfusion status and CT-detected extravascular blood product volumes. In addition, patients who received packed red blood cells (pRBCs) as part of a massive transfusion protocol (MTP) were separated into two groups: those who met the Critical Administration Threshold (CAT), defined as patients who received three or more units of PRBCs within 60 minutes, and those who did not meet CAT threshold. Data were analyzed using unpaired T-tests, with a P value of < 0.05 considered to be statistically significant.

RESULTS

The study cohort consisted of 278 patients with a mean age of 36.0 years (range 18-56), including 195 males (70.1%) with an average Injury Severity Score (ISS) of 26 (range 5-75). The most common mechanism of injury was motor vehicle collision (N=239, 86.0%). All patients had extravascular blood products detected on CT. A total of 144 patients (51.8%) received blood transfusion products, most commonly packed red blood cells (PRBCs, N=138 or 95.8%) which also comprised the largest average volume of blood products (mean 1478.8 mL per patient). There was a statistically significant difference in the hematoma volume between patients who did and did not receive a blood transfusion (405.1 mL vs 173.2 mL, p=0.0001). There was a statistically significant difference in hematoma volumes for patients who met CATs criteria versus those who did not (614.3 mL vs 299.9 mL, p<0.0001). There was a strong, positive and linear relationship between pRBC volumes transfused and measured extravascular blood product volumes (R-value = 0.82).

CONCLUSION

Extravascular blood product volumes as measured on admission CT positively correlated with blood transfusion volumes received.

CLINICAL RELEVANCE/APPLICATION

The findings from our study suggest that admission CT-measured extravascular blood product volumes could potentially be used to predict blood transfusion needs in the initial resuscitation period.

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M2-SPGI

Gastrointestinal Imaging Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPGI-1 FEASIBILITY OF NON-CONTRAST-ENHANCED PORTAL VENOUS 4D FLOW MRI IN SEVERE OBESITY

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Thekla H. Oechtering, MD (*Abstract Co-Author*)
Alma Spahic (*Abstract Co-Author*)
David T. Harris, PhD (*Abstract Co-Author*)
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Tanya Wolfson, MS (*Abstract Co-Author*)
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Alejandro Roldan, PhD (*Abstract Co-Author*)
Kevin M. Johnson (*Abstract Co-Author*)
Gavin Hamilton, PhD (*Abstract Co-Author*)
Lael Ceriani (*Abstract Co-Author*)
James Goodman (*Abstract Co-Author*)
Rashmi Agni (*Abstract Co-Author*)
Eduardo Grunvald (*Abstract Co-Author*)
Garth Jacobsen (*Abstract Co-Author*)
Luke Funk (*Abstract Co-Author*)
Oliver Wieben, PhD (*Abstract Co-Author*)
Claude B. Sirlin, MD (*Abstract Co-Author*)
Scott B. Reeder, MD, PhD (*Abstract Co-Author*)

PURPOSE

Although 4D flow MRI can measure portal venous flow, prior studies required contrast agents due to challenges such as complex anatomy, small vessels, extensive coverage, and slow flow. Obesity adds complications such as high fat signal, reduced signal-to-noise ratio, and complex background phase corrections. Radial 4D flow MRI can acquire large volumes with improved resolution compared to traditional Cartesian k-space sampling, enabling non-contrast acquisitions. This study evaluates the feasibility of non-contrast 4D flow MRI in obese adults undergoing weight loss surgery (WLS).

METHODS AND MATERIALS

This prospective study enrolled adults (BMI > 35 kg/m²) undergoing WLS at two academic centers. Non-contrast radial 4D flow MRI (3.0T) was performed five times after 12-hr fasting: before a pre-surgical diet, 1-2 days pre-surgery, and 12, 26 and 52 wks post-surgery. Two readers independently measured flow in proximal, middle, and distal portal vein (PV), splenic vein (SV), and right (RPV) and left (LPV) portal vein cross-sections. Image quality was rated qualitatively as 'analyzable', 'marginally analyzable', or 'unanalyzable' using pre-defined criteria. Feasibility was assessed via conservation of mass, comparing flow in the PV to that at the confluence (SMV, SV) and bifurcation (LPV, RPV) by linear regression, and by computation of Bland-Altman bias and limits of agreement (LoA). Inter-reader variability to assess reproducibility was also analyzed (Bland-Altman bias, LoA). All analyses pooled data from all visits.

RESULTS

One hundred five participants (90 women; 44 ± 10 yrs) were enrolled. BMI decreased from 46 ± 7 kg/m 2 to 35 ± 7 kg/m 2 one yr post-surgery. Of 413 attempted 4D flow acquisitions, 3 failed to reconstruct, 375 were analyzed (311 'analyzable', 64 'marginally analyzable'), and 35 were excluded as being 'unanalyzable'. Conservation of mass showed strong correlation at bifurcations (R^2=0.94) and confluences (R^2=0.84), with small bias (-5% and -13%) and moderate LoA: [-22%, 13%] and [-43%, 17%]. Inter-reader variability showed minimal bias (-0.4%) with moderate LoA [-19%, 18%].

CONCLUSION

Non-contrast radial 4D flow MRI is feasible in obese adults, with low rates of reconstruction failure and of 'unanalyzable' data, good conservation of mass performance comparable to prior contrast-enhanced studies, and good inter-reader agreement. These findings support radial 4D flow MRI as a potential quantitative tool for assessing portal venous flow in obesity.

CLINICAL RELEVANCE/APPLICATION

Limited 4D flow MRI adoption for portal assessment is primarily due to technical challenges including the need for contrast. Demonstrating reliability of this non-invasive method with minimal preparation could significantly enhance its clinical use.

M2-SPGI-2 PHOTON-COUNTING CT WITH VIRTUAL MONOENERGETIC IMAGING FOR GASTRIC CANCER: ENHANCINGPREOPERATIVE T/N STAGING AND VASCULAR VISUALIZATION

Bin Lin (*Presenter*)
Jiaxing Wu (*Abstract Co-Author*)
Xue Geng (*Abstract Co-Author*)

PURPOSE

To evaluate the image quality of arterial-phase photon-counting computed tomography (PCCT), including three-dimensional (T3D) imaging and virtual monoenergetic images (VMIs) at different energy levels, in gastric cancer patients. The study aimed to assess the clinical value of PCCT in improving preoperative tumor (T) and nodal (N) staging accuracy and facilitating surgical planning.

METHODS AND MATERIALS

Patients with pathologically confirmed gastric cancer underwent arterial-phase PCCT (NAEOTOM Alpha, Siemens). T3D and VMI datasets (40-170 keV, 10-keV intervals) were reconstructed. Objective metrics included CT attenuation, image noise, signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR). Two radiologists

independently assessed subjective image quality using a 5-point Likert scale and evaluated T/N staging. Paired t-tests and Wilcoxon signed-rank tests were used for statistical comparisons.

RESULTS

A total of 33 patients (16 males, 17 females; mean age 67.1 ± 11.2 years) were included. CT attenuation and noise decreased progressively with increasing energy levels ($P < 0.05$). The 60-keV VMI achieved the highest tumor-to-wall CNR and received the highest subjective scores (mean score 4.92) for tumor conspicuity and overall image quality ($P < 0.05$). T3D reconstructions demonstrated superior vascular SNR (46.01 [6.67, 161]) and CNR (50.84 [19.10, 87.08]) ($P < 0.05$). In the surgical subgroup (n = 18), pathological-radiological correlation demonstrated a concordance rate of 94.4% (17/18) for T-staging and 77.8% (14/18) for N-staging, highlighting the diagnostic utility of PCCT.

CONCLUSION

60-keV VMIs offer optimal lesion delineation, while T3D reconstructions enhance vascular visualization. The combined application of these PCCT-based techniques provides a comprehensive and reliable approach for preoperative assessment in gastric cancer, improving T/N staging accuracy and supporting individualized surgical planning.

CLINICAL RELEVANCE/APPLICATION

Photon-counting CT with optimized 60-keV VMI and T3D imaging significantly improves gastric tumor characterization and vascular mapping compared to conventional CT approaches. Integrating these advanced imaging protocols into preoperative workflows enhances staging precision, informs surgical strategies, and potentially improve clinical outcomes for gastric cancer patients.

M2-SPGI-4 INTRAINDIVIDUAL COMPARISON OF PHOTON-COUNTING AND ENERGY-INTEGRATING DETECTOR CT IN PERIHILAR CHOLANGIOCARCINOMA

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PURPOSE

Perihilar cholangiocarcinomas (pCCC) remain diagnostically and surgically challenging. While ERCP, conventional CT, and MRI/MRCP each offer advantages for preoperative planning, imaging of the individual hilar anatomy is often limited. Photon-counting detector CT (PCD-CT) has shown promising results in high-resolution vascular and oncologic imaging and may thus provide superior delineation of hilar structures and tumor extent in pCCC. Therefore, this study aimed to directly compare objective and subjective image quality between PCD-CT and energy-integrating detector CT (EID-CT) in patients with pCCC who received consecutive scans on both imaging modalities.

METHODS AND MATERIALS

From an institutional database of 302 patients with pCCC (2008-2025), eight patients who had undergone both contrast-enhanced abdominal PCD-CT and EID-CT were retrospectively included. An intraindividual comparison was conducted assessing objective image quality by measuring vessel attenuation, image noise, signal-to noise (SNR) and contrast-to-noise ratios (CNR). Additional subjective image analysis was performed using a 5-point Likert scale by three independent readers (2 radiologists, 1 visceral surgeon), evaluating overall image quality, noise, sharpness, and assesibility of the hilum. Paired t-tests and Wilcoxon signed-rank tests were used for statistical analysis.

RESULTS

Patients had a mean age of 64 ± 16 years with equal gender distribution. The median interval between scans was 21 (IQR 58) days. Dose-length product was comparable between PCD-CT and EID-CT (480 vs. 496 mGy*cm; P =.44). Nevertheless, PCD-CT showed significantly higher SNR (6.9 vs. 3.5 for arterial phase and 21.2 vs. 13.0 for venous phase; P =.02 and .04, respectively). In the subjective analysis, PCD-CT achieved significantly higher scores for overall image quality (4 [quartiles 4-5] vs. 3 [3-3]; P =.009), noise (4.5 [4-5] vs. 2.5 [2-3]; P =.008), and sharpness (4 [4-5] vs. 3 [3-3]; P =.009). Additionally, hilar assessibility was rated superior in PCD-CT (3 [3-3] vs. 4 [4-4.75], P =0.02).

CONCLUSION

Preliminary findings suggest improved subjective and objective image quality with PCD-CT at comparable radiation doses. Reduced image noise and enhanced contrast may facilitate superior assessment of the individual hilar anatomy. These findings support further investigation in larger prospective cohorts.

CLINICAL RELEVANCE/APPLICATION

PCD-CT may improve individualized imaging in patients with pCCC, enhancing preoperative planning and potentially impacting clinical management through better tumor visualization.

M2-SPGI-5 MANUAL VERSUS AUTOMATED 2D MR ELASTOGRAPHY FOR FIBROSIS STAGING IN MASLD: ACCURACY AND INTER-METHOD REPRODUCIBILITY

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PURPOSE

Fibrosis staging is important for metabolic dysfunction-associated steatotic liver disease (MASLD) management, especially to establish eligibility for metabolic dysfunction-associated steatohepatitis (MASH) clinical trials, and emerging therapies for which F = 2 fibrosis is considered to be an eligibility criterion. This study evaluates diagnostic performance of manual and automated 2D magnetic resonance elastography (MRE) analysis to detect F = 2 fibrosis using histology as reference standard, and reproducibility of manual and automated 2D MRE analysis.

METHODS AND MATERIALS

This is a secondary analysis of two completed prospective studies of adults with known or suspected MASLD who underwent 3T 2D MRE and liver biopsy within = 180 days. MRE liver stiffness was assessed manually by trained readers following Quantitative Imaging Biomarker Alliance (QIBA) guidelines, and automatically using a convolution network-based algorithm created by our research team. Readers were blinded to histology, and to each other's results. Fibrosis was staged (NASH CRN criteria). For each method, the area under the receiver operating characteristic curve (AUC) and its 95% confidence interval (CI) for classifying F = 2 fibrosis, and sensitivity and specificity at rule-in (specificity = 90%) and rule-out (sensitivity = 90%) thresholds, respectively, were calculated. Reproducibility between methods was assessed using QIBA-recommended precision metrics: Bland-Altman (BA) bias, limits of agreement (LoA), within-participant coefficient of variation (wCV), proportional

reproducibility coefficient (RDC%), and intraclass correlation coefficient (ICC). Bootstrapped 95% CIs were constructed. Bonferroni-adjusted comparisons were made with bootstrap-based tests.

RESULTS

Two hundred twenty-eight participants were enrolled (127 women; mean age 51.5 ± 13.8 yrs; mean BMI 31.4 ± 5 kg/m²), underwent 274 MRE exams. For F = 2 fibrosis, AUROCs [95% CIs] were 0.89 [0.82, 0.93] for manual and 0.90 [0.85, 0.94] for automated analyses (p=0.08). Rule-in threshold was 3.2 kPa (manual) and 3.0 kPa (automated); rule-out was 2.45 kPa for both. Sensitivity was 72% at rule-in for manual and 76% for automated analyses (p=0.22). Specificity was 59% at rule-out for manual and 60% for automated (p=0.79). BA bias, LoA, wCV, RDC%, and ICC [95% CIs] for manual vs. automated analyses were 0.09 kPa, [-0.4, 0.6], 6%, 16%, and 0.97 [0.94, 0.98], respectively.

CONCLUSION

Automated and manual MRE analyses shows comparable diagnostic performance for identifying F = 2 fibrosis in MASLD.

CLINICAL RELEVANCE/APPLICATION

Automated MRE may offer a reliable, efficient alternative to manual interpretation, reducing inter-reader variability and streamlining fibrosis staging in MASLD.

M2-SPGI-6 UTILITY OF ULTRA-HIGH B-VALUE (B=3000) DIFFUSION-WEIGHTED IMAGING IN DIFFERENTIATING LIVER METASTASES FROM HEMANGIOMAS

Kumi Ozaki, MD, PhD (*Presenter*)

PURPOSE

To evaluate the diagnostic performance of ultra-high b-value (b=3000 s/mm²) diffusion-weighted imaging (DWI) compared to conventional b-values in differentiating liver metastases from hemangiomas, with particular focus on small (<10 mm) lesions.

METHODS AND MATERIALS

This prospective study included 67 patients (mean age, 65.7±10.6 years) with 208 liver lesions (133 metastases, 75 hemangiomas) confirmed by histopathology or follow-up imaging. Of these, 83 metastases and 54 hemangiomas measured less than 10 mm in diameter. All patients underwent liver MRI on a 3T scanner with multiple b-value DWI (0, 800, and 3000 s/mm²). Three diagnostic protocols were compared: (1) conventional DWI (b=800) with ADC maps generated from b=0 and b=800; (2) conventional DWI plus computed DWI (cDWI) at b=1500, 2000, 2500, and 3000 s/mm²; and (3) conventional DWI plus cDWI plus acquired ultra-high b-value DWI (b=3000). Diagnostic performance was evaluated by two experienced radiologists blinded to clinical information and lesion type. Sensitivity, specificity, accuracy, and area under the receiver operating characteristic curve (AUC) were calculated for each protocol.

RESULTS

For lesions =10 mm, no significant differences in diagnostic performance were observed among the three protocols (AUC: 0.921 vs. 0.933 vs. 0.940, p>0.05). However, for lesions <10 mm, the addition of ultra-high b-value DWI (b=3000) significantly improved diagnostic accuracy compared to conventional DWI alone (AUC: 0.874 vs. 0.731, p<0.01). The protocol including computed DWI showed intermediate performance (AUC: 0.812), significantly better than conventional DWI alone (p<0.05) but inferior to the protocol including acquired b=3000 DWI (p<0.05). Sensitivity for detecting small metastases increased from 76.4% with conventional DWI to 83.2% with computed DWI and 91.5% with acquired b=3000 DWI. Specificity for small hemangiomas also improved progressively across the three protocols (70.5% vs. 79.8% vs. 87.3%).

CONCLUSION

Ultra-high b-value (b=3000) DWI significantly improves the diagnostic performance in differentiating small (<10 mm) liver metastases from hemangiomas compared to conventional b-value DWI. While computed DWI offers some improvement, acquired ultra-high b-value images provide superior diagnostic accuracy, particularly for challenging small lesions.

CLINICAL RELEVANCE/APPLICATION

Implementation of ultra-high b-value DWI (b=3000) in routine liver MRI protocols could enhance detection and characterization of small liver metastases, potentially impacting patient management by enabling earlier detection of metastatic disease.

M2-SPGI-7 MRI-BASED PREOPERATIVE RISK FACTORS ANALYSIS OF LAPAROSCOPIC VERSUS OPEN LIVER RESECTION FOR PATIENTS WITH BCLC STAGE 0-A HEPATOCELLULAR CARCINOMA

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PURPOSE

Surgical resection remains the most effective treatment for hepatocellular carcinoma (HCC). However, regardless of whether laparoscopic liver resection (LLR) or open liver resection (OLR) is utilized, the high postoperative recurrence rate remains the primary obstacle to achieving a cure. The aim of this study was to explore MRI-based preoperative risk factors of long-term outcomes of LLR versus OLR for patients with BCLC Stage 0-A HCC.

METHODS AND MATERIALS

This two-center retrospective study was approved by the Ethics Committees of our institution, consecutive patients who fulfilled the following criteria were identified from April 2011 to May 2023. Treatment plans for patients were determined during a comprehensive surgical board or mutil-disciplinary team. Recurrence-free survival (RFS) and overall survival (OS) rates following liver resection were computed using the Kaplan-Meier method. The inverse probability of treatment weighting approach was employed to address potential selection bias inherent between the LLR and OLR outcomes. The preoperative predictive models were developed and validated for RFS and OS after OLR and LLR, that based on the preoperative clinical and MR imaging predictors.

RESULTS

667 eligible patients were enrolled in this study, 235 patients underwent pure LLR and 441 patients underwent OLR for HCC, the 5-year RFS rate after LLR was 47.3%, the 5-year OS rate was 87.1%. The 5-year RFS rates after OLR was 38.0%, the 5-year OS rate was 73.8%. Cirrhosis, Esophageal Gastric Varices, Tumor Size, Markedly Low ADC, PVP Peritumoral Hypoenhancement were the independent risk factors of RFS after LLR, AFP (=400), Esophageal Gastric Varices, Tumor Size, RimAPHE, T2 Peritumoral Hyperintensity and PVP Peritumoral Hypoenhancement were the independent risk factors of OS after LLR. Cirrhosis, MVI, tumor Size, Infiltrative Subtype and Tumor blood products were the independent risk factors of RFS after OLR, Tumor grade, Ascites, Tumor Size, Infiltrative Subtype, Corona Enhancement, and Nodule-in-nodule Architecture were the independent risk factors of OS after OLR. In the training and validation set of LLR group, the AUC was 0.734 and 0.702 for the RFS, 0.919 and 0.643 for the OS, in the OLR group, AUC was 0.648 and 0.669 for the RFS, 0.709 and 0.760 for the OS.

CONCLUSION

The outcomes of LLR and OLR were associated to clinical and MRI characteristics, the predictive model based on preoperative MRI is utilized to implement the risk stratification after LLR and OLR surgeries.

CLINICAL RELEVANCE/APPLICATION

1) The outcomes of LLR and OLR were associated to individual clinical and MRI characteristics. 2) The predictive model based on preoperative MRI has significant clinical significance for risk stratification after LLR combined with OLR surgery.

M2-SPGI-8 MEDSEGGEN: SEMANTIC SYNTHESIS FOR MEDICAL IMAGING SEGMENTATION DATA GENERATION

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PURPOSE

Robust medical image segmentation models are hindered by limited access to large, high-quality labeled datasets, especially in specialized domains like gastrointestinal (GI) imaging. Current generative augmentation techniques, including inpainting and stitching, lack anatomical diversity and often produce inconsistent outputs. This study introduces MedSegGen, a semantic synthesis framework using Latent Diffusion Models (LDMs), designed to generate diverse, anatomically realistic image-mask pairs to improve segmentation model training.

METHODS AND MATERIALS

We developed a two-stage training pipeline on the HyperKVasir dataset, which contains 88,000 unlabeled and 1,000 labeled GI endoscopy images. First, a Vector-Quantized Generative Adversarial Network (VQ-GAN) was fine-tuned on the unlabeled data to learn a structured latent space. Second, a conditional LDM was trained in this latent space using segmentation masks to guide image generation. To increase anatomical variation, we implemented a novel mask interpolation module that blends existing binary masks via radial per-pixel interpolation, smoothing, and spatial augmentations. A Sobel-based contour loss was selectively applied during diffusion training on labeled data, preserving anatomical boundary fidelity. Evaluation metrics included Fréchet Inception Distance (FID), Learned Perceptual Image Patch Similarity (LPIPS), and Multi-Scale Structural Similarity Index (MS-SSIM), computed across bootstrapped sets of synthetic images and masks.

RESULTS

Our VQ-GAN baseline achieved a FID of 66.85, while MedSegGen generated diverse conditional samples with an average FID of 142.0477 ± 1.6877, LPIPS of 0.6698 ± 0.0020, and MS-SSIM of 0.2313 ± 0.0013. Despite higher FID values, which reflect deviation from real distributions, generated samples exhibited clinically realistic variability and structural consistency in visual inspection. The mask interpolation pipeline introduced novel anatomical configurations absent in the original dataset. Contour-aware loss improved the alignment of synthetic images with the guiding masks.

CONCLUSION

MedSegGen successfully synthesizes diverse, high-fidelity GI image-mask pairs from limited labeled data. The model's two-stage structure, mask interpolation, and conditional regularization offer a scalable solution for medical image augmentation through novel image backgrounds and foregrounds.

CLINICAL RELEVANCE/APPLICATION

By augmenting limited medical imaging datasets with anatomically realistic synthetic pairs, MedSegGen improves the training and generalization of segmentation models, potentially enhancing diagnostic performance in GI endoscopy and other imaging domains.

M2-SPGI-9 POST-LYMPHANGIOGRAPHIC CT (PLCT) IN PROTEIN-LOSING ENTEROPATHY

Yuming Yang (*Presenter*)

PURPOSE

To investigate the imaging features and clinical value of post-lymphangiographic CT in diagnosis and differential diagnosis in protein-losing enteropathy (PLE).

METHODS AND MATERIALS

Forty-two patients diagnosed as PLE were retrospectively reviewed in this study from 2011 to 2017, including 42 primary intestinal lymphangiectasia (PIL), and 15 other kinds of PLE, confirmed by 99 Tc m -labelled human serum albumin scintigraphy and/or capsule endoscopy. All patients underwent direct lymphangiography and post-lymphangiographic CT. All the imaging were blinded reviewed by two radiologists respectively, and the assessments of imaging features included intestinal wall thickening, dilation of intestinal lumen, edematous lesions, abnormal distribution of contrast agents, reflux, lymph nodes and leakage. Statistical analyses were performed with $P < 0.05$.

RESULTS

Compared with other kinds of PLE, patients with PIL demonstrated lower onset age (14.7 ± 10.6 vs. 38.8 ± 10.7, $P < 0.01$). The proportion of abnormal distribution of contrast media in intestinal wall and mesentery are higher in PIL than other PLE as well as lymph reflux. While no statistical difference was found in intestinal wall dilatation, edematous lesions, abnormal distribution of contrast media in other abdominal cavity, leakage and lymph node (all $P > 0.05$).

CONCLUSION

Post-lymphangiographic CT demonstrates capability in detection of location, distribution and range of abnormal lymphatics, which is useful for differential diagnosis and therapeutic adoptions for PLE.

CLINICAL RELEVANCE/APPLICATION

It is necessary to evaluate the systematic lymphatic circulation abnormality in patients with PLE using post-lymphangiographic CT, as this assessment plays a crucial role in guiding personalized therapeutic strategies.

M2-SPGI-10 ASSESSMENT OF EXTRAPANCREATIC PERINEURAL INVASION IN PANCREATIC DUCTAL ADENOCARCINOMA: CORRELATION OF CT AND RADIOMIC FEATURES WITH HISTOPATHOLOGY AND PROGNOSTIC IMPLICATIONS

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PURPOSE

To evaluate the non-invasive predictability of extrapancreatic perineural invasion (EPNI) in pancreatic ductal adenocarcinoma (PDAC) using CT and radiomic analysis, assess concordance with histopathology and determine prognostic value.

METHODS AND MATERIALS

This retrospective, single-center study included patients with histopathologically confirmed PDAC who underwent pancreatoduodenectomy between 2016 and 2023. Preoperative contrast-enhanced CTs were independently reviewed by two blinded radiologists for evaluation of EPNI. CT findings including peripancreatic linear stranding/soft-tissue suggesting the presence of EPNI, pancreatic duct involvement, duodenal and vascular invasion, lymph node metastasis, and shortest tumor-celiac/(superior mesentersc artery)SMA distances were recorded. Manual 3D segmentations of the tumor and mesopancreas were performed using ITK-SNAP.Radiomic

features were extracted with PyRadiomics; feature selection employed correlation filtering, mRMR, RFE, and feature importance ranking. Predictive models(SVM, RF) were developed using stratified cross-validation for radiomic-only and combined radiologic-radiomic models.Model performance was assessed by F1 score, accuracy, and AUC.Comparative statistical, interobserver agreement and survival analyses were performed.

RESULTS

Among 90 patients, histopathological EPNI was present in 67.8%.Sensitivity and specificity for detection of EPNI were 93.4%, 58.6%, respectively for Reader 1; and 90.2%, 72.4%, respectively for Reader 2.Interobserver agreement was substantial(?=0.661).Concordant radiologic EPNI showed strong association with histopathological EPNI($p<0.05$).Significant correlations were found between EPNI and surgical margin positivity, peripancreatic fat invasion, lymph node metastasis, tumor-celiac distances ($p<0.05$).The radiomics-based model achieved an F1 score of 0.842 and an AUC of 0.707; whereas the combined radiologic-radiomic model demonstrated improved performance with an F1 score of 0.859 and an AUC of 0.832.EPNI-positive patients had shorter progression free survival (19.8 vs. 39.5 months, $p=0.069$) and overall survival (22.3 vs. 29.7 months, $p=0.235$), though not statistically significant.

CONCLUSION

Radiologic and radiomic assessments are effective non-invasive tools for preoperative EPNI prediction in PDAC.EPNI may impact prognosis, warranting further prospective validation.

CLINICAL RELEVANCE/APPLICATION

CT-based radiologic-radiomics combined model could noninvasively predict EPNI.

M2-SPGI-11 DEEP LEARNING-DERIVED THREE-DIMENSIONAL BODY COMPOSITION PREDICTS PANCREATIC FISTULA POST RADICAL DISTAL PANCREATECTOMY

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PURPOSE

Accurate prediction of postoperative pancreatic fistula (POPF) after radical distal pancreatectomy (DP) is critical for optimizing surgical strategies. The objective of this study was to develop and validate a deep learning-based framework for three-dimensional (3D) body composition analysis to forecast POPF in patients with pancreatic cancer (PC).

METHODS AND MATERIALS

A retrospective analysis was conducted on patients who underwent radical DP at two institutions between 2015 and 2022. A deep learning-based 3D segmentation model was developed to assess abdominal muscles and fat using preoperative computed tomography (CT) images. Predictive models for POPF were constructed using Gradient Boosting Decision Trees (GBDT) and their performance was evaluated using the area under the receiver operating characteristic curve (AUC) and decision curve analysis (DCA) on validation and external test datasets.

RESULTS

The study comprised 230 patients with PC, with a mean age of 62 years. The incidence of POPF was observed to be 47.4%. In terms of muscle segmentation, the Dice similarity coefficients (DSCs) for the testing set varied between 91.84% and 98.41% across different regions of the abdominal musculature. For the segmentation of visceral and subcutaneous adipose tissue, the DSCs in the testing set were 97.10% and 98.57%, respectively. The integrated clinical and imaging-based POPF prediction model demonstrated superior performance, achieving an AUC of 0.82, with a sensitivity of 0.81 and a specificity of 0.76 in the external test set.

CONCLUSION

The implementation of a deep learning-based 3D body composition analysis pipeline exhibited high accuracy in predicting POPF following radical DP for PC.

CLINICAL RELEVANCE/APPLICATION

Deep learning-based 3D body composition analysis accurately predicts pancreatic fistula risk after radical distal pancreatectomy, facilitating individualized perioperative management for patients with pancreatic cancer.

M2-SPGI-13 DIRECT COMPARISON OF LIVER STIFFNESS AND FAT QUANTIFICATION BY VIBRATION-CONTROLLED TRANSIENT ELASTOGRAPHY (VCTE), ULTRASOUND (US), AND MAGNETIC RESONANCE IMAGING (MRI)

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PURPOSE

Metabolic dysfunction-associated steatotic liver disease (MASLD) is a leading cause of liver failure. Although multiple modalities quantify liver stiffness and fat, direct comparison of modalities is needed to determine the most effective screening approach for MASLD. We directly compared vibration-controlled transient elastography (VCTE) and ultrasound (US) using magnetic resonance imaging (MRI) as the reference standard with all modalities performed sequentially on the same day.

METHODS AND MATERIALS

Veterans (n=101) with obesity (body mass index (BMI) > 30) and/or type 2 diabetes (DM2) were enrolled in an IRB-approved study in 2022-2024. Liver stiffness was obtained by VCTE (FibroScan, M or XL probe), US auto point shear wave elastography (auto-pSWE, Siemens ACUSON Sequoia, DAX transducer), and MRI elastography (MRE, Siemens MAGNETOM Vida Fit). Liver fat quantification was obtained by controlled attenuation parameter (CAP) in VCTE, ultrasound derived fat fraction (UDFF), and MRI proton density fat fraction (PDFF). Blood-based tests including fibrosis-4 (FIB-4) index and enhanced liver fibrosis (ELF) test were included. Several linear models were developed to determine accuracy of liver stiffness and fat measurements based on available data to predict MRI values. After fitting a Bayesian linear model using US, VCTE, FIB-4, ELF, and patient data (age, gender, BMI, race, ethnicity, and DM2), we used projection predictive variable selection to analyze the best possible sub-models and plotted their root mean squared error (RMSE) in estimating MRI values for liver stiffness and fat. Models were compared using leave-one-out resampling for post-selection inference.

RESULTS

Of 101 veterans enrolled (median age 68 years, range 37-75 years), most were male (n=90) and had type 2 diabetes (n=84). Median BMI was 31.6 (range 19.3-49.1). Quantitative US is the strongest predictor of MRI for liver stiffness and fat. US auto-pSWE can predict liver stiffness by MRE with a RMSE of 0.62 kPa in conjunction with BMI, DM2, and FIB-4. US UDFF can predict liver fat fraction by MRI PDFF with a RMSE of 5.0% in conjunction with age, BMI, race, ethnicity, and DM2. Without US, VCTE is a weaker predictor of MRE with a RMSE of 0.77 kPa with 7 predictors (VCTE, age, BMI, race, DM2, FIB-4, and ELF). Similarly, VCTE CAP is a weaker predictor of MRI PDFF with a RMSE of 7.2% with 4 predictors (VCTE CAP, race, ethnicity, and DM2).

CONCLUSION

Quantitative US auto-pSWE and UDFF are strong predictors of MRI values for liver stiffness and fat. VCTE is less accurate than quantitative US. Quantitative US performance can be improved by incorporation of additional clinical variables.

CLINICAL RELEVANCE/APPLICATION

Quantitative US instead of VCTE should be considered for frontline MASLD screening.

M2-SPGI-15 MULTIMODEL MRI AND MULTIOMICS REVEAL HIGH-RISK NEUROPHENOTYPE IN BRAIN-GUT CIRCUITS AS THERAPEUTIC TARGET FOR CROHN'S DISEASE

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PURPOSE

The brain-gut axis shapes Crohn’s disease (CD) pathogenesis, yet CD-associated neurophenotypes lack defined clinical and mechanistic significance. We aimed to define these neurophenotypes, assess their prognostic impact, elucidate neurophenotype-driven progression mechanisms using multiomics, and validate their therapeutic potential in vivo .

METHODS AND MATERIALS

This prospective double-center study enrolled 109 CD patients undergoing baseline multimodal neuro-MRI, MR enterography, ileocolonoscopy, and fecal/blood samples collection. The neurophenotypes were characterized using multimodal neuro-MRI model developed from 13 out of 13,870 features. 83 patients were followed up for disease progression, with repeated brain-gut assessments. Multi-omics (fecal microbiome/metabolomics, serum metabolomics/neurotransmitters) were used to decode the mechanisms underlying neurophenotype-driven progression. Dextran sulfate sodium (DSS)-induced colitis mice with different neurophenotypes were treated with repeated transcranial magnetic stimulation (rTMS) to explore its therapeutic potential.

RESULTS

Multimodal neuro-MRI accurately mapped CD-specific neural signatures (Fig.A), stratifying patients into high-risk (neurophenotype score=0.45) and low-risk neurophenotypes with robust cross-center validity (training cohort AUC=0.842, test cohort AUC=0.824) (Fig.B). High-risk neurophenotype was identified as an independent predictor of accelerated disease progression (Hazard ratio=15.46, P=0.030), independently of intestinal inflammation. Integrated multi-omics revealed that high-risk neurophenotype contributed to CD progression through microbial-metabolic-neurotransmitter networks wherein tryptophan emerged as the central regulatory hub (Fig.C). Serum tryptophan levels negatively correlated with neurophenotype severity and intestinal disease progression (Fig.D). rTMS targeting high-risk neurophenotype in DSS-induced colitis mice elevated tryptophan levels and ameliorated intestinal disease activity (Fig.E).

CONCLUSION

This study redefines high-risk neurophenotype as a sustained pathogenic driver rather than a mere phenomenon, proposing brain-gut axis modulation as a promising therapeutic strategy distinct from conventional anti-inflammatory approaches.

CLINICAL RELEVANCE/APPLICATION

Using repetitive transcranial magnetic stimulation to treat high-risk neurophenotype elevated serum tryptophan levels and alleviated colitis in DSS-colitis mice, confirming its therapeutic potential for translation into clinical practice.

M2-SPGI-16 A STUDY OF DEEP LEARNING RECONSTRUCTION ALGORITHM IN IMPROVING PORTAL VEIN CT IMAGE QUALITY

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Jianxin Guo (*Abstract Co-Author*)

PURPOSE

To explore the application value of deep learning reconstruction algorithm (DLIR) in improving portal vein CT image quality.

METHODS AND MATERIALS

32 cases of portal vein rawdata were retrospectively reconstructed into 1.25mm slice thickness images using 50% adaptive statistical iterative reconstruction (ASIR-V) and DLIR at medium (DLIR-M) and high strengths (DLIR-H). The CT value and image noise of main portal vein, right portal vein branch, left portal vein branch and paravertebral muscle were measured, and the contrast-noise-ratio (CNR) for vessels was calculated. Moreover, the edge-rising-slope (ERS) of main portal vein edge was measured to evaluate image spatial resolution. The overall image noise, image contrast, and portal vein branch display were evaluated using a 5-point grading scale and image artifacts using a 4-point grading scare by two experienced radiologists. In addition, the display rate of small portal vein branches (display score>2) in the three reconstruction algorithms were calculated.

RESULTS

DLIR-M and DLIR-H images had significantly lower image noise and higher CNR for the main portal vein, right branch and left branch than 50% ASIR-V images, with DLIR-H having the lowest noise and highest CNR. The ERS values of DLIR (M, H) images were also significantly higher than 50% ASIR-V images (all $P<0.01$). The subjective scores of DLIR-H images were higher than 50% ASIR-V images, ($P<0.01$). In addition, the display rates of small branches of portal vein in DLIR images were (DLIR-M: 93.75%; DLIR-H: 100%), significantly higher than ASIR-V 50% (68.75%).

CONCLUSION

Compared with conventional 50%ASIR-V algorithm, DLIR algorithm can significantly reduce the image noise of portal vein, improve the spatial resolution and the display rate of small branches of portal vein, and has the potential to be applied to the follow-up portal vein scanning with reduced radiation and contrast doses.

CLINICAL RELEVANCE/APPLICATION

To explore the application value of deep learning reconstruction algorithm (DLIR) in improving portal vein CT image quality.

M2-SPGI-17 CT-BASED FRACTAL DIMENSION ANALYSISPREDICTS INTRA-TUMORAL TERTIARY LYMPHOID STRUCTURES AND SURVIVAL IN PANCREATIC DUCTAL ADENOCARCINOMA: A RETROSPECTIVE MULTICENTER STUDY

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PURPOSE

To develop a CT-based fractal dimension model integrated with clinical variables for predicting intra-tumoral tertiary lymphoid structures (TLS) statues in pancreatic ductal adenocarcinoma (PDAC).

METHODS AND MATERIALS

This retrospective multicenter study enrolled 164 pathologically confirmed PDAC patients (training/validation: 131/33) with pretreatment multiphase CT and TLS status determined by histopathology (2020-2023). Fractal dimension and lacunarity were quantified on arterial/portal venous phase (PVP) CT. Clinical variables (CA125, CA19-9, TNM stage, etc.) were analyzed. Predictive models were developed using logistic regression and validated for survival stratification.

RESULTS

TLS positivity (45.7%, 75/164) correlated with prolonged overall survival (OS) in both cohorts ($p<0.001$). In the training cohort, univariate analysis revealed significant differences in lacunarity in PVP ($p = 0.008$), CA125 ($p = 0.007$), CA19-9 ($p = 0.005$), and age ($p = 0.015$) when comparing across the TLS groups. Multivariable logistic regression analysis incorporating clinical features and lacunarity in PVP indicated that only lacunarity in PVP was independently associated with TLS ($p = 0.036$). The logistic model achieved an area under the curve (AUC) of 0.696 in the training cohort (positive predictive value [PPV] = 0.737, negative predictive value [NPV] = 0.656) and 0.67 in the external validation cohort (PPV = 0.778, NPV = 0.667). Using a cutoff value of 0.501 for the predictability of the logistic model, patients predicted as TLS-positive exhibited significantly better OS than those predicted as TLS-negative in both the training cohort ($p = 0.002$) and the external validation cohort ($p = 0.011$).

CONCLUSION

This study establishes CT-based fractal lacunarity in PVP as an independent predictor of intra-tumoral TLS in PDAC, with its integration into a clinical-radiographic model enabling noninvasive TLS stratification and prognostication. The validated model highlights TLS as a critical imaging biomarker for guiding immunotherapeutic strategies in pancreatic oncology.

CLINICAL RELEVANCE/APPLICATION

This model provides a preoperative imaging tool to assess TLS status in PDAC, which may inform immunotherapy eligibility evaluation (e.g., PD-1/IL-33-targeted therapies) and risk-adapted therapeutic approaches. The lacunarity-TLS correlation provides a quantifiable imaging surrogate for immune microenvironment remodeling, complementing traditional biomarkers like CA19-9 in personalized prognosis. Its multicenter validation supports clinical translation for dynamic monitoring of TLS evolution during neoadjuvant therapy.

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M2-SPGU

Genitourinary Imaging Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPGU-1 MULTI-B-VALUE DIFFUSION MRI PREDICTS THE BANFF CLASSIFICATION OF RENAL TRANSPLANT BIOPSIES

Mira M. Liu, PhD (*Presenter*)
Jonathan P. Dyke,, PhD (*Abstract Co-Author*)
Steven Salvatore (*Abstract Co-Author*)
Thangamani Muthukumar (*Abstract Co-Author*)
Bachir Taouli, MD (*Abstract Co-Author*)
Samira Farouk (*Abstract Co-Author*)
Octavia Bane, PhD, MS (*Abstract Co-Author*)
Sara Lewis, MD (*Abstract Co-Author*)

PURPOSE

To evaluate multi-b-value diffusion models for Banff classification of renal allografts

METHODS AND MATERIALS

n a prospective, IRB-approved two-center study, 99 patients (50±13yo, 64M/35F) with surveillance or clinically indicated biopsy underwent 3T MRI (Skyra, Siemens Healthcare). MRI included multi-b-value DWI (9 b-values: 0-800 s/mm2) and diffusion models of ADC, intravoxel incoherent motion, and spectral diffusion. 2017 Banff classifications were scored by pathologists and serum GFR collected. Cortical regions-of-interest were delineated in all allografts by Observer 1 and in a subset of 20 by Observer 2 for interobserver analysis by intraclass correlation coefficient (ICC), and two subjects scanned twice for tests-retest coefficient of variation (CoV) assessment. Diagnostic performance was calculated via ROC analysis of univariate logistic regression models built with 5-fold cross-validation and bootstrapping.

RESULTS

CKD-EPI GFR was 47±21mL/min/1.73m2 and Banff 2017 interstitial fibrosis and tubular atrophy (IFTA) scores were as follows: 39 IFTA=0, 22 IFTA=2, 20 IFTA=4, 18 IFTA=6. Multi-b-value diffusion parameters demonstrated significant diagnostic ability for Banff classifications of severe tubulitis (AUC=0.86, p<0.001), interstitial inflammation (AUC=0.82, p=0.002), inflammation in areas of fibrosis (AUC=0.65, p=0.012) , glomerulitis (AUC=0.70, p<0.001), arteriolar hyalinosis (AUC=0.62, p=0.03), fibrosis (AUC=0.69, p<0.001), tubular atrophy (AUC=0.69, p=0.001), and tubular injury (AUC=0.63, p=0.025). Spectral diffusion was sensitive to mild-to-moderate fibrosis (IFTA=1-4; AUC=0.65, p=0.023), and detected fibrosis in allografts still presenting with normal function (AUC=0.72, p=0.007). Decreased tubular diffusion and increased tissue diffusion suggesting tubular injury and collagen deposition correlated with fibrosis score (Fig.1). Interobserver correlation ranged from poor to excellent with 14/40 features returning an ICC between 0.50 and 0.75, and 10/40 above 0.75. Tissue diffusion components showed the highest interobserver reliability, and IVIM and ADC demonstrated better ICC and CoV(%) than spectral diffusion.

CONCLUSION

Multi-b-value diffusion demonstrates promise for noninvasive Banff Classification of kidney transplant pathology and may provide clinically relevant information on transplant pathology. Parameter reliability needs further work; ROIs sampling cortical strips may improve ICC.

CLINICAL RELEVANCE/APPLICATION

Banff classification of transplant biopsy samples is a consensus grading system for renal allograft failure and rejection. Multi-b-value DWI MRI of renal allografts may improve non-invasive assessment of allograft histopathology.

M2-SPGU-2 PREDICTING PELVIC LYMPH NODE METASTASES IN PROSTATE CANCER: INTEGRATING PRIMARY TUMOR FEATURES FROM MRI AND PSMA PET/CT

Jonas Kluckert, MD (*Presenter*)
Volkan Beylergil, MD (*Abstract Co-Author*)
Jenna Schabdach (*Abstract Co-Author*)
Natalie Gangai (*Abstract Co-Author*)
Maida Wasim (*Abstract Co-Author*)
Yousef Mazaheri, PhD (*Abstract Co-Author*)
Lawrence H. Schwartz, MD (*Abstract Co-Author*)
Oguz Akin, MD (*Abstract Co-Author*)

PURPOSE

The presence of pelvic lymph node metastases in the initial staging of prostate cancer has a significant impact on treatment planning. PSMA PET/CT is superior to MRI for lymph node assessment, but has limitations, particularly for micrometastases. We aimed to identify features of the primary tumor on biparametric MRI and PSMA PET/CT that more accurately predict pelvic lymph node invasion than imaging features of the pelvic lymph nodes alone.

METHODS AND MATERIALS

We retrospectively identified consecutive patients with treatment-naïve prostate cancer who underwent prostate MRI and PSMA PET/CT within 90 days between January 2017 and August 2024 followed by radical prostatectomy and extended lymph node dissection within 180 days. We performed univariate correlation analysis of imaging and clinical features with histopathological N-stage as a reference standard. Numerical features were analyzed using Point-Biserial Correlation, ordinal features with Spearman's rank correlation and binary features using Chi-Square-Test. Features with significant univariate correlation were then used to train a logistic regression model to predict pelvic lymph node invasion. Model predictions were compared to predictions made using only the pelvic lymph node appearance on PET/CT through 10-fold cross-validation and performance was evaluated using the area under the receiver operating characteristic curve (AUROC), positive predictive value (PPV), and negative predictive value (NPV).

RESULTS

We analyzed 348 patients with an average age of 63.3 years (IQR 59.0-69.0). PI-RADS score, index lesion size, suspected presence of extracapsular extension, seminal vesicle invasion or adjacent organ invasion, ISUP grade group at biopsy, suspected pelvic lymph node metastasis on PET/CT and pre-treatment PSA level demonstrated a significant correlation ($p<0.05$) with pN1 in the extended pelvic lymph node dissection. A logistic regression model based on these features outperformed diagnosis based on pelvic lymph node appearance on PET/CT alone with an AUROC of 0.77 (CI: 0.72-0.82) compared to 0.58 (0.53-0.62), respectively. Our model's PPV and NPV for pelvic lymph node metastases were 0.75 (0.61-0.89) / 0.69 (0.45-0.88) and 0.82 (0.80-0.84) / 0.83 (0.81-0.84) in the full cohort and in the 331 PET/CT negative cases, respectively.

CONCLUSION

Combining primary tumor characteristics on MRI with findings on PSMA PET/CT markedly improves the accuracy of predicting pelvic lymph node metastases in prostate cancer.

CLINICAL RELEVANCE/APPLICATION

Our study supports the predictive value of combined clinical and imaging features for pelvic lymph node metastases in prostate cancer and highlights the diagnostic accuracy of combined PSMA PET/CT and MRI features.

M2-SPGU-3 EVALUATION OF A SIMPLIFIED PROSTATE MRI EXTRAPROSTATIC EXTENSION SCORE

Andrei S. Purysko, MD (*Presenter*)
Emily Knott (*Abstract Co-Author*)
Ryan Ward, MD, MBA (*Abstract Co-Author*)
Jennifer Bullen, MSc (*Abstract Co-Author*)

PURPOSE

The primary aim of this study was to evaluate the ability of a simplified prostate MRI score to predict extraprostatic extension (EPE) and to assess whether lesion location impacted accuracy. A secondary aim was to determine the incremental value of adding this MR score to known clinical predictors.

METHODS AND MATERIALS

661 consecutive patients underwent prostate MRI followed by radical prostatectomy (RP) at a single center between January 2019 and January 2025. Exclusion criteria included prior treatment, >6 months between MRI and RP, or incomplete data, yielding a final sample of 507 patients. MRIs were prospectively interpreted using PI-RADS, and EPE was assessed with a simplified 5-point score: Absent - no capsule/anterior fibromuscular stroma (AFS) contact;Probably absent - capsule/AFS contact <1.5 cm, no irregularity/bulge;Equivocal - capsule/AFS contact =1.5 cm OR irregularity/bulge;Probably present - contact =1.5 cm AND irregularity/bulge;Present - tumor extends beyond the capsule.ROC curves and AUCs were estimated for detecting any EPE, focal EPE, and non-focal EPE. Subgroup analyses evaluated differences by zone (PZ vs TZ/CZ) and lesion location (base-mid-apex; anterior-lateral-medial-posterior). A multivariable logistic regression model included PSA, pre-MRI biopsy grade group, PI-RADS, and lesion diameter. A second model added the MR score. AUCs were compared using DeLong's method.

RESULTS

The simplified MR EPE score achieved an AUC of 0.765 (95% CI: 0.725-0.805) for detecting any EPE. Accuracy was higher for non-focal vs focal EPE (AUC: 0.808 vs 0.640; $p < 0.001$). No significant differences in AUC were found across anatomic zones or lesion locations. Among 428 patients with complete data, the MR score was a significant independent predictor of EPE (OR: 1.5; 95% CI: 1.2-2.1; $p = 0.003$). Adding the MR score improved model AUC from 0.801 to 0.812, though not significantly ($p = 0.139$).

CONCLUSION

The simplified MRI score demonstrated good performance for predicting EPE, particularly non-focal disease. While lesion location did not affect accuracy, the score was an independent predictor and modestly improved multivariable model performance.

CLINICAL RELEVANCE/APPLICATION

This scoring system may assist with preoperative risk stratification by providing a simple, structured MRI-based method to evaluate EPE.

M2-SPGU-4 MOLECULAR-BASED PROSTATIC MRI WITH 3D CHEMICAL EXCHANGE SATURATION TRANSFER (CEST) IMAGING AND DIFFUSION-WEIGHTED IMAGING (DWI): CAPABILITY FOR DISTINGUISHING MALIGNANT FROM BENIGN PROSTATIC AREAS

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Kaori Yamamoto (*Abstract Co-Author*)
Maiko Shinohara (*Abstract Co-Author*)
Natsuka Yazawa (*Abstract Co-Author*)
Yuichiro Sano, RT (*Abstract Co-Author*)
Masato Ikedo (*Abstract Co-Author*)
Masao Yui (*Abstract Co-Author*)
Masanori Ozaki (*Abstract Co-Author*)
Masahiko Nomura, MD, PhD (*Abstract Co-Author*)
Takeshi Yoshikawa, MD (*Abstract Co-Author*)
Daisuke Takenaka, MD (*Abstract Co-Author*)
Yoshiyuki Ozawa, MD, PhD (*Abstract Co-Author*)
Yoshiharu Ohno, MD, PhD (*Abstract Co-Author*)

PURPOSE

3D Chemical exchange saturation transfer (CEST) imaging is recently reported as useful for providing regional CEST information within entire tumor. The purpose of this study was to compare the capability of molecular-based MRI consisting of 3D CEST imaging, diffusion weighted imaging (DWI) for distinguishing malignant from benign prostatic areas.

METHODS AND MATERIALS

Fifty-two suspected prostatic cancer patients underwent DWI at b value as 0 and 1500 s/mm 2 and 3D CEST imaging at a 3T MR system, surgical treatments and pathological examinations. According to the pathological results, 154 areas were determined as malignant prostatic areas, and 154 out of 470 areas were computationally selected as benign prostatic areas. On each 3D CEST imaging, magnetization transfer ratio asymmetry (MTR asym) at 3.5 ppm map was generated from z-spectra by pixel-by-pixel analyses. Then, 308 ROIs were placed over malignant or benign areas on each map, and MTR asym and ADC values were determined. Each index was compared between malignant and benign areas by Student's t-test. Then, logistic regression analysis was performed to investigate the discriminating factors. ROC analysis was performed to compare diagnostic performance among MTR asym , ADC and combined discriminators. Finally, sensitivity, specificity and accuracy were compared among all methods by McNemar's test.

RESULTS

MTR asym and ADC of malignant area had significant differences with those of benign area (MTR asym : $p<0.0001$, ADC: $p<0.0001$). MTR asym (Odds ratio [OR]: 1.01, $p<0.0001$) and ADC (OR: 0.03, $p<0.0001$) were determined as significant discriminators. Area under the curves (AUC) of combined discriminators (AUC=0.86) was significantly better than that of MT Rasym (AUC=0.81, $p=0.001$) and ADC (AUC=0.76, $p<0.0001$). Specificity (SP) and accuracy (AC) of combined discriminators (SP:

72.1%, AC: 78.6%) were significantly higher than those of MTR asym (SP: 60.4%, p<0.0001; AC: 73.1%, p<0.0001) and ADC (SP: 64.2%, p<0.0001; AC: 74.0%, p<0.0001).

CONCLUSION

Molecular-based MRI would be better to combine 3D CEST imaging and DWI for improving diagnostic performance for differentiating malignant from benign prostatic area, when compared with each method.

CLINICAL RELEVANCE/APPLICATION

When combined 3D CEST imaging with DWI, molecular-based MRI shows superior diagnostic performance to each method for differentiating malignant from benign prostatic areas.

M2-SPGU-6 CLOSING THE EXPERTISE GAP: AI-ASSISTED PI-RADS SCORING VS. FULLY AUTOMATED AI

Guillaume Herpe, MD (*Presenter*)
Chloe Adam, PhD (*Abstract Co-Author*)
Luc Beuzit (*Abstract Co-Author*)
Camille Ruppli (*Abstract Co-Author*)
Gaspard d'Assignies, MD, PhD (*Abstract Co-Author*)

PURPOSE

Prostate MRI plays a crucial role in detecting clinically significant prostate cancer (csPCa), but its effectiveness is hindered by inter-reader variability and moderate specificity in spite the development of a standardized framework : The Prostate Imaging Reporting and Data System (PI-RADS). Advances in artificial intelligence (AI) have introduced automated tools capable of improving diagnostic accuracy, standardizing interpretation, and enhancing workflow efficiency. This study evaluates the performance of an AI-based PI-RADS scoring system (PAROS v1.0.0, Incepto Medical), comparing it to radiologists with varying expertise.

METHODS AND MATERIALS

A total of 201 prostate MRI cases from the ProstateX dataset were analyzed in a multi-reader, multi-case study. Five general radiologists (250-500 prior prostate MRI reads) evaluated cases in two sequential sessions: first without AI assistance and then with AI assistance after a four-week washout period with randomized case reshuffling. One expert (>1000 reads) read the cases without AI assistance. The AI tool performed lesion detection for csPca (PI-RADS =3). Ground truth was established using biopsy results, with csPCa defined as ISUP grade =2. Performance metrics included sensitivity, specificity, accuracy, and comparison between standalone AI, non-expert radiologists, and the expert reader.

RESULTS

The study included 201 patients with a mean age of 63.6 years and a median PSA level of 11.0 ng/ml, with 76 cases of csPCa primarily located in the peripheral (n=40) and transition zones (n=36). Five general radiologists and one expert completed a total of 2,211 reads.Standalone AI outperformed AI-assisted non-expert radiologists, with an accuracy of 73% (95% CI : 67%-79%) ($p < 0.001$) vs 65% (95% confidence intervals [CI]: 62%-68%)($p < 0.001$) respectively. AI-assisted non-expert radiologists improved in specificity (34% to 50%, $p = 0.04$) and accuracy (55% to 65%, $p = 0.04$), approaching expert-level performance. However,Expert radiologist w/o AI remained superior to both AI and AI-assisted non-experts with an accuracy of 79% (95% CI: 72-84%).

CONCLUSION

Standalone AI demonstrates superior diagnostic performance compared to non-expert radiologists, supporting its role in bridging the expertise gap and standardizing prostate MRI interpretation.These results align with the findings of Saha et al., who demonstrated that an AI system achieved a statistically superior AUROC (0.91) compared to a pool of 62 radiologists (AUROC 0.86) in detecting csPCa using PIRADS framework.

CLINICAL RELEVANCE/APPLICATION

These findings suggest that AI could enhance screening programs by reducing reliance on specialized expertise and improving overall diagnostic consistency.

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M2-SPHN

Head & Neck Imaging Monday Morning Poster Discussions

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Sub-Events

M2-SPHN-1 SEGMENTAL VISUALIZATION OF 100 HYPOGLOSSAL NERVES IN CADAVERS USING HIGH RESOLUTION 3D ISOTROPIC CISS MR IMAGING: INITIAL EXPERIENCE FROM SPARC-REVA

Owen Emch (*Presenter*)
Shruti Kumari, MBBS (*Abstract Co-Author*)
Mridhula Muthukumar (*Abstract Co-Author*)
Chris A. Flask, PhD (*Abstract Co-Author*)
Daniel Herzka (*Abstract Co-Author*)
Ari M. Blitz, MD (*Abstract Co-Author*)

PURPOSE

High-resolution isotropic 3D MR imaging with and without contrast is routinely used for imaging evaluation of cranial nerve anatomy and pathologic conditions. Imaging is essential to make an accurate topographical and causal diagnosis of CN XII pathology and injury. Clinical examination cannot localize with accuracy the site of pathology or damage to the nerve. The purpose of this research is to study the extent to which the different segments of CN XII can be seen on 0.5mm 3T 3D CISS MRI in cadavers and compare the visibility of CN XII on CISS, T1 VIBE, and T2-weighted sequences.

METHODS AND MATERIALS

50 embalmed cadavers were scanned with a 3T MRI scanner using 3D isotropic 0.5-0.6 mm resolution 3D-CISS, T1-VIBE, and T2-weighted MRI sequences; a total of 100 CN XII were examined. Two readers independently evaluated visualization of the segments of CN XII (medullary, cisternal, skull base segment, carotid space and anterior extracranial segment) on CISS MRI according to a qualitative scale ranging from 1 to 5 with 5 being the best.

RESULTS

3D CISS allows for visualization of CN XII on MRI along its length up to the anterior segment. CN XII is best seen in the cisternal, skull base (hypoglossal canal), and carotid space segment on CISS MRI and can be traced up to the middle of the anterior extracranial segment. The nuclear segment could not be seen but the hypoglossal trigone can be easily delineated on CISS MRI. Compared to T1-VIBE, and T2 sequences, CN XII is much better seen on CISS MRI.

CONCLUSION

The superior visibility of the segments of CN XII on CISS sequences allows for assessment of involvement of nerve by pathologies and injury. The high signal-to-noise ratio, along with high spatial resolution with isotropic 3D CISS images that can be reconstructed in multiple planes, makes this sequence superior to conventional 2D MR imaging sequences, as well as the high-resolution T1-weighted postcontrast sequences in current use.

CLINICAL RELEVANCE/APPLICATION

Routine use of 3D isotropic CISS MRI for the pathological assessment of cranial nerve XII offers significant advantages over other MRI sequences, providing superior imaging quality. Its ability to produce high-resolution, isotropic images with excellent contrast allows for a more detailed visualization of the nerve's anatomy and its potential pathologies.

M2-SPHN-2 HIGH-RESOLUTION INTRAORAL ULTRASOUND FOR DEPTH OF INVASION ASSESSMENT IN EARLY TONGUE SQUAMOUS CELL CARCINOMA: TECHNICAL REFINEMENTS AND VALIDATION

Maria Paola Belfiore (*Presenter*)
Marialuisa Balzano (*Abstract Co-Author*)
Marco Montella (*Abstract Co-Author*)
PASQUALE PARRELLA (*Abstract Co-Author*)
Dario Di Stasio (*Abstract Co-Author*)
Salvatore Cappabianca, MD (*Abstract Co-Author*)

PURPOSE

To validate the accuracy and reproducibility of high-resolution intraoral ultrasound (ioUS) in measuring depth of invasion (DOI) in early-stage oral squamous cell carcinoma (OSCC) of the tongue and to address common methodological inconsistencies in current imaging practices.

METHODS AND MATERIALS

Thirty-five patients (21 males, 14 females; mean age 64.7 ± 10.3 years) with histologically confirmed OSCC of the tongue (dorsal, lateral, or ventral surfaces) and clinical tumor size =2 cm (T1-T2) were prospectively enrolled. ioUS imaging was performed using an 18 MHz linear probe in a non-contact technique. For each patient, three high-quality images were selected based on bilateral visualization of intact epithelial margins. A horizontal DOI reference line was defined at the epithelium-connective tissue interface, and DOI was measured perpendicularly to the deepest hypoechoic area. Images with acoustic shadowing were excluded. DOI values were normalized to correct for tissue shrinkage during histopathological processing. Measurements were performed using ImageJ software. Statistical analysis included Spearman's correlation, intraclass correlation coefficient (ICC), and Mann-Whitney U test.

RESULTS

ioUS demonstrated a strong correlation with pathological DOI (Spearman's ? = 0.93; $p < 0.001$), and all lesions were correctly staged as T1 or T2, with 100% concordance with pathological staging. Normalized DOI data showed excellent reproducibility (ICC >0.90). No significant differences were found between ioUS and pathological DOI measurements ($p > 0.05$).

CONCLUSION

High-resolution ioUS provides accurate and reproducible measurements of DOI in early tongue OSCC, with staging performance equivalent to histopathological analysis. Technical refinements, including standardized image acquisition and definition of reference lines, are critical for clinical reliability.

CLINICAL RELEVANCE/APPLICATION

ioUS represents a reliable, non-invasive imaging tool for precise preoperative assessment of DOI in early tongue OSCC, offering a cost-effective alternative to CT or MRI and aiding in accurate staging and surgical planning. Furthermore, ioUS represents a valid alternative for the study of patients who cannot undergo MRI due to the presence of dental prostheses that would create artefacts on the study volume, due to adverse reactions to the contrast medium or in general in all those conditions that represent contraindications to magnetic resonance imaging

M2-SPHN-3 CHARACTERISTICS OF VAGUS NERVE VARIATIONS IN THE NECK ON HIGH RESOLUTION 3T 3D CISS MRI IN CADAVERS: A SPARC-REVA STUDY

Mridhula Muthukumar (*Presenter*)
Shruti Kumari, MBBS (*Abstract Co-Author*)
Chris A. Flask, PhD (*Abstract Co-Author*)
Daniel Herzka (*Abstract Co-Author*)
Ari M. Blitz, MD (*Abstract Co-Author*)

PURPOSE

The cervical portion of vagus nerve (CN X) is located within the carotid sheath, usually posterolateral to the carotid artery (CA) and posteromedial to the internal jugular vein (IJV). However, several variations in the CN X position have been reported. CN X is commonly manipulated during neck dissection along with the CA and the IJV, and can be injured during these procedures. Therefore, knowledge of these anatomical variants is paramount to reduce the risk of CN X injury during both surgical and non-surgical management of various diseases of the cervical region. Our aim is to study the characteristics of CN X variations using the carotid artery (CA) and the internal jugular vein in cadavers on 3D CISS MRI.

METHODS AND MATERIALS

55 embalmed cadavers were scanned with a 3T MRI scanner using 3D isotropic 0.5-0.6 mm resolution 3D-CISS MRI sequence; a total of 110 CN X were examined by two readers. These findings were confirmed on anatomic dissection. Based on the method used by Dongbin et al for studying CN X position relative to CA and IJV using ultrasound, variations of the CN X position are based on a reference axis consisting of both the CA and IJV (C-I axis). On MRI, a CN X variation was defined as a CN X located anterior or medial to the C-I axis in the suprahyoid and infrahyoid regions of the neck, which makes CN X susceptible to injury. The subtypes of CN X variations were classified as anterolateral, anteromiddle, anteromedial, and medial based on the relative location of the CN X to the CA. The primary outcome parameters were the percentage of CN X variations and differences according to the side and level of the neck.

RESULTS

Out of 55 cadavers, right and left CN X variations were identified in 6 (10.91%) and 18 (32.73%), respectively. The anterolateral type was the commonest type observed on both sides. There are more variations in the infrahyoid neck compared to the suprahyoid region of the neck. 1 right (1.8%) and 5 left CN X (9.09%) were located <2 mm from the lateral border of the ipsilateral thyroid gland.

CONCLUSION

Variations in the CN X position were relatively common on MRI. The variations primarily involved CN X in the lower cervical region with a significant left sided predominance.

CLINICAL RELEVANCE/APPLICATION

In clinical practice, surgeons and interventional radiologists should consider the presence of variations in the CN X position, and take steps to avoid inadvertent CN X injuries, particularly in the left lower cervical region. Also given the extensive variability of CN X, our study highlights the importance of pre-operative imaging of CN X specially using CISS MRI to prevent procedural nerve injuries and complement therapeutic targeting.

M2-SPHN-4 APPLICATION ANALYSIS OF PLAIN MRI WITH DELAYED CONTRAST-ENHANCED TECHNIQUES IN PATIENTS WITH SUDDEN SENSORINEURAL HEARING LOSS

Qingyu Zhang (*Presenter*)
Xueming Zeng (*Abstract Co-Author*)

PURPOSE

By analyzing the clinical and magnetic resonance imaging (MRI) characteristics of sudden sensorineural hearing loss (SSNHL), this study aims to clarify the diagnostic value of MRI and delayed contrast-enhanced techniques in the disease, as well as explore the pathophysiological processes of the inner ear during its onset.

METHODS AND MATERIALS

A retrospective analysis was conducted on clinical data of SSNHL patients treated in the Otolaryngology Department of BenQ Hospital from September 2020 to June 2024. Patients were categorized into four groups based on hearing loss patterns: low-frequency descent, high-frequency descent, flat-type, and total deafness. Inner ear abnormalities, including endolymphatic hydrops and labyrinthine hyperenhancement, were identified using plain T1WI, T2WI, and delayed (8-hour post-contrast) 3D-FLAIR imaging. Statistical analysis was performed on the findings.

RESULTS

Among 215 patients (96 male, 116 female; age 46.69±15.06 years), 40 underwent plain MRI, 58 delayed contrast-enhanced MRI, and 146 combined plain+delayed MRI.Low-frequency group (n=62): 58 underwent contrast-enhanced MRI. Endolymphatic hydrops: 15.5% (9/58); labyrinthitis: 5.2% (3/58).High-frequency group (n=50): 38 underwent contrast-enhanced MRI. Endolymphatic hydrops: 5.3% (2/38); labyrinthitis: 13.2% (5/38).Flat-type group (n=77): 61 underwent contrast-enhanced MRI. Endolymphatic hydrops: 9.8% (6/61); labyrinthitis: 23.0% (14/61).Total deafness group (n=55): 47 underwent contrast-enhanced MRI. Endolymphatic hydrops: 2.1% (1/47); labyrinthitis: 50.1% (24/47). On T1WI plain scans, 19 cases showed higher signal intensity compared to the healthy side:Low-frequency group: 4.7% (2/43);High-frequency group: 4.9% (2/41);Flat-type group: 8.8% (5/57);Total deafness group: 22.2% (10/45)

CONCLUSION

In delayed contrast-enhanced 3D-FLAIR MRI sequences of the inner ear, we observed that the low-frequency hearing loss group predominantly exhibited endolymphatic hydrops as the primary imaging feature, whereas the flat-type hearing loss group and total deafness group more frequently demonstrated inflammatory labyrinthine enhancement characteristics.

CLINICAL RELEVANCE/APPLICATION

The delayed post-contrast 3D-FLAIR imaging technology not only enables precise localization of lesions in peripheral vestibular disorders but also supports preliminary inferential diagnosis of pathological mechanisms in conditions such as Ménière's disease (MD), sudden sensorineural hearing loss (SSNHL), and related pathologies, including endolymphatic hydrops (EH), vascular compromise, inflammation, or hemorrhage.

M2-SPHN-6 IMAGING-GUIDED AI MODEL FOR HIF-1α-DRIVEN RECURRENCE RISK STRATIFICATION IN PAPILLARY THYROID CANCER

Yan Zhou, MD, MD (*Presenter*)

PURPOSE

Accurately predicting recurrence risk in papillary thyroid cancer (PTC) is critical for guiding personalized treatment strategies and improving patient outcomes. This study aimed to establish HIF-1a as a key prognostic biomarker and develop an artificial intelligence (AI)-based model integrating imaging and clinical data for HIF-1a-driven recurrence risk stratification.

METHODS AND MATERIALS

A total of 491 PTC patients were divided into training (n=149), internal test (n=112), and two external test sets (n=110, n=120). Data from TCGA, lab experiments, and our center were used to validate HIF-1a's prognostic role. An AI-driven predictive model was developed using radiomics features from thyroid ultrasound and CT imaging combined with clinical data to predict HIF-1a expression. Ten machine learning algorithms were employed, and model performance was evaluated using the area under the receiver operating characteristic curves, calibration curves, and precision-recall analysis. A web-based risk calculator was developed based on SHapley Additive exPlanations (SHAP) analysis for model interpretation. Recurrence-free survival analysis (RFS) was performed to assess the model's prognostic value across all datasets.

RESULTS

High HIF-1a expression was significantly associated with advanced tumor stage, lymph node metastasis, extrathyroidal extension, and recurrence in PTC. The random forest model exhibited excellent performance, with strong calibration and high precision-recall results. SHAP analysis identified the radscore, Hashimoto's thyroiditis, and tumor size as key predictors of HIF-1a expression. Multi-center validation confirmed the model's ability to predict RFS, with high HIF-1a expression associated with worse outcomes ($p < 0.01$).

CONCLUSION

This study established HIF-1a as a key biomarker for recurrence risk and developed an AI-enhanced model integrating imaging and clinical features for HIF-1a-driven recurrence risk stratification, thus supporting clinical decision-making in PTC patients.

CLINICAL RELEVANCE/APPLICATION

This AI-based model offers a practical tool for preoperative HIF-1a-driven recurrence risk stratification in PTC. Through using HIF-1a as an intermediary biomarker, it links imaging features with tumor biology and recurrence risk, providing a non-invasive way to predict recurrence and guide personalized treatment strategies.

M2-SPHN-8 HIGH RESOLUTION 3D ISOTROPICCISS MR IMAGING OF RECURRENT LARYNGEAL NERVE IN CADAVERS WITH ANATOMIC-RADIOLOGIC CORRELATION: INITIAL EXPERIENCE FROM SPARC-REVA

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PURPOSE

Recurrent laryngeal nerve (RLN) preservation is an essential component of thyroid and parathyroid surgeries. Permanent RLN injury can result in dysphonia, aspiration, and dyspnea with a signi&#7;cant impact on patient quality of life. Pre-operative imaging can determine both the location and trajectory relative to key cervical structures and guide surgical planning or be used with a navigation system during surgery to localize and preserve the RLN in real-time. Imaging RLN is fraught with several technical challenges, including small size and physiological motion in the neck. Routine clinical use of CISS MRI to visualize the vagus nerve and its branches in patients is limited and we hope to address this problem. In our research our aim is to study the extent to which we can visualize the right and left RLNs on CISS MRI in cadavers and lay the foundation for translation of this work to living subjects.

METHODS AND MATERIALS

55 embalmed cadavers were scanned with a 3T MRI scanner using 3D isotropic 0.5-0.6 mm resolution 3D-CISS (Constructive Interference in Steady state), VIBE (Volumetric Interpolated Brain Examination), T1 and T2 TSE, PSIF techniques; a total of 110 CN X were examined. Two readers independently evaluated visualization of the left and right RLN on CISS MRI. Following this the findings were confirmed on anatomic dissection, micro-CT evaluation and histological analysis.

RESULTS

Based on our results we found that 3D CISS MRI is superior in visualizing CN X and RLN compared with other sequences. Out of the 55 cadavers we could confidently identify, and trace left RLN in 27 (49%) and right RLN in 13 (24%) cadavers, with some newly reported anatomic variants.

CONCLUSION

In cadavers the use of 3T CISS MRI allows visualization of left and right RLN in the neck and thorax. There are differences in visualization of left and right RLN, with the left being better visualized. SPARC-REVA is the most comprehensive mapping of CN X and its branches to date, from the perspectives of sample size, range of imaging modalities, lengths of nerve, and imaging resolutions. These data may aid in the translation of this work into clinical imaging for pre-operative identification and pathological detection.

CLINICAL RELEVANCE/APPLICATION

The identi&#7;cation and preservation of the RLN is an essential goal of thyroid and parathyroid surgeries. MRI represents a promising adjunctive technique to assist surgeons in this respect with the potential to decrease RLN injury rates. The future integration of CISS MRI for visualizing the RLN in living subjects, with reasonable imaging acquisition times and motion compensation, holds great promise for routine pre-operative, diagnostic and therapeutic imaging.

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M2-SPIN

Imaging Informatics Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPIN-1 APPLICATION OF DEEP LEARNING-BASED CT QUANTIFICATION OF MUSCLE, VISCERAL FAT, AND INTRAMUSCULAR FAT TO IDENTIFY LABORATORY AND CLINICAL RISK FACTORS FOR SARCOPENIA

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Charles E. Kahn JR, MD, MS (*Abstract Co-Author*)
Jeffrey Duda (*Abstract Co-Author*)
Daniel Rader (*Abstract Co-Author*)
James C. Gee, PhD (*Abstract Co-Author*)
Walter R. Witschey, PhD (*Abstract Co-Author*)
Hersh Sagreiya, MD (*Abstract Co-Author*)

PURPOSE

Sarcopenia, the age-related loss of muscle mass and function, affects 5-10% of the population and causes impaired mobility and increased mortality. However, it is not clinically well-recognized, and muscle estimation methods like DXA lack accuracy. Deep learning CT segmentation can accurately quantify body composition, but prior studies analyzed small sample sizes or lacked comprehensive disease associations. The goal was to apply deep-learning segmentation to CT scans in the Penn Medicine BioBank to quantify body composition trends and identify risk factors associated with sarcopenia.

METHODS AND MATERIALS

Segmentations of abdominal CT scans were performed between the inferior aspect of the lung and inferior aspect of the L5 vertebrae to quantify muscle, visceral fat, and intramuscular fat (IMF). Associations of HDL-C, A1C, and triglyceride levels with body composition were evaluated. Phenome-wide association studies (PheWAS) assessed statistical interactions between clinical phenotypes and the three imaging-derived metrics, adjusting for age, sex, race, and BMI, with statistical significance set at p<2.82E-5 (Bonferroni correction).

RESULTS

Among 6,747 patients, higher HDL-C levels were linked to lower visceral fat and IMF: patients above the 90th percentile exhibited 49.6% less visceral fat and 30.9% less IMF than those below the 10th percentile. In contrast, visceral fat increased by 62.0% with higher A1C and 104% with higher triglycerides, while IMF rose by 43.7% and 39.7%, respectively (<10th to >90th percentile). PheWAS identified multiple disease associations for each imaging phenotype: lower muscle was associated with obesity (p=3.74E-11) and diaphragmatic hernia (p=1.68E-07); higher visceral fat was associated with diabetes (p=6.62E-28) and hypertension (p=3.24E-20); and higher IMF was linked to fluid overload (p=8E-67) and pulmonary heart disease (p=8.79E-48).

CONCLUSION

This study identified quantitative trends of metabolic markers in a large cohort, measuring how muscle volume changes in relation to laboratory values. Furthermore, PheWAS provided insight into comorbidities that may accelerate sarcopenia progression, such as diabetes, obesity, and hypertension. These findings help refine the clinical risk profile for sarcopenia, linking body composition metrics to laboratory results and comorbidities. Future research can explore genetic risk factors via genome-wide association studies.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the potential of integrating AI tools into clinical practice, providing age- and sex-based criteria for body composition and relating them to laboratory values and comorbidities — improving sarcopenia diagnosis, risk stratification, and treatment monitoring.

M2-SPIN-2 CAN AI BE TRUSTED TO SUMMARIZE RADIOLOGY REPORTS FOR PATIENTS? A ROBUSTNESS EVALUATION USING ADVERSARIAL EDITS

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Asad Aali (*Abstract Co-Author*)
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PURPOSE

Large Language Models (LLMs) show promise in creating patient-friendly summaries of radiology report impressions. However, there is a need to assess their reliability, ideally without manual evaluation. Thus, we propose evaluating LLM-generated summaries by comparing those generated before and after controlled modifications ("adversarial edits") to assess whether they reliably capture the introduced edits.

METHODS AND MATERIALS

We analyzed 5,125 abdominal CT report impressions, systematically creating pairs of original and modified impressions with adversarial edits. These known edits served as ground truth, enabling evaluation of a summarizer LLM (Llama 3.3 70B) without manual annotation. We used two editing approaches: (1) substitution of terms (e.g., anatomy, pathology, confidence terms) to test whether summaries accurately maintained the unaltered facts and correctly reflected the modified terms, and (2) removal of specific imaging findings to test whether the summaries included the expected number of findings before and after the edits. Each approach included difficulty levels of easy, medium, and hard. We used a second LLM (Llama 3.1 8B) to quantify the factual faithfulness, sensitivity to substitutions, certainty fidelity, and absence of hallucinations between the two summaries. We hypothesize that if the evaluator LLM considers the summaries from both original and edited impressions identical, the summarizer LLM failed to adapt its summary to capture the adversarial edits.

RESULTS

After the original impressions were edited with hard term substitutions, LLM-generated patient summaries were fully factually accurate in 51% of cases. Certainty fidelity was correctly maintained in 66% of summaries, while 86% of summaries were sensitive to the substitutions. Hallucinations were introduced in 15% of cases. A negative Spearman correlation (?=-0.22, p<0.01) between factual faithfulness and hallucinations indicated factual inaccuracies coinciding with invented details.

CONCLUSION

Our automated framework for evaluating LLM summaries via adversarial testing revealed that summaries can include factual errors, fail to capture subtle term substitutions, and introduce hallucinations. Thus, systematic evaluation methods that detect such errors are crucial to ensure the reliability of LLMs before deployment.

CLINICAL RELEVANCE/APPLICATION

LLM translation of radiological impressions into layperson language holds promise for improving patient understanding but remains vulnerable to errors. This study introduced a framework to evaluate the accuracy of LLMs for summarization without placing the burden solely on radiologists. The identified potential risks can guide the development of safer patient-facing AI applications.

M2-SPIN-3 RESNETFFT: SEEING BEYOND PIXELS FOR RADIOLOGICAL IMAGE CLASSIFICATION

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Surya P. Bhatt (*Abstract Co-Author*)
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PURPOSE

Conventional deep learning approaches for medical image analysis primarily focus on spatial features, potentially overlooking critical frequency-domain information inherent in radiological images. This study introduces ResNetFFT, a novel architecture augmenting standard ResNet model with Fast Fourier Transform (FFT) features to capture both spatial and frequency characteristics.

METHODS AND MATERIALS

Our ResNetFFT model enhances the conventional ResNet-18 architecture by incorporating FFT features with spatial information. For each input image (2D|3D), we apply FFT to convert spatial data into frequency domain representations. The resulting FFT magnitude coefficients are then concatenated with the original spatial data along the channel dimension, providing the network complementary information from both domains. This enriched input was processed through a modified ResNet-18 architecture with squeeze-and-excitation attention mechanisms to weight feature channel importance dynamically. The model was evaluated on multiple datasets from MedMNIST v2, including chest X-rays, breast mammograms, retinal OCT scans (2D), and lung nodule, fracture, intracranial vessels, and multi-organ CT scans (3D). Performance was assessed using accuracy and area under the ROC curve (AUC) with direct comparisons to ResNet-18 and 2.5D approaches.

RESULTS

ResNetFFT demonstrated superior performance across diagnostic tasks. For 2D datasets, the model achieved 84.9% accuracy and AUC of 0.95 for pneumonia detection (vs. ResNet-18: 81.7%, AUC 0.93), 88.5% accuracy and AUC of 0.90 for breast cancer classification (vs. ResNet-18: 83.2%, AUC 0.88), and 70.8% accuracy with AUC of 0.92 for OCT classification (vs. ResNet-18: 68.3%, AUC 0.89). In 3D volumetric data, ResNetFFT reached 78.1% accuracy and AUC of 0.720 for lung nodule detection (vs. 3D ResNet-18: 75.3%, AUC 0.698), 46.7% accuracy and AUC of 0.624 for fracture classification (vs. 3D ResNet-18: 43.1%, AUC 0.601), 94.0% accuracy and AUC of 0.944 for vessel classification (vs. 3D ResNet-18: 90.2%, AUC 0.921), and 89.0% accuracy with AUC of 0.992 for organ classification (vs. 3D ResNet-18: 85.6%, AUC 0.975). Compared to 2.5D approaches, ResNetFFT showed 3-7% improvement in AUC while maintaining comparable computational efficiency.

CONCLUSION

ResNetFFT enhances medical image analysis by integrating frequency-domain features with spatial information providing a complimentary perspective in diagnostic tasks.

CLINICAL RELEVANCE/APPLICATION

ResNetFFT's improved performance in detecting radiological patterns offers value in scenarios requiring high diagnostic sensitivity, such as early-stage lung nodule detection and vascular abnormality identification.

M2-SPIN-4 ESTABLISHING A SEMANTIC ALIGNMENT FRAMEWORK FOR PRE/POST-CONTRAST CT: TOWARD MULTIMODAL IMAGE CORRESPONDENCE WITH ATTENTION-BASED MATCHING

Kyungwon Yun (*Presenter*)
Jungwon Kwak, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop a semantic alignment framework for pre-/post-contrast CT registration using transformer-based matching, with an emphasis on phase-robust and anatomically adaptive components. The goal is to enable automated subtraction imaging and MPR generation and lay the groundwork for multimodal alignment.

METHODS AND MATERIALS

A transformer-based semantic matcher was implemented with three key components: (1) Token Similarity Masking , which suppresses attention between tokens with large inter-phase intensity differences; (2) ROI-Adaptive Keypoint Filtering , which stratifies keypoints by segmentation-defined anatomical classes and selects top-k salient points per class; (3) Multiplane Keypoint Projection , which aggregates features across axial, sagittal, and coronal planes to improve 3D alignment. Phantom CT data were used to compare performance with ORB. Keypoint feature alignment error (in pixels) was used for quantitative evaluation.

RESULTS

Compared to ORB (mean 35.05 px, s = 61.73 px), the proposed method achieved a substantially lower mean feature distance error of 3.32 pixels with a standard deviation of only 2.77 pixels. Median error also improved from 6.61 px (ORB) to 2.56 px. This indicates not only improved alignment accuracy, but also remarkable consistency and robustness across samples. Subtraction images generated using the proposed alignment showed improved structural coherence.

CONCLUSION

The proposed framework significantly improves CT alignment across contrast phases, offering more accurate and stable correspondence than traditional methods. Its modular design supports integration into clinical post-processing and scalable extension to multimodal imaging.

CLINICAL RELEVANCE/APPLICATION

By enhancing subtraction imaging and anatomical alignment consistency, this method reduces manual effort in vascular imaging workflows and provides a generalizable foundation for future multimodal AI-assisted diagnostic tools.

M2-SPIN-5 AUTOMATED 3D CT REPORT GENERATION USING LLM WITH EXPERT-INFORMED ASSESSMENT

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PURPOSE

While large language models (LLMs) have shown promise in generating reports for X-rays and 2D CT slices, comprehensive 3D image-based reporting solutions remain largely unexplored despite their importance in capturing spatial and pathological nuance in clinical practice. Our study aims to: 1) develop an automated system to generate standardized reports for 3D CT scans through LLM integration with 3D imaging; and 2) develop an expert-based validation framework to evaluate clinical acceptability of AI-generated reports.

METHODS AND MATERIALS

We developed 3DRadReport, a novel automated system that analyzes 3D CT scans to generate clinically relevant reports. This system involves a specialized 3D image processing module inspired by recent foundation models, which efficiently extracts relevant image embeddings for interpretation by an LLM (GPT2-Medium). This study involved a public dataset of 50,188 3D chest CT scans with reports. To comprehensively assess report quality, we used both automated metrics and expert validation. For expert evaluation, we developed a web-based scoring system and sampled 200 borderline cases using clinical metric (0.4<GREEN score<0.6). The scoring template included fields for 1-10 rating, missing findings across 17 diagnostic categories, and a qualitative feedback section. This enabled a statistical comparison between the clinical metric and expert ratings to estimate how well the metric reflects clinical efficacy.

RESULTS

For 3,039 test cases, our model achieved strong performance on text-based metrics: Average BLEU: 0.28, METEOR: 0.44, and Average ROUGE: 0.46. The GREEN Score was 0.58±0.26, indicating moderate report quality. Among 200 borderline cases, only 15.6% were expert-accepted, with a modest positive correlation between expert and the GREEN score (Spearman's ? = 0.17, p = 0.019). In a multivariate regression analysis, expert-identified missed findings were the strongest independent predictor of expert ratings, each lowering the rating by 7.2% (p < 0.001). GREEN score-based missed findings (ß = 0.0234, p = 0.028) were positively associated with the ratings but had a substantially weaker impact than expert-marked ones.

CONCLUSION

Our 3D report generation system demonstrated strong text-based performance across a large test set. Our study is the first comprehensive evaluation combining the GREEN score with detailed expert analysis, revealing significant limitations of current clinical metrics and highlighting the need for more robust evaluation tools.

CLINICAL RELEVANCE/APPLICATION

As the first study to systematically evaluate GREEN score performance against expert assessments, it highlights critical gaps in current automated clinical metrics for reliable deployment of 3D reporting solutions.

M2-SPIN-6 DUAL-TASK LEARNING WITH SEMANTICALLY-ENRICHED FEATURES ENHANCES ANALYSIS PERFORMANCE OF AP AND PA CHEST X-RAYS

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Heeguen Kang (*Abstract Co-Author*)
Hongjun Yoon (*Abstract Co-Author*)
Seongeun Lee (*Abstract Co-Author*)
Sohyun Jeong (*Abstract Co-Author*)

PURPOSE

To address performance degradation in automated chest X-ray (CXR) interpretation for anteroposterior (AP) views compared to posteroanterior (PA) views, we developed and evaluated deep learning (DL) models to enhance semantic understanding, robustness, and general performance. Existing approaches often suffer from label noises, ambiguous findings, and domain mismatches from pretraining non-clinical data. We hypothesized that learning deeper semantic structures could improve classification of predefined abnormalities and generalize better across views.

METHODS AND MATERIALS

Model 1 was a standard classification network with an ImageNet-pretrained encoder to classify five chest abnormalities: consolidation (CSN), pneumothorax (PTX), nodule or mass (NDL), fibrosis (FIB), and pleural effusion (PEF). Model 2 added an image reconstruction decoder, in comparison to model 1, to promote semantic feature learning while sharing the same classification task. Both models were fully fine-tuned with basic augmentations using 1,600,905 CXR images from three public datasets and four private hospitals (82.09% normal). External evaluation was performed using a separate private dataset (272 images; 40.44% normal) and the public ChestX-Det dataset (2,216 images; 24.55% normal).

RESULTS

Model 2 showed overall performance gains when evaluating with AP, PA, and collective view images improving mAUROC of 0.019 (AP: +0.0179, PA: +0.0223) in public and 0.0286 (AP: +0.0358, PA: +0.0359) in private dataset when compared to model 1. In the public dataset, the AP-PA AUROC gap was modestly reduced (Model 1: -0.0198; Model 2: -0.0158). In the private dataset, the gap remained stable (Model 1: +0.0496; Model 2: +0.0497). For individual findings, Model 2 improved view consistency for PTX (?AUROC: -0.1023 to -0.0211, p=0.0089) and FIB (?AUROC: +0.1309 to +0.0995, p=0.0002) in the public dataset. In the private dataset, CSN, FIB, and NDL showed favorable but non-significant trends. No notable differences were observed for PEF.

CONCLUSION

Adding a reconstruction task to abnormality classification improved model performance under full fine-tuning, regardless of view. Model 2 selectively improved robustness for PTX and FIB in the AP-PA performance gaps. Learning deeper semantic features may enhance view-invariant diagnostic consistency.

CLINICAL RELEVANCE/APPLICATION

Semantic-aware learning strategies can improve CXR classification performance and reduce view-related gaps, enhancing reliability and fairness of AI-assisted interpretation in clinical practice.

M2-SPIN-7 A GENERALIZABLE AI-BASED BONE MINERAL DENSITY CLASSIFICATION FROM CONTRAST AND NON-CONTRAST SPINE CT SCANS

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Niklas Eisl (*Abstract Co-Author*)
Karine Louis (*Abstract Co-Author*)
Marko Zlatic (*Abstract Co-Author*)
Patrick Schmidt (*Abstract Co-Author*)
Lea-Elena Braunschneider (*Abstract Co-Author*)
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Valentin Koch (*Abstract Co-Author*)

PURPOSE

We aimed to develop and validate a generalizable, contrast-aware algorithm for the automatic classification of osteoporosis and osteopenia from sagittal spinal CT scans, to support routine clinical diagnosis with high specificity and adequate sensitivity in order to minimize unnecessary follow-up procedures.

METHODS AND MATERIALS

We collected data from a diverse, multi-center cohort that included CT scans from seven scanner manufacturers and 32 different scanner models. We compiled two independent datasets: one for training a contrast phase correction model (n = 633 studies) and another for bone mineral density (BMD) classification (n = 779 studies). To assign ground truth BMD categories (normal, osteopenia, or osteoporosis) we used T-scores from matched DEXA scans obtained from the same patients. We included only cases where the DEXA scan occurred between 30 days before and 90 days after the CT scan to minimize treatment-induced label shifts. Radiologists manually reviewed all data after strict anonymization.For BMD analysis, we selected CT scans that covered at least three vertebrae and segmented the vertebral bodies using TotalSegmentator, a U-Net based model. We trained a separate model on the contrast phase dataset to correct for intravenous contrast, ensuring consistency in HU measurements. After segmenting the vertebrae, we isolated the spongiosa region and calculated the median Hounsfield Unit (HU) values for each vertebra. Using cross-validated grid search, we determined sex-specific HU thresholds to classify BMD. We then evaluated the model on a fully independent holdout set (n = 184) to validate classification performance.

RESULTS

The contrast correction model significantly reduces the measured HU value difference between contrast-enhanced and uncontrasted scans (R^2 from 0.86 to 0.96) from the same study. The BMD prediction model achieves 60.0% sensitivity and 88.0% specificity on the holdout set. Subgroup analyses revealed consistent performance across sex and age groups as well as contrast presence, with no evidence of systematic bias. Qualitative evaluations confirmed robust segmentation and prediction behavior.

CONCLUSION

To the best of our knowledge, this is the first CT-based algorithm capable of classifying bone mineral density across the entire spine in both contrast-enhanced and non-contrast scans. It demonstrates strong performance under real-world conditions and represents a substantial step forward in opportunistic osteoporosis screening.

CLINICAL RELEVANCE/APPLICATION

This algorithm enables accurate, automated BMD assessment from routine CT scans, supporting opportunistic osteoporosis screening and aiding early detection to help prevent fractures.

M2-SPIN-8 SEQUENCE-AWARE MTANN FOR SEGMENTATION OF RARE SOFT-TISSUE SARCOMAS IN MULTI-SEQUENCE MRI WITH MISSING SEQUENCES

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PURPOSE

Rare soft-tissue sarcomas (STS), accounting for less than 1% of adult cancers, pose diagnostic and therapeutic challenges due to heterogeneity and limited data. As conventional deep learning models require large datasets, their effectiveness is limited for rare cancers. We developed a clinically applicable model that accurately segments STS in MRI, even with small datasets and incomplete sequences, capturing fine anatomical details and dynamically adapting to available imaging to improve diagnosis and treatment planning.

METHODS AND MATERIALS

A dataset of 155 patients with benign and malignant tumors (STS) was collected, including 155 T2-weighted (T2w) and 76 gadolinium-enhanced (GD) MRI scans. Tumors were manually segmented by a radiologist and verified by an orthopedic surgeon. We propose a sequence-aware massive-training artificial neural network (SA-MTANN) comprising: (1) a multi-kernel MTANN backbone, (2) a multi-resolution mechanism, and (3) a sequence-aware (SA) module. The multi-kernel MTANN processes 3D patches using different receptive fields to capture global and local tumor features. The multi-resolution mechanism integrates high-, mid-, and low-resolution representations for enhanced context. Outputs are up-sampled and combined through a weighted sum to create the segmentation map. The SA module adapts to missing sequences by pooling and dynamically weighting T2w and GD features; when GD is absent, the model relies on T2w alone, maintaining robust performance. The model is trained with binary cross-entropy loss at the patch level with post-processing refinement.

RESULTS

The dataset was divided into large (109 cases), medium (54 cases), and small (26 cases) subsets, with 20 cases for testing (9 T2w+GD, 11 T2w only). The main metric was the Dice similarity coefficient (DSC). SA-MTANN achieved DSCs of 83.0%, 80.6%, and 78.7% for large, medium, and small sets, respectively, outperforming nnU-Net and U-Net, particularly in small datasets. The SA module was crucial for handling missing GD sequences, maintaining accuracy with T2w-only inputs. SA-MTANN also provided superior boundary delineation compared to nnU-Net and MAML.

CONCLUSION

We developed a sequence-aware deep learning model for rare cancer segmentation, excelling with limited datasets and incomplete imaging. SA-MTANN dynamically adapts to available inputs, outperforming conventional models. It maintains high accuracy without GD and requires fewer computational resources, making it ideal for clinical use in rare cancers with limited infrastructure.

CLINICAL RELEVANCE/APPLICATION

Our method enables accurate STS segmentation from limited T2 MRI data, using low resources and improving clinical decision-making despite rare cancer imaging challenges.

M2-SPIN-9 DIFFICULTY-BASED ACTIVE BOOSTING FOR ROBUST LUNG NODULE CLASSIFICATION WITH MULTI-EXPERT MTANN ENSEMBLE

Shogo Kodera (*Presenter*)
Seyed Mohammad Chavoshian (*Abstract Co-Author*)
Hiroko Oshibe (*Abstract Co-Author*)
Ze Jin, PhD (*Abstract Co-Author*)
Kenji Suzuki, PhD (*Abstract Co-Author*)

PURPOSE

Deep learning (DL) AI for diagnostic aid has shown promise but requires extensive training data and expensive GPU resources, limiting clinical adoption. While massive-training artificial neural network (MTANN) operates efficiently with limited data, recent research indicates that combining multiple specialized MTANNs as expert models yields higher classification performance than using a single comprehensive MTANN. We developed a Difficulty-Based Active Boosting (DBAB) framework using histogram-based resampling to create and ensemble specialized MTANN submodels.

METHODS AND MATERIALS

LIDC-IDRI database with 381 malignant and 303 benign nodules was utilized. Nodules were processed into 51×51×51 voxel volumes of interest. Using 3-fold cross-validation, one-third of the data served as training/validation with two-thirds as testing. Our framework involves: 1) Training an initial MTANN on a small subset; 2) Analyzing malignancy-score histograms to identify difficult nodules: malignant nodules with low scores (false negative (FN) risk) and benign nodules with high scores (false positive (FP) risk); 3) Strategically resampling these challenging cases to train expert submodels for FN and FP reduction; 4) Integrating outputs through a neural network. This approach systematically targets specific nodule types that cause overlapping distributions.

RESULTS

We developed a histogram-guided DBAB framework that strategically creates expert MTANN submodels to robustly handle challenging nodule types. This systematic approach significantly improved classification accuracy and robustness by reducing overlap in malignancy score distributions, leading to fewer FNs and FPs. In addition, with exceptional parameter efficiency (0.034M parameters) enables CPU operation, making it practical for clinical deployment where high-performance computing resources are unavailable.

CONCLUSION

We developed a histogram-guided DBAB framework that strategically creates expert MTANN submodels to robustly handle challenging nodule types. This systematic approach significantly improved classification accuracy and robustness by reducing overlap in malignancy score distributions, leading to fewer FNs and FPs. In addition, with exceptional parameter efficiency (0.034M parameters) enables CPU operation, making it practical for clinical deployment where high-performance computing resources are unavailable.

CLINICAL RELEVANCE/APPLICATION

By enhancing robustness against difficult-to-classify lung nodules, our DBAB MTANN ensemble supports radiologists in achieving more accurate diagnoses. Its CPU compatibility further enables AI in practical use without high-end hardware.

M2-SPIN-10 BEYOND PIXELS: RADIOLOGIST ASSESSMENT OF AI-GENERATED MAMMOGRAM REALISM, DISTINGUISHABILITY, AND THE INFLUENCE OF CLINICAL EXPERIENCE

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Maria Luiza Teixeira (*Abstract Co-Author*)
Julia Stefanne Santos Simao (*Abstract Co-Author*)
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Felice A. Burn, MD (*Abstract Co-Author*)

PURPOSE

Generative AI offers potential for synthetic medical imaging data, yet clinical realism is critical. Standard metrics may miss nuances discernible by experts. This Turing test with radiologists assessed synthetic mammogram verisimilitude, aiming to understand expert perception complexities and identify assessment factors, informing robust evaluation and guiding AI development towards clinical utility.

METHODS AND MATERIALS

Six radiologists of varying experience evaluated 420 mammograms (140 real; 140 Diffusion; 140 StyleGAN). Real 2048x2048 images were from an in-house dataset used for model training. Participants assessed realism (0-100), classified images as real/synthetic, and noted micro-calcifications. Responses and decision times were recorded.

RESULTS

Overall, radiologists distinguished synthetic from real mammograms with sensitivity 0.66 and specificity 0.74. Performance varied by experience; more experienced radiologists showed lower error rates, less experienced approached chance-level decisions for synthetic images. Inter-radiologist agreement for image classification was slight overall (average Cohen's Kappa: 0.217), yet this varied markedly with experience: ranging from slight to moderate. Higher synthetic image realism correlated positively with increased radiologist detection error. Additionally, incorrect real image classifications incurred significantly longer assessment times. Diffusion model images were rated more realistic than GANs and incurred longer assessment times.

CONCLUSION

This Turing test revealed Diffusion models generated mammograms perceived as more realistic than GAN, though neither fully replicated real image characteristics. Radiologist experience critically impacted synthetic image identification and substantially modulated inter-rater agreement. The correlation between higher realism and detection difficulty, alongside variations in inter-radiologist consistency linked to experience, highlights complexities in expert visual assessment. These findings, including varied decision times, underscore that robust generative AI validation in medical imaging must account for observer experience and multiple perceptual factors to ascertain synthetic data reliability, guiding development towards genuine clinical value.

CLINICAL RELEVANCE/APPLICATION

Robustly evaluating synthetic medical images using expert radiologists, considering experience, is crucial for the safe integration of generative AI into clinical training, research, and potential diagnostic support.

M2-SPIN-11 IMPROVED PENETRATING BRAIN INJURY CASE MANAGEMENT THROUGH ATTENTION-BASED MULTIPLE INSTANCE LEARNING

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Ali Mansour (*Abstract Co-Author*)
Olga Pasternak Wise, MD, MS (*Abstract Co-Author*)
Joel Toledo-Urena (*Abstract Co-Author*)
Farima Fakhri (*Abstract Co-Author*)
Fernando Goldenberg (*Abstract Co-Author*)
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PURPOSE

To develop improved understanding of the imaging manifestation of penetrating brain injury (PBI) and utilize predictive models to better stratify patients based on outcomes and treatment response.

METHODS AND MATERIALS

This IRB-approved retrospective study analyzed head CT (HCT) images obtained from PBI patients from our local Level 1 Trauma Center. Inclusion criteria were if the patient 1) was older than 16 years old, 2) suffered a PBI caused by gunshot wound to the head, 3) showed dural injury on initial HCT, and 4) was not pronounced dead on arrival to the hospital. Ultimately, we obtained a dataset of 230 cases, with 110 survivors and 120 deceased. The MIDRC Generalized Stratified Sampling algorithm was used to split cases into training and testing sets with matched distributions of survival% and GCS, giving 174 training cases and 56 test cases, which were utilized for machine learning model development and evaluation, respectively. We implemented a deep attention-based multiple instance learning (AMIL) algorithm to predict patient mortality from initial HCT. Briefly, this approach extracts deep learning embeddings from individual HCT slices via a pre-trained ResNet50 model, then aggregates slice information into an HCT representation to predict likelihood of survival. Performance was evaluated via ROC analysis in the binary mortality prediction task with 95% confidence intervals estimated via 1000 bootstrap iterations. We compared predictions with GCS and provided model interpretability via attention weight curve,

conveying which regions were, on average, most important to the classification decision. Finally, we obtained an external dataset of 102 military PBI cases on which to evaluate model generalizability.

RESULTS

The AMIL approach achieved an AUC of 0.90 [80, 0.96], comparing favorably to standard risk scores (Rotterdam AUC=0.80, Marshall AUC=0.66) and other published models. A case-by-case comparison of the AMIL predictions with GCS shows moderate agreement, with deviations explicable given broader context. Similarly, the attention weight curve reveals that the model found higher relative importance in lower brain regions (e.g., below the 3 rd ventricle), agreeing with clinical expectation. The model generalized to the external validation set with an AUC of 0.85 [0.75, 0.93].

CONCLUSION

The AMIL approach has demonstrated significant potential in evaluating PBI cases, achieving strong performance on both internal and external data while matching clinical expectations for GCS comparison and explainable output.

CLINICAL RELEVANCE/APPLICATION

Current clinical standards do not properly evaluate PBI. This AI study is a strong first step toward improving PBI case stratification and management.

M2-SPIN-12 DEBLURRING ULTRASOUND IMAGES TO IMPROVE CLASSIFICATION OF THICKENED SYNOVIUM

Pascal N. Tyrrell, PhD (*Presenter*)
Youyang Guo (*Abstract Co-Author*)
Noushin Jafarpisheh (*Abstract Co-Author*)

PURPOSE

To determine if a deblurring masked auto-encoder (DeblurMIM (Kang et al, 2023)) improves automated detection of thickened synovium with the presence of knee recess distension on knee musculoskeletal ultrasound compared with a published convolutional neural-network (CNN) baseline (Balla et al, 2024) trained for detecting thickened synovium.

METHODS AND MATERIALS

The study is the first application of DeblurMIM to musculoskeletal ultrasound to my knowledge. In this retrospective study, 4,389 suprapatellar ultrasound images (1,651 positive; 2,738 negative) were balanced by patient and splitted 70/10/20 % by patient for training, validation, and testing. A DeblurMIM encoder was first pretrained to reconstruct sharp images from synthetically blurred inputs (Gaussian s = 1.1; mask ratio 75 %). The pretrained encoder was then fine-tuned with a MLP. The comparator was an EfficientNet-B4 CNN retrained under identical data partitions. Five-fold patient-level cross-validation was performed. Accuracy was the primary metric to evaluate the model; AUROC, sensitivity, and specificity were secondary metrics. Differences were assessed with paired bootstrap resampling (5,000 replicates); $p < 0.05$ denoted significance.

RESULTS

DeblurMIM achieved an accuracy of 79.4 %, outperforming the CNN baseline (71.5 %) by 7.9 percentage points (95 % CI 3.5 - 11.6; $p < 0.001$). AUROC improved from 0.81 to 0.87 (+0.06), and sensitivity increased from 0.58 to 0.80 (+0.22). Specificity decreased non-significantly from 0.84 to 0.78 (CI includes 0). Under additional synthetic blur (s = 2.5), DeblurMIM preserved 93 % of its original accuracy, whereas the baseline retained 96 %, but the absolute performance gap remained = 5 percentage points across all blur levels.

CONCLUSION

Learned deblurring with a masked auto-encoder significantly enhances classification of thickened synovium on knee ultrasound and remains robust under increased image blur. The higher sensitivity comes at a modest loss of specificity; threshold optimization may be required in settings where rate of false positives needs to be reduced. DeblurMIM represents a practical preprocessing strategy to improve musculoskeletal ultrasound interpretation without enlarging training datasets. Limitation: The network was exposed only to synthetic Gaussian blur during pretraining, which may lead to overfitting and reduced generalizability to real-world degradations such as speckle noise. Diverse image noises and imperfections are needed for multicentre validation.

CLINICAL RELEVANCE/APPLICATION

By recovering diagnostically useful detail from blurred MSK-US frames, DeblurMIM could support earlier, more reliable detection of thickened synovium in routine clinical settings.

M2-SPIN-13 INCORPORATING RADIOLOGISTS' EYE-GAZE IN MACHINE LEARNING MODELS IMPROVES IDENTIFICATION OF UNCOMMON FINDINGS: A PROOF-OF-CONCEPT STUDY

Prateek Prasanna, PhD (*Presenter*)
Moinak Bhattacharya (*Abstract Co-Author*)

PURPOSE

Long-tailed disease classification from chest X-rays remains a critical challenge due to the imbalance between frequent and rare pathologies. While radiologists can accurately interpret incidental findings through dynamic visual attention, deep learning models often fail to detect such underrepresented "tail-class" diseases due to training data imbalance. We introduce GazeLT, a novel radiologist-in-the-loop framework that incorporates temporal eye gaze patterns of radiologists to improve long-tailed classification performance.

METHODS AND MATERIALS

GazeLT models the temporal visual search process of radiologists using an integration-disintegration mechanism that captures both fine-grained and coarse-level features. The framework is trained and evaluated on two large-scale public datasets: NIH-CXR-LT (n = 89,237) and MIMIC-CXR-LT (n = 111,898). The model uses gaze-conditioned attention modules to prioritize clinically relevant regions across time windows during image interpretation. Baselines include state-of-the-art long-tailed loss functions and visual attention-based models without temporal gaze integration.

RESULTS

GazeLT outperforms the best-performing long-tailed loss function by 4.1% and a visual attention-based baseline by 21.7% in average accuracy across both datasets. The greatest improvements are observed in the classification of rare pathologies, validating the effectiveness of modeling temporal gaze dynamics.

CONCLUSION

Integrating radiologist eye gaze into deep learning architectures significantly enhances performance in long-tailed classification tasks. GazeLT provides a novel strategy for incorporating expert-level attention patterns into medical image interpretation.

CLINICAL RELEVANCE/APPLICATION

GazeLT demonstrates the potential of human-in-the-loop AI systems to improve diagnostic performance, especially for rare diseases often missed by traditional AI models. This approach could help bridge the gap between expert radiology practice and automated interpretation in real-world clinical settings.

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M2-SPIR

Interventional Radiology Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPIR-1 FACTORS CONTRIBUTING TO LOCAL RECURRENCE OF HEPATOCELLULAR CARCINOMA AFTER TRANSCATHETER ARTERIAL CHEMOEMBOLIZATION: INCORPORATING TEXTURE ANALYSIS OF CONE-BEAM CT DURING HEPATIC ARTERIOGRAPHY

Hideki Ishimaru, MD, PhD (*Presenter*)
Tomoki Nakano, MD (*Abstract Co-Author*)
Satomi Yoshimi (*Abstract Co-Author*)
Shuto Miyamura (*Abstract Co-Author*)
Oka Taiga (*Abstract Co-Author*)
Takamasa Nishimura (*Abstract Co-Author*)
Chika Somagawa, MD (*Abstract Co-Author*)
Ryo Toya, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to investigate the factors contributing to local recurrence after transcatheter arterial chemoembolization (TACE) by incorporating texture analysis data from CT during hepatic arteriography using cone-beam CT (CBCTHA).

METHODS AND MATERIALS

Of 257 HCC nodules (101 patients) treated with TACE between October 2019 and February 2024, 96 nodules (62 patients) were enrolled and retrospectively analyzed after excluding nodules smaller than 2 cm in diameter that were difficult to analyze using 3D volumetric analysis. At the beginning of the TACE treatment session, CBCTHA was obtained by injecting one-half diluted iodine contrast medium through the proper or common hepatic artery (the imaging delay was 4sec). 3-D angiography generated from CBCTHA data was used to identify each target lesion and feeding arteries. Chemoembolization was performed as selectively as possible with 1.7-F microcatheters and involved the injection of a mixture of anticancer drug (up to 50 mg of epirubicin) and emulsified lipiodol. Embolization was performed using gelatin sponge particles. The CBCTHA data were loaded onto a 3D workstation. Two radiologists in consensus manually segmented the tumor volumetric region of interest on the CBCTHA, and texture parameters (kurtosis, skewness, and entropy) were calculated. In addition to texture parameters, several other factors were correlated with the local recurrence rate through a univariate analysis using the Cox proportional hazards model. These factors included age, sex, tumor size and number, AFP, PIVKA-II, BCLC stage, and systemic drug therapy prior to TACE. Factors with a significance level of $p < 0.20$ were included in the multivariate model.

RESULTS

In the univariate analysis, tumor size, AFP, PIVKA-II, and entropy emerged as risk factors for local recurrence, with $P < 0.05$. The P values for kurtosis and skewness were 0.36 and 0.07, respectively, in the same analysis. In the multivariate analysis, systemic drug therapy before TACE (Lenvatinib prior to TACE, hazard ratio 3.14, $P<0.01$), tumor size (hazard ratio 7.78, $P=0.03$), and entropy on CBCTHA (hazard ratio 0.11, $P=0.01$) were identified as independent risk factors for local recurrence.

CONCLUSION

CBCTHA-derived tumor entropy, tumor size, and lenvatinib administration prior to TACE were predictors of local recurrence after TACE.

CLINICAL RELEVANCE/APPLICATION

Entropy of tumors observed on cone-beam CT during hepatic arteriography serves as an indicator for forecasting local recurrence following TACE.

M2-SPIR-2 BLOCKING IL-6/STAT3 SIGNALING PATHWAY TO INHIBITS HEPATIC METASTATIC GROWTH FOLLOWING RADIOFREQUENCY ABLATION

Haixing Liao, PhD (*Presenter*)
Yu Yi Cai (*Abstract Co-Author*)
Zheng-Nan Lai (*Abstract Co-Author*)
Peirong Fang (*Abstract Co-Author*)
Qing Tang (*Abstract Co-Author*)
Lian-Tu He (*Abstract Co-Author*)
Yuanzhen Liu (*Abstract Co-Author*)

PURPOSE

To evaluate targeted blockade of IL-6/STAT3 inflammatory signaling pathway can effectively suppress tumor burden after radiofrequency ablation (RFA), while elucidating its underlying molecular mechanisms.

METHODS AND MATERIALS

Eighty mice(40 normal mice,20 IL-6KO mice,and 20 STAT-3KO mice) were used in this institutional animal care and committee-approved study. First, a mouse hepatic metastasis model was established by implanting 2*10 5 tumor cells via splenic injection followed by immediate splenectomy.The mouse colorectal cancer tumor cell lines, MC38, was injected into C57B/6 mice. Next, animals were randomized to receive either standardized RFA or a sham procedure 24hr post-transplantation. Procedures were performed by means of laparotomy that exposed the liver surface for placement of a 21-gauge needle with a 1-cm exposed tip. Energy was titrated to a mean temperature of 70°C±1 for 300sec. Sham procedures consisted of electrode placement without energy application. The whole liver was harvested at 21 days for MC38 to permit quantification of tumors. Data were compared with analysis of variance and two-tailed Student t test.

RESULTS

For C57BL/6 mice with MC38 tumor implantation,RFA of 3.5%±0.02 of the mouse liver volume induced an increased tumor load distributed throughout the entire liver in comparison to that of sham procedure (RFA vs Sham:100.6±60.7 vs 43.0±22.4,$P<0.05$). For IL-6 KO and STAT-3 KO C57BL/6 mice with MC38 tumor implantation, tumor counts were measured at two diameter thresholds (>3 mm and <3 mm). Post-RFA versus sham treatment showed no statistically significant difference in tumor

count and the proportion of liver surface area occupied by tumors (IL-6 KO experiment:34.17 vs. 19.43; P = 0.0569)(STAT-3 KO experiment:41.1 ± 30.4 vs. 40.0 ± 23.1; P = 0.941). (The proportion of liver surface area occupied by tumors: 42.0% ± 14.5 vs.30.2% ± 7.0; P = 0.092).In MC38 cells genetically modified via CRISPR-Cas9 to knock out STAT3,it also revealed no significant difference in tumor count between RFA and sham groups (43.5 vs. 40.0; P = 0.788).

CONCLUSION

RFA significantly increase tumor load in normal mice by activating the inflammatory microenvironment.However,after systemic knockout of IL-6 or STAT3,RFA fails to induce significant tumor growth, indicating that IL-6/STAT3 inflammatory signaling pathway plays a critical role in RFA-induced tumor progression.

CLINICAL RELEVANCE/APPLICATION

Targeting IL-6/STAT3 signaling pathway effectively suppresses pro-tumorigenic inflammation triggered by RFA, offering a robust experimental foundation to refine adjuvant therapeutic strategies post-RFA.

M2-SPIR-4 PREOPERATIVE EMBOLIZATION CAN REDUCE INTRAOPERATIVE BLOOD LOSS AND PERIOPERATIVE BLOOD TRANSFUSION FOR SPINAL TUMOR RESECTIONS

Yanqing Zhao, MD (*Presenter*)

PURPOSE

Spinal tumor surgeries are associated with challenges such as massive intraoperative blood loss (IBL), perioperative blood transfusion (PBT), and prolonged surgery time (ST). However, the efficacy of preoperative embolization (PE) across different surgical approaches remains controversial. This study aimed to evaluate the impact of PE on IBL, PBT, and ST in spinal tumor en-bloc resections and debulking surgeries, while identifying associated risk factors and assessing the safety of PE.

METHODS AND MATERIALS

A single-center ambispective cohort study of 706 patients (374 males; mean age, 51.0 ± 16.2 years) with primary and metastatic spinal tumors treated between January 2015 to December 2023 was analyzed. Among them, 208 underwent PE (en-bloc resection = 122, debulking surgery = 86), and 498 did not (en-bloc resection = 83, debulking surgery = 415).Statistical analyses included Wilcoxon rank-sum tests, Fisher's exact tests, and Poisson regression to identify associations and calculate incidence rate ratios (IRR).

RESULTS

PE significantly reduced IBL and PBT in en-bloc resections compared to non-PE cases(both $p < 0.001$). In debulking surgeries, PE significantly decreased PBT ($p = 0.002$).Multivariate analyses identified non-PE cases (both $p < 0.001$) and tumors involving =2vertebrae (both $p < 0.001$) as independent risk factors for increased IBL and PBT, whilehypovascular tumors were associated with significantly lower IBL (IRR = 0.840, $p = 0.001$).Coil + particle embolization (n = 103) significantly outperformed coil-alone embolization (n =105), reducing IBL ($p = 0.002$), PBT ($p < 0.001$), and ST ($p = 0.001$). Adverse events occurred in34 patients (16.35%), with 32 mild and 2 moderate cases.

CONCLUSION

PE can reduce IBL and PBT in spinal tumor surgeries, particularly in en-blocresections and hypervascular tumors. Coil + particle embolization offers superior efficacy overcoil-alone embolization in minimizing IBL, PBT, and ST.

CLINICAL RELEVANCE/APPLICATION

Preoperative embolization (PE) proved highly effective in optimizing outcomes forspinal tumor en-bloc surgeries, significantly reducing intraoperative blood loss (IBL) andperioperative blood transfusions (PBT) compared to non-PE cases. Furthermore, non-PE casesand tumors involving =2 vertebrae were identified as significant risk factors for increased IBLand PBT. Notably, coil + particle embolization enhanced the benefits of PE, markedly reducingIBL, PBT, and surgery time compared to coil-alone embolization.

M2-SPIR-5 PROTECT THE RECURRENT LARYNGEAL NERVICES IN US-GUIDED MICROWAVE ABLATION OF THYROID NODULES AT ZUCKERANDL TUBERCLE: A PILOT STUDY

Ziyue Hu (*Presenter*)
Man Lu, PhD (*Abstract Co-Author*)

PURPOSE

MWA is a new and important minimally invasive treatment option that can be used to treat benign and malignant tumors of the thyroid, breast, liver, and lung. Numerous studies have demonstrated that MWA is a safe and effective technique to reduce the volume of thyroid nodules. However, recurrent laryngeal nerve (RLN) injury is still a prevalent complication, with neurological abnormalities described in 1.0-9.1% of patients. Moreover, if the patient has thyroid nodules at the Zuckerkandl tubercle (ZTTN), the RLN is at a higher risk of damage as the ZTTN is located in close proximity to the RLN. In this context, we employed high-frequency ultrasound (US) to preoperatively visualize the RLN and to lower the risk of the RLN injury during MWA for ZTTN. The purpose of our study was to evaluate the safety and efficacy of US-guided MWA in patients with ZTTN.

METHODS AND MATERIALS

103 consecutive patients with thyroid nodules at Zuckerkandl tubercle (ZTTN) were enrolled in this study from November 2017 to August 2021. Prior to the surgery or US-guided microwave ablation (MWA), preoperative ultrasound visualization of the recurrent laryngeal nerve (RLN) and ZTTN was performed, the size and the position relationship between them were observed. Patients were followed up at 1, 3, 6, and 12 months after MWA and the volume reduction rates (VRR) of the thyroid nodules were analyzed.

RESULTS

All patients successfully had the RLN and ZTTN detected using ultrasound before surgery or ablation with a detection rate of 100%. For the 103 patients, the majority of ZTTN grades were categorized as grade 2, with the distance from the farthest outside of ZTTN to the outer edge of thyroid ranging between 6.0 and 10.0 mm. The position relationship between ZTTN and RLN was predominantly type A in 98 cases, with type D observed in 5 cases. After MWA, the median nodule volume had significantly decreased from 4.61 (2.34, 8.70) ml to 0.42 (0.15, 1.41) ml and the VRR achieved 84.36±13.87% at 12 months. No nodules regrew throughout the 12-month follow-up period. Of the 11 patients experienced hoarseness due to RLN entrapment before ablation, 7 recovered immediately after separation of the RLN and ZTTN during MWA, 2 recovered after one week, and the other 2 recovered after two months.

CONCLUSION

In conclusion, the RLN is closely related to ZTTN and mainly located at the back of it. Hydrodissection during MWA can separate the RLN from ZTTN. US-guided MWA is a safe and efficient treatment for ZTTN. Accurate identification of the RLN during MWA is crucial to protect the nerve and prevent nerve damage.

CLINICAL RELEVANCE/APPLICATION

The RLN is closely related to ZTTN and mainly located at the back of ZTTN. The RLN can be separated from ZTTN by hydrodissection during MWA. US-guided MWA is a safe and effective treatment for ZTTN.

M2-SPIR-6 PREDICTING CRYOABLATION OUTCOMES IN RENAL CELL CARCINOMA USING 3D VOLUMETRIC IMAGING FEATURES

Chih-Ying Huang, MD (*Presenter*)
Jia-An Hong, MD (*Abstract Co-Author*)

Nai-Wen Chang, MD (*Abstract Co-Author*)
Chih Chien Li, MD (*Abstract Co-Author*)
Chien An Liu, MD (*Abstract Co-Author*)
Shu Huei Shen, MD (*Abstract Co-Author*)

PURPOSE

Cryoablation has been established as an effective treatment for renal cell carcinoma (RCC). This study aimed to implement automated segmentation of renal structures on pre-treatment CT images, extract relevant imaging features, and identify potential predictors of treatment outcomes following cryoablation in RCC.

METHODS AND MATERIALS

Patients with RCC who underwent cryoablation were included. Pre-treatment CT images were processed to generate segmentation masks for the kidney, tumor, cysts, and renal sinus. Relevant imaging features were extracted and analyzed to assess their associations with treatment response.

RESULTS

A total of 142 patients were included. Univariable logistic regression revealed significant associations between local tumor control and both tumor volume (P=.001) and the contact area between the tumor and the renal sinus (P<.001). Multivariable logistic regression further demonstrated that larger tumor volume (P=.019, OR=1.043) and a greater tumor-renal sinus contact area (P=.002, OR=1.340) were independently associated with failure of local tumor control. Additionally, the Cox proportional hazards model showed that a greater tumor-renal sinus contact area (P=.019, HR=1.261) was significantly associated with local tumor progression following complete cryoablation.

CONCLUSION

Tumor volume and the contact area between the tumor and the renal sinus were associated with failure of local tumor control following cryoablation in RCC. A greater tumor-renal sinus contact area was also predictive of local tumor progression despite complete cryoablation.

CLINICAL RELEVANCE/APPLICATION

Pre-treatment imaging features may serve as predictive markers for treatment outcomes following cryoablation in RCC, potentially guiding clinical decision-making.
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M2-SPMK

Musculoskeletal Imaging Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPMK-2 DIAGNOSTIC PERFORMANCE AND RELIABILITY OF QUALITATIVE ASSESSMENT AND QUANTITATIVE PARAMETERS DERIVED FROM THIRD-GENERATION DUAL-ENERGY CT FORDIAGNOSING ANTERIORCRUCIATE LIGAMENT INJURY

Xiao-Ling Ma (*Presenter*)

PURPOSE

This study aims to investigate the diagnostic value of visual assessment and quantitative parameters derived from third-generation low-dose dual-energy CT (DECT) in detecting the integrity of anterior cruciate ligament (ACL) in patients with acute trauma.

METHODS AND MATERIALS

Patients with unilateral knee joint injury who were scheduled to undergo ACL reconstruction or suture were prospectively enrolled. The bilateral knees of all participants were examined by third-generation dual-source DECT and 3.0 T MRI, followed by arthroscopy of the knee joint within two weeks. Two radiologists independently observed ACL staining in Bone Marrow 2 color-coded map of Mono+ mode, blinded to patients' clinical information, where the normal ACL was stained to be dark red while the injured ACL was stained lightly or almost unstained. Then the mixed-energy CT value, 50 Kev CT value, electron cloud density (Rho), effective atomic number (Z) and Rho/Z were measured and compared between intact ACLs and torn ACLs in mixed-energy mode, Mono+ mode and Rho/Z mode, respectively. MRI examination and knee arthroscopy were used as the reference standards.

RESULTS

A total of 66 patients diagnosed with unilateral ACL injury were enrolled. The sensitivity, specificity, PPV and NPV of dual-energy staining reduction for diagnosing ACL injury were 93.9%, 90.9%, 91.2% and 93.8%. The intraclass correlation coefficients for quantitative parameters ranged from 0.848 to 0.930, indicative of excellent agreement. The mixed-energy CT value, 50 Kev CT value, Rho and Rho/Z of the injured ACLs were significantly lower than those of the intact ACLs (all P <0.001), and Z value of the injured ACLs was slightly higher than that of the intact ACLs (P =0.006). The optimal cutoff values of mixed-energy CT, 50 Kev CT, Rho, Z and Rho/Z for diagnosing ACL injury were 69.5, 68.1, 65.6, 7.55 and 8.9, with AUCs of 0.997, 0.987, 0.958, 0.652 and 0.952. The mixed-energy CT value had highest diagnostic efficacy in diagnosing ACL injury [sensitivity, 1.000 (95% CI: 0.894, 1.000); specificity, 0.970 (95% CI: 0.842, 0.999); PPV, 0.971 (95% CI: 0.844, 0.999); NPV, 1.000 (95% CI: 0.891, 1.000)]. No statistically significant difference was found in diagnostic efficacy of MRI and dual-energy CT in detecting ACL injury (P =0.731).

CONCLUSION

The visual assessment and quantitative parameters derived from the third-generation dual-source DECT harbor a satisfactory performance in detecting ACL injury.

CLINICAL RELEVANCE/APPLICATION

The visual assessment and quantitative parameters derived from third-generation dual-source DECT are expected to replace MRI as a promising imaging approach for evaluating the integrity of ACLs and the maturity of autologous ACL transplantation after surgery.

M2-SPMK-3 FROM INCIDENTAL TO INTENTIONAL: UNLOCKING BONE HEALTH INSIGHTS FROM ROUTINE CT DATA

Bryn Matheson (*Presenter*)
Matthias Walle (*Abstract Co-Author*)
Steven K. Boyd, PhD (*Abstract Co-Author*)

PURPOSE

Computed tomography (CT) scans represent a vast, underutilized resource for the opportunistic assessment of bone health. However, the lack of standardized, publicly available automated analysis tools and large-scale normative reference cohorts has limited their application in clinical settings. This study demonstrates the feasibility of an automated, open-source workflow that combines deep learning segmentation and density calibration to extract volumetric bone mineral density (vBMD) from real-world clinical CT scans to generate normative centile curves.

METHODS AND MATERIALS

A retrospective cohort of 4602 clinical CT scans was obtained from 35 health centres across Alberta, Canada. Scans were excluded if patients were taking bone-altering medications at the time of the scan or had a documented history of hip fracture. Automated segmentation of the first lumbar vertebra (L1) and calibration tissues was performed using a custom-trained nnU-Net model. A previously established internal calibration approach was used to convert Hounsfield Units (HU) to bone-equivalent densities. The integral vBMD (mg/cc) of the L1 was calculated. Age- and sex-based comparisons were performed using Mann-Whitney U tests. Centile curves were generated using Generalized Additive Models for Location, Scale and Shape (GAMLSS).

RESULTS

The cohort included 2461 males and 2143 females. Sex differences were observed in vBMD ($p<0.05$), and age-stratified analysis (<50 vs >50 years) revealed significant declines in both groups with increasing age ($p<0.01$). Females exhibited a substantially greater reduction in vBMD than males (-31% vs -12%), particularly during the 40 to 60-year range, likely reflecting accelerated bone loss perimenopause.

CONCLUSION

This study showcases the feasibility of fully automated vBMD extraction from clinical CT by integrating image processing, deep learning, and density calibration with large-scale real-world data. While this analysis was performed at the vertebral level, this approach can be applied to any musculoskeletal site. The resulting site- and sex-specific centile curves provide a foundation for osteoporosis screening and diagnosis.

CLINICAL RELEVANCE/APPLICATION

Most existing tools for vBMD measurement from large-scale clinical CT data are expensive and operate as black-box systems with limited transparency, which makes integration into clinical settings challenging. In contrast, our open-source approach (https://github.com/Bonelab/Ogo) offers a free, transparent, and reproducible alternative. Generating population-based normative data using fully automated tools marks significant steps toward integrating bone health assessment into routine imaging and broadening access to bone health assessment.

M2-SPMK-4 CLINICAL ASSESSMENT OF TECHNIQUES FOR MINIMIZING METAL ARTIFACTS IN PHOTON COUNTING CT SCANS FOR LUMBAR FIXATION EVALUATION

Liu Xing (*Presenter*)

PURPOSE

To compare the image quality of Monoenergetic Plus 190keV and iterative Metal Artifact Reduction (iMAR) technique in patients with lumbar fixation.

METHODS AND MATERIALS

Sixty patients were prospectively enrolled and randomly assigned to two groups, with examination performed using Siemens photon counting CT (NAEOTOM Alpha). Group A patients underwent examination using Twin-Beam (TB) scanning mode, with 190keV images reconstructed using Monoenergetic Plus technique, while group B patients underwent examination using single-energy scanning mode, with images reconstructed using iterative Metal Artifact Reduction (iMAR) technique. The standard deviation (SD) values of the high-density artifacts area, low-density artifacts area, and surrounding soft tissue regions at the most severe metal artifacts in the two groups of images were measured. Independent sample T-test was utilized to compare the differences between the two groups. Two senior radiologists utilized the 5-component table (1~5 points, non-assessable ~ excellent) method to score the metal artifacts removal ability and overall image quality of the two groups of images. Mann-Whitney U test was used to compare the subjective scores of the two groups of images, and the consistency of the scores was analyzed by Kappa test.

RESULTS

In terms of objective measurements, the SD values for group A were significantly lower than those of group B (Group A=63.5±49.3, Group B=134.7±73.8; t=-3.492, P<0.05). When it comes to the subjective assessment of metal artifact removal, the images from group A were rated higher than group B (Group A: 4.33±0.61, Group B: 3.12±0.90; P<0.05), and the consistency of the two groups' image evaluations was good (Kappa=0.603, P<0.05). However, for the subjective assessment of overall image quality, the images from group A were rated lower than group B (Group A: 3.01±0.66, Group B: 4.12±0.52; P<0.05) with excellent consistency (Kappa=0.901, P=0.000).

CONCLUSION

When examining patients with lumbar fixation, Monoenergetic Plus 190keV images have demonstrated superior ability in reducing metal artifacts compared to iMAR algorithms. However, the iMAR technique was found to be more effective in improving the overall subjective quality of the images.

CLINICAL RELEVANCE/APPLICATION

Different clinical situations may require different imaging techniques and reconstruction methods to ensure accurate diagnosis and treatment. Therefore, selecting the appropriate scanning and reconstruction methods based on specific clinical needs can be crucial for achieving optimal results.

M2-SPMK-5 ASSOCIATION OF CT-DERIVED BIOLOGICAL AGE WITH ALL-CAUSE MORTALITY IN THE NATIONAL LUNG SCREENING TRIAL

Leon Lenchik, MD (*Presenter*)
Fang-Chi Hsu (*Abstract Co-Author*)

PURPOSE

There is increasing interest in using CT scans as biomarkers of aging. Our purpose was to use a novel large vision-language model based on three-dimensional (3D) CT scans to determine the biological age of older adults and examine its association with all-cause mortality in the National Lung Screening Trial (NLST).

METHODS AND MATERIALS

13,311 baseline CT scans from older adults (mean age: 64.8 years, age range: 60-74 years;) in the NLST were partitioned into an 80% training set (10,648 CT exams) and a 20% testing set (2,663 CT exams). We developed a biological age prediction model using a publicly available large vision-language model (Merlin). First, we encoded each 3D CT dataset into a 512-dimensional vector. We then used a prediction head consisting of a two-layer perceptron to output the biological age. During the training phase, the parameters within Merlin model were fixed but the weights of the prediction head were optimized. In the test set, the biological age was predicted using the trained model. The associations between biological and chronological age with all-cause mortality were determined using logistic regression models, adjusted for sex, race, pack-years of smoking, and body mass index.

RESULTS

In the 2,663 individuals (1064 women, 1599 men) in the test set, the CT-derived biological age had a mean absolute error (MAE) of 2.74 years. At a mean 6 years of follow-up, 240 (9.01%) of individuals were deceased. Both the CT-derived biological age and patients chronological age were associated with all-cause mortality. The odds ratio (OR) for CT-derived biological age was 1.22 (95%CI: 1.15, 1.29); p<0.0001). For patient chronological age, the OR was 1.12 (95% CI: 1.08, 1.16; p<0.0001).

CONCLUSION

CT-derived biological age was associated with all-cause mortality in a large heterogeneous population of older adults.

CLINICAL RELEVANCE/APPLICATION

Large vision language models allow for measurement of surrogates of biological age on CT exams. CT-derived biological age can improve clinical practice by helping develop novel prediction models for adverse health outcomes in older adults.

M2-SPMK-6 IMPACT OF CALCIUM SUPPRESSION IMAGING ON HAND AND WRIST FRACTURE DETECTION IN SPECTRAL CT: A COMPARISON WITH X-RAY AND CT

Thomas Marth, MD (*Presenter*)
Franziska Adomat (*Abstract Co-Author*)
Fides Schwartz, MD (*Abstract Co-Author*)
Reto Sutter, MD (*Abstract Co-Author*)
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PURPOSE

Calcium suppression (CaSupp) bone imaging from spectral computed tomography (SpCT) can detect bone marrow edema, such as in the setting of acute fractures. However, its impact on fracture detection in clinical routine is not yet fully understood.

METHODS AND MATERIALS

Retrospective evaluation of both 127 X-ray and 127 SpCT examinations of the hand and wrist of 125 patients (male/female, 60/67; mean age, 55 ± 19.5 years). Three successive readouts were conducted with a minimum time interval of four weeks. The first reading was performed using X-ray images only, the second with conventional

CT images only, and the third with conventional CT images plus CaSupp images reconstructed from SpCT data. Two readers evaluated images independently for the presence of fractures. Fracture counts were evaluated and compared for each readout. Inter-reader agreement was assessed using kappa statistics.

RESULTS

Reader 1 rated a total of 162 bones as fractured on X-ray images, 180 on CT images, and 193 on conventional CT plus CaSupp images. Reader 2 rated 184 bones as fractured on X-ray, 191 on conventional CT and 203 on conventional CT plus CaSupp images. When using CaSupp images alongside conventional CT, compared to conventional CT images alone, reader 1 identified a total of 13 additional fractures (four scaphoid, two capitate, two metacarpale I, two ulna, one lunate, one triquetrum, and one metacarpale V fracture), while reader 2 found 12 additional fractures (three lunate, two triquetrum, one scaphoid, one ulna, one metacarpale I, one radius, one trapezium, one capitate, and one hamate fracture). Inter-reader agreement for fractures was moderate for X-ray (& 81;;=0.44), moderate to substantial for conventional CT (& 81;;=0.52), and almost perfect for CaSupp images combined with conventional CT (& 81;;=0.92).

CONCLUSION

CaSupp images of the hand and wrist, when combined with conventional CT images, can reveal additional fractures missed on X-ray and conventional CT images alone. In particular, fractures of the carpal bones could be revealed due to the presence of bone marrow edema in CaSupp images.

CLINICAL RELEVANCE/APPLICATION

As missed fractures lead to poor patient outcomes and high costs for the health care system, reconstruction and evaluation of CaSupp images of the inherently available spectral raw data in spectral dual-layer CT systems are recommended for fracture diagnosis.

M2-SPMK-7 AI-DRIVEN ASSESSMENT OF VERTEBRAL ROTATION IN ADOLESCENT IDIOPATHIC SCOLIOSIS USING WEIGHT-BEARING CONE-BEAM CT

Jianrong He (*Presenter*)
Zejun Liang (*Abstract Co-Author*)
Yiteng Zhang (*Abstract Co-Author*)
Yu Zhang (*Abstract Co-Author*)
Zhenlin Li (*Abstract Co-Author*)
Jing Tang (*Abstract Co-Author*)

PURPOSE

To assess the accuracy of an AI algorithm for quantifying vertebral rotation angles on weight-bearing cone-beam CT images in AIS patients, and to investigate how well the two-dimensional Nash & Moe grading system represents three-dimensional vertebral rotation under weight-bearing conditions.

METHODS AND MATERIALS

This prospective study included 72 adolescents diagnosed with AIS. Six vertebrae per patient were selected and measured manually by two experienced radiologists. All vertebrae were also analyzed using a U-Net-based deep learning algorithm to obtain automated vertebral rotation angles. Nash & Moe grades were independently assessed from standing radiographs. Agreement between automated and manual 3D measurements was evaluated using intraclass correlation coefficients and correlation analyses. The explanatory power of Nash & Moe grades for 3D vertebral rotation was analyzed by linear regression.

RESULTS

The automated measurement of vertebral rotation angles showed good agreement and strong correlation with manual measurements (Intra-class correlation coefficient=0.882, Spearman R=0.900, both $p < 0.001$). The linear relationship between automated and manual measurements was strong for thoracic ($R\ 2 = 0.777$) and lumbar vertebrae ($R\ 2 = 0.792$). Nash & Moe grades showed moderate explanatory power for 3D vertebral rotation angles measured by the algorithm, with R^2 values of 0.549 (thoracic) and 0.629 (lumbar) in linear regression model. Similar R 2 values were obtained between Nash & Moe grades and manual rotation measurements ($R\ 2 = 0.526$ for thoracic and $R\ 2 = 0.621$ for lumbar vertebrae).

CONCLUSION

Our AI-driven measurement algorithm enables accurate quantification of vertebral rotation under weight-bearing conditions. In comparison, the 2D Nash & Moe classifications only offers an approximate estimation of vertebral rotation and lack the precision required for detailed assessment.

CLINICAL RELEVANCE/APPLICATION

This AI-based 3D measurement approach may enhance the diagnostic precision of scoliosis assessment, offering clinicians a more objective and reproducible tool for evaluating vertebral rotation in standing AIS patients. It could inform better treatment planning and improve monitoring of disease progression.

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M2-SPMS

Multisystem Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPMS-1 CODE-FREE DEEP LEARNING (CFDL) IN CLASSIFYING RADIOGRAPHIC IMAGES FOR KNEE OSTEOARTHRITIS (KOA) AND PEDIATRIC PNEUMONIA

Matthew Bilson, BA (*Presenter*)
Andrew Farah (*Abstract Co-Author*)
Peter Joseph Mounsef (*Abstract Co-Author*)
Wassim Elmasry, MD (*Abstract Co-Author*)
James Man Git Tsui (*Abstract Co-Author*)
Natalia Gorelik, MD, MPH (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility of using code-free deep learning (CFDL) to classify radiographic images, by (1) comparing its performance against state-of-the-art (SOTA) models for grading knee osteoarthritis and (2) assessing its accuracy in distinguishing between types of pediatric pneumonia.

METHODS AND MATERIALS

Medical students with no prior programming experience utilized CFDL to develop models for classifying knee osteoarthritis (KOA) severity and pediatric pneumonia subtypes. The public KOA dataset, obtained from the NIH, includes 9,786 radiographic images annotated with Kellgren-Lawrence (K-L) severity scores (2,578 minimal, 1,286 moderate, 295 severe). The public pneumonia dataset, sourced from Guangzhou Women and Children's Medical Center, consists of pediatric 5,856 chest radiographs labeled as normal (1,582), viral (1,494), or bacterial (2,780). Google Cloud AutoML Vertex AI, a plug-and-play platform that automates model building and hyperparameter tuning, was used to develop classification models. The datasets were split into training, validation, and testing sets (70:10:20 for KOA as per SOTA, and 80:10:10 for pneumonia). Performance was evaluated using accuracy from the test set. For KOA, results were compared to SOTA models, while for pediatric pneumonia, only the accuracy was reported, as no direct comparisons were available.

RESULTS

Vertex AI achieved an accuracy of 86.3%, compared to the reported SOTA performance of 89.0% in classifying KOA images. For pediatric pneumonia, the model reached an accuracy of 83.2%.

CONCLUSION

Vertex AI performed comparably to SOTA for the classification of KOA severity and better than chance regarding pediatric pneumonia. CFDL democratizes AI, enabling clinicians without programming experience to achieve near-expert performance.

CLINICAL RELEVANCE/APPLICATION

Code-free AI tools like Vertex AI allow for accurate KOA grading and paediatric pneumonia triage. Thus, these models can be used expertly by those with little coding experience and is scalable in low-resource settings.

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M2-SPNMMI

Nuclear Medicine & Molecular Imaging Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPNMMI-1 POTENTIAL OF LARGE LANGUAGE MODELS FOR PROOFREADING PET REPORTS

Wolfgang Roll (*Presenter*)
Max Masthoff, MD (*Abstract Co-Author*)
David Ventura (*Abstract Co-Author*)
Clemens Backhaus (*Abstract Co-Author*)
Michael Schaefers, MD (*Abstract Co-Author*)
Kambiz Rahbar (*Abstract Co-Author*)
Lucas Plagwitz (*Abstract Co-Author*)
Philipp Schindler, MD (*Abstract Co-Author*)

PURPOSE

The aim of this study was to investigate the ability of three large language models (LLMs), GPT-o1 DeepSeek R1-70b and Llama 3.3-70b, to detect common errors in anonymized German PET/CT and PET/MRI reports.

METHODS AND MATERIALS

A retrospective dataset of 200 consecutive PET reports (100 correct, 100 with up to three artificially introduced errors each) was used. A total of 183 deliberately introduced errors were categorised as spelling & grammar, content or technical. Each report was presented to the three LLM with the same single prompt without subsequent modifications. The number of correctly identified errors and the time taken to complete each log were recorded.

RESULTS

Overall, GPT-o1 detected 84.2% (154/183) of the errors, significantly outperforming DeepSeek R1-70b (47.0%, 86/183) and Llama 3.3-70b (57.4%, 105/183; $p < 0.001$). GPT-o1 also showed superior detection rates for spelling & grammar (76.8% vs. 25.3% vs. 38.9%) and technical (97.1% vs. 57.1% vs. 65.7%) errors. The detection of content errors did not differ significantly between the three models ($p = 0.406$). Reading time per report was significantly faster for GPT-o1 (28 ± 4 seconds), followed by Llama (48 ± 8 seconds) and DeepSeek (108 ± 29 seconds) ($p < 0.0001$).

CONCLUSION

In PET/CT and PET/MRI reports based on German texts, GPT-o1 demonstrated the highest error detection rate of the LLMs evaluated. Future efforts to optimize and potentially fine-tune privacy-compliant open-source models might further improve their accuracy.

CLINICAL RELEVANCE/APPLICATION

Imaging reports are the key component of information transfer between the imaging specialist and the referring physician. Final review and approval of these report is done by board-certified imaging specialists. Increasing workload in PET-CT, due to novel tracers and technical developments, e.g. large axial field of view scanners, underlines the need for technical improvements also in error detection, potentially by the help of LLM.

M2-SPNMMI-2 PROSPECTIVE EVALUATION OF COMFORTABLE OPEN-COIL MRI FOR WHOLE-BODY PET/MRI

Fatemeh Rashidi, MD (*Presenter*)
James Wang (*Abstract Co-Author*)
Alan B. McMillan, PhD (*Abstract Co-Author*)
Ali Pirasteh, MD (*Abstract Co-Author*)

PURPOSE

Evaluate the potential of whole-body PET/MRI using the scanner’s embedded posterior array (PA) and transmit/receive (TR) in combination. This novel approach (c omfortable o pen coil M RI f or whole-body i maging, COMFI) enables a PET/MRI setup/experience that is similar to PET/CT (more streamlined and comfortable than traditional full coil PET/MRI).

METHODS AND MATERIALS

This was a prospective single-center study using a single scanner (Signa PET/MR, GE Healthcare). To assess image quality, Dixon-fat-suppressed T2- and T1-weighted images were obtained on healthy volunteers using COMFI and full coil setups (consecutively) with identical parameters. To assess lesion detectability, patients referred for clinical PET/MRI underwent COMFI PET/MRI shortly after the full coil clinical exam with identical parameters. A dual-board-certified radiologist/nuclear medicine physician reviewed anonymized full coil and COMFI exams independently, blinded, separated by a washout period and in randomized order. To assess image quality (in healthy volunteers), 4 anatomical regions (head/neck, thorax, abdomen/pelvis, and musculoskeletal) were evaluated on each T1- and T2-weighted images using a 5-point Likert scale; scores =3 were considered diagnostic. An exam was rated diagnostic if all anatomic regions rated =3 on one image series. To assess lesion detectability (in patients), lesions suspicious for malignancy were recorded in the following regions (up to 20 per region): liver, pancreas, bowel, lung, bones, lymph nodes, and other less common regions. Average scores and number of lesions were compared between COMFI and full coil exams using the paired t test; $P < 0.05$ was considered significant.

RESULTS

Full coil and COMFI setups yielded diagnostic quality exams among all 22 healthy volunteers. Full coil setup yielded higher image quality than COMFI on a per-sequence basis, respective average scores 3.8 and 4.8, $P<0.01$). Among the 11 patients enrolled, full coil and COMFI PET/MRI respectively detected 113 and 120 lesions ($P=0.07$). There was no lesion detected on full coil PET/MRI that was missed on COMFI PET/MRI.

CONCLUSION

Patient setup without anterior surface coils and with hybrid utilization of the embedded PA and T/R coils can provide diagnostic quality PET/MRI exams with potentially no compromise in lesion detectability. COMFI setup may not be sufficient for exams that need dedicated high-quality MRI of an anatomic region; further investigation is needed to demonstrate its diagnostic accuracy and potential improvement in patient comfort and access.

CLINICAL RELEVANCE/APPLICATION

PET/MRI without anterior surface coils can improve workflow and patient comfort/access without compromising lesion detectability, thus improving PET/MRI utilization.

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M2-SPNPM

Noninterpretive Skills (Beyond Imaging) Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPNPM-1 ENVIRONMENTAL SUSTAINABILITY IN RADIOLOGY: SWITCH FROM PAPER-BASED TO DIGITAL OUTPATIENT APPOINTMENT COMMUNICATION

Aly Muhammad Ladak (*Presenter*)
Hayley Panet (*Abstract Co-Author*)
Daphne Antonopoulos (*Abstract Co-Author*)
Ania Z. Kielar, MD, FRCPC (*Abstract Co-Author*)
Kate Hanneman, MD, MPH (*Abstract Co-Author*)

PURPOSE

There is growing interest in digital communication systems in healthcare. However, there is limited data on the associated environmental benefits in radiology. The purpose of this study was to determine greenhouse gas emissions and paper waste avoided by switching from paper-based to digital communications for outpatient medical imaging appointment scheduling.

METHODS AND MATERIALS

This retrospective study employs a natural experimental design, leveraging an unplanned national postal strike to evaluate the impact of disrupted mail-based appointment communication at an academic medical imaging department covering 5 hospital sites. The Canada Post strike disrupted the ability to send outpatient MRI appointment letters from November 15 to December 17, 2024, necessitating a temporary switch to digital-only communication (telephone and electronic patient portal). The control period was defined as the rest of 2024, with baseline paper-based mail communication of all outpatient MRI appointments scheduled more than 30 days in advance. Environmental impact was evaluated as paper waste and greenhouse gas emissions in carbon dioxide equivalents (CO 2 e) avoided.

RESULTS

A total of 54,158 outpatient MRIs were scheduled in 2024, of which 41,333 (76.3%) were booked more than 30 days in advance (3970 with digital-only communication during the strike period and 37,360 with paper-based communication during the control period). GHG emissions were significantly lower with digital compared to paper-based mail communication (median 1.2 kg/day CO 2 e, IQR 0.5-1.3 kg/day vs. 24.0 kg/day CO 2 e, IQR 17.2-30.8 kg/day, p<0.001). Compared to baseline paper-based mail communication, digital appointment communication avoided 155.2 g CO 2 e GHG emissions (95.6% reduction) and 11.3 g paper waste (100% reduction) per MRI, with no difference in the proportion of missed (no-show) appointments (43 [1.1%] vs. 521 [1.4%], p=0.11). A permanent switch to digital appointment communication for outpatient MRI would avoid 465 kg of paper waste and 6414 kg CO 2 e per year in one department, equivalent to 16,335 miles driven by an average passenger vehicle. Extrapolating across Canada, this change could avoid 786 metric tons of paper waste and 10,837 metric tons CO 2 e per year, equivalent to 2258 homes' electricity use for one year.

CONCLUSION

The adoption of digital-only appointment communication for outpatient MRI led to a significant reduction in GHG emissions and paper waste without increasing the proportion of missed appointments.

CLINICAL RELEVANCE/APPLICATION

Unexpected events, such as a national postal strike, can be leveraged to build environmentally sustainable and climate-resilient radiology departments by bouncing forward rather than back to baseline after a disruption.

M2-SPNPM-2 CLINICAL PRODUCTIVITY AND COMPENSATION FOR RADIOLOGISTS ACCORDING TO PRACTICE TYPE

Dheeman Futela, MBBS (*Presenter*)
Ajay Malhotra, MD, MMM (*Abstract Co-Author*)

PURPOSE

To assess recent trends in clinical productivity and compensation of radiologists according to practice and provider characteristics.

METHODS AND MATERIALS

We studied deidentified data from the American Medical Group Association for providers in "Radiology: Non-interventional" (DR) and "Radiology: Interventional" (IR) specialties from survey years 2019 and 2023. Primary outcomes were total clinical compensation (CC), work RVUs performed (wRVUs), and clinical compensation per unit work RVU (CC/wRVU). Outcomes were adjusted to 1.0 clinical full-time equivalent (FTE) and compared using non-parametric statistical tests. Trends over time were analyzed as percentage growth in median values and compared to overall market inflation using the consumer price index (CPI).

RESULTS

The 2023 AMGA survey included compensation and productivity responses from 1791 diagnostic radiologists and 386 interventional radiologists. DRs had a lower median CC ($561K vs $708K) with greater wRVUs (10673 vs 8087) compared to IRs (P<.001). Therefore, median CC/wRVU for DRs ($56) was significantly lower than IRs ($81, P<0.001). Non-academic practice was associated with a greater median CC ($592K) and wRVUs (11239) compared to medical schools ($569K and 10566) and teaching hospitals ($557K and 10124) (P<.001). However, CC/wRVU was lowest for non-academic DRs ($53), followed by medical school ($56), and highest for teaching hospitals ($58) (P<.001). Practices of group size fewer than 50 had the highest CC ($656) and wRVU (12932), and the lowest median CC/wRVU ($49) among all practice types. Since 2019, median CC for DRs increased by 8.9% and median CC/wRVU increased by 3.6%, both lagging behind the consumer price index (18.8%). According to physician characteristics, age less than 40 years, female gender, and less than 10 years in practice were associated with lower median CC; however, CC/wRVU did not differ significantly by age, gender, or years in practice (P>.05).

CONCLUSION

Non-academic practices and practices with smaller group sizes are associated with the highest CC but lowest CC/wRVU. CC/wRVU did not vary by physician age, gender or years in practice. Between 2019-2023, CC increased but trailed behind market inflation. Further, increased productivity during this interval resulted in stagnant CC/wRVU.

CLINICAL RELEVANCE/APPLICATION

This study shows clinical compensation and productivity trends according to practice types to inform both practice managers and newly graduating or early career radiologists. Using this data could help in address staffing, ensuring access to care for patients, and negotiations for subsidies, or additional sources of funding, especially in the face of decreasing reimbursements and academic consolidation.

M2-SPNPM-3 UNDERUTILIZATION OF FOLLOW-UP IMAGING AMONG INCARCERATED PATIENTS: A RETROSPECTIVE ANALYSIS OF ADHERENCE TO RADIOLOGIC RECOMMENDATIONS

Yu Sakai, MD (*Presenter*)
Daniel Lee (*Abstract Co-Author*)
Regina O. Redfern, BS (*Abstract Co-Author*)
Tessa S. Cook, MD, PhD (*Abstract Co-Author*)
Rose Onyeali (*Abstract Co-Author*)
Colbey W. Freeman, MD (*Abstract Co-Author*)

PURPOSE

The United States has a significant incarcerated population, with approximately 1.5 million persons in state and federal prisons and over 10 million admitted to local jails annually. Incarcerated patients face significant obstacles in obtaining medical care. No study has systematically examined adherence to follow-up imaging recommendations in currently incarcerated individuals. We hypothesize that incarcerated patients have a lower rate of successful imaging follow-up compared to broader populations.

METHODS AND MATERIALS

This retrospective, single-center study utilized the electronic medical record (EMR) to identify radiology reports for incarcerated individuals admitted to the emergency department or inpatient. Identification of incarceration status was based on correctional facility addresses, phone numbers, or incarceration-related discharge flags from Pennsylvania, New Jersey, and Delaware. Reports were screened using a structured text-query to identify potential recommendations (“recommend” and/or “follow-up”). Two radiologists manually reviewed each report to determine inclusion. Inclusion criteria included use of definitive language (e.g., “recommends” rather than “optional”) and time-specific suggestions for follow-up imaging, endoscopy, and/or biopsy. EMRs were then searched to assess follow-up adherence, defined per the American College of Radiology as 30 days before and 60 days after the recommended follow-up interval.

RESULTS

Between January 2017 and November 2024, 15,680 imaging records (accessions) were identified for incarcerated patients. Screening by text-query yielded 1,891 records. Manual review yielded 243 individual radiology reports that met inclusion criteria. Among these, 83 (34.2%) showed evidence of any follow-up, of which only 37 (15.2%) were true outpatient follow-up. 24 (9.9%) were completed incidentally during subsequent emergency department visits or readmissions, and 22 (9.1%) during the initial ED or inpatient encounter. The 15.2% follow-up rate is markedly lower than the above 50% adherence rate reported in broader populations (Mabotuwana et al., AJR 2019) and lower than reported rates of 46% and 36% in ED and inpatients, respectively (Hansra et al., JACR 2021).

CONCLUSION

Timely outpatient follow-up occurred in fewer than one in six cases among incarcerated individuals, a rate notably lower than in the general population.

CLINICAL RELEVANCE/APPLICATION

There is potentially a critical gap in continuity of care for incarcerated patients. Future efforts could focus on improving care coordination, facilitating access to outpatient imaging, and exploring follow-up strategies tailored to the needs of incarcerated and recently released individuals.

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M2-SPNR

Neuroradiology Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPNR-1 HIGH PERFORMANCE HEAD GRADIENT SYSTEM AND MULTI-ECHO RESTING STATE FMRI ENHANCES SENSITIVITY FOR FUNCTIONAL NETWORKS AND CONNECTIVITY IN NEUROLOGICAL STUDIES FOR BRAIN TRAUMA

Jiayu Shao (*Presenter*)
Herman Morris, PhD (*Abstract Co-Author*)

PURPOSE

The use of fMRI in neuroradiology is limited by the challenge of distinguishing neurological function related signals from physiological noise. This often results in longer scan durations, increasing both patient burden and costs. High-performance head gradient (HPHG) MRI systems may help address these limitations. Their faster slew rates enable the acquisition of multiple gradient echoes (ME) within the time typically required for a single echo (SE) on conventional whole body clinical systems. Here, we discuss how HPHG scanners improve fMRI performance, offering enhanced imaging speed, signal sensitivity, and resting state network detection.

METHODS AND MATERIALS

Eight healthy volunteers (mean [SD] age: 34.3 years [11.2]; 4 females) were scanned on a General Electric MAGNUS 3.0 T scanner. Resting-state T2*-weighted BOLD images were acquired using a Nova 3T 32-channel head coil and a 3-echo ME imaging sequence (TR = 1900 ms; TEs = 11, 21, 32 ms). A high-resolution T1-weighted anatomical image (MPRAGE) was also obtained. The third gradient echo was used to simulate a conventional SE acquisition. Data were preprocessed using the AFNI software package (Cox 1999), denoised with the ANATICOR method, and combined across ME acquisitions using the Tedana method (Kundu 2011). The resulting residual time series were registered to standard Talairach space. Temporal signal-to-noise ratio (tSNR) was calculated by dividing the voxel-wise time series mean by its standard deviation. Resting-state functional connectivity (rsFC) was assessed by computing the Pearson correlation between a Default Mode Network (DMN) seed, extracted from a functional atlas (Yeo 2011), and the rest of the brain in each participant.

RESULTS

We evaluated HPHG fMRI performance using tSNR as a measure of signal sensitivity. In all four brain lobes, the ME method showed a significant tSNR advantage over SE, with the most notable improvements in the frontal and occipital lobes. To assess the practical impact of this increased sensitivity, we conducted an rsFC analysis. We derived DMN-to-whole-brain rsFC maps from both SE and ME datasets. The ME data revealed more specific and sensitive functional connectivity, identifying more connections at a higher statistical threshold compared to the SE data.

CONCLUSION

HPHG scanners enable faster image acquisition and shorter gradient echo-times compared to conventional scanners. The ME fMRI method on an HPHG scanner produced more sensitive measures of resting-state fMRI, and better detection of functional networks compared to SE methods available on conventional systems.

CLINICAL RELEVANCE/APPLICATION

HPHG ME fMRI reduces scan times and produces superior functional brain mapping results in neuroradiology examinations for better diagnosis.

M2-SPNR-5 INTRA-ARTERIAL THROMBOLYTIC VS. MECHANICAL THROMBECTOMY IN DISTAL MEDIUM MIDDLE CEREBRAL ARTERY ACUTE ISCHEMIC STROKE: A PRELIMINARY MULTINATIONAL MULTICENTER PROPENSITY SCORE-MATCHED STUDY

Hamza A. Salim, MD (*Presenter*)
Benjamin Pulli, MD (*Abstract Co-Author*)
Vivek Yedavalli, MD, MS (*Abstract Co-Author*)
Dhairya Lakhani, MD (*Abstract Co-Author*)
Adrien Guenego, MD (*Abstract Co-Author*)
Adam A. Dmytriw, MD,FRCPC (*Abstract Co-Author*)
Max Wintermark, MD (*Abstract Co-Author*)

PURPOSE

Optimal treatment for acute ischemic stroke due to distal medium-vessel occlusion (DMVO) in the middle cerebral artery (MCA) is uncertain. Mechanical thrombectomy (MT) may carry higher risks in DMVO. Intra-arterial thrombolysis (IAT) might be a safer alternative. We compared outcomes of IAT and MT in MCA DMVO patients.

METHODS AND MATERIALS

We conducted a retrospective, multicenter, propensity score-matched study within the MAD-MT registry, including patients with acute ischemic stroke due to MCA DMVO (M2, M3, M4 segments) who underwent IAT or MT, with or without intravenous thrombolysis. Propensity score matching controlled for confounders. The primary outcome was an excellent functional outcome, defined as a modified Rankin Scale score of 0 to 1 at 90 days.

RESULTS

After matching, 184 patients were analyzed (19 IAT, 165 MT). Baseline characteristics were balanced. At 90 days, an excellent functional outcome was achieved in 37% of IAT patients and 29% of MT patients (P = 0.47). Functional independence (modified Rankin Scale score of 0 to 2) rates were 50% versus 40% (P = 0.42). Mortality rates were similar (13% vs. 17%). Successful reperfusion (modified Thrombolysis in Cerebral Infarction score of 2b to 3) was higher with MT (90% vs. 68%; P = 0.018), but symptomatic intracranial hemorrhage occurred only in the MT group (7.1% vs. 0%).

CONCLUSION

In patients with MCA DMVO, IAT was associated with similar functional outcomes and fewer safety events compared to MT, despite lower recanalization rates.

CLINICAL RELEVANCE/APPLICATION

IAT may be a safer alternative to MT in selected patients.

M2-SPNR-6 LEVERAGING DEEP LEARNING TO SYNTHESIZE AMYLOID PATHOLOGY IMAGES FROM MULTI-MODAL MRI

Manmohi Dake, PhD (*Presenter*)
Abhilasha Jain, MS (*Abstract Co-Author*)
Jeremiah Fadugba (*Abstract Co-Author*)

PURPOSE

To assess the clinical utility of a synthetic image created using multi-modal Magnetic Resonance Imaging (MRI) in detecting amyloid pathology, a hallmark pathology seen in Alzheimer's disease (AD). Given the limited accessibility, high cost, and invasiveness of conventional amyloid detection methods such as PET imaging, this technology may help facilitate affordable and accessible amyloid detection, particularly in resource-constrained settings.

METHODS AND MATERIALS

A deep learning model was developed using a U-Net framework in order to synthesize amyloid pathology images from multi-modal MRI scans (T1 and T2-weighted MRI). The model was trained using 1,327 paired MRI and 18F-AV-45 Positron Emission Tomography (PET) data from the Alzheimer's Disease Neuroimaging Initiative (ADNI), with patients across the Alzheimer's disease spectrum. A subset of 188 pairs of images was used as the validation set. Similarity between the actual PET images and the synthetic images was assessed using Structural Similarity Index Measure (SSIM), Peak signal-to-noise ratio (PSNR), Mean Squared Error (MSE) and Pearson Correlation for image quality assessment. The percentage difference in Standard Uptake Value ratio (SUVR) was calculated using FreeSurfer with the whole cerebellum as the reference region to assess the clinical utility of the synthetic images.

RESULTS

On comparing the synthetic images and the original PET images from the validation set, an SSIM of 0.9895 ± 0.01, PSNR of 33.5213 ± 3.56, MSE of 0.0007 ± 0.0007 and high correlation ($r = 0.99$, $p < 0.01$), was observed. Composite SUVR values derived from the synthetic and the actual PET images showed an absolute percentage difference of 12.38% ± 8.29 ($W = 8388$, $p = 0.68$).

CONCLUSION

Synthesis of amyloid pathology images from multi-modal MRI using a deep learning model may provide a clinically relevant surrogate for traditional amyloid detection methods. The minimal, non-significant differences in SUVR between synthetic and actual PET images, and the high structural fidelity of the synthetic images, suggest a compelling alternative to conventional approaches, particularly in regions devoid of traditional amyloid detection methods.

CLINICAL RELEVANCE/APPLICATION

The ability to synthesize amyloid pathology images from MRI offers an accessible, non-invasive, and cost-effective screening tool needed in clinical practice. In settings with limited access to PET imaging, this approach could significantly enhance early detection of amyloid pathology, improving diagnosis and facilitating earlier, more effective interventions. Further validation across diverse populations is essential to fully establish its clinical utility and bring this solution to healthcare systems worldwide.

M2-SPNR-7 FUNCTIONAL HAND MOTOR CORTEX IS NOT ALWAYS ON ANATOMICAL"HANDKNOB"

Ziang Wang (*Presenter*)
Jialan Zheng (*Abstract Co-Author*)
Zihan Li (*Abstract Co-Author*)
Hongjia Yang (*Abstract Co-Author*)
Jennifer McNab, PhD (*Abstract Co-Author*)
Zuo-Xiang He (*Abstract Co-Author*)
Qiyuan Tian (*Abstract Co-Author*)

PURPOSE

Tracking fibers from the thalamus to the hand motor cortex (HMC) using diffusion MRI accurately identifies the thalamic Vim nucleus for effectively planning MRI-guided focused ultrasound (MRgFUS) thalamotomy for essential tremor. The anatomically defined "handknob" region (AHMC) known for its "knob" shape is often used to approximate the functional HMC (FHMC) area. This study aimed to verify the validation of this approximation.

METHODS AND MATERIALS

Data. Preprocessed T1w data, activation z-maps from finger tapping task fMRI (tfMRI) and myelination maps (T1w/T2w) of 34 subjects from Human Connectome Project were used. ROI delineation. AHMC regions were manually delineated by an expert neuroradiologist on T1w images. FHMC regions were defined as the largest cluster of tfMRI activation ($z>2.3$) within the pre-central gyrus segmented by FreeSurfer on T1w data. Overlap measurement. Overlap between AHMC and FHMC was quantified using: (1) Centroid Distance (i.e., Euclidean distance between centroids) and 2) Peak Deviation Index (PDI) (i.e., relative difference between peak z-values within AHMC and FHMC regions). A hemisphere was defined as "anatomy-function mismatched" (AFM) if both of its metrics were outliers. Mye lination analysis. Given HMC receives myelinated axons, myelination level in AHMC, FHMC, and their overlap region was examined and compared using Wilcoxon signed-rank test.

RESULTS

2 hemispheres from 2 subjects were identified as AFM. This percentage (2/34) is comparable to the previously reported percentage of MRgFUS non-responders (1/8) (Tian et al. 2018. NeuroImage: Clinical). AHMC regions exhibit clear "knob" shapes, indicating that the AFM phenomenon is biologically plausible. Moreover, AHMC regions exhibited significantly lower myelination compared to both FHMC and their overlapping, which exhibited highest myelination, indicating that AHMC regions might not represent HMC in while typically encompasses the most highly myelinated portion of FHMC.

CONCLUSION

AHMC and FHMC regions may exhibit spatial inconsistence in cases, which might be a biomarker for the abnormality of thalamocortical structural connectivity that might lead to change of Vim location in the thalamus and non-respondence to MRgFUS treatment.

CLINICAL RELEVANCE/APPLICATION

AFM of AHMC and FHMC regions can be potentially used for screening patients for MRgFUS treatment. FHMC regions can be potentially used for improving diffusion MRI fiber tracking to more accurately localize the Vim nucleus.

M2-SPNR-8 ROLE OF THE POSTERIOR CIRCULATION INVOLVEMENT IN MOYAMOYA DISEASE BASED ON 7T MRI

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PURPOSE

Moyamoya disease (MMD) is a chronic cerebrovascular disease characterized by progressive steno-occlusion of the internal carotid arteries and compensatory development of a "puff of smoke" collateral network. As the internal carotid artery (ICA) progressively narrows, the posterior cerebral artery (PCA) may develop as a collateral pathway to compensate for anterior circulation insufficiency, therefore, steno-occlusive changes in the PCAs can lead to poorer clinical outcomes in patients with MMD. Despite its potential significance, posterior circulation MMD (PCMMD) remains understudied, likely due to the limited visualization of the posterior circulation using conventional non-invasive imaging techniques. 7.0T MRI has a advantage in imaging small vessels, therefore, We aim to investigate the relationship between the progression of PCMMD and the MMD progression based on 7T MRI.

METHODS AND MATERIALS

We retrospectively analyzed 241 hemispheres from 123 patients with MMD (mean age: 41.67 ± 11.21 years; 54 male) who underwent 7T MRI scans. Hemispheres were stratified into symptomatic (with stroke events) and asymptomatic (without stroke events) subgroups based on clinical presentation and standard MRI findings. PCA involvement was graded on a 4-point scale (0: no disease; 1: mild; 2: moderate; 3: severe) using 7T time-of-flight magnetic resonance angiography (TOF-MRA). Additionally, distal PCA compensation and Suzuki staging were assessed.

RESULTS

PCA involvement identified in 205 (85.0%) hemispheres. Of those 205 patients with PCMMD, disease severity ranged from 99 (41.3%) with mild, 80 (33.3%) with moderate, and 25 (10.4%) with severe. The distribution of cases was as follows: 49 symptomatic (20.3%), and 192 asymptomatic (79.7%).The MMD stroke event was significantly associated with PCMMD severity ($P<0.001$). Patients with higher Suzuki stage have more severe PCMMD ($P<0.001$). A total of 139 (58.1%) hemispheres had distal PCA compensation. Patients with a high Suzuki stage are more likely to have distal PCA compensation ($P<0.001$).

CONCLUSION

PCMMD severity based on 7T showed a significant related to the MMD progression, which may serve as a valuable factors to selecting MMD patients with high risk of progression.

CLINICAL RELEVANCE/APPLICATION

Posterior circulation moyamoya disease (PCMMD) is understudied due to poor conventional imaging. 7T MRI excels in small vessel visualization. PCMMD severity correlates with MMD stroke risk, higher Suzuki stages, and distal PCA compensation. 7T-based PCMMD grading significantly predicts MMD progression, serving as a key marker for identifying high-risk patients.

M2-SPNR-9 QUANTITATIVE MRI FOR ASSESSING THE RESPONSE TO DISEASE-MODIFYING TREATMENT IN ALZHEIMER'S DISEASE: 5.0 T T1RHO MAPPING IN MEDIAL TEMPORAL LOBE

Lijun Dong (*Presenter*)

PURPOSE

To investigate the potential of the longitudinal relaxation time in the rotating frame (T1rho) mapping, a new quantitative imaging sequence for Alzheimer's disease, in visualizing the treatment response before and during disease-modifying treatment (DMT) at 5.0 T ultra-high field.

METHODS AND MATERIALS

Thirty prospectively recruited patients with Alzheimer's disease diagnosed based on cerebrospinal fluid biomarkers went through 5.0 T MRI examinations, including three-dimensional T1-weighted imaging (3D-T1WI) and T1rho mapping. All patients received DMT (Lecanemab). MRI examinations were performed before, 3-month and 6-month after the treatment. T1rho mapping was registered to 3D-T1WI, and brain region segmentation was applied to 3D-T1WI. T1rho values of the medial temporal lobe were calculated. The T1rho values were compared between the time points using analysis of variance. Spearman correlations were assess between T1rho values with mini-mental state examination (MMSE), Alzheimer's disease assessment scale-cognitive subscale (ADAS-Cog), Alzheimer's disease cooperative study scale for activities of daily living (ADCS-ADL), and neuropsychiatric inventory (NPI).

RESULTS

Significant differences in T1rho values at the three time points ($P<0.05$) were detected. Twenty (67%) patients showed a decrease of T1rho values in medial temporal lobe after received DMT. The T1rho values showed a weak negative correlation with ADCS-ADL ($r= -0.216$, $P=0.043$; $r= -0.198$, $P=0.049$; $r= -0.294$, $P=0.031$) and weak positive correlation with ADAS-Cog ($r= 0.230$, $P=0.032$; $r= 0.199$, $P=0.044$; $r= 0.026$, $P=0.029$). However, no correlation was observed between the T1rho values and MMSE or NPI ($P>0.05$).

CONCLUSION

The treatment response before and during DMT could be detected on T1rho mapping in medial temporal lobe. Moreover, T1rho values showed correlations with clinical scales such as ADCS-ADL and ADAS-Cog.

CLINICAL RELEVANCE/APPLICATION

It is possible to apply T1rho mapping in assessing the treatment response of DMT in Alzheimer's disease. T1rho value in medial temporal lobe has the potential to complement clinical scales in the clinical practice.

M2-SPNR-10 EVALUATION OF VENDOR-AGNOSTIC DEEP LEARNING DENOISING IN PEDIATRIC NON-CONTRASTED LOW DOSE CRANIAL CT

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Andrea Kronfeld (*Abstract Co-Author*)
Marc A. Brockmann, MD (*Abstract Co-Author*)
Ahmed Othman, MD (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the effect of a vendor-agnostic deep learning denoising (DLD) algorithm on the diagnostic image quality of pediatric non-contrast low dose cranial computed tomography (cCT).

METHODS AND MATERIALS

This retrospective single-center study included cCT data from 59 consecutive patients under 18 years of age who underwent routine imaging for neurological emergencies and trauma, followed by MRI within 7 days after cCT. The images were reconstructed using filtered back projection (FBP) and a vendor-agnostic deep learning-based denoising method (DLD-cCT). Quantitative analysis was performed using specialized MatLab tool and included the signal-to-noise ratio (SNR). Qualitative analysis was conducted by two independent readers using a 4-point Likert scale to evaluate the following cCT quality criteria: overall image quality, image noise, artifacts, gray matter-white matter differentiation (GM-WM), sharpness, and diagnostic confidence.

RESULTS

DLD-cCT outperformed conventional cCT. Quantitative analysis demonstrated significant improvements in SNR (DLD-cCT = 14.33 ± 8.5 vs. cCT = 6.63 ± 3.28; $p < 0.001$). Qualitative analysis revealed significantly better results across all assessed criteria for both readers ($p < 0.001$). Interrater agreement ranged from moderate to almost perfect.

CONCLUSION

The vendor-agnostic deep learning denoising algorithm significantly improved quantitative and qualitative imaging parameters.

CLINICAL RELEVANCE/APPLICATION

Vendor-agnostic deep learning denoising contributes to improved image quality, thereby facilitating greater diagnostic confidence.

M2-SPNR-11 UNREMARKABLE BRAIN CT SCREENING VIA MODALITY-SPECIFIC ADAPTATION OF A MULTIMODAL FOUNDATION MODEL: A RETROSPECTIVE CLINICAL SIMULATION STUDY

Namkug Kim, PhD (*Presenter*)
Seungjun Lee (*Abstract Co-Author*)
Sujeong Kwon, BA (*Abstract Co-Author*)
Gil-Sun Hong, MD, PhD (*Abstract Co-Author*)

PURPOSE

Emergency departments (EDs) generate large volumes of imaging, with most non-contrast brain CTs (NCCTs) being unremarkable but still requiring full radiologist review—contributing to workload and burnout. Existing AI tools often target specific findings or rely on general foundation models lacking CT-specific optimization, limiting their effectiveness. We developed and externally validated BrainCT-CLIP, a multimodal foundation model tailored for NCCT, to automatically identify unremarkable scans and evaluated its potential to reduce workload through a clinical simulation with supplementary AI tools.

METHODS AND MATERIALS

In this retrospective study, we trained BrainCT-CLIP on 135,635 NCCTs paired with radiology reports from Hospital A (2000-2018). Two independent, consecutive ED cohorts—544 from Hospital A (February 2019) and 1,795 from Hospital B (January-May 2019)—were labeled "unremarkable" or "remarkable" by an experienced radiologist. BrainCT-CLIP extends BioMedCLIP's vision-text framework with a learnable Hounsfield-Unit (HU) windowing layer and additional transformer encoder blocks to capture CT-specific features. Benchmarks included MedicalNet, PubMedCLIP, and BioMedCLIP (with and without CT preprocessing). Metrics were area under the receiver operating characteristic curve (AUC), sensitivity, specificity, negative predictive value (NPV), and workload reduction—and the proportion of scans auto-flagged as unremarkable. The threshold was set on internal data to ensure = 95% sensitivity and NPV. In simulated clinical workflow, we combined BrainCT-CLIP with a commercial AI screening tool to estimate practical workload reduction.

RESULTS

BrainCT-CLIP achieved an AUC of 0.87, surpassing MedicalNet (0.53), PubMedCLIP (0.68 with CT preprocessing; 0.67 without), BioMedCLIP (0.77 with; 0.67 without). At its threshold, BrainCT-CLIP reduced radiologist workload by 23% while preserving sensitivity of 0.97 and NPV of 0.98. Other models failed to meet sensitivity/NPV targets or yield meaningful workload reduction. In the simulated workflow, the combined AI system yielded a 24% workload reduction with sensitivity of 0.99 and NPV of 0.99.

CONCLUSION

By integrating CT-specific preprocessing and architectural enhancements, BrainCT-CLIP outperforms existing foundation models on NCCT. It automatically flags 23% of scans as unremarkable, offering a practical triage tool that streamlines emergency workflows and ensures prompt detection of critical findings.

CLINICAL RELEVANCE/APPLICATION

By safely identifying unremarkable scans and prioritizing urgent cases, BrainCT-CLIP can reduce radiologist review time by 23%, accelerate patient management, and optimize resource allocation in emergency settings.

M2-SPNR-12 STRUCTURAL AND FUNCTIONAL ALTERNATIONS OF MEDIAL AND LATERAL ENTORHINAL CORTEX WITH SUBJECTIVE COGNITIVE DECLINE: ASSOCIATIONS WITH SPATIAL NAVIGATION AND OLFACTORY FUNCTION

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Jiaming Lu (*Abstract Co-Author*)
Qian Chen, PhD (*Abstract Co-Author*)
Futao Chen (*Abstract Co-Author*)
Yajing Zhu (*Abstract Co-Author*)
Xin Zhang, MD (*Abstract Co-Author*)
Bing Zhang, PhD (*Abstract Co-Author*)

PURPOSE

Subjective cognitive decline (SCD) is a preclinical stage of Alzheimer's disease (AD) and considered its best diagnostic window. Entorhinal cortex, one of the most vulnerable regions for AD, is divided into medial entorhinal cortex (MEC) and lateral entorhinal cortex (LEC), which is associated with spatial navigation and olfactory function, respectively. In the present study, we aimed to explore the structural and functional alterations of the medial and lateral entorhinal cortex in SCD individuals, and to investigate their associations with cognitive performance, spatial navigation, and olfactory function.

METHODS AND MATERIALS

Seventy-seven control subjects and 106 SCD individuals were enrolled, and neuropsychological evaluations, 2D computerized spatial navigation test, olfactory assessment, structural and resting-state functional MRI were collected. Bilateral MEC and LEC were selected as seeds to investigate alternations of the volumes, ALFF value, ALFF/VBM ratio, static (sFC) and dynamic functional connectivity (dFC).

RESULTS

In SCD individuals, the medial/lateral EC exhibited decreased sFC with the whole brain, primarily within the visual, sensory motor, and default mode network. The dFC between right LEC and right triangular part of inferior frontal gyrus decreased, while dFC between left MEC and right putamen, and between right MEC and right middle temporal gyrus increased. Additionally, the increase of ALFF/VBM ratio was found in right LEC. The olfactory function was associated with both LEC and MEC, while spatial navigation function was more related to MEC. Finally, the model integrating neuroimaging metrics, cognitive performance, spatial navigation and olfactory function achieved an AUC of 0.955.

CONCLUSION

Early pathological changes occur in the medial/lateral EC despite the absence of cognitive impairment at the SCD stage, and, they are strongly associated with spatial navigation and olfactory function. The structural and functional metrics of medial/lateral EC may serve as early AD diagnostic biomarkers.

CLINICAL RELEVANCE/APPLICATION

This study is expected to identify biomarkers for early diagnosis of AD. By investigating the mechanisms underlying AD-related impairments in spatial navigation and olfactory function, it aims to provide insights for precision therapeutics.

M2-SPNR-13 MA-NET-BASED AUTOMATED MEASUREMENT OF PITUITARY GLAND VOLUME ACROSS DIFFERENT AGE GROUPS AND GENDERS USING MRI

Hayoun Kim, MD, PhD (*Presenter*)
Boda Nam, MD (*Abstract Co-Author*)

PURPOSE

Accurate evaluation of pituitary gland anatomy, including physiological variations in volume across age groups and sex, is important for clinical assessment. Manual measurement of pituitary volume (PV) is time-consuming and operator-dependent. This study aims to apply an automated method using MRI and MA-net to evaluate PV across a broad age range and both sexes.

METHODS AND MATERIALS

This retrospective study included 1,823 patients (911 males and 912 females) aged between 1 and 89 years who underwent brain MRI scans. Patients with pituitary or endocrine abnormalities were excluded. The participants were categorized into the following age groups in 10-year intervals from 1 to 90 years. PV was measured using T1 sagittal MRI images with a thickness of 1-3 mm from non-enhanced brain MRIs. The measurements were analyzed using the MA-net artificial intelligence learning method. The relationship between mean PV and age, as well as between mean PV and sex, was evaluated using the Chi-square test, Mann-Whitney U test, and ANCOVA, with a p-value < 0.05 considered statistically significant.

RESULTS

The mean PV was 672.78 ± 261.93 mm^3 in male and 752.66 ± 281.53 mm^3 in female, with female showing an average volume 79.88 mm^3 larger than male. This difference was statistically significant ($p < 0.001$). PV also demonstrated significant differences based on both gender and age, with F-values of 192.568 and 75.404, respectively ($p < 0.001$). As age increased, there was an interaction effect on the differences in pituitary volume between genders ($F = 5.783$, $p < 0.001$). Pituitary volume increased rapidly in younger individuals (up to their 20s), with female showing a significantly greater increase compared to male. After the 20s, the volume decreased rapidly in male during their 30s and then showed a gradual decline thereafter. In female, the volume gradually decreased after their 30s ($p < 0.001$).

CONCLUSION

Pituitary volume was significantly larger in females than in males across all age groups, with peak values in the teens and twenties. Age- and sex-related patterns were clearly demonstrated using MA-net-based automated MRI analysis. These values may serve as a reference for distinguishing physiological variation from pathology. The automated method enables rapid, objective assessment of pituitary size. This approach may improve diagnostic accuracy and efficiency in clinical practice.

CLINICAL RELEVANCE/APPLICATION

Automated AI-based measurement of pituitary volume across age and gender variations enhances diagnostic efficiency and accuracy, providing valuable insights for clinical assessments and research.

M2-SPNR-14 AI-BASED AUTOMATED MEASUREMENT OF PITUITARY GLAND VOLUME IN IDIOPATHIC CENTRAL PRECOCIOUS PUBERTY: DIAGNOSTIC UTILITY AND HORMONAL CORRELATION

Hayoun Kim, MD, PhD (*Presenter*)
Boda Nam, MD (*Abstract Co-Author*)

PURPOSE

Idiopathic central precocious puberty (IPP) is associated with a significant increase in pituitary gland volume (PV) compared to age-matched controls. However, PV measurements most commonly used are time-consuming and labor-intensive, relying on manual methods. This study evaluates the feasibility of using artificial intelligence (AI) to automate PV measurement and assesses its potential for diagnosing IPP. Additionally, the study explores the correlation between PV, hormone levels, and physical parameters in IPP patients.

METHODS AND MATERIALS

A total of 163 patients were analyzed, including 77 patients diagnosed (25 males and 52 females, median age, 8 years; interquartile range, 7-9 years) with IPP and who underwent brain MRI from July 2016 to December 2024. A control group of 86 patients who underwent brain MR imaging without symptoms of precocious puberty was also included (50 males and 36 females, median age, 7 years; interquartile range, 8-9 years). Out of a total of 168 collectd patients, 5 were excluded due to in accurate pituitary gland volume date. The pituitary gland volume was measured using 1-3 mm thickness T1 sagittal images from non-enhanced brain MR imaging, analyzed with the MA-net artificial intelligence learning method.

RESULTS

There were significant differences in height, weight, and Luteinizing Hormone levels between the IPP group and the control group. However, there were no significant differences in age, BMI, thyroid hormone, vitamin D, testosterone, and estradiol levels between the two groups. The median values of PV were 420 mm^3 in the IPP group and 367 mm^3 in the control group, showing a significant difference of 53 mm^3 ($P < .05$).

CONCLUSION

Pituitary volume (PV) was significantly higher in the IPP group compared to controls. Automated PV measurement, along with hormone levels and physical parameters, could enable more efficient and accurate diagnosis of IPP.

CLINICAL RELEVANCE/APPLICATION

AI-based automated pituitary volume measurement may provide a rapid and objective method for diagnosing idiopathic central precocious puberty

M2-SPNR-16 SYSTEMATIC ERRORS IN MEDIAL SUPERIOR FRONTAL AND CINGULATE PARCELLATIONS BY FREESURFER: IMPLICATIONS FOR CLINICAL NEUROIMAGING

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Lynn Morch-Johnsen (*Abstract Co-Author*)
Ingrid Agartz, MD,PhD (*Abstract Co-Author*)
Kang-Lung Lee, MD (*Abstract Co-Author*)
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John Suckling (*Abstract Co-Author*)
Graham Murray (*Abstract Co-Author*)

PURPOSE

Region of interest (ROI) analysis is widely used in neuroimaging for pathology detection, treatment, and prognosis. Although the medial superior frontal and anterior-middle cingulate regions are implicated in neuropsychiatric disorders, variability in the paracingulate sulcus (PCS), present in 50-75% of hemispheres, may cause parcellation errors (e.g., FreeSurfer) by misidentifying it as the cingulate sulcus, causing misalignment. This shifts ROI boundaries, misassigning the PCS from the superior frontal to cingulate regions. Although recognized, this misalignment has not been quantified. This study quantifies FreeSurfer's misalignment and its association with PCS prominence, hypothesizing that greater PCS prominence correlates with larger errors.

METHODS AND MATERIALS

T1-weighted MRIs from 278 healthy individuals (mean age = 34.7 ± 9.7 years; 146 males [52.9%]; 223 right-handed [80.2%]) were analyzed. Data were preprocessed and parcellated using FreeSurfer v6.0.0 and v7.4.1, focusing on four regions from the default Destrieux Atlas: superior frontal, anterior cingulate, middle-anterior cingulate, and middle-posterior cingulate. PCS was manually labeled across 556 hemispheres. Correct alignment was quantified as %PCS vertices within the superior frontal region; misalignment was %PCS vertices in the cingulate regions. Associations between PCS prominence (vertex count) and correct alignment/misalignment were assessed using Pearson correlations, with differences evaluated via bootstrap resampling (5,000 iterations).

RESULTS

Among 278 participants, 136 (48.9%) had < 80% correct alignment in the left hemisphere and 138 (49.6%) in the right; 130 (46.8%) and 124 (44.6%) showed > 20% misalignments in the left and right, respectively. PCS prominence correlated more strongly with misalignment than correct alignment (left hemisphere: r = 0.83 vs. 0.68, 95% CI of the difference = [0.07, 0.25]; right hemisphere: r = 0.84 vs. 0.51, 95% CI = [0.22, 0.44]). Findings were consistent across both FreeSurfer versions.

CONCLUSION

FreeSurfer's default parcellation (v6.0.0 and v7.4.1) showed that about 50% of participants had < 80% correct alignment or > 20% misalignment in superior frontal and cingulate regions. Misalignment showed a stronger association with PCS prominence, supporting our hypothesis.

CLINICAL RELEVANCE/APPLICATION

This study highlights the high prevalence of mislocalized boundaries between medial superior frontal and cingulate ROIs in FreeSurfer, the most widely used structural neuroimaging tool. Manual editing should be considered for these regions, as accurate localization is critical for precision medicine. Misassignment may compromise treatments like transcranial magnetic stimulation for depression.

M2-SPNR-17 PRELIMINARY STUDY ON SPATIAL HETEROGENEITY OF GLIOMAS THROUGH MULTIPARAMETRIC MRI: INSIGHTS INTO TUMOR MICROENVIRONMENT

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Mingmei Li, MMed (*Abstract Co-Author*)
Zhiping Lin (*Abstract Co-Author*)
Liping Qing (*Abstract Co-Author*)
Qin Zhao (*Abstract Co-Author*)
Hao Li (*Abstract Co-Author*)
Meiying Chen (*Abstract Co-Author*)
Demin Xu (*Abstract Co-Author*)
Yulong Qi (*Abstract Co-Author*)
Guanxun Cheng, PhD (*Abstract Co-Author*)

PURPOSE

To explore the potential of multiparametric MRI-derived habitat imaging for preoperative prediction of IDH-1 mutation status, recurrence, WHO grade, and Ki-67 expression in gliomas.

METHODS AND MATERIALS

Volumes of interest (VOIs) including tumor and peritumoral infiltrative edema regions were delineated on T2-weighted fluid-attenuated inversion recovery (T2 FLAIR) and contrast-enhanced T1-weighted (T1CE) images. Eight spatial habitats were generated from apparent diffusion coefficient (ADC), T1CE, and FLAIR sequences using the Otsu algorithm. The volumetric fraction of each habitat (H_i, representing the proportion of the i-th habitat to the entire VOI) was analyzed using the Mann-Whitney U test and univariate logistic regression. The performance of significant predictors was further evaluated using the area under the receiver operating characteristic curve (AUC).

RESULTS

A total of 39 patients (mean age, 47.8 ± 14.9 years [SD]; 29 male) were included. For IDH-1 mutation status, H 3 showed increased odds (OR = 2.609, 95% CI: 1.179-5.771; P = 0.018; AUC = 0.754), while H 8 showed decreased odds (OR = 0.301, 95% CI: 0.108-0.836; P = 0.021; AUC = 0.735). Regarding recurrence, H 5 (OR = 3.453, 95% CI: 1.202-9.923; P = 0.021; AUC = 0.783) and H 6 (OR = 5.589, 95% CI: 1.375-22.721; P = 0.016; AUC = 0.919) were identified as significant predictors. Furthermore, H 3 was associated with lower odds of high tumor grade (OR = 0.283, 95% CI: 0.117-0.686; P = 0.005; AUC = 0.814) and high Ki-67 expression (OR = 0.358, 95% CI: 0.158-0.811; P = 0.014; AUC = 0.751). Conversely, H 8 was associated with higher odds of high tumor grade (OR = 47.113, 95% CI: 1.117-1986.923; P = 0.044; AUC = 0.845) and high Ki-67 expression (OR = 3.179, 95% CI: 1.173-8.614; P = 0.023; AUC = 0.743).

CONCLUSION

Multiparametric MRI-derived spatial habitats effectively characterize glioma spatial heterogeneity and show potential as a non-invasive preoperative tool for inferring key tumor biology aspects.

CLINICAL RELEVANCE/APPLICATION

This non-invasive predictive capability of spatial heterogeneity features holds potential to improve preoperative patient stratification and facilitate personalized treatment planning for glioma.

M2-SPNR-19 HIGHER TEA CONSUMPTION IS ASSOCIATED WITH LOWER BASAL GANGLIA SUSCEPTIBILITY IN AGING: EVIDENCE FROM THE UK BIOBANK

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Changhu Liang, MD, PhD (*Abstract Co-Author*)
Lingfei Guo, MD (*Abstract Co-Author*)
Yilin Guo (*Abstract Co-Author*)
Yiwen Chen (*Abstract Co-Author*)
Zhenyu Cheng (*Abstract Co-Author*)
Na Wang (*Abstract Co-Author*)

PURPOSE

Iron deposition in the basal ganglia is a key biomarker of brain aging and neurodegeneration. This study investigated the relationship between tea consumption, demographic and lifestyle factors, and quantitative susceptibility mapping (QSM) values in basal ganglia nuclei among healthy middle-aged and elderly adults in the UK Biobank.

METHODS AND MATERIALS

We included 25,980 participants (aged 50-79) from the UK Biobank who underwent 3T MRI. Susceptibility values of the caudate nucleus, putamen, globus pallidus, and substantia nigra were derived from QSM. Daily tea intake, coffee consumption, smoking, alcohol use, sleep, waist circumference, and C-reactive protein were recorded. Linear and polynomial regression models assessed associations between tea intake and susceptibility values, with gender-stratified analysis and adjustment for confounders.

RESULTS

Daily consumption of =4 cups of tea was associated with significantly reduced susceptibility values in all basal ganglia nuclei (e.g., -0.063 in caudate, -0.093 in substantia nigra; all $P < .001$). In men, increasing tea intake from 0 to 3 cups/day corresponded to a 0.044 SD reduction in susceptibility, equating to a "rejuvenation" effect of 1.50 brain years; in women, the reduction was 0.162 SDs, equivalent to 5.59 brain years. Additional factors positively associated with basal ganglia susceptibility included age, waist circumference, smoking status, and C-reactive protein. Coffee intake was not significantly associated with susceptibility values.

CONCLUSION

Tea consumption is independently associated with lower iron-related susceptibility in basal ganglia, with a dose-dependent and gender-specific "neuroprotective" effect. These findings support tea as a modifiable lifestyle factor linked to healthier brain aging.

CLINICAL RELEVANCE/APPLICATION

Quantitative susceptibility values of basal ganglia offer sensitive imaging markers of iron burden and brain aging. Tea intake may represent a modifiable factor with potential neuroprotective implications.

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

M2-SPOB

OB/Gynecology Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPOB-1 AMIDE PROTON TRANSFER - WEIGHTED HABITAT RADIOMICS: AN SUPERIOR APPROACH FOR PREOPERATIVE PREDICTION OF LYMPHOVASCULAR SPACE INVASION IN CERVICAL CANCER

Jie Li (*Presenter*)
Qinghe Han (*Abstract Co-Author*)

PURPOSE

To explore the predictive ability of habitat radiomic features extracted from amide proton transfer-weighted (APTw) MRI for lymphovascular space invasion (LVSI) in patients with cervical cancer (CC).

METHODS AND MATERIALS

This prospective study included consecutive adult patients with suspected CC who underwent APTw MRI from December 2022 to December 2024. The regions of interest delineated on T2-weighted images were replicated on APTw images, and radiomic scores for the APTw habitats (APTw_h3) were calculated. The pathological assessment of LVSI from hysterectomy samples served as the reference standard. Multivariable logistic regression was employed to identify variables associated with LVSI and to develop a diagnostic model for predicting LVSI. The areas under the receiver operating characteristic curve (AUCs) were used to evaluate the performance of the imaging parameters and the overall model and were compared with the DeLong test.

RESULTS

A total of 124 patients were included, among whom 74 were LVSI-negative (median age, 47 years [IQR, 41-55 years]) and 50 were LVSI-positive (median age, 51 years [IQR, 42-58 years]). Compared with the APTw value (AUC, 0.704) and the apparent diffusion coefficient (AUC, 0.609), APTw_h3 (AUC, 0.796) demonstrated better predictive performance for LVSI. Tumour size, cancer antigen-125 level, and APTw_h3 were associated with LVSI positivity (odds ratio range, 1.01-9.06; $P < 0.001$). The combined model (AUC, 0.903; $P < 0.001$) showed better predictive performance for LVSI than the clinicoradiological model (AUC, 0.733; $P < 0.001$) and the APTw_h3 model (AUC, 0.796; $P < 0.001$).

CONCLUSION

The habitat radiomic features of APTw images can be used to predict LVSI in CC.

CLINICAL RELEVANCE/APPLICATION

By utilizing habitat radiomic features derived from APTw MRI, clinicians can obtain a non-invasive and more accurate prediction of lymphovascular space invasion (LVSI), a critical factor influencing treatment strategies and patient outcomes. The superior predictive performance of the APTw_h3 feature, as demonstrated by its AUC of 0.796 compared to traditional APTw and ADC values, offers a more reliable imaging biomarker for LVSI. Furthermore, the combined model incorporating APTw_h3 with clinical and radiological factors achieved an impressive AUC of 0.903, providing a robust tool for preoperative risk stratification. This advancement enables clinicians to identify patients at higher risk of LVSI early, facilitating personalized treatment planning. For instance, patients predicted to be LVSI-positive can undergo more aggressive surgical approaches and adjuvant therapies, while those predicted to be LVSI-negative can avoid potential overtreatment.

M2-SPOB-2 COMPARISON OF RADIOMICS MODEL WITH O-RADS AND RADIOLOGISTS FOR RISK STRATIFICATION OF OVARIAN MASSES: A RETROSPECTIVE MULTI-CENTER STUDY

Long Ling (*Presenter*)
Jin Junjie (*Abstract Co-Author*)

PURPOSE

To develop an MRI-based radiomics model to categorize ovarian masses and to compare the model performance to Ovarian-Adnexal Reporting and Data System (O-RADS) and radiologists' assessments.

METHODS AND MATERIALS

This retrospective multicenter study included 497 patients (249 benign, 248 malignant) allocated to training, internal, and external validation sets(293/124/80 masses, respectively). Radiomics features were extracted from preoperative MRI. The minimum redundancy maximum relevance and least absolute shrinkage and selection operator algorithm were used for feature selection. The diagnostic performance of the radiomics model, O-RADS, and independent assessments by junior and senior radiologists was evaluated using the area under the receiver operating characteristic curve (AUC) and compared using DeLong's test.

RESULTS

In external validation, the radiomics model (AUC = 0.939) outperformed O-RADS (AUC = 0.862; $P = 0.047$) and the junior radiologist (AUC = 0.802; $P = 0.003$) and was similar to the senior radiologist (AUC = 0.886; $P = 0.231$). Subgroup analysis of O-RADS score 4 showed the model (AUC = 0.879) outperformed both radiologists (junior: $P = 0.001$; senior: $P = 0.005$).

CONCLUSION

The performance of radiomics model to categorize ovarian masses was superior to O-RADS and junior radiologist and similar to senior radiologist. As a complementary tool to O-RADS, it allows for refined risk stratification for ovarian masses with an O-RADS score 4, providing clinicians with quantitative decision support to improve preoperative diagnosis and guide treatment planning.

CLINICAL RELEVANCE/APPLICATION

Radiomics model improved risk stratification and supports precise clinical decision-making for ovarian masses with an O-RADS score of 4, thereby improving the management of patients with ovarian masses.

M2-SPOB-3 LONG-GRADIENT ECHO IMAGES FOR FETAL MR IMAGING OF THE FETAL SPINE, RIBS AND EXTREMITIES - INTERGROUP COMPARISON BETWEEN T2WI, UNPROCESSED AND PROCESSED LONG-GRADIENT ECHO IMAGES AT DIFFERENT GESTATIONAL AGES

Nitin P. Ghonge, MD, MBBS (*Presenter*)
Nidhi Goyal, MD, FRCR (*Abstract Co-Author*)

PURPOSE

To evaluate feasibility of long-gradient echo images for fetal MR imaging at different gestational ages. To compare the quantitative and qualitative assessment of T2-HASTE, unprocessed and processed long-gradient echo images for fetal spine, ribs and long bones. To describe the potential role of long-gradient echo for fetal MRI.

METHODS AND MATERIALS

22 consecutive patients referred for fetal MRI were included. MRI was performed on Philips 3T scanner [Ingenia]. Apart from T2 HASTE, long gradient echo sequence was performed. Magnetic susceptibility of fetal vertebrae varies linearly over gestation. TE of 7-8 msec was used. The raw phase images were processed using a homodyne high pass filter of size 32*32. This provided clean filtered phase images to create the susceptibility weighting mask, which was multiplied with the magnitude images. Mean SNR values were calculated from each set using circular ROI on a mid-dorsal vertebral body and compared. Qualitative assessment was performed by two radiologists in consensus. The evaluation parameters are mentioned in the pdf file. '3-point Likert scale' was used to decide the level of confidence in interpretation as NORMAL [2: HIGH level of confidence / 1: LOW level of confidence / 0: NOT sure]. The scale values were compared between three image groups for each of the anatomical parameters.

RESULTS

Long gradient echo MR sequence could be acquired in all the patients and allowed evaluation of fetal spine, ribs and long bones. T2W images showed mean SNR value of 2.6 as compared to 3.9 in the unprocessed and 3.6 in the processed long gradient echo images. Processed echo images seem to further increase the mean SNR values, in the gestational age category of < 24 weeks. Qualitative assessment showed higher degree of confidence with long gradient echo sequence images for the vertebral counting, cranio-vertebral junction, vertebral bodies, intervertebral disc, spinal alignment, closure of posterior elements and the long bones. Spinal canal, spinal cord and conus were better visualized on the T2WI.

CONCLUSION

Long gradient echo MR sequence could be optimally performed for the evaluation of fetal spine, ribs and long bones from 20-37 weeks gestation. This showed increased mean SNR values as compared to T2WI for the fetal spine. Processed images seem to further increase the mean SNR values at gestational age < 24 weeks. Qualitative assessment showed higher degree of confidence with long gradient echo sequence images for the assessment of the osseous structures.

CLINICAL RELEVANCE/APPLICATION

Long gradient echo MR sequence may be included in the routine Fetal MRI protocol. This may serve as a robust alternative to low-dose CT imaging for prenatal evaluation of the fetal spine, ribs and long bones in appropriate clinical settings.

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M2-SPPD

Pediatric Imaging Monday Morning Poster Discussions

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Sub-Events

M2-SPPD-1 MRI FEATURES AND PREVALENCE OF SUBCUTANEOUS AXILLARY RIDGE TISSUE IN HEALTHY ADOLESCENT PATIENTS; ARE THESE VESTIGIAL BREAST MOUNDS ALONG THE EMBRYOLOGICAL MILK LINE?

Pedro Henrique Caldeira Brant Faria, MD (*Presenter*)
Philip N. Asamoah, MD (*Abstract Co-Author*)
Ani Maroyan (*Abstract Co-Author*)
Sarah D. Bixby, MD, MBA (*Abstract Co-Author*)

PURPOSE

A thin band of soft tissue in the axillary ridge mimicking breast tissue has been noted on adolescent patients undergoing MR shoulder arthrography for suspected intra-articular pathology. According to surgical literature, most adults have chains of vestigial breast mounds along the embryological milk line starting at the axilla, which would correlate with MRI findings. This study aimed to determine the prevalence and imaging features of a band of subcutaneous soft tissue in the anterior axillary ridge in healthy adolescent patients undergoing shoulder MRI, which likely represents normal fibroglandular tissue based on comparison with imaging findings in patients with biopsy-proven axillary breast tissue.

METHODS AND MATERIALS

We retrospectively searched PACS for shoulder MR arthrogram studies performed in patients aged 10-18 years from April 2023 to July 2024. Exams were reviewed to ensure inclusion of T1-weighted and T2-weighted sequences through the axilla. Two radiologists independently assessed each study for the presence of a well-demarcated band of tissue—T2 intermediate and T1 hypointense—following the contour of the axillary fold. Maximal thickness of the tissue was measured when present. Associated soft tissue findings were recorded. Differences in mean thickness between males and females were assessed using a t-test. Electronic medical records were reviewed for current medications and associated medical conditions.

RESULTS

A total of 200 studies were reviewed; 107 included adequate imaging of the axillary fold. Of these, 93% (n = 99; 41 male, 60 female) demonstrated the axillary band of tissue. No patients were taking relevant medications or had associated medical comorbidities. The mean tissue thickness was 2.29 mm in males and 2.72 mm in females, with no statistically significant difference (p = 0.516). Thickness ranged from 1.0-6.0 mm in females and 0.7-5.2 mm in males. The tissue was consistently confined to the anterior aspect of the axillary ridge with a characteristic inverted-U shape. No associated cysts or masses were identified.

CONCLUSION

A subcutaneous ridge of axillary soft tissue with surrounding fat is a common incidental finding on shoulder arthrograms in adolescents, present in 93% of cases regardless of gender. This feature has not been previously described and may be mistaken for a pathological process if not recognized.

CLINICAL RELEVANCE/APPLICATION

Recognition of this common, likely normal variant in the axillary fold is important to prevent misinterpretation as a soft tissue abnormality, particularly in the adolescent population undergoing shoulder MRI.

M2-SPPD-2 REDEFINING PEDIATRIC KIDNEY TRANSPLANT SURVEILLANCE? PRELIMINARY FINDINGS OF CEUS AS A NONINVASIVE PREDICTOR OF HISTOLOGIC DAMAGE

Tatiana Morales, MD (*Presenter*)
Hansel J. Otero, MD (*Abstract Co-Author*)
Susan J. Back, MD (*Abstract Co-Author*)
Laith R. Sultan, MD, MPH (*Abstract Co-Author*)
Bernarda Viteri, MD (*Abstract Co-Author*)

PURPOSE

Contrast-enhanced ultrasound (CEUS) offers an alternative to biopsy for assessing microvascular damage of kidney transplants. We compared CEUS parameters with histopathological measures of transplant dysfunction.

METHODS AND MATERIALS

This prospective, single-center study enrolled pediatric kidney transplant recipients undergoing clinically indicated biopsies from Nov 2020 to Dec 2024. CEUS imaging was performed within 48 hours prior to biopsy. After intravenous administration of ultrasound contrast agent (0.03 mL/kg) a 2-minute cine loop of the transplanted kidney was obtained. Four cortical regions of interest (ROI) were identified in post-processing using Interactive Data Language (IDL) software, depicting: mean transit time (MTT), time to peak (TTP), peak enhancement (PE) and perfusion index (PI). The values were compared to Banff 2017 histopathologic criteria of rejection, total inflammation (ti : categorized as 0 vs. 1-3), and the chronic allograft damage index (CADI) composite score. A generalized estimating equations model was used to account for repeated measures.

RESULTS

Forty CEUS examinations were performed; one had an incomplete clip, leaving 39 exams from 28 subjects (75% male) for analysis. The median age at the time of CEUS was 16 years (IQR: 6). The mean estimated glomerular filtration rate was 68.9 mL/min/1.73m² (IQR: 20.3), and the median time from transplant to biopsy was 14 months (IQR: 23). Median CEUS parameters were: TTP 12.7 seconds (IQR: 17.6), MTT 57.1 seconds (IQR: 41.2), PE 136.3 a.u. (IQR: 29.3), and PI 27.6 a.u. (IQR: 1.52). The median CADI score was 2 (IQR: 2), 26/39 biopsies (66.7%) showed a ti score of 0, and 15 showed rejection (38.5%). TTP and PE were significantly associated with CADI score (ß = 0.05, p = 0.013 and ß = 0.02, p = 0.048, respectively). MTT was significantly associated with both CADI (ß = 0.37 per 10 seconds, p = 0.002) and ti score (OR = 1.51, p = 0.013).

CONCLUSION

As CEUS perfusion parameters increased, CADI also did. Mean transit time was also strongly associated with total inflammation suggesting delayed or reduced perfusion in affected allografts.

CLINICAL RELEVANCE/APPLICATION

CEUS may serve as a non-invasive tool for surveillance of kidney allograft health and detecting early dysfunction.

M2-SPPD-3 ASSOCIATION OF CONTRAST-ENHANCED ULTRASOUND PARAMETERS WITH MICROVESSEL DENSITY IN HEPATOBLASTOMA

Yazi YOU (*Presenter*)
Yi Tang (*Abstract Co-Author*)

PURPOSE

This study aimed to explore the association between qualitative and quantitative features of contrast-enhanced ultrasound (CEUS) and microvessel density (MVD) in hepatoblastoma (HB), while assessing the potential of CEUS as a noninvasive, preoperative method for predicting tumor progression.

METHODS AND MATERIALS

This retrospective analysis was carried out in one medical center and included 40 children with histopathologically confirmed HB (22 males, 18 females; average age, 3.8 ± 1.2 years). Both gray-scale ultrasound and CEUS results were reviewed. Lesions were evaluated using time-intensity curve (TIC) analysis software to extract quantitative parameters. Postoperative tissue specimens were stained with CD34 immunohistochemistry, and MVD was quantified as the reference standard. Statistical analyses were conducted to assess the correlation between CEUS findings and MVD.

RESULTS

Lesions were separated into high (n = 22, 55%; MVD > 38) and low (n = 18, 45%; MVD = 38) MVD groups, based on a cutoff value of 38 vessels per high-power field (hpf). High MVD lesions exhibited significantly more uneven distribution, non-diffuse enhancement, and a higher incidence of perforating vessels than low MVD lesions ($p < 0.05$). Additionally, a significant association was observed between high MVD levels and higher Adler-grade vascular flow ($p < 0.05$). Receiver Operating Characteristic (ROC) curve analysis revealed that the relative wash-out rate (rWoR) value of = 1.36 could serve as a predictor for low MVD, with a sensitivity of 61.1% and specificity of 81.8% (AUC = 0.717; 95% CI: 0.549-0.885; p = 0.019).

CONCLUSION

The qualitative and quantitative aspects of CEUS show a notable correlation with MVD, endorsing its application as a noninvasive tool before surgery for forecasting HB malignancy and assisting in clinical decision processes.

CLINICAL RELEVANCE/APPLICATION

This study highlights the potential clinical utility of CEUS as a noninvasive imaging modality for evaluating HB in pediatric patients. By demonstrating a significant correlation between CEUS features—particularly perfusion patterns and time-intensity curve parameters—and tumor MVD, the findings support CEUS as a preoperative surrogate marker of tumor angiogenesis and aggressiveness. Integrating CEUS into routine clinical assessment may aid in risk stratification, surgical planning, and individualized treatment decisions, reducing the reliance on invasive procedures for histopathological evaluation.

M2-SPPD-4 PICC-ING THE RIGHT SPOT: A COMPARISON OF UPPER VS. LOWER EXTREMITY PLACEMENTS IN PEDIATRIC PATIENTS

Aarti Luhar, MD (*Presenter*)
Luo Xu (*Abstract Co-Author*)
James W. Sayre, PhD,MS (*Abstract Co-Author*)

PURPOSE

Durable venous access in pediatric patients poses a significant challenge due to the small size of the patient and their vasculature. Peripherally inserted central catheters (PICCs) are frequently utilized for blood draws, medication administration, intensive care unit (ICU) drips, nutrition support, and long-term antibiotic administration. At our institution, PICCs have typically been placed through upper extremity veins, but recent anecdotal evidence suggests greater success with lower extremity PICC placements in these patients. This study aims to compare the success rates and complication rates of PICCs placed in the upper versus lower extremities in the youngest pediatric patients.

METHODS AND MATERIALS

A retrospective chart review was conducted for pediatric patients aged 0-6 months who underwent PICC placement at our institution from 2013 to 2022. Data were extracted from our institutional electronic medical record system (EPIC Systems). Complications of PICC placement were defined as local swelling, suspected infection, failed attempt, stenosis, malposition, and malfunction (ie difficulty aspirating or flushing). The data was analyzed using IBM SPSS software to evaluate for differences in successful placement and complications between lower and upper extremities.

RESULTS

A total of 480 pediatric patients were identified for inclusion in the study. Statistical analysis using Pearson Chi-square test revealed a significantly higher success rate for single PICCs placed in the lower versus upper extremity 95.2% vs 86.2%, with a p-value=0.001. No significant difference was observed in overall complication rates, between lower versus upper 5.6% versus 5.2%, with a p-value=0.849.

CONCLUSION

For the youngest pediatric patients requiring durable venous access, lower extremity PICC placement demonstrated a significantly higher success rate compared to upper extremity placement without significant difference in complication rates. This suggests that lower extremity placement may be the preferred option in this patient population.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that PICC placement in the lower extremity offers a higher success rate without increase in complication, thereby improving PICC placement success and preserving upper extremity vessels for future venous access in our youngest patients.

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M2-SPPH

Physics Monday Morning Poster Discussions

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Sub-Events

M2-SPPH-2 EVALUATION OF INTELLIGENT NOISE REDUCTION IN NEONATAL PORTABLE CHEST RADIOGRAPHS. A VISUAL GRADING STUDY OF RESPIRATORY FINDINGS

Atsuko Fujikawa, MD, PhD (*Presenter*)
Shin Matsuoka, MD (*Abstract Co-Author*)
TAKAO TANUMA (*Abstract Co-Author*)
Yuki Saito, MD,BS (*Abstract Co-Author*)
Hidefumi Mimura, MD (*Abstract Co-Author*)

PURPOSE

To determine how Canon's Intelligent Noise Reduction (INR) and subsequent sharpness enhancement affect visual detection of transient tachypnea of the newborn (TTN) and respiratory distress syndrome (RDS) signs on first-day portable chest radiographs in neonates.

METHODS AND MATERIALS

For each of 61 neonates, the initial bedside chest radiograph was post-processed four ways: Raw, Raw + Sharpness, INR, and INR + Sharpness. Images were randomized and scored independently by pediatric radiologists using a 3-point Likert scale (1 = Not, 2 = Uncertain, 3 = Yes) for seven findings: perihilar streaks, fluid in fissures, reticulogranular pattern, air bronchograms, diffuse opacity, hyperinflation, and low lung volume. Paired Wilcoxon tests compared each processed image with its Raw counterpart; subgroup analysis explored birth-weight effects.

RESULTS

INR significantly increased scores for reticulogranular pattern ($p = 0.003$), diffuse opacity ($p = 0.013$) and hyperinflation ($p = 0.003$) versus Raw. INR + Sharpness retained these gains and provided an additional rise for diffuse opacity ($p = 0.016$). Sharpness applied without prior noise reduction produced no significant change in any finding. Mean score improvements were greatest in infants < 1.5 kg, where quantum mottle is most limiting. Air-bronchogram visibility improved numerically with INR but did not reach significance on the 3-point scale.

CONCLUSION

Noise reduction is the primary driver of image-quality enhancement in neonatal portable radiography, while sharpness adds value only after noise is suppressed. The INR ± Sharpness workflow improves depiction of key RDS/TTN findings without increasing radiation dose.

CLINICAL RELEVANCE/APPLICATION

Integrating INR into routine NICU chest-radiograph protocols can sharpen early diagnosis of neonatal respiratory disorders while preserving current low-dose exposure.

M2-SPPH-4 GADOLINIUM CONCENTRATION DEPENDENT SIGNAL ENHANCEMENT PROFILES USING ROUTINE CLINICAL SEQUENCES WITH GADOPICLENOL, GADOTERATE, GADOBUTROL, AND GADOXETATE AT 1.5, 3 AND 7 TESLA

Thomas Marth, MD (*Presenter*)
Johannes M. Froehlich, PhD (*Abstract Co-Author*)
Daniel Nanz (*Abstract Co-Author*)
Reto Sutter, MD (*Abstract Co-Author*)

PURPOSE

Gadopiclenol, a new macrocyclic gadolinium- (Gd) based contrast agent (GBCA), exhibits a higher longitudinal relaxivity (r_1) than current standard GBCAs, and, thus, has the potential to be used at lower dose or to generate a brighter T1-weighted (T1w) signal at equivalent dose. As the relationship between enhancement and contrast agent concentration (c) is non-linear and can strongly vary between sequences, the corresponding signal profiles were experimentally explored in a phantom study and compared to those of established GBCAs.

METHODS AND MATERIALS

Standardized aqueous dilution series (0.0, 0.1, 0.25, 0.5, 1, 2.5, 5, 10, and 25 mmol/L in normal saline (0.9% sodium chloride)) of gadopiclenol, and the current standard GBCAs gadoterate, gadobutrol, and gadoxetate were imaged at a field strength of 1.5, 3, and 7 Tesla (T) in a standardized setting at room temperature. The imaging protocol included 9 clinical fast spin-echo (FSE) and gradient-echo sequences. Signal intensities (SIs) were measured for each c, set in relation to the SI of water (rSI), and compared across the 4 GBCAs. Additionally, T1 relaxation times were measured at 3 T and r_1 was calculated and compared across the 4 GBCAs.

RESULTS

The maximum rSI in T1w FSE was observed at a lower Gd c (1.0 mmol/L at all 3 field strengths, 1.5, 3, and 7 T) in the gadopiclenol series than in the series with the current standard GBCAs (gadoterate and gadobutrol, 2.5 mmol/L for all 3 field strengths, gadoxetate, 2.5 mmol/L at 1.5 and 3 T, and 1.0 and 2.5 mmol/L at 7 T). The maximum rSI measured at 1.0 mmol/L gadopiclenol was comparable (± 12% rSI) to the maximum rSI measured at 2.5 mmol/L of gadoterate, gadobutrol, and gadoxetate (at 1.5 T, 552 to 629, 607, and 590; at 3 T, 520 to 532, 534, and 512; at 7 T, 330 to 347, 318, 336; respectively). Molar gadopiclenol relaxivity, r_1, in aqueous solution at 20°C at 3 T (12.0 $s^{-1} \cdot mM^{-1}$) was 3 to 4 times higher than r_1 of gadoterate and gadobutrol (2.8 and 3.4 $s^{-1} \cdot mM^{-1}$, respectively), and 2.7 times higher than that of gadoxetate (4.5 $s^{-1} \cdot mM^{-1}$).

CONCLUSION

The experiments confirmed the maximum SI in clinical T1w images to be shifted to lower Gd c of gadopiclenol compared to standard GBCAs at all field strengths. In the low-c range, approximately half the Gd c was sufficient to produce a comparable T1w signal enhancement compared to current standard GBCAs at all field strengths.

CLINICAL RELEVANCE/APPLICATION

Our study is the first to confirm the expected maximum SI shift to a lower Gd c of the new contrast agent gadopiclenol in clinical T1w FSE acquisitions compared to standard GBCAs. The results confirm the potential to reduce the Gd c or dose when using gadopiclenol compared to the current standard GBCAs in clinical T1w sequences and can help guide the choice of Gd c for clinical examinations with gadopiclenol.

M2-SPPH-5 SEGMENTATION-GUIDED SEQUENTIAL REGISTRATION FOR CT PERFUSION IN LIVER

Jinzhong Yang, PhD (*Presenter*)
Zhan Xu, PhD (*Abstract Co-Author*)
Yao Zhao (*Abstract Co-Author*)
Xinru Chen (*Abstract Co-Author*)
Jinyong Lin (*Abstract Co-Author*)
Roya Barati (*Abstract Co-Author*)
Chaan Ng, MD (*Abstract Co-Author*)

PURPOSE

Sequential image registration in dynamic CT perfusion (CTp) is essential for accurate liver cancer diagnosis and treatment assessment. CTp scans typically comprise multiple cine scans with a narrow craniocaudal extent (~ 4 cm), and may include sequential helical scans also with limited craniocaudal coverage (~ 20 cm). Reliable registration of these scans into a common space is important but challenging due to breath-hold variations during scan and post-perfusion intensity changes. We developed a deep learning-based registration framework to achieve fully automated registration of CTp cine and helical scans.

METHODS AND MATERIALS

A total of 39 CTp scans from 20 patients, each with 1 to 3 scan sessions, were included in this study. Each CTp scan has 59-89 cine scans and 8-10 helical scans. Liver was manually segmented on 20 randomly selected helical scans, which were used to train a 2D nnU-Net model for liver auto-segmentation of and on another 5 cine scan and 5 helical scans for testing. In each CTp scan, the first helical scan in the middle of the entire CTp acquisition was used as the reference and all other cine and helical scans were registered to it. The registration framework first applied rigid registration focusing on liver to correct the craniocaudal displacement due the breath-hold variations. Next, a deformable registration based on TransMorph and Swin transformer with liver guidance were applied to achieve a finer-scale registration of in-plane details. 30 CTp scans were used to train the model and the remaining 9 CTp scans were used for testing. Registration performance was evaluated using Dice Similarity Coefficient (DSC, =1 in perfect result) between the contoured reference and deformed images. and Hausdorff Distance (HD, =0 in perfect result) by comparing the contour directly of deformed liver with the reference liver contours/masks.

RESULTS

Liver segmentation was validated the testing set with an average DSC of 0.91±0.07. Of the 9 testing CTp scans, a total of 658 registration were performed. After registration, the DSC of liver contours was improved from 0.834 ± 0.025 to 0.959 ± 0.019, and the HD was improved from 4.6 ± 2.1 mm to 0.959 ± 0.019, respectively. A Student's t-test showed significant difference before and after registration in terms of both DSC and HD ($p<0.001$).

CONCLUSION

The proposed segmentation-guided registration framework has demonstrated effectiveness for automatic sequential registration for liver CTp scans.

CLINICAL RELEVANCE/APPLICATION

The sequential image registration framework can automatically register cine scans and helical scans from a CTp acquisition with high accuracy; this will greatly facilitate the workflow and accuracy of CT perfusion analyses.

M2-SPPH-7 DOES THE USE OF ULTRASOUND INCREASE THE ANTIBIOTIC SENSITIVITY OF BACTERIA ADHERENT TO PENILE IMPLANT SURFACES? AN IN VITRO STUDY

Priscilla Machado, MD (*Presenter*)
Saatvik Kambhampati (*Abstract Co-Author*)
Analyse Giordano (*Abstract Co-Author*)
Francisco Aguirre (*Abstract Co-Author*)
Brian Im (*Abstract Co-Author*)
Lauren J. Delaney, PhD (*Abstract Co-Author*)
Noreen J. Hickok, PhD (*Abstract Co-Author*)
Flemming Forsberg, PhD (*Abstract Co-Author*)
Paul H. Chung, MD (*Abstract Co-Author*)

PURPOSE

Erectile dysfunction (ED) occurs due to cardiovascular disease, diabetes, among others. Approximately 25,000 men with ED opt for placement of a penile implant (ED implant) each year with the rate increasing on average 8% annually. Approximately 1-3% of patients undergoing primary and 7-18% undergoing revision ED implant surgery will experience the devastating complication of device infection. Ultrasound may be an optimal, external method to reduce implant infection in the post-operative period. Ultrasound is known to increase tissue permeability and antibiotic susceptibility and may be able to disrupt biofilms. This study investigated whether the application of ultrasound could increase antibiotic susceptibility and reduce adherent bacteria on ED implant surfaces.

METHODS AND MATERIALS

Sterile 12 mm discs were obtained from Coloplast Titan implants and incubated with 10 5 colony-forming units per milliliter (CFU/mL) of methicillin-sensitive Staphylococcus aureus (ATCC25923) in trypticase soy broth (TSB) for 24 hours. Samples were then rinsed with phosphate-buffered saline (PBS) and placed into 10% human serum solutions containing normal saline or 0.5 mg/mL vancomycin and 0.04 mg/mL of gentamicin. Samples were then incubated for 6 hours in 15 mL of the respective solution and removed for ultrasound treatment. Ultrasound treatment using a Logiq E10 scanner with a C1-6 probe (GE HealthCare) was applied for 30 min using color Doppler imaging with an MI of 1.6. Next samples were rinsed with PBS and adherent bacteria released by shaking in 0.3% Tween-20. Suspended bacteria were serially diluted, plated onto 3M PetriFilms, and counted. Experiments were conducted as 3 repetitions. Mann-Whitney U tests were performed to compare outcomes with $p<0.05$ being considered significant.

RESULTS

Vancomycin/gentamicin alone reduced adherent S. aureus bacterial counts by ~0.5 log compared to normal saline ($p=0.054$). Ultrasound further increased vancomycin/gentamicin antibiotic sensitivity by an additional ~2 log, reducing bacterial load by a total of ~2.5 log compared to normal saline control ($p=0.019$). Samples in the normal saline with ultrasound group showed no decrease in bacterial counts when compared to normal saline alone ($p=0.82$). Ultrasound application increased antibiotic susceptibility and reduced adherent bacteria by an additional ~2 log compared to antibiotic alone (~0.5 log) for a total reduction of ~2.5 log.

CONCLUSION

Ultrasound post-operatively may be used as a method to reduce implant infection.

CLINICAL RELEVANCE/APPLICATION

Infection remains a serious surgical concern and current antibiotic regiments are not completely effective. Ultrasound combined with the existing antibiotics regimen can reduce implant infection.

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M2-SPRO

Radiation Oncology Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-SPRO-1 SPINAL INSTABILITY NEOPLASTIC SCORE AS A PREDICTOR OF VERTEBRAL FRACTURE IN PATIENTS UNDERGOING RADIATION THERAPY FOR SPINAL METASTASES: A SINGLE-INSTITUTION STUDY

Patrick Doyle, MS (*Presenter*)
Sarah Caplan (*Abstract Co-Author*)
Neil Klinger (*Abstract Co-Author*)
Kee-Young Shin (*Abstract Co-Author*)
Maeve Dillon-Martin (*Abstract Co-Author*)
Thomas Johnson (*Abstract Co-Author*)
Heejoo Kang (*Abstract Co-Author*)
Teresia Perkins (*Abstract Co-Author*)
Claire Novack (*Abstract Co-Author*)
Alexander Spektor, MD, PhD (*Abstract Co-Author*)
Mai Anh Huynh, MD,PhD (*Abstract Co-Author*)
Ellen Kim, MD (*Abstract Co-Author*)
Shyam Tanguturi, MD (*Abstract Co-Author*)
Cara Richards (*Abstract Co-Author*)
Wenxin Xu (*Abstract Co-Author*)
David Kozono, MD, PhD (*Abstract Co-Author*)
Ron N. Alkalay, PhD (*Abstract Co-Author*)
David B. Hackney, BA, MD (*Abstract Co-Author*)
Tracy A. Balboni, MD, MPH (*Abstract Co-Author*)

PURPOSE

The Spinal Instability Neoplastic Score (SINS) is the most common method of assessing spine stability in the setting of spinal metastases. We sought to assess (1) the SINS score as a predictor of vertebral compression fracture (VCF), (2) the risk contributions of the 6 SINS individual factors, and (3) other contributors to fracture risk.

METHODS AND MATERIALS

In total, 194 patients with 391 spinal lesions that had not previously been treated with vertebroplasty/kyphoplasty, radiation therapy (RT), or surgery were enrolled prior to RT and followed for new or worsened fracture.

RESULTS

187 patients who were treated to 361 vertebral levels underwent post-RT follow-up. Average follow-up time for patients on study was 9.4 months (range: 0.2-38.8 months). A total of 33 new or worsened fractures (9.1% of lesions followed) were observed, with an average time to fracture of 4.4 months (range 0.1-27.8 months). Of all 6 SINS factors, three were found to be individually significantly associated with increased risk of fracture, these were: lesion location in L2-L4 (HR=2.78, p=0.04), mixed or lytic appearance on CT (mixed HR=3.87, p=0.01, lytic HR=2.68, p=0.02), and <50% vertebral collapse (HR=3.52, p<0.01). SINS as a summated score was significantly associated with increased risk of fracture on multivariable analysis (MVA, p<0.01). Use of bone-strengthening medications such as bisphosphonates was also significantly associated with decreased risk of fracture in MVA in stable (SINS =6) (HR=0.10, p=0.03) and potentially unstable (SINS 7-12) lesions (HR 0.18, p=0.03).

CONCLUSION

These findings support that SINS is a useful tool for estimating VCF risk, with lesion location, metastasis bone morphology, and presence of <50% collapse being the strongest predictors. Additionally, findings suggest that bone-strengthening medications such as bisphosphonates may mitigate the risk of developing VCF after RT.

CLINICAL RELEVANCE/APPLICATION

Better understanding of the risk factors involved in post-RT VCF may help to inform multidisciplinary clinical decision making around the treatment of metastases in the bony spine.

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M2-SPVA

Vascular Imaging Monday Morning Poster Discussions

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Sub-Events

M2-SPVA-1 CORRELATION BETWEEN BRACHIOCEPHALIC ARTERY FAT ATTENUATION INDEX AND CLINICAL ACTIVITY IN PATIENTS WITH TAKAYASU ARTERITIS

Yang Lu, BMedSc, MMEd (*Presenter*)

PURPOSE

This study aimed to evaluate the imaging characteristics of the perivascular fat attenuation index (FAI) in patients with Takayasu's arteritis (TA) and assess the correlation between FAI and disease activity.

METHODS AND MATERIALS

This retrospective study included 70 consecutive TA patients [40 patients with brachiocephalic artery involvement (TA-BCA) and 30 patients without BCA involvement (TA-nonBCA)], along with 55 normal individuals. Computed tomography angiography (CTA) was performed utilizing a standardized protocol, encompassing the region from the common carotid artery (CCA) bifurcation to 3cm below the aortic arch. Image processing was conducted using the Skviewer software to delineate perivascular fat as adipose tissue radially displaced from the outer wall of the blood vessel to an extent equivalent to its diameter. Divide the BCA into the innominate artery (IA), proximal segment of the left common carotid artery (p-LCCA), middle segment of the left common carotid artery (m-LCCA), proximal segment of the right common carotid artery (p-RCCA), and middle segment of the right common carotid artery (m-LRCA). Intergroup analysis of vascular segment data with SPSS 25.0. MedCalc software was utilized to generate ROC curves and relevant indicators. Disease activity was assessed using ITAS (2010) and ITAS-A.

RESULTS

FAI values were significantly higher (P<0.05) in the TA-BCA and TA-nonBCA groups than in the normal control cohort. Notably, the p-LCCA demonstrated the most consistent measurable and easily affected segment. In the TA-nonBCA group, the optimal cutoff was -89.715 Hu, with 73.3% sensitivity and 98.2% specificity (AUC: 0.927, 95% CI: 0.872-0.982, P<0.001). In the TA-BCA group, with the active stage (n=23) and inactive stage (n=17), the optimum cutoff with 100% sensitivity and 82.4% specificity (AUC: 0.951, 95% CI: 0.890-1, P<0.001) was -73.445 HU. In the TA-BCA group, univariate and multivariate analyses showed that the FAI is an independent risk factor for determining active inflammation (OR: 1.267, 95% CI: 1.035-1.551, P=0.022).

CONCLUSION

A reliable biomarker to distinguish TA patients from normal individuals was their significantly higher FAI from CTA of the brachiocephalic artery. Quantitative parameters from FAI enable the assessment of Takayasu arteritis inflammatory activity.

CLINICAL RELEVANCE/APPLICATION

The perivascular FAI is a reliable biomarker for separating TA patients from normal individuals. Monitoring inflammation activity and anti-inflammatory efficacy may benefit from this study.

M2-SPVA-2 HIGH-FREQUENCY ULTRASONIC COMBINED WITH SUPERB MICROVASCULAR IMAGINGTECHNOLOGY IN THE EVALUATION OF HYPERTROPHIC SCARS:A PRELIMINARY STUDY

Xiaoyi Chen, BS (*Presenter*)
Yi Zhang (*Abstract Co-Author*)
Yixuan Zhang (*Abstract Co-Author*)
Xinping Bai (*Abstract Co-Author*)
Jianxin Liu (*Abstract Co-Author*)

PURPOSE

In this study, high-frequency ultrasonic and Superb Microvascular Imaging (SMI) technology were used to evaluate the thickness and microvascular changes in skin layer of hypertrophic scar lesions, and to discuss the evaluation value of high-frequency ultrasonic combined with SMI technology in hypertrophic scar lesions.

METHODS AND MATERIALS

This study prospectively included 9 patients (2 males and 7 females) with hypertrophic scar lesions diagnosed by senior physicians in the Department of Plastic and Aesthetic Surgery of XX Hospital from December 2024 to March 2025, and analyzed a total of 20 lesions. First, high-frequency ultrasonic was used to measure the thickness of the skin at the lesion of hypertrophic scar and the skin on the healthy side. The Vascular Index (VI) was measured by SMI technology to compare the differences of VI in skin layer between the lesion and the healthy side.Seven of the lesions were treated with triamcinolone olone injection. One month later, high-frequency ultrasound combined with SMI technology was re-employed to evaluate the scars. The differences in scar thickness and VI before and after treatment were compared.

RESULTS

The skin thickness of 20 hypertrophic scar lesions was 2.97±1.21mm and that of the healthy site was 1.36±0.33mm (P < 0.05). The VI of lesions of 20 hypertrophic scar lesions and healthy sides were 6.80 (4.73, 18.50) % and 1.15 (0.25, 2.83) %, respectively (P < 0.05). The skin thickness of 7 hypertrophic scar lesion sites before triamcinolone injection was 2.93±1.20mm (P < 0.05), and after triamcinolone injection was 2.11±1.09mm (P < 0.05). The VI of the lesion site before and after triamcinolone injection were 6.20 (4.50, 9.50) % and 3.70 (0.30, 5.70) % , respectively (P < 0.05).

CONCLUSION

High-frequency ultrasonic combined with SMI technology can accurately detect thickness and microvessels changes in skin layer. It’s more objective to evaluate the activity of hypertrophic scar lesions than the current clinical scar scoring scale and physicians' subjective evaluation. Ultrasound technology is convenient and non-invasive, suitable for scar follow-up and guides the selection of follow-up treatment.

CLINICAL RELEVANCE/APPLICATION

Hypertrophic scar lesions were thicker than normal skin layer, and microvessels in skin layer increased. After triamcinolone injection, the lesions' skin became thinner and the microvessels decreased. It's more objective to evaluate the activity of hypertrophic scar lesions than the current clinical scar scoring scale and physicians' subjective evaluation. Ultrasound technology is convenient and non-invasive, suitable for scar follow-up and guides the selection of follow-up treatment.

M2-SPVA-3 A PRELIMINARY STUDY ON PREDICTING THE STABILITY OF DEEP VEIN THROMBOSIS USING CT TEXTURE ANALYSIS

Fei Yang, MS (*Presenter*)
DAWEI WANG (*Abstract Co-Author*)

PURPOSE

To evaluate the predictive value of CT-based thrombus texture analysis for assessing deep vein thrombosis (DVT) stability.

METHODS AND MATERIALS

A total of 108 patients with DVT diagnosed through clinical examination and ultrasound at our hospital between May 2020 and October 2024 were enrolled. Patients were divided into DVT with acute pulmonary embolism (APE) (n=40) and DVT without APE (n=23) groups. Texture features were extracted from CT thrombi images using the Least Absolute Shrinkage and Selection Operator algorithm. Imaging, clinical, and combined models were developed through logistic regression analyses and evaluated using receiver operating characteristic (ROC) curves, calibration curves, and clinical decision curves, with the areas under the curves (AUCs) compared using the DeLong test.

RESULTS

DVT textural features (gray-level run-length matrix run entropy, gray-level co-occurrence matrix (GLCM) cluster shade, GLCM-maximum cross-correlation), and clinical parameters (smoking, sex, D-dimer), were identified as independent predictors of DVT stability. The AUCs for the imaging, clinical, and combined models were 0.792 (0.705-0.880), 0.832 (0.753-0.910), and 0.890 (0.825-0.954), respectively. The combined model outperformed the clinical and imaging models ($P < 0.05$). Clinical decision curve analysis revealed superior predictive accuracy (0.03-0.75) compared to the clinical (0.13-0.87) and imaging (0.12-0.83) models. It achieved the highest net benefit at a risk probability > 0.03, offering optimal efficacy and the greatest clinical value in predicting DVT stability.

CONCLUSION

Integrating CT texture features with clinical parameters enhances the prediction of DVT stability, underscoring its potential clinical applications.

CLINICAL RELEVANCE/APPLICATION

1. This study innovatively applies CT texture analysis to predict the stability of deep vein thrombosis (DVT), offering a novel imaging-based approach for clinical assessment. 2. Texture features, including gray-level run-length matrix run entropy, gray-level co-occurrence matrix cluster shade, and GLCM-maximum cross-correlation, are identified as independent predictors of DVT stability, providing new insights into thrombus characterization. 3. We establish and compare three predictive models (imaging, clinical, and combined models), demonstrating that the combined model incorporating both CT texture features and clinical parameters could enhance the precision of DVT management and improve patient outcomes, highlighting its potential for early identification of unstable DVT and prevention of acute pulmonary embolism.

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M5A-SPBR

Breast Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPBR-1 TOPOGRAPHICAL DISTRIBUTION OF BREAST CANCER BRAIN METASTASIS SUBTYPES: A SYSTEMATIC REVIEW AND META-ANALYSIS

Sami Almasri (*Presenter*)
Gordon R. Daly (*Abstract Co-Author*)

PURPOSE

This systematic review aims to analyze spatial distribution of breast cancer brain metastasis (BCBM) among different subtypes, to improve clinical decision-making, refine treatment approaches, and improve prognostic predictions for BCBM.

METHODS AND MATERIALS

A systematic review was conducted in accordance with PRISMA guidelines and registered on PROSPERO. Eligible studies included those including specific information on BCBM subtype and anatomical location. Meta-analyses were performed for each molecular subtype and their distribution in each brain region using random effects models

RESULTS

Eleven studies were included, with six eligible for quantitative meta-analysis. The highest proportion of frontal lobe metastases originated from triple-negative breast cancer (TNBC) at 32% (95% CI: 18-50%), followed by HR+/HER2- at 29% (95% CI: 21-38%). Cerebellar metastases were most common in HR+/HER2- cases at 37% (95% CI: 27-47%), followed by HR-/HER2+ at 29% (95% CI: 19-41%). Occipital lobe involvement was highest in HR+/HER2- at 33% (95% CI: 25-41%). The temporal lobe showed high involvement from HR+/HER2- (30%, 95% CI: 20-41%) and TNBC (28%, 95% CI: 19-41%). HR+/HER2- predominated in the parietal lobe (32%, 95% CI: 24-40%). HR+/HER2- significantly favored posterior circulation regions ($p < 0.05$), whereas TNBC significantly favored anterior circulation territories ($p<.05$).

CONCLUSION

BCBM demonstrates non-random topographic patterns in accordance with molecular subtype, suggesting that metastatic spread may be influenced by tumor biology.

CLINICAL RELEVANCE/APPLICATION

These findings support the development of targeted imaging protocols and subtype-specific treatment strategies. Understanding metastatic pathways of each subtype has important implications for personalized oncology, aiding in surveillance, therapeutic planning, and risk stratification of high-risk brain regions.

M5A-SPBR-2 OVERVIEW OF DIFFERENT REIMBURSEMENT STRATEGIES AMONG CONTRAST-ENHANCED MAMMOGRAPHY (CEM) EXPERTS - A SURVEY STUDY

Thiemo van Nijnatten, MD, PhD (*Presenter*)
Javier Azcona Saenz, MD (*Abstract Co-Author*)
Rodrigo Alcantara, MD, MSc (*Abstract Co-Author*)
Pascal A. Baltzer, MD (*Abstract Co-Author*)

PURPOSE

To perform an international survey among global expert breast radiologists regarding contrast-enhanced mammography (CEM) on the topic of reimbursement strategies.

METHODS AND MATERIALS

An online questionnaire on CEM reimbursement strategies was distributed to 29 selected global expert breast radiologists regarding CEM. Hospital information, CEM implementation, estimated costs, reimbursement availability, registration and declaration codes, as well as personal opinions on CEM reimbursement were collected. Replies were exploratively analyzed with descriptive and non-parametric statistics.

RESULTS

Twenty out of 29 global expert breast radiologists regarding CEM responded this survey. Initiation of local CEM implementation ranged from 2011 to 2024. All hospitals offered CEM for clinical/diagnostic indications, with price ranges for breast MRI higher than for CEM in all, but two cases. Sixty percent of hospitals (12/20) reported receiving reimbursement for CEM. The remaining 40% declared not receiving reimbursement, citing reasons such as coverage by department budget, lack of dedicated billing code, or absence of reimbursement by the national healthcare system and/or insurance providers. Among the 12 hospitals receiving reimbursement, 67% (8/12) obtained full reimbursement for all components of CEM, and 75% (9/12) for all indications. Reimbursement sources varied by hospital type, with public and university hospitals mainly publicly funded, and private hospitals relying on insurance or patient payments.Most respondents (75%, 15/20) reported no dedicated national reimbursement code for CEM currently exists. Of these respondents, 53% (8/15) used FFDM code. Most hospitals lacked separate codes for the contrast medium (60%, 9/15) or its intravenous injection (93.3%, 14/15). Among hospitals without a national code, 73% (11/15) were aware of efforts to establish one. Although nearly half of participants (45%, 9/20) faced reimbursement challenges, 65% (13/20) stated that reimbursement strategies did not affect CEM adoption.

CONCLUSION

Substantial heterogeneity in CEM reimbursement strategies do exist, with most hospitals securing full coverage through alternative strategies until dedicated national reimbursement codes are established.

CLINICAL RELEVANCE/APPLICATION

Different CEM reimbursement strategies do exist on a global level. This information might affect the convenience for CEM implementation in different institutes.

M5A-SPBR-3 PREOPERATIVE BREAST EDEMA ON T2-WEIGHTED MRI AS A PREDICTOR OF SENTINEL LYMPH NODE METASTASIS IN CLINICALLY NODE-NEGATIVE BREAST CANCER: A RETROSPECTIVE BICENTRIC STUDY

Tianwen Xie (*Presenter*)
Yan Huang (*Abstract Co-Author*)
Qiufeng Zhao (*Abstract Co-Author*)
Yajia Gu (*Abstract Co-Author*)

PURPOSE

To investigate the predictive value of breast edema identified on preoperative T2-weighted MRI for sentinel lymph node (SLN) metastasis in patients with clinically node-negative (cN0) invasive breast cancer.

METHODS AND MATERIALS

In this retrospective bicentric study, women with cN0 invasive breast cancer who underwent preoperative breast MRI between January 2016 and December 2019 at two independent institutions were included. Breast edema on T2-weighted images was assessed. Univariate and multivariate logistic regression analyses were performed to identify independent predictors of SLN metastasis. The area under the receiver operating characteristic curve (AUC) and negative predictive value (NPV) were calculated.

RESULTS

Of the 381 patients, SLN metastasis was observed in 67 of 267 patients (25.1%) in the primary cohort and in 24 of 114 patients (21.1%) in the validation cohort. Breast edema was independently associated with SLN metastasis in both cohorts. A model based solely on breast edema achieved an AUC of 0.738 (95% CI: 0.667-0.809) and an NPV of 89% in the primary cohort, with consistent performance in the validation cohort. Compared with a model using only clinicopathological features (age and molecular subtype), the combined model incorporating breast edema significantly improved predictive performance (AUC: 0.822 vs. 0.654, $p < 0.001$; NPV: 92% vs. 83%), which was confirmed in the validation cohort (AUC: 0.793 vs. 0.616, $p = 0.021$; NPV: 92% vs. 88%).

CONCLUSION

Breast edema is independently associated with SLN metastasis. Breast edema combing with clinical-pathological features may help identify patients at lower risk of SLN metastasis, potentially aiding in SLNB omission decisions.

CLINICAL RELEVANCE/APPLICATION

The preoperative breast MRI assessment of edema may serve as a valuable risk-stratification tool for predicting SLN metastasis in cN0 breast cancer patients. The combination of breast edema with clinical-pathological factors enhances predictive performance and may help identify patients who could be suitable candidates for SLNB omission.

M5A-SPBR-4 A BIOPHYSICS-BASED COMPUTATIONAL APPROACH BOTH OUTPERFORMS AND SYNERGIZES WITH A COMMERCIAL MAMMOGRAPHIC DENSITY ASSESSMENT SOFTWARE FOR BREAST CANCER PREDICTION

Andre Khalil, PhD, MS (*Presenter*)
Joshua Hamilton, MS, BS (*Abstract Co-Author*)
Jeremy Juybari (*Abstract Co-Author*)

PURPOSE

The accelerated growth of AI approaches found a niche with image-based risk prediction from mammography. These methods' uninterpretability limits their clinical acceptance. Mammographic breast density is the most widely recognized image-based risk factor for breast cancer. We developed an interpretable biophysics-based computational approach that categorizes mammographic tissue into fatty tissue, active dense tissue, which is structurally reorganizing, and passive dense tissue. This categorization relies on robust measurements of scale-invariant tissue organization features and, as a result, is agnostic to mammogram gantry processing. We hypothesize that these active vs. passive dense tissue regions are more predictive of breast cancer than overall mammographic dense tissue.

METHODS AND MATERIALS

Using the OPTIMAM database, bilateral mammographic screenings were acquired on Hologic's Selenia units ~3 years prior to diagnosis for n=197 cases (mean age = 59.4), or the last screening on record for n=3712 controls (mean age = 59.8). The areas of fatty, active dense, and passive dense tissue were calculated, and the volumetric breast density (VBD) and fibro-glandular volume (FGV) were obtained from software developed by Lunit Inc. Three pairs of "main effects" and "interaction" generalized linear models (GLM) were developed to predict cancer vs. control status with the predictive variables being, for model 1 (Commercial-derived Model): VBD, FGV, and patient age; for model 2 (Our Model): amounts of fatty, passive dense, active dense tissue, our own measurement of mammographic percent density, and patient age; and for model 3 (Combined Model): a synergistic combination of the variables from models 1 and 2. For each model, the mean and 95% confidence intervals were calculated for the area under the curve (AUC) from bootstrapped receiver operating characteristic curves. The images and data used in this publication are derived from the OPTIMAM imaging database (https://medphys.royalsurrey.nhs.uk/omidb/about-omi-db/). We acknowledge the OPTIMAM project team and staff at the Royal Surrey NHS Foundation Trust who developed the OPTIMAM database, and Cancer Research UK who funded the creation and maintenance of the database.

RESULTS

Our model (AUCs = 0.64, 0.71) outperforms and synergizes (AUCs = 0.66, 0.82) with the commercial-derived model (AUCs = 0.6, 0.61).

CONCLUSION

Our biophysics-based approach produces interpretable measurements that could provide improved breast cancer risk prediction.

CLINICAL RELEVANCE/APPLICATION

Our model outperforms deep learning models from the literature, but it does not suffer from these models' limitations, such as generalizability, calibration, and interpretability.

M5A-SPBR-5 POTENTIAL OF ARTIFICIAL INTELLIGENCE TO DETECT INTERVAL BREAST CANCERS

Babita Panigrahi, MD (*Presenter*)
Lisa A. Mullen, MD (*Abstract Co-Author*)
Emily Ambinder, MD, MS (*Abstract Co-Author*)

PURPOSE

Interval breast cancers (IBCs), diagnosed within one year of a negative or benign screening mammogram, tend to be more aggressive than screen-detected cancers. Causes include radiologist oversight or subtle/absent findings. These false-negative (FN) cases offer an opportunity to assess whether artificial intelligence (AI) could have detected IBCs earlier.

METHODS AND MATERIALS

We retrospectively reviewed all patients at a multisite academic center with BI-RADS 1 or 2 screening mammograms between July 1, 2013, and June 30, 2020, who were diagnosed with an IBC within a year. An FDA-approved AI tool (Transpara v1.7.4, ScreenPoint Medical) retrospectively scored the FNs, assigning lesion-level risk as low (=42), intermediate (43-74), or elevated (=75), which was not available when the exam was performed. Radiologists categorized IBCs as missed, minimal

actionable, minimal nonactionable, true interval, mammographically occult, or technical exclusion. Lesions were considered AI-detected if scored intermediate or elevated. Chi-square analysis tested associations of AI detection with patient and cancer characteristics, with p-values <0.05 considered significant.

RESULTS

Of 211,517 eligible screening mammograms, 96 IBCs were diagnosed (FN rate: 0.45/1000). 66 FN mammograms (69%) utilized digital breast tomosynthesis (DBT). Mean patient age was 62 ± 12 years. Radiologists classified 12 (13%) as missed, 16 (17%) minimal actionable, 16 (17%) minimal nonactionable, 13 (14%) true interval, 38 (40%) mammographically occult, and 1 (1%) technical exclusion. AI assessed 82 cases (14 excluded), yielding lesion-specific risk scores of low in 51 (62%), intermediate in 19 (23%), and elevated in 12 (15%). 31 IBCs (38%) with intermediate/elevated scores were considered detectable by AI. Among these, 23 (74%) were soft tissue findings, 1 (3%) calcifications, and 7 (23%) both. AI detection was significantly associated with retrospective mammographic visibility (p<0.001), symptomatic presentation (e.g., pain, lump, nipple discharge) vs. asymptomatic screening MRI detection (p=0.005), and scattered/heterogeneously dense breasts (p=0.01). DBT use and tumor features were not significantly associated.

CONCLUSION

AI may have facilitated earlier detection of 38% of IBCs, particularly those retrospectively visible and presenting symptomatically.

CLINICAL RELEVANCE/APPLICATION

AI has the potential to enhance early detection of interval breast cancers, especially those missed or underestimated by radiologists, supporting its role as an adjunct in screening.

M5A-SPBR-6 PROGNOSTIC MODEL BASED ON MRI FEATURES FOR PREDICTING DISEASE-FREE SURVIVAL IN BREAST CANCER PATIENTS AFTER NEOADJUVANT CHEMOTHERAPY

Shuluan Chen (*Presenter*)
Shunan Che, MD (*Abstract Co-Author*)
Mengying Yang (*Abstract Co-Author*)
Yuan Tian (*Abstract Co-Author*)
Dehong Luo, MD (*Abstract Co-Author*)
Jing Li, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop a prognostic model based on clinicopathological variables and magnetic resonance imaging (MRI) findings to predict disease-free survival (DFS) in breast cancer patients after neoadjuvant chemotherapy (NAC).

METHODS AND MATERIALS

A retrospective analysis was conducted on 286 patients with invasive breast cancer who underwent MRI before and after NAC (hereafter, referred to as pre- and post-NAC, respectively), received NAC and surgical treatment from January 2014 to December 2021. Univariate Cox regression analysis was used for preliminary screening and variables with P<0.05 were included in the Lasso-Cox analysis to construct models. The predictive performance of the models was evaluated using the area under the curve (AUC) of receiver operating characteristic (ROC) curves, concordance index (C-index), and calibration curves. Risk scores derived from the combined model stratified patients into high- and low-risk groups. Survival differences were analyzed using the log-rank test.

RESULTS

After univariate Cox regression and Lasso-Cox analysis, the clinicopathological model included clinical T stage, clinical N stage, pathological complete response (pCR) in primary tumor, pCR in axillary lymph nodes, pathological T stage and microvessel invasion. The pre-NAC MRI model included multifocal or multicentric lesions, lesion enhancement types, peritumoral edema and ipsilateral suspicious internal mammary lymph nodes. The post-NAC MRI model included regression patterns, max diameter, TIC types, recist response and radiological complete response (rCR). The combined model incorporating clinicopathological variables, pre-NAC, and post-NAC MRI features demonstrated superior predictive performance (C-index=0.765) compared to individual models or pairwise combined models. A risk score cut-off of 1.014 from the combined model effectively stratified patients into high- and low-risk groups.

CONCLUSION

The prognostic model based on clinicopathological variables, pre-NAC and post-NAC MRI features offers improved predictive accuracy for DFS in breast cancer patients after NAC, enabling enhanced risk stratification and individualized follow-up strategies.

CLINICAL RELEVANCE/APPLICATION

The prognostic model facilitates early identification of high-risk recurrence factors, enabling personalized treatment and potentially improving survival outcomes for breast cancer patients after NAC.

M5A-SPBR-7 THE RADIOACTIVE SEED LOCALIZATION FOR IMPALPABLE BREAST CANCER CONSERVATIVE SURGERY: META-ANALYSIS

Hortencia Ferreira, MSc, PhD (*Presenter*)

PURPOSE

Breast cancer is the most common among women with malignant neoplasm in Brazil and the early diagnosis is essential to provide less mutilating treatment for patients. The lesions are impalpable and can be submitted to conservative surgery, which requires an intraoperative localization method to guide the surgeon during tumor excision. This study aimed to develop a meta-analysis comparing the surgical efficiency of two intraoperative breast localization techniques, wire-guided localization (WGL) and radioactive seed localization (RSL).

METHODS AND MATERIALS

The systematic research was performed in databases such as Embase, LILACS, PubMed, SciELO, and Web of Science. The selected studies in the screening process went through a standard form of data extraction. The ROBINS-1 and ROB-2 tool was applied to analyze the bias risk and methodological quality. The Review Manager 5.4 software was used to perform the meta-analysis by the random effects analysis model to calculate the relative risk, considering a 95% confidence interval.

RESULTS

Six randomized controlled trials and 32 cohort studies were identified, meeting the inclusion criteria. The overall quality was high for randomized trials and moderate for cohort studies. The population consisted of women with impalpable breast cancer, aged 22-92 years old, with single or multiple markers, and neoadjuvant chemotherapy patients were included. The results demonstrated an RSL superiority over WGL for the rates of positive surgical margin (RR 0.78, 95% CI [0.70-0.88], 15085 patients), reoperation (RR 0.71, 95% CI [0.61-0.84], 13884 patients) and recurrence (RR 0.41, 95% CI [0.19-0.86], 1525 patients, followed up for 13-109 months).

CONCLUSION

The results demonstrated that RSL is superior to WGL in surgical efficiency in the intraoperative localization of impalpable breast lesions. RSL is a valid localization method for surgical efficiency for patients with non-palpable breast cancer and can be applied in various indications for breast-conserving surgery with intraoperative localization, including neoadjuvant treatment.

CLINICAL RELEVANCE/APPLICATION

The success of breast-conserving surgery depends on the complete removal of the tumor. So, completing surgery with negative surgical margins reduces reoperation rates and the risk of disease recurrence. Furthermore, a longer time between lesion localization and surgery allows greater flexibility in scheduling radiology and surgery

sectors, in addition to the possibility of the seed placement procedure taking place before neoadjuvant chemotherapy.

M5A-SPBR-8 ARTIFICIAL INTELLIGENCE-DERIVED MAMMOGRAPHY SCORES CAN PREDICT ONCOTYPE DX RISK SCORES IN ESTROGEN RECEPTOR POSITIVE BREAST CANCERS

Jung-Oh Lee, MD, MSc (*Presenter*)
Su Min Ha, MD (*Abstract Co-Author*)
Jung Hyun Yoon, MD, PhD (*Abstract Co-Author*)
Hye Sun Lee (*Abstract Co-Author*)

PURPOSE

The Oncotype Dx Recurrence Score (RS) is a multigene assay that predicts the risk of recurrence and potential benefit from chemotherapy in estrogen receptor (ER)-positive early-stage breast cancers. In this study, we evaluated whether artificial intelligence (AI) scores derived from preoperative mammography could serve as imaging biomarker to predict Oncotype Dx RS and patient outcomes in ER-positive invasive breast cancers.

METHODS AND MATERIALS

From December 2012 to August 2022, 1852 women who were treated for ER-positive, HER2-negative invasive breast cancers who had Oncotype Dx assays from two tertiary institutions were included. Preoperative mammograms were retrospectively analyzed for imaging data (density, abnormality type, BI-RADS assessment). A commercially-available AI system for mammography interpretation was used for AI scores. Patients were stratified into low (RS<18), intermediate (RS 19-31), and high (RS >31) risk groups. Logistic regression identified factors associated with RS groups. Cox proportional hazards and competing risk analysis assessed predictors for recurrence.

RESULTS

Among 1852 patients, 1047 (56.5%), 649 (35.0%) and 156 (8.4%) had low, intermediate, and high RS, respectively. Median AI score was significantly higher in high RS group (96.7%, IQR: 79.7-99.0) compared to intermediate (92.0%, IQR: 30.4-98.8) or low RS groups (86.0%, IQR: 22.0-98.0, P<.001). Higher rates of patients with age >50 years, dense breast tissue, presence of calcifications on mammography, and higher AI scores were seen in high RS group (all P<.05). In multivariable analysis, breast density (OR=0.61, P=.03), presence of calcifications (OR: 3.971, P=.006), and AI score (cutoff at 73.8%, OR=2.387, P<.001) independently predicted high RS. Regarding recurrence, age (>50 years, HR=0.36, P=.004), and invasive cancer size (HR=1.68, P=.027) and Oncotype Dx score (HR=1.02, P=.004) were independent predictors. Although significant on univariable analysis (HR=2.216, P=.038), AI score at 73.8% did not show association to recurrence on multivariable analysis (P=.236).

CONCLUSION

AI scores from preoperative mammography demonstrate significant correlation with Oncotype Dx RS, particularly in identifying high RS. These findings suggest that AI-based imaging factor may complement genomic assays and contribute to noninvasive personalized risk stratification.

CLINICAL RELEVANCE/APPLICATION

AI-based imaging biomarker show promise for preoperative risk stratification and may be integrated into clinical decision making for adjuvant therapy.

Abstract Archives of the RSNA, 2025

M5A-SPCA

Cardiac Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPCA-1 COMPREHENSIVE RISK MODELING OF AF RECURRENCE POST-ABLATION USING RADIOMICS AND CLINICAL FEATURES

Xiaoyan Lei (*Presenter*)
Kehui Liu (*Abstract Co-Author*)
Xiaohua Zhang (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)
Shikuan Li (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Feng Chen, MD, PhD (*Abstract Co-Author*)

PURPOSE

Recurrence after radiofrequency ablation (RFA) for atrial fibrillation (AF) is common, with traditional models mainly relying on clinical factors, often overlooking imaging features. Epicardial adipose tissue (EAT) plays a role in AF recurrence. This study aims to develop three predictive models—radiomics, clinical, and combined—to enhance prediction accuracy for post-ablation recurrence.

METHODS AND MATERIALS

This retrospective study included 168 AF patients who underwent RFA between January 2020 and October 2024. Preoperative contrast-enhanced cardiac CT images and clinical data were collected. Patients were divided based on recurrence within two years or the first late recurrence (=30 seconds of atrial arrhythmia). The radiomics model involved manually delineating the EAT region using 3D Slicer, followed by feature extraction with PyRadiomics, selecting 1218 features through LASSO regression. The clinical model was based on baseline clinical and laboratory data, including BMI and HbA1c levels. The combined model integrated radiomics and clinical features, analyzed through LASSO regression. The dataset was split into a training set (70%) and a test set (30%), with model performance evaluated using AUC, sensitivity, specificity, F1 score, and decision curve analysis (DCA).

RESULTS

The radiomics model identified 13 significant features, showing that EAT's 3D morphology and texture complexity influenced recurrence risk. The AUC for the training set was 0.878 (95% CI: 0.810-0.934) and 0.846 (95% CI: 0.733-0.939) for the test set. The clinical model identified three key predictors: early recurrence history, HbA1c = 6.0 %, and BMI > 25 kg/m². The AUC for the training set was 0.809 (95% CI: 0.723-0.888) and 0.824 (95% CI: 0.695-0.941) for the test set. The combined model, merging radiomics and clinical factors (early recurrence history, HbA1c, BMI), had an AUC of 0.935 (95% CI: 0.887-0.972) for the training set and 0.884 (95% CI: 0.775-0.974) for the test set. Decision curve analysis showed the combined model provided the highest clinical net benefit in the 0.05-0.20 risk threshold range.

CONCLUSION

The combined model, integrating radiomics and clinical features, outperformed the individual models, showing the highest AUCs (testing set :0.884). This model offers a more reliable method for predicting AF recurrence, improving post-ablation management.

CLINICAL RELEVANCE/APPLICATION

The combined radiomics-clinical model improves prediction accuracy, aiding clinicians in making more informed decisions and reducing recurrence risks post-ablation. This approach enhances patient management and outcomes.

M5A-SPCA-10 HEAD-TO-HEAD COMPARISON OF CORONARY ARTERY PLAQUE ANALYSIS USING SPECTRAL PHOTON-COUNTING CT VERSUS HD-IVUS IN PATIENTS WITH CHRONIC TOTAL OCCLUSION

Magdalena Dobrolinska, MD (*Presenter*)
Marcel Greuter, PhD (*Abstract Co-Author*)
Niek Prakken (*Abstract Co-Author*)
Tim Leiner, MD, PhD (*Abstract Co-Author*)
Maksymilian Opolski (*Abstract Co-Author*)

PURPOSE

To assess the accuracy of photon-counting computed tomography (PCCT) for characterizing coronary artery plaque morphology, using high definition intravascular ultrasound (HD-IVUS) as the reference standard.

METHODS AND MATERIALS

This retrospective study included patients with chronic total occlusion of a coronary artery who underwent coronary CT angiography (CCTA) on a photon counting CT (PCCT, NAEOTOM Alpha, Siemens Healthineers) before undergoing percutaneous coronary intervention (PCI) for revascularisation. High definition intravascular ultrasound (HD-IVUS) imaging was performed immediately following successful intraplaque recanalization of the coronary occlusion and before stent implantation. A total of 99 matched cross-sectional slices from CCTA and IVUS were analyzed. Plaque morphology was classified on IVUS as: calcified (hyperechoic plaques with acoustic shadowing), fibrous (echogenicity similar to adventitia without attenuation), lipid-rich (echo attenuation), calcium-lipid, calcium-fibrous, and fibro-lipid (mixed acoustic features). CCTA images were reconstructed at six monoenergetic (monoE) levels: 40, 55, 70, 90, 120, and 140 keV. Plaques were manually segmented on each monoE image, and mean and minimum Hounsfield Units (HU) were recorded.

RESULTS

At 70 keV, calcified plaques exhibited the highest mean HU values (calcified: 1200±362HU; calcium-fibrous 514±49HU; calcium-lipid 154±68HU), while non-calcified plaques, namely fibrous (92±30HU), fibro-lipid (76±32HU), and lipid-rich (73±24 HU), had significantly lower values. There were no significant differences between fibrous and fibro-lipid, and fibrous and lipid-rich plaques ($p = 0.436$ and $p = 0.99$, respectively). For fibro-lipid and fibrous plaque, both mean and minimum HU values

decreased with increasing monoE level. Importantly, minimum HU values for lipid-rich plaques increased with higher monoE levels, a pattern opposite to that observed in fibrous and fibro-lipid plaques.

CONCLUSION

Monoenergetic reconstructions improve differentiation among non-calcified coronary plaque types. Notably, lipid-rich plaques display a distinctive HU spectrum that facilitates their identification.

CLINICAL RELEVANCE/APPLICATION

PCCT shows promise for enhanced identification and characterization of non-calcified coronary plaques, with particular focus on lipid-rich plaques related to the vulnerable plaque concept, potentially improving risk stratification and guiding personalized treatment strategies.

M5A-SPCA-12 T2 PARAMETRIC MAPPING INHOMOGENEITY IN PATIENTS WITH CARDIAC SARCOIDOSIS: A SIGN OF ACTIVE INFLAMMATION

Arzu Canan, MD (*Presenter*)
Mauricio Barbosa, MD, PhD (*Abstract Co-Author*)
Yin Xi, PhD (*Abstract Co-Author*)
Vlad Zaha (*Abstract Co-Author*)
Kartik Agusala (*Abstract Co-Author*)
Asha Kandathil, MD (*Abstract Co-Author*)
Suhny Abbara, MD (*Abstract Co-Author*)
Ronald M. Peshock, MD (*Abstract Co-Author*)
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PURPOSE

To evaluate diagnostic potential of T1 and T2 parametric mapping sequences and increased focal T2 inhomogeneity for identifying active inflammation in cardiac sarcoidosis.

METHODS AND MATERIALS

Patients with cardiac sarcoidosis who had both CMR and PETCT before Dec 2022 were screened for eligibility. After excluding ineligible patients, 28 patients with cardiac sarcoidosis and 28 age- and sex-matched controls were included. Based on PETCT findings, patients with cardiac sarcoidosis were categorized into two groups: PET-positive and PET-negative. Native T1 and T2 parametric mapping images were segmented using the AHA16-segment model in 3D Slicer (slicer.org).Two independent readers analyzed all cases, while one reader segmented control group.For each patient, max segmental values, standard deviation(SD), mean absolute deviation(MAD) of segmental values, MAD of SD(MAD-SD), and log-transformed MAD-SD, were calculated for both native T1 and T2 parametric mapping. MAD values were used to assess increased tissue inhomogeneity. Pairwise Wilcoxon test was used with Holm correction for each parameter. ICC was used to assess reader agreement.

RESULTS

Among 107 patients, 79 were excluded (63-absent,9-incomplete,and 7-non-diagnostic parametric mapping).Final cohort consisted of 28 patients:13 in PET-positive and 15 in PET-negative group. Median interval between CMR and PETCT was 44 days. No significant differences in age, LV and RV EDV or EF between groups were noted(Table 1).Individual comparisons of T1 and T2 values between groups are listed in Table 2.For native T1, max segmental value, SD, and MAD of segmental values were significantly higher in PET-positive group compared to both PET-negatives and controls. Although max segmental T2 and SD values were higher in PET-positive group than in PET-negative group, the differences were not statistically significant. When comparing PET-positive group to controls, max mean, max SD and mad mean showed statistically significant elevation. No significant differences in T1 or T2 parameters between PET-negative group and controls was found. Inter-reader agreement for T1 parameters was moderate, whereas for T2 parameters was good, with highest agreement for T2-SD (ICC=0.88).

CONCLUSION

MAD-T2 values provide an assessment of T2 inhomogeneity, which may be useful in identifying active myocardial inflammation, such as edema, especially when maximum T2 values are below upper normal thresholds in patients with cardiac sarcoidosis.Attention to these parameters may offer improved reproducibility and enhanced detectability of active inflammation.

CLINICAL RELEVANCE/APPLICATION

MAD-T2 may enhance detection of active myocardial inflammation in cardiac sarcoidosis, even when T2 values appear normal.

M5A-SPCA-14 DIAGNOSTIC ACCURACY OF CORONARY ARTERY CALCIUM CT IN INDIA AND PAKISTAN: A META-ANALYSIS

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Shannon J. Zhou, MD (*Abstract Co-Author*)
Reham M. Ellessy, MBBCh (*Abstract Co-Author*)
Amr M. Salem, MBChB (*Abstract Co-Author*)
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PURPOSE

Though Coronary Artery Calcium Scoring (CACS) is recognized as an effective tool to guide risk stratification and avoid downstream testing in at-risk patients in high-income countries, little data exists on applicability of this tool in countries with developing economies. In this systematic review and meta-analysis, we examined the use of CACS in predominantly low-intermediate risk patients in India and Pakistan to determine its diagnostic performance compared to gold-standard CT or conventional coronary angiography.

METHODS AND MATERIALS

The authors searched the PubMed, SCOPUS, and World of Science databases for peer-reviewed studies evaluating populations in India and Pakistan between 2003-2024 in accordance with PRISMA guidelines. We examined the relationship between CACS and obstructive (=50% stenosis) coronary artery disease diagnosed by angiography among patients at risk for coronary artery disease.

RESULTS

In India and Pakistan, 11 studies included 4105 patients who met inclusion criteria. Some studies included symptomatic patients (5/11, 45.4%), other studies included asymptomatic patients with =1 risk factors (4/11, 36.4%), or all-comers (2/11, 18.2%). Mean age was 51.91 ± 10.97 with 70.4% male. Most studies (81.82%) used CT scanners with = 64 detector rows, and all studies used the Agatston method for CACS. Overall, 47.7% (95%CI=30.2-65.3%) had CACS = 0. The pooled negative predictive value (NPV) for CACS = 0 to rule out obstructive CAD was 90.9% (95% CI=84.1-95%) (see Figure of Forest Plot). The prevalence of CACS > 0 was 52% (95%CI=38.6-65.3%). Prevalence of CACS 1-99, 100-399, and = 400 was 25.09%, 19%, and 8.7%, respectively. Compared to gold-standard angiography, sensitivity, specificity, and positive predictive value (PPV) of CACS > 0 for CAD were 89.1% (95% CI=73.8-96%), 85.2% (95% CI=71.7-92.9%), and 88% (95% CI=77-0.94.2%). Of the five studies with reported data, 12.54% (±10.31%) of patients had noncalcified atherosclerotic plaque.

CONCLUSION

Among mostly low- to intermediate-risk patients in India and Pakistan, the absence of CAC was associated with a low prevalence of obstructive CAD on angiography. However, the pooled NPV was lower than previously published in high-income countries. Randomized studies are needed to assess the utility of CAC testing as a large-scale gatekeeper in this setting.

CLINICAL RELEVANCE/APPLICATION

The results of this study support the efficacy of CACS for risk stratification in India and Pakistan. High NPV supports the use of CACS to rule out obstructive CAD and act as a gatekeeper for subsequent testing in non-acute coronary syndrome patients. Additional research is required to understand why the pooled NPV was lower in India/Pakistan than previously published in high-income countries.

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M5A-SPCH

Chest Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPCH-1 ASSOCIATIONS OF AIRWAY RESPIRATORY MECHANICS WITH LUNG HEALTH, SMOKING, AND PHYSICAL ACTIVITY PARAMETERS

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Xinyu ZHANG (*Abstract Co-Author*)
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Kung-Sik Chan (*Abstract Co-Author*)
Elizabeth A. Regan, MD,PhD (*Abstract Co-Author*)
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PURPOSE

Respiratory lung function is compromised in chronic obstructive pulmonary disease (COPD). Radiographic markers of emphysema, air-trapping, and small airway disease have been established as signs of compromised lung health in COPD. We retrospectively study associations of multi-volume CT-based respiratory mechanical biomarkers of lobar airways with lung health, smoking, and physical activity.

METHODS AND MATERIALS

Automated algorithms were applied to total lung capacity (TLC) and residual volume (RV) CT images to compute breathing-related measures of airway radial expansion (? air-R) and along-the-length stretching (? air-S) (Figure 1(a)). ? air-R is computed as the change (%) in cross-sectional area (CSA) at a matching airway between TLC and RV, while ? air-S is computed as the change (%) in path-length from the carina to a matching airway between TLC and RV. For each ?-metric, lobe-specific mean value over segmental airways was computed for each participant of the Genetic Epidemiology of COPD (COPDGene) study Iowa cohort at baseline visits; exclusion criteria: never-smokers, BMI <20kg/m 2 or >35kg/m 2 , and missing data. Pearson correlation values of ?-metrics with spirometry, emphysema, airway wall thickness (pi10), air trapping, smoking pack-years, and six-minute walk distance (6MWD) were computed.

RESULTS

The correlation (r-values) heat map of lobar airway ?-metrics with lung health, smoking, and physical activity parameters is presented in Figure 1(b) (n = 853; age (mean±SD): 64.2±8.3 years; 384 females; BMI: 27.9±3.6 kg/m 2). In general, stronger associations were observed for ? air-S as compared to ? air-R and at lower lobes than upper lobes. Spirometric lung function measures positively correlated with both ?-metrics, while radiographic lung health markers of emphysema, air trapping and pi10 were negatively associated. The associations with spirometric and radiographic measures were significant at lower lobes for ? air-R and at both lobes for ? air-S . Smoking pack-years showed a significant negative association only with ? air-S at upper lobes, while significantly positive association was observed for the physical ability metric 6MWD for ? air-R at lower lobes and ? air-S at both lobes.

CONCLUSION

Spirometric and radiographic lung health parameters as well as physical activity were correlated with respiratory airway mechanical measures; these associations were stronger for along-the-length airway stretching and at lower lobes. Smoking showed significant negative association with along-the-length airway stretching at upper lobes.

CLINICAL RELEVANCE/APPLICATION

Understanding regional interactions of breathing-related mechanical properties of airways with lung health, smoking, and physical activity parameters in COPD.

M5A-SPCH-3 ASSESSMENT OF PULMONARY VENTILATION FUNCTION IN COPD PATIENTS WITH PHASE-RESOLVED FUNCTIONAL LUNG (PREFUL) MRI

Yu Zhang (*Presenter*)
Ting Yin (*Abstract Co-Author*)
Robert Grimm, PhD (*Abstract Co-Author*)
Chunchao Xia (*Abstract Co-Author*)
Zhenlin Li (*Abstract Co-Author*)

PURPOSE

Lung magnetic resonance imaging based on the phase-resolved functional lung(PREFUL) technique allows assessment of pulmonary ventlation function. Previous studies are limited to Asian populations and COPD populations. To assess the feasibility and accuracy of PREFUL MRI in Asian patients with chronic obstructive pulmonary disease (COPD), especially with different COPD severity.

METHODS AND MATERIALS

39 COPD patients (age 41-75 years, 23 males and 16 females) were examined at 3T MRI. Subjects were scanned during free-breathing in a supine position with the following imaging parameters: TE/TR = 1.86/0.74ms, flip angle = 4°, slice thickness = 15mm, field of view = 500x500mm, matrix size = 256x256. A total of 6-10 slices were obtained to cover the whole lung and 500 images per slice were acquired in 60 seconds duration. The images were processed using the research Software MR Lung. Pixel-wise ventilation parameters were extracted from the respiratory cycle, which included: regional ventilation (RVent), flow-volume loop correlation (FVLc), regional ventilation defect percentage (RV DP) and FVLc defect percentage (FVLc DP). Pulmonary function tests (PFT) were performed within one month of the MRI. Forced expiratory volume in 1 s (FEV1), FEV1% predicted (FEV1 %), and forced vital capacity (FVC) were measured in accordance with guidelines. COPD severity was

defined according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD). The relationship between PREFUL-derived ventilation parameters, PFT parameters and GOLD stage were evaluated using Spearman's correlation (r) analyses.

RESULTS

Among the lung function parameters derived from PREFUL MRI, FLVc, RV DP and FLVc DP showed good to strong correlation with the GOLD stages, FEV1, FEV1 %, and FEV1/FVC values obtained from PFT results, while RVent only showed mild correlation with GOLD stages and PFT results. Detailed correlations were summarized in Figure 1. Figure 2 presented representative images of patients with different GOLD stages. As the GOLD stage became more severe, PREFUL MRI images showed more ventilation-related defects, with areas of exacerbation occurring predominantly in the lower lungs, consistent with the greater susceptibility of the lower lobe to damage in patients with COPD.

CONCLUSION

In conclusion, our results suggest that functional information derived from PREFUL MRI allows the assessment of the ventilatory function of the lungs by means of ventilatory parameters and could be used to assess lung function in COPD patients.

CLINICAL RELEVANCE/APPLICATION

The results suggest that PREFUL MRI-related parameters can effectively differentiate between different grades of COPD and may assist in diagnosing and monitoring COPD.

M5A-SPCH-4 ULTRA-LOW-DOSE CHEST CT WITH DEEP LEARNING RECONSTRUCTION FOR LUNG CANCER SCREENING: COMPARISON WITH STANDARD-DOSE FOR LUNG-RADS ASSESSMENT

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Zhiming Xiang (*Abstract Co-Author*)
Qiuxing Chen (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To explore the feasibility of different reconstruction algorithms in ultra-low-dose chest CT (ULDCT) based on BMI grouping, focusing on image quality and Lung Imaging Reporting and Data System (Lung-RADS) assessment.

METHODS AND MATERIALS

In this prospective study, patients with suspected pulmonary nodules underwent both standard-dose CT (SDCT; 100 kVp/smart MA) and ultra-low-dose CT (ULDCT). ULDCT scans were divided into two groups (UL-A and UL-B) based on different dose settings. SDCT, reconstructed with adaptive statistical iterative reconstruction-Veo (ASIR-V50%), served as the reference. ULDCT images were reconstructed using ASIR-V50%, filtered back projection (FBP), and deep learning image reconstruction (DLIR) at medium (DLIR-M) and high (DLIR-H) strengths. Lung-RADS classifications were assigned using computer-aided detection (CAD) software. Image quality was analyzed using Kruskal-Wallis one-way analysis. The agreement of Lung-RADS classification with the reference was assessed using weighted kappa (Kw) statistics.

RESULTS

A total of 193 patients (mean age ± standard deviation, 58 ± 14 years; 99 men) with 869 pulmonary nodules were included. The effective dose (ED) was 3.62 ± 1.40 mSv for standard-dose CT (SDCT), 0.88 ± 0.19 mSv for UL-A, and 0.48 ± 0.11 mSv for UL-B, corresponding to dose reductions of 73.58% and 85.96%, respectively ($P < 0.001$). Compared to ASIR-V50% and FBP, DLIR significantly reduced both lung tissue and background noise (standard deviation, SD) and improved SNR and CNR ($P < 0.001$). Among DLIR methods, DLIR-H outperformed DLIR-M in reducing SD and increasing SNR and CNR ($P < 0.001$). Additionally, Image quality was significantly better in the UL-A group compared to UL-B ($P < 0.001$). Lung-RADS agreement (weighted kappa, Kw) between SDCT and ULDCT reconstructions showed no significant difference between the two dose groups ($P > 0.001$): UL-A group—ASIR-V50% (0.971), DLIR-M (0.971), DLIR-H (0.957), FBP (0.957); UL-B group—ASIR-V50% (0.981), DLIR-M (0.981), DLIR-H (0.975), FBP (0.970).

CONCLUSION

ULDCT showed high concordance with SDCT in Lung-RADS categorization, with no significant impact of dose differences on nodule risk classification. DLIR enhanced image quality at ultra-low doses, with a positive correlation between radiation dose and image quality. Among the reconstruction methods, DLIR-M outperformed DLIR-H and FBP in Lung-RADS assessment.

CLINICAL RELEVANCE/APPLICATION

Lung-RADS standardizes CT-based lung cancer screening and helps monitor outcomes. ULDCT greatly lowers radiation while keeping high consistency in Lung-RADS classification, highlighting its clinical value for routine screening.

M5A-SPCH-5 ULTRA-HIGH RESOLUTION CT PULMONARY ANGIOGRAPHY WITH PHOTON-COUNTING DETECTOR CT: LOW DOSE, HIGH IMPACT

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Jan P. Grunz, MD (*Abstract Co-Author*)
Alena Kollmann, MD (*Abstract Co-Author*)
Thorsten A. Bley, MD (*Abstract Co-Author*)
Henner Huflage, MD (*Abstract Co-Author*)

PURPOSE

To assess image quality (IQ) in CT pulmonary angiography (CTPA) with ultra-high resolution (UHR) photon-counting detector (PCD) CT at two clinically relevant dose levels compared to standard resolution (SR) energy-integrating detector (EID) CTPA.

METHODS AND MATERIALS

In this retrospective IRB-approved study, 227 CTPAs acquired between April and October 2024 were analyzed (75 EID-CT; 76 PCD-CT at IQ level 50, 76 at IQ level 25). UHR scans were acquired on a dual-source PCD-CT scanner using flash mode and reconstructed at 55 keV, while dual-source dual-energy SR EID scans served as reference. Objective IQ (vessel attenuation) was assessed using standardized ROIs. Subjective IQ - including pulmonary artery visibility, iodine map IQ and self-reported diagnostic confidence - was rated by three blinded radiologists using dedicated 5-point scales. For all exams, radiation dose parameters were documented.

RESULTS

Peripheral vessel visibility and overall subjective IQ were rated higher in both UHR groups, with no relevant differences between IQ25 and IQ50. Self-reported diagnostic confidence was higher with UHR CTPAs, particularly when combined with iodine maps: after viewing both, CTPA and iodine maps, readers (R) gave the two highest confidence scores in 100% (R1/R3) and 92.1% (R2) of IQ50 scans, and 100% (R1), 96% (R3) and 94.6% (R2) of IQ25 scans. For SR EID scans, highest or second-to-highest confidence levels were reported in only 73.3% (R3), 66.7% (R1) and 66.6% (R2) of cases. Median HU values in the pulmonary trunk were higher in both UHR groups (623.3 HU for IQ25, 567.8 HU for IQ50) compared to the SR EID group (397.2 HU), all $p < 0.001$. Mean radiation dose was highest in the UHR IQ50 group (CTDIvol 6.7 mGy), lowest in the UHR IQ25 group (3.0 mGy) and intermediate in the SR EID group (4.7 mGy).

CONCLUSION

Subjective IQ and diagnostic confidence in CTPA were significantly improved with UHR PCD-CT compared to conventional SR EID-CT. Readers consistently rated vascular detail, iodine map quality and overall diagnostic confidence higher with UHR imaging. Notably, even at substantially reduced radiation dose levels, UHR at 3.0 mGy achieved IQ and diagnostic performance comparable to UHR at 6.7 mGy.

CLINICAL RELEVANCE/APPLICATION

UHR PCD-CTPA offers improved image quality, increased pulmonary artery visibility and higher diagnostic confidence in reporting pulmonary embolism, while enabling significant dose reduction compared to conventional EID-CT systems.

M5A-SPCH-6 EVALUATING CHANGES IN REGIONAL STATIC LUNG COMPLIANCE VIA PORCINE BLEOMYCIN LUNG INJURY MODEL

Anna Fuss (*Presenter*)
Sun-Joo Jang (*Abstract Co-Author*)
Albert Sinusas, MD (*Abstract Co-Author*)
Stephanie Thorn (*Abstract Co-Author*)

PURPOSE

To study developing methodology to evaluate lobar-level static lung compliance (SLC) through analysis of a porcine unilateral bleomycin-induced lung injury model, extracting changes in lobar SLC as a measure of lung function in various regions.

METHODS AND MATERIALS

Yorkshire pigs (n=5) were anesthetized, intubated, and placed in supine and head up tilt (30 degree) position. Bleomycin sulfate (2.5 U/kg) diluted in 1ml/kg normal saline solution was delivered using image guidance into left lower lobe bronchus during balloon occlusion to avoid contralateral spillage. End-inspiratory ECG-gated chest CT was acquired immediately thereafter with 64-slice CT (Verizon-CT 400, Spectrum Dynamics) at baseline (A), 7 days post lung-injury (B), and 14 days post lung-injury (C). At each time interval, lungs were subjected to and imaged at 0, 10, 20, and 30 cmH2O pressure respectively. Images were analyzed using MIM Encore Software (Version 7.3.6), combining semi-automatic workflows, manual inclusion of lung consolidation, and lobar segmentation. Lobar volumes were extracted from each scan and used to compare ?SLC across "A-B" (7 days), and "A-C" (14 days) time intervals.

RESULTS

The whole lung ?SLC across interval A-C, averaged across 5 pigs, measured from 0-30 cmH2O, was -3.64 (ml/cmH2O). Comparatively, over the same intervals, the injured left and right lungs experienced an average -3.38 (ml/cmH2O) and -0.15 (ml/cmH2O) ?SLC, respectively. Lobar level analysis showed the left lower lobe had the greatest average decrease in SLC over the total time interval. A significant difference was found in the A-C interval ?SLC values ($p = 0.024$), specifically demonstrating a significantly greater decrease in the left lower lobe than the right lower lobe ($p = 0.049$). Interestingly, the left lower lobe experienced a -4.07 (ml/cmH2O) ?SLC over interval A-B, yet a -3.65 (ml/cmH2O) overall ?SLC over interval A-C, indicating some lung recovery in latter half of experimental time interval.

CONCLUSION

CT imaging over a range of inflation pressures provides an index of changes in regional SLC in porcine bleomycin regional lung injury model. The injured left lower lobe experienced the greatest decrease in SLC. Therefore, lobar lung segmentation of non-contrast CT images has been established to measure changes in regional lung compliance.

CLINICAL RELEVANCE/APPLICATION

Establishing a non-invasive means of assessing changes in SLC can be used to evaluate the efficacy of radiotracer-based theranostics targeted at inhibiting fibroblast activation protein in clinical conditions the result in lung fibrosis.

M5A-SPCH-7 THE APPLICATION OF PHOTON-COUNTING DETECTOR CT IN A LUNG CANCER COHORT: A COMPARATIVE STUDY OF VIRTUAL NON-CONTRAST AND PURECALCIUM IMAGES VERSUS TRUE NON-CONTRAST IMAGES

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Yuhan Zhou, MD (*Abstract Co-Author*)
Limin Lei, MD (*Abstract Co-Author*)
Zhihao Wang (*Abstract Co-Author*)
Yi Fan Guo (*Abstract Co-Author*)

PURPOSE

To determine the effectiveness of photon-counting detector CT (PCD-CT) using virtual non-contrast (VNC) and PureCalcium (PC) images for the reliable evaluation of lung cancer lesions compared to true non-contrast (TNC) images.

METHODS AND MATERIALS

A total of 100 patients were prospectively enrolled in this study between September and December 2024, and all underwent chest plain and contrast-enhanced scans on PCD-CT. The TNC, VNC, and PC images were reconstructed with slice thicknesses of 5.0 mm, 1.0 mm, and 0.4 mm, respectively, and were labeled as TNC, VNC-AP, VNC-VP, PC-AP, and PC-VP. Objective parameters, including CT attenuation, image noise, signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR), were assessed. Additionally, subjective evaluations of image noise, delineation of anatomical structures, lesion sharpness, and overall image quality were scored on a 5-point Likert scale.

RESULTS

Among the 100 patients (58 males), no significant differences were observed between the objective parameters of PC-VP and TNC images ($P > 0.05$). Compared to TNC, VNC-AP and PC-AP showed higher CT attenuation for vessels, subcutaneous fat, and muscle, with similar results for vessels (pulmonary artery and descending aorta) in VNC-VP ($P < 0.05$). The largest absolute error in attenuation between TNC and VNC images were observed in subcutaneous fat (29.60 ± 10.11 for VNC-AP and 32.50 ± 12.23 for VNC-VP). No significant differences were found between PC-VP and TNC images in terms of image noise, anatomical structure delineation, lesion sharpness, and overall image quality ($P > 0.05$). Regarding image noise, TNC images exhibited superior scores compared to VNC images. The scores for anatomical structure delineation and lesion sharpness in VNC-AP and PC-AP were both lower than those of TNC, with statistically significant differences.

CONCLUSION

PC-VP images obtained from PCD-CT demonstrated accurate and high-quality imaging comparable to TNC images, offering a reliable approach for reducing radiation dose in patients with lung cancer.

CLINICAL RELEVANCE/APPLICATION

By selecting appropriate VNC or PC images to replace TNC images, the accumulation of radiation dose during the follow-up process of tumor patients can be reduced

M5A-SPCH-8 DEEP LEARNING-GUIDED QUANTITATIVE TUMOR SIGNATURES EVALUATE IMMUNOTHERAPY RESPONSE: A MULTICENTER VALIDATION STUDY

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Mengsu Zeng, PhD (*Abstract Co-Author*)
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PURPOSE

This study aims to evaluate the response of immunotherapy in advanced non-small cell lung cancer derived from deep learning-guided quantitative analysis of tumor signatures, and to compare the manual assessment with conventional RECIST criteria.

METHODS AND MATERIALS

In this multicenter study, 97 patients (55 from Center A and 42 from Center B) undergoing immune checkpoint inhibitor therapy were retrospectively analyzed. Baseline and post-treatment CT scans (after 2-3 therapy cycles) were recorded. A deep learning-guided 3D segmentation model was developed and externally validated to quantify tumor signatures, including tumor volume, long diameter, and short diameter, which were used to assess the immunotherapy response in advanced non-small cell lung cancer. The U-Net-based convolutional neural network, trained on a publicly available dataset, generated full 3D tumor masks with a "one-click" within the approximate lesion location. Quantitative parameters were automatically extracted from the model masks and compared to physician-derived measurements. Changes between baseline and follow-up diameters were classified per RECIST1.1 into complete response (CR), partial response (PR), stable disease (SD), or progressive disease (PD). Model-based classifications were compared to radiologist calls for concordance.

RESULTS

The model achieved mean Dice coefficients of 0.78 ± 0.15 (pre-treatment) and 0.67 ± 0.21 (post-treatment), indicating good agreement with manual contours. Automated diameters correlated strongly with manual measurements ($r = 0.92$, $p < 0.001$) and showed minimal bias (mean difference: 1.8 mm; 95% limits of agreement: -4.5 to 8.1 mm). Overall agreement between model-predicted and radiologist-assigned response categories was 88% (? = 0.81). Discrepancies (12% of cases) occurred primarily in borderline SD/PR calls and lesions with necrotic or heterogeneous features.

CONCLUSION

The deep learning-guided semi-automatic segmentation approach enables rapid, reproducible tumor quantification and immunotherapy response assessment that closely matches expert radiologists. This tool holds promise for streamlining clinical workflows and reducing interobserver variability.

CLINICAL RELEVANCE/APPLICATION

This semi-automatic segmentation software for quantitative analysis of advanced lung tumors post-immunotherapy serves as a valuable adjunct in clinical assessment. Automating tumor delineation reduces physicians' workload and delivers objective efficacy metrics, supporting more personalized treatment decisions.

M5A-SPCH-9 INFLUENCE OF RADIATION DOSE REDUCTION AND RECONSTRUCTION ALGORITHMS TO QUANTITATIVE COPD EVALUATIONS ON HIGH-DEFINITION CT WITH SUPER-HIGH-RESOLUTION MODE IN SMOKERS

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Tatsuya Kimoto (*Abstract Co-Author*)
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Takeshi Yoshikawa, MD (*Abstract Co-Author*)
Daisuke Takenaka, MD (*Abstract Co-Author*)
Yoshiharu Ohno, MD, PhD (*Abstract Co-Author*)

PURPOSE

High-definition CT (HDCT) with energy integrated detector is clinically available and can provide higher spatial resolution images by high-resolution (HR: 0.5 mm×80 rows/1792 channels) and super-high-resolution (SHR: 0.25 mm×160 rows/1792 channels) modes as compared with conventional multi detector row CTs. The purpose of this study was to determine the influence of radiation dose and reconstruction algorithms to quantitative chronic obstructive pulmonary disease (COPD) evaluation on HDCT with SHR mode in smokers.

METHODS AND MATERIALS

49 smokers underwent HDCT with SHR mode at standard- (CTDI vol : 9.0±1.8mGy), reduced- (1.7±0.2mGy) and ultra-low-dose (0.8±0.1mGy) levels. All HDCT data were reconstructed with hybrid-type iterative reconstruction (IR), model-based IR and deep learning reconstruction (DLR). Standard protocol in this study was standard-dose HDCT with hybrid-type IR. According to pulmonary function test results, all smokers were divided into five groups as follows: 'non-COPD', 'GOLD I', 'GOLD II', 'GOLD III' and 'GOLD IV' groups. In each smoker, percentages of low attenuation volume within lung (%LAV) and wall area at sixth level bronchi (%WA) were automatically measured by means of our proprietary software. To determine the influence of radiation dose reduction and reconstruction algorithm to quantitative COPD evaluation, each index was correlated between each HDCT and standard protocols by Pearson's correlation. Moreover, paired t-test was performed to compare each index between each HDCT and standard protocols. Furthermore, both indexes on each HDCT protocol were compared among all groups by Tukey's HSD test.

RESULTS

With each reconstruction methods, %LAV ($0.97=r$, $p<0.0001$) and %WA ($0.92=r$, $p<0.0001$) had excellent correlations between each HDCT and standard protocols. At each HDCT protocol, both indexes of 'non-COPD' and 'GOLD I' groups had significant differences with those of others ($p<0.05$). Moreover, both indexes of 'GOLD II' group had significant difference with that of 'GOLD III' or 'GOLD IV' groups ($p<0.05$).

CONCLUSION

HDCT with SHR mode has little influence of radiation dose reduction and reconstruction algorithm to quantitative CT evaluation of COPD in smokers.

CLINICAL RELEVANCE/APPLICATION

Quantitatively assessed HDCT with super-high-resolution mode has little influence of radiation dose reduction and reconstruction algorithm to quantitative CT evaluation of COPD in smokers.

M5A-SPCH-10 TUMOR RIM-SPECIFIC CT RADIOMICS IMPROVES PREDICTION OF PATHOLOGICAL COMPLETE RESPONSE TO NEOADJUVANT IMMUNOTHERAPY IN NSCLC

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Jingyi Yang (*Abstract Co-Author*)
Fangyuan Qu, MD (*Abstract Co-Author*)
Qiliang Wang (*Abstract Co-Author*)
Xiaoting Cai (*Abstract Co-Author*)
Yicai Zhang (*Abstract Co-Author*)
Fan Liu (*Abstract Co-Author*)
Jiahui E (*Abstract Co-Author*)
Ying Liu (*Abstract Co-Author*)

PURPOSE

This study aims to enhance pathological complete response (pCR) prediction to neoadjuvant immunotherapy in non-small cell lung cancer (NSCLC) patients by using radiomics analysis across various volumes of interest (VOIs) of the primary tumor on CT images.

METHODS AND MATERIALS

A total of 229 NSCLC patients who received neoadjuvant immunotherapy between August 2018 and May 2024 were retrospectively analyzed. Pre-treatment CT images were used to construct radiomics models based on four tumor-related volumes of interest (VOIs): gross tumor volume (GTV), tumor rim volume (TRV) which included 3mm inward contraction and 3mm outward expansion of the tumor boundary, 3 mm peritumoral region (PTV3), and 6 mm peritumoral region (PTV6). Radiomics signature was constructed using linear discriminant analysis (LDA), with 10-fold cross-validation. Model performance was assessed using area under the curve (AUC), calibration, and decision curve analysis (DCA). SHapley Additive exPlanations (SHAP) were used to interpret and visualize the prediction process of the optimal model. In addition, radiogenomic analysis was performed in 36 patients from the TCIA database with available RNA-sequencing data to explore the biological relevance of radiomics features.

RESULTS

Ninety-seven patients (42.4%) achieve pCR after neoadjuvant immunotherapy. The TRV radiomics model demonstrated the highest accuracy for the prediction of pCR in the testing cohort (AUC: 0.827, 95% CI: 0.742-0.913), significantly outperforming GTV (0.631, 95% CI: 0.516-0.746), PTV3 (0.658, 95% CI: 0.546-0.770), and PTV6 radiomics models (0.689, 95% CI: 0.580-0.798) (all $p < 0.05$). Calibration curves of all radiomics models showed good agreement between predicted and observed outcomes. DCA revealed higher net clinical benefit of the TRV model compared to others. Further radiogenomic analysis showed that higher TRV radiomics score correlated with increased antitumor immune cell infiltration and upregulation of immune regulatory and cellular metabolism pathways.

CONCLUSION

The proposed TRV radiomics model provides superior predictive performance for assessing pCR in NSCLC patients undergoing neoadjuvant immunotherapy compared to conventional tumor or peritumoral regions radiomics models.

CLINICAL RELEVANCE/APPLICATION

TRV-based CT radiomics provides a noninvasive and robust approach for early identification of NSCLC patients likely to benefit from neoadjuvant immunotherapy, supporting precision medicine by tailoring treatment strategies and potentially sparing non-responders from unnecessary interventions.

M5A-SPCH-11 DEVELOPING AND VALIDATION OF A MULTIMODAL-BASED MACHINE LEARNING MODEL FOR DIAGNOSIS OF USUAL INTERSTITIAL PNEUMONIA: A PROSPECTIVE MULTICENTER STUDY

Hongyi Wang (*Presenter*)
Min Liu (*Abstract Co-Author*)
Huaping Dai (*Abstract Co-Author*)

PURPOSE

Usual interstitial pneumonia (UIP) indicates poor prognosis and is frequently misidentified, necessitating an auxiliary diagnostic tool. This study was to establish and validate a machine learning (ML) classifier using radiomics features and clinical data to identify UIP from other ILD patterns.

METHODS AND MATERIALS

We conducted a prospective cohort study with chest high-resolution chest computed tomography (HRCT) scans from ILD patients across three medical centers. Using multidisciplinary diagnosis-determined UIP as the reference, we extracted multimodal data including whole-lung radiomics features on HRCT and demographics, smoking, lung function, and comorbidity data. An eXtreme Gradient Boosting (XGBoost) classifier predicted UIP likelihood was used to design a nomogram that was tested in a multicenter ILD clinical cohort. An area under the receiver operating characteristic curve (AUC) and Kaplan-Meier plots with multivariable cox regression were used to assess the performance of the established model.

RESULTS

The study included 5213 HRCT image datasets in training (n=3639), internal (n=785), and external (n=789) validation datasets in 3433 male ILD patients (average age 61.7 ± 10.8 years). UIP prevalence was 43.7% across the whole dataset with 42.7% and 41.3% for internal validation set and external validation set. The radiomics-based classifier had an AUC of 0.790 in the validation set, and 0.786 for the test dataset. Integrating multimodal data improved AUCs to 0.802 and 0.794, respectively. The integration model was comparable to doctors with over 10 years of experience in ILD. Predicted UIP status was associated with high all-cause mortality risk ($p<0.001$, hazard ratio: 3.108 and 95% confidence interval: 2.162 - 4.466).

CONCLUSION

The classifier combining radiomics and clinical features showed strong performance across varied UIP prevalence. This automated tool efficiently classifies UIP in ILD patients undergoing chest HRCT, enabling early antifibrotic intervention.

CLINICAL RELEVANCE/APPLICATION

We developed and validated a robust classification diagnostic model for UIP diagnosis by integrating radiomics and clinical data. The nomogram demonstrated superior performance and clinical utility, offering a reliable and interpretable tool for UIP detection which could improve the homogenization of ILD diagnosis.

M5A-SPCH-12 PATHOLOGIC FIBROBLASTIC FOCI CORRELATE WITH CT-QUANTIFIED FIBROTIC PROGRESSION IN INTERSTITIAL LUNG DISEASE

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Tae Iwasawa, MD, PhD (*Abstract Co-Author*)
Tomoe Sawazumi (*Abstract Co-Author*)
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Takashi Ogura, MD (*Abstract Co-Author*)

PURPOSE

To test whether larger fibroblastic foci (FF) and hepatocyte nuclear factor-4a (HNF4a) expression are associated with faster interstitial-lung-disease (ILD) progression on CT quantified with QZIP-ILD.

METHODS AND MATERIALS

Between October 2018 and August 2023, 100 ILD patients with baseline and follow-up thin-section CT (median interval = 322 days) and surgical lung biopsy were retrospectively reviewed.CT: QZIP-ILD classified voxels into eight patterns; the yearly percent change in each pattern was the progression score.Pathology: Whole-slide images were analyzed in QuPath. Annotated FF, stroma and air trained slide-specific random-forest models. FF was recorded as the percentage of tissue area occupied by fibroblastic foci; HNF4a-positive area was measured in mm^2. Outputs were verified by a board-certified pathologist.Statistics: Two-sided Pearson correlations with Benjamini-Hochberg correction ($a = 0.05$). Sample sizes after missing data: FF vs CT change - upper 100/lower 94; HNF4a vs CT change - 71/71; FF vs HNF4a - upper 71/lower 68.

RESULTS

Higher FF percentage correlated with yearly increases in upper-lobe honeycombing ($r = 0.27$, $p < 0.01$) and traction bronchiectasis ($r = 0.24$, $p < 0.05$). In lower lobes, it correlated with consolidation + fibrosis ($r = 0.21$, $p < 0.05$) and traction bronchiectasis ($r = 0.24$, $p < 0.05$). Upper-lobe HNF4a area correlated with honeycombing ($r = 0.42$, $p < 0.001$) and traction bronchiectasis ($r = 0.35$, $p < 0.01$); no significant HNF4a correlations were seen in lower lobes. FF percentage and HNF4a were also correlated only in upper samples ($r = 0.45$, $p < 0.01$).

CONCLUSION

QZIP-ILD progression rises in proportion to FF burden and, in upper lobes, to HNF4a expression, identifying both as quantitative markers of rapid ILD fibrosis progression.

CLINICAL RELEVANCE/APPLICATION

Automated CT progression metrics combined with digitally quantified histology provide reproducible biomarkers for risk stratification, guide imaging follow-up, and can enrich patient selection and endpoints in future antifibrotic trials.

M5A-SPCH-13 CORRELATION OF PROGRESSION PREDICTION, AND EXTENT SCORES FROM HIGH-RESOLUTION CT, FAPI-PET WITH PATHOLOGY SPECIMEN WITH INTERSTITIAL LUNG DISEASE TREATED BY LUNG TRANSPLANT: PRELIMINARY RESULTS OF A PROSPECTIVE EXPLORATORY STUDY

Grace Hyun Kim, PhD, MS (*Presenter*)
Ji Yeon Kim (*Abstract Co-Author*)
Pangyu Teng, PhD (*Abstract Co-Author*)
Masatoshi Hotta, MD, PhD (*Abstract Co-Author*)
Gregory A. Fishbein, BS (*Abstract Co-Author*)
Vilasinee Rerkpichaisuth (*Abstract Co-Author*)
Andrea Oh, MD (*Abstract Co-Author*)
Jeremie Calais, MD (*Abstract Co-Author*)

PURPOSE

Recent studies suggest that machine learning algorithms and quantitative interstitial lung disease (ILD) patterns on high-resolution CT (HRCT) may help predict a progressive fibrosing ILD phenotype. This study aimed to test whether a predictive score and ILD patterns on HRCT are associated with fibrosis extent in pathological specimens from ILD patients who underwent lung transplantation.

METHODS AND MATERIALS

This preliminary post-hoc analysis used data from a single-center, open-label, single-arm, prospective exploratory biodistribution study of 68Ga-FAPI-46 PET imaging in ILD. Patients confirmed by HRCT and scheduled for lung transplantation were included. The most recent volumetric HRCT prior to PET was analyzed. Quantitative ILD (QILD) scores were computed using machine learning-based radiomic features. QILD includes fibrotic reticular patterns (quantitative lung fibrosis, QLF) and inflammatory ground-glass opacities (QGG). A single time point prediction (STP) score representing predicted progressive ILD was also calculated. Imaging findings were aligned with pathology samples. Formalin-fixed, paraffin-embedded lung tissues were stained with hematoxylin and eosin and digitized. Fibrosis and honeycombing, markers of irreversible damage, were delineated using QuPath. Quantitative analysis measured fibrosis extent across the tissue. Matched regions of interest (ROIs) were identified between pathology and HRCT. Associations were tested using mixed-effects models.

RESULTS

Between Nov 2021-Apr 2022, four ILD patients underwent HRCT and FAPI PET/CT before lung transplant. Two patients (with NSIP and IPF) had 19 usable pathology slides. Mean (±SD) pathology fibrosis extent was 71.1% (±21.7), range 41.5-99.5%. Matched HRCT ROIs (6 and 2 months pre-transplant) had mean QLF of 48.0% (±34.9), QGG of 20.8% (±21.4), STP of 62.9% (±16.0), and combined maximum QLF or STP of 90.4% (±21.8). Matched pathological fibrosis extent was positively associated with max HRCT scores ($p = 0.033$), and QLF ($p = 0.019$) after adjusting for SUVmax. QGG showed a negative trend ($p = 0.11$).

CONCLUSION

Fibrotic and predicted progressive regions on HRCT were positively associated with fibrosis in pathology. These findings support further development of predictive CT and FAPI-PET biomarkers for stratification and monitoring of progressive ILD.

CLINICAL RELEVANCE/APPLICATION

Imaging-based identification of progressive fibrosing ILD phenotype may improve prediction of disease progression and guide patient management.

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M5A-SPER

Emergency Radiology Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPER-1 VIRTUAL CONTRAST-ENHANCED CTA FOR THORACIC AORTIC DISSECTION USING A REGISTRATION-GUIDED GAN

Motohiko Yamazaki, MD, PhD (*Presenter*)
Yuma Fuzawa, MD (*Abstract Co-Author*)
Masaki Tominaga (*Abstract Co-Author*)
Takuya Yagi (*Abstract Co-Author*)
Hiroyuki Ishikawa, MD, PhD (*Abstract Co-Author*)

PURPOSE

CT angiography (CTA) is the gold standard for diagnosing aortic dissection but may be omitted in patients with contraindications to contrast media or when clinical suspicion is low. Non-contrast CT often lacks sufficient contrast between the true and false lumens, complicating diagnosis. This study aimed to generate virtual contrast-enhanced CTA from non-contrast CT using a registration-guided generative adversarial network (Reg-GAN) and evaluate its utility in diagnosing thoracic aortic dissection.

METHODS AND MATERIALS

In this retrospective study, the training dataset included 110 aortic dissection and 100 non-dissection cases, selected from emergency department patients who underwent contrast-enhanced CTA between 2015 and 2023. The test dataset consisted of 63 consecutive cases from 2024 at the same institution and 25 emergency cases from an external institution. An additional 700 non-dissection CTA cases from a non-emergency cohort were used for pretraining. The Reg-GAN model was trained to generate virtual contrast-enhanced CTA while compensating for spatial misalignment between non-contrast CT and true contrast-enhanced CTA. Training used 3D patches (384×256×8), a batch size of 1, and the Adam optimizer (learning rate = 0.0001) for 20 epochs. The diagnostic performance and image quality of the virtual contrast-enhanced CTA were evaluated.

RESULTS

In the internal test set (n = 63), the virtual contrast-enhanced CTA achieved a sensitivity of 91.4% (32/35) and a specificity of 100% (28/28) for detecting aortic dissection. In the external test set (n = 25), the virtual contrast-enhanced CTA achieved a sensitivity of 100% (9/9) and a specificity of 87.5% (14/16). The contrast-to-noise ratio between the true lumen and the thrombosed false lumen was significantly higher in the virtual contrast-enhanced CTA than in the original non-contrast CT (154.06 ± 215.61 vs. 0.79 ± 0.92, $p < 0.001$). However, discontinuous depiction of the intimal flap in the virtual contrast-enhanced CTA made it difficult to identify the entry and re-entry sites. The image similarity between the virtual and true contrast-enhanced CTA was relatively good in both the internal and external test sets (mean structural similarity index ± standard deviation: 0.793 ± 0.046 and 0.833 ± 0.028, respectively).

CONCLUSION

The virtual contrast-enhanced CTA generated using the Reg-GAN model improved the visualization of thoracic aortic dissection compared to non-contrast CT and demonstrated good diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

Although virtual contrast-enhanced CTA cannot fully replace true CTA, it may serve as a valuable adjunct to assist radiologists in interpreting non-contrast CT for the evaluation of thoracic aortic dissection.

M5A-SPER-2 AI-DRIVEN TRIAGE OF INTRACRANIAL HEMORRHAGE ON ED HEAD CT IMPROVES RADIOLOGIST TURNAROUND TIME

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Owen Donnelly, RT (*Abstract Co-Author*)
Debra Desmarais, MBA (*Abstract Co-Author*)
Daniel Sacchetti (*Abstract Co-Author*)
John A. Mungovan, MD (*Abstract Co-Author*)

PURPOSE

The purpose of this study is to evaluate whether radiologists use AI-generated notifications to prioritize new cases of intracranial hemorrhage (ICH) on noncontrast head CTs in the emergency department (ED), as measured by turnaround time (TAT). It was hypothesized that AI allows radiologists to effectively prioritize new true positive (TP) ICH over follow-up, false positive (FP), and negative studies.

METHODS AND MATERIALS

All noncontrast head CTs flagged as positive for ICH by a commercial AI platform across a multi-hospital integrated health system over 12 months were reviewed. Studies read between 10 PM and 7:30 AM were excluded, as overnight radiologists did not have access to the AI. Sites included three hospital-based EDs: one is a Level II trauma center and all three are primary stroke centers. All positive studies were reviewed and categorized as TP or FP. Mean TATs were calculated for TP, FP, and negative cases. TAT was defined as the time from scan availability to first radiologist access. Follow-up scans of known hemorrhage were identified and analyzed separately to isolate new ICH.

RESULTS

Out of 14,707 ED head CTs at this institution in 2024, 632 (4.3%) had positive AI notifications. Of these, 383 were TP (61%) and 243 were FP (39%). Fifty-four TP cases (8%) were follow-ups of known ICH. Average TAT for new ICH (TP excluding follow-ups) was 12.9 minutes. FP cases averaged 16.2 minutes, and negative cases 15.7 minutes. TAT for all TP was 13.8 minutes. The difference in TAT between TP and FP cases was statistically significant ($p=0.02$), and greater when analyzing new ICH only ($p=0.001$). The difference between new TP and negative studies was also significant ($p<0.0001$). Radiologists accessed AI alerts via a Picture Archiving and

Communication System (PACS)-integrated widget showing key images and follow-up status. This allowed rapid triage without opening full studies. Shorter TAT for new ICH suggests radiologists leveraged the widget to identify and prioritize rapid turnaround of new ICH reports.

CONCLUSION

Radiologists at this institution effectively used AI notifications to prioritize review of new ICH cases, improving reporting speed. This has the potential to improve patient outcomes by decreasing wait time to diagnosis.

CLINICAL RELEVANCE/APPLICATION

AI can improve time-to-diagnosis for new intracranial hemorrhage in the ED by helping radiologists efficiently triage and report true positives more quickly.

M5A-SPER-3 DEEP LEARNING-DERIVED XP-AGE: A NOVEL CHEST RADIOGRAPH-BASED BIOMARKER TO IMPROVE ICU MORTALITY PREDICTION

Yasuhito Mitsuyama (*Presenter*)
Ryo Deguchi (*Abstract Co-Author*)
Hirotaka Takita, MD, PhD (*Abstract Co-Author*)
Shannon Walston (*Abstract Co-Author*)
Yukio Miki, MD, PhD (*Abstract Co-Author*)
Daiju Ueda, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to determine whether "Xp-age"—a newly developed, deep learning-based biomarker of biological aging derived from chest radiographs—could enhance the accuracy of established ICU mortality prediction scores (SAPS II, APACHE II, and SOFA). By directly integrating an imaging-based measure of aging, this work introduces a novel approach to refining risk stratification in critically ill patients.

METHODS AND MATERIALS

We retrospectively analyzed adult ICU admissions at a single center who had both chest radiographs and complete data for SAPS II, APACHE II, or SOFA. The Xp-age model, previously trained on radiographs from healthy individuals, was applied without additional fine-tuning. We replaced the age component in SAPS II and APACHE II with Xp-age and compared standard SOFA with versions that included either chronological age or Xp-age. Predictive performance for ICU mortality was assessed via 10-fold cross-validation with XGBoost.

RESULTS

Among 8,177 ICU admissions, incorporating Xp-age improved predictive performance across scoring systems. In SAPS II, replacing chronological age with Xp-age increased the AUROC from 0.79 to 0.81 ($p=0.015$). APACHE II showed an AUROC increase from 0.77 to 0.81 ($p<0.001$). For SOFA, adding Xp-age raised the AUROC from 0.83 to 0.85 ($p=0.012$), whereas adding chronological age offered no substantial gain. Survival analyses revealed distinct high- and low-risk groups of Xp-age models ($p <0.001$).

CONCLUSION

Replacing or supplementing chronological age with Xp-age, a novel biomarker captured from chest radiographs, boosts the predictive accuracy of ICU mortality scores. These findings suggest that Xp-age captures physiologic dimensions of aging beyond chronological age, offering a new avenue for more precise prognostic assessment in critical care.

CLINICAL RELEVANCE/APPLICATION

By incorporating an innovative, imaging-based aging biomarker into conventional ICU scoring tools, clinicians may achieve enhanced risk stratification and more targeted patient management, ultimately improving outcomes and resource allocation in critical care settings.

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M5A-SPGI

Gastrointestinal Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPGI-1 DIAGNOSTIC ACCURACY OF FULL VS. ABBREVIATED GADOXETATE-ENHANCED MRI IN COLORECTAL CANCER: PRELIMINARY RESULTS FROM A PROSPECTIVE RCT

Harry R. Marshall, MD, PhD (*Presenter*)
Karen Dunn (*Abstract Co-Author*)
Vibhuti Kalia, MD, FRCR (*Abstract Co-Author*)
Darryl W. Ramsewak, MD (*Abstract Co-Author*)
Shelby Champion (*Abstract Co-Author*)
Natalie Grindrod (*Abstract Co-Author*)
Zahra Kassam, MD, FRCPC (*Abstract Co-Author*)

PURPOSE

Colorectal adenocarcinoma is a leading cause of cancer mortality, with liver metastases in up to 50% of patients. Accurate detection is essential for staging and treatment planning, with gadoxetate-enhanced MRI playing a central role. Abbreviated MRI protocols are emerging alternatives due to reduced scan time, cost, and improved throughput. Although prior studies suggest similar diagnostic performance to full protocols, most are small and retrospective. We report preliminary results from a prospective, randomized trial comparing abbreviated versus standard gadoxetate-enhanced liver MRI in patients with colorectal cancer.

METHODS AND MATERIALS

Sixty patients with histologically confirmed colorectal cancer and suspected or known liver metastases were randomized 1:1 to either an abbreviated or standard gadoxetate-enhanced MRI protocol. Randomization used variable block sizes (4, 6, or 8) with concealed allocation. The abbreviated protocol included T2-weighted, diffusion-weighted, and hepatobiliary phase sequences. The full protocol additionally included T2 fat-saturation, T1 in-phase/out-of-phase, and dynamic contrast-enhanced sequences. Three abdominal radiologists independently reviewed all MRIs in a blinded fashion, without access to clinical data or prior imaging. Readers marked up to 10 lesions per case and assigned a suspicion score (1-5) for each. Ground truth was based on pathology when available, or follow-up/prior imaging. Performance was evaluated using AUC, sensitivity, specificity, and accuracy. Final statistical testing will occur upon full enrollment (n=200).

RESULTS

Fifty-eight patients completed the study (one withdrew; one excluded for protocol deviation). Of 367 lesions, 342 had reference standards (72 pathology-confirmed, 270 by imaging follow-up). Of these, 173 were metastatic and 169 benign; most common benign diagnoses were cysts (n=106), ablation zones (n=28), and hemangiomas (n=9). Average AUC across readers was 0.94 (range: 0.92-0.97) for abbreviated MRI and 0.95 (range: 0.89-0.98) for full MRI. At fixed 90% sensitivity, mean specificity and accuracy were 90% and 90% for abbreviated MRI, and 92% and 91% for full MRI.

CONCLUSION

Radiologist performance in detecting liver metastases was comparable between abbreviated and full MRI protocols. These findings support the potential of abbreviated MRI as a resource-efficient alternative.

CLINICAL RELEVANCE/APPLICATION

Abbreviated gadoxetate-enhanced liver MRI may deliver diagnostic performance similar to full protocols while reducing scan time, interpretation time, and cost. These results support broader adoption in oncologic imaging workflows.

M5A-SPGI-2 THE VALUE OF SPECTRAL CT DERIVED SPLENIC EXTRACELLULAR VOLUME FRACTION COMBINED WITH CT VOLUME RELATED PARAMETERS IN IDENTIFYING HIGH RISK VARICES IN CIRRHOTIC PATIENTS

Yiming Yang (*Presenter*)
Yupin Liu (*Abstract Co-Author*)
Dongjing Zhou (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the value of spectral-CT derived splenic extracellular volume fraction (ECV) combined with CT volume-related parameters in identifying high-risk varices (HRV) of cirrhotic patients.

METHODS AND MATERIALS

This study recruited a total of 89 cirrhotic patients, who underwent spectral-CT scanning in the equilibrium phase. Using upper gastrointestinal endoscopy as the reference standard, the patients were divided into the HRV group (n=40) and the non-HRV group (n=49). Spectral-CT derived ECV of liver (L-ECV) and spleen (S-ECV), as well as normalized iodine concentration of the liver (L-NIC) and spleen (S-NIC) were measured based on the iodine concentration (Fig 1a). Total liver volume (TLV), volume ratio of Couinaud segments I-III to segments IV-VIII (LSVR) and splenic volume (SV) were measured in the viewer workstation(Fig 1b). The spectral-CT quantitative parameters and CT volume-related parameters were compared between the HRV and the non-HRV cirrhotic patients using univariate analysis. The multivariate logistic analysis was used to build a model for diagnosing HRV. Receiver operating characteristic curve (ROC) analysis was performed to determine the performance of the combined model, spectral-CT quantitative parameters and CT volume-related parameters in diagnosing HRV.

RESULTS

Univariate analysis showed statistically significant differences in S-ECV, L-ECV, S-NIC, TLV, LSVR, SV between the HRV and the non-HRV cirrhotic patients ($p<0.05$)(Table 1). The combined CT model, developed based on S-ECV, SV and LSVR was built by multivariate logistic analysis (Table 1). The areas under the curve (AUCs) of the combined model, S-ECV, SV and LSVR for diagnosing HRV were 0.863, 0.794, 0.800 and 0.793 respectively (all $p < 0.05$)(Fig 2, Table 2).

CONCLUSION

The model including spectral-CT derived splenic ECV, splenic volume and liver segmental volume ratio could effectively identify high-risk varices of cirrhotic patients.

CLINICAL RELEVANCE/APPLICATION

Noninvasive identification of HRV in cirrhotic patients is of significant value because it could help avoid some unnecessary upper gastrointestinal endoscopy. Splenic ECV combined with CT volume-related parameters added clinical value in diagnosing HRV for patients with liver cirrhosis, which may provide helpful and reliable evidence for clinical diagnosis and treatment.

M5A-SPGI-4 CONTEXT-AWARE DEEP LEARNING ENABLES EXPERT-LIKE BOWEL INFLAMMATION DETECTION IN MRE IMAGES

Hansang Lee, PhD (*Presenter*)
Chaelin Lee (*Abstract Co-Author*)
Seohyun Lee (*Abstract Co-Author*)
Nieun Seo, MD, PhD (*Abstract Co-Author*)
Joonseok Lim, MD (*Abstract Co-Author*)
Helen Hong, PhD (*Abstract Co-Author*)

PURPOSE

Accurate detection of bowel inflammation in Magnetic Resonance Enterography (MRE) is critical for evaluating disease severity in Crohn's disease (CD). However, conventional deep learning models often operate on single slices, neglecting valuable contextual information, resulting in suboptimal performance. We investigated whether incorporating spatial context into detection models not only improves detection accuracy but also increases the correlation of automated lesion count/area with human annotations, reflecting more human-like assessment.

METHODS AND MATERIALS

We retrospectively analyzed MRE scans from 208 patients (training: 104, validation: 52, test: 52). Expert radiologists annotated inflammatory lesions (bounding boxes), providing ground truth for lesion count and total area per patient. We developed and compared two context-aware methods against their corresponding baselines: (1) A YOLOv4-based method incorporating spatial context via multi-slice input, and (2) A Mask R-CNN (MRCNN)-based method employing FocalNet as a backbone for hierarchical contextual feature learning. Detection performance was evaluated using slice-level mean Average Precision (mAP), precision, and recall. To assess models' similarity with human annotations, we measured Spearman correlation coefficients between model-predicted lesion statistics (count and area per patient) and expert annotations.

RESULTS

The proposed context-aware YOLOv4 model achieved the highest detection performance across all metrics (mAP@50 = 74.5%, precision@50 = 70.7%). The proposed FocalNet-enhanced context-aware MRCNN also outperformed baseline MRCNN, showing improvements in both mAP and recall. In terms of similarity with human annotation, the proposed context-aware MRCNN showed Spearman correlations of 0.70 ($p<0.05$) for lesion count and 0.63 ($p=0.05$) for area. The proposed context-ware YOLOv4 achieved correlations of 0.65 ($p<0.01$) for count and a strong 0.68 ($p<0.01$) for area, outperforming its vanilla baseline. These findings suggest that context-aware methods not only detect lesions more accurately but also better align with expert assessment patterns.

CONCLUSION

Incorporating contextual information into deep learning methods improves both detection accuracy and similarity with human expert behavior. The proposed context-aware YOLOv4 showed particularly strong alignment with human assessment, suggesting its potential utility in supporting assessment of CD activity. (This work was supported by grants from NRF (RS-2024-00336063) and KHIDI (HI22C1496).)

CLINICAL RELEVANCE/APPLICATION

By providing expert-like lesion quantification, the proposed context-aware methods may assist radiologists in objective sMARIA scoring in CD.

M5A-SPGI-5 AVOIDING PATIENT RE-SCANS: DEEP LEARNING-BASED SYNTHESIS OF ABDOMINAL CONTRAST ENHANCED CT FROM AVAILABLE SERIES

Tejas Sudharshan Mathai, PhD, MS (*Presenter*)
Xinya Wang (*Abstract Co-Author*)
Praveen Thoppey Srinivasan Balamuralikrishna, MBBS (*Abstract Co-Author*)
Vivek Batheja (*Abstract Co-Author*)
Ronald M. Summers, MD, PhD (*Abstract Co-Author*)

PURPOSE

Radiologists routinely use abdominal contrast-enhanced CT (CECT) to diagnose a variety of diseases. However, a patient's clinical indication dictates the specific CT protocol used for imaging. This obviates the acquisition of certain CECT series, e.g., portal-venous (PV) phase during lung cancer screening. Yet for opportunistic screening purposes, these unacquired CECT series are important for organ, fat, and muscle volumetry. In this work, an automated tool was developed to synthesize a CECT given a non-contrast CT and a desired phase condition.

METHODS AND MATERIALS

First, to learn features of various phases in a CT study, the publicly available MAISI model was trained on the public DeepLesion (4460 patients, 10,649 studies, 42,851 series) and WAW-TACE (233 patients, 233 studies, 854 series) datasets. Next, given a non-contrast CT and desired portal-venous condition, a diffusion model extracted features from MAISI to synthesize the required CECT. Four diffusion models were tested: VCM, Adapter, ControlNet, and STControl (ours). The pancreas segmentation task assessed the PV CECT synthesis quality using the public TotalSegmentator (TS) tool. Our framework was tested on an internal Institution-A dataset (63 patients, 63 studies, 63 non-contrast and 63 PV series) and external Vin-Dr dataset (46 patients, 46 studies, 46 non-contrast and 46 PV series). Two clinicians (2+ years of experience) annotated the pancreas in the PV CTs in these test datasets. Segmentation metrics, such as Dice Similarity Coefficient (DSC) and Normalized Surface Distance (NSD), were computed. Statistical analysis was done using one-way repeated measures Analysis of Variance (ANOVA) and Tukey's post-hoc test.

RESULTS

On Institution-A dataset, our STControl model obtained 67.8+/- 14.2 DSC and 35.8 +/- 12.0 NSD. On Vin-Dr dataset, our model obtained 57.8 +/- 16.0 DSC and 29.1 +/- 11.7 NSD. Across all segmentation metrics, STControl was statistically significantly better compared to Adapter ($p = 0.001$) and VCM ($p < 0.001$) on both internal and external datasets.However, no difference was observed ($p = 0.92$) between STControl and ControlNet.

CONCLUSION

With our model, TS closed the segmentation performance gap between the synthesized PV and reference PV series. To our knowledge, we are the first to develop a 3D diffusion model for 3D abdominal CECT translation.

CLINICAL RELEVANCE/APPLICATION

Our framework is generalizable and can synthesize any CT from the available series in a study. This may be of value when organ morphology rather than focal lesions is critical, as in body composition analysis. Moreover, patient re-scans are reduced, and patients are not exposed to extra radiation doses or subject to contrast agent hypersensitivity.

M5A-SPGI-6 ACCURACY OF MULTIPARAMETRIC ULTRASOUND WITH FAT FRACTION FOR THE ASSESSMENT OF HEPATIC STEATOSIS IN MASLD PATIENTS: AN INTERIM ANALYSIS

Antonino Andrea Blandino, MD (*Presenter*)
Roberto Cannella, MD (*Abstract Co-Author*)
Giordana Mattana, MD (*Abstract Co-Author*)
Tommaso V. Bartolotta, MD,PhD (*Abstract Co-Author*)

PURPOSE

To investigate the performance of quantitative ultrasound with US Fat Fraction (USFF) in patients with metabolic dysfunction-associated steatotic liver disease (MASLD).

METHODS AND MATERIALS

Patients with MASLD prospectively underwent same-day MRI (3T), using the mDixonQuant sequence for fat fraction quantification, and quantitative ultrasound, consisting of Tissue Attenuation Imaging (TAI), Tissue Scatter-distribution Imaging (TSI), and USFF, performed by a radiologist and a radiology resident to assess inter-reader reliability.Spearman's rank-order correlation was calculated between USFF and MRI fat fraction. The diagnostic performance was investigated with the area under the receiver operating characteristics curve (AUC), sensitivity and specificity according to the optimal cutoff.

RESULTS

One hundred and three (103) patients (67 males, median age: 60 years) were enrolled. Among them, 82 (79.6%) had grade=1 steatosis and 37 (35.9%) had grade=2 steatosis. There was a high positive correlation between USFF and MRI fat fraction (rho 0.815, p<0.001). For the diagnosis of grade=1 steatosis the AUCs were 0.886 (95%CI: 0.823, 0.949) for TAI, 0.797 (95%CI: 0.706, 0.889) for TSI, and 0.896 (95%CI: 0.834, 0.959) for USFF. An USFF >6.47 had a sensitivity of 91.5% and a specificity of 76.19% for grade=1 steatosis. For the diagnosis of grade=2 steatosis, the AUCs were 0.913 (95%CI: 0.854, 0.973) for TAI, 0.863 (95%CI: 0.791, 0.934) for TSI, and 0.928 (95%CI: 0.876, 0.980) for USFF. An USFF >11.94 had a sensitivity of 89.2% and a specificity of 84.85% for grade=2 steatosis. Reproducibility of USFF was excellent (ICC: 0.952; 95%CI: 0.930, 0.968).

CONCLUSION

USFF provides excellent performance and reproducibility for quantifying hepatic steatosis in patients with MASLD.

CLINICAL RELEVANCE/APPLICATION

By providing noninvasive, cost-effective quantification of liver fat with high accuracy and reproducibility, USFF facilitates early detection, risk stratification and management of steatosis in MASLD.

M5A-SPGI-8 DIAGNOSTIC PERFORMANCE OF MACHINE LEARNING MODELS FOR PREDICTING ADVANCED LIVER FIBROSIS: A BIVARIATE META-ANALYSIS

Bruno Ishizuka (*Presenter*)
Victor Arthur Ohannesian (*Abstract Co-Author*)
Luciano Falcao (*Abstract Co-Author*)
Karina De Lima Andrade (*Abstract Co-Author*)
Ricardo Suruagy-Motta (*Abstract Co-Author*)
Mariana Lee Han (*Abstract Co-Author*)
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Carlos Tudino (*Abstract Co-Author*)
Fernanda Fleming (*Abstract Co-Author*)
Miguel J. Francisco Neto, MD, PhD (*Abstract Co-Author*)

PURPOSE

To systematically assess the diagnostic accuracy of machine learning (ML) models for detecting advanced liver fibrosis in patients with chronic liver disease, using histopathology or elastography-based imaging as reference standards.

METHODS AND MATERIALS

A systematic review and bivariate diagnostic meta-analysis were conducted in accordance with PRISMA-DTA guidelines. Databases searched included PubMed, Embase, Scopus, Web of Science, and CENTRAL (through April 2025). Studies were eligible if they evaluated the performance of ML models in classifying advanced liver fibrosis (=F3 or F4) using liver biopsy or two-dimensional shear wave elastography as reference standards. The main outcomes were pooled sensitivity, specificity, area under the receiver operating characteristic curve (AUROC), positive and negative likelihood ratios (LR+, LR-), and diagnostic odds ratio (DOR). Between-study heterogeneity and threshold effects were assessed, and publication bias was evaluated using Deeks' funnel plot asymmetry test. Statistical analyses were performed using Stata v15 and the MIDAS module.

RESULTS

Sixteen studies were included, comprising 3,558 reference-positive and 10,052 reference-negative patients. The pooled sensitivity of ML models for detecting advanced fibrosis was 0.90 (95% CI: 0.82-0.94), and specificity was 0.82 (95% CI: 0.71-0.90). The positive likelihood ratio (LR+) was 5.1 (95% CI: 3.0-8.6), and the negative likelihood ratio (LR-) was 0.13 (95% CI: 0.07-0.22). The diagnostic odds ratio was 40 (95% CI: 17-93), with an AUROC of 0.93 (95% CI: 0.90-0.95). Heterogeneity was considerable (I^2 = 99%), but threshold effects were negligible (R = -0.12; proportion due to threshold = 0.01). Between-study variance was moderate for both sensitivity (ICC = 0.27) and specificity (ICC = 0.34). Deeks' test did not reveal evidence of publication bias (p = 0.461).

CONCLUSION

ML-based models demonstrate high diagnostic accuracy for detecting advanced liver fibrosis, with excellent sensitivity and strong discriminatory performance (AUROC > 0.90). Despite high heterogeneity, the low negative likelihood ratio supports their potential utility in ruling out advanced fibrosis in clinical practice.

CLINICAL RELEVANCE/APPLICATION

Machine learning algorithms represent promising noninvasive tools for the identification of advanced hepatic fibrosis, especially in settings where liver biopsy is contraindicated or unavailable. Given their high sensitivity and ease of deployment in routine clinical imaging workflows, these models may support early risk stratification and management of patients with chronic liver disease, particularly in large-scale screening or resource-limited scenarios.

M5A-SPGI-10 DEEP LEARNING FOR AUTOMATED EVALUATION OF SARCOPENIA, MYOSTEATOSIS AND PROGNOSIS IN PATIENTS WITH LOCALLY ADVANCED RECTAL CANCER USING BASELINE CT: AN EXTERNAL VALIDATION STUDY

Kui Sun, MMedSc, PhD (*Presenter*)

PURPOSE

Sarcopenia, assessed by skeletal muscle index (SMI), and myosteatosis, quantified through muscle density (MD), are critical prognostic determinants in locally advanced rectal cancer. Current CT-based manual measurements of SMI and MD remain labor-intensive. This two-center study developed a deep learning using baseline CT to facilitate the evaluation of muscle biomarkers and validated their prognostic value in locally advanced rectal cancer (LARC).

METHODS AND MATERIALS

A two-center retrospective analysis was conducted on 408 patients (329 patients from center1, 79 patients from center2). ResNet-50 was trained using five-fold cross-validation on L3-level CT images to classify MD and SMI. The generalizability of the well-trained model was evaluated on the external validation cohort. Additionally, three junior physicians were enlisted to perform independent visual evaluations. The results of these manual assessments were compared with the diagnostic outputs generated by the model. Evaluation metrics included the area under the receiver operating characteristic curve (AUC), and Kaplan-Meier survival analysis for disease-free survival (DFS) and overall survival (OS).

RESULTS

The model achieved a higher performance for MD compared to SMI in both the development (mean AUC, 0.929 vs. 0.884) and external validation cohorts (0.875 vs. 0.737, p<0.01). Subgroup analysis demonstrated the stability of MD-AI with AUC ranging from 0.851 to 1.000. MD significantly stratified DFS (p<0.05 in the overall and development cohorts) and OS (p<0.05 across all cohorts). Visual assessments by junior physicians were inferior to the AI model (MD, AUC: 0.683-0.723 vs. AI: 0.918; SMI, AUC: 0.549-0.565 vs. AI: 0.786).

CONCLUSION

An artificial intelligence effectively and automatically assessed skeletal muscle status in LARC.

CLINICAL RELEVANCE/APPLICATION

By integrating MD-AI into routine CT workflows, clinicians can objectively predict survival outcomes (DFS/OS) and tailor treatment strategies to mitigate skeletal muscle abnormalities-related complications.

M5A-SPGI-11 PREDICTIVE VALUE OF MRE-MEASURED INFLAMMATORY BURDEN AND SEVERITY FOR ASSESSING TREATMENT RESPONSE IN SMALL BOWEL CROHN'S DISEASE

Jordi Rimola, MD, PhD (*Presenter*)
Julia M. Saidman, MD (*Abstract Co-Author*)
Agnes Fernandez-Clotet (*Abstract Co-Author*)
Josep Puig, MD,PhD (*Abstract Co-Author*)
Ingrid Ordas (*Abstract Co-Author*)

PURPOSE

Identifying predictors of therapeutic response is the cornerstone of personalised medicine. Changes in intestinal lesion severity have received much attention, but the value of changes in inflammation length has not been properly analysed. We aim to identify findings on MR Enterography (MRE) 46 weeks after initiating biological treatment in small bowel Crohn's disease (SBCD) that predict adverse long-term outcomes.

METHODS AND MATERIALS

Post-hoc analysis of a prospective longitudinal single-centre study included patients with SBCD requiring biological treatment. MRE data were obtained at baseline and at week 46 after treatment initiation. Patients were followed two years afterwards. Severity of SBCD lesions was assessed by the segmental MaRIA score. The length of the inflammation was made using a 3D curved multiplanar reconstructions (Horos®). A logistic regression analysis was performed to assess the prognostic value of different radiologic findings, including length of inflammation (inflammatory burden) and severity of lesions for disease modifying events.

RESULTS

Among the 65 patients included, 39 (60%) had =1 adverse outcome during the follow-up: 29 (44.6%) had clinical recurrence; 20 (30.76%) required surgery, and 12 (18.46%) hospitalization. At week 46, healing of severe lesions (defined as MaRIA<11) was found in 23/65 (35.4%).In the multivariate analysis, persistence of severe lesions at week 46 predicts higher risk of surgery (OR=7.44 [95%CI1.84-50.5] p=0.013) and has a trend to increase the risk of any event (OR=7.88 [95%CI1.12-159] p=0.07), whereas improvement of radiological severity (reduction of MaRIA) has protective effect over any modifying disease events (OR=0.89 [95%CI0.82-0.96] p=0.003) or treatment discontinuation (OR=0.92 [95%CI0.85-0.98] p=0.01). In contrast, changes in the length of inflammation or severe inflammation did not predict any adverse events.

CONCLUSION

Improvement in radiological severity of SBCD as measured by MaRIA has a positive impact on clinically relevant disease outcomes. Continued investigation by increasing the sample size in relation to the reduction of inflammatory burden is needed.

CLINICAL RELEVANCE/APPLICATION

Identifying MR parameters that predict clinically relevant outcomes helps to define therapeutic endpoints.

M5A-SPGI-13 EARLY CHANGE IN SKELETAL MUSCLE DENSITY PREDICTS RECURRENCE FOLLOWING CURATIVE RESECTION OF WELL-DIFFERENTIATED PANCREATIC NEUROENDOCRINE TUMORS

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Yuqi Wang (*Abstract Co-Author*)
Jing Zhu (*Abstract Co-Author*)
Yan Deng (*Abstract Co-Author*)
Haopeng Yu (*Abstract Co-Author*)
Zixing Huang (*Abstract Co-Author*)
Bin Song (*Abstract Co-Author*)

PURPOSE

This study aimed to establish the prognostic impact of early changes in skeletal muscle index (SMI) and density (SMD) in patients with well-differentiated (G1/G2) pancreatic neuroendocrine tumors (pNETs).

METHODS AND MATERIALS

Sixty-eight patients with G1/G2 pNETs who underwent curative resection between August 2013 and December 2022 were retrospectively analyzed. Skeletal muscle area (SMA) and SMD were measured at the L3 level using preoperative and 1-year postoperative abdominal CT scans. Changes in skeletal muscle index (?SMI) and density (?SMD) were calculated, with a decrease of >5% defined as a significant decline. Patients were stratified into decreased and stable groups based on ?SMI and ?SMD, respectively. Recurrence-free survival (RFS) was evaluated using Kaplan-Meier curves and Cox regression models.

RESULTS

Among the 68 patients (median age 51 years; 39 [57.4%] female), histopathology confirmed G1 disease in 24 (35.3%) and G2 in 44 (64.7%). With a median follow-up of 44.5 months, 18 patients (26.5%) experienced disease recurrence. The decreased ?SMD group showed significantly poorer RFS compared to the non-decreased group ($p < 0.01$). However, no significant difference was found between ?SMI groups ($p > 0.05$). Multivariate analysis indicated that ?SMD (decreased vs. stable; HR = 6.245, 95% CI: 1.377-28.323, $p < 0.01$) and tumor size (=3 cm vs. <3 cm; HR = 0.284, 95% CI: 0.080-1.017, $p < 0.05$) were independently associated with RFS.

CONCLUSION

Early postoperative decline in SMD is an independent prognostic biomarker for recurrence in patients with G1/G2 pNETs, supporting its clinical utility in risk stratification and guiding postoperative surveillance.

CLINICAL RELEVANCE/APPLICATION

Quantitative CT-based assessment of muscle density provides an objective imaging biomarker to assess recurrence risk. Early detection of SMD decline may facilitate intensified follow-up or consideration of adjuvant therapy in high-risk pNET patients.

M5A-SPGI-14 CONTRAST-ENHANCED CT-DERIVED EXTRACELLULAR VOLUME FRACTION PREDICTS SURVIVAL IN POSTOPERATIVE PANCREATIC CANCER PATIENTS

Shuai Ming (*Presenter*)
Wei Wei (*Abstract Co-Author*)

PURPOSE

To evaluate the prognostic value of extracellular volume (ECV) fraction derived from contrast-enhanced computed tomography (CECT) in predicting survival outcomes of patients with resectable pancreatic ductal adenocarcinoma (PDAC).

METHODS AND MATERIALS

The study cohort included a total of 166 patients with resectable PDAC who underwent CECT before operative excision between Jan 2018 and Mar 2021. The CT-derived tumor ECV fractions were calculated from the unenhanced and equilibrium-phase CT images. The effects of patient clinical factors, CECT image parameters, and tumor ECV fractions on overall survival (OS) and progression-free survival (PFS) were assessed by univariate and multivariate analyses using Cox proportional hazards models. In addition, to verify the reliability of ECV, Masson's trichrome staining was performed on surgically resected specimens from a subset of patients to quantify intratumoral collagen content. Pearson correlation was used to analyze the relationship between CT-derived ECV and collagen ratio (CR).

RESULTS

The median value of CT-derived tumor ECV was 32% (21% - 41%). Increased ECV fractions were positively associated OS and PFS. Age and CT-derived ECV fraction was an independent predictor of OS ($p = 0.012$; $p = 0.001$), while tumor size and CT-derived ECV fraction was an independent predictor of PFS ($p = 0.016$; $p = 0.001$) in patients with resectable PDAC. In addition, ECV was determined to be strongly correlated with CR ($r = 0.860$, $p < 0.001$).

CONCLUSION

CECT-derived ECV fraction is strongly correlated with collagen ratio and is positively related to OS and PFS of patients with resectable PDAC.

CLINICAL RELEVANCE/APPLICATION

CECT-derived ECV fraction could be used as a reliable noninvasive biomarker for predicting survival in patients with resectable PDAC.

M5A-SPGI-15 DEEP LEARNING-BASED CONTOURING OF HEPATIC COUINAUD SEGMENTS ON CT: UTILITY FOR VOLUMETRIC ANALYSIS OF FUTURE LIVER REMNANT

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Vivek Batheja (*Abstract Co-Author*)
Cathleen Hannah (*Abstract Co-Author*)
Mike Kassin (*Abstract Co-Author*)
Ifechi Ukeh (*Abstract Co-Author*)
Jonathan Hernandez (*Abstract Co-Author*)
Ronald M. Summers, MD, PhD (*Abstract Co-Author*)

PURPOSE

Hepatocellular carcinoma (HCC) is a common primary liver tumor, and the liver is a frequent site of metastasis of other cancers. High tumor burden, proximity to hepatic vessels, and other comorbidities mean only 30% of patients are candidates for treatment. However, surgical resection requires a 20 - 40% future liver remanent (FLR) to avoid post-operative complications. The purpose is to develop an automated tool that delineates hepatic Couinaud segments for pre-surgical treatment planning and FLR volumetry.

METHODS AND MATERIALS

Two CT datasets were used for training: 1) 442 patients from the public Medical Segmentation Decathlon (MSD) Hepatic Vessels dataset, and 2) 77 patients imaged at Institution-A with ascites, splenomegaly and those who underwent hepatic arterial embolization. Two CT datasets were used for testing: 1) 14 patients from Institution-A (internal): 8 of whom underwent right-sided portal vein embolization with pre- and post-surgical CT exams available, and (2) 197 patients in the public TCIA Colorectal Liver Metastasis (CRLM) dataset. A senior radiologist annotated the FLR in the CRLM dataset, while the Couinaud segments were annotated by two physicians in the remaining datasets. Segments 2,3,4 in the internal test dataset was considered as the FLR. A 3D nnU-Net was trained with default hyperparameters to outline the Couinaud segments. Metrics, such as Dice Similarity Coefficient (DSC), Hausdorff Distance (HD) error (in mm), and volume error (in cc) were calculated. The performance was compared to a previously described 3D U-Net developed to quantify liver segmental volume ratio (LSVR) in patients with cirrhosis.

RESULTS

For the internal test dataset, compared against 3D U-Net, our 3D nnU-Net obtained a DSC of 0.89 +/- 0.2 vs. 0.75 +/- 0.35 ($p = 0.014$), HD error of 10.6 +/- 10.9 vs. 28.5 +/- 42.5 mm ($p = 0.019$), and volume error of 3.8 +/- 45.6 vs. 11.3 +/- 106.1 cc ($p = 0.35$). For the external CRLM dataset, our 3D nnU-Net obtained a DSC of 0.99 +/- 0.01 vs. 0.97 +/- 0.07 ($p < 0.001$), HD error of 0.88 +/- 1.84 vs. 9.57 +/- 3.62 mm ($p < 0.001$), and volume error of 13.7 +/- 28.1 vs. 47.9 +/- 51.8 cc ($p < 0.001$).

CONCLUSION

The automated tool generalized well to the external CRLM dataset and can potentially reduce the cumbersome manual annotation of Couinaud segments on CT, which requires > 2 hours to perform.

CLINICAL RELEVANCE/APPLICATION

The tool may be useful for accurate volumetry on patients undergoing portal vein embolization to increase the FLR and estimation of liver segmental volume ratio (LSVR) for diagnosis of liver fibrosis and cirrhosis.

M5A-SPGI-16 EFFECTIVENESS AND SAFETY OF A NOVEL MANGANESE-BASED LIVER SPECIFIC MR CONTRAST MEDIA AGENT, ACE-MBCA: QUANTITATIVE ASSESSMENTS FROM THE SPARKLE STUDY

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Beatrice L. Madrazo, MD (*Abstract Co-Author*)
Nadilka Hettiarachchige (*Abstract Co-Author*)

Andreas Norlin, PhD (*Abstract Co-Author*)
Alvin C. Silva, MD (*Abstract Co-Author*)

PURPOSE

To assess the efficacy of a novel oral manganese-based liver-specific magnetic resonance (MR) contrast media agent, ACE-MBCA (Ascelia Pharma Manganese Based Contrast Agent), based on quantitative outcomes from the phase III SPARKLE study.

METHODS AND MATERIALS

This prospective, global, multicenter study included 85 patients with known or suspected liver lesions and severe renal impairment. Patients underwent unenhanced MR imaging (UMRI) before administration of the liver-specific contrast agent, followed by an enhanced MRI (ACE-MBCA MRI). Signal intensity was measured within regions of interest of the normal liver parenchyma, focal liver lesions (up to 5) and outside the patient (background), in pre- and post-contrast T1-weighted MR images by 3 independent readers. Quantitative endpoints included percent signal intensity enhancement (SI%) of liver parenchyma, liver-to-lesion contrast (LLC), signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR). Safety endpoints included adverse events (AEs).

RESULTS

Mean liver SI% increased from 59.6% to 72.2% in ACE-MBCA-enhanced images across the 3 readers. Mean LLC rose from 0.109-0.143 in unenhanced images to 0.291-0.331 in ACE-MBCA images. SNR and CNR exhibited similar changes. These quantitative parameters align with previously reported significant improvements in lesion visualization in the same study. No patients were withdrawn from the study. The most reported post dose AEs were mild to moderate nausea (16.1%), diarrhea (13.8%), vomiting (9.2%), and increased blood urea (3.4%). No drug-related serious AE or deaths were reported.

CONCLUSION

The study demonstrated a change in signal intensity of the liver parenchyma and focal liver lesions in T1-weighted MR images consistent with a hypointense contrast agent. ACE-MBCA 800 mg provides significant improvement in focal lesion visualization over unenhanced MR and was safe for patients with suspected or known liver lesion and severe renal impairment.

CLINICAL RELEVANCE/APPLICATION

The use of ACE-MBCA in liver MRI may benefit patients lacking alternatives to Gadolinium-based agents when the use of the latter is medically inadvisable or when use of IV contrast agents cannot be administered.

M5A-SPGI-17 ADVANCING CHRONIC PANCREATITIS DIAGNOSIS WITH CT RADIOMICS: NEW BIOMARKERS FOR DIAGNOSIS AND STAGING

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Soren Nicolai Frederiksen Hostrup (*Abstract Co-Author*)
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Ingfrid H. Haldorsen, MD, PhD (*Abstract Co-Author*)
Trond Engjom (*Abstract Co-Author*)
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Asbjorn Mohr Drewes, MD,PhD (*Abstract Co-Author*)
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PURPOSE

Chronic pancreatitis (CP) is a progressive inflammatory disease causing pancreatic damage and complications such as exocrine pancreatic insufficiency (EPI), diabetes and pain. Standard imaging often detects CP only at advanced stages and provides limited insight into associated complications. Radiomics, combined with artificial intelligence (AI), can extract pixel-level imaging features and detect subtle tissue changes not visible to the human eye. This study aimed to identify CT-based radiomic features that distinguish CP from healthy controls and classify patients based on complications. A secondary objective was to assess the interpretability of these features and their association with clinical outcomes.

METHODS AND MATERIALS

This multicenter imaging study included 208 prospectively enrolled CP patients from the Scandinavian Baltic Pancreatic Club database and 150 healthy controls from Aalborg University Hospital. All underwent CT imaging in the portal venous phase. Manual segmentation of the pancreas was followed by extraction of 110 radiomic features using PyRadiomics. LASSO regression was used for feature selection. Support vector machine models were trained to classify CP and predict complications (EPI, diabetes, pain), and externally validated on 79 CP patients from Haukeland University Hospital. Feature interpretability was assessed by correlating selected features with imaging findings (atrophy, calcifications, pseudocysts, ductal dilatation). Additionally, AI model prediction probability scores were correlated with fecal elastase levels and disease severity.

RESULTS

The radiomics-based AI models demonstrated high accuracy in distinguishing CP from controls, with an external validation accuracy of 0.85. For predicting EPI, diabetes, and pain, accuracies were 0.68, 0.65, and 0.58. Sixteen radiomic features significantly correlated with pancreatic volume and calcifications; none with pseudocysts or ductal dilatation. Fecal elastase levels strongly correlated with predicted EPI probability scores ($p = 0.002$), and higher disease severity was associated with increased prediction probability scores.

CONCLUSION

Radiomics presents a promising approach for diagnosing and staging CP, as well as assessing its complications. Despite variability in predictive accuracy across complications, the results highlight its clinical potential. Future studies with larger, more diverse cohorts and advanced AI models may further enhance diagnostic accuracy and utility.

CLINICAL RELEVANCE/APPLICATION

Radiomics-based AI applied to routine CT offers a new noninvasive method for CP diagnosis and staging, with potential to improve decision-making, enable earlier intervention, and support personalized CP management.

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M5A-SPGU

Genitourinary Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPGU-1 COMPUTERIZED DECISION SUPPORT FOR HIGH- AND LOW-RISK ADRENAL CANCER DIAGNOSIS IN CT USING RADIOMIC BIOMARKERS

Santiago Fiori (*Presenter*)
Lubomir M. Hadjiiski, PhD (*Abstract Co-Author*)
Ana Yordanova (*Abstract Co-Author*)
Elaine M. Caoili, MD, MS (*Abstract Co-Author*)
Richard H. Cohan, MD (*Abstract Co-Author*)
Heang-Ping Chan, PhD (*Abstract Co-Author*)
Russell G. Day (*Abstract Co-Author*)
Francis P. Worden, MD (*Abstract Co-Author*)
Gary Hammer (*Abstract Co-Author*)
Chuan Zhou, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the accuracy of automatically extracted radiomic features from CT scans in the differentiation of high- and low-risk adrenal cancer during primary tumor assessment.

METHODS AND MATERIALS

Adrenal cancer is a deadly disease with a 5-year disease-specific survival rate of 50-60% for localized cancer and 10-20% for advanced stage disease. Patients with early-stage disease may be mistaken for having benign lesions, left untreated, and subsequently develop locally aggressive disease and/or metastasis, progressing to more advanced stages. Failure in early diagnosis may result in worse outcomes and survival rates. Therefore, effective imaging biomarkers that can improve early differentiation of high- and low-risk neoplasms are crucial. High-risk adrenal cancers are considered to be pT2 stage and above, while low-risk adrenal cancers are below pT2 stage. Adrenal cancer is a rare disease. Our hospital is a national center specialized in treating and researching adrenal cancer. This allowed an elevated number of cases to be gathered. 89 retrospective adrenal cancer patients were initially identified with IRB approval. Inclusion criteria were: (1) available baseline abdominal CT exam containing the entirety of the adrenal mass; (2) lesion size measuring 5 cm or less; (3) available cancer stage and grade pathology information. 20 eligible cases with 20 cancers (13 high-risk, 7 low-risk) were used in this pilot study. All tumors were segmented and 3D tumor boundary extracted using our Auto-Initialized Cascaded Level Set (AI-CALS) system. 91 radiomic biomarkers including 59 tumor heterogeneity and 32 morphological features (volume (V), 23 gray level (GL) and 8 shape (S)) were extracted from the segmented lesions. An optimal feature subset was selected from the available feature set. A linear discriminant classifier was used to merge the selected features for classification of high- and low-risk tumors. A two-loop leave-one-out training and testing resampling scheme was implemented for feature classification. The classification performance was evaluated by the area under the receiver operating characteristic curve (AUC).

RESULTS

For the 20 cancers, the test AUC for prediction of high-risk versus low-risk cancer at baseline was 0.85±0.10. The selected useful biomarkers included a 1 GL, 2 S and 1 heterogeneity features.

CONCLUSION

Machine learning of radiomic characteristics of adrenal tumors in CT could achieve high performance in the assessment of cancer stages.

CLINICAL RELEVANCE/APPLICATION

Intelligent analysis of radiomic features has the potential to improve cancer stage assessment for adrenal cancer patients. Early accurate assessment of the high- or low-risk of cancer allows for better treatment planning.

M5A-SPGU-2 RADIOPROTEOMIC CORRELATIONS IN PROSTATE CANCER: LINKING FUNCTIONAL IMAGING TO MOLECULAR PROFILES

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Simon Spohn (*Abstract Co-Author*)
Matthias Fahrner (*Abstract Co-Author*)
Constantinos Zamboglou (*Abstract Co-Author*)
Benedict Oerther, MD (*Abstract Co-Author*)
Martin Freitag (*Abstract Co-Author*)
Tobias Fechter (*Abstract Co-Author*)
Ievgen Glavynskyi (*Abstract Co-Author*)
Peter Bronsert (*Abstract Co-Author*)
Oliver Schilling (*Abstract Co-Author*)

PURPOSE

Prostate cancer (PCa) remains the most common malignancy in men in Western countries. While image-guided biopsies are standard for tumour grading, they carry risks of complications and sampling errors, driving interest in non-invasive characterization using multiparametric MRI (mpMRI) and prostate-specific membrane antigen positron emission tomography (PSMA-PET). This study integrates radiomic features from these imaging modalities with histopathological and proteomic data to investigate associations between imaging phenotypes and molecular tumor characteristics.

METHODS AND MATERIALS

Patients with primary PCa underwent preoperative mpMRI and PSMA-PET prior to radical prostatectomy. Imaging datasets were spatially aligned with digitized whole-mount histopathology sections using ex vivo CT. Proteomic analysis of targeted tissue samples from tumor regions was performed via liquid chromatography-tandem

mass spectrometry (LC-MS/MS(. Radiomic features including standardized uptake value (SUV) from PET and apparent diffusion coefficient (ADC) from MRI, were correlated with proteomic profiles using linear regression and gene ontology enrichment.

RESULTS

20 patients with 68Ga-PSMA-PET and 15 with 18F-PSMA_PET were included. Proteomic analysis fo the first 20 patients with 68Ga-PSMA identified over 2,400 proteins across the samples. A positive correlation was observed between PSMAPET SUV and histopathological PSMA expression levels. Linear regression revealed distinct protein subsets associated with SUV and ADC values. Gene ontology analysis demonstrated that regions with higher SUV were enriched for biological processes such as telomere maintenance and RNA processing, while lower SUV regions correlated with structural adhesion pathways. Areas exhibiting the radiomic texture feature "QSZHGE" showed dysregulation of fatty acid metabolism-related proteins. Elevated ISUP grades were associated with increased matrisomal proteins, suggesting extracellular matrix remodeling.

CONCLUSION

This study establishes spatially resolved correlation between imaging markers and proteomic signatures in localized PCa. These insights support the development of non-invasive diagnostic tools for intermediate- and high risk PCa patients. Additional analyses are planned.

CLINICAL RELEVANCE/APPLICATION

Correlation between imaging and biology holds promise to further improve risk stratification and non-invasive tumour charakterisation in PCa, which can be used for further treatment personalization.

M5A-SPGU-3 AN EFFECTIVE BIOIMAGING PROGNOSTIC MARKER FOR CCRCC: A DEEP LEARNING FUSION MODEL UTILIZING MULTIPHASE CT IMAGES AND HISTOPATHOLOGICAL WHOLE SLIDE IMAGES

Changyi Ma, MD (*Presenter*)

PURPOSE

To develop and validate a DL fusion model using multiphase CT images and WSI for postoperative risk stratification in ccRCC patients.

METHODS AND MATERIALS

This retrospective study included 274 ccRCC patients who underwent multiphase CT scans (Jan 2008-Mar 2021), with diagnoses confirmed by histopathology post-surgery. The patient cohort was divided into a training set of 164 patients for model development and a test set of 110 patients for model validation. DL models based on multiphase CT images and histopathological WSIs were developed and validated. Performance comparisons among models were made through accuracy (ACC) and receiver operating characteristic (ROC) curve analyses, with integrated discrimination improvement (IDI) analysis and the DeLong test assessing diagnostic performance. Decision curve analysis (DCA) evaluated clinical utility, and Kaplan-Meier analysis assessed variable-survival correlations.

RESULTS

The CT and Pathology Mutual Guidance Fusion Diagnostic Network (CPNet) exhibited higher predictive performance for postoperative disease-free survival (DFS) in ccRCC patients than the other models. The area under the ROC curves (AUCs) of the CMP-Pathology Fuse, NP-Pathology Fuse, PCP-Pathology Fuse, and Three-phase-Pathology Fuse models were 0.7965, 0.798, 0.8363, and 0.8341, respectively, with corresponding ACCs of 69.09%, 69.09%, 75.45%, and 70.00%, respectively. Moreover, IDI and DCA showed that the PCP-based CPNet model exhibited comparable performance to the three-phase CPNet model (P >0.05) and provided significant net benefits (0.01-0.95).

CONCLUSION

The PCP-based CPNet model is a valuable tool for predicting postoperative DFS in ccRCC patients that can be effectively integrated into clinical practice and has the potential to become An effective bioimaging prognostic marker.

CLINICAL RELEVANCE/APPLICATION

ccRCC is an aggressive, heterogeneous tumor with a poor prognosis. Prognostic assessments need multi-modal data. Radiological images have limits, while pathological images offer micro-level details. Integrating these for ccRCC outcome prediction is important. Our study aimed to develop and validate a DL fusion model using multiphase CT images and WSI for postoperative risk stratification in ccRCC patients.

M5A-SPGU-4 IMPROVING PREOPERATIVE PREDICTION OF MUSCLE INVASION STATUS IN BLADDER CANCER USING ARTIFICIAL INTELLIGENCE MODEL COMBINING INTRATUMORAL AND PERITUMORAL IMAGES OF DUAL-ENERGY CT

Changyu Du (*Presenter*)
Mengting Hu (*Abstract Co-Author*)
Wei Wei (*Abstract Co-Author*)
Yijun Liu (*Abstract Co-Author*)
Jianying Li, PhD (*Abstract Co-Author*)

PURPOSE

To demonstrate the improved preoperative prediction of muscle invasion status in bladder cancer (BCa) using deep learning (DL) models that utilize multi-parameters of dual-energy CT (DECT) images of both intratumoral and peritumoral regions of BCa.

METHODS AND MATERIALS

A retrospective analysis was conducted on 207 patients with pathologically confirmed BCa who underwent DECT urography, including 141 cases of non-muscle-invasive bladder cancer (NMIBC) and 66 cases of muscle-invasive bladder cancer (MIBC). All patients were randomly divided into training and test cohorts in a 7:3 ratio. Radiomic features were extracted from the venous phase 40, 70 and 100keV, and iodine-based material-decomposition (IMD) images of the intratumoral and both intra- and peritumoral regions (IntraPeri). A ResNet50 DL model was also established to extract DL features. Feature selection was carried out sequentially using the Mann-Whitney U test, Spearman correlation analysis, and LASSO. Support Vector Machine classifiers were employed to construct four models: intratumoral radiomics (Intra-Rad), intratumoral DL (Intra-DL), IntraPeri radiomics (IntraPeri-Rad), and IntraPeri DL (IntraPeri-DL). The predictive performance of each model was evaluated by plotting the receiver operating characteristic curve and calculating the area under the curve (AUC), accuracy, sensitivity, and specificity. Calibration curves and decision curves were drawn to assess model accuracy and clinical benefit.

RESULTS

In the test cohort, the diagnostic efficacies of the models combining the intra- and peritumoral regions surpassed that of the intratumoral alone: AUC of 0.981 with IntraPeri-DL vs. 0.632 with Intra-DL; and 0.712 with IntraPeri-Rad vs. 0.608 with Intra-Rad model. Among the four models, the IntraPeri-DL model demonstrated the best predictive performance using the Delong test (AUC = 0.981, accuracy = 0.937, sensitivity = 0.895, specificity = 0.955) (P < 0.001 for all). Calibration curves and decision curves indicated that the IntraPeri-DL model had good calibration ability and clinical applicability.

CONCLUSION

The DL model uses multi-parameters of DECT images of both intra- and peritumoral regions of BCa represents a non-invasive and effective tool for the preoperative assessment of its muscle invasion status.

CLINICAL RELEVANCE/APPLICATION

BCa is a prevalent malignant tumor of the urinary tract, ranking as the fourth most common cancer among men. It is classified into two types based on infiltrative characteristics: NMIBC and MIBC, each requiring distinct clinical management strategies. Accurate assessment of muscle invasion in BCa is vital for developing personalized treatment approaches.

M5A-SPGU-5 CAPTAIN RANDOMIZED CONTROLLED TRIAL OF MRI-GUIDED TRANSURETHRAL ULTRASOUND ABLATION (TULSA) VERSUS ROBOTIC RADICAL PROSTATECTOMY: INITIAL PERIOPERATIVE OUTCOMES

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Naveen Kella (*Abstract Co-Author*)
Rahul Mehan (*Abstract Co-Author*)
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PURPOSE

Randomized controlled trials (RCTs) comparing ablation to standard therapy for prostate cancer (PCa) have failed to recruit due to poor equipoise or acceptance of randomization. The CAPTAIN RCT (NCT05027477) compares TULSA to robotic radical prostatectomy (RP) in 201 men with localized, intermediate-risk PCa. Allocation is 2:1 TULSA:RP. Primary endpoints are the proportion of men preserving pad-free urinary continence and erections sufficient for penetration, and freedom from salvage treatment. Initial perioperative outcomes and return to baseline activity are compared here.

METHODS AND MATERIALS

Patients were randomized balancing key covariates. Full eligibility included intraprostatic calcifications =3 mm through-plane on CT, SW-MRI or FFE-MRI. RP was performed per local standard of care; TULSA ablation plans were subtotal to whole-gland ablation. Hospitalization, blood loss, and 30-day patient diaries (EQ-5D-5L, NRS pain score) were collected.

RESULTS

Recruitment opened in Jan 2022 expanding to 23 sites. By Jan 2025, 201 patients were randomized, with 174 treated or scheduled (69% TULSA, 31% RP). For TULSA vs RP, median (IQR) age was 63 (58-68) vs 64 (59-68) y, proportions with PSA =10ng/mL were 77% vs 74% and 23% vs 26% with PSA>10ng/mL (p=0.90). Proportions of TULSA vs RP patients with GG2/3 PCa were 76%/24% vs 78%/22% (p=0.72). On baseline imaging for TULSA vs RP, gland volume was 41 (31-50) cc vs 35 (29-47) cc (p=0.10). Intraprostatic calcifications were absent/=3mm/>3mm in 63%/18%/17% vs 65%/22%/11% (all p>0.05). There was significantly less intraprocedural blood loss [0 (0-0) vs 100 (100-200) mL] and shorter stay [0.29 (0.27-0.32) vs 1.24 (1.12-1.36) d] after TULSA (both p<0.001). Patients reported significantly less decline in overall health on the EQ-5D 0-100 visual analog scale after TULSA vs RP for all 30 days, lower 0-10 NRS pain to 6 d, and greater ability performing usual activities to 9 d. Significantly fewer patients reported extreme problem/inability after TULSA vs. RP over the first month for mobility (0% vs 12%), self-care (2.8% vs 17%), and usual activities (17% vs 40%). Top-recruiting sites developed pre-screening workflows, fostered equipoised discussion, and offered CAPTAIN to patients seeking RP.

CONCLUSION

Initial CAPTAIN perioperative outcomes demonstrate that TULSA had no blood loss and no overnight stay, along with reduced post-procedure pain, and more rapid recovery to baseline activities and overall health compared with RP.

CLINICAL RELEVANCE/APPLICATION

CAPTAIN is the first RCT of ablative vs radical treatment for PCa to successfully recruit to target. Initial outcomes demonstrate that TULSA had no blood loss and no overnight stay, reduced pain, and more rapid recovery to baseline activities of daily life.

M5A-SPGU-6 DEVELOPMENT AND EXTERNAL VALIDATION OF A DEEP LEARNING MODEL FOR DETECTING CLINICALLY SIGNIFICANT PROSTATE CANCER ON BIPARAMETRIC MRI USING A LARGE-SCALE MULTI-CENTER DATASET

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Hirotsugu Nakai, MD (*Abstract Co-Author*)
Ayumu Kido (*Abstract Co-Author*)
Kotaro Yoshida, MD (*Abstract Co-Author*)
Adam T. Froemming, MD (*Abstract Co-Author*)
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Naoki Takahashi, MD (*Abstract Co-Author*)

PURPOSE

To develop a deep learning (DL) model for detecting clinically significant prostate cancer (csPCa) using a large-scale biparametric MRI dataset and to validate its performance on an external test set.

METHODS AND MATERIALS

This multi-center retrospective study included 13,739 MRI exams (12,041 patients) performed in patients without history of csPCa between 1/2017 and 7/2023 as the training set, and 1,344 exams (1,344 patients) performed between 8/2023 and 12/2023 as the internal test set. The dataset included pathology proven exams and PI-RADS 1-2 exams without pathology as negative cases. Exams with severe metal artifacts were excluded. The publicly available PI-CAI challenge dataset (1,488 exams) was used as an external test set. A DL-based Image model was developed using nnU-Net on 7,413 exams from the training set (2413 exams with csPCa and manually

placed ROIs). A clinical model was developed using neural net on all cases in the training set with age, PSA, PSA density, and transition zone-PSA density. Image+Clinical model combined outputs from Image and Clinical models. Patient-level performance was evaluated using area under the receiver operating characteristic (AUROC). For the internal test set, the model's performance was compared with that of radiologists using DeLong test. Lesion-level performance was evaluated using free-response receiver operating characteristic (FROC) on 766 exams (217 csPCa) from the external test set.

RESULTS

For the internal test set, AUROC for Image model, Image+Clinical model, and radiologists were 0.89, 0.91, and 0.90 ($p=0.54$ for Image model vs. radiologists and $p=0.25$ for Image+Clinical model vs. radiologists), respectively, when cases with PI-RADS 1-2 without pathology were included, and 0.84, 0.86, and 0.77 (both $p < 0.001$) for pathology proven cases. For the external test set, AUROC for the Image model and Image+Clinical model were 0.86 and 0.88, respectively. Lesion-level sensitivities at false positive levels of 0.1, 0.5, 1, 1.5, and 2 lesions per patient were 56.6%, 81.6%, 85.1%, 87.0%, and 88.2%, respectively, on the external test set.

CONCLUSION

DL-based Image+Clinical model demonstrated excellent performance in detecting csPCa in both internal and external test sets, outperforming radiologists in pathology proven cases on the internal test set.

CLINICAL RELEVANCE/APPLICATION

DL model could serve as an objective, reproducible tool to assist radiologists in detecting csPCa on biparametric MRI, potentially improving workflow efficiency and standardizing interpretation. The integration of clinical parameters with imaging enhances diagnostic accuracy beyond visual assessment alone.

M5A-SPGU-7 CAN ERECTILE DYSFUNCTION BE EVALUATED BY THE USE OF ULTRASOUND IMAGING WITHOUT AN INTRACAVERNOSAL INJECTION OF A VASOACTIVE AGENT?

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Priscilla Machado, MD (*Abstract Co-Author*)
Ji-Bin Liu, MD (*Abstract Co-Author*)
Saatvik Kambhampati (*Abstract Co-Author*)
Aaron Hochberg (*Abstract Co-Author*)
Paul H. Chung, MD (*Abstract Co-Author*)

PURPOSE

Erectile dysfunction (ED) is a highly prevalent condition that affects approximately 30 million men in the United States. Penile duplex ultrasound (DUS) has long been considered standard of care, recent advances in ultrasound technology warrant investigation. Superb microvascular imaging (SMI) is a microvascular flow imaging mode represented as a color overlay image or as a grayscale map of flow, named cSMI and mSMI, respectively. Shear wave elastography (SWE) is a technique to measure tissue stiffness. This study investigated the use of cSMI, mSMI and SWE as novel techniques for evaluating ED in subjects undergoing penile DUS.

METHODS AND MATERIALS

To date 36 adult male subjects with clinical ED were enrolled in this ongoing, IRB approved study. Subjects underwent spectral Doppler, cSMI, mSMI and SWE examination of the right and left sides of the penis before and after an ICI of a vasoactive agent (i.e., Tri-mix which is a compounded alprostadil, phentolamine, and papaverine) using an Aplio i800 ultrasound system (Canon Medical Systems USA) equipped with an i18LX5 linear probe. The spectral Doppler data analyzed was peak systolic (PS) velocities and resistance index (RI) values, which is used clinically to evaluate arterial penile flow with the PS values expressed in cm/s and venous penile flow assessed with RI values. The cSMI and mSMI images were analyzed by pixel count using ImageJ (NIH). The SWE values were obtained in kPa. The data was analyzed by comparing pre injection (flaccid penis) and post injection (erect penis) images for all modalities using paired t-tests.

RESULTS

Mean age of subjects was 50 years (range: 23 -78). The mean IIEF score was 11 (range: 3-22; lower values indicate more severe ED). The mean spectral Doppler PSV ± SD were 22.39 ± 9.68 cm/s pre injection and 40.26 ± 16.82 cm/s post injection ($p < 0.0001$), mean RI ± SD were 0.94 ± 0.13 pre injection and 0.88 ± 0.10 post injection ($p = 0.008$). The mean cSMI pixel counts ± SD were 99.64 ± 6.64 pre injection and 101.10 ± 6.14 post injection ($p = 0.69$). The mean mSMI pixel counts ± SD were 124.10 ± 3.72 pre injection and 124.0 ± 3.67 post injection ($p = 0.89$). The mean SWE ± SD were 43.26 ± 22.36 kPa pre injection and 34.24 ± 21.02 kPa post injection ($p = 0.07$).

CONCLUSION

The cSMI, mSMI and SWE imaging modes may be able to identify characteristics consistent with ED in the flaccid penis facilitating clinical practice for providers and improving patient experience.

CLINICAL RELEVANCE/APPLICATION

The sensitive nature of ED and the intimate process of penile DUS makes for a less than ideal patient experience. SMI and SWE may be able identify penile characteristics consistent for ED in the flaccid penis facilitating clinical practice for providers and improve the patient experience.

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M5A-SPHN

Head & Neck Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPHN-1 AUTOMATIC COCHLEAR MORPHOMETRY: INTRAINDIVIDUAL COMPARISON OF FULL-DOSE HEAD CT AND LOW-DOSE IMAGING ALTERNATIVES

Jan P. Grunz, MD (*Presenter*)
Henner Huflage, MD (*Abstract Co-Author*)
Andreas Kunz, MD (*Abstract Co-Author*)

PURPOSE

In cochlear implantation, precise estimation of cochlear duct length (CDL) is essential for individualized electrode carrier selection to provide stimulation of all crucial frequency bands. Besides full-dose head CT, the cochlea is also assessable in examinations with lower radiation dose, which are performed additively in different clinical scenarios. This study provides a comparison of CDL measurements based on full-dose head CT versus low-dose cervical spine, carotid artery, and paranasal sinus imaging. The aim was to analyze how radiation dose affects automatic cochlear morphometry.

METHODS AND MATERIALS

In this retrospective investigation, a total of 459 patients (mean age, 70.7 ± 17.8 [SD] years, 240 women) underwent automatic CDL measurements based on full-dose head CT (120 kVp). Additional cochlear morphometry was performed in these individuals based on cervical spine (Sn 150 kVp, 293 patients), carotid artery (100 kVp, 133 patients), or paranasal sinus imaging (Sn 100 kVp, 33 patients). Contrast-to-noise ratios (CNR) were calculated based on standardized measurements in bone and subcutaneous fat tissue. Wilcoxon signed rank and Kruskal-Wallis tests were employed for intraindividual and interindividual radiation dose, CDL, and CNR comparisons.

RESULTS

Full-dose head CT (median 52.9 [49.2-56.8] mGy) was associated with a higher volume CT dose index than cervical spine (16.3 [15.6-16.9] mGy), carotid artery (8.4 [8.2-8.7] mGy), and paranasal sinus CT (fixed dose 5.0 mGy; all P <.001). CNR was highest in full-dose head scans (24.3 [21.4-27.1]). Among the other scan protocols, cervical spine CT (8.6 [8.2-8.9]) was associated with higher CNR than paranasal sinus (6.6 [5.7-7.4]) and carotid artery scans (3.8 [3.7-4.0]; all P <.001). No significant CDL difference was ascertained for head versus cervical spine (35.4 versus 35.5 mm; P =.371) and head versus paranasal sinus CT (34.9 versus 35.0 mm; P =.112), whereas the cochlear duct was measured to be slightly shorter in the carotid artery angiography sample (35.6 versus 35.4 mm; P <.001).

CONCLUSION

Despite lower CNR, automatic CDL measurements based on CT imaging of the cervical spine, carotid artery, and paranasal sinus yield comparable results to full-dose head CT. This suggests potential for considerable dose reduction in cochlear morphometry without decreasing measurement accuracy.

CLINICAL RELEVANCE/APPLICATION

In radiation-sensitive patients, such as children, automatic preoperative CDL measurements can be reliably performed based on different low-dose CT examinations depicting the temporal bone.

M5A-SPHN-2 EXPLAINABLE MACHINE LEARNING ON MULTI-SEQUENCE MRI FOR TREATMENT ALLOCATION IN HYPOPHARYNGEAL CANCER: A MULTICENTRE RETROSPECTIVE COMPARATIVE STUDY

Cheyu Hsu, MD, MS (*Presenter*)
Rou-Yi Chen, MSc (*Abstract Co-Author*)
Sung-Hsin Kuo, MD, PhD (*Abstract Co-Author*)
Hsin-Han Tsai (*Abstract Co-Author*)
Po-Ting Chen, MD (*Abstract Co-Author*)
Kao-Lang Liu, MD (*Abstract Co-Author*)
Weichung Wang, PhD (*Abstract Co-Author*)

PURPOSE

Predicting treatment response is essential for selecting optimal therapy—total laryngectomy (TL) or concurrent chemoradiotherapy (CCRT)—in patients with hypopharyngeal squamous cell carcinoma (HPSCC). We developed and validated a machine learning-based radiomics model using pre-treatment MRI to predict response to CCRT and guide treatment in patients with HPSCC.

METHODS AND MATERIALS

This retrospective study analysed patients with HPSCC from three institutions between January 2004-December 2022. Radiomic features from tumor and peritumoral regions on multi-sequence MRI were combined with clinical factors to create a clinico-radiomic model. A Light Gradient Boosting Machine learning model was trained with nested cross-validation generated radiomic signatures, which were externally validated. Model-derived risk categories were compared to outcomes between TL and CCRT cohorts.

RESULTS

The study included 613 patients (mean age, 56.1 ± 9.83 years; 592 men), divided into discovery (CCRT) (N = 334), validation (CCRT) (N = 121), and comparison (TL) (N = 158) cohorts. The clinico-radiomic model achieved area under the curve values of 0.88 and 0.85 for predicting CCRT response in the discovery and validation cohorts, respectively. Risk stratification revealed significant differences in survival outcomes. High-risk patients benefited from TL over CCRT (5-year disease-free survival: 34% vs. 12%; overall survival [OS]: 42% vs. 24%), while low-risk patients had comparable outcomes across treatments. The model-guided protocol (TL for high-risk, CCRT for low-risk) improved 5-year OS by 11%.

CONCLUSION

The clinico-radiomic model accurately predicted CCRT response and helped stratify patients with HPSCC into risk groups, enabling personalized treatment allocation.

CLINICAL RELEVANCE/APPLICATION

Our study presents a significant advancement in the field of hypopharyngeal squamous cell carcinoma (HPSCC) by introducing a explainable, machine learning-based radiomics model validated across multiple centers. This model demonstrated high predictive accuracy in forecasting the response to concurrent chemoradiotherapy (CCRT) and effectively stratified patients into high- and low-risk groups, thereby guiding personalized treatment decisions.

M5A-SPHN-3 EFFICACY AND SAFETY OF ETHANOL ABLATION FOR BRANCHIAL CLEFT CYST: A RETROSPECTIVE COHORT STUDY

Eun Ju Ha, MD (*Presenter*)

PURPOSE

To evaluate the efficacy, safety and factors influencing the treatment response to ultrasonography (US)-guided ethanol ablation (EA) in patients with branchial cleft cysts (BCCs).

METHODS AND MATERIALS

Between February 2009 and December 2023, 74 patients with second BCCs who either refused surgery or were ineligible for it underwent EA. After excluding 17 patients lost to follow-up, a total of 57 patients were included in this study. All index masses were confirmed as benign through fine-needle aspiration cytology prior to treatment. Under US guidance, EA was performed by aspiration of the internal cystic contents, followed by saline irrigation, and injection of 99% ethanol into the lesion. The therapeutic outcome- including volume reduction ratio, therapeutic success rate, and complications- was evaluated. Factors influencing the treatment response were analyzed based on nodule and treatment characteristics.

RESULTS

The mean initial volume of the cysts was 24.8 ± 19.6 mL (range, 2.0-96.5 mL). Before EA, the mean symptomatic and cosmetic scores were 5.8 ± 3.3 (0 - 10) and 3.6 ± 0.8 (1-4), respectively. Following EA, with a mean of 1.6 ± 1.0 treatment sessions, the mean cyst volume significantly decreased to 0.7 ± 1.1 mL (range, 0.0-3.5 mL), corresponding to a mean volume reduction ratio of 98.1 ± 1.8% (range, 94.3%-100.0%) ($P < .001$) at the last follow-up. Therapeutic success was achieved in all nodules (54/54, 100%), with significant improvements in both symptomatic ($P < .001$) and cosmetic ($P < .001$) scores by the last follow-up. The initial volume was a key factor associated with treatment response to EA for BCCs, with an area under the receiver operating characteristic curve of 0.71 using a cutoff value of 25.8 mL. Intracystic hemorrhage occurred in one patient during the EA.

CONCLUSION

EA is an effective treatment for patients with BCCs who refuse surgery or are ineligible for it. While an initial volume < 25.8 mL is crucial for achieving therapeutic success after a single treatment, multiple treatment sessions can lead to therapeutic success in all patients.

CLINICAL RELEVANCE/APPLICATION

EA is a safe and effective treatment for patients with BCCs, especially those who refuse or are ineligible for surgery. Initial cystic volume predicts the therapeutic success after a single treatment.

M5A-SPHN-5 DEEP LEARNING RECONSTRUCTION FOR ACCELERATED T1WI AND T2WI DIXON SEQUENCES IN HEAD AND NECK TUMORS

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Yu Chen, MD (*Abstract Co-Author*)
Yun Wang (*Abstract Co-Author*)
Zhuhua Zhang (*Abstract Co-Author*)
Tong Su, MD (*Abstract Co-Author*)
Zhentan Xu (*Abstract Co-Author*)
Haihong Fu, MD (*Abstract Co-Author*)
Huadan Xue, MD (*Abstract Co-Author*)

PURPOSE

To investigate the impact of deep learning (DL)-reconstructed T1WI and T2WI_Dixon sequences in acquisition time, image quality and diagnostic performance compared with conventional MRI in patients with head and neck tumors.

METHODS AND MATERIALS

Eighty patients who clinically diagnosed with head and neck tumors and underwent neck MRI in our hospital were prospectively collected. Each patient underwent two MRI examinations: conventional sequences included T1WI, T2WI_Dixon (in phase, water, and fat), and DL-reconstructed sequences included DL-T1WI, DL-T2WI_Dixon (in phase, water, and fat). Subjective image quality evaluation used a 5-point scale to score the sharpness, artifacts, overall image quality and diagnostic confidence. Objective image quality was assessed by calculation of the SNR of muscle, fat, tumor and CNR of tumor by one experienced radiologist. The interchangeability of DL-reconstructed sequences and conventional sequences for detection of an abnormality were assessed.

RESULTS

Compared to conventional T1WI sequence, DL-T1WI sequence reduced the scanning time by 46% (conventional: 164 s vs DL: 89 s); compared to conventional T2WI_Dixon sequence, DL-T2WI_Dixon sequence reduced the scanning time by 47% (conventional: 188 s vs DL: 101 s). Sharpness, artifacts, overall image quality and diagnostic confidence were significantly better for DL-reconstructed than for the conventional sequences (DL-T1WI: 4.8±0.9 vs. T1WI: 4.2±1.1, DL-T2WI_Dixon: 4.7±0.7 vs. T2WI_Dixon: 4.0±1.2, all $p<0.001$). There were no statistically significant differences in SNR of muscle, fat, tumor and CNR of tumor between conventional and DL-reconstructed sequences (all $p > 0.05$). The DL-reconstructed sequences and conventional sequences were clinical interchangeable for detection of abnormalities.

CONCLUSION

DL accelerated T1WI and T2WI_Dixon sequences shortened scanning time, improved subjective image quality, maintained good objective image quality and was diagnostic interchangeable with conventional sequences.

CLINICAL RELEVANCE/APPLICATION

With a 47% reduction in examination time, DL accelerated T1WI and T2WI_Dixon sequences could remain excellent image quality and diagnostic performance. Therefore, DL accelerated technique improved the clinical application efficiency and extended the clinical application range in head and neck tumors.

M5A-SPHN-6 PERILESIONAL DOMINANCE: RADIOMICS OF MULTIPARAMETRIC MRI ENHANCES DIFFERENTIATION OF IGG4-RELATED OPHTHALMIC DISEASE AND ORBITAL MALT LYMPHOMA

Jie Li (*Presenter*)
Qinghe Han (*Abstract Co-Author*)

PURPOSE

To develop and validate a diagnostic framework integrating intralesional (ILN) and perilesional (PLN) radiomics derived from multiparametric MRI (mpMRI) for distinguishing IgG4-related ophthalmic disease (IgG4-ROD) from orbital mucosa-associated lymphoid tissue (MALT) lymphoma.

METHODS AND MATERIALS

This multicenter retrospective study analyzed 214 histopathologically confirmed cases (68 IgG4-ROD, 146 MALT lymphoma) from two institutions (2019-2024). A LASSO-SVM classifier was optimized through comparative evaluation of seven machine learning models, incorporating fused radiomic features (1,197 features) from ILN/PLN regions. Diagnostic performance was benchmarked against two subspecialty radiologists (10-20 years' experience) using receiver operating characteristics - area under the curve (AUC) and decision curve analysis (DCA), adhering to CLEAR/METRICS guidelines.

RESULTS

The fusion model (FR_RAD) achieved state-of-the-art performance: training AUC = 0.927 (95% CI 0.902-0.958), external testing AUC = 0.907 (0.857-0.965). Subspecialty radiologists demonstrated lower diagnostic performance, with Radiologist 1 achieving an AUC of 0.671 (95% CI 0.630-0.710) and Radiologist 2 an AUC of 0.740 (95% CI 0.700-0.780), both significantly lower than the model ($p < 0.001$). In terms of accuracy, FR_RAD outperformed Radiologists 1 and 2 by 36.4% (90.0% vs. 66.2%) and 26.8% (90.0% vs. 71.3%), respectively ($p < 0.01$). DCA demonstrated a net benefit of 0.18 at a high-risk threshold of 30%, equivalent to avoiding 18 unnecessary biopsies per 100 cases.

CONCLUSION

The fusion model integrating multi-regional radiomics from mpMRI achieves precise differentiation between IgG4-ROD and orbital MALT lymphoma, outperforming subspecialty radiologists.

CLINICAL RELEVANCE/APPLICATION

This study establishes a clinically validated radiomics framework that non-invasively differentiates IgG4-related ophthalmic disease from orbital MALT lymphoma with high accuracy, outperforming conventional MRI and radiologists' assessments. By integrating intralesional and perilesional radiomics from multiparametric MRI, the model reduces diagnostic uncertainty, supports early treatment initiation, and decreases the need for invasive biopsies in a high-risk anatomical area. Its high sensitivity and specificity enable timely initiation of appropriate therapies, potentially improving patient outcomes and reducing complications. The framework also provides objective, quantitative data to support multidisciplinary decision-making and offers a tool for monitoring treatment response and disease progression, advancing precision medicine in ophthalmology.

M5A-SPHN-7 PREOPERATIVE PREDICTION OF LYMPH NODE METASTASIS IN PAPILLARY THYROID CARCINOMA USING DUAL-ENERGY CT IODINE MAPS COMBINED WITH MORPHOLOGICAL FEATURES

Bo Gao, MD (*Presenter*)
Bo Gao, MD (*Abstract Co-Author*)
Haiqiao Sun (*Abstract Co-Author*)
Huizhi Mi (*Abstract Co-Author*)
Jingbin ZHANG (*Abstract Co-Author*)
Xiaohui Li (*Abstract Co-Author*)
Jiaxing Wu (*Abstract Co-Author*)
Jing Fan Zhang (*Abstract Co-Author*)
Wei Guo Xu (*Abstract Co-Author*)

PURPOSE

To evaluate the predictive value of dual-energy computed tomography (DECT) iodine quantification combined with lymph node morphological characteristics for identifying metastatic lymph nodes in patients with papillary thyroid carcinoma (PTC).

METHODS AND MATERIALS

This retrospective study included 75 histologically confirmed PTC patients who underwent DECT between 2021 and 2023 as an internal validation cohort, and 47 patients from 2023 to 2024 as an external validation cohort. Univariate and multivariate logistic regression analyses were performed to identify independent predictors of lymph node metastasis. A predictive model was constructed based on these variables and validated both internally and externally.

RESULTS

Multivariate analysis identified arterial phase iodine concentration (= 2.6 mg/mL), marked arterial enhancement, heterogeneous enhancement pattern, irregular shape, indistinct margins, and incomplete capsule of the primary thyroid nodule as independent predictors of lymph nodes metastasis. A nomogram integrating DECT- derived iodine metrics and morphological features was developed. In the internal validation cohort, the model achieved an area under the curve (AUC) of 0.992 (95% CI: 0.956-0.984), with a cutoff value of 0.2, sensitivity of 98%, and specificity of 95%. In the external validation cohort, the AUC was 0.950 (95% CI: 0.893-0.884), with a cutoff value of 0.486, sensitivity of 89%, and specificity of 88%.

CONCLUSION

A predictive model combining DECT iodine concentration with CT-based morphological features provides high diagnostic accuracy for preoperative identification of metastasis lymph nodes in patients with PTC.

CLINICAL RELEVANCE/APPLICATION

This non-invasive approach offers a valuable tool to assist clinicians in preoperative surgical planning, enabling more personalized treatment strategies for patients with papillary thyroid carcinoma.

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M5A-SPIN

Imaging Informatics Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPIN-1 A MULTIMODAL MACHINE LEARNING FRAMEWORK FOR COMPREHENSIVE OUTCOMES PREDICTION IN PULMONARY EMBOLISM

Chenhao Lyu (*Presenter*)
Yuli Wang (*Abstract Co-Author*)
Harrison X. Bai, MD (*Abstract Co-Author*)
Zhusi Zhong (*Abstract Co-Author*)
Ihab R. Kamel, MD, PhD (*Abstract Co-Author*)
Zhicheng Jiao (*Abstract Co-Author*)
Cheng Ting Lin, MD (*Abstract Co-Author*)
Jing Wu (*Abstract Co-Author*)

PURPOSE

To develop and validate a multimodal machine learning framework that integrates imaging, textual, and clinical data to predict key outcomes in patients with pulmonary embolism (PE).

METHODS AND MATERIALS

Data were collected from two institutions, each including 11 PESI-related clinical variables, two medical therapies, CTPA scans, initial clinical notes, radiology reports, and echocardiography reports. Institution 1's dataset comprised 1,422 patients with acute PE, identified through automated radiology report analysis using Llama 3.3. This dataset was randomly split 80:20 for training and internal testing. Text embeddings were generated from reports using the Gatortron-base model, while image embeddings were extracted from CTPA scans using a 3D ResNet-50 model. These were combined with structured clinical variables and fed into an XGBoost classifier. Institution 2's dataset, comprising 85 patients, served as an external validation cohort.

RESULTS

The multimodal model demonstrated strong predictive performance across all endpoints in the internal test cohort from Institution 1. For mortality prediction, the model achieved an AUC of 0.873, with 82.8% accuracy and a C-index of 0.832. ICU admission prediction showed comparable performance with an AUC of 0.873, accuracy of 77.5%, and C-index of 0.874. Notably, prediction of chronic thromboembolic pulmonary hypertension (CTEPH) achieved an AUC of 0.928, an accuracy at 98.9%, and a C-index of 0.924. Pulmonary hypertension prediction also performed well, with an AUC of 0.811, accuracy of 81.1%, and C-index of 0.780. In the external validation cohort from Institution 2, the model maintained high performance, achieving an AUC of 0.772 with 98.8% accuracy for CTEPH, and an AUC of 0.983 with 96.5% accuracy for pulmonary hypertension.

CONCLUSION

This multimodal machine learning framework demonstrated robust and generalizable predictive performance across multiple PE-related outcomes by integrating imaging, textual, and structured clinical data.

CLINICAL RELEVANCE/APPLICATION

By enabling precise, real-time risk stratification, this AI system has the potential to enhance clinical decision-making and resource allocation in PE care, with seamless integration into radiology workflows and electronic medical records.

M5A-SPIN-2 EXPLORING MULTIMODAL DATA FUSION APPROACHES IN RADIOLOGY: AN EXAMPLE IN PREDICTION OF POST-SURGICAL MARGIN STATUS IN SOFT TISSUE SARCOMA

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PURPOSE

Multimodal deep learning holds significant potential for enhancing model performance and improving disease outcome prediction by integrating data from diverse sources, including imaging, electronic health records (EHR), genomics, and more. Incorporating heterogeneous data types into a unified deep learning model presents challenges, as each modality often requires distinct modeling strategies that may not be compatible. The process of integrating diverse data types is referred to as "data fusion," and several approaches—namely early, intermediate, and late fusion—have been proposed. These methods differ based on the stage at which data from different modalities are combined and the extent of modality-specific processing that occurs prior to integration. Here, we investigate these data fusion techniques (Figure 1) for combining longitudinal MRI with clinical data to predict post-surgical margin status in patients with soft tissue sarcoma (STS). Post-surgical margin status is an important prognostic factor for recurrence in many cancers, including STS, and accurate preoperative risk stratification could play a key role in improving patient outcomes.

METHODS AND MATERIALS

We conducted a retrospective analysis of 202 patients diagnosed with primary STS who received neoadjuvant radiotherapy followed by surgical resection. To predict clinical outcomes, we developed a deep learning framework that integrated clinical, pathological, and imaging data using various data fusion strategies. Deep learning model performance was evaluated based on AUROC, sensitivity, and specificity on the hold-out test set.

RESULTS

The intermediate fusion approach demonstrated the best performance, achieving an AUROC of 0.82 (0.61 - 1.0) on the longitudinal test set, reaching a sensitivity of 67% and specificity of 78%, surpassing the performance of unimodal models. This was followed by the early fusion model that achieved an AUROC of 0.79 (0.62 - 0.97) on the test set. The late fusion approach achieved the lowest performance among all fusion strategies.

CONCLUSION

We demonstrated that the choice of data fusion approach in multimodal deep learning has a substantial impact on the overall predictive performance of the model. Our findings underscore the importance of exploring multiple fusion approaches when working with multimodal data, including imaging. Our model can be used to stratify patients based on their risk of having a positive post-surgical margin and potentially improve care.

CLINICAL RELEVANCE/APPLICATION

Post-surgical margin status is one of the strongest predictors of local recurrence in STS. Utilizing multimodal patient data to identify patients at a high-risk for positive margins has the potential to improve care and prevent negative outcomes.

M5A-SPIN-3 GROUNDING TECHNIQUES TO ENSURE TRACEABILITY AND IDENTIFY HALLUCINATIONS IN LLM GENERATED IMPRESSIONS

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PURPOSE

In the impression section of the radiology report, the reading radiologist summarizes important findings for prioritized communication to the referring physician. Using large language models (LLM), researchers and industrial partners have sought to auto-generate impressions from the findings, with recent work displaying expert-level performance in completeness, correctness, and conciseness. Nevertheless, it is well known that LLM sometimes hallucinate. The referring physician may look up the source of the summarized impressions to find additional details. Traceability saves time by providing links to the source. Hence, whether the content is written by a radiologist or an LLM, there is a strong need for traceability. The studies on traceability of source text remains less explored. Recent studies suggest using LLM based prompting technique to extract the source text for summaries. However, we argue that LLM based grounding techniques are less efficient than traditional lexical techniques and show that an ensemble aids in improving the accuracy of grounding techniques. Here, we compare grounding methods which automatically 1) identify source material from the finding and 2) detect hallucinations, that is, impressions which are not generated from the findings.

METHODS AND MATERIALS

We use three open-source radiology report datasets: MIMIC, CARES and OpenI. truth mapping from original impression to source is established and then reviewed by clinical experts. LLM is used to produce an artificial impression. Mapping is performed as with the original, but also hallucinations are identified as needed. We compare 3 techniques a) text match b) fuzzy matching and c) LLM based matching for grounding and evaluate the significance of each method and compare against their ensemble. We use LLM based techniques for hallucination detection. We compare two LLMs, the one with smaller number of model parameters and one with the larger number of model parameters to present the performance of varying sized LLMs for traceability and hallucination detection in clinical text content.

RESULTS

Text match can identify mapping for 80%, fuzzy matching for 90% and LLM with 5% additional for the impressions. Hallucinations are detected at an AUC of 90%.

CONCLUSION

Traditional techniques in combination with LLM based techniques are able to better achieve grounding and hallucination detection compared to any single technique.

CLINICAL RELEVANCE/APPLICATION

As GenAI and LLM's are incorporated more and more into clinical practice, guardrails are required to ensure quality of care is not impacted. Automated approaches with high accuracy have the potential to retain the time-savings of automatically generated impressions while ensuring that hallucinations are minimized.

M5A-SPIN-4 SHOW ME THE MONEY: EVALUATING UTILIZATION OF AI/ML-ENABLED MEDICAL DEVICES USING NATIONAL MEDICARE CLAIMS DATA

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PURPOSE

Artificial intelligence (AI) and machine learning (ML) continue to transform clinical practice. As of March 2025, the FDA has approved 1,016 AI/ML-enabled medical devices, 77% in radiology. These tools promise to improve diagnostic accuracy, reduce clinical workload, and expand access to care. However, real-world adoption of these tools is low due to lack of perceived value. Using Medicare Claims Data, we evaluate utilization of AI devices by analyzing claims and amount paid out for these tools.

METHODS AND MATERIALS

Using the 2024 AMA CPT code set, we identified CPT codes linked to FDA approved AI/ML devices. Medicare claims data from 2018-2023 were extracted from CMS datasets. For each CPT code, we extracted the associated clinical specialty, total claims, and Medicare reimbursement. Trends in utilization and Medicare spending were analyzed over time and by specialty.

RESULTS

Eighteen distinct AI-related CPT codes were identified, with radiology comprising 50% of the codes, followed by cardiology (17%), and other specialties. 95,290 claims were submitted for AI-enabled services between 2018 and 2023, accounting for $7.4 million in Medicare spending. AI utilization rose sharply over this period. Annual spending on AI-related services increased from $31,261.58 in 2018 to $4.18 million in 2023, a >130-fold increase. Radiology led this growth, expanding from $31,000 to over $4.1 million annually, accounting for the majority of AI reimbursement. Despite overall growth, subspecialty adoption varied widely. A few CPT codes, such as those used in cardiac imaging and ophthalmologic screening, contributed most claims. In contrast, multiple AI-enabled procedures for genetics and oncology had little or no reported usage. Spending also varied by geography, with the top 5 regions including Manhattan, NY; Fort Lauderdale, FL; NYC Suburbs, NY; NC; and Santa Clara, CA.

CONCLUSION

AI/ML-enabled medical devices are increasingly represented in Medicare claims, with exponential growth driven largely by radiology. There is a disparity between regulatory approval and clinical adoption demonstrated by spending concentrated in a few procedures, while many FDA-cleared tools show little real-world use. These findings highlight a growing but uneven integration of AI into routine care, emphasizing the need for continued evaluation of implementation, reimbursement, and equity in access.

CLINICAL RELEVANCE/APPLICATION

Understanding billing trends regarding AI-enabled services provides critical insight into the real-world use and adoption gaps of medical AI. These findings inform stakeholders about which AI tools are gaining traction, where clinical gaps remain, and how resource allocation and reimbursement policies may influence adoption across specialties.

M5A-SPIN-5 THE SHARED GENETIC ARCHITECTURE BETWEEN SCHIZOPHRENIA AND CARDIAC MAGNETIC RESONANCE IMAGING PHENOTYPES

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PURPOSE

Schizophrenia (SCZ) is a complex psychiatric disorder often accompanied by systemic physiological abnormalities, including cardiac dysfunction. Cardiac magnetic resonance imaging (CMR) provides detailed markers of cardiac structure and function, enabling investigations into cross-system biological links. However, the shared genetic architecture between SCZ and cardiac imaging traits remains largely unknown. This study aims to explore the common genetic underpinnings connecting SCZ and CMR phenotypes.

METHODS AND MATERIALS

We leveraged European ancestry GWAS summary statistics for SCZ (53,386 cases and 77,258 controls) and 28 CMR phenotypes (n=31,875) with six categories (ascending aorta [AAo], descending aorta [DAo], left ventricle [LV], right ventricle [RV], left atrium [LA], and right atrium [RA]). Pleiotropic SNPs were identified using Pleiotropic analysis under composite null hypothesis (PLACO), with significance defined at P PLACO < 1×10?6. Independent SNPs were determined via LD clumping 250kb, $r^2 < 0.1$). FUMA was used to perform the SNP-level annotations for these pleiotropic SNPs, using Combined Annotation Dependent Depletion (CADD) scores, regulomeDB (RDB) scores, and minChrState values. Gene ontology enrichment analysis was conducted via ToppGene.

RESULTS

We found a total of 437 unique significant independent pleiotropic SNPs between SCZ and 28 CMR phenotypes, including 170 pleiotropic SNPs for the left ventricle (LV), 71 SNPs for right ventricle (RV), 48 SNPs left atrium (LA), 70 SNPs for right atrium (RA), 76 SNPs for ascending the aorta (AAo) and 53 SNPs for descending aorta (DAo) (Figure 1). Functional annotations revealed that over 60% of SNPs were intronic, with several exhibiting high CADD and regulatory scores. Enrichment analysis highlighted 44 biological processes, with a strong emphasis on synapse-related functions, suggesting synaptic dysfunction as a shared pathological mechanism linking SCZ and cardiac alterations (Figure 2).

CONCLUSION

Our findings reveal significant genetic overlap between SCZ and cardiac structure/function, particularly implicating synaptic biology. These insights advance understanding of the complex systemic manifestations of SCZ and suggest potential avenues for integrated therapeutic strategies.

CLINICAL RELEVANCE/APPLICATION

This study underscores the importance of incorporating cardiac imaging biomarkers in the comprehensive assessment of individuals with SCZ, revealing that alterations in cardiac structure may be partially driven by shared genetic liabilities. The identification of common genetic pathways suggests the potential utility of cross-disciplinary diagnostic frameworks and highlights novel targets for integrated therapeutic strategies.

M5A-SPIN-6 EARLY RISK ESTIMATION OF PANCREATIC DUCTAL ADENOCARCINOMA USING PRE-DIAGNOSTIC CT IMAGING AND RADIOLOGY REPORTS

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PURPOSE

Pancreatic ductal adenocarcinoma (PDAC) carries high mortality due to late diagnosis. We evaluated deep learning-based risk estimation models that integrate pre-diagnostic CT-derived radiomic and body composition, demographics, and free-text radiology report embeddings to stratify early-stage PDAC risk.

METHODS AND MATERIALS

Pre-diagnostic CT were segmented (pancreas, visceral fat (VF), subcutaneous fat (SF) and skeletal muscle (SM) via TotalSegmentator; total body area (TBA) via a custom script), and segmentation results were manually reviewed. We extracted 104 pancreatic radiomics features (shape, first-order, second-order statistics) with PyRadiomics. Body composition metrics included VF / total fat, VF / (VF + SM), SF / (SF + SM), and VF, SF, and SM were normalized to TBA. Demographics include age, sex, race, and ethnicity. Reports were parsed into Indications, Findings, Impressions, and Pancreas-specific sections; embeddings for each section were generated using Sentence-BERT (all-MiniLM-L6-v2). Fusing all features, our models were trained with the negative partial log-likelihood loss. Performance was assessed by concordance index (C-index), and Kaplan-Meier (KM) curves on internal and external cohorts. KM curves were compared using the log-rank test. Predicted risk scores stratified high (>0) versus low (=0) risk groups.

RESULTS

We retrospectively collected pre-diagnostic abdominal CTs (within 5 yrs) from 2,495 PDAC patients at the XX institute (2011-2023) by referring to our institutional cancer registry. Across cohorts, the mean time to diagnosis was ~58 months with censoring rates of 38% - 43%. Pancreatic PyRadiomics-only model achieved C-indices of 0.65 (95% CI: 0.61-0.68) and 0.59 (95% CI: 0.56-0.62) on internal and external cohorts, respectively. Report-embedding model (Indications + Pancreas) yielded 0.67 (95% CI: 0.63-0.70) and 0.64 (95% CI: 0.60-0.68). Fusion of radiomics and embeddings yielded 0.68 [95% CI: 0.65-0.71] and 0.65 [95% CI: 0.61-0.68]). The full fusion model (radiomics + embeddings + demographics + body composition) achieved the highest C-indices: 0.71 (95% CI: 0.68-0.74) internal and 0.70 (95% CI: 0.66-0.73) external. KM analysis clearly separated low- and high-risk groups ($p < 0.001$).

CONCLUSION

A deep learning fusion approach combining CT pancreatic radiomic, body composition, free-text report embeddings, and demographic features yields robust prognostic performance for pre-diagnostic risk stratification in PDAC.

CLINICAL RELEVANCE/APPLICATION

Incorporating CT and radiology report data into prognostic models may enable earlier identification of high-risk PDAC patients and could support prompt, evidence-based clinical decision-making.

M5A-SPIN-7 USING GENERATIVE SIMULATION TO PREDICT TUMOR RESPONSE FOR TREATMENT

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PURPOSE

To estimate treatment outcomes in HCC patients without follow-up imaging, we simulate post-treatment tumors based on pre-treatment status and treatment plan.

METHODS AND MATERIALS

Accurately predicting TACE response in HCC patients is crucial for optimizing patient selection and improving outcomes, as not all patients benefit equally. To address this, we have developed a generative AI model that simultaneously predicts post-treatment tumor appearance and overall survival using pre-treatment CT scans. Tumors were localized and segmented using a previously validated AI algorithm, nn-UNet. We trained a tumor diffusion model conditioned on the pre-treatment CT volume, treatment plan, and patient demographics to synthesize the post-treatment tumor appearance. A deep prognosis model was then developed to predict treatment outcomes, including viable/non-viable tumor classification and overall survival analysis from the pre-treatment tumor CT and generated post-treatment tumor CT volumes. We curated a dataset of 338 paired pre- and post-treatment CT scans from HCC patients, each accompanied by detailed treatment plans and survival outcomes. Internal validation was conducted on 36 held-out HCC patients, and two external validation cohorts included 47 patients collected independently from another center, and 116 patients from the curated public dataset WAW-TACE, respectively.

RESULTS

The synthesized post-treatment CTs resembled their real counterparts. We achieve a Visual Turing Test specificity of 79.17%, 70.83%, and 75.00% from three board-certified radiologists on the internal validation cohort. Our prognosis model trained on real pre-treatment and post-treatment CT scans achieved a C-index of 0.765 for overall survival analysis, and an accuracy, F1-score of 82.4%, 73.1% for viable/non-viable tumor classification, which was superior to two clinically-validated methods with a C-index of 0.724,0.719, on the internal validation cohort. Also, the model generalized well with marginal performance drops on two external validation cohorts, achieving the C-index of 0.676 and 0.620, better than other methods.

CONCLUSION

We demonstrate the feasibility of synthesizing realistic post-treatment tumor appearances while simultaneously predicting treatment response and overall survival, which can be used to assist physicians in early prognosis assessment.

CLINICAL RELEVANCE/APPLICATION

Post-treatment tumor assessment is a critical step in interventional oncology workflows. We simulate these images ahead of time, offering clinicians an early window into likely treatment responses. This potentially provides an AI framework to help clinicians select the most appropriate locoregional treatment therapies for HCC patients.

M5A-SPIN-8 AUTOMATED AI-BASED AORTIC SEGMENTATION AND MEASUREMENT ON NON-CONTRAST CT: A VALIDATED CONTRAST-FREE ALTERNATIVE TO CTA

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PURPOSE

To develop and validate a fully automated AI pipeline for aortic segmentation and measurement on non-contrast CT, providing a robust, reproducible, and contrast-free alternative to CT angiography (CTA) for clinical assessment and longitudinal follow-up.

METHODS AND MATERIALS

A deep learning workflow based on nnUNet, was trained on 139 paired CTA and CT plain scans from Prince of Wales Hospital. Manual CTA annotation and measurement, following AHA and ESC guidelines, were performed by three residents (1-years) and corrected by cardiologist (20-years). For CT plain, annotation was registered from CTA images with measurements directly taken from the paired CTA. The system performs automated aortic segmentation and PCA-based diameter measurement aligned with AHA/ACC guidelines. Segmentation was evaluated using Dice similarity coefficient (DSC) and intersection over union (IoU). Measurement performance was compared to manual measurement, including commercial software, 1-year readers, and z-axis methods, using intraclass correlation coefficient (ICC), Pearson's r, Mean absolute error (MAE) , and root mean square error (RMSE). Subgroup analyses were conducted across anatomical regions, landing zones, follow-up status (pre- and postoperative), age, and sex to assess robustness. Longitudinal tracking of pre- and post-operative diameter changes was evaluated.

RESULTS

The pipeline achieved excellent segmentation on CT plain scans (DSC 0.98, IoU 0.97), closely matching gold standard. Automated CT plain-based global maximum diameter measurements showed high agreement with gold standard (ICC = 0.97, Pearson'r = 0.97, MAE = 1.95 mm, RMSE = 2.48 mm), outperformed commercial software, 1-year readers, and the z-axis method, while performing comparably to automated CTA. High reliability (ICC > 0.9) and low error (MAE < 2.5 mm) were seen in all subgroups. For regional measurement in CT plain versus CTA, MAE was 2.31 mm (ascending), 2.19 mm (arch), 2.20 mm (descending). Across all landing zones, MAE ranged from 0.69 to 3.49 mm. Longitudinal tracking showed pre-/post-op change, with an average CTA-CT plain difference of 1.27 mm (anatomical regions) and 1.99 mm (landing zones).

CONCLUSION

AI-enabled CT plain imaging achieves rapid, reproducible, and accurate aortic measurement, offering a practical, contrast-free alternative to CTA in both diagnostic and follow-up settings.

CLINICAL RELEVANCE/APPLICATION

This workflow standardizes aortic assessment, reduce operator variability, and expand access to safe, accurate aortic monitoring, especially for patients contraindicated for contrast. Limitations include higher MAE in complex regions, relatively small dataset size, and the need for further multi-center validation.

M5A-SPIN-9 AI-DRIVEN LIVER LESION DETECTION IN ABDOMINAL CT WITH AUTOMATED REPORTING

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PURPOSE

Accurate identification and quantification of liver lesions on abdominal CT are critical for the diagnosis, staging, and treatment planning of hepatic diseases, including primary and metastatic liver cancers. Manual segmentation is time-consuming and prone to variability. Liver volume estimation is also clinically important for evaluating hepatic reserve, particularly in surgical planning and treatment monitoring. We aim to implement an AI-based system that automates liver and lesion segmentation, quantifies lesion characteristics and liver volume, and generates structured reports to support radiologists in routine workflows.

METHODS AND MATERIALS

We developed a two-stage deep learning pipeline leveraging the nnUNet framework for automated analysis of contrast-enhanced abdominal CT scans. The first stage performs liver segmentation, isolating the organ from surrounding structures to enable targeted analysis. The second stage focuses on detecting and segmenting intrahepatic lesions within the segmented liver volume. Both stages were trained and validated using an expert-annotated dataset. The dataset consists of 1500 abdominal CT cases and is annotated by an expert radiologist. The system produces detailed outputs including 3D segmentation overlays for liver and lesions, and a report summarizing findings, total liver volume, lesion count, and the diameter and volume of each lesion.

RESULTS

On a test set of 100 CT scans, liver segmentation achieved a Dice score of 0.97. Lesion segmentation reached a mean Dice of 0.85. Lesion detection sensitivity was 93% for lesions >10 mm and 82% for lesions =10 mm. A radiologist verified these results.

CONCLUSION

Our AI system provides accurate and automated liver and lesion segmentation, quantitative lesion characterization, and liver volume analysis. The integrated reporting function can support consistent clinical decision-making and follow-up. In our future developments, we aim to expand this framework to include the types of liver lesions, multi-organ analysis, and detection of other abdominal abnormalities, broadening its utility as a comprehensive AI assistant in abdominal imaging.

CLINICAL RELEVANCE/APPLICATION

This AI solution can enhance radiology workflow efficiency and diagnostic consistency. Liver volume assessment is crucial for evaluating suitability for surgical resection or transplant and assessing treatment impact on liver parenchyma. By automating segmentation and structured reporting, the system can assist in early detection, monitoring, and treatment planning of hepatic disease, with future expansion to multi-organ analysis further broadening its clinical utility.

M5A-SPIN-10 AUGMENTATION IN AI MODELS: ENHANCING RADIOLOGY IMPRESSIONS THROUGH COMPARATIVE VALIDATION, PROMPT-BASED LEARNING, AND ROUGE EVALUATION

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PURPOSE

The results from NLP and/or clinical language understanding (CLU) based generation of auto-impression from radiology findings have limitations. To address these limitations, we explored if a prompt-based LLM (ATARI based on GPT 4o) can augment the performance of an NLP-CLU-based auto-impression generator in a multicenter, multispecialty radiology reports dataset.

METHODS AND MATERIALS

Our IRB-approved study included 2,000 consecutive radiology reports belonging to adult patients, where the impression section was generated using Powerscribe Smart Impression (PSI, Nuance) from four radiology practices (500 consecutive reports from each center). The vendor recorded the use and modification of PSI outputs for each report, user, and practice site. All data were transferred to an encrypted Microsoft Excel file containing the following information: exam type, site code, user code, findings section, smart impression, and final impression. Two physician coinvestigators classified differences between the PSI and final impressions (FI) in 2,000 reports: minor differences (addition/change/deletion of single sentence/number/word/diagnosis in PSI to generate FI) and major differences (change in the entire PSI or multiple sentences, numbers, or diagnoses). Then, we applied prompt-based LLM to generate new impressions (LLM-I) for all PSI requiring changes (n=874) and reassessed LLM-I with the same classification criteria. Descriptive statistics were performed to determine the proportion of modified and non-modified LLM-I outputs for different exam types and practices. We used ROUGE (Recall-Oriented Understudy for Gisting Evaluation) metrics to quantitatively compare the similarity of LLM-I and PSI with the FI.

RESULTS

The PSI and FI impressions were identical for 56.3% (1,126/2,000) reports. Major changes were required for 777 (38.85%) reports, with just 9 (0.45%) reports needing complete revision (Table). LLM-I "fixed" issues associated with 109/874 reports (12.47%) where PSI required minor changes and 33/874 reports (3.77%) where PSI had major changes. However, ROUGE scores for LLM-I were significantly lower than for PSI ($p < 0.001$) across impressions requiring no change versus no changes. The results were generalizable across all four practice centers.

CONCLUSION

Our multicenter, real-world auto-impression clinical implementation data demonstrate that NLP-CLU and LLM can help generate an accurate impression section from the findings section with either no or minor modifications.

CLINICAL RELEVANCE/APPLICATION

LLM-generated impressions can help troubleshoot performance issues related to NLP-CLU-generated impressions. ROUGE scores might not help compare the success of auto-impression-generating methods.

M5A-SPIN-11 SMALL-DATA AI: SEMI-SUPERVISED CONTRASTIVE-LEARNING (SSCL-MTANN) FOR CLASSIFICATION BETWEEN MALIGNANT AND BENIGN LUNG NODULES IN 3D CT IN SMALL SAMPLE-SIZE SCENARIO

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PURPOSE

Accurate classification of volumetric medical images such as classification between malignant and benign lung nodules in 3D CT remains a critical challenge, especially when annotated data is scarce. Manual labeling of 3D medical scans is labor-intensive, costly, and time-consuming for radiologists. This study proposes a semi-supervised contrastive learning framework, SSCL-MTANN, that enhances pulmonary nodule classification by leveraging patch-based modeling and a novel spatial proximity-based pair sampling strategy for contrastive learning, specifically tailored for low-label settings in lung cancer diagnosis.

METHODS AND MATERIALS

We propose SSCL-MTANN, a two-phase semi-supervised framework for classifying lung nodules as benign or malignant in 3D CT scans. In Phase 1, a lightweight encoder is pretrained on unlabeled volumes using a novel spatial proximity-based pair selection (SPPS) strategy for contrastive learning. In Phase 2, the encoder is fine-tuned on a small labeled set using soft labels derived from Gaussian-modeled annotations. The method was evaluated on the public LIDC-IDRI dataset containing 1,018 CT scans. Nodules between 3-30 mm were included, while micro-nodules (<3 mm) and large masses (>30 mm) were excluded. After preprocessing, 400 nodules (200 malignant, 200 benign) were used. Standardized 3D VOIs (51×51×51 voxels) were extracted around each nodule. The model was trained using only 5-15% labeled data, with the rest used as unlabeled.

RESULTS

Our SSCL-MTANN achieved an AUC of 0.76 using only 5% labeled data, significantly outperforming the performance (AUC: 0.50-0.59, 0.50-0.69) of both state-of-the-art (SOTA) semi-supervised (Pseudo labeling, mean teacher, and mix match) and fully supervised baseline models (Alexnet, Resnet18, VGG16, ViT), respectively. With 15% labeled data, our method reached an AUC of 0.81—demonstrating superior feature representation and classification accuracy even under severe data constraints.

CONCLUSION

We proposed a novel semi-supervised framework, SSCL-MTANN, that effectively addresses the small-labeled-data challenge in lung nodule classification in 3D CT. Integrating spatially-aware contrastive learning with patch-based modeling improves feature separation and classification in low-data regimes.

CLINICAL RELEVANCE/APPLICATION

SSCL-MTANN reduces the annotation burden by enabling high-performance AI training with as little as 5% labeled data, significantly reducing radiologists' manual labeling effort. By effectively leveraging unlabeled 3D CT scans, it provides accurate lung nodule classification, supporting radiologists in accurate lung cancer diagnosis and enhancing decision-making in resource-constrained clinical settings.

M5A-SPIN-12 PRECISION IMAGING OF SEX-SPECIFIC ADAPTATION IN GLUTEUS MAXIMUS MORPHOLOGY AND TYPE-2 DIABETES: A LARGE-SCALE MRI STUDY

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PURPOSE

The gluteus maximus (GM) is one of the body's largest muscles, playing a key role in bipedal motion and metabolic health. MRI studies often focus on measuring its volume or fat infiltration. Statistical shape analysis characterises tissue morphology and localises shape variation via statistical parametric maps (SPMs), independent of volume. While widely used for internal organs, its application to skeletal muscle, especially the GM, remains limited. This study uses UK Biobank MRI data to examine how sex-specific GM morphology is related to body measures and type 2 diabetes (T2D).

METHODS AND MATERIALS

MRI scans were acquired using a Siemens Aera 1.5T scanner, with imaging protocols reported previously. GM was segmented from 61,290 UK Biobank Dixon MRI scans using a deep-learning pipeline trained on 158 manual annotations (Dice = 0.94), with quality visually validated at multiple stages by experienced analysts. Predictors of GM measures were identified using least absolute shrinkage and selection operator regression with stability selection across 86 variables (demographics, biomarkers, and diseases). Population-based templates were built for left/right GM in 300 men and 300 women, then registered to individual segmentations using affine and non-rigid registration to propagate standardised surface meshes (~15,000 vertices) with anatomical correspondence. Surface-to-surface (S2S) distance quantified shape variation as vertex-wise deviations from the template mesh, in millimeters, with positive values for outward expansion and negative for shrinkage. Mass univariate regression with correction for multiple testing identified variables associated with S2S variation.

RESULTS

GM shape exhibited outward S2S deformation in the anterior to posterior view with BMI, alcohol intake, physical activity, and grip strength, and an inward deformation with age, frailty, osteoporosis, and sedentary time ($P<0.05$). In men, T2D was associated with focal areas of inward S2S deformation (median S2S:-0.41mm for right and -0.39mm for left GM, $P<0.05$), suggesting atrophic changes. In contrast, women with T2D exhibited focal outward deformation (median S2S: 0.45mm for right and 0.49 mm for left GM, $P<0.05$), suggesting fatty hypertrophy.

CONCLUSION

This study highlights the value of automated MRI-based 3D phenotyping for musculoskeletal analysis, with SPMs revealing distinct, sex-specific GM morphological signatures associated with T2D, potentially reflecting divergent phenotypes of metabolic dysfunction

CLINICAL RELEVANCE/APPLICATION

Sex-specific GM shape changes in T2D may indicate early functional decline and metabolic compromise, reflecting local differences in response to insulin tolerance that require further investigation.

M5A-SPIN-13 TRIPLE-LOW CT PERFUSION PROTOCOL WITH DEEP LEARNING RECONSTRUCTION IN ACUTE ISCHEMIC STROKE: A DOSE REDUCTION STRATEGY MAINTAINING DIAGNOSTIC QUALITY

Haina Xu (*Presenter*)
Xin Qin (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Feng Chen, MD, PhD (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To assess the clinical viability of a triple-low CT perfusion (CTP) protocol, characterized by low radiation dose (80 kV, 80 mA), low contrast volume (40 mL), and low injection rate (4 mL/s), in combination with deep learning image reconstruction (DLIR-H), compared to a standard-dose protocol (80 kV, 120 mA, 50 mL, 5 mL/s) using iterative reconstruction (ASIR-V 50%).

METHODS AND MATERIALS

In this prospective, randomized study, 102 patients with suspected acute ischemic stroke (AIS) were assigned to either the standard or triple-low protocol (n=51 each). Four groups were analyzed: Group A (standard + DLIR-H), Group B (standard + ASIR-V 50%), Group C (triple-low + DLIR-H), and Group D (triple-low + ASIR-V 50%). CT attenuation (HU), noise (SD), signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and perfusion parameters (CBF, CBV, MTT, TTP, Tmax) were evaluated in gray and white matter. Radiation dose and contrast parameters were recorded. Two blinded radiologists independently scored perfusion map quality using a 3-point scale (0-2), with interobserver agreement assessed using the Kappa statistic.

RESULTS

The triple-low protocol reduced CTDIvol, DLP, and effective dose by approximately 33%, and contrast volume and injection rate by 20% ($P<0.001$). Gray matter attenuation was consistent across all groups ($P>0.05$), with minor CT value differences (<2 HU) in white matter under identical reconstruction methods. DLIR-H achieved lower noise and higher SNR/CNR than ASIR-V under identical scanning protocols ($P<0.05$). Group C (triple-low + DLIR-H) exhibited SD and SNR comparable to Group B (standard + ASIR-V 50%) ($P>0.05$), but with superior CNR ($P=0.03$). Perfusion parameters (CBF, CBV, MTT, TTP) showed no significant differences between groups ($P>0.05$), while Tmax varied slightly in some regions (<0.5 s, $P<0.05$). Median subjective scores exceeded diagnostic thresholds in all groups, with strong interobserver agreement (Kappa = 0.649-0.708). No significant differences were observed in infarct core and penumbra volumes between DLIR-H and ASIR-V under standard-dose protocols ($P>0.05$).

CONCLUSION

The triple-low CTP protocol with DLIR-H significantly reduces radiation and contrast doses without compromising image quality or perfusion assessment, supporting its clinical application in AIS imaging.

CLINICAL RELEVANCE/APPLICATION

This approach enhances patient safety while maintaining diagnostic reliability, providing a promising alternative for acute stroke imaging, particularly in vulnerable populations.

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Nov. 30 – Dec. 4
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M5A-SPIR

Interventional Radiology Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPIR-1 EVALUATING THE SAFETY OF SELECTIVE INTERNAL RADIATION THERAPY FOR PRIMARY AND SECONDARY LIVER MALIGNANCIES: A STUDY OF 4,432 PATIENTS

Thomas J. Vogl, MD, PhD (*Presenter*)
Andreea-Ioana Nica (*Abstract Co-Author*)
Leona Alizadeh, MD (*Abstract Co-Author*)
Christian Booz, MD (*Abstract Co-Author*)
Ibrahim Yel, MD (*Abstract Co-Author*)
Philipp Reschke (*Abstract Co-Author*)

PURPOSE

To evaluate the safety profile of Selective Internal Radiation Therapy (SIRT) in the treatment of primary and secondary liver malignancies, with a specific focus on the incidence and management of periprocedural complications.

METHODS AND MATERIALS

We conducted a retrospective analysis of data from the national quality assurance registry maintained by the German Society of Minimally Invasive Therapies and Interventional Radiology (DeGIR), covering the period from 2018 to 2023. The study aimed to identify adult patients (aged >18 years) who underwent SIRT for liver tumors. We evaluated the incidence, types, and management of complications, classifying them as either 'procedure-related complications' (PRCs), occurring during or within 24 hours of the intervention, or 'post-procedure complications' (PPCs), defined as those arising more than 24 hours after the procedure.

RESULTS

The study included 4432 patients, comprising 1563 females (35.3%) and 2869 males (64.7%), with a mean age of 67.42 ± 11.39 years. Most complications related to SIRT were classified as PRCs, with 36 cases (0.8%) reported. The most common cause was drug side effects (5 patients, 0.1%), followed by arterial bleeding in 3 cases (0.1%). The majority of PRCs (45.7%) fell under Category 2/B, indicating patients who require prolonged monitoring. One death (Category 6/F, 2.9%) occurred within 24 hours post-intervention. In 50% of cases (18), complications were managed by the procedure-performing radiologist, while 27.8% (10 cases) required treatment by other specialties. In 16.7% (6 cases), no treatment was needed, and in 5.6% (2 cases), the treatment status was not specified. PPCs occurred in only 4 patients (0.09%), resulting in a total of 40 patients (0.9%) experiencing periprocedural complications.

CONCLUSION

Our findings suggest that SIRT is a safe procedure for patients with liver tumors, as it demonstrates a low incidence of complications, with many being effectively managed within the same medical specialty.

CLINICAL RELEVANCE/APPLICATION

Our research findings indicate that most complications arise within the initial 24-hour period following the intervention. This underscores the necessity for vigilant patient monitoring during this time frame.

M5A-SPIR-2 CLINICAL OUTCOMES OF TIPS-PVR IN CIRRHOTIC PATIENTS WITH RECENT PORTAL VEIN THROMBOSIS: A SINGLE-CENTER STUDY

Zohaa Faiz, MD (*Presenter*)
Vijay Ramalingam, MD (*Abstract Co-Author*)
Mariam Dogar (*Abstract Co-Author*)
Jeffrey L. Weinstein, MD (*Abstract Co-Author*)
Ammar Sarwar, MD (*Abstract Co-Author*)
Muneeb Ahmed, MD (*Abstract Co-Author*)

PURPOSE

Portal vein thrombosis (PVT) is a significant complication in patients with cirrhosis and may lead to portal hypertension and increased risk of variceal bleeding. The American Association for the Study of Liver Diseases (AASLD) classifies PVT as recent (<6 months) or chronic (>6 months). While most studies have focused on chronic PVT and the role of portal vein recanalization-transjugular intrahepatic portosystemic shunt (PVR-TIPS) in transplant bridging, there is limited data on the safety and efficacy of PVR-TIPS in recent PVT. This study aims to evaluate the safety and effectiveness of PVR-TIPS in cirrhotic patients with recent PVT.

METHODS AND MATERIALS

We conducted a retrospective analysis of cirrhotic patients with recent PVT who underwent PVR-TIPS between 2000 and 2024 at a single academic institution. Patients were categorized by PVT etiology and thrombus extent according to AASLD criteria. Outcomes assessed included technical success, one-year patency of TIPS and PV, need for TIPS intervention, symptom recurrence, and mortality.

RESULTS

A total of 50 cirrhotic patients (55% male; mean age 58 ± 11 years) underwent PVR-TIPS for recent PVT during the study period. The most common etiologies of PVT were portal hypertension (50%), idiopathic causes (34%), and hypercoagulable states (6%). Technical success was achieved in all patients (100%). In terms of thrombus distribution, 76% had involvement of the main, right, or left portal veins (MPV, RPV, or LPV), 60% had superior mesenteric vein (SMV) involvement, and 22% had splenic vein involvement.50 % (25/50) presented with completely occlusive PVT. Of the 33 patients with one-year follow-up data, 94% (31/33) had maintained TIPS patency and 97% (32/33) had maintained portal vein patency. TIPS revision to maintain patency was required in 39% (13/33) of patients. At the one-year mark, 85% of patients had no evidence of vessel occlusion, and 60% were asymptomatic. The overall one-year mortality rate was 22%, with 11 of 50 patients dying within one year of the procedure. Ten patients received a liver transplant after TIPS-PVR with end -to-end anastomosis of the portal vein.

CONCLUSION

PVR-TIPS may be a safe and effective treatment for cirrhotic patients with recent PVT, offering high technical success rates and a viable option for restoring portal venous flow .

CLINICAL RELEVANCE/APPLICATION

This study addresses a critical gap in the literature, as no prior studies have systematically evaluated outcomes of PVR-TIPS in cirrhotic patients with recent portal vein thrombosis (PVT). Our findings show that PVR-TIPS is a safe and effective intervention highlighting its potential as a first-line treatment where evidence-based guidance is lacking.

M5A-SPIR-3 LONG-TERM OUTCOMES OF ENDOBILIARY RADIOFREQUENCY ABLATION PLUS STENTING IN MALIGNANT BILIARY OBSTRUCTION: A PATIENT-LEVEL META-ANALYSIS OF RANDOMIZED TRIALS

Parisa Kaviani, MD (*Presenter*)
Mohamed Sherif Ali Ahmed (*Abstract Co-Author*)
Hassan Magdy, MD (*Abstract Co-Author*)
Yara Ibrahim (*Abstract Co-Author*)
Mohamed Anwar (*Abstract Co-Author*)
Ahmed Elshaboury (*Abstract Co-Author*)
Abdulrahman Mohamed Ibrahim Mohamed Mohamed (*Abstract Co-Author*)
Sara Hosny El-Farargy (*Abstract Co-Author*)
Mohamed Elkasaby, MD (*Abstract Co-Author*)

PURPOSE

To assess the long-term efficacy and safety of RFA combined with stenting compared to stenting alone in patients with MBO using reconstructed individual patient data (IPD) from randomized controlled trials (RCTs).

METHODS AND MATERIALS

We searched Pubmed, Scopus, Web of Science, and Cochrane CENTRAL through March 15th, 2025 for RCTs comparing RFA plus stenting versus stenting alone in MBO. IPD were reconstructed from Kaplan-Meier curves using the tow-step approach. Time-to-event outcomes were analyzed using Cox proportional hazards models, with subgroup analyses by cancer and stent type. Restricted mean survival time (RMST) and landmark analyses were also performed. Pairwise meta-analysis was also performed.

RESULTS

Seven RCTs involving 640 patients were included. RFA significantly improved overall survival (OS) compared to stenting alone (HR = 0.75, 95% CI: 0.63-0.91; p = 0.002; RMST difference = 2.8 months). Subgroup analysis showed no OS benefit in cholangiocarcinoma (HR = 0.82; p = 0.14) or pancreatic cancer (HR = 1.07; p = 0.757). OS improvement was observed only with plastic stents (HR = 0.48; p < 0.001), not metal stents (HR = 0.69; p = 0.312). No overall difference was found in stent patency (HR = 1.05; p = 0.666), but landmark analysis revealed worse patency beyond 6 months with RFA (HR = 2.00; p = 0.008), particularly in metal stents (HR = 2.94; p = 0.018). The rate of adverse events was similar between groups (risk ratio = 1.13; p = 0.53).

CONCLUSION

RFA combined with stenting improves long-term OS in MBO, especially with plastic stents, but offers no overall benefit in stent patency and may increase the risk of late dysfunction in metal stents. The safety profile was comparable to stenting alone. These findings support the selective use of RFA, particularly in patients with favorable prognosis and plastic stent indication.

CLINICAL RELEVANCE/APPLICATION

This individual patient data meta-analysis offers robust evidence on the long-term impact of endobiliary RFA in managing malignant biliary obstruction.The findings support the selective integration of RFA into clinical practice for patients with favorable prognosis and plastic stent use, where a significant survival advantage was observed. In contrast, routine use in metal stent cases is not advised due to potential for late stent dysfunction.These results can guide oncologists, endoscopists, and interventional radiologists in optimizing palliative strategies for MBO, emphasizing the importance of individualized stent selection and careful risk-benefit assessment for RFA use.

M5A-SPIR-4 ADVERSE EVENTS FROM MICROWAVE ABLATION COMPARED TO CRYOABLATION IN PATIENTS WITH PRIMARY AND METASTATIC LUNG CANCER: A SYSTEMATIC REVIEW AND META-ANALYSIS

Milan Patel (*Presenter*)

PURPOSE

Image-guided Thermal Ablation (IGTA) technology is an effective treatment modality for advanced primary and metastatic lung cancer. Microwave Ablation (MWA), Cryoablation (CA), and Radiofrequency Ablation (RFA) are the primary methods used in modern medicine. However, there is limited data comparing their safety profiles. We aim to study the difference in incidence of adverse events (AEs) between MWA and CA in the treatment of primary and metastatic lung cancer.

METHODS AND MATERIALS

We searched PubMed for retrospective cohort studies reporting AEs associated with IGTAs. We conducted a meta-analysis of the common AEs encountered during ablation procedures. Odds Ratios were generated to quantify differences in AEs accounting for random effect models. Rate ratios were utilized to correlate technique differences with the incidence of AEs.

RESULTS

A total of 588 patients across 10 studies were included with 533 patients differentiated between males (50.8%) and females (49.2%) with a mean age of 63 (Range: 58-78). A total of 950 tumors were treated across 656 ablation sessions (42% MWA, 58% CA) with an average tumor diameter of 15.44mm (7.41-30.14mm). Tumors treated ranged from Stages 1-4 NSCLC and extra thoracic metastases. Our findings suggest there was no significant difference in rates of pneumothorax or hemothorax between MWA and CA (Pneumothorax OR: 1.45, CI [0.79-2.66]; Hemothorax OR: 1.41, CI [0.66-3.01]). There was a significant difference in probes used between MWA and CA (RR: 0.58, CI [0.38-0.90], p = 0.02). Primary Technical Success of treatment and Length of hospital stay were comparable between the MWA and CA groups.

CONCLUSION

Both MWA and CA are effective treatment modalities for primary and metastatic lung cancer. The treatment modality used correlates with quantity of probes used, with CA typically requiring more probes for treatment compared to MWA.

CLINICAL RELEVANCE/APPLICATION

These findings suggest there is no difference in rates of pneumothorax and hemothorax between MWA and CA, despite a significant difference in probe usage during intervention.

M5A-SPIR-5 PREOPERATIVE PREDICTION MODEL FOR HISTOPATHOLOGIC CONCORDANCE IN THYROID NODULES: DIAGNOSTIC PERFORMANCE OF FNAB CYTOLOGY COMBINED WITH CLINICAL PARAMETERS

Yujiang Liu (*Presenter*)
Ying Feng (*Abstract Co-Author*)

PURPOSE

To evaluate the concordance between fine-needle aspiration biopsy (FNAB) cytology using the Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) and postoperative histopathology, and to develop a preoperative prediction model for histopathologic concordance.

METHODS AND MATERIALS

This retrospective study included 1071 consecutive patients (age =18 years) with thyroid nodules who underwent both FNAB and surgical resection at a single tertiary center between January 2019 and August 2020. Clinicopathologic variables were analyzed using ?2 tests. A multivariable logistic regression model incorporating key predictors was developed with 10-fold cross-validation in Python.

RESULTS

Overall concordance between FNAB and surgical pathology was 81.0% (867/1071), with sensitivity of 82.2%, specificity of 55.3%, and positive predictive value of 99.4%. Significant predictors of concordance included nodule location (P=0.042), size (P=0.004), TI-RADS subclassification (P=0.006), and TBSRTC category (VI vs V: 97.8% vs 100%). The prediction model demonstrated exceptional performance with an AUC of 0.976 (95% CI: 0.962-0.989), accuracy of 94.9%, sensitivity of 97.1%, and specificity of 87.6%. BRAF mutation status and patient age were identified as critical modulators of diagnostic alignment.

CONCLUSION

This study establishes a robust preoperative prediction model integrating clinical, cytopathologic, and molecular markers to assess histopathologic concordance in thyroid nodules. The high diagnostic accuracy (AUC >0.97) underscores its potential for personalized surgical decision-making, particularly for nodules =0.5 cm. Key innovation lies in quantifying modifiable discordance factors while validating TBSRTC VI/V categories as reliable predictors of malignancy.

CLINICAL RELEVANCE/APPLICATION

The high diagnostic accuracy (AUC >0.97) underscores its potential for personalized surgical decision-making, particularly for nodules =0.5 cm.

M5A-SPIR-6 INTRAPROCEDURAL SPECTRAL CT THERMOMETRY DURING MICROWAVE ABLATION

Nicole Varble, PhD (*Presenter*)
Laetitia Saccenti, MD (*Abstract Co-Author*)
Ivane Bakhutashvili (*Abstract Co-Author*)
Nathan Huber, PhD (*Abstract Co-Author*)
John W. Karanian, PhD (*Abstract Co-Author*)
Bradford J. Wood, MD (*Abstract Co-Author*)
William F. Pritchard JR, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of dual-layer spectral CT for real-time, non-invasive measurement of tissue temperature during thermal ablation.

METHODS AND MATERIALS

Under a protocol approved by the Institutional Animal Care and Use Committee, healthy swine (n=3) underwent microwave ablation (MWA). Four thermocouples per subject were percutaneously inserted in the expected ablation zone under ultrasound guidance. A 5 min, 65 Watt MWA was performed (Neuwave). Sequential dual-layer spectral CT scans (IQon, Philips) were performed at 1-minute intervals during and after ablation (n=16 scans/subject). Pre- and post-ablation contrast-enhanced CTs were acquired. From spectral base images, virtual monoenergetic images (70 keV) were used to mask air and metal artifacts and to identify and segment ROIs at the thermocouple tips. Conventional CT, effective atomic number (Z-eff), and electron density (EDW) maps were analyzed and the ROIs results were compared to measured temperature using 1 st -4 th order polynomial curve fitting (MATLAB R2023a). Best fit was determined by root mean squared error (RMSE). Explanted ablation zones were sectioned transverse to the MWA probe track, formalin fixed, paraffin embedded, and 7um sections were hematoxylin and eosin stained and examined under light microscopy.

RESULTS

192 temperature measurements with corresponding spectral imaging results were analyzed. Thermocouples were located a mean 8.7±6.3mm from the MWA probe shaft with maximum temperatures of 46-99ºC. CTDI vol for the CT scans were 7.6-8.1 mGy. On post-MWA contrast-enhanced CTs, the mean ablation zone dimensions were 3.5±0.1cm x 2.4±0.7cm. Polynomial curve fitting found a weak linear correlation between temperature and conventional CT and Z-eff ($r=-0.433$, $p<0.001$, $r=0.550$, $p<0.001$, respectively). A strong negative linear correlation was found between temperature and EDW ($r=-0.797$, 95% CI [-0.844 -0.739], $p<0.001$, RMSE = 8.0ºC). Explanted ablation zones showed an ellipsoidal hemorrhagic ring surrounding areas of decreased cell integrity with central necrosis at the probe emitting point, matching non-perfused contrast-enhanced CT zones, and EDW measurements correlated to 60ºC.

CONCLUSION

In vivo monitoring of tissue temperature using dual-layer spectral CT imaging and EDW mapping during thermal ablation is feasible.

CLINICAL RELEVANCE/APPLICATION

Clinical translation of CT thermometry has been challenging, but may be feasible with spectral CT and may be integrated into existing ablation workflow. This offers opportunities to improve treatment monitoring during thermal ablation. While it does require the use of radiation, more judicious use of CT would be expected. Further work to determine the validity in human liver and tumors may be required.

M5A-SPIR-7 "XR MARKS THE SPOT" - TECHNICAL DEVELOPMENT AND INITIAL EVALUATION OF A MIXED REALITY SIMULATOR FOR ENDOVASCULAR TRAINING

Colin J. McCarthy, MD (*Presenter*)
Jeah Kim (*Abstract Co-Author*)
Andrea Cabochan (*Abstract Co-Author*)
Willy Ci (*Abstract Co-Author*)
Jason Morris (*Abstract Co-Author*)
Steven Patterson (*Abstract Co-Author*)
Yi Jenny Wang (*Abstract Co-Author*)
Jeffrey L. Weinstein, MD (*Abstract Co-Author*)

PURPOSE

To develop and test a novel endovascular simulator software application for a commercially available mixed-reality headset, and obtain preliminary feedback from interventional radiology attendings and trainees.

METHODS AND MATERIALS

An immersive mixed reality / spatial computing environment was created for VisionOS 2.4 on the Apple Vision Pro, deployed to the devices using TestFlight (Apple Inc, Cupertino, CA). A completely virtual angiosuite including procedure table, drapes, simulated patient, fluoroscopy screen and other equipment was digitally rendered. The environment is manipulated using custom gestures for fine-wire manipulation, including pinch/pull and pinch/roll, and the native finger and hand-tracking features of

VisionOS, together with hands-free voice commands to toggle the X-ray on and off. The tool includes gamified features such as checkpoint-based progression, real-time feedback through simulated angiographic views, and performance scores. A sample scenario (splenic embolization for trauma) was created and volunteers viewed a recorded simulation and completed a survey. In total, 13 interventional radiology trainees and 10 interventional radiology attendings were invited to participate.

RESULTS

The study was completed by 4 trainees and 5 attending radiologists. Prior to watching the recorded mixed reality simulation, 7 of the 9 respondents noted that they had previously used an endovascular simulator. The prior use of a virtual reality (VR) or augmented reality (AR) headset was 66.7% and 44.4%, respectively. There was a wide range of confidence recorded with regard to use of VR or AR headsets. 5 respondents reported they believed VR/AR could play a role in training, and 3 respondents recorded “maybe”. After watching the recorded simulation, 7 people responded “yes” and 2 responded “maybe” to the same question. Participants rated various aspects of the simulator. Of the 9 participants, 5 believed this technology could replace existing simulators, and 4 reported it may be complimentary to existing platforms.

CONCLUSION

Simulation is a key component of medical training, but can be limited based on access to proprietary simulation platforms. This application requires only a headset, with no additional materials. Preliminary feedback has been positive, and further development is ongoing.

CLINICAL RELEVANCE/APPLICATION

The advanced features available on modern mixed-reality headsets allow for immersive simulation experiences without additional specialized equipment or room space. Potential benefits over existing simulators include analysis of specific metrics related to motion efficiency and attention, using available hand and eye tracking capabilities.

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Nov. 30 – Dec. 4
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M5A-SPMK

Musculoskeletal Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPMK-1 RECOMMENDATIONS FOR IMAGING ENDPOINTS IN CLINICAL TRIALS FOR NEUROFIBROMATOSIS TYPE 1-ASSOCIATED MALIGNANT PERIPHERAL NERVE SHEATH TUMORS: A SYSTEMATIC REVIEW

Mona Dabiri, MD (*Presenter*)
Shivani Ahlawat, MD (*Abstract Co-Author*)
Laura M. Fayad, MD (*Abstract Co-Author*)

PURPOSE

To generate evidence-based minimum recommendations for image acquisition, interpretation and quantitative endpoints for use in centralized or decentralized Neurofibromatosis type 1 (NF1)-related malignant peripheral nerve sheath tumors (MPNST) clinical trials.

METHODS AND MATERIALS

PubMed was searched (PRISMA) via Covidence. Original English-language MPNST articles with =10 patients were eligible; reviews, case reports and animal studies were excluded. Two reviewers extracted imaging and quality-assurance data. Of 346 records screened, 45 met inclusion; descriptive statistics summarized findings.

RESULTS

A total of 45 studies (n = 3729 patients) were included. Among these, 1030 patients had histologically confirmed MPNSTs: 557 (54%) were NF1-associated, 243 (24%) were sporadic, and 230 (22%) unclassified. Additional patients included 2400 with benign peripheral nerve sheath tumors (PNSTs) and 570 with plexiform neurofibromas (PNFs). MRI was used in all studies, with T1-, T2-, and STIR sequences reported in 34 (76%), 30 (67%), and 19 (42%) studies, respectively. Diffusion-weighted imaging (DWI) was used in 24 studies (53%), all of which reported ADC values; thresholds for malignancy ranged from 0.9 to 1.4 ×10?³ mm²/s. Only one study used ADC longitudinally to assess treatment response. Dynamic contrast-enhanced MRI (DCE-MRI) was used in 4 studies (9%), mostly with quantitative enhancement metrics. FDG-PET/CT was used in 20 studies (44.4%) with SUVmax cutoffs (3.5-6.1) and tumor-to-liver ratios (TLR) to distinguish MPNSTs from benign lesions. RECIST 1.1 was the most common response criterion (n = 18; 40%), followed by WHO and modified Choi criteria. Five studies (11%) used 3D volumetric analysis, exclusively in MPNSTs, primarily in interventional trials. Centralized image review was reported in only 3 studies (7%), and only 2 (4%) assessed inter-reader agreement. A single study (2%) described centralized data storage or image-sharing infrastructure.

CONCLUSION

There are the gaps of consistency in acquisition protocols, endpoint criteria, and quality assurance in current imaging methods for NF1-MPNST clinical trials. Our systematic review highlights the need for standardization through minimum imaging recommendations—especially in MRI and PET/CT acquisition parameters, ADC/SUVmax thresholds, and centralized image review—to enhance trial comparability and clinical utility.

CLINICAL RELEVANCE/APPLICATION

Standardized imaging will improve reliability and reproducibility of endpoints in NF1-MPNST trials.

M5A-SPMK-2 AI-BASED AUTOMATED DETECTION AND CHARACTERIZATION OF HIP FRACTURES AND BONE LESIONS ON PELVIC RADIOGRAPHS

Krishna Nand Keshava Murthy, PhD, MSc (*Presenter*)
Anirudha Shastri (*Abstract Co-Author*)
Abdallah A. Araji, MD (*Abstract Co-Author*)
Natalie Gangai (*Abstract Co-Author*)
Etay Ziv, MD,PhD (*Abstract Co-Author*)
Sinchun Hwang, MD (*Abstract Co-Author*)
Seth Margolin (*Abstract Co-Author*)

PURPOSE

Detection of bone lesions and fractures on radiograph of the pelvis is an arduous and time-consuming task due to subtle features and overlapping anatomies, but crucial in oncologic patients. Detection consistency varies with radiologist's experience levels. We trained an AI algorithm to spatially localize and classify lesions and fractures and evaluated its performance.

METHODS AND MATERIALS

Our retrospective data set consisted of 2617 images from unique patients (50.1% female; 49.9% male) at a tertiary cancer center, of which 817 were normal and the rest had bone lesions and/or fractures. The abnormalities were identified and annotated with bounding boxes by two board-certified radiologists (totally 3481 lesions and 387 fractures). The Faster RCNN AI model was trained using 70% of the data, validated on 15% for fine-tuning hyperparameters and tested on the remaining 15% held out set. Performance was evaluated using average precision across various intersection over union (IoU) thresholds of predicted abnormality bounding box overlap with ground truth (AP), Receiver Operating Characteristic (ROC) and Precision-Recall (PR) curves. An unpaired t-test was used to assess statistical significance in comparisons.

RESULTS

The overall AP of fracture and lesion detection were 16.73 and 6.29, respectively. The corresponding APs at IoU thresholds of 50 and 75 were 40 and 15.51, and 16.36 and 3.21, respectively. Fracture detection outperformed lesion detection across all metrics—AP, AP50, and AP75—with p-values of <0.001, <0.001, and <0.003, respectively. The area under ROC and PR were 80 and 40 for fracture detection and 70 and 16.4 for lesion detection, respectively.

CONCLUSION

AI algorithm was successful in automatically detecting fractures and lesions on pelvic radiographs, achieving higher performance on fractures compared to lesions.

CLINICAL RELEVANCE/APPLICATION

Automatic detection of pelvic lesions and fractures can help radiologists perform faster with better diagnostic consistency, standardizing interpretation and enhancing patient care.

M5A-SPMK-3 DIFFERENTIATION OF BENIGN AND MALIGNANT LESIONS USING CHEMICAL SHIFT IMAGING WITH THE DIXON METHOD IN VERTEBRAL MARROW LESIONS: ARE TRADITIONAL SIR CUTOFF VALUES USEFUL?

Hirotoshi Maruyama, RT (*Presenter*)

PURPOSE

The signal intensity ratio (SIR) cutoff values are obtained from opposed-phase and in-phase images in chemical shift imaging (CSI). These values are valuable for differentiating benign from malignant vertebral marrow lesions. The Dixon turbo spin echo (Dixon TSE) method has emerged as an alternative to the dual gradient echo (dual GRE) method for CSI. However, the imaging principles of Dixon TSE and dual GRE differ. Therefore, the SIR may differ. Most previous reports have focused on dual GRE, and few studies have reported on SIR cutoff values using Dixon TSE. This study aimed to evaluate the impact of SIR cutoff values from dual GRE in differentiating benign from malignant lesions using Dixon TSE and improve diagnostic accuracy by determining the SIR cutoff values for Dixon TSE.

METHODS AND MATERIALS

A phantom with varying fat fractions (FF) was scanned using dual GRE and Dixon TSE. The SIR was calculated, and the correlation between SIR and FF was analyzed. Lumbar spine MRI using Dixon TSE was performed in 40 patients with suspected vertebral marrow lesions and 29 healthy volunteers. Clinical and radiologic follow-up results were used as the gold standard to classify vertebral marrow lesions as benign or malignant. SIR cutoff values of Dixon TSE were determined using receiver operating characteristic (ROC) analysis. Furthermore, the sensitivity and specificity based on SIR cutoff values of dual GRE, as reported previously, were compared with those of Dixon TSE. Finally, cases with different diagnostic results are presented.

RESULTS

When FF was = 30%, the correlation coefficients between SIR and FF were -0.95 for Dixon TSE and -0.90 for dual GRE. The phantom study results suggest that SIR can effectively evaluate FF of lesions in both dual GRE and DIXON TSE. The SIR cutoff value for Dixon TSE was 0.612 (specificity = 0.930, sensitivity = 1.000). In contrast, the SIR cutoff value for dual GRE, as reported by Zidan et al., was 0.91. In this study's ROC analysis, the specificity and sensitivity most similar to this cutoff value were 1.000 and 0.571, respectively. In Dixon images, when the cutoff value for dual GRE is used, the sensitivity for detecting lesions may decrease. In clinical practice, differentiation between benign and malignant lesions varied between SIR cutoff values for dual GRE and Dixon TSE.

CONCLUSION

The SIR cutoff value for Dixon TSE was 0.612. Using the SIR cutoff value for each CSI method improves the sensitivity of differentiating benign and malignant vertebral marrow lesions.

CLINICAL RELEVANCE/APPLICATION

The cutoff values for the SIR in CSI are valuable for differentiating benign from malignant vertebral marrow lesions. However, to improve the sensitivity of lesion detection, an appropriate cutoff value should be determined according to the CSI method.

M5A-SPMK-4 SACROCOCCYGEAL BENIGN NOTOCHORDAL CELL TUMORS: THEIR PREVALENCE IN MR SACRUM AND STABILITY OVER TIME

Josip Nincevic, MD (*Presenter*)
Onur Yildirim (*Abstract Co-Author*)
Muhammad Atif Naveed, MD (*Abstract Co-Author*)
Junting Zheng (*Abstract Co-Author*)
Marinela Capanu (*Abstract Co-Author*)
Natalie Gangai (*Abstract Co-Author*)
Meera Hameed, MD (*Abstract Co-Author*)
Sinchun Hwang, MD (*Abstract Co-Author*)

PURPOSE

To determine the prevalence and morphological change of benign notochordal cell tumors (BNCT) and their stability at imaging follow-ups.

METHODS AND MATERIALS

This retrospective study included MR sacrum studies performed between 2012 and 2016 in a tertiary cancer center. Each study was reviewed for presence of BNCT, defined as midline T2 hyperintense and T1 iso/hypointense lesions larger than 0.2 cm. The lesion location, number of lesions, contrast enhancement, and atypical features (cortical involvement) were assessed. Follow-up studies (MRI, CT, PET) were assessed for growth and morphological changes. Patient demographic and histologic data were collected. Fisher’s exact test was used to examine associations between synchronous BNCT and pathological chordoma.

RESULTS

In 1469 MR sacrum studies performed on 1006 patients (average age 50 years; 54% male, 46% female), the prevalence of BNCT was 7.8% (78/1006patients). BNCT were typically small (median 0.8 cm, interquartile range: 0.6-1.0) and most frequently found in Co1 (38%) and S5 (32%). Atypical features included cortical scalloping or destruction (9/78, 11.5%), extraosseous extension (5/78, 6.4%), and contrast enhancement (3/75, 4%). The presence of multiple synchronous BNCT (18.1%,14/78) was significantly associated with chordoma (29%, 4/14 vs 6.3%, 4/64 patients with synchronous and single BNCT, respectively, p=0.031). Follow-up imaging, available for 74.3% of patients (58/78) with a median duration of 3.9 years (interquartile range: 2.0-8.7), demonstrated stability in 57/58 (98.3%) patients. Only 1 (1.7%) lesion showed growth from 1.1 cm to 2.1 cm over 3.6 years.

CONCLUSION

BNCTs have low prevalence in MRI sacrum and the majority are small with infrequent growth over a median of four years. They most commonly occur in sacrococcygeal junction and exhibit a potential association with the presence of multiple synchronous lesions and the occurrence of chordoma in a subset of patients.

CLINICAL RELEVANCE/APPLICATION

Sacrococcygeal BNCTs are relatively uncommon on MRI and generally remain small and stable, suggesting that routine aggressive intervention and frequent imaging follow-up are unnecessary. Recognizing their typical imaging features, while being mindful of atypical presentations and the observed association with chordoma, is crucial for accurate radiological interpretation and appropriate clinical management.

M5A-SPMK-5 IMPROVED METAL ARTIFACT REDUCTION FOR 3D-PRINTED CERVICAL VERTEBRAL IMPLANTS USING TIN-FILTERED DUAL-SOURCE CT

Ruixin Yan (*Presenter*)
Ning Lang, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the effectiveness of tin-filtered dual-source CT (Sn150-kVp DSCT), with and without iterative metal artifact reduction (iMAR), in improving postoperative image quality of three-dimensional (3D)-printed artificial vertebral bodies (AVBs) in the cervical spine, compared with conventional 120-kVp single-energy CT (SECT).

METHODS AND MATERIALS

This retrospective study included 30 patients who underwent anterior cervical discectomy and fusion using 3D-printed AVBs. Each patient had paired postoperative SECT and Sn150-kVp DSCT scans. Subjective image quality (artifact severity, soft tissue clarity, bone delineation, and AVB visibility) was scored independently by four blinded readers using a 4-point Likert scale. Fleiss' Kappa assessed inter-reader agreement. Objective metrics included contrast-to-noise ratio normalized to dose (CNRD), signal-to-noise ratio normalized to dose (SNRD), figure of merit (FOM), and paravertebral muscle noise. Radiation doses (CTDIvol, DLP) were extracted from PACS. Wilcoxon signed-rank tests were used for statistical comparisons between SECT, Sn-DSCT, and Sn+iMAR-DSCT protocols.

RESULTS

Both Sn-DSCT and Sn+iMAR protocols significantly outperformed SECT in all subjective metrics ($p < 0.001$). Artifact scores improved from 3.70 (SECT) to 1.95 (Sn) and 1.92 (Sn+iMAR). SNRD was higher in tin-filtered protocols (Sn: 3.10 ± 1.97; Sn+iMAR: 2.78 ± 1.20) than SECT (2.42 ± 1.26; $p < 0.05$), while CNRD showed no significant difference. FOM and noise were substantially lower in Sn-based protocols compared to SECT (FOM: 7.06 vs. 54.4; Noise: 8.55 vs. 20.81; $p < 0.001$). iMAR did not provide statistically significant improvement over Sn alone. Radiation dose was comparable across protocols. Inter-reader agreement was highest in the Sn+iMAR group (? > 0.86).

CONCLUSION

Tin-filtered DSCT substantially improves visualization of 3D-printed AVBs by reducing metal artifacts and noise, without increasing radiation exposure. The additive benefit of iMAR appears limited in porous titanium cages due to already reduced artifact burden from Sn filtration.

CLINICAL RELEVANCE/APPLICATION

This study supports the use of Sn150-kVp DSCT as a superior imaging strategy for evaluating cervical 3D-printed implants, enhancing diagnostic confidence in postoperative settings. These findings may guide standardized imaging protocols for follow-up assessment of osseointegration and implant positioning in spinal reconstruction

M5A-SPMK-6 DIAGNOSTIC VALUE OF 3.0T MAGNETIC RESONANCE DIFFUSION-WEIGHTED IMAGING (DWI) IN BRUCELLAR SPONDYLITIS: IMAGING FEATURE ANALYSIS AND SUBJECTIVE SCORING BY RADIOLOGISTS BASED ON 50 CLINICAL CASES

Chunlong Yan (*Presenter*)
Zerun Wang (*Abstract Co-Author*)

PURPOSE

To explore the diagnostic value of 3.0T magnetic resonance diffusion-weighted imaging (DWI, b=800 s/mm²) in acute-stage Brucellar Spondylitis (BS) and validate its clinical efficacy using radiologists' subjective scores.

METHODS AND MATERIALS

Retrospectively analyzed MRI data from 50 serologically confirmed BS patients (18 acute-stage, 32 chronic-stage) scanned with a GE 3.0T MRI system. Imaging protocols included conventional sequences (sagittal T2WI, sagittal T2WI with fat suppression FS, sagittal T1 FSE, axial T2WI) and axial DWI (b=800 s/mm²). Two senior radiologists independently evaluated the detection capability of each sequence for acute-stage lesions and assigned subjective diagnostic confidence scores using a 5-point Likert scale.

RESULTS

The sensitivity of DWI for acute-stage BS (94.4%) was significantly higher than conventional sequences (T2WI 72.2%, T2WI+FS 68.8%, T1WI 61.1%). Subjective scores indicated the highest diagnostic confidence for DWI (4.8±0.4 vs. T2WI+FS 3.7±0.6 vs. T2WI 3.9±0.6, $p<0.01$). Combining DWI with conventional sequences improved accuracy to 96%. ADC values effectively differentiated active infection (acute: 0.72±0.15 vs. chronic: 1.18±0.21×10?³ mm²/s, $p<0.001$).

CONCLUSION

3.0T DWI is pivotal for diagnosing acute-stage BS. Quantitative ADC values combined with radiologists' subjective scores optimize clinical decision-making, demonstrating significant clinical value through its high sensitivity and enhanced diagnostic confidence.

CLINICAL RELEVANCE/APPLICATION

In this study, with a b-value of 800 s/mm² combined with a slice thickness of 4 mm and a matrix of 512×512, the partial volume effect was reduced, the signal-to-noise ratio and resolution were balanced, and tiny abscesses (less than 5 mm) could be clearly visualized.

M5A-SPMK-7 CONSTRUCTION OF A MACHINE LEARNING MODEL FOR DETECTING OCCULT RIB FRACTURES: EVALUATION OF DUAL-ENERGY CT

Sipin Luo (*Presenter*)

PURPOSE

This study aims to analyze the radiomics features of occult rib fractures using dual-energy CT (DECT) and develop an artificial intelligence model to assist diagnosis.

METHODS AND MATERIALS

Rib DECT data from patients (January to October, 2023) were reconstructed into 120kvplike and Water (HAP) images. Occult fractures and normal ribs were labeled 1:1 based on follow-up results. Radiomics features were extracted and screened using Pearson correlation coefficient, SelectKBest, and LASSO. Seven machine learning models (logistic regression, support vector machine, decision tree, adaptive augmentation, perceptron, random forest, and K-nearest neighbors) were developed. The data were divided into training/validation sets (7:3) and a test set (November-December 2023). Five-fold cross-validation was performed, and AUC was compared using the Delong test.

RESULTS

This study included 153 occult rib fractures and corresponding normal ribs for training/validation, and 59 occult fractures for testing.A total of 1,781 features were extracted, with 14 from 120kvplike and 21 from Water (HAP) images selected for model development. The perceptron model performed well on 120kvplike images (AUC:0.93, sensitivity:0.83, specificity:0.89, accuracy:0.86), while the logistic regression model excelled on Water (HAP) images (AUC: 0.91, sensitivity:0.76, specificity:0.86, accuracy:0.81). The Delong test showed no significant difference in AUC between models ($p>0.05$), but the Water (HAP)-based model was more stable.

CONCLUSION

The perceptron model performs well on conventional CT but has average stability, while the logistic regression model on DECT MD images offers better diagnostic performance and stability. A DECT-based diagnostic model holds significant clinical potential.

CLINICAL RELEVANCE/APPLICATION

This study compared the performance of machine learning models in detecting occult rib fractures between conventional CT and dual-energy CT (DECT) multi-material decomposition (MD) images. The results demonstrated that the DECT MD-based model achieved superior diagnostic efficacy in the test set with enhanced model stability, providing valuable insights for future development and validation of AI-assisted diagnostic systems.
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M5A-SPNMMI

Nuclear Medicine & Molecular Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPNMMI-1 UTILIZATION OF MODEL-BASED EFFECTIVE HALF-LIFE AND SINGLE-TIMEPOINT IMAGING FOR PERSONALIZED KIDNEY DOSIMETRY

Mercy Akerele, PhD (*Presenter*)
Richard Laforest, PhD (*Abstract Co-Author*)
Justin Mikell, PHD (*Abstract Co-Author*)
Vikas Prasad, MD, PhD (*Abstract Co-Author*)

PURPOSE

Accurate dosimetry in radiopharmaceutical therapy (RPT) requires multi-timepoint imaging, which is difficult to implement given clinical logistics and patient convenience. Alternative single timepoint techniques have been proposed but are limited given they assume a specific clearance and imaging timepoint, whereas clearance exhibit intra- and inter-patient variance. This study evaluates the feasibility of single-timepoint dosimetry for the kidneys using personalized effective half-life (P-T eff) based on patient weight and kidney volume

METHODS AND MATERIALS

Ten 177 Lu-based therapy patients (4 NET, 6 PCa) with multi-timepoint post-therapy SPECT/CT imaging (4-, 24-, or 48 - 96 h) were included. The kidneys were auto segmented with MOOSE AI and time activity data was extracted via MIM. Correlation between the actual T eff was modelled from the multi-timepoint data and several factors (patient weight, kidney volume, creatinine, eGFR, and imaging timepoint). P-T eff was then generated using leave-one-out method for each patient from the remaining 9 patients. Time integrated activity was calculated by voxel-wise trapezoidal numerical integration of the SPECT/CT timepoints plus analytical integration of exponential fit to last two timepoints out to infinity. The absorbed dose was calculated using the Monte Carlo calculation as implemented in Hermes software (Ground-truth). Single-time-point dosimetry was then calculated with the Hanscheid, Madsen and the P-T eff methods using the latest timepoint imaging data (48 - 96 h)

RESULTS

The best models to estimate the patient-specific T eff were found using two combinations of kidney volume (ml), patient weight (kg) and imaging timepoint (s), with correlation coefficient R = 0.71/0.72. Using eGFR and creatine gave R = 0.63 and R = 0.66 respectively. Model 1 is [kidney volume (ml) /(patient weight (kg) * e time (s))], while model 2 is [kidney volume (ml) /(patient weight (kg) * time (s)]. For all ten patients, the average actual T eff is 69.69±37.00 h, while models 1 and 2 gave 68.69±26.38 h and 69.07±25.89 h respectively. Compared with the multi-timepoint dosimetry results, the %error in kidney dose was -15.48±13.34% and -10.21±13.91% for Hanscheid and Madsen methods respectively, while the T eff models 1 and 2 gave %errors of 0.38±16.14% and -0.13±16.13% respectively

CONCLUSION

This study suggests that using personalized effective half-life and single-timepoint imaging could be a suitable alternative for multi-timepoint kidney dosimetry. More data is still needed to consolidate these findings

CLINICAL RELEVANCE/APPLICATION

Implementing individualized patients' dosimetry enables clinical integration for achieving personalized RPT thereby enhancing treatment responses and minimizing toxicity

M5A-SPNMMI-2 DIAGNOSTIC POTENTIAL OF APPARENT DIFFUSION COEFFICIENT-BASED LYMPH NODE CLASSIFICATION IN BREAST CANCER PATIENTS UNDERGOING ^{18}F-FDG PET/MRI

Helena A. Peters, MD (*Presenter*)
Daniel Weiss (*Abstract Co-Author*)
Matthias Boschheidgen (*Abstract Co-Author*)
Vivien Lorena Ivan, MD (*Abstract Co-Author*)
Marie Scheuer (*Abstract Co-Author*)
Julian Kirchner (*Abstract Co-Author*)
Aleksandar Milosevic, MD (*Abstract Co-Author*)
Peter Minko, MD (*Abstract Co-Author*)
Lale Umutlu, MD (*Abstract Co-Author*)
Gerald Antoch, MD (*Abstract Co-Author*)
Kai Jannusch (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic potential of apparent diffusion coefficient (ADC) values for classifying lymph nodes as benign or malignant in breast cancer patients undergoing 18 F-FDG PET/MRI staging.

METHODS AND MATERIALS

Mean ADC values and short axis diameters (± standard deviation) of 199 thoracic lymph nodes in 113 newly diagnosed breast cancer patients were analyzed retrospectively. All patients underwent 18 F-FDG PET/MRI staging performed between July 2017 and June 2021. A node-by-node comparison was performed with respect to pathological node status. Nodal FDG-uptake in whole body 18 F-FDG PET/MRI serves as the reference standard for nodal malignancy. Group comparison using Mann-Whitney U test, receiver-operating characteristic curve (ROC) analysis and diagnostic performance was calculated. Using P values below 0.05 were defined as statistically significant. Confidence intervals (CI; 95%) were calculated.

RESULTS

Ninety-three lymph nodes were FDG-negative while 106 lymph nodes were FDG-positive. Benign lymph nodes had significantly lower short-axis diameters ((5.3 ± 1.5 mm versus 12.7 ± 8.6 mm); $p < 0.01$; U: 531; Z: -10.83). ADC values were significantly lower in FDG-positive lymph nodes (0.72 ± 0.16 x 10 -3 mm 2 /s) than in FDG-negative lymph nodes ((1.18 ± 0.18 x 10 -3 mm 2 /s); $p < 0.01$; U: 146.00; Z: -11.80). ROC analysis and Youden's index revealed an ADC cut-off of 0.95 x 10 -3 mm 2 /s (AUC: 0.98; $p < 0.01$; CI: 0.96 -1.01). According to the calculated cut-off, sensitivity, specificity, and accuray of ADC values for differentiating benign from malignant lymph nodes were 98%, 97% and 97%, respectively.

CONCLUSION

ADC values can differentiate benign from malignant lymph nodes in breast cancer patients and correlate significantly with metabolic data from 18 F-FDG PET/MRI. A defined ADC cut-off may support reliable identification of malignant nodes.

CLINICAL RELEVANCE/APPLICATION

Apparent diffusion coefficient (ADC) values obtained from diffusion-weighted MRI offer a reliable, non-invasive tool for lymph node evaluation during the staging of newly diagnosed breast cancer patients. Our defined ADC cut-off value may serve as a valuable tool to support objective, image-guided clinical decision-making.
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M5A-SPNPM

Noninterpretive Skills (Beyond Imaging) Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPNPM-1 RADTRANSLATE 2.0: AN AI-BASED APPROACH TO SIMPLIFY AND TRANSLATE EMERGENCY RADIOLOGY REPORTS FOR PATIENTS WITH LIMITED ENGLISH PROFICIENCY

Praneet Khanna, BA (*Presenter*)
Joel K. Samuel, MD,MBBS (*Abstract Co-Author*)
Aneesh Mazumder (*Abstract Co-Author*)
Arya Rao (*Abstract Co-Author*)
Michael Hood, MD (*Abstract Co-Author*)
Marc D. Succi, MD (*Abstract Co-Author*)

PURPOSE

Radiology reports are integral for summarizing diagnostic imaging findings, but contain complex medical concepts that exceed the average American's reading ability. Millions in the U.S. have limited English proficiency (LEP) and face barriers in understanding written medical information, often leading to lower satisfaction and poorer health outcomes. Yet, diagnostic reports are rarely translated, and hospitals frequently lack the resources and time to provide written summaries in the patients' preferred languages. Large language models (LLMs), such as GPT-o1, may be used to improve patient health literacy. Additionally, Google Translate is widely used in healthcare, but its accuracy can vary greatly by language and context. This study evaluates a two-step application of GPT-o1: (1) simplifying emergency radiology reports into patient-friendly language, and (2) translating those simplified reports into Arabic, Mandarin, and Spanish using GPT and the Google Translate API. The findings of this study will outline the use of LLMs to support multilingual, health-literate communication in radiology. They may contribute to the future clinical adoption of LLMs to promote health equity for linguistically diverse patient populations.

METHODS AND MATERIALS

30 de-identified computed tomography (CT) reports of patients undergoing imaging in the emergency room that reflected various common conditions were selected. The entire report was then simplified using GPT-o1 with a standardized prompt. The reports were then translated into Spanish, Mandarin, and Arabic using GPT and Google Translate. For the simplified outputs, three board-certified emergency radiologists assessed each report using a 5-point Likert scale for accuracy and comprehensibility. Professional medical interpreters graded the translated outputs on a similar 5-point Likert scale. Descriptive statistics analyzed ratings and comparisons.

RESULTS

Radiologist validation of the simplified reports showed high average accuracy and comprehensibility of scores. 100% of the reports were rated as useful for patient understanding.The translated outputs varied for translational accuracy based on the model, with GPT dominating in translational accuracy and patient comprehensibility. Interpreters across all three languages universally preferred translations from GPT-o1.

CONCLUSION

GPT consistently demonstrated strong performance in summarizing and translating radiology reports into patient-friendly language. GPT also outperformed Google Translate in multilingual outputs across Arabic, Spanish, and Mandarin translations.

CLINICAL RELEVANCE/APPLICATION

LLMs' use to simplify and translate radiology reports may improve healthcare equity and literacy for LEP patients.

M5A-SPNPM-2 ASSESSING BARRIERS AND CAPACITY FOR EXPANSION OF DIAGNOSTIC RADIOLOGY RESIDENCY PROGRAMS IN THE U.S

Himi Begum (*Presenter*)
Hannah Short (*Abstract Co-Author*)
Sarapettey Sandifer (*Abstract Co-Author*)
Michael A. Bruno, MD, MS (*Abstract Co-Author*)

PURPOSE

The increasing demand and utilization of diagnostic imaging have outpaced the current radiologist workforce, contributing to national shortages. Despite ongoing efforts to expand training capacity, ACGME-imposed complement caps and program-specific constraints may limit sustainable growth. This study aims to evaluate the perceived capacity for complement expansion among ACGME-accredited diagnostic radiology residency programs and to identify barriers to increasing resident complement.

METHODS AND MATERIALS

A Qualtrics survey was distributed to program directors and assistant program directors at 197 ACGME-accredited diagnostic radiology residency programs. The survey collected data on current residency size, perceived capacity for additional residents, history of requests for complement increases within the past five years, ACGME decisions, and reported barriers. Responses were analyzed using descriptive statistics.

RESULTS

A total of 47 programs responded (23.9% response rate). The average program size was 8.5 residents per year (SD = 3.7). Of 46 valid responses, 39 programs (84.8%) reported capacity to expand, with a mean potential increase of 2.8 residents annually (SD = 2.1). Among the 13 programs (27.7%) that requested a complement increase within the past five years, 11 were approved (84.6%) and two were denied, citing faculty/resource limitations and funding barriers. Among programs that had not submitted a request, common reasons included faculty constraints, administrative burden, or unclear benefit. Notably, insufficient patient volume or imaging studies were not major limiting factors.

CONCLUSION

Most responding programs report the capacity to train additional residents, and ACGME data show strong support for expansion requests when institutional resources are sufficient. However, non-clinical barriers, such as funding and administrative support, limit programs from pursuing and achieving complement increases.

CLINICAL RELEVANCE/APPLICATION

As the demand for radiologists continues to rise, augmenting the complement size of existing training programs represents a viable strategy to address ongoing workforce shortages. This study highlights the potential for growth across U.S. diagnostic radiology residencies and the need for systemic support to advance residency program expansion efforts.

M5A-SPNPM-3 DOES AI ADD ECONOMIC VALUE TO RADIOLOGY? - A SYSTEMATIC REVIEW

Isabel Molwitz, MD, MBA (*Presenter*)
Inka Ristow, MD (*Abstract Co-Author*)
Jennifer Erley, MD (*Abstract Co-Author*)
Tugba Akinci D'Antonoli, MD (*Abstract Co-Author*)
Ali S. Tejani, MD (*Abstract Co-Author*)
Michail Klontzas, MD, PhD (*Abstract Co-Author*)
Merel Huisman, MD, PhD (*Abstract Co-Author*)
Gerhard B. Adam, MD (*Abstract Co-Author*)
Lisa C. Adams, MD, PhD (*Abstract Co-Author*)

PURPOSE

To summarize the evidence of AI’s economic value across the radiological workflow.

METHODS AND MATERIALS

A comprehensive search of PubMed, Business Source Ultimate, and EconLit was conducted for original research articles published between January 2010 and November 2024. Medical Subject Headings and keywords included “artificial intelligence/machine learning/deep learning/natural language processing,” “radiology,” and “economic value/cost/budget/revenue/efficiency”. Studies were selected based on explicit quantification of economic outcomes, excluding those with only soft outcome criteria like time savings without cost quantification. Study quality was assessed using CHEQUE criteria.

RESULTS

From the initial 1,879 search results, 21 studies (1.1%) met the inclusion criteria. The majority evaluated machine learning tools (10/21[47.6%], nine on deep learning), followed by computer-assisted diagnostics (CAD; 7/21[33.3%]), natural language processing (NLP; 2/21[9.5%]), and hypothetical AI models (2/21[9.5%]). AI demonstrated economic value, as quantified through cost savings or incremental cost-effectiveness ratios, in resource-intensive tasks, when accuracy matched human performance and costs were fixed. For instance, AI-based lung cancer screening achieved incremental cost savings of up to USD 242 per patient. AI increased costs when specificity was below humans’ or when using pay-per-use models; as observed with CAD systems raising mammography screening costs by up to USD 19 per patient. In fast tasks such as X-ray evaluations, AI showed value in settings with radiologist shortages. AI reduced costs through protocol optimization and increased revenue via improved follow-up compliance.

CONCLUSION

AI’s value in radiology is context-dependent, varying with task complexity, examination volume, and implementation model. Further high-quality economic evaluations of AI tools are essential.

CLINICAL RELEVANCE/APPLICATION

AI holds significant potential to enhance economic value in radiology, yet its financial benefits are highly context-dependent, influenced by factors such as task complexity, sensitivity and specificity of the AI, payment models, and societal or provider willingness-to-pay thresholds for quality-adjusted life year gains.

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M5A-SPNR

Neuroradiology Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPNR-1 ALTERED INDIVIDUAL-LEVEL BRAIN MORPHOLOGICAL SIMILARITY NETWORKS IN CHILDREN WITH DUCHENNE MUSCULAR DYSTROPHY: LINKING NEUROIMAGING BIOMARKERS TO COGNITIVE IMPAIRMENT

Xiaoyu Niu (*Presenter*)
Huayan Xu (*Abstract Co-Author*)
Yingkun Guo (*Abstract Co-Author*)
Suming Zhang (*Abstract Co-Author*)

PURPOSE

This study aimed to assess alterations in individual-level morphometric similarity networks (MSNs) in children with Duchenne muscular dystrophy (DMD) and their association with cognitive dysfunction, identifying neuroimaging biomarkers linked to cognitive impairment.

METHODS AND MATERIALS

We included 111 DMD children and 80 age-/sex-matched healthy controls (HC). High-resolution 3D T1-weighted structural MRI was acquired for all participants. Cognitive function was assessed in DMD children using the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV). Individual morphological networks were constructed by measuring interregional similarity in gray matter volume distributions. Graph theory analysis evaluated global and nodal topological properties. Network-Based Statistic (NBS) identified between-group differences in network connectivity. Pearson correlation analysis was further performed to identify associations between cognitive scores and neural abnormalities.

RESULTS

Both DMD and HC groups exhibited small-world architecture (gamma >1, lambda ˜1). Compared to HC, DMD children showed significant differences in nodal topological properties: increased degree centrality (DC) in bilateral hippocampus and left cerebellar lobule 3, and decreased DC in right cerebellar lobule 7b ($p < 0.05$, FDR-corrected). NBS revealed a hypoconnected subnetwork in DMD (28 nodes, 53 edges), predominantly involving cerebellar-frontotemporal-subcortical circuit, spanning sensorimotor, default mode, and frontoparietal networks. The area under the curve of DC in left cerebellar lobule 3 negatively correlated with full-scale intelligence quotient (FSIQ) and perceptual reasoning index (PRI) scores in DMD.

CONCLUSION

Our study reveals that DMD children retain global network properties but have significant changes in nodal properties of the cerebellum and hippocampus, suggesting these areas may act as critical pathophysiological hubs. Furthermore, disrupted morphological network organization—characterized by hypoconnectivity in cerebellar-frontotemporal-subcortical circuit—likely underpins cognitive impairment. Individualized MSN topological properties may serve as potential neuroimaging biomarkers to advance clinical diagnosis and therapeutic strategies for DMD.

CLINICAL RELEVANCE/APPLICATION

This study identifies distinct morphological network disturbances in DMD, providing imaging biomarkers for early detection of cognitive risk. Findings emphasize the cerebellum's role in DMD-related neurocognitive impairment, guiding future interventions targeting cerebellar-frontotemporal-subcortical circuit plasticity to mitigate cognitive decline.

M5A-SPNR-2 STA-MCA BYPASS SURGERY INDUCED DIFFERENT PERFUSION REDISTRIBUTION PATTERNS IN THE MIDDLE CEREBRAL ARTERY TERRITORY BETWEEN MOYAMOYA ANDCEREBROVASCULAR STENO-OCCLUSIVEPATIENTS: A STUDY BY DSC-PWI

Haotian Chen (*Presenter*)
Zijun Li (*Abstract Co-Author*)
Yuting Wang (*Abstract Co-Author*)

PURPOSE

The Superficial Temporal Artery-Middle Cerebral Artery (STA-MCA) bypass surgery has become an effective treatment for Moyamoya Disease (MMD) but remains contentious for cerebrovascular atherosclerotic stenosis-occlusion (grouped as N-MMD), partly due to the unclear hemodynamic alteration postoperatively. This study aims to compare the perfusion changes after STA-MCA bypass in N-MMD and MMD patients.

METHODS AND MATERIALS

A total of 64 consecutive patients who underwent STA-MCA bypass for either MMD or N-MMD were prospectively included. All patients received preoperative (time point 1, TP1) and postoperative (1-2 weeks, TP2) DSC-PWI MRI. A subset of patients (n=30) reached a long-term follow-up timepoint (6-9 months postoperatively, TP3) and underwent a third DSC-PWI. Normalized CBF (nCBF, calculated as the ratio of mean CBF values of MCA territory to mean CBF values of the cerebellum) related indices were manually calculated, including central nCBF (caudate and lenticular nucleus), MCA territory cortical nCBF, mean nCBF and hemodynamic stress distribution (hdSD, the ratio of central nCBF to cortical nCBF). ANOVA was used to compare the perfusion indices among the groups.

RESULTS

Of the 64 included cases, 32 (50%) were N-MMD cases. The mean age was 52 years and 37 patients (58%) were male. A significant increase of central nCBF ($P=0.02$), cortical nCBF ($P<0.001$) and mean nCBF ($P<0.001$) were observed postoperative in N-MMD patients, indicating an overall increase of perfusion in the MCA territory, while the hdSD showed no significant change. For MMD patients, a significant increase of cortical nCBF ($P=0.004$), mean CBF ($P=0.01$) and decrease of hdSD ($P=0.009$) were observed, indicating redistribution of CBF towards the cortical portion. There was a significant effect of time on perfusion redistribution during long-term follow-up, indicating a sustained hemodynamic remodeling in both MMD and non-MMD patients.

CONCLUSION

There was a significant redistribution of cerebral perfusion towards the cortical portion in MMD patients following surgery. Whereas N-MMD patients hemodynamically benefited from surgery by the increase of both central and cortical perfusion. This indicates STA-MCA bypass induced different patterns of perfusion alteration for the two groups. The long-term clinical outcomes related to these alterations remain to be substantiated through extended longitudinal studies.

CLINICAL RELEVANCE/APPLICATION

Our findings suggest STA-MCA bypass may benefit a broader population of intracranial stenosis/occlusion, but through different patterns of perfusion alteration for MMD and N-MMD patients as revealed by DSC-PWI. This could be further explored for stroke prognosis stratification through extended longitudinal studies.

M5A-SPNR-3 UNFAVORABLE PERFUSION COLLATERAL SCORE IS ASSOCIATED WITH HIGHER ODDS OF POOR OUTCOMES IN LARGE VESSEL OCCLUSION STROKE

Hamza A. Salim, MD (*Presenter*)
Dhairya Lakhani, MD (*Abstract Co-Author*)
Manisha Koneru (*Abstract Co-Author*)
Licia P. Luna, MD, PhD (*Abstract Co-Author*)
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Kambiz Nael, MD (*Abstract Co-Author*)
Argye Hillis, MD (*Abstract Co-Author*)
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PURPOSE

Effective collateral circulation significantly influences clinical outcomes in patients with acute ischemic stroke (AIS) due to large vessel occlusion (LVO). We developed and evaluated a composite Perfusion Collateral Score (PCS), combining the unfavorable dichotomizations of CT perfusion-derived parameters (hypoperfusion intensity ratio [HIR], cerebral blood volume [CBV] index, and prolonged venous transit [PVT]), hypothesizing that higher scores, representing worse collateral status, are associated with poor functional outcomes at 90 days.

METHODS AND MATERIALS

In this retrospective study or a prospectively collected database, we analyzed 225 AIS-LVO patients presenting within 24 hours of symptom onset who underwent diagnostic CT perfusion imaging. PCS was calculated (range 0-3) based on unfavorable values of HIR (=0.4), CBV index (<0.8), and presence of PVT, where each unfavorable parameter is allotted one point when present. The primary outcome was 90-day modified Rankin Scale (mRS) score, categorized into favorable (0-2) and unfavorable (3-6).

RESULTS

Higher PCS correlated significantly with worse 90-day outcomes, lower likelihood of favorable functional independence (mRS 0-2: 62% for PCS 0 vs. 23% for PCS 3; P=0.001), larger infarct volumes, and increased neurologic disability at discharge (P<0.001). In multivariable analysis, increasing PCS was independently associated with reduced odds of favorable outcomes (mRS 0-2: adjusted OR, 0.60; 95% CI, 0.39-0.90; P=0.015). The probability of unfavorable outcome increased progressively from 36% (PCS 0) to 76% (PCS 3).

CONCLUSION

The PCS, integrating three perfusion-based collateral parameters, is associated with 90-day functional outcomes in AIS-LVO patients.

CLINICAL RELEVANCE/APPLICATION

This scoring system offers an efficient, objective method to identify patients at higher risk for poor outcomes, optimizing rapid decision-making and resource allocation. Prospective validation is warranted.

M5A-SPNR-4 COMPARATIVE EVALUATION OF 7T VERSUS 3T SUSCEPTIBILITY-WEIGHTED IMAGING FOR CEREBRAL MICROBLEED DETECTION IN ASYMPTOMATIC MOYAMOYA DISEASE PATIENTS WITH HYPERTENSION

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PURPOSE

MMD is a major stroke cause in children/young adults. Hemorrhagic MMD has poor prognosis with high disability/mortality rates. Despite unclear pathophysiology, patients often experience recurrent bleeds, even in unaffected hemispheres. Identifying high-risk rebleeding patients remains a key challenge in hemorrhagic MMD management. Cerebral microbleeds (CMBs) may predict hemorrhage risk in moyamoya disease (MMD), with hypertension being a key risk factor. 7T MRI's superior SNR and prolonged T1 relaxation enable exceptional imaging resolution, allowing visualization of fine neuroanatomy. The enhanced resolution of 7T imaging may improve identification of microvascular pathology and hemorrhage risk stratification in this population. This study compares 7T versus 3T SWI quality, specifically evaluating 7T's advantage in detecting CMBs among hypertensive patients with asymptomatic MMD.

METHODS AND MATERIALS

Fourteen asymptomatic moyamoya disease patients with hypertension (mean age, 41.3 years ±10.3, 9 men) were enrolled with informed consent acquired before the study. All the patients underwent both 3T MRI and 7T MRI routine examinations with SWI included within 24 hours. The 7T examination was performed at a whole-body 7T MR scanner (MAGNETOM Terra, Siemens Healthcare, Erlangen, Germany) equipped with an 8Tx/32Rx head coil. The imaging parameters for 7T SWI were: repetition time 21.0 ms, echo time 14.0 ms, thickness 1.5 mm, flip angle 10 o . The imaging parameters for 7T SWI were: repetition time 37.0 ms, echo time 25.0 ms, thickness 3.0 mm, flip angle 15 o . The images were assessed by two neuroradiologists with blinded clinical information. The image quality score (0-5, worse to good), the location and number of CMBs to each patient were recorded.

RESULTS

The image quality score of 7T SWI and 3T SWI was the same (4.8±0.4 points). CMBs were detected present in 8 (61.5%) patients based on 7T SWI and 3 (23.1%) patients based on 3T SWI. Five patients (35.7%) presented CMBs positive on 7T but negative on 3T. 7T SWI presented a total of 14 CMBs in all patients while 3T SWI only presented 9 CMBs. For the 9 CMBs only presented on 7T (Figure 1), 3 of them were located in the anterior circulation, and 6 of them were located in the posterior circulation.

CONCLUSION

7T SWI has a significant advantage in presenting the CMBs in patients with asymptomatic MMD and hypertension, which may help select more hypertension MMD patients with high bleeding risk in clinical.

CLINICAL RELEVANCE/APPLICATION

7T SWI detected CMBs in 61.5% (8/13) of hypertensive MMD patients versus 23.1% (3/13) with 3T SWI, identifying 35.7% (5/14) additional cases. This superior detection capability suggests 7T SWI's clinical value for assessing hemorrhagic risk in asymptomatic patients.

M5A-SPNR-5 NEUROAIHUB: AN AI-DRIVEN FRAMEWORK FOR AUTOMATED DISCOVERY AND RETRIEVAL OF NEURORADIOLOGY DATASETS

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PURPOSE

To develop and evaluate an AI-driven framework, "NeuroAIHub" (https://neuroai.streamlit.com), for automated curation and discovery of neuroradiology imaging datasets to enhance data accessibility and accelerate research in neuroradiology.

METHODS AND MATERIALS

We manually extracted datasets from various sources and compiled them into a comprehensive database. This database is continuously enriched through an automated, agentic AI-based pipeline that utilizes web search tools to keep the data up to date. Additionally, a dataset exploration AI agent and a Python package were developed to enable customized dataset retrieval based on user-defined criteria, further enhancing accessibility and flexibility for researchers and clinicians.

RESULTS

The manual dataset extraction process curated a comprehensive base of 173 datasets across diverse categories, including neurodegenerative, neoplastic, cerebrovascular, psychiatric, spinal, and neurodevelopmental diseases. The automated AI-driven pipeline further enhances this database by continuously updating it with new datasets. On average, the pipeline can add four new datasets and their corresponding metadata for each category in less than a minute. This results in a total update time of approximately 480 seconds for the entire database, ensuring timely enrichment and up-to-date accessibility for researchers and clinicians.

CONCLUSION

NeuroAIHub streamlines neuroradiology dataset discovery, offering a scalable, user-friendly tool for researchers and clinicians. Future community contributions will further enhance its adaptability and impact.

CLINICAL RELEVANCE/APPLICATION

NeuroAIHub accelerates neuroradiology research by enabling efficient dataset access, supporting AI-driven diagnostics and treatment planning.

M5A-SPNR-6 LONG-TERM CLINICAL AND ANGIOGRAPHIC OUTCOME IN INTRACRANIAL ANEURYSMS TREATED WITH PARENT ARTERY OCCLUSION

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PURPOSE

Parent artery occlusion (PAO) remains a valuable treatment option for complex intracranial aneurysms not suitable for conventional endovascular approaches. This study evaluated long-term clinical and angiographic outcomes following PAO, with analysis based on aneurysm morphology, location, rupture status, clinical presentation, and angiographic results.

METHODS AND MATERIALS

We retrospectively analyzed patients treated with PAO between March 2005 and December 2024. Clinical outcomes were assessed using the modified Rankin Scale (mRS), and Pearson's chi-square test was used to identify predictors of occlusion status and clinical outcome.

RESULTS

Data analysis is ongoing. Among 30 patients with complete data analysis, 14 (46.6%) had aneurysms in the anterior circulation, and 16 (53.3%) presented with ruptured aneurysms. Twelve (40%) had fusiform morphology, 15 (50%) were >10 mm in length, 23 (76.6%) had neck sizes <10 mm, and 19 (63.3%) had dome-to-neck ratios <2. Complete occlusion was achieved in 25 patients (83%). At a mean follow-up of 22.1 months, 3 recurrences (10%) were observed. There were no peri-procedural deaths or post-procedural ruptures. Fusiform aneurysms showed a trend toward favorable long-term outcomes ($p = 0.063$).

CONCLUSION

PAO offers a safe and effective long-term treatment for select complex intracranial aneurysms, with low recurrence and no post-procedural rupture. Moderate peri-procedural morbidity highlights the importance of careful patient selection.

CLINICAL RELEVANCE/APPLICATION

For patients with intracranial aneurysms that are not amenable to conventional endovascular techniques, PAO provides a viable alternative with favorable long-term safety and efficacy. Careful patient selection—based on aneurysm characteristics and clinical presentation—can optimize outcomes and reduce the risk of complications, offering patients a durable treatment option with minimal recurrence and high rates of occlusion.

M5A-SPNR-7 CT-BASED HEAD & NECK COMPOSITION METRICS PREDICT RISK OF CONVERSION TO EARLY DEMENTIA

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PURPOSE

Visceral adiposity and sarcopenia are related to Alzheimer disease (AD) risk, yet not much is known about the risk associated with fart and muscle composition of head and neck. CT scan quantification of adipose and fat can provide a pretest probability for AD. We investigated the relationship between head CT composition metrics and AD risk.

METHODS AND MATERIALS

Participants with normal cognition and negative amyloid PET at their baseline visit from the Knight ADRC cohort were enrolled. Based on subsequent cognitive measurements, we determined whether each participant: i) stably converted from normal cognition to early dementia or ii) remained cognitively normal throughout the follow up period and calculated the dementia-free survival in both groups. The low-dose attenuation correction CT from the PET/CT scan closest to the last cognitively normal date was used to perform head CT adipose and fat composition analysis using the Data Analysis Facilitation Suite (DAFS, version 3). Closest brain MRI within 1 year of this scan was used to extract concurrent brain volumes.

RESULTS

500 participants met the inclusion criteria (age: 69±8, 41.8% male, 13.2% African American). Over a median follow up of 123 months, 48(2.6%) participants stably converted to early dementia. Individuals with higher fraction of inter-intramuscular adipose tissue in the head had a 3-times increased risk of conversion from normal cognition to early dementia (Fig A). Males with higher normalized temporalis muscle volume were protected against conversion to early dementia (HR(95%CI):0.3(0.1-0.8)) (Fig B). There was a direct relationship between the volume of the temporalis muscles and volume of the precuneus and entorhinal cortices that persisted even after correction for head size (Fig C & D).

CONCLUSION

Head fat and muscle quantifications informs future risk of dementia and correlate with brain atrophy.

CLINICAL RELEVANCE/APPLICATION

Long-term clinical applications of this approach would translate into a CT-driven dementia probability score that helps identify older individuals who are likely to benefit from AD confirmatory tests and potentially disease-modifying therapeutics. Our method could be scaled to the over 25 million head and neck CT scans performed annually in the United States.

M5A-SPNR-8 SIMPLE LINEAR MEASUREMENTS OF THE PUTAMEN RELIABLY DIFFERENTIATE MSA FROM OTHER PARKINSONIAN DISORDERS ON MRI

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PURPOSE

Differentiating Parkinsonian type Multiple System Atrophy (MSA-P) from other parkinsonian disorders remains a clinical challenge, particularly at initial presentation. This study evaluates the utility of simple linear measurements of the putamen to distinguish MSA from idiopathic Parkinson's Disease (iPD) and Progressive Supranuclear Palsy (PSP). The proposed measurements are obtained at the level of reliable MRI landmarks to ensure consistency.

METHODS AND MATERIALS

Two readers retrospectively assessed patients presenting with parkinsonism who underwent 3.0T MRI from 2011-2024 at our institution. Putaminal thickness was measured at the anterior commissure (AC) line and the midline between the AC and posterior commissure (mid AC-PC). Relative measurements were calculated as a percentage of putaminal thickness relative to the inner table diameter. Automatic estimates of putaminal and total intracranial volume using FreeSurfer were also obtained. Statistical analyses included estimation of intraclass correlation coefficients, ROC curve analysis and Pearson correlation coefficients.

RESULTS

The study included 111 patients (35 MSA-P, 11 MSA-mix, 25 PSP, and 40 iPD). No significant differences in age or sex between groups were found. Inter-observer reliability was high, with intraclass correlation coefficients exceeding 0.8 for all described measurements. ROC curve analysis demonstrated that decreased putaminal thickness estimated by simple linear measurements is a strong distinguishing feature for MSA patients presenting with parkinsonism compared to PSP and iPD patients. Putaminal diameter at the AC line (AUC 0.92 95%CI [0.87, 0.97]) and mid AC-PC line (AUC 0.94 [0.90, 0.99]) were comparable in discriminatory performance to relative measurements at these levels (AUC 0.93 [0.88, 0.98] and AUC 0.90 [0.84, 0.97] respectively), as well as to absolute and relative automatic volumetric putaminal segmentation (AUC 0.90 [0.83, 0.96] and AUC 0.87 [0.80, 0.94] respectively). Best differentiating threshold for MSA diagnosis was less than 8.2 mm at the AC line (87% sensitivity, 80% specificity), and less than 3.9 mm at the mid AC-PC line (78% sensitivity, 100% specificity). Pearson analysis showed moderate to strong positive correlations between volumetric and linear measurements.

CONCLUSION

We propose two straightforward linear metrics to assess putaminal atrophy with comparable performance to volumetric measurements in distinguishing MSA from other parkinsonian disorders.

CLINICAL RELEVANCE/APPLICATION

The proposed linear metrics with optimal differentiating thresholds facilitate detection and quantification of putaminal atrophy, providing a simple, reliable method to distinguish MSA from other parkinsonian disorders.

M5A-SPNR-10 OMT AND TENSOR SVD BASED DEEP LEARNING MODEL FOR SEGMENTATION AND PREDICTING GENETIC MARKERS OF GLIOMA: A MULTICENTER STUDY

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PURPOSE

Glioma is the most common primary malignant brain tumor and preoperative genetic profiling is essential for management of glioma patients. Our study focused on tumor regions segmentation and predicting the World Health Organization (WHO) grade, isocitrate dehydrogenase (IDH) mutation, and 1p/19q codeletion status using deep learning models on preoperative Magnetic Resonance Imaging (MRI).

METHODS AND MATERIALS

We developed an optimal mass transport (OMT) approach to transform irregular MRI brain images into tensors. In addition, we proposed an algebraic pre-classification (APC) model utilizing multi-mode OMT tensor singular value decomposition (SVD) to estimate pre-classification probabilities. The fully automated deep learning model named OMT-APC was used for multitask classification. Our study incorporated preoperative brain MRI data from 3,565 glioma patients across 16 datasets spanning Asia, Europe, and America. Among these, 2,551 patients from 5 datasets were used for training and internal validation. In comparison, 1,014 patients from 11 datasets, including 242 patients from The Cancer Genome Atlas (TCGA), were used as independent external test.

RESULTS

OMT segmentation model achieved mean lesion-wise Dice scores of 0.880. The OMT-APC model was evaluated on the TCGA dataset, achieving accuracies of 0.855, 0.917 and 0.809, with AUC scores of 0.845, 0.908 and 0.769 for WHO grade, IDH mutation, and 1p/19q codeletion, respectively, which outperformed the four radiologists in all tasks.

CONCLUSION

These results highlighted the effectiveness of our OMT and tensor SVD-based methods in brain tumor genetic profiling, suggesting promising applications for algebraic and geometric methods in medical image analysis.

CLINICAL RELEVANCE/APPLICATION

This work has considerable clinical significance that would help neuro-oncologists make more appropriate treatment plans for patients.

M5A-SPNR-12 BEGINNER'S MIND: LONGITUDINAL MULTIMODAL MRI UNCOVERS NEUROPLASTIC CHANGES SUPPORTING DIAGNOSTIC SKILL ACQUISITION IN RADIOLOGY INTERNS

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PURPOSE

To investigate experience-dependent neuroplasticity associated with early-stage diagnostic skill acquisition in radiology interns using longitudinal multimodal MRI. This study aims to identify structural and functional brain changes emerging after short-term clinical exposure and to uncover neural markers predictive of visual diagnostic expertise. Findings may inform cognitively adaptive training strategies in radiologic education.

METHODS AND MATERIALS

In this longitudinal study, 41 radiology interns undergoing one-month clinical training in X-ray interpretation completed behavioral testing, structural MRI (sMRI), and resting-state functional MRI (rs-fMRI) before and after the rotation. Diagnostic performance was assessed using the Radiology Expertise Task. Voxel-based morphometry and whole-brain functional connectivity analyses were conducted. Support vector machine classification with recursive feature elimination differentiated pre- from post-training subjects using sMRI and rs-fMRI data. An independent cohort and leave-one-out cross-validation were used to evaluate model performance.

RESULTS

Visual diagnostic performance improved significantly after training. Classification accuracy reached 91.7% (sMRI) and 93.3% (rs-fMRI), with independent test accuracies of 90.9% and 81.8%, respectively. Overlapping structural and functional changes were found in eight regions, including the fusiform gyrus, anterior cingulate, orbitofrontal cortex, and hippocampus. Functional connectivity between frontal and occipital regions correlated with diagnostic accuracy and reaction time. Gray matter volume changes also correlated with behavioral performance. Network-level reorganization was observed: increased coherence within exogenous networks (e.g., visual, somatomotor) and decreased coherence within endogenous networks (e.g., default mode, frontoparietal), along with increased integration between them.

CONCLUSION

Short-term clinical training induces measurable neuroplastic changes supporting early diagnostic skill development. These changes reflect dynamic interactions between visual perception, attention, memory, and decision-making systems, with implications for evidence-based radiology education.

CLINICAL RELEVANCE/APPLICATION

Identifying neural substrates of diagnostic learning can guide the development of targeted educational strategies and neurofeedback tools that enhance visual reasoning and accelerate radiologic expertise.

M5A-SPNR-13 CORRELATION BETWEEN CAROTID PLAQUE-RADS CLASSIFICATION ON CTA AND ISCHEMIC CEREBROVASCULAR EVENTS: A RISK ASSESSMENT STUDY

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PURPOSE

Ischemic cerebrovascular events (ICE), linked to carotid plaque characteristics, are a major cause of death and disability. This study explored the correlation between Carotid Plaque-RADS and ICE, to assess its risk-stratification efficiency for guiding early intervention.

METHODS AND MATERIALS

Retrospectively, 7,228 neck CTA cases (2019 - 2024) were screened, yielding 1,232 cases (774 symptomatic, 458 asymptomatic). Two radiologists assessed plaque traits and Carotid Plaque-RADS. After propensity score matching(PSM) (371 vs. 371), Spearman, Logistic, ROC, Kaplan-Meier, and Cox analyses were performed.

RESULTS

PSM balanced confounding factors. Symptomatic group had more high-level Carotid Plaque-RADS (=3) ($P < 0.001$). The results of Spearman correlation analysis showed that there was a weak positive correlation between the Carotid Plaque-RADS and ICE ($r = 0.347$, $P < 0.001$). Logistic regression analysis indicated that the risk of ICE was the highest in 4c plaques (OR = 7.856, 95% CI: 4.122-14.974, $P < 0.001$), and the high classification grade of Carotid Plaque-RADS was an important independent risk factor for the occurrence of ICE ($P < 0.001$). ROC curve analysis showed that the area under the curve (AUC) of Carotid Plaque-RADS for diagnosing ICE after matching was 0.650, which was significantly better than the simple degree of stenosis (AUC = 0.546, $P < 0.001$), but lower than the combined model of the degree of stenosis and the Carotid Plaque-RADS classification (AUC = 0.676, $P < 0.001$). During 43±19 month follow-up, 11.6% asymptomatic had ischemic stroke, 19.4% symptomatic had recurrent stroke. There were significant differences in the DFS and RFS rates among different carotid Plaque-RADS classifications ($P < 0.001$)and stenosis degree ($P < 0.001$) . As the Plaque-RADS classification increased from 1 to 4, the DFS and RFS rates decreased significantly ($P < 0.001$). For mild/moderate stenosis, Plaque-RADS =3 vs. <3 showed different DFS/RFS ($P < 0.001$). For patients with severe stenosis, the RFS rate of patients who received carotid revascularization was significantly higher ($P < 0.001$). Cox analysis indicated that Plaque-RADS =3 and severe stenosis linked to ischemic/recurrent stroke risk.

CONCLUSION

CTA-based Carotid Plaque-RADS effectively identifies ICE high-risk populations, especially for high-level plaques (=3), improving stroke risk stratification in mild/moderate stenosis. PSM-controlled confounding factors provide evidence for Carotid Plaque-RADS in assessing ICE, aiding early clinical strategies.

CLINICAL RELEVANCE/APPLICATION

Carotid artery; Atherosclerosis; Carotid Plaque-RADS; Computed tomography angiography; Ischemic cerebrovascular events; Propensity score matching

M5A-SPNR-14 AI-DRIVEN ANALYSIS OF BRAIN CT FOR INTRACEREBRAL HEMORRHAGE DETECTION

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PURPOSE

The intracerebral hemorrhage (ICH) is a critical and potentially fatal type of cerebrovascular disease. In severe instances, it can disrupt vital functions such as breathing and may result in death, making immediate medical intervention essential. Manual interpretation of brain CT can be time-consuming. We aim to develop a system based on AI (Artificial Intelligence) to automatically detect ICH in non-contrast brain CT scans. This system can be integrated into the diagnostic workflow and will assist clinicians with fast, accurate decisions in acute care.

METHODS AND MATERIALS

We developed an AI-based framework utilizing convolutional neural networks, specifically leveraging a two-stage 3D nnUNet architecture. In the first phase, the model segments the brain parenchyma, followed by targeted segmentation of intracerebral hemorrhage in the second phase. Training was conducted on a curated dataset of 700 anonymized non-contrast brain CT scans, each precisely annotated by an expert radiologist to ensure high clinical fidelity. The system performs binary segmentation to distinguish hemorrhagic tissue from healthy brain structures. After inference, the model outputs a DICOM-compatible overlay that highlights hemorrhagic regions, along with a structured report summarizing key clinical details, including hemorrhage presence, lesion dimensions, and volumetric analysis. This AI tool is designed to support radiologists and emergency clinicians by delivering fast, reliable, and quantifiable insights, thereby streamlining decision-making in urgent care environments.

RESULTS

We tested our approach on a private brain CT dataset of 50 samples. Our proposed approach achieved 93% sensitivity, 82.3% specificity, and 84.6% precision for ICH detection. An overall accuracy of 94% is obtained. A radiologist verified the results.

CONCLUSION

The findings of this study demonstrate that our AI system is effective in detecting and localizing intracerebral hemorrhages. With continued validation and integration into clinical workflows, the system holds promise for enhancing diagnostic efficiency and supporting better patient outcomes in acute stroke care. As we continue to develop this system, we aim to broaden its capabilities by including detailed ICH subtype classification and identifying other critical findings, including ischemic stroke, thereby supporting more precise and personalized treatment planning.

CLINICAL RELEVANCE/APPLICATION

Our AI tool automates the detection of intracerebral hemorrhage by integrating it into clinical workflows. It provides real-time decision support, improving diagnostic accuracy and facilitating timely intervention in emergency departments where rapid detection is crucial for patient survival.

M5A-SPNR-17 DIAGNOSTIC ACCURACY OF DUAL-ENERGY CT FOR INTRACEREBRAL HEMORRHAGE VS. CONTRAST STAINING, RADIATION DOSE, AND STROKE APPLICATIONS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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PURPOSE

Dual-energy computed tomography (DECT) has emerged as a valuable imaging modality in cerebrovascular diseases, particularly in differentiating intracerebral hemorrhage (ICH) from contrast staining after endovascular procedures. This systematic review and meta-analysis aims to investigate the diagnostic performance of DECT in distinguishing ICH from contrast staining after procedures, alongside its technical protocols, radiation dose implications, and broader cerebrovascular applications.

METHODS AND MATERIALS

A systematic review and meta-analysis was conducted according to PRISMA and PRISMA-DTA guidelines. Literature searches of MEDLINE and EMBASE were performed up to March 2025. Studies were included if they evaluated DECT in cerebrovascular disease with extractable technical and diagnostic performance data. Pooled sensitivity and specificity were calculated for distinguishing ICH from contrast staining using a bivariate random-effects model. Radiation dose metrics, including CTDIvol and DLP, were also pooled from eligible studies using random-effects meta-analysis.

RESULTS

Sixty-eight studies with 5,530 patients were included, of which 10 contributed to the diagnostic accuracy meta-analysis. DECT showed high pooled sensitivity (96.1%, 95% CI: 83.8-99.1%) and specificity (97.8%, 95% CI: 91.4-99.5%) in differentiating ICH from contrast staining. Radiation dose analysis from 13 studies (n=637) yielded a pooled CTDIvol of 28.83 mGy, and from 9 studies (n=485), a pooled DLP of 517.66 mGy·cm—both comparable to single-energy CT. The most common DECT setup used dual-source scanners with 80/140 kVp and post-processing with virtual non-contrast and iodine maps.

CONCLUSION

DECT offers excellent diagnostic accuracy for differentiating ICH from contrast staining without increasing radiation dose compared to conventional CT. These results support its use in acute stroke imaging, particularly following endovascular therapy. DECT's post-processing techniques, such as virtual non-contrast and iodine maps, enhance its ability to assess stroke-related complications. Standardization of protocols remains essential to reduce variability and enable broader clinical adoption.

CLINICAL RELEVANCE/APPLICATION

DECT should be the preferred imaging modality for differentiating ICH from contrast staining in the post-endovascular treatment setting, offering improved diagnostic confidence (pooled sensitivity of 96.1% and specificity of 97.8%) without increased radiation burden (pooled CTDIvol of 28.83 mGy and DLP of 517.66 mGy×cm, comparable to conventional single-energy CT).

M5A-SPNR-18 NON-INVASIVE ASSESSMENT OF GLYMPHATIC SYSTEM FUNCTION IN CSVD WITH MILD COGNITIVE IMPAIRMENT BASED ON MULTIPARAMETRIC MRI

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Haixia Mao (*Abstract Co-Author*)
Xiangming Fang, MD (*Abstract Co-Author*)

PURPOSE

In this cross-sectional study, we utilized a variety of non-invasive methods based on multi-parameter magnetic resonance imaging (MRI) to evaluate the glymphatic system function in patients with cerebral small vessel disease (CSVD), both with and without mild cognitive impairment. Our objective is to identify changes in glymphatic function among CSVD-MCI patients through imaging analysis, thereby enabling timely intervention.

METHODS AND MATERIALS

We conducted a comprehensive analysis of data from participants with mild cognitive impairment and normal cognition derived from a prospective CSVD study. We calculated the DTI-ALPS index, gBOLD-CSF coupling strength, and choroid plexus volume (CPV) separately and performed comparative analyses. According to the

STRIVE2 criteria, the occurrence of each CSVD markers was quantified into an ordinal "summary SVD score" ranging from 0 to 4. The correlations between the three glymphatic system parameters and CSVD imaging markers were analyzed and we further explored the interaction between glymphatic function and cognitive outcomes.

RESULTS

A total of 308 subjects were recruited (mean age, 72 years ± 9 [SD]; 162 women), of whom 141 CSVDs and 167 healthy controls (HC). The CSVD group was further divided into CSVD-MCI (mild cognitive impairment) and CSVD-NCI (without cognitive impairment). Significant differences were found in the DTI-ALPS indices and CPV between HC and CSVD-NCI groups (P < 0.001) and CSVD-MCI groups (P <0.001) in a univariate general linear model corrected for age, sex, hypertension and diabetes. Severer periventricular (PWMH) (ß = -0.350, p <0.001; ß =0.404, p <0.001)and deep white matter hyperintensities (DWMH) (ß = -0.330, p <0.001; ß =0.324, p <0.001), number of microbleeds (ß= -0.255, p <0.001; ß =0.191, p <0.001),number of lacunas (ß = -0.194, p < 0.001; ß =0.177, p <0.001), and severer enlarged perivascular spaces in basal ganglia (BG EPVS) (ß = -0.335, p < 0.001; ß =0.390, p <0.001) were related to ALPS-index and CPV. Moreover, a significant correlation was found between ALPS-index and CPV (ß = -0.387, p < 0.001).

CONCLUSION

Our results indicated that the difference of ALPS-index and CPV between CSVD with/without mild cognitive impairment are significant. Effective imaging markers may enable non-invasive monitoring of glymphatic changes, thereby facilitating the identification of optimal timing for clinical interventions.

CLINICAL RELEVANCE/APPLICATION

The ALPS index and CPV may serve as non-invasive imaging biomarkers for identifying mild cognitive impairment in CSVDs, thereby facilitating timely clinical intervention for MCI patients and potentially delaying the further development of cognitive impairment.

M5A-SPNR-19 COMPARATIVE EFFICACY OF SBRT AND ABLATION VS SBRT ALONE FOR SPINAL OSSEOUS METASTASES

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PURPOSE

The purpose of this study is to evaluate whether ablation can improve pain relief in patients with spinal osseous metastases experiencing refractory pain following SBRT, and whether the combination of SBRT and ablation improves locoregional control.

METHODS AND MATERIALS

Inclusion criteria were patients with painful spinal metastases treated with either SBRT or SBRT combined with ablation between 2015 to 2024. Exclusion criteria included patients without follow up and pediatric patients. Clinical data obtained for retrospective analysis included demographic information (age, sex, primary tumor type), treatment details (radiation dose and fractionation, ablation modality), functional status as measured by Karnofsky performance status, pain scores as measured by VAS, and morphine milligram equivalent (MME). Locoregional control was assessed by follow up imaging via CT, PET, or MR at 3,6, and 12 months. Statistical analysis included Student's t -test for continuous variables and chi-square tests for categorical variables.A p -value of < 0.05 was considered statistically significant.

RESULTS

16 patients were included in the combination treatment group (SBRT+ablation), and 16 age matched controls were included in the SBRT control group. Key differences between the groups include the number of osseous metastases, surgical history, and SBRT dose delivery, which are summarized in table 1. In the combination group, 81 percent of patients previously underwent SBRT and were referred to ablation due to persistent pain or new fracture, with mean time between SBRT and ablation 5.5 months. In both the combined group and SBRT alone, there was a statistically significant decrease in VAS pain score at all time points, with combined therapy decreasing 2.5 points at 12 months compared to baseline (p=.006), vs 1.8 points for SBRT alone (p=.008). There was no significant change in either opioid consumption or functional status following intervention in either group. Combined therapy had improved local control at all time points (6.3% local failure vs 12.5% at 12 months), but this did not reach statistical significance. There were no adverse events.

CONCLUSION

Ablation led to significant reduction in pain scores post-intervention in a cohort mostly composed of patients with refractory pain following SBRT. While there was improved local control in the combined group, this did not reach statistical significance.

CLINICAL RELEVANCE/APPLICATION

Refractory pain following SBRT for osseous spinal metastases is common and ablation can serve as an effective treatment adjunct. Further studies are needed to determine if combined therapy leads to improved local control.

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M5A-SPOB

OB/Gynecology Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPOB-1 MACHINE LEARNING MODEL BASED ON PLACENTA MRI RADIOMICS TO PREDICT THE RISK OF IUGR AND GUIDE CLINICAL FOLLOW-UP

Claudia Cutonilli, MD (*Presenter*)
Lucia Manganaro, MD (*Abstract Co-Author*)
Marco Gennarini (*Abstract Co-Author*)
Federica Curti, MD (*Abstract Co-Author*)
Roberta V. Ninkova, MD (*Abstract Co-Author*)
Sandrine Riccardi (*Abstract Co-Author*)
Valentina Miceli, MD (*Abstract Co-Author*)
Angelica Cupertino, MD (*Abstract Co-Author*)
Chiara Amoroso (*Abstract Co-Author*)
Flaminia Frezza, MD (*Abstract Co-Author*)

PURPOSE

To develop a machine learning model based on Magnetic Resonance Imaging images to stratify the single-subject risk of IUGR.

METHODS AND MATERIALS

We collected images of Magnetic Resonance Imaging (T2W) from 72 subjects. Each image contained exactly one volume of interest (VOI), thus there is a univocal correspondence between subjects and samples. Among these, 37 samples (51.4%) belonged to class "IUGR" (Positive class) and 35 samples(48.6%) belonged to class "healthy" (Negative class), according to clinical follow up. This image set was used for the training, validation, and testing of five machine-learning models (Random Forest, Support Vector Machine, K-NearestNeighbors, Multi-Layer Perceptron, Logistic Regression).

RESULTS

The best model showed ROC-AUC (%) of 75** (67-83), Accuracy (%) of 68** (62-75), Sensitivity (%) of 69** (61-77), Specificity (%) of 67* (54-80), PPV (%) of 70** (63-77), NPV (%) of 67** (60-74) (*p<0.05, **p<0.005).

CONCLUSION

Among the five different machine learning ensembles tested (Random Forest, Support Vector Machine, K-Nearest Neighbors, Multi-Layer Perceptron, Logistic Regression), the Random Forest classifier model demonstrated the best performance for distinguishing between "IUGR" and "healthy" subjects, with a sensitivity of 69%.

CLINICAL RELEVANCE/APPLICATION

The research concludes that the specific machine learning model, particularly the Random Forest implementation, can effectively and significantly predict IUGR risk using placental MRI radiomics, showing good accuracy and reliability.The findings from this research suggest that, with further validation and development, this machine learning model could potentially contribute to the earlier diagnosis of IUGR in the future.

M5A-SPOB-2 PHYSICALLY-PRIMED AI-ENHANCED IVIM ANALYSIS OF PLACENTAL DIFFUSION-WEIGHTED MRI REVEALS FUNCTIONAL DIFFERENCES IN LGA PREGNANCIES ASSOCIATED WITH MATERNAL DIABETES

Moti Freiman, PhD (*Presenter*)
Naama Gavrielov (*Abstract Co-Author*)
Moran Gawie-Rotman (*Abstract Co-Author*)
Zeina Abdel-Rauf (*Abstract Co-Author*)
Roni Shreter, MD (*Abstract Co-Author*)
Esther Maor-Sagie (*Abstract Co-Author*)
Rinat Gabbay-Benziv (*Abstract Co-Author*)

PURPOSE

Maternal diabetes increases the risk of large for gestational age (LGA) fetuses, associated with complications like birth trauma and metabolic disorders. As placental dysfunction underlies LGA, early detection is critical. While IVIM analysis of DWI offers non-invasive placental biomarkers, it is limited by unstable parameter estimates from sparse b-value sampling. This study evaluates whether physically-primed AI models incorporating b-values can improve detection of functional placental differences between healthy and LGA pregnancies.

METHODS AND MATERIALS

Placental diffusion-weighted imaging (DWI) was performed on a 1.5T scanner (Ingenia, Philips Medical Systems, Best, The Netherlands) using a multi-channel coil. Axial 2D spin-echo images with fat suppression were acquired with TR = 4215 ms, TE = 103 ms, slice thickness = 5.0 mm, spacing = 6.0 mm, in-plane resolution = 1.01 × 1.01 mm², and a 121 × 116 matrix. Nine b-values (0-1000 s/mm²) were used, with a total scan time of ~531 seconds. DWI data from pregnant women with uncontrolled diabetes and healthy controls were analyzed to estimate IVIM parameters—D (diffusion), D* (pseudo-diffusion), and f (pseudo-diffusion fraction)—using classical IVIM and two physically-primed AI models, SUPER-IVIM-DC and SUPER-IVIM-DC-Boot, optimized for limited b-value data. Group differences were evaluated using Welch's t-test.

RESULTS

Five pregnant women with maternal diabetes and eight healthy pregnant controls (mean age: 30.0 ± 5.5 vs. 35.5 ± 2.9 years; gestational age: 35 ± 2.8 vs. 30.3 ± 4.9 weeks) were enrolled in the study. Classical IVIM showed no significant group differences. Using SUPER-IVIM-DC, D was significantly lower in the diabetic group

(0.001827 ± 0.000086 mm²/s) compared to controls (0.001997 ± 0.000136 mm²/s, p = 0.03997). SUPER-IVIM-DC-BOOT showed significant differences in both D (0.001931 ± 0.000073 vs. 0.002043 ± 0.000104 mm²/s, p = 0.04365) and f (0.2896 ± 0.0428 vs. 0.3421 ± 0.0279, p = 0.0494), highlighting impaired placental diffusivity and perfusion in maternal diabetes.

CONCLUSION

AI-based methods, especially SUPER-IVIM-DC and BOOT, were more sensitive than classical IVIM in detecting functional placental differences in LGA pregnancies, revealing impaired diffusivity and perfusion. These models show promise as non-invasive tools for early identification of placental dysfunction in high-risk pregnancies.

CLINICAL RELEVANCE/APPLICATION

Physically-primed AI models allow reliable placental biomarker extraction from limited DWI data and reveal functional differences in LGA pregnancies. They offer a non-invasive tool for early detection of placental dysfunction in maternal diabetes, supporting timely intervention and better outcomes.

M5A-SPOB-3 THERAPEUTIC DECISION-MAKING IN PATIENTS WITH BOWEL ENDOMETRIOSIS: THE CLINICAL VALUE OF MRI

Federica Curti, MD (*Presenter*)
Roberta V. Ninkova, MD (*Abstract Co-Author*)
Angelica Cupertino, MD (*Abstract Co-Author*)
Chiara Amoroso (*Abstract Co-Author*)
Alessandro Calabrese, MD (*Abstract Co-Author*)
Claudia Cutonilli, MD (*Abstract Co-Author*)
Carlo Catalano, MD (*Abstract Co-Author*)
Lucia Manganaro, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the role of magnetic resonance imaging (MRI) in guiding the choice between medical and surgical treatment in patients with intestinal endometriosis, through detailed analysis of lesion morphology and anatomical involvement.

METHODS AND MATERIALS

We retrospectively enrolled 215 patients with bowel endometriosis who underwent MRI between 2017 and March 2024, with at least 1 year of follow-up. Of these, 135 patients underwent surgical treatment, either alone or combined with medical therapy, while 80 patients received medical treatment exclusively. The intestinal endometriotic lesions were assessed on MRI, with particular attention to location (low, mid, or upper rectum; rectosigmoid junction; extrapelvic sites), based on the distance from the anal margin. Additional features including the number of nodules, longitudinal extension, lesion thickness, and circumferential involvement were also evaluated.In addition to MRI features, clinical symptoms were systematically assessed using the NRS scale, with comparative analysis of pre- and post-treatment scores. The occurrence of bowel obstruction and post-surgical complications were also recorded.

RESULTS

The upper rectum was the most frequently affected site (33%), followed by the rectosigmoid junction (22%), mid-rectum (20%), lower rectum (13%), and extrapelvic intestinal segments (12%). The overall incidence of bowel obstruction was 5.1%, observed exclusively in patients with lesions located =10 cm from the anal verge and demonstrating circumferential involvement of =4/8. Surgical treatment demonstrated superior efficacy in patients with lesions >14 mm in thickness and =4/8 circumferential involvement, achieving a significantly greater reduction in symptom severity (mean NRS reduction: 4.3 ± 1.2) compared to medical therapy alone (mean NRS reduction: 2.1 ± 1.0; p < 0.001). Conversely, in patients with smaller or less extensive lesions, symptom control was comparable between medical and surgical approaches (mean NRS reduction: 3.0 ± 1.3 vs. 2.9 ± 1.1; p = 0.74). Among patients undergoing surgery, 65.2% experienced postoperative complications, with bladder incontinence being the most frequent adverse event (26.7%).

CONCLUSION

MRI plays a pivotal role in the management of bowel endometriosis, offering detailed lesion characterization and enabling personalized treatment by identifying features linked to symptom severity and the risk of bowel obstruction, thus supporting the selection of the most beneficial treatment approach for each patient.

CLINICAL RELEVANCE/APPLICATION

MRI-derived features may function as imaging biomarkers for risk stratification, assessing the likelihood of bowel obstruction and guiding individualized treatment strategies.

M5A-SPOB-4 RECENT ADVANCES IN AI-BASED MODELS FOR OVARIAN TUMOR DIAGNOSIS AND CLASSIFICATION: A SYSTEMATIC REVIEW AND META-ANALYSIS

Andrew Farah (*Presenter*)
Matthew Bilson, BA (*Abstract Co-Author*)
Aliyah Baakoe (*Abstract Co-Author*)
Labbaik Aas (*Abstract Co-Author*)
Wassim Elmasry, MD (*Abstract Co-Author*)
James Man Git Tsui (*Abstract Co-Author*)
Antonio G. Tongue, MD,FRCPC (*Abstract Co-Author*)

PURPOSE

Ovarian cancer remains a major cause of gynecologic cancer mortality. Early and accurate detection is essential for guiding clinical management and improving outcomes, but current imaging methods are limited by variability and subjectivity. Artificial intelligence (AI) has shown promise in improving diagnostic accuracy, with ongoing advancements in model architecture and imaging applications. Given this rapid progress, there is a continued need to reassess the performance of recent AI-based models for ovarian tumor classification. This systematic review and meta-analysis assess pooled diagnostic performance across imaging modalities and examines the influence of recent model characteristics.

METHODS AND MATERIALS

Following PRISMA guidelines, we searched MEDLINE, Embase, Scopus, Web of Science, and preprint servers for studies published between January 2022 and January 2025. Included studies used AI to perform binary classification of ovarian tumors using ultrasound (US), CT, or MRI. Risk of bias was assessed using QUADAS-2. Pooled diagnostic metrics (accuracy, sensitivity, specificity, diagnostic odds ratio [DOR]) were calculated using common-effect and random-effects models, with subgroup analyses by imaging modality and validation strategy. The protocol was submitted to PROSPERO (awaiting registration ID).

RESULTS

34 studies met inclusion criteria, with 19 eligible for meta-analysis (12 US, 4 CT, 3 MRI). Pooled diagnostic accuracy was 94.5% (95% CI: 94.1-94.9) under the common-effect model and 89.3% (95% CI: 86.6-92.1) under the random-effects model. Sensitivity and specificity were 95.1% and 93.9%, and overall DOR was 65.3 (95% CI: 56.2-75.8) and 82.6 (95% CI: 40.9-166.6) respectively. US models showed high performance, with a random-effects DOR of 106.8 (95% CI: 56.8-201.0), and accuracy, sensitivity, and specificity exceeding 90%. Most models employed deep learning, with ensemble CNNs outperforming radiomics and traditional ML approaches. Risk of bias was low or unclear in most studies. External validation was infrequent while subgroup analyses showed considerable heterogeneity.

CONCLUSION

AI models demonstrate strong diagnostic performance in classifying ovarian tumors, especially in US-based applications. However, heterogeneity and limited data in CT and MRI studies limit generalizability. Greater external validation, standardized protocols, and multicenter datasets are needed for clinical adoption.

CLINICAL RELEVANCE/APPLICATION

Our findings reinforce the need for standardized imaging benchmarks, open-access multicenter datasets, and external validation. Adoption of AI-specific quality frameworks such as QUADAS-AI is essential for safe and effective clinical translation.

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M5A-SPPD

Pediatric Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPPD-1 INTRARENAL REFLUX IS LINKED TO SUBSEQUENT KIDNEY SCARRING: A RETROSPECTIVE STUDY

Jisun Hwang, MD (*Presenter*)
Young Jin Ryu, MD (*Abstract Co-Author*)

PURPOSE

This study investigates whether intrarenal reflux (pyelotubular backflow) isassociated with kidney scarring in children with urinary tract infection (UTI).

METHODS AND MATERIALS

We retrospectively reviewed 441 children diagnosed with UTI who underwentvoiding cystourethrography (VCUG) and a technetium-99m dimercaptosuccinic acid (DMSA) scan more than three months after the UTI. Intrarenal reflux was identified on VCUG. Using multivariate logistic regression, we analyzed the association between intrarenal reflux and kidney scarring on DMSA scans, adjusting for vesicoureteral reflux (VUR) grade and other clinical variables.

RESULTS

Out of 874 kidney units, VUR was detected in 255 units (29.1%), with intrarenalreflux present in 35 units (13.7%). Kidney scarring was observed in 12.7% of all kidney units. Intrarenal reflux was significantly associated with an increased risk of kidney scarring (odds ratio 3.35, 95% confidence interval 1.31-8.58) after adjusting for VUR grade. Notably, 92% of photon defects on DMSA scans in units with intrarenal reflux were located at the reflux site.

CONCLUSION

Intrarenal reflux is an independent predictor of kidney scarring beyond conventional VUR grading. Recognizing and reporting intrarenal reflux during VUR assessment may aid in developing tailored management strategies for children with UTI and VUR.

CLINICAL RELEVANCE/APPLICATION

We suggest that physicians document and report the presence of intrarenal reflux during VCUG. Recognizing intrarenal reflux would be helpful for providing tailoring individualized management strategies, including decision-making processes regarding potential surgical interventions.

M5A-SPPD-2 THE SONORA PROJECT: TOWARDS SAFE, OPTIMIZED AND PERSONALIZED RADIOLOGY AND RADIOTHERAPY PROCEDURES FOR PREGNANT PATIENTS

Francesca De Monte (*Presenter*)
Hrvoje Brkic (*Abstract Co-Author*)
Zeljka Knezevic (*Abstract Co-Author*)
Christos Pafilis (*Abstract Co-Author*)
Dario Faj (*Abstract Co-Author*)

PURPOSE

The European Basic Safety Standards Directive requires that medical procedures involving pregnant patients pay attention to justification and optimisation, taking into account both the expectant mother and the unborn child. In Diagnostic-Interventional Radiology (DIR) and Radiotherapy (RT), the lack of harmonization of clinical practice leads to large differences in fetal dose estimation. The SONORA project aims to harmonize practice by: 1. developing physical and computational phantoms for all gestational stages; 2. quantifying fetal doses and evaluating dosimetry techniques across DIR procedures, RT modalities, and patient anatomies; 3. identifying key factors contributing to discrepancies in current clinical dose estimates; 4. creating and validating a patient-specific proton-therapy dose-estimation tool. This work is supported by PIANOFORTE Open grant call 2023 (HORIZON-EURATOM-2023-NRT-01) and by the Croatian Science Foundation (Project IP-02-2020-3593).

METHODS AND MATERIALS

A survey across the Europe was launched to investigate methods and tools for fetal dose estimation, assess fetal dose ranges for various procedures, identify optimization strategies to reduce fetal exposure across Europe. Fetal doses for specific procedures were evaluated using both in silico models and physical anthropomorphic phantoms ("Tena") representing a pregnant woman in her second trimester. Measurements were conducted at various institutions using radiophotoluminescent dosimeters (RPLDs). Multiple codes Monte Carlo simulation across DIR procedures as well as photon and proton RT were performed.

RESULTS

For DIR , preliminary results show that fetal doses generally remain below 1 mGy unless the fetus lies within the primary beam; abdominal CT may be up to 50 mGy. Observed significant variability in fetal doses for defined procedures further emphasizes the need for protocol optimization and harmonization. Survey analysis is ongoing and results will be presented.

CONCLUSION

The SONORA project will provide a good-practice guide for fetal dose estimation in DIR and RT, alongside with a validated proton-therapy dose-estimation application. Ethical considerations of fetal dose and associated risk data will be considered to increase the quality of risk-benefit communication with the patient.

CLINICAL RELEVANCE/APPLICATION

SONORA's dosimetry framework and decision-support tool will enable clinicians to make evidence-based decisions that reduce fetal radiation exposure while maintaining diagnostic and therapeutic effectiveness. Standardized methods will improve risk-benefit communication with pregnant patients and strengthen radiation safety practices in European radiology and oncology centers.

M5A-SPPD-3 Zhongfeng Xie (*Presenter*)

UNRAVELING THE COMPLEX INTERPLAY BETWEEN GLYMPHATIC FUNCTION, AGE, AND BRAIN STRUCTURE IN SCHOOL-AGED CHILDREN WITH AUTISM SPECTRUM DISORDER

PURPOSE

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition. Although extensive research has explored the neurobiological foundations of ASD, the relationship between glymphatic dysfunction, brain structure, and age in children with ASD remains poorly understood and insufficiently studied. Understanding the interactions among these factors is crucial for uncovering the pathological mechanisms of ASD and developing targeted interventions.

METHODS AND MATERIALS

A total of 130 participants, including 67 children with ASD and 63 typically developing (TD) children, were enrolled. Glymphatic function was assessed using diffusion tensor image analysis along the perivascular space (ALPS). Voxel-based morphometry was employed to measure gray matter volume (GMV). Statistical analyses were conducted to explore correlations between age, ALPS indices, and GMV, and to assess whether age moderates these relationships.

RESULTS

Children with ASD exhibited reduced glymphatic function, with significant differences in the ALPS_left (ALPS_L) index ($P = 0.024$) and ALPS_bilateral (ALPS_Bi) index ($P = 0.025$) indices compared to TD children. The ALPS index was positively correlated with age ($P < 0.05$) and negatively correlated with GMV, particularly in regions linked to social and cognitive processing. Moderation analysis revealed that age moderates the relationship between the ALPS index and GMV, with older children showing a more pronounced effect. Receiver operating characteristic (ROC) curve analysis indicated that the ALPS index effectively distinguishes ASD from TD children (ALPS_L index area under the curve (AUC) = 0.710, ALPS_Bi index AUC = 0.712).

CONCLUSION

Our study suggests that glymphatic dysfunction in children with ASD may be age-dependent, influencing brain structure, particularly GMV. The ALPS index holds potential as a diagnostic biomarker for early detection of ASD-related neurobiological changes, with implications for targeted therapeutic interventions.

CLINICAL RELEVANCE/APPLICATION

ALPS, as an indicator of glymphatic function, provides a new perspective for understanding brain development in children with ASD. We found that the increase in ALPS index is associated with the normalization of GMV, suggesting that improving glymphatic function may help mitigate the negative effects on brain development, with age playing an important role in this process. Therefore, early detection and intervention of glymphatic dysfunction could become key to restoring brain structural development, with varying effects across different age groups. This finding not only offers new insights into the developmental mechanisms of autism but may also guide the development of intervention strategies.

M5A-SPPD-4 SEEING THE UNSEEN: THE CHALLENGES OF PRENATAL IMAGING DIAGNOSIS OF SYNTELENCEPHALY - A CASE SERIES AND LITERATURE REVIEW

Mariana Cerdeira Machado, MD (*Presenter*)
Matheus Luis Silva (*Abstract Co-Author*)
Caroline Victorino Felix De Lima, MD (*Abstract Co-Author*)
Adriana De Oliveira, MD (*Abstract Co-Author*)
Fernanda Tovar-Moll, MD,PhD (*Abstract Co-Author*)
Patricia Oliveira-Szejnfeld, MD (*Abstract Co-Author*)

PURPOSE

Syntelencephaly is a rare type of holoprosencephaly (HPE), also called the middle interhemispheric (MIH) variant, characterized by a spectrum of malformations, the hallmark being hemispheric fusion in the posterior frontal and/or anterior parietal lobes. Prenatal diagnosis is crucial, as it directly influences management and prognosis, yet it can be extremely challenging. Through a thorough literature review and the analysis of original cases, we propose a practical imaging-based approach to facilitate early and accurate prenatal diagnosis.

METHODS AND MATERIALS

This is a case series study of 5 fetuses to which the diagnosis of syntelencephaly was attributed through fetal magnetic resonance (fMR). We conducted a systematized analysis and demonstrated key imaging features of cases from our database in which nonspecific or suspicious alterations were identified on neurosonography (nUS) and later diagnosed as the MIH HPE through fMR. We also performed a comprehensive literature review, focusing on prenatal diagnosis and the main imaging findings, follow-up, and prognosis.

RESULTS

The 5 cases we analyzed (100%) on fMR presented a hemispheric fusion on the high frontoparietal convexity, lateral sulcus dimorphism, and absence of the cavum septi pellucidi (CSP). Other findings: 4/5 presented with microcephaly, 4/5 with mild ventriculomegaly (VM), 2/5 with residual frontal horns, 1/5 with a posterior cyst, and 3/5 with thalamic fusion.The literature review demonstrated that prenatal imaging diagnosis of MIH HPE can be challenging, especially for professionals with limited experience in fetal nUS or brain MRI. The main findings are often misinterpreted as isolated VM and, when recognized, the absence of the CSP. Postnatal clinical manifestations include delayed neuropsychomotor and cognitive development, seizures, and others, with severity varying according to the extent of brain involvement and associated anomalies.

CONCLUSION

Neurosonography and fMR performed by experienced professionals are critical for the prenatal diagnosis of syntelencephaly, allowing prompt identification of the interhemispheric fusion in the high frontoparietal convexity. Moreover, we found that 100% of our cases presented with lateral sulcus dimorphism and absence of the CSP; and 80% with microcephaly and VM.

CLINICAL RELEVANCE/APPLICATION

Due to the subtlety of its imaging findings, syntelencephaly remains underdiagnosed prenatally. Improving early recognition through detailed neurofetal imaging enhances diagnostic accuracy, permits better parental counseling, and aids multidisciplinary perinatal planning. This study contributes to refining diagnostic criteria and emphasizes the role of specialized imaging in improving clinical outcomes.

Abstract Archives of the RSNA, 2025

M5A-SPPH

Physics Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPPH-2 (PIXEL) SIZE MATTERS: THE SMALL PIXEL EFFECT IN ULTRA-LOW-DOSE MIDFACE CT

Henner Huflage, MD (*Presenter*)
Andreas Kunz, MD (*Abstract Co-Author*)
Caroline Bestler, MD (*Abstract Co-Author*)
Tobias Wech (*Abstract Co-Author*)
Thorsten A. Bley, MD (*Abstract Co-Author*)
Jan P. Grunz, MD (*Abstract Co-Author*)

PURPOSE

Examinations with ultra-high-resolution (UHR) collimation do not entail a dose burden in photon-counting CT (PCCT), since no post-patient filter is required to narrow the detector aperture. This study investigated whether the acquisition of smaller pixels in UHR mode holds advantages compared with standard-resolution scans of the midface region.

METHODS AND MATERIALS

Fourteen cadaveric heads were examined using both UHR (120 × 0.2 mm) and standard collimation (144 × 0.4 mm) on twelve dose levels (0.08-10 mGy) with a first-generation cadmium-telluride PCCT scanner. UHR images were reconstructed with three dedicated bone kernels (Br64 [spatial frequency at 10% of the modulation transfer function 12.8 line pairs/cm], Hr76 [21.0] and Hr84 [27.9]), whereas only Hr64 and Hr76 could be used for standard-resolution data. Signal-to-noise ratios (SNR) were computed among all datasets. In addition, image quality was assessed subjectively by nine independent radiologists using an in-house programmed forced choice comparison tool totaling 15,930 performed pairwise tests.

RESULTS

Comparing reconstructions with the sharp Hr76 kernel, SNR was higher in UHR images than in standard-resolution data on each dose level (all P <.001). In contrast, no significant difference was established between reconstructions with the intermediate Hr64 kernel (all P =.30). When acquiring data in UHR mode, sharper reconstructions (i.e., Hr84 instead of Hr76 and Hr76 instead of Hr64) were feasible without a significant loss of SNR (all P =.06). Subjective assessment revealed high interrater agreement (Fleiss kappa = 0.711, 95% confidence interval 0.689-0.734) with sharp UHR images being preferred by readers in the majority of comparisons on each dose level.

CONCLUSION

In PCCT of the midface, the smaller pixel size of UHR data allows for a substantial SNR increase over standard-resolution imaging, when employing comparable reconstruction sharpness. This 'small pixel effect' can either be used for dose reduction or higher spatial resolution depending on the convolution kernel selection.

CLINICAL RELEVANCE/APPLICATION

Not entailing a dose burden in PCCT, data acquisition in UHR mode facilitates higher SNR for midface imaging tasks with different dose requirements (i.e., rhinosinusitis, preoperative planning, trauma).

M5A-SPPH-3 HAGGAN: HYBRID-LOSS AND ATTENTION-GUIDED MRI-TO-CT SYNTHESIS FOR INTRACRANIAL CALCIFICATION

Yijun Lv (*Presenter*)
Genggeng Qin, MD, PhD (*Abstract Co-Author*)

PURPOSE

Intracranial calcifications, commonly observed in brain tumors and physiological conditions, hold significant clinical value in diagnosis, radiotherapy planning, and prognosis evaluation. However, due to the inherently low sensitivity of MRI to calcium and bone-like structures, accurately detecting and characterizing calcifications on MRI remains a substantial challenge. This study aims to address this technical limitation by proposing a cross-modal image synthesis algorithm based on a conditional generative adversarial network (cGAN) . We developed and evaluated a novel supervised deep learning framework, termed HAGGAN (Hybrid-Attention-Guided GAN) , which generates high-fidelity synthetic CT (sCT) images from paired MRI inputs to enhance the visualization of calcified structures in MRI-guided workflows.

METHODS AND MATERIALS

The proposed HAGGAN framework incorporates a hybrid objective function and an attention gate (AG) mechanism , with ResNet serving as the backbone network, to produce high-quality sCT images. The dataset included images from 177 patients with brain tumors and 51 patients with physiological calcifications . A total of 760 CT slices from 185 patients were used for training, and 188 CT slices from 47 patients were used for validation and testing. To benchmark HAGGAN’s performance, we compared it with several state-of-the-art supervised and unsupervised methods, including U-Net, Pix2Pix, LSeSim, and CycleGAN. The quality of the generated sCT images was quantitatively assessed using mean absolute error (MAE) , peak signal-to-noise ratio (PSNR) , and structural similarity index measure (SSIM) .

RESULTS

Compared with U-Net, Pix2Pix, LSeSim, and CycleGAN, the proposed HAGGAN outperformed existing supervised and unsupervised approaches in both quantitative and qualitative evaluations. Specifically, it achieved an MAE of 0.032 , an SSIM of 0.815 , and a PSNR of 21.245 dB .

CONCLUSION

Experimental results demonstrate that HAGGAN can generate sCT images with high fidelity in terms of fine calcifications, brain parenchyma, and lesion regions, achieving visual similarity to real CT (rCT) images. In quantitative evaluations, HAGGAN consistently outperformed other advanced methods, including U-Net, Pix2Pix, LSeSim, and CycleGAN.

CLINICAL RELEVANCE/APPLICATION

HAGGAN addresses the technical bottleneck of MRI in identifying calcified and osseous components with high accuracy. It offers valuable support for clinical diagnosis, tumor recurrence monitoring, and prognosis evaluation, enhancing diagnostic precision in neuroimaging. Furthermore, by reducing the need for unnecessary CT scans, it may lessen the imaging burden on patients and optimize clinical workflows.

M5A-SPPH-5 FEASIBILITY OF 50% REDUCTION OF IODINATED CONTRAST MEDIA WITHOUT COMPROMISING IMAGE QUALITY USING PHOTON COUNTING CT: A PHANTOM-BASED APPROACH

Ayuto Ito, BS (*Presenter*)
Hiroki Kawashima, PhD (*Abstract Co-Author*)
Katsuhiro Ichikawa, PhD (*Abstract Co-Author*)
Yasuhiro Kawahara (*Abstract Co-Author*)
Kyo Noguchi, MD (*Abstract Co-Author*)

PURPOSE

To demonstrate the feasibility of a 50% reduction of iodinated contrast media using photon counting CT via a phantom-based approach using diluted-iodine equivalent materials with 6 and 12 mg/mL iodine concentrations that were formed to simulated shapes of large and small contrast-enhanced vessels.

METHODS AND MATERIALS

Two phantom compositions were used in this study. One was that two rod-shaped inserts with the same 30-mm diameter (30-mm target) and the 6 and 12 mg/mL iodine concentrations were placed into a water phantom with a diameter of 300 mm. The other was the same water phantom in which the two inserts were replaced with two wire-shaped inserts with the same 2-mm diameter (2-mm target). Each phantom was scanned using three CT scanners at CTDI of 15 mGy: 64-row multi-slice CT with single energy 120 kV (SE 120 kV), dual-source dual-energy CT (DECT) with 80/Sn150 kV, and photon counting CT (PCCT) with 120 kV. For DECT and PCCT, virtual monoenergetic images at 50 and 40 keV were generated. The mean CT number and task transfer function (TTF) were measured using the 30-mm target. For the 2-mm target, a synthetic oversampled image of the wire over the scan range was generated for analysis; a peak CT number and TTF were measured using the established wire method. The image noise (SD) was measured in the uniform water region. A contrast-to-noise ratio (CNR) and a peak signal-to-noise ratio (PSNR) were calculated from the mean and the peak CT numbers divided by the SD. We compared the measurements obtained with the 12 mg/mL iodine insert for SE 120 kV with those obtained with the 6 mg/mL iodine insert for low keV images.

RESULTS

For the 30-mm target, 50%TTFs were approximately 0.41, 0.34, and 0.40 mm -1 for SE 120 kV, DECT 50 keV, and PCCT 50 keV, respectively. The 6 mg/mL iodine CNRs of DECT and PCCT at 50 keV were higher than the 12 mg/mL iodine CNR of SE 120 kV. For the 2-mm target, 50%TTFs were approximately 0.38, 0.28, and 0.36 mm -1 for SE 120 kV, DECT 50 keV, and PCCT 50 keV. While the 12 mg/mL iodine PSNR of SE 120 kV was 3.9, the 6 mg/mL iodine PSNR of DECT and PCCT at 50 keV were 2.9 and 4.2; those at 40 keV were 3.0 and 5.1.

CONCLUSION

This study demonstrated that PCCT can provide higher iodine CNR and PSNR by the low keV reconstruction, even with half the iodine concentration of SE 120 kV. This study also revealed that the low keV imaging of DECT is insufficient for small vessels, while the PCCT has no such shortage.

CLINICAL RELEVANCE/APPLICATION

The low keV reconstruction of PCCT helps to reduce the patient's iodine burden without compromising image quality, even for small vessels, compared with the widely used SE 120 kV CT.

M5A-SPPH-6 BMI-BASED CONTRAST MEDIA OPTIMIZATION IN CT ANGIOGRAPHY: A SCALABLE APPROACH TO SAFER AND MORE SUSTAINABLE IMAGING

Alessandro Roncacci, MD, PhD (*Presenter*)
Chryssa Paraskevopoulou, MSc (*Abstract Co-Author*)
Cristian Colmo (*Abstract Co-Author*)
Milda Vaisvilaite-Vasilionoke (*Abstract Co-Author*)
Daiva Adomaitiene (*Abstract Co-Author*)
Athanasia Papachristodoulou, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of a BMI-based contrast media and radiation dose optimization protocol for CT angiography, developed as part of a broader strategy to improve patient safety, standardize clinical practice, and promote sustainable imaging.

METHODS AND MATERIALS

A contrast media optimization protocol was developed and piloted at a high-volume European imaging site. Patients undergoing cardiac and peripheral vascular CT angiographies were stratified into three BMI categories (18-25, 25-30, >30). The intervention included standardization of contrast protocols tailored to specific clinical indications, along with comprehensive staff training on safe and effective contrast administration Contrast volume, injection flow rates, and CT acquisition parameters were tailored to each category. Lower tube voltage settings (80-100 kV) were employed when feasible to enhance iodine efficiency via its k-edge while minimizing radiation dose. A radiation dose monitoring system was used to automatically capture patient data, contrast usage, and CTDIvol, enabling a data-driven approach to protocol evaluation and refinement.

RESULTS

Post-implementation analysis demonstrated substantial reductions in both contrast volume and radiation dose. In patients with BMI >30, contrast volume was reduced by 15% and CTDIvol by 10%. For BMI 25-30, contrast volume decreased by 6% and CTDIvol by 19%. In the BMI 18-25 group, Constrast volume was reduced by 9% and CTDIvol by 33%. Across all BMI groups, diagnostic quality was preserved, according to radiologists feedback and with vascular enhancement values consistently within the 350-400 HU target range. Protocol adherence improved, and contrast media use was significantly reduced. The approach is now being adapted for broader implementation across additional imaging sites and procedure types.

CONCLUSION

BMI-based optimization of contrast media and radiation dose in CT angiography is feasible, safe, and clinically effective. This protocol supports a scalable model that enhances diagnostic consistency, reduces patient exposure, and aligns imaging practice with environmental responsibility.

CLINICAL RELEVANCE/APPLICATION

This protocol shows that personalized contrast dosing and acquisition settings based on BMI can improve patient safety, reduce contrast waste, and maintain high-quality imaging outcomes. It offers a practical framework for scaling sustainable imaging practices across radiology networks.

M5A-SPPH-7 CHANGES IN CERVICAL INTERVERTEBRAL DISCS AFTER FLIGHT TRAINING IN NATIONAL GUARD FIGHTER PILOTS

L. Tugan Muftuler, PhD (*Presenter*)
Aditya Vedantam (*Abstract Co-Author*)
Rachel Cutlan (*Abstract Co-Author*)

Keri Hainsworth (*Abstract Co-Author*)
Benjamin Gerds (*Abstract Co-Author*)
Chris Dooley (*Abstract Co-Author*)
Peter Le (*Abstract Co-Author*)
Timothy Meier (*Abstract Co-Author*)
Narayan Yoganandan (*Abstract Co-Author*)
Brian Stemper (*Abstract Co-Author*)

PURPOSE

Neck pain is more prevalent in fighter pilots than other military personnel or civilians. Head rotations during high-g maneuvers strain the cervical spine and expose the discs to injury, triggering degenerative processes that cause pain. Investigating disc changes after flight training can reveal the types of injuries caused by these exposures, ultimately promoting spinal health by fostering the design of more ergonomic environments, training protocols, and gear.

METHODS AND MATERIALS

Eighteen fighter pilots completed a baseline, ten of which participated in follow-up MRI after flight training (ages 28-49y, mean 39.3; military flight hours 500-3500h, mean 2312h). Nineteen age-matched civilian controls were included for comparisons. Participants completed demographic, flight history, and pain questionnaires. Study was approved by IRB and written consents were obtained. Discs were automatically labeled by nnUNet on T2 weighted MRIs and radiomics features were calculated in each disc. Feature values were compared before and after the training, and between pilots and controls.

RESULTS

Paired t-tests revealed lower mean MRI signal in all discs ($p<0.001$), increased kurtosis ($p=0.01$) and skewness ($p<0.001$), primarily in C3C4 and C4C5, after flight exposure. These changes collectively suggest measurable disc hydration loss. T-tests showed lower kurtosis, skewness, and higher mean for the pilots at baseline compared to matched controls (all $p<0.001$). ANOVA with height as covariate revealed no significant differences in disc volume between pilots and controls. These indicate that water content in discs was higher for the pilots, and there was no measurable disc height loss.

CONCLUSION

Radiomics analysis provided a quantitative, unbiased and precise assessment of changes in discs after flight training. Disc dehydration seen in the pilots after training was expected since it is common after heavy physical exercises and recovers with rest. The disc heights were comparable to matched controls, but pilots had better hydrated discs, possibly due to better physical fitness. Disclosure: Views expressed are those of the authors and do not reflect the official views of the USAF, nor the Department of Defense. Mention of trade names, commercial products, or organizations do not imply endorsement by the U.S. Government. Acknowledgements: This research was part of the Military Aircrew Neck and Back Pain Study, and was supported by Air Force Research Laboratory contract FA8650-22-C-6461 and the Department of Veterans Affairs Medical Research.

CLINICAL RELEVANCE/APPLICATION

Understanding neck injuries in individuals exposed to periods of heavy spine loading is crucial for developing effective prevention and treatment strategies.

M5A-SPPH-9 COMPARATIVE EFFECTIVENESS OF TERIPARATIDE-DENOSUMAB SEQUENTIAL VERSUS DENOSUMAB MONOTHERAPY IN ACUTE POST-FRACTURE OSTEOPOROSIS MANAGEMENT: A 12-MONTH RANDOMIZED TRIAL

Fang Wang (*Presenter*)

PURPOSE

To evaluate differential bone mineral density (BMD) responses between teriparatide-to-denosumab sequential therapy versus denosumab monotherapy during the critical 6-month post-fracture window in osteoporosis patients.

METHODS AND MATERIALS

The trial enrolled 39 patients with acute fractures (=6 months post-injury) at our hospital between June 2023 to June 2024. Participants were randomized to 1) sequential group (n=18): Teriparatide 20 μg/day subcutaneously ×6 months ? Denosumab 60mg biannually; 2) Monotherapy group (n=21): Denosumab 60 mg biannually. All patients received calcium, vitamin D supplementation and standardized osteoporosis education. Dual-energy X-ray absorptiometry (GE Lunar iDXA) measured BMD at lumbar spine (LS), femoral neck (FN), and total hip (TH) for every six months. Clinical outcomes included biochemical markers, VAS, and incident fracture events.

RESULTS

There were no significant differences in baseline characteristics between groups except for elevated bone turnover markers in the sequential groups (P1NP: 55.8 vs 46.5 ng/ml; ß-CTX:682.5 vs 428 pg/ml, both $p<0.05$). Both regimens significantly improved BMD at 12 months (all sites $p<0.05$ vs baseline), with sequential therapy exhibiting superior gains at LS (+ 12.25%±7.07% vs + 6.36%±5.80%, $p<0.05$) and TH (median +5.71% [IQR 2.12%-8.24%] vs +2.13% [0.14%-3.69%], $p<0.05$). Significant reduction in VAS (both $p<0.05$ vs baseline) and comparable new fracture incidence (sequential group: 5.6%; monotherapy: 4.8%) were observed in both groups. Declined P1NP and ß-CTX were also observed in both groups (both $p<0.05$ vs baseline), though intergroup differences did not reach statistical significance.

CONCLUSION

While both regimens effectively reduce pain and bone turnover markers (P1NP, ß-CTX), sequential therapy (Teriparatide-to-Denosumab) demonstrates superior gains in BMD at LS and TH for those acute post-fracture patients compared to denosumab monotherapy.

CLINICAL RELEVANCE/APPLICATION

The sequential treatment strategy of osteoporosis provides an important idea for optimizing long-term management. For patients with extremely high fracture risk, it is recommended to give priority to the use of bone formation drugs, then sequential inhibition of bone resorption drugs, which significantly increase BMD and reduce fracture risk.

M5A-SPPH-10 TECHNOLOGICAL INTEGRATION BETWEEN CANON PRIME SP WITH BAYER SMART INJECTOR: CLINICAL AND ECONOMIC BENEFITS IN PULMONARY ANGIOTOMOGRAPHY

Jose Castro, PhD (*Presenter*)
Hortencia Ferreira, MSc, PhD (*Abstract Co-Author*)
Danielle Cristina Novais Da Silva (*Abstract Co-Author*)
Sergio S. Dertkigil, MD (*Abstract Co-Author*)
Fabiano Reis (*Abstract Co-Author*)

PURPOSE

The evolution of computed tomography (CT) includes AI and automated injection systems to optimize imaging and resource use. Canon Prime SP applies AI for image enhancement and dose reduction, while Bayer's Medrad Stellant SmartFlow ensures precise contrast control, reducing waste. This study evaluates the clinical and economic impact of integrating these technologies.

METHODS AND MATERIALS

Pulmonary angiotomography exams from two CT systems were retrospectively analyzed: Aquilion 64 CT (2008) and Canon Prime CT (2024) with AiCE (Advanced Intelligent Clear IQ Engine). The Canon Prime used the Medrad Stellant SmartFlow(Bayer) injector for real-time contrast monitoring. A total of 200 exams from 2024

(Canon Prime SP) and 100 exams from 2023 (Aquilion 64) were compared. Only patients aged 18 years or older were included. Parameters assessed included radiation dose (DLP, mGy·cm), contrast volume (mL), vascular enhancement (HU), and image acquisition time (s) to determine the impact of technological integration.

RESULTS

The use of Canon Prime SP, combined with Bayer's intelligent injector, brought significant advances in radiation dose optimization, contrast savings, and image quality. AI implementation in Canon Prime SP allowed up to 72% reduction in radiation dose compared to the Aquilion 64, without compromising diagnostic quality. The intelligent injector enabled an 18.75% saving in contrast per exam, averaging a 16 mL reduction per procedure. Considering a routine of three PET exams per day and a unit cost of R$1.50/mL, estimated annual savings reach R$26,280.00. Image quality was maintained or improved through AI, with enhanced sharpness and noise reduction, allowing lower radiation doses. Another key benefit was improved contrast traceability and safety. Bayer's system enabled real-time monitoring of variables such as batch, expiration date, pressure, and flow—minimizing adverse events and standardizing processes. It also allowed automatic generation of individualized injection reports sent to the PACS, ensuring better control of contrast administration.

CONCLUSION

The incorporation of newer technologies reduces patient radiation exposure, improves image quality, and optimizes costs, reinforcing the need for continuous protocol updates.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the importance of implementing customized protocols per device to maximize diagnostic efficiency and promote safety and sustainability in pulmonary angiotomography.

M5A-SPPH-11 DEEP LEARNING IMAGE RECONSTRUCTION ENHANCES DIASTOLIC CORONARY CTA IMAGE QUALITY UNDER TRIPLE-LOW PROTOCOLS ACROSS BMI CATEGORIES

Xiaohua Zhang (*Presenter*)
Xiaoyan Lei (*Abstract Co-Author*)
Feng Chen, MD, PhD (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To investigate the efficacy of high-strength deep learning image reconstruction (DLIR-H) in improving diastolic-phase coronary CTA image quality across body mass index (BMI) strata under a triple-low protocol (low radiation dose, low contrast volume, low injection rate), in comparison with 50% adaptive statistical iterative reconstruction (ASIR-V).

METHODS AND MATERIALS

In this prospective single-center study, 47 patients with suspected coronary atherosclerosis underwent coronary CTA between August 2024 and April 2025. Patients were grouped by BMI: Group A (<24 kg/m², n=20), Group B (24-28 kg/m², n=21), and Group C (>28 kg/m², n=6). Scans were performed at 70, 80, or 100 kVp with tailored contrast doses (35-55 mL) and injection rates (3.0-5.0 mL/s), followed by 40 mL saline flush. Diastolic-phase datasets were reconstructed using both DLIR-H and ASIR-V 50%. Quantitative evaluation included CT attenuation, image noise (standard deviation), signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) across major coronary segments (LM, pLAD, pLCX, pRCA, mRCA, dRCA) and the aortic root (AO). Image quality was rated independently by two experienced cardiothoracic radiologists on a five-point Likert scale, with inter-observer consistency assessed using Kappa statistics.

RESULTS

DLIR-H significantly enhanced image quality in all BMI groups. In Group A, DLIR-H reduced pRCA noise (51.92 ± 16.38 to 40.61 ± 14.76, $P < 0.001$) and increased AO CNR (21.5 ± 8.1 to 36.09 ± 12.87, $P < 0.001$). In Group B, LM noise decreased (38.32 ± 9.17 to 29.78 ± 8.97, $P < 0.001$) and dRCA SNR improved (12.43 ± 5.13 to 15.18 ± 5.30, $P < 0.001$). In Group C, AO noise dropped substantially (29.95 ± 10.35 to 15.85 ± 4.62, $P = 0.002$), with a marked increase in pRCA CNR (25.92 ± 11.19 to 46.65 ± 19.14, $P = 0.002$). Subjective image quality ratings were significantly higher for DLIR-H across all BMI categories (Group A: $P = 0.003$; Group B: $P < 0.001$; Group C: $P = 0.022$), with excellent interobserver agreement (Kappa > 0.8). Despite BMI-associated increases in effective dose (Group A: 0.77 ± 0.14 mSv; Group B: 1.34 ± 0.25 mSv; Group C: 2.02 ± 0.58 mSv, all $P < 0.05$), DLIR-H consistently maintained superior image quality under reduced exposure conditions.

CONCLUSION

DLIR-H markedly enhances diastolic coronary CTA quality across BMI levels, reducing noise and improving contrast under ultra-low-dose protocols.

CLINICAL RELEVANCE/APPLICATION

DLIR-H delivers high-quality diastolic coronary imaging under reduced radiation and contrast, supporting accurate diagnosis, especially in overweight patients.

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M5A-SPRO

Radiation Oncology Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPRO-1 LOCATION ACCURACY AND REPRODUCIBILITY OF ISOCENTERS USING TRANSARTERIAL MARKERS FOR SBRT OF LIVER LESIONS

Nasreddin Abolmaali, MD (*Presenter*)
PHILIPP SCHILLING (*Abstract Co-Author*)
Stephanie Abolmaali (*Abstract Co-Author*)
Seyed Schahin Tillmann Abolmaali (*Abstract Co-Author*)

PURPOSE

In patients with liver tumors SBRT may require markers for accurate treatment planning. Transarterial placed coil markers (TAM) are safer than percutaneously inserted markers since only one puncture is required and risks of puncture (e.g. pneumothorax, liver bleeding, tumor seeding) and marker migration are avoided. The aim of our study was to determine whether TAM show spatial stability of the markers position in tissue during the duration of the entire treatment. Additionally, we investigated the precision of the definition of the tumor isocenter (TI) as specified by TAM during therapy.

METHODS AND MATERIALS

Between January 2017 and March 2020, twelve patients received 2-4 TAM for liver SBRT. TAM were placed in close vicinity around the liver tumors using coaxial transarterial coils (length 10mm) placed in tumor feeding arteries. 4D-averaged CTs fused with MRI were used for ITV contouring, a total of 140 fractions were allocated with safety margins of 10mm. For all fractions, a CBCT was acquired to verify tumor and TAM location. Local stability of TAM during the entire therapy were measured in every CBCT by distance measurements between the coils in each fraction and the movement of their center-of-mass (COM) over time. Additionally, the fusion of the TIs as defined by the physician was compared to the TI that resulted from the automatic generated isocenter using TAM.

RESULTS

Eight patients received two markers and were treated with 108 fractions; four patients were treated with eight fractions each, three of them received three markers and one patient received four markers. TAM appeared as a 32 mm² structure on average in the CBCT of the linac and produced only minor artifacts. The average distance between the markers was 50.5 mm and the mean difference of COMs, i.e. the inter-fractional movement over the treatment time, was 1.5mm±1.1mm(SD). The upper quartile of the mean difference of COMs was less than 2.0mm, in one patient the maximum deviation in one fraction was 5.5mm. None of the TAM left the liver. The distance between the TIs positioned by a physician and the TIs generated by the automatic matching algorithm applied to the TAMs resulted in a mean deviation of 3.5mm±2.6mm(SD) during the entire therapy and thus revealed almost identical positions.

CONCLUSION

TAM for SBRT of liver lesions showed high local spatial stability over the entire therapy allowing for accurate tumor localization using CBCT for each fraction. Definition of tumor isocenters for every fraction using TAM and automatic matching was fast and revealed high accuracy.

CLINICAL RELEVANCE/APPLICATION

Since TAM are as accurate as percutaneous markers for liver SBRT, but provide an advantageous safety profile, we recommend TAM as new standard for accurate and fast treatment planning in SBRT of the liver.

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M5A-SPVA

Vascular Imaging Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-SPVA-1 IMPROVED DETECTION OF ASCENDING AORTITIS USING MOTION-CORRECTED DIFFUSION-WEIGHTED MRI

Tomoko Hyodo, MD (*Presenter*)
Hayato Kaida (*Abstract Co-Author*)
Atsushi K. Kono, MD, PhD (*Abstract Co-Author*)
Yuji Nozaki (*Abstract Co-Author*)
Kazunari Ishii, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic performance of diffusion-weighted MRI with Acceleration Motion Compensation (AMC-DWI) in detecting inflammation of the ascending aorta in patients with suspected or diagnosed large-vessel vasculitis.

METHODS AND MATERIALS

This retrospective study included patients who underwent whole-body MRI at 1.5T, consisting of DWI (b = 800) with and without AMC, and balanced turbo field echo (b-TFE) sequences, and also underwent FDG-PET/CT within ±2 weeks of MRI. Patients with prior thoracotomy or insufficient image quality were excluded. For ascending aorta, signal intensity was scored on DWI (0-3), and diagnostic confidence for ascending aortitis was scored (0-4) using DWI with and without AMC. Diagnostic confidence was also reassessed by adding b-TFE to AMC-DWI; b-TFE was used to assess the anatomical position and wall thickening of the ascending aorta, providing supplemental information to support diagnostic confidence. FDG-PET/CT served as the reference standard based on binary visual assessment of FDG uptake in the ascending aorta: uptake equal to or greater than that of the liver was defined as positive (ascending aortitis), while uptake below that of the liver was defined as negative. Target-to-background ratio (TBR; SUVmax of the ascending aorta / SUVmean of the superior vena cava) was also calculated for correlation analysis.

RESULTS

Thirty-one patients (mean age, 61 years; 24 women) were included. DWI signal score increased after applying AMC, and this change tended to be greater in PET-positive aortitis cases, although the difference was not statistically significant (Wilcoxon rank-sum test, p = 0.162). Diagnostic confidence score with AMC-DWI showed higher diagnostic performance for detecting ascending aortitis than non-AMC-DWI (AUC: 0.84 vs. 0.62, ROC analysis). The addition of b-TFE slightly increased the AUC to 0.85, with no significant differences among the three (DeLong's test, all p > 0.1). In PET-positive aortitis, the increase in diagnostic confidence score after applying AMC was significantly greater than in PET-negative cases (Wilcoxon rank-sum test, p = 0.011). Additionally, AMC-DWI confidence score showed a significant positive trend with increasing PET-derived TBR (Jonckheere-Terpstra test, p = 0.050).

CONCLUSION

AMC-DWI outperformed non-AMC-DWI in detecting ascending aortitis, demonstrating higher signal intensity and diagnostic confidence, and showing consistency with PET-based TBR.

CLINICAL RELEVANCE/APPLICATION

Incorporating motion-corrected DWI for the ascending aorta may enhance the feasibility of whole-body MRI as a practical tool for evaluating large-vessel vasculitis, offering a radiation-free alternative to FDG-PET/CT.

M5A-SPVA-2 FULLY AUTOMATED DETECTION SYSTEM FOR ABDOMINAL AORTIC ANEURYSM USING DEEP LEARNING AND API INTEGRATION

Taehun Kim, PhD (*Presenter*)
Kim Jiyoon (*Abstract Co-Author*)
Yongwon Cho, PhD (*Abstract Co-Author*)
Hyokee Kim (*Abstract Co-Author*)
Yeo Eun Han, MD, PhD (*Abstract Co-Author*)

PURPOSE

Although abdominal CT is widely performed for various clinical indications and consistently includes the abdominal aorta within its field of view, radiologists often overlook subtle changes in aortic diameter during routine interpretations, as these scans are typically not acquired with aortic pathology in mind. However, an abdominal aortic diameter of 3 cm or greater necessitates regular follow-up due to the risk of aneurysmal progression and potential rupture. While automated algorithms for measuring aortic diameter have been explored, none have specifically targeted portal venous phase (PVP) abdominal CT, which represents the standard imaging phase for most abdominal CTs. This study is to develop a fully automated algorithm using deep learning (DL) and an application programming interface (API) for measurement of the abdominal aortic diameter on PVP abdominal CT, thereby facilitating incidental detection of early abdominal aortic aneurysm (AAA) in routine clinical practice.

METHODS AND MATERIALS

PVP abdominal CT scans from 332 patients including normal and AAA were enrolled from two institutions between 2004 and 2023. A total of 232 AAA cases (212 and 20 from each institution) were manually segmented by medical doctors. The nnU-Net was used 90% and 10% for training and test, respectively. An independent test dataset consisting of 100 AAA patients from the original cohort and 100 additional controls were predicted and converted into 3D models. A manual 3D measurement protocol was established and then used to develop a fully automated algorithm using API. Segmentation performance was evaluated using the Dice similarity coefficient (DSC) and 95th percentile Hausdorff distance (HD95). Automated measurement was compared with manual ones, and diagnostic performance was evaluated using a 3 cm clinical threshold.

RESULTS

The segmentation achieved a DSC of 0.9250 ± 0.0390 and an HD95 of 6.11 ± 9.24 mm. The differences between manual and automated measurements were 3.77 ± 2.14 mm for normal and 3.81 ± 3.37 mm for AAA. Measurement time was reduced by 16.92-fold for normal and 5.02-fold for AAA using automation. Manual

measurement showed one false positive and false negative, whereas automated measurement showed three false positives.

CONCLUSION

We developed a DL and API-based system for automated segmentation and measurement of AAA, on PVP abdominal CT. It demonstrated high accuracy and significantly improved efficiency, overcoming limitations of manual approaches.

CLINICAL RELEVANCE/APPLICATION

Given the high mortality and complications of AAA, early diagnosis through accurate measurement is crucial. This study presents a clinically applicable DL and API-based system that offers a reliable and efficient solution for automated AAA screening.

M5A-SPVA-3 THE USE OF LOW-CONCENTRATION IODINE CONTRAST AGENTS AND DUAL-ENERGY CT (DECT) IS SUPERIOR TO THE USE OF HIGH-CONCENTRATION IODINE CONTRAST AGENTS AND SINGLE-ENERGY CT (SECT) IN TERMS OF BOTH CONTRAST ENHANCEMENT AND PREVENTION OF RENAL DYSFUNCTION IN AORTIC CT ANGIOGRAPHY

Akira Yamada, MD, PhD (*Presenter*)
Hiroyuki Kubota (*Abstract Co-Author*)
Yasunari Fujinaga, MD (*Abstract Co-Author*)

PURPOSE

Low-keV virtual monochromatic X-ray CT imaging (VMCT) using dual-energy CT (DECT) is expected to strengthen contrast-enhanced effect of iodinated contrast agents (CA), thereby potentially reducing risk of acute kidney injury (AKI) associated with iodine dose reduction. However, to date, there have been no reports comparing CT-Angiography (CTA) with use of low-concentration CA and DECT (LC-DE-CTA) and CTA with use of high-concentration CA with single-energy CT (HC-SE-CTA) in terms of both contrast enhancement and prevention of AKI. The purpose of this study is to verify that LC-DE-CTA is superior to HC-SE-CTA in terms of both contrast enhancement and prevention of AKI.

METHODS AND MATERIALS

This retrospective study at a single institution was approved by institutional ethics committee, and informed consent from patients was waived. This study included 679 patients with 1,053 examinations who underwent multiple CTA examinations for preoperative evaluation and postoperative follow-up of aortic diseases between December 2018 and November 2024, with renal function assessment via blood sampling within 74 hours of CT examination. During entire study period, initial examination was performed as HC-SE-CTA using high-concentration CA (370 mgI/mL, 100 mL), and for subsequent examinations, HC-SE-CTA was performed during first half of study period, and LC-DE-CTA using a low-concentration CA (240 mgI/mL, 100 mL) with 50 keV VMCT was performed during second half of study period. Tube voltage in HC-SE-CTA was 120 kVp. Contrast effect was evaluated based on CT values of ascending aorta in CTA. Stage of AKI was assessed using serum creatinine levels before and after CTA from 0 (no AKI) to 3 according to KDIGO 2012 criteria. A stepwise linear regression analysis was performed with stage of AKI as the dependent variable and pre-examination estimated glomerular filtration rate (eGFR), sex, age, use of low-concentration CA, initial or subsequent examination, and examination period as explanatory variables.

RESULTS

Mean CT values and 95% confidence intervals of ascending aorta were 363.4 (351.6-375.1) HU in HC-SE-CTA, 523.6 (504.5-542.7) HU in LC-DE-CTA. Mean stage and its 95% confidence intervals of AKI was 0.12 (0.09-0.14) in HC-SE-CTA, 0.04 (0.02-0.07) in LC-DE-CTA. Stepwise linear regression analysis revealed that only pre-examination eGFR ($P < 0.001$) and the use of low-concentration CA ($P = 0.01$) are statistically significant predictors for stage of AKI after CTA.

CONCLUSION

LC-DE-CTA is superior to HC-SE-CTA in terms of both contrast enhancement and prevention of AKI.

CLINICAL RELEVANCE/APPLICATION

By combining low-concentration CA with DECT, it is possible to perform safe and high-quality CTA in patients at risk of renal dysfunction.

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M5B-SPBR

Breast Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPBR-1 PREDICTION OF HIGH AND LOW EXPRESSION OF TUMOR-INFILTRATING LYMPHOCYTES (TILS) IN BREAST CANCER USING MRI BI-RADS FEATURES AND CLINICOPATHOLOGICAL PARAMETERS

Jiejie Zhou, PhD, MD (*Presenter*)
Yang Zhang, PhD (*Abstract Co-Author*)
Yan-Lin Liu (*Abstract Co-Author*)
Jeon-Hor Chen, MD (*Abstract Co-Author*)
Wang Meihao (*Abstract Co-Author*)
Min-Ying Su, PhD (*Abstract Co-Author*)

PURPOSE

Tumor-infiltrating lymphocytes (TILs) in breast cancer are known as promising predictive biomarkers associated with responses to neoadjuvant chemotherapy and immunotherapy, and they are also prognostic biomarkers associated with progression-free survival. The assessment based on a small biopsy specimen may suffer from sampling bias. This study aimed to investigate how the MRI features and clinical/histological parameters can be combined to distinguish high and low TILs groups.

METHODS AND MATERIALS

A total of 678 patients with pathologically diagnosed BC were included in the study, divided into training and testing sets with approximately a 7:3 ratio. MRI features were reviewed by two radiologists by consensus using BI-RADS lexicon descriptors. The expression of TILs was evaluated on H&E-stained slides. The percentage of TILs in the stroma adjacent to the tumor cells was assessed, and they were separated into low (<10%) and high (= 10%) groups. The machine learning models were trained to differentiate the two groups. Initially, a support vector machine (SVM) classifier was trained using imaging features to distinguish between the two groups and provided an imaging score, which reflects the likelihood of high or low TILs expression based on imaging alone. Then, the imaging score was added to the clinical and histological parameters (age, age = 50, ER, PR, menopause, N-stage, Ki-67) to train a nomogram model and a final combined SVM machine learning model. The predictions were evaluated using Receiver Operating Characteristic (ROC) analysis.

RESULTS

When only using imaging features, the SVM achieved an AUC of 0.79 on the training set and 0.74 on the testing set. By combining the imaging score with clinical and molecular biomarkers, the predictive performance improved. The nomogram model achieved an AUC of 0.81 in training and 0.79 in testing, showing a modest enhancement in prediction accuracy. The SVM model using both feature sets yielded the best performance, reaching an AUC of 0.84 in training and 0.81 in testing sets. Figure 1 illustrates two cases with HR+/HER2- subtype BC with high and low TILs. Figure 2 shows two HER2+ cases, and Figure 3 shows two triple-negative cases. Figure 4 shows the nomogram developed by using all parameters.

CONCLUSION

Machine learning algorithms using integrated pre-treatment MRI features and molecular/clinical features can be used to build models for predicting TIL expression, which may contribute to refined stratification and personalized management.

CLINICAL RELEVANCE/APPLICATION

MRI features and molecular biomarkers could differentiate high vs. low TILs. Sophisticated machine learning models combining MRI and clinical-histological parameters could further improve accuracy to guide treatment selections.

M5B-SPBR-2 TRENDS IN POSITIVE BREAST BIOPSY RATES IN WOMEN UNDER 40

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PURPOSE

The incidence of breast cancer is increasing in women. Recent data suggests that women under 40 are more likely to be diagnosed with later-stage and more aggressive breast cancer subtypes, leading to increased mortality rates. Non-Hispanic Black women under 40 have the highest incidence and mortality rates. Breast radiologists are often the first point of contact for these women to receive a workup, biopsy, and referral for surgical consultation. This retrospective study investigates the recent breast cancer trends in women under 40 at an academic breast imaging center.

METHODS AND MATERIALS

This IRB-approved retrospective study assessed the image-guided core-needle breast biopsy results for all women under age 40 from 2016 to 2024. The age, ethnicity, race and biopsy results were documented. Cancer subtype and receptor status were documented for patients diagnosed with breast cancer.

RESULTS

A total of 920 women under age 40 underwent an image-guided core biopsy from 2016-24 at our facility. Sixty-eight (7.4%) women were diagnosed with breast cancer, of which 61 (90%) had invasive disease. The average age of diagnosis was 31 years old, with the youngest patient being 17 years old. Among the patients with invasive breast cancer, 18 (30%) had triple negative breast cancer (TNBC). Over this time period, there was a relatively stable incidence of 1.3 cancers per month, with significant increases in 2019 (2.7 per month) and 2024 (2.3 per month). Among the patients diagnosed with breast cancer, 31 identified as Black (46%), 4 as Asian (6%), 3 as Hispanic (4%), and 29 as White (43%). Among the patients diagnosed with TNBC, 9 identified as Black (50%), 1 as Hispanic (6%), and 7 as White (39%).

CONCLUSION

While the overall incidence of breast cancer in women under 40 remains low, this study supports previously observed higher rates of aggressive cancer subtype (30% TNBC) in this age group compared to the typical rate of 15-20% in the routine screening patient population. While there was no statistically significant change in the observed incidence of breast cancer in women under 40 at our institution over our study period. Larger-scale reviews of cancer registry data would be important to confirm the trend in breast cancer incidence in women under 40.

CLINICAL RELEVANCE/APPLICATION

There is limited data on the increasing incidence of breast cancer in women under 40. Studies suggest this patient population has a higher incidence of aggressive breast cancer subtypes,. Further research is needed to evaluate the breast cancer trends in patients outside the routine screening age to determine if updates to screening recommendations or targeted assessment protocols are warranted.

M5B-SPBR-3 TOTAL-BODY STAGING AND SURGICAL PLANNING IN BREAST CANCER WITH PHOTON-COUNTING CT

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Marco Gerli (*Abstract Co-Author*)
Marco Ali, PhD (*Abstract Co-Author*)
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PURPOSE

To assess photon counting detector computed tomography (PCD-CT) as a single session imaging modality for locoregional and systemic total-body staging in breast cancer patients, aiming to reduce reliance on MRI, lower contrast and radiation dose, and improve patient experience and surgical planning.

METHODS AND MATERIALS

A PCD-CT protocol for total body staging and surgical planning was developed, including virtual non-contrast, arterial (upper abdomen), portal (thorax and abdomen), and delayed phases (abdomen and brain), with spectral reconstruction. Contrast (Iomeron 400 mg/mL) was administered at 0.7 mL/kg via venous access in the arm contralateral to the tumor. The protocol was validated in 17 consecutive adult female patients (mean age: 51; range: 30-78) with biopsy proven breast cancer scheduled for neoadjuvant chemotherapy or mastectomy, retrospectively evaluated with available breast MRI. For confirmed malignancies, the abovementioned protocol was applied. In cases with mixed benign/malignant findings, an additional thoracic arterial phase was included, as benign nodules may enhance earlier, while malignancies are better seen in the venous phase. Two radiologists independently reviewed each case on PCD-CT and MRI, assessing the primary tumor, locoregional lymph nodes, and extramammary findings.

RESULTS

PCD-CT demonstrated effective detection of the primary tumour and locoregional lymphadenopathy, with diagnostic efficacy for preoperative management comparable to breast MRI; in all cases, PCD-CT showed consistent findings with MRI in tumor detection, size, multifocality, lymph node, and pectoralis muscle involvement. Microcalcifications were seen only on PCD-CT, showing superior spatial resolution. Among 17 cases, PCD-CT revealed axillary adenopathy (n=12), internal mammary adenopathy (n=3), pectoralis fascia invasion (n=1), brain metastasis (n=1), and suspicious liver lesions (n=1), supporting its systemic staging value. Compared to MRI+CT, the PCD-CT protocol was faster (10 min vs 30 min) with a single contrast injection. Radiation dose was ~35 mSv, 60% lower than 64-slice CT. Finally, unlike MRI, PCD-CT is performed with the patient in a supine position, judged by surgeons as more anatomically and surgically favourable.

CONCLUSION

The PCD-CT protocol enables efficient and accurate staging and improves preoperative planning with precise locoregional and total-body imaging in a single session, while reducing contrast media, radiation dose, time, and cost compared to the MRI+conventional CT protocol.

CLINICAL RELEVANCE/APPLICATION

PCD-CT allows efficient locoregional and total-body staging in breast cancer patients, easing patient workload and enhancing surgical planning with precise anatomical detail.

M5B-SPBR-5 A PRELIMINARY EVALUATION OF NNU- NET FOR AUTOMATED BREAST DENSITY SEGMENTATION IN DIGITAL BREAST TOMOSYNTHESIS

Nehal Doiphode (*Presenter*)
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PURPOSE

Breast density is a well-established risk factor for breast cancer, and digital breast tomosynthesis (DBT) enables routine volumetric breast density (VBD) estimation from 3D imaging. However, existing methods often rely on 2D projections or require raw DBT data, which is rarely archived. As nnU-Net has emerged as a leading out-of-the-box deep learning framework for biomedical image segmentation, validated across 23 diverse public datasets, it presents a natural baseline for this task. In this study, we examine the performance of nnUNet on DBT based breast density segmentation to assess its generalizability to this domain.

METHODS AND MATERIALS

We used a subset of anonymized DBT studies from a larger institutional dataset acquired at a medical academic center. The subset included 100 participants representing a range of breast density patterns. Reference segmentations of dense tissue were obtained from a previously validated software that uses both raw and processed images. All data were preprocessed and structured following nnU-Net's standardized format. Upon ingestion, nnU-Net generated a dataset fingerprint that informed its automatic pipeline selection. We tested two default configurations generated by nnU-Net for this 3D imaging task: (1) 2d, a slice-wise 2D U-Net applied to each DBT slice independently, and (2) 3d_fullres, a fully volumetric 3D U-Net operating at high resolution. Both models were trained using nnU-Net's default settings without manual tuning.

RESULTS

We trained both 2d and 3d_fullres nnU-Net configurations on DBT data using 5 fold cross validation. In the 2D configuration, validation loss decreased gradually, with pseudo Dice scores plateauing around 0.80 after approximately 30 epochs. In contrast, the 3D configuration showed faster convergence, achieving slightly higher maximum pseudo Dice values (~0.825) earlier in training

CONCLUSION

nnU-Net achieved moderate performance on the task of dense tissue segmentation from DBT, with pseudo Dice scores stabilizing around 0.80-0.825 across both 2D and 3D configurations. Increasing the training set size beyond an initial cohort did not yield substantial improvements, indicating that the task remains challenging even with well-established segmentation frameworks. These results highlight the need for DBT-specific model development and suggest that out-of-the-box pipelines may be insufficient for capturing the complex patterns associated with breast density in tomosynthesis.

CLINICAL RELEVANCE/APPLICATION

Our findings emphasize the limitations of current general-purpose segmentation frameworks in this domain and underscore the need for tailored solutions to fully leverage DBT for routine, reproducible density assessment in clinical practice.

M5B-SPBR-6 EARLY WASHOUT PHENOMENA IN ULTRAFAST DCE-MRI: THE POTENTIAL OF NOVEL ANALYTICAL METHODS

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PURPOSE

Ultrafast dynamic contrast-enhanced MRI (UF-DCE MRI) provides high temporal resolution for assessing early contrast enhancement in breast lesions. While early-phase kinetics like maximum slope (MS) are diagnostically useful, late washout patterns in UF-DCE MRI are less explored, despite their value in conventional DCE-MRI. This study evaluates breast cancer diagnostic performance using UF-DCE MRI by analyzing both early-phase kinetics and late-phase signal changes.

METHODS AND MATERIALS

This IRB-approved retrospective study included 175 patients who underwent UF-DCE MRI at Nagoya University Hospital in 2024. Contrast-enhanced imaging began at injection and continued for 72 seconds, acquiring 20 phases at 3.5-second intervals. Kinetic curves were generated with base-phase at injection start, early-phase at the kinetic curve inflection point (typically 35 seconds post-injection), and late-phase at 72 seconds post-injection. Washout was defined as >10% signal decrease from early to late phase. Enhancement patterns on UF-DCE MRI were compared with conventional DCE-MRI and correlated with pathology.

RESULTS

Some lesions showed signal decrease between early and late UF-DCE phases, indicating washout occurred before early conventional DCE-MRI (Figure 1). Fast enhancement patterns were similar between UF-DCE and conventional DCE-MRI, but conventional washout cases showed varied UF-DCE patterns (washout, plateau, or persistent) (Figure 2). In the late-phase UF-DCE MRI, the Luminal A (LA) subtype was more common in the washout group (63.6%, 14/22) than in the non-washout group (46.5%, 53/114), though not statistically significant (P = 0.166). Among cases with whole-lesion washout, 83.3% (5/6) were LA subtype (P = 0.106). MS showed no correlation with cancer subtypes, but was significantly higher in invasive cancer (median: 21.4%/sec) than in DCIS (median: 12.2%/sec) (P = 0.017). On the other hand, no significant difference in invasive carcinoma proportion was found between washout and non-washout groups.

CONCLUSION

UF-DCE MRI revealed washout patterns in some cases during its late phase, suggesting that washout occurs earlier than detectable in conventional DCE-MRI (Figure 1). Washout on UF-DCE MRI was associated with the LA subtype, and MS significantly differed between invasive cancer and DCIS. These parameters may improve lesion characterization.

CLINICAL RELEVANCE/APPLICATION

UF-DCE MRI could identify washout patterns without requiring prolonged scans, enabling abbreviated protocols that reduce imaging time without compromising diagnostic value. The combination of MS and washout patterns may help determine when delayed-phase imaging can be omitted safely.

M5B-SPBR-7 DOES THE PRESENCE OF IODINATED CONTRAST AFFECT TOMOSYNTHESIS PERFORMANCE?

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PURPOSE

Among a mix of asymptomatic and symptomatic women going to biopsy who had both a native digital breast tomosynthesis (DBTn) examination and also another DBT performed after iodinated contrast injection (DBTc), to assess the impact of iodinated contrast (e.g. "shine through") on false-positive recalls (FPR) from DBT.

METHODS AND MATERIALS

In an IRB-approved, HIPAA-compliant protocol, 5 radiologist observers (with 1-17 years' experience interpreting DBT) reviewed 175 routine-view DBT examinations twice. We excluded known cancers and examinations more than 100 days apart, leaving 158 paired exams, 53 (33.5%) of which had new cancer. Observers reviewed either the DBTn or DBTc examination for each case, then the complement 4 weeks later. DBTn included synthetic 2D images and DBTc included the low-energy exposure from the concurrent contrast-enhanced mammography (CEM) examination. Recalled findings were detailed, and a forced BI-RADS assessment was locked in through software developed for this study (BI-RADS 1 or 2; 3; 4A; 4B; 4C; 5, with BI-RADS 3 or higher considered recall). Sensitivity, FPR rate, and areas under the receiver operating characteristic curve (AUC) were determined and odds ratios (OR) were calculated.

RESULTS

Mean participant age was 53.6 years (range 30-81) and median lesion size 12 mm. Among 53 cases with malignancy, across 265 interpretations, sensitivity was fractionally larger at 241/265 (90.9%) for DBTc versus 233/265 (87.9%) for DBTn, OR 1.4 (95% CI 0.89 to 2.15); difference was 0.03 (95% CI from -0.01 to 0.06). FPR rates were fractionally smaller at 59.8% (314/525) for DBTc versus 63.2% (332/525) for DBTn, OR 0.86 (95% CI 0.69 to 1.07); difference was -0.03 (95% CI from -0.09 to 0.01). Post-contrast assessments resulted in fractionally larger AUC, albeit not statistically significantly greater, at 0.81 for DBTc versus 0.77 for DBTn (95% CI for difference from -0.01 to 0.08). At least some of the differences observed were due to positioning; review of discrepant cases is ongoing.

CONCLUSION

We observed non-inferiority of DBT sensitivity, false-positive recall rate, and AUC in the presence of iodinated contrast.

CLINICAL RELEVANCE/APPLICATION

Adding concurrent DBT to CEM does not adversely affect the diagnostic performance of DBT.

M5B-SPBR-8 ULTRASOUND-GUIDED CRYOABLATION FOR BREAST CANCER IN NON-SURGICAL PATIENTS

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Laura Lopez, MD (*Abstract Co-Author*)
Ignacio Fernandez Sobrado (*Abstract Co-Author*)

PURPOSE

To present our single-center experience on the use of percutaneous cryoablation (PCA) for the local control of breast cancer (BC) in patients who chose not to have surgery or were considered inoperable.

METHODS AND MATERIALS

All biopsy-proven BC diagnosed in our institution and managed with PCA were retrospectively reviewed. In this study we include those BC diagnosed in non-surgical patients with, at least, 6 months imaging follow-up. PCA was performed under ultrasound (US) guidance, using a liquid nitrogen-based system. Imaging follow-up with mammography and US or contrast-enhanced mammography (CEM) was scheduled every 6 months. Patient's tolerance to the procedure, adverse effects and results regarding local control of the disease were assessed.

RESULTS

From May 2019 to April 2025, 79 BC, diagnosed in 73 women that were considered inoperable, were treated under local anesthesia with PCA in our institution. All cases were previously reviewed in a multidisciplinary tumor board. Sixty-nine of them (median age 87 years, range 48-98 years) have, at least, one imaging examination performed 6 months after the procedure. Median tumor size was 23 mm, range 6-46 mm. The mean follow-up was 19.8 months (range 6-45 months). Sixty were luminal BC, 3 were Her2 (+) and 8 were triple negative tumors. All luminal cancers received endocrine therapy. Complete tumoral necrosis was achieved in 56 tumors (81.2%). There was axillary progression in two triple negative BC. Recurrence in a different location was diagnosed in two patients. PCA was successful 100% of luminal cancers up to 2.5 cm. No major complications were seen and the procedure was well tolerated.

CONCLUSION

PCA is a safe and well-tolerated outpatient procedure. The study outcomes suggest that PCA is effective and could be an alternative to surgery for the management of luminal BC up to 2.5 cm in those women that are considered not candidates for surgery.

CLINICAL RELEVANCE/APPLICATION

Percutaneous cryoablation is a minimally invasive procedure, without significant complications. It could be a safe alternative to surgery for the management or early-stage breast cancer.

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M5B-SPCA

Cardiac Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPCA-1 RELAX: THE EFFECTS OF COMPRESSED SENSING AND DEEP LEARNING-BASED RECONSTRUCTION ON NATIVE T1-RELAXATION TIMES OF THE MYOCARDIUM

Alessio Perazzolo, MD (*Presenter*)
Camilla Vittoria Vita, MD (*Abstract Co-Author*)
Vincenzo Scialo (*Abstract Co-Author*)
Mohamed Gamal, MD (*Abstract Co-Author*)
Tzu Cheng Chao (*Abstract Co-Author*)
Jacinta Browne, PhD (*Abstract Co-Author*)
Omer Demirel (*Abstract Co-Author*)
Spencer Waddle (*Abstract Co-Author*)
Tim Leiner, MD, PhD (*Abstract Co-Author*)

PURPOSE

Quantitative native T1 mapping is a key component in CMR for myocardial tissue characterization; however, slow acquisition and the lack of whole-heart coverage remain limitations. Undersampling techniques in k-space, such as compressed sensing (CS), and deep learning-based reconstruction methods focused on denoising (SmartSpeed, SS) have improved morphological and cine imaging, but their impact on quantitative relaxation times remain underexplored. This study evaluated image quality and native T1 quantification across 10 methods with varying CS acceleration levels, spatial resolutions, and presence/absence of denoising reconstruction.

METHODS AND MATERIALS

In this prospective single-center study, 48 healthy volunteers underwent native T1 mapping using a 3T Philips MRI scanner. After quality review, 41 subjects were included. Image quality (IQ), aliasing, and susceptibility artifacts were rated by two blinded readers using a 4-pt Likert scale. Quantitative analysis was performed on a per-segment basis using custom software, yielding mean and SD for each AHA segment. Nine cases were reanalyzed by three additional readers to assess interobserver variability. The reference T1-mapping protocol was obtained with CS 3, with spatial resolution of 2.0×2.0×10mm. Additional acquisitions were obtained with CS 3, 4, 5 and spatial resolutions of 2.0×2.0×10mm, 1.8×1.8×1mm, and 1.6×1.6×10mm for CS 3 and 2.0×2.0×10mm for CS 4 and 5.

RESULTS

Shapiro-Wilk tests confirmed non-normal distribution for qualitative scores and normal distribution for quantitative T1 values per segment. Significant differences emerged in IQ and aliasing among methods (Kruskal-Wallis, $p<0.05$), but not in susceptibility artifacts. Higher CS levels slightly reduced IQ and increased aliasing. SS slightly improved overall IQ without affecting aliasing. Higher spatial resolution kept qualitatively metrics stable. Segment-wise quantitative analysis showed good inter-operator agreement (ICC2 overall = 0.77). Bland-Altman analysis showed low bias across methods, with a max deviation of 10.51ms (overall) and 22.3ms (per-segment) from the standard.

CONCLUSION

Native myocardial T1 values remained stable across various CS acceleration factors, changes in spatial resolution and application of denoising, with clinically negligible bias for tissue characterization based on native T1 mapping.

CLINICAL RELEVANCE/APPLICATION

These findings support the use of CS and denoising to reduce acquisition time and improve temporal resolution for individual scans, benefiting patients with arrhythmias or elevated heart rates. Overall, these results advocate for patient-tailored T1 mapping protocols, further improving efficiency and diagnostic utility of quantitative CMR.

M5B-SPCA-3 PRE- AND POSTOPERATIVE RIGHT HEART REMODELING IN CHRONIC THROMBOEMBOLIC PULMONARY HYPERTENSION: INSIGHT FROM CARDIAC MAGNETIC RESONANCE

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Carmen Palacios (*Abstract Co-Author*)
Judit Mestres Marti (*Abstract Co-Author*)
Eduard Sole-Gonzalez (*Abstract Co-Author*)
Maria Ascaso (*Abstract Co-Author*)
Marcelo Sanchez, MD (*Abstract Co-Author*)
Joan Albert Barbera (*Abstract Co-Author*)
Isabel Blanco (*Abstract Co-Author*)
Susana Prat-Gonzalez, MD, PhD (*Abstract Co-Author*)
Manuel Castella (*Abstract Co-Author*)
Ana Garcia-Alvarez (*Abstract Co-Author*)

PURPOSE

Right heart remodeling is a relevant prognostic factor for heart failure and mortality in patients with pulmonary hypertension. This study aims to evaluate right heart remodeling in patients with chronic thromboembolic pulmonary hypertension (CTEPH) using cardiac magnetic resonance (CMR), and to compare structural and functional parameters before and after pulmonary endarterectomy (PEA).

METHODS AND MATERIALS

Between 2023-2024, patients with confirmed CTEPH who were eligible for PEA were prospectively enrolled. All patients underwent comprehensive CMR within 3 days prior to surgery and again at 6 months postoperatively. CMR assessment included evaluation of biatrial and biventricular volumes and function. Pulmonary artery (PA)

hemodynamics were analyzed using both phase-contrast and 4D flow sequences. Pulmonary vascular resistance (PVR) was estimated using a validated CMR-derived formula: PVR (Wood Units) = 19.38 - [4.62×Ln(PA average velocity,cm/s)] - [0.08×right ventricle ejection fraction (RVEF,%)]. Myocardial tissue characterization was performed using native T1 mapping and late gadolinium enhancement (LGE).

RESULTS

Twenty patients were included (mean age: 62.7 years; range: 21-80 years; 55% female). Postoperative CMR demonstrated significant reductions in indexed RV end-diastolic volume (pre 86.6±29.4 mL/m² vs. post-op 68.3±22.4 mL/m², p <0.05), RV end-systolic volume and right atrial area, consistent with right heart reverse remodeling. RVEF showed a trend toward improvement, increasing from 42.7 ± 10.8% to 47.7 ± 5.2% (p =0.07). No significant changes were observed in left ventricular parameters. Maximal PA size decreased significantly following surgery (9.4±2 vs 7.9±1.7 cm2, p <0.05) as well as CMR estimated PVR (pre-op: 6.6±1.5 WU vs. post-op: 4.6±1 WU, p <0.001). LGE at the RV insertion points was common, present in 95% of patients at the inferior insertion point and in 90% at the anterior insertion point. Native T1 values at mid septum showed no significant differences between pre- and postoperative assessments.

CONCLUSION

Cardiac MRI demonstrates significant reverse remodeling of the right heart and a reduction in CMR estimated PVR following PEA in patients with CTEPH. Although RVEF showed only a trend toward improvement, the most consistent changes were seen in right ventricular volumes. These findings underscore the value of CMR in assessing structural and functional recovery, supporting its role in prognostic evaluation and postoperative follow-up in this population.

CLINICAL RELEVANCE/APPLICATION

Cardiac MRI provides a comprehensive, noninvasive assessment of right heart reverse remodeling and pulmonary vascular changes after PEA, offering valuable prognostic insights in patients with CTEPH.

M5B-SPCA-4 INTEGRATING CT-FFR RESULTS INTO CAD-RADS 2.0 CLASSIFICATION FOR IMPROVED ISCHEMIC LESION IDENTIFICATION

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Sung Min Ko, PhD (*Abstract Co-Author*)
JUN SIK KIM (*Abstract Co-Author*)
GIYONG AN (*Abstract Co-Author*)

PURPOSE

To evaluate whether integrating CT-FFR results into the anatomical stenosis classification of CAD-RADS 2.0 significantly improves the accuracy of identifying ischemic lesions, particularly in patients with intermediate stenosis (CAD-RADS 3, approximately 50-69%).

METHODS AND MATERIALS

This retrospective study included 101 patients (age 70 ± 10 , height 162 ± 9 cm, weight 66 ± 11 kg, BMI 25 ± 3 kg/m², heart rate 66 ± 10 bpm, calcium score 527 ± 570) who underwent both CT-FFR and invasive FFR. The predictive performances of CT-FFR (=0.80) and CCTA (=50% stenosis) for detecting invasive FFR =0.80 were compared across all RCA, LAD, LCX and subgroup CAD-RADS 3 (50-69% stenosis).

RESULTS

For all pooled vessels, CT-FFR demonstrated superior diagnostic performance compared to CCTA, with specificity of 97% (95% CI: 94-98) vs. 64% (95% CI: 58-70), PPV of 77% (95% CI: 62-87) vs. 29% (95% CI: 22-37), and accuracy of 93% (95% CI: 90-95) vs. 68% (95% CI: 62-73). The AUC for CT-FFR was 0.95 (95% CI: 0.90-0.98) compared to 0.77 (95% CI: 0.71-0.82) for CCTA (p < 0.05) (Table 1 and Figure 2). Similar results were observed in each branch: RCA, LAD, and LCX (Table 1). In moderate stenosis (CAD-RADS 3), CT-FFR showed improved performance with specificity of 91% (95% CI: 80-97) vs. 0% (95% CI: 0-7), PPV of 76% (95% CI: 53-90) vs. 31% (95% CI: 22-43), and accuracy of 82% (95% CI: 71-89) vs. 31% (95% CI: 21-43). The AUC for CT-FFR was 0.96 (95% CI: 0.87-1.00) compared to 0.68 (95% CI: 0.54-0.82) for CCTA (p < 0.05).

CONCLUSION

Integrating CT-FFR into the CAD-RADS 2.0 classification enhances specificity and positive predictive value, improving the accuracy of identifying ischemic lesions, particularly in patients with intermediate stenosis (CAD-RADS 3).

CLINICAL RELEVANCE/APPLICATION

This optimized approach can avoid unnecessary invasive testing for patients with CAD-RADS 3 and CT-FFR >0.80 and identify functionally significant stenosis in patients with CAD-RADS 2 and CT-FFR =0.80, ultimately improving clinical outcomes.

M5B-SPCA-5 HIGH-RESOLUTION DEEP LEARNING CT RECONSTRUCTION FOR WATCHMAN DEVICE ASSESSMENT IN A CARDIAC PHANTOM

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Kelsey Schluter, BS (*Abstract Co-Author*)
Jakub Siembida, MD,MA (*Abstract Co-Author*)
Sarv Priya, MD, MBBS (*Abstract Co-Author*)
Prashant Nagpal, MD (*Abstract Co-Author*)

PURPOSE

To evaluate deep learning-based reconstruction techniques with varying matrix sizes for the post-procedural assessment of Watchman devices in a dynamic cardiac phantom.

METHODS AND MATERIALS

A dynamic cardiac CT phantom (SKK II, Kyoto Kagaku, Japan) with a Watchman device (Boston Scientific, MN, USA) attached to the heart surface was scanned on a 320-slice CT scanner (Aquilion INSIGHT edition, Canon) using a 0.24 s rotation time, 100 kV, and 90 mA. Heart rates of 60, 80, 100, and 110 bpm were simulated over a full cardiac cycle. . Image reconstruction was performed with retrospective gating over the scanner determined optimal cardiac phase using two advanced deep learning algorithms, AiCE (level 1) and PIQE (level 1), in conjunction with the vendor provided metal artifact reduction technique SEMAR using a matrix size of 512 and 1024 (PIQE only). Signal to noise (SNR) and sharpness of individual wires of the watchman device as well as the size and intensity of hypointense artifacts around the wires was measured. Noise was measured within a 1.74 cm diameter circular region of interest in a homogeneous area of the heart. The individual wires of the Watchman device were manually segmented to facilitate sharpness measurements, which were determined using the maximum gradient of the intensity profile across the wires. Furthermore, the extent of hypointense artifacts surrounding the metallic wires was quantified by measuring the area under the curve of the pixel intensity profile in the vicinity of the device. A Wilcoxon signed rank test was used to test for significant differences.

RESULTS

Across all heart rates, SNR was significantly higher for PIQE 512 compared to AiCE 512 (65.3±8.0 vs. 11.5±2.6 , p<0.0001), and further increased with PIQE 1024 (90.0±11.8 , p<0.0001). Sharpness was significantly higher for AiCE 512 compared to PIQE 512 (155.6±45.3 vs 144.2±54.7 , p<0.0001), but significantly higher for PIQE 1024 compared to AiCE 512 (185.1±70.1 , p<0.0001). Both PIQE 512 and PIQE 1024 show significantly less hypointense artifacts compared to AiCE 512 (PIQE 512 : 274.3±307.5 (p=0.001) , PIQE 1024 : 552.0±304.7 (p=0.007) , AiCE 512 : -749.0±784.7).

CONCLUSION

PIQE reconstruction, particularly with a 1024 matrix size, offers significant advantages for visualizing and assessing a Watchman device in post-procedure CTs due to improved SNR, sharpness, and reduced metal artifacts.

CLINICAL RELEVANCE/APPLICATION

Accurate post-procedural CT assessment of Watchman device placement is critical for detecting potentially life-threatening complications like migration, device-related thrombus, or peri-device leak. High-resolution deep learning reconstruction, such as PIQE 1024 , enhance visualization of fine device structures, thereby aiding in this crucial evaluation.

M5B-SPCA-6 INCREMENTAL PROGNOSTIC VALUE OF PLAQUE BURDEN ESTIMATION IN CAD-RADS 2.0 FOR PREDICTING MAJOR ADVERSE CARDIOVASCULAR EVENTS

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Gorka Bastarrika Aleman, MD (*Abstract Co-Author*)
Ana Ezponda, MD (*Abstract Co-Author*)

PURPOSE

To assess whether incorporating plaque burden estimation using the segment involvement score (P-SIS) in CAD-RADS 2.0 improves the prediction of major adverse cardiovascular events (MACE) compared to the stenosis-based classification of CAD-RADS 1.0 in patients undergoing coronary CT angiography.

METHODS AND MATERIALS

A retrospective cohort of 562 patients undergoing CCTA between September 2017 and April 2022 was evaluated using CAD-RADS 1.0 and CAD-RADS 2.0 systems. The P-SIS score (P1-P4) was calculated. MACE was defined as a composite of heart failure, myocardial infarction, unstable angina, stroke, or cardiac death.Cox regression models (univariate and multivariate) assessed associations between imaging scores and MACE. Baseline clinical characteristics and medication use were also analyzed.

RESULTS

Over a median follow-up of 51.2± months, 41 patients (7.3%) experienced MACE. Patients with MACE were older and had higher rates of comorbidities including COPD, hypertension, diabetes, chronic kidney disease, and arrhythmias. Notably, 72.5% of MACE cases occurred in patients with CAD-RADS 1-2. Moderate-to-severe plaque burden (P3-P4) was present in 85.4% of MACE cases. In univariate analysis, P-SIS was significantly associated with MACE (HR 4.08; 95% CI 1.71-9.75; p=0.002). A high-risk classification using CAD-RADS 2.0 (CAD-RADS =3 or any CAD-RADS with P=3) showed stronger predictive performance for MACE in both univariate (HR 4.6; 95% CI 1.80-11.78; p<0.001) and multivariate analyses (HR 3.69; 95% CI 1.25-10.86; p=0.018), whereas CAD-RADS 1.0 did not retain independent prognostic significance.

CONCLUSION

CAD-RADS 2.0, by incorporating plaque burden estimation through P-SIS, significantly improves the prognostic assessment of patients undergoing CCTA. This enhanced classification allows for better identification of individuals at risk of major adverse cardiovascular events, even among those with non-obstructive coronary artery disease.

CLINICAL RELEVANCE/APPLICATION

Routine inclusion of plaque burden modifiers in CCTA reports, as proposed in CAD-RADS 2.0, facilitates more accurate cardiovascular risk stratification and may inform earlier preventive or therapeutic interventions in patients traditionally considered low risk.

M5B-SPCA-7 OXYGEN-SENSITIVE MRI (OS-MRI)-BASED EVALUATION OF CARDIO-CEREBRAL OXYGENATION RESERVE IN HEART FAILURE PATIENTS

Yang Lei (*Presenter*)
Yong Ju Yang (*Abstract Co-Author*)
Feifei Zhou, MD (*Abstract Co-Author*)

PURPOSE

To investigate whether oxygenation sensitive magnetic resonance imaging (OS-MRI) can be an emerging tool to quantify cardio-cerebral oxygenation reserve in patients with heart failure and the relationship between decreased cardio-cerebral oxygenation reserve and cognitive dysfunction.

METHODS AND MATERIALS

The study is a prospective, single-center cohort study that evaluates the cardio-cerebral oxygenation reserve and cognitive function status of patients hospitalized for heart failure from March 2025 to December 2025, and divides heart failure into four stages: A, B, C, and D according to the American Heart Association stage. The included population underwent oxygen-sensitive magnetic resonance imaging (OS-MRI) combined with the Montreal Cognitive Assessment (MoCA) scale during hospitalization, and a group of healthy volunteers were recruited to use their cardio-cerebral oxygenation reserve as a diagnostic criterion. Primary outcome measures are change in MORE and CORE (?SI)and MoCA score (less than 26 points consider mild cognitive dysfunction).

RESULTS

60 patients with HF (age 64.4±8.3 years; 37.5% women) were included in the analysis. Both cerebral oxygenation reserve and MORE in HF patients were lower than those in healthy volunteers (MORE: 0.57±2.9 and 4.8±3.3, CORE: 0.25±0.39 and 1.22±0.50, respectively), and the Montreal Cognitive Assessment score (HF, 23.6±2.8; Health, 27.5±1.2; P=0.002) with cardio-cerebral oxygen reserves. The Montreal cognitive assessment score was correlated with MORE (r=0.56, P=0.040).

CONCLUSION

Our findings suggest that oxygen-sensitive magnetic resonance imaging can identify patients with heart failure with reduced cardiocerebral oxygenation reserves, and that this impaired response is associated with cognitive decline.

CLINICAL RELEVANCE/APPLICATION

This study provides quantitative and definitive diagnostic criteria for assessing oxygenation reserve in heart failure patients, enriches the clinical understanding of cardio-cerebral comorbidities, and promotes the development of multi-organ integrated treatment strategies.

M5B-SPCA-10 DEEP LEARNING-BASED AUTOMATED SEGMENTATION OF INTRACARDIAC 4D FLOW MRI USING CT-DERIVED SEGMENTATION TRANSFER

Ji-Hoon Jung (*Presenter*)
Jong Eun Lee, MD, PhD (*Abstract Co-Author*)
Hongmin Oh (*Abstract Co-Author*)
Hyungkyu Huh (*Abstract Co-Author*)

Gyu-Han Lee (*Abstract Co-Author*)
Hojin Ha (*Abstract Co-Author*)
June-Goo Lee, PhD (*Abstract Co-Author*)
Dong Hyun Yang, MD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a fully automated deep learning-based segmentation method for intracardiac 4D flow MRI using segmentation masks transferred from chest computed tomography angiography (CTA).

METHODS AND MATERIALS

This retrospective study included consecutive patients who underwent both 4D flow MRI and chest CTA for preoperative evaluation of valvular heart disease between January 2023 and December 2024. Segmentation masks of cardiac chambers, the aorta, and pulmonary artery were automatically generated using an in-house deep learning algorithm to transfer CT-derived segmentations obtained by the publicly available TotalSegmentator tool. Non-rigid registration aligned these segmentations to the corresponding 4D flow MRI datasets. Segmentation accuracy was assessed using the Dice similarity coefficient against the reference standard: cine MRI-based semiautomatic manual segmentation by a cardiothoracic radiologist. Concordance correlation coefficients (CCCs) were calculated to assess agreement for quantitative metrics including left ventricular (LV) end-diastolic volume (EDV), end-systolic volume (ESV), LV ejection fraction (LVEF), and aortic volumes.

RESULTS

Of the included 44 patients (mean age, 66.7 ± 15.0 years; 24 men), transferred CT-derived segmentation masks demonstrated high spatial agreement with both cine MRI-based and semiautomatic manual segmentations, achieving a mean Dice coefficient of 0.81 ± 0.05. Quantitative metrics derived from automated CT-based segmentation showed good correlation with reference standards, yielding CCCs ranging from 0.77 to 0.82 for LV EDV, LV ESV, LVEF, and aortic volumes.

CONCLUSION

Deep learning-based CT-derived segmentation transfer enables accurate and reproducible segmentation and quantification in intracardiac 4D flow MRI, eliminating the need for additional cine MRI acquisitions.

CLINICAL RELEVANCE/APPLICATION

This automated segmentation approach may streamline cardiac imaging workflows, reduce examination times, enhance reproducibility, and facilitate broader clinical adoption of comprehensive hemodynamic assessments using 4D flow MRI.

M5B-SPCA-11 DEEP LEARNING RECONSTRUCTION ENHANCES SYSTOLIC CORONARY CTA IMAGE QUALITY UNDER TRIPLE-LOW PROTOCOLS ACROSS BMI CATEGORIES

Xiaohua Zhang (*Presenter*)
Xiaoyan Lei (*Abstract Co-Author*)
Feng Chen, MD, PhD (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To assess the impact of high-strength deep learning image reconstruction (DLIR-H) on image quality of systolic-phase coronary CTA in patients with varying BMI, under protocols incorporating low radiation, low contrast volume, and low injection rate, compared to conventional iterative reconstruction (ASIR-V 50%).

METHODS AND MATERIALS

In this prospective single-center study, 47 patients with suspected coronary atherosclerosis were stratified by BMI: Group A (<24 kg/m², n=20), Group B (24-28 kg/m², n=21), and Group C (>28 kg/m², n=6). Coronary CTA was performed using tailored triple-low scanning protocols (70-100 kVp; contrast 35-55 mL; injection rates 3.0-5.0 mL/s). Images were reconstructed using DLIR-H and ASIR-V 50%. Objective assessments included CT attenuation, image noise (SD), signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) in the LM, LAD, LCX, RCA (proximal, mid, distal), and aortic root (AO). Two radiologists independently rated subjective image quality using a five-point Likert scale.

RESULTS

DLIR-H significantly reduced image noise compared to ASIR-V in all BMI groups ($P < 0.001$). For example, in Group A, proximal RCA noise decreased from 44.38 ± 14.05 to 37.13 ± 13.91 (-16.3%); in Group C, AO noise dropped by 46.9% (35.18 ± 10.54 to 18.68 ± 8.68). DLIR-H markedly improved SNR and CNR in all BMI groups. In Group B, distal RCA CNR increased from 19.46 ± 6.71 to 32.70 ± 14.09 (+68.1%). Subjective image quality was significantly higher with DLIR-H in all groups ($P < 0.05$), with median Likert scores of 4 (IQR: 4-5) versus 3 for ASIR-V in Group A. Inter-reader agreement was excellent (Kappa > 0.9). Although effective radiation dose (ED) increased with BMI (Group A: 0.77 ± 0.14 mSv; Group C: 2.02 ± 0.58 mSv; $P = 0.004$), DLIR-H consistently delivered the largest noise reductions and CNR gains across all BMI strata.

CONCLUSION

DLIR-H significantly enhances systolic coronary CTA image quality across BMI groups under triple-low protocols. It achieves substantial noise reduction (16.3%-46.9%) and marked increases in SNR and CNR (up to 76.7%), with consistently high subjective ratings. These results support DLIR-H as a robust tool for low-dose, high-clarity coronary imaging, particularly in patients with elevated BMI.

CLINICAL RELEVANCE/APPLICATION

DLIR-H enables high-quality systolic-phase coronary CTA imaging even under stringent dose-reduction protocols. Its capacity to preserve diagnostic clarity in overweight and obese patients is critical for accurate detection of coronary artery disease, making it a valuable advance in personalized, low-exposure cardiac imaging strategies.

M5B-SPCA-12 MINIMIZATION OF CALCIFIC PLAQUE BLOOMING IN CT ANGIOGRAPHY BY ENERGY OPTIMIZATION WITH RAPID-SWITCHING DUAL-ENERGY EID-CT: PHANTOM STUDY WITH AUTOMATED LINE PROFILE ANALYSIS

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Shawn Newlander, MS (*Abstract Co-Author*)
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Marton Kolossvary, MD, PhD (*Abstract Co-Author*)
Milan Vecsey-Nagy, MD, PhD (*Abstract Co-Author*)
Hugo M. Marques, MD, PhD (*Abstract Co-Author*)
Jadranka Stojanovska, MD, MS (*Abstract Co-Author*)
Elliot R. McVeigh, PhD (*Abstract Co-Author*)
George E. Wesbey III, MD (*Abstract Co-Author*)

PURPOSE

Previous spectral PCD-CT phantom studies confirmed the value of high keV virtual monoenergetic images (VMI) in reducing calcium blooming in CTA. Similar studies with EID-CT have not been reported. This study aims to quantify energy dependent blooming in EID-CT across 11 different VMI energy levels using a cylindrical phantom with an intermediate density calcium hydroxyapatite (CaHA) plaque insert. The objective was to determine the VMI energy level(s) that minimize blooming using reference ground truth ultra-high-resolution EID-CT.

METHODS AND MATERIALS

A cylindrical phantom with a 1.5 mm-thick, 10 mm-long CaHA plaque (370 mg CaHA/cm³), simulating 50% stenosis in blood-equivalent contrast (blood ˜ 45 HU at 120 kVp), was positioned in a water bath at isocenter within an anthropomorphic thorax phantom surrounded by a 35 cm fat attenuation ring. A standard CTA protocol was used: 0.6 mm helical slices, 0.5 s rotation, 200 mA, with rapid-switched dual-energy (80/140 kVp) acquisition on a 256-slice CT scanner (1.2 mm focal spot). Images were reconstructed with 25 cm FOV, standard kernel, and deep learning noise reduction. Eleven VMIs (40-140 keV) were generated. All acquisition parameters remained identical across VMIs. Plaque diameter was measured computing edge width at half maximum (EWHM) and full width at half maximum (FWHM) from five averaged line profiles. Ground truth was obtained using a high-resolution 120 kVp axial temporal bone protocol in air (7 cm FOV, 0.7 mm focal spot).

RESULTS

Noise power spectra showed no significant variation across VMIs. Line profiles demonstrated that both EWHM and FWHM decreased linearly with increasing energy (R^2 = 0.922, and 0.922, respectively), confirming increasing blooming at lower keV (ANOVA $p < 0.0001$). The ground truth plaque diameter was 1.37 mm, while plaque diameter measured as FWHM ranged from 1.43 mm at 140 keV to 1.59 mm at 40 keV ($p<0.0001$). Post hoc Tukey analysis revealed significant differences in FWHM between lower and higher VMI energies. Compared to 40 keV, values at 70 keV and above were significantly lower ($p < 0.01$), confirming a consistent reduction in blooming at higher energies. No significant difference was observed between adjacent high-keV levels.

CONCLUSION

High energy VMI synthesis from dual energy EID-CT produces the most accurate measure of CAC diameter, presumably by minimizing beam hardening artifact from the stronger photoelectric absorption of calcium relative to water at low keV.

CLINICAL RELEVANCE/APPLICATION

Calcium blooming is a major limitation in CT angiography, often leading to overestimation of stenosis.

M5B-SPCA-13 MYOCARDIAL ULTRASONIC RADIOMIC FEATURE ANALYSIS FOR THE ETIOLOGICAL DIFFERENTIATION OF LEFT VENTRICULAR HYPERTROPHY

Yue Liu (*Presenter*)
Xinyue Liu (*Abstract Co-Author*)
Yansong Liu (*Abstract Co-Author*)

PURPOSE

Cardiac ultrasound is usually insufficient for the etiological diagnosis of left ventricular hypertrophy (LVH). We aimed to develop an artificial intelligence algorithm using myocardial ultrasonic radiomic features to differentiate common etiologies of LVH, such as hypertrophic cardiomyopathy (HCM), hypertensive heart disease (HHD), uremic cardiomyopathy (UCM) and cardiac amyloidosis (CA).

METHODS AND MATERIALS

In this study, 249 HCMs, 148 HHDs, 148 UCMs and 182 CAs were recruited. The data were randomly divided into a training set and a test set at an 8:2 ratio. On the basis of the four-chamber view of two-dimensional cardiac ultrasound, we selected the interventricular septum as the region of interest (ROI) to extract radiomic features. Several causal diagnosis models for left ventricular hypertrophy, including RandomForest, ExtraTrees, XGBoost and LightGBM, were constructed using the features after dimensionality reduction.

RESULTS

The LightGBM model (area under the curve of 0.844 for HCM, 0.734 for HHD, 0.813 for UCM and 0.749 for CA) based on radiomics outperformed the other three models. (RandomForest: area under the curve of 0.797 for HCM, 0.666 for HHD, 0.759 for UCM and 0.658 for CA; ExtraTrees: area under the curve of 0.823 for HCM, 0.632 for HHD, 0.778 for UCM and 0.715 for CA; XGBoost: area under the curve of 0.839 for HCM, 0.701 for HHD, 0.807 for UCM and 0.709 for CA).

CONCLUSION

We developed several artificial intelligence-based classification models and then selected the one with the highest diagnostic efficacy (LightGBM). This model utilizes radiomics based on cardiac ultrasound to enhance the diagnostic and differential capabilities of LVH.

CLINICAL RELEVANCE/APPLICATION

Although cardiac ultrasound is an important method for detecting LVH, distinguishing its etiology is difficult. This study revealed that the radiomics-based LVH etiology diagnosis model constructed on the basis of cardiac ultrasound has good diagnostic performance. The fundamental reason is that radiomics can extract a large amount of image information that the human eye cannot observe, which to some extent can compensate for the deficiency of diagnosis by ultrasound physicians relying only on experience and the naked eye, highlighting the importance of this method in the etiological diagnosis of diseases via relevant images.

M5B-SPCA-14 IMPACT OF SUPER-RESOLUTION DEEP LEARNING RECONSTRUCTION ON CORONARY CT ANGIOGRAPHY-DERIVED PLAQUE QUANTIFICATION

Limiao Zou (*Presenter*)
Yunxin Zhong (*Abstract Co-Author*)
Min Xu, PhD (*Abstract Co-Author*)

PURPOSE

Coronary CT angiography (CCTA) allows for noninvasive coronary plaque quantification, with moderate to good correlations to intravascular ultrasound, and provides powerful cardiovascular risk prediction. However, CCTA still has some limitations regarding spatial resolution and soft tissue contrast, which diminish its capacity to accurately quantify coronary plaques. Utilizing data from ultra-high-resolution CT as training target, a novel super-resolution deep learning reconstruction (SR-DLR) technique has been developed and the possible impact on coronary plaque quanfication remains unknown. Therefore, the aim of this study was to compare SR-DLR with conventional hybrid iterative reconstruction (HIR) on quantitative plaque assessment.

METHODS AND MATERIALS

From September 2023 to November 2024, 109 patients who underwent clinically indicated CCTA for assessment of suspected or known coronary artery disease were consecutively enrolled. CCTA images were reconstructed with both HIR (Adaptive Iterative Dose Reduction (AIDR) 3D, FC43 kernel) and SR-DLR (Precise IQ Engine (PIQE), Cardiac kernel). Total plaque volumes were quantified and further classified into three components based on the specific Hounsfield unit (HU) threshold: low-attenuation plaque (LAP) (<30 HU), fibrous plaque (30—350 HU) and calcified plaque (>350 HU).

RESULTS

A total of 223 plaques were identified. Overall, total plaque volumes were significantly higher with SR-DLR than with HIR (196.36 mm 3 [107.44, 333.50] vs. 166.64 mm 3 [87.90, 295.76], P < 0.001). While calcified plaque volums were significantly lower with SR-DLR compared with HIR (79.64 mm 3 [33.46, 149.78] vs. 80.50 mm 3 [32.58, 151.92], P=0.04), LAP volume (1.44 mm 3 [0.00, 11.38] vs. 0.26 mm 3 [0.00, 4.50]) and fibrous plaque volume (79.26 mm 3 [37.42, 160.76] vs. 61.76 mm 3 [29.02, 130.20]) (all P < 0.001) were significantly higher with SR-DLR.

CONCLUSION

Compared with HIR, higher total plaque volumes were obtained with SR-DLR, with lower calcified plaque volume and higher LAP and fibrous plaque volume.

CLINICAL RELEVANCE/APPLICATION

CCTA-derived plaque quanfication via SR-DLR may potentially improve risk stratification of coronary artery disease

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M5B-SPCH

Chest Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPCH-1 TRACHEOBRONCHIAL TREE 3D PRINTING ACCURACY: EFFECTS OF PATIENT PHYSICAL CHARACTERISTICS, IMAGE RECONSTRUCTION AND SEGMENTATION PARAMETERS ON POLYJET 3D PRINTED MODELS COMPARED TO CT SOURCE IMAGES

Lucas Betts, MD (*Presenter*)
Kalley Johnson (*Abstract Co-Author*)
Richard Csordas, BS (*Abstract Co-Author*)
Athillesh Sivapatham, MD (*Abstract Co-Author*)
Christian W. Cox, MD (*Abstract Co-Author*)

PURPOSE

To determine how segmentation threshold (upper Hounsfield unit, HU), patient factors (BMI, age, sex), and CT reconstruction kernel influence the dimensional accuracy of PolyJet-printed tracheobronchial models, and to identify threshold values that minimize print-CT diameter discrepancies.

METHODS AND MATERIALS

Following IRB approval, twelve adults (6F/6M; mean age 68.3 years; mean BMI 28.08) with standard chest CT (= 1 mm slices) were retrospectively selected with even representation of BMI categories. The mid trachea (MT), bronchus intermedius (BI), and left lower lobe superior segmental bronchus (SSB) were segmented in Materialise Mimics using upper HU thresholds ranging from -900 to -200 HU in 100-HU increments. The resulting meshes were exported as STL files and printed on a Stratasys J5 Medijet PolyJet 3D printer. Printer validation with geometric calibration models confirmed intrinsic error below 0.1 mm. Printed luminal diameters were measured with digital calipers and compared to electronic measurements on axial CT images. Linear mixed-effects models assessed the effects of HU threshold (per 100 HU), BMI (per unit), age (per year), sex, airway diameter, and reconstruction kernel on print-CT discrepancy, including interaction terms to probe threshold sensitivity.

RESULTS

Incremental adjustment of upper limit HU for segmentation produced near linear relationships to model airway diameter with greatest accuracy relative to CT measurement between -300 (SSB) to -400 (BI and MT). Patient BMI demonstrated statistically significant main effect on MT and BI print diameters ($p=0.0025$ and $p=0.048$). Statistically significant main effects on tracheal prints were present for patient age ($p=0.0362$) and BI prints for biologic sex ($p=0.012$). Interaction effects between HU and other variables were significant for BMI/Age/biologic sex for the trachea, BMI/Age/Reconstruction kernel for BI and biologic sex for SSB.

CONCLUSION

Upper HU thresholds of -300 to -400 HU yield submillimeter-accurate airway prints and were not subject to segmentation artifacts present at lower cutoff values. A predictable, near-linear relationship between HU and model diameter allows for predictable segmentation tuning, and accounting for BMI, age, and sex can further refine fidelity. The sample size of our study was a limitation; this could be addressed through the use of an automated segmentation and measurement algorithm to scale up model generation and analysis.

CLINICAL RELEVANCE/APPLICATION

Applying optimized HU thresholds and patient-specific adjustments enables production of highly accurate 3D airway models for surgical planning, simulation training, and custom device development.

M5B-SPCH-2 A STUDY ON PREDICTING STROKE-RELATED PNEUMONIA IN INTRACEREBRAL HEMORRHAGE PATIENTS BASED ON HEAD CT RADIOMICS

Zhiming Zhou (*Presenter*)

PURPOSE

To investigate the value of head non-contrast enhanced CT (NCCT) radiomics in predicting stroke-associated pneumonia (SAP).

METHODS AND MATERIALS

A total of 522 ICH patients from China were retrospectively analyzed, including 421 from our hospital (295 for the training cohort and 126 for the validation cohort) and 101 from another hospital as the testing cohort. Patients were divided into pneumonia and non-pneumonia groups based on whether pneumonia occurred within seven days of stroke onset. Independent risk factors were identified using univariate and multivariate analysis to construct a clinical model. Optimal radiomics features of brain hematoma and edema were selected using radiomics analysis methods, and radiomics scores (Radscore) were calculated. Multiple models were constructed by incorporating ICH_Radscore and EDEMA_Radscore into the clinical model. Model performance was evaluated using receiver operating characteristic (ROC) curves, and the best model was visualized as a nomogram.

RESULTS

Baseline NIHSS, dysphagia, NLR, and SII were identified as independent risk factors for SAP. Using feature selection methods, we identified 6 optimal hematoma features and 5 optimal edema features. Significant differences between the SAP and non-SAP groups were found in multiple features, including ICH_Radscore and EDEMA_Radscore. Multifactor analysis showed that EDEMA_Radscore remained significant when combined with clinical risk factors. Various models, including APS-A-Score, ICH_Radscore, EDEMA_Radscore, Clinical_Model, Clinical_ICH_Model, Clinical_EDEMA_Model, and Combined_model, demonstrated good predictive performance in validation and test cohorts, with AUCs ranging from 0.780 to 0.915. The Combined_model performed slightly better, with good consistency and clinical applicability in predicting SAP occurrence. Additionally, the Combined_model achieved AUCs of 0.846 and 0.834 in predicting the prognosis of ICH patients in the verification and test cohorts.

CONCLUSION

Head NCCT radiomics is effective for predicting SAP in ICH patients, and the nomogram of the Combined_model can serve as a predictive tool for SAP in ICH patients.

CLINICAL RELEVANCE/APPLICATION

This study offers a non-invasive and cost-effective radiomics-based tool using head NCCT to predict SAP risk in ICH patients, enabling early identification of high-risk individuals and guiding personalized management strategies to enhance clinical outcomes.

M5B-SPCH-3 ADDITIVE VALUE OF BODY COMPOSITION BASED ON BASELINE CHEST CT FOR LONG-TERM PROGNOSIS IN NSCLC

Junli Tao (*Presenter*)

PURPOSE

To explore whether CT-quantified body composition parameters, including skeletal muscle, subcutaneous fat and pericardial fat are associated with prognosis of NSCLC,and aiming to establish a simple and synergistic prediction model that combine body composition and clinical indicators to improve prognosis for patients with NSCLC.

METHODS AND MATERIALS

This retrospective study included patients from 2017 to 2022 with NSCLC confirmed by pathology.The skeletal muscle area (SMA) and density (SMD) (including pectoralis major and pectoralis minor muscle) and subcutaneous fat parameters (area and density) were obtained semi-automatically at the fourth thoracic vertebrae (Th4). Pericardial fat volume (PFV) and density (PFD) were automatically calculated. The skeletal muscle and subcutaneous fat index (SMI and SFI) were calculated as SMA and SFA divided by height squared respectively, while pericardial fat index (PFI) was PFV divided by body surface area (BSA).Cox proportional hazards modelling was used to assess the association between body composition and 5-year overall survival (OS).Four survival prediction models were constructed (model I: including prognostic nutritional index, model II: including body composition, model III: including tumor staging, model IV: including body composition and tumor staging).The effectiveness of the established model in predicting the long-term prognosis of NSCLC was evaluated and compared.

RESULTS

A total of 1160 patients were included. Lower skeletal muscle index (SMI; HR: 0.655, 95% CI: 0.555-0.773, P = 0.00), lower subcutaneous fat index (SFI; HR: 0.383, 95% CI: 0.291-0.505, P = 0.00) and lower pericardial fat index (PFI; HR: 0.652, 95% CI: 0.546-0.780, P = 0.00) were independent prognostic factors for worse 5-year OS in NSCLC. Higher subcutaneous fat densities (SFD; HR: 1.892, 95% CI: 1.605-2.231, P = 0.00) and pericardial fat densities (PFD; HR: 1.892, 95% CI: 1.605-2.231, P = 0.00) were associated with worse 5-year OS. Compared to Model I , Model II had a superior prognostic efficacy for 5-year OS. Model IV had the best predictive abilities for OS (C-index 0.783).

CONCLUSION

CT-quantified body composition were closely related to NSCLC prognosis. Patients with higher SMI, SFI and PFI had longer 5-year OS, whereas higher SFD and PFD were unfavourable prognostic factors. The integration of CT-quantified body composition parameters has added value to the TNM staging system in predicting prognosis in NSCLC.

CLINICAL RELEVANCE/APPLICATION

The body composition of baseline chest CT can be of clinical value as an independent predictor of 5-year OS in NSCLC as well as having additive value for TNM prognostic evaluation indicators for survival stratification and long-term prognostic prediction.

M5B-SPCH-4 EVALUATING LARGE LANGUAGE MODEL FOR IDENTIFYING POSITIVE PULMONARY EMBOLISM CASES IN CHEST CT REPORTS TO ASSESS IMAGING UTILIZATION

Azfar Basunia, MD (*Presenter*)
Satvik Tripathi (*Abstract Co-Author*)
Tessa S. Cook, MD, PhD (*Abstract Co-Author*)
Friedrich D. Knollmann, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the ability of a large language model (LLM) to automatically identify positive cases of pulmonary embolism (PE) in contrast-enhanced chest CT reports ordered from the emergency department, to support analysis of potential imaging utilization.

METHODS AND MATERIALS

A HIPAA-compliant deployment of GPT-4 was used to process 300 contrast-enhanced chest CT reports. The model was prompted using chain-of-thought (CoT) reasoning to extract structured variables from each report, including: (1) clinical indication, (2) PE presence or absence, (3) PE type (acute, chronic, or acute on chronic), and (4) justification for the PE classification. Additionally, the model inferred the Wells Score and provided a supporting rationale based on the clinical context in the report. All outputs were validated through manual review by a clinical radiologist.

RESULTS

The LLM accurately identified the presence or absence of PE in 299 out of 300 reports (99.7% accuracy). In the one discordant case, the model misclassified the study as showing chronic PE when no embolus was present. Notably, the justification included the correct excerpt from the report, which described the radiologist's consideration of artifact versus chronic thrombus. Among the 93 reports with confirmed PE, the model correctly identified the PE type in 89 cases (95.7% accuracy). The LLM effectively distinguished between acute and chronic emboli using contextual information from the findings and impression sections, even in the absence of explicit labeling in the original report.

CONCLUSION

The model also shows promise in inferring clinical reasoning structures such as Wells Score with justification, making it a viable tool for evaluating diagnostic yield and potential overutilization of imaging.

CLINICAL RELEVANCE/APPLICATION

Automated extraction of structured findings and clinical reasoning from chest CT reports using LLMs may enable scalable analysis of imaging utilization and appropriateness in emergency care settings, supporting more efficient and evidence-based radiology practice.

M5B-SPCH-5 TRANSFORMER-BASED INTEGRATION OF CHEST RADIOGRAPHS AND CLINICAL DATA FOR PREDICTING 30-DAY MORTALITY IN PATIENTS WITH COMMUNITY-ACQUIRED PNEUMONIA

Changi Kim, MS (*Presenter*)
Eui Jin Hwang, MD, PhD (*Abstract Co-Author*)

PURPOSE

Both findings of chest radiograph (CR) and clinical data are essential information for decision-making in patients with community-acquired pneumonia (CAP), while the integration of information from two different domains has been limited. We aimed to develop and validate a transformer-based fusion deep learning model integrating CR and clinical data for prediction of 30-day mortality in CAP patients.

METHODS AND MATERIALS

We retrospectively collected CR images and 17 clinical variables (age, sex, vital signs, and blood tests) from consecutive CAP patients who visited the ED of a tertiary institution between 2010 and 2018 (development dataset) to develop a fusion model. The model combined CR and clinical data, each processed by a transformer-based architecture, with their outputs concatenated and input into a multilayer perceptron. We collected two separate datasets to evaluate the performance of the model: a) Test dataset A, data from consecutive CAP patients who visited ED of the same institution in 2019; and b) Test dataset B, data from CAP patients in a publicly available MIMIC-IV-ED dataset (test dataset B). The area under receiver operating characteristic curve (AUC) of the fusion model for the prediction model of 30-day mortality was evaluated in test datasets, and compared with three benchmark models: a) CURB-65 score, an established risk assessment tool based on clinical data; b) a Cox proportional hazard (PH) model based on clinical data only (clinical model); and c) a convolutional neural network-based deep learning model using CR only (CR model).

RESULTS

The development dataset, and test datasets A and B comprised 6,199 (3,818 male patients; mean age, 67 years; 30-day mortality rate, 7%), 996 (578 male patients; mean age, 70 years; 30-day mortality rate, 7%), and 4,703 (2,405 male patients; mean age, 66 years; 30-day mortality rate, 10%) CAP patients, respectively. The fusion model showed AUCs of 0.80 and 0.84 in test datasets A and B, respectively. The fusion showed higher AUCs than CURB-65 score (0.65 [p<.001] and 0.69 [p<.001] in test datasets A and B, respectively hereafter), clinical model (0.69 [p<.001] and 0.72 [p<.001]), and CR model (0.76 [p=.058] and 0.81 [p<.001]).

CONCLUSION

The transformer-based fusion model integrating CRs with various clinical data could predict 30-day mortality of CAP patients with higher accuracy compared to traditional CURB-65 score, and prediction model solely based on either clinical data or CR images.

CLINICAL RELEVANCE/APPLICATION

Integration of CR image findings and clinical data using the transformer-based fusion model may enable more precise prognostication of patients with CAP. It may help clinical decision-making regarding hospitalization, intensity of monitoring, and critical care interventions.

M5B-SPCH-6 ROLE OF ARTIFICIAL INTELLIGENCE IN EVALUATION OF NCCT THORAX IN PATIENTS WITH FEBRILE NEUTROPENIA

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Vasundhara Smriti, MD (*Abstract Co-Author*)
SUYASH KULKARNI (*Abstract Co-Author*)
Nitin S. Shetty, MBBS, MD (*Abstract Co-Author*)

PURPOSE

Non-contrast CT (NCCT) thorax is used to evaluate patients with hematological malignancies with febrile neutropenia. It is however suboptimal in its accuracy to identify the infectious pathogen. We developed a deep learning model to automatically segment lung abnormalities and identify the infectious agent on NCCT images.

METHODS AND MATERIALS

This IRB-approved retrospective study included 374 patients with febrile neutropenia (from Jan 2015 to May 2024), selected from 500 NCCT scans after excluding mixed infections, poor quality images, or cases without confirmed microbiological diagnoses. Infectious opacities were manually segmented by a radiologist with three years' experience using 3D Slicer. Ground-truth labels included bacterial, fungal, TB, viral, and normal lungs. A U-Net with ResNet-34 encoder was used for segmentation, while a parallel ResNet-18 CNN performed classification. Data was split 70/15/15 for training, validation, and testing. Dice Loss and Categorical Cross-Entropy were used for training. Dice score and IoU were calculated for segmentation. Classification performance was evaluated using F1-score, precision, and recall. Statistical tests were performed using SciPy and Scikit-learn.

RESULTS

Out of the 374 patients (58% males, mean age 41.3 years), 112 had bacterial infections, 97 had fungal, 51 had TB, 43 had viral infections, and 71 were classified normal. The U-Net segmentation model achieved Dice scores of 0.61, 0.58 and 0.59 for bacterial and fungal infection and TB respectively on the validation set. Viral infections were excluded from final segmentation analysis due to unstable model convergence. The ResNet-18 classification model demonstrated an overall macro-averaged F1-score of 0.557 on the held-out test set. Per-class F1 score was 0.64, 0.53, 0.45, 0.58, and 0.61 for bacterial, fungal, viral, TB, and normal respectively. Bacterial and TB classes showed better overall accuracy. Misclassification was primarily observed between fungal and bacterial infections and between TB and fungal patterns. Several factors constrained model performance, including underrepresentation of viral and TB cases. External validation on multi-institutional datasets is necessary for assessing generalizability.

CONCLUSION

Our U-Net and ResNet-based model achieved moderate performance in detecting and classifying lung infections in febrile neutropenic patients, with bacterial and TB infections being most reliably identified.

CLINICAL RELEVANCE/APPLICATION

Our model demonstrates a potential role in accurately identifying the infectious etiology for patients with febrile neutropenia, allowing for timely appropriate treatment.

M5B-SPCH-8 GENERATIVE ARTIFICIAL INTELLIGENCE IN CHEST X-RAY INTERPRETATION: EXPERT CONSENSUS OF THE KOREAN SOCIETY OF THORACIC RADIOLOGY USING THE DELPHI METHOD

Won Gi Jeong, MD, PhD (*Presenter*)
Gongyoung Jin, MD, PhD (*Abstract Co-Author*)
Yun-Hyeon Kim, MD (*Abstract Co-Author*)

PURPOSE

Advancements in generative artificial intelligence (AI) have led to the development of automated radiology report generation tools, particularly for chest X-rays (CXRs). While these tools may improve efficiency and address radiologist shortages, their accuracy, reliability, and clinical applicability remain uncertain. Expert consensus is needed to guide their use. This study aimed to establish expert consensus from the Korean Society of Thoracic Radiology on the accuracy and potential clinical applications of an AI-automated CXR report generation tool using the Delphi method.

METHODS AND MATERIALS

A Delphi survey was conducted among 20 thoracic radiologists who reviewed 60 CXR cases across six clinical settings (health screening, inpatient, emergency department, intensive care unit (ICU), respiratory outpatient, and non-respiratory outpatient) using an AI-automated report generation tool (KARA-CXR, version 1.0.0.3). Participants assessed accuracy, hallucination rate, readability, and clinical applicability using a 9-point Likert scale. Consensus was defined as =70% agreement within a response category. Content validity ratio and coefficient of variation were calculated.

RESULTS

Consensus was reached on 41 of 72 survey items (56.9%). The AI tool demonstrated the highest accuracy in health screening (86%) with a 3.5% hallucination rate and 2% interpretation error rate. Lower accuracy was observed in inpatient (64.5%), emergency (66.5%), and ICU (60%) settings, with higher hallucination and error rates. Consensus was neutral on reliability outside the health screening setting and the tool's potential to enhance radiologists' accuracy and efficiency. Standalone AI use was opposed in inpatient, ICU, respiratory outpatient, and non-respiratory outpatient settings. Additionally, 85% of radiologists emphasized the need for education and guidelines before clinical implementation.

CONCLUSION

Consensus among Korean thoracic radiologists was neutral regarding the clinical applicability of AI-automated CXR report generation tool, except in health screening settings where accuracy was highest. Independent AI reporting was not endorsed. Further performance improvements, validation studies, and academic guidelines are needed before broader clinical adoption.

CLINICAL RELEVANCE/APPLICATION

This study underscores the importance of expert oversight, validation, and regulatory guidelines for the safe and effective implementation of AI-automated CXR report generation tool in clinical practice.

M5B-SPCH-9 THE DIAGNOSTIC PERFORMANCE OF CHATGPT 4O IN INTERPRETING CHEST AND ABDOMINAL X-RAY IMAGES

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Malik Galijasevic, MD (*Abstract Co-Author*)
Michael Swoboda, MD (*Abstract Co-Author*)
Leonhard Gruber (*Abstract Co-Author*)
Gerlig Widmann, MD, MSc (*Abstract Co-Author*)
Gudrun Feuchtner, MD (*Abstract Co-Author*)

PURPOSE

Large language models (LLMs), such as ChatGPT, have emerged as potential clinical support tools, but their reliability in radiological image interpretation remains unclear. The primary aim of our study was to evaluate the diagnostic accuracy of ChatGPT 4o in interpreting chest X-rays (CXR) and abdominal X-rays (AXR), comparing its performance to expert radiology findings, secondary aims were diagnostic confidence and patient safety.

METHODS AND MATERIALS

A total of 500 X-rays, including 257 CXR (51.4%) and 243 AXR (48.5%), were analyzed. Diagnoses made by ChatGPT 4o were compared to expert interpretations. Confidence scores (1-4) were assigned, and responses were evaluated for patient safety.

RESULTS

ChatGPT 4o correctly identified 345 of 500 (69%) pathologies (95% CI: 64.81-72.9). For AXR, 175 of 243 (72.02%) pathologies were correctly diagnosed (95% CI: 66.06-77.28), while for CXR, 170 of 257 (66.15%) were accurate (95% CI: 60.16-71.66). The highest detection rates among CXR were observed for pulmonary edema, tumor, pneumonia, pleural effusion, cardiomegaly and emphysema, and lower rates for pneumothorax, rib fractures, and enlarged mediastinum. AXR performance was highest for intestinal obstruction and foreign bodies, and weaker for pneumoperitoneum, renal calculi, and diverticulitis. Confidence scores were higher for AXR (mean 3.45 ± 1.1) than CXR (mean 2.48 ± 1.45). All responses (100%) were considered as safe for the patient. Interobserver agreement was high (kappa = 0.920), and reliability (2 nd prompt) was moderate (kappa = 0.750).

CONCLUSION

ChatGPT 4o demonstrated moderate accuracy for the interpretation of X-rays, being higher for AXR compared to CXR. Improvements are required for its use as efficient clinical support tool.

CLINICAL RELEVANCE/APPLICATION

This study provides the evaluation of ChatGPT-4o's diagnostic performance on plain chest and abdominal X-rays. The findings highlight its potential as a clinical support tool in emergency or resource-limited settings, particularly for non-radiologists, while emphasizing the need for expert oversight due to moderate accuracy and limited reliability in complex cases.

M5B-SPCH-10 PREDICTING LYMPHOVASCULAR INVASION IN STAGE IA LUNG ADENOCARCINOMA: A CT-BASED CLASSIFICATION AND REGRESSION TREE MODEL

Chen Lihua (*Presenter*)
Yao Huang (*Abstract Co-Author*)
Junli Tao (*Abstract Co-Author*)
Daihong Liu, PhD (*Abstract Co-Author*)
Jiuquan Zhang (*Abstract Co-Author*)

PURPOSE

Lymphovascular invasion (LVI) is a significant histopathological marker associated with poor prognosis in lung cancer patients. However, there is a notable lack of reliable, non-invasive preoperative tools to accurately predict LVI. We aim to develop and validate a computed tomography (CT)-based classification and regression tree (CART) model for the preoperative prediction of LVI in patients with clinical stage IA lung adenocarcinoma (LUAD).

METHODS AND MATERIALS

The study was approved by the institutional review board of each participating hospital and conducted by the principles of the Declaration of Helsinki and the statement of TRIPOD. This multi-centre cohort study recruited patients who underwent resection and had a preoperative CT examination. The CT features were independently and visually evaluated by two thoracic radiologists who were blinded to each other. Any discrepancies were resolved by a third radiologist. An internal cohort (n = 525) is included to construct the LVI classi& 7;cation and regression tree model (LVI-CART). An external cohort (n = 115) and a public cohort (n = 57) are then used to fully validate the predictive performance of the LVI-CART. The survival rates of the patients were analysed using the Kaplan-Meier method, and the survival curves were compared using the log-rank test.

RESULTS

Univariate logistic regression analysis revealed that tumor diameter, nodule type, and pleural indentation were significantly associated with pathological LVI status (all $P < 0.05$). Variables with $P < 0.05$ in the univariate analysis were included in stepwise multivariable logistic regression, which identified tumor diameter and nodule type as independent predictors of LVI status (all $P < 0.05$). The LVI-CART model with diameter and nodule type shows acceptable performance in predicting pathological LVI, with area under the curve values of 0.719, 0.756, and 0.835 in the internal validation set, external validation set and test set, respectively. A predicted LVI positive relative to the median value in the outcomes cohort was found to be independently associated with 1-, 3-year RFS and 1-, 3-, 5-year OS (all P values < 0.05).

CONCLUSION

The LVI-CART model could be used to preoperatively predict LVI and identify patients with poor prognosis in clinical IA LUAD. The model is like to be simple and easily applicable to risk stratification.

CLINICAL RELEVANCE/APPLICATION

The LVI-CART model provides clinicians with an easy-to-use method for preoperative identification of patients with clinical stage IA lung adenocarcinoma who are LVI-positive. It also provides a framework for a comprehensive assessment of patient survival risk.

M5B-SPCH-11 MRI OUTPERFORMS CT IN RESPONSE ASSESSMENT AFTER NEOADJUVANT THERAPY FOR LOCALLY ADVANCED ESOPHAGEAL SQUAMOUS CELL CARCINOMA: A PROSPECTIVE STUDY BASED ON RECIST CRITERIA

Jin Rong Qu, MD (*Presenter*)
Binbin Han (*Abstract Co-Author*)
Wenshi Li (*Abstract Co-Author*)

PURPOSE

To compare the diagnostic performance of magnetic resonance imaging (MRI) and contrast-enhanced computed tomography (CT) in evaluating treatment response after neoadjuvant therapy (NAT) for locally advanced esophageal squamous cell carcinoma (ESCC), based on Response Evaluation Criteria in Solid Tumors (RECIST).

METHODS AND MATERIALS

This prospective cohort study (July 2019-June 2024) enrolled 108 patients with ESCC (cT2-T4a/N0-N3/M0; mean age 63.5±7.1 years; 84 males). All patients underwent MRI and contrast-enhanced CT before and after NAT prior to esophagectomy. Two radiologists independently assessed treatment response on CT and MRI images. Postoperative pathologic tumor regression grade (TRG) served as the reference standard: complete response (CR: TRG0, n=28) versus non-CR (TRG1-3, n=80), and good response (GR: TRG0-1, n=43) versus non-GR (TRG2-3, n=65). Chi-square tests and Cohen's kappa values were used to compare imaging assessments with pathological findings.

RESULTS

CT demonstrated accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of 64.81%, 25.00%, 77.50%, 28.00%, and 74.70%, respectively, in discriminating CR from non-CR. In contrast, MRI showed significantly superior performance: accuracy (92.59%), sensitivity (89.29%), specificity (93.75%), PPV (83.33%), and NPV (96.15%). Cohen's kappa coefficient revealed high agreement between MRI and postoperative pathology for CR assessment (?=0.815, p<0.001), while CT showed no statistically significant agreement (?=0.031, p=0.715). MR tumor regression grade (mrTRG) demonstrated excellent concordance with pathological TRG (CR/non-CR: ?=0.905; GR/non-GR: ?=0.702, p<0.001).

CONCLUSION

MRI outperforms CT in assessing treatment response after NAT for locally advanced ESCC, demonstrating high diagnostic accuracy (>92%). The mrTRG system accurately stratifies TRG, suggesting MRI as the preferred imaging modality for implementing RECIST in ESCC management.

CLINICAL RELEVANCE/APPLICATION

MRI-based RECIST assessment combined with the mrTRG system provides accurate risk stratification and individualized treatment planning for locally advanced ESCC, offering superior clinical utility and pathological concordance compared to CT.

M5B-SPCH-12 AUTOMATED INTERSTITIAL LUNG ABNORMALITY PROBABILITY PREDICTION ON CT: ASSOCIATION WITH MORTALITY IN PATIENTS WITH ESOPHAGEAL CANCER

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Daiki Nishigaki, PhD (*Abstract Co-Author*)
Shuhei Doi, MD (*Abstract Co-Author*)
Kazuki Yamagata, MD (*Abstract Co-Author*)
Yuka Fujita, MD (*Abstract Co-Author*)
Yukiko Tokuda, MD, PhD (*Abstract Co-Author*)
Noriyuki Tomiyama, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic performance of automated interstitial lung abnormality (ILA) probability prediction and investigate its association with mortality in patients with esophageal cancer.

METHODS AND MATERIALS

This retrospective study included patients diagnosed with esophageal cancer between January 2011 and December 2015. ILA was visually scored on pretreatment baseline chest CT (<1 mm slice thickness) using a three-point scale (0 = non-ILA, 1 = indeterminate for ILA, 2 = ILA). Previously developed artificial intelligence (AI) models were applied to the CT images. A total of 12 AI models were used, incorporating different classification algorithms (support vector machine [SVM], random forest [RF], and convolutional neural network [CNN]) and handling of indeterminate ILA slices and cases. These models generated probability values ranging from 0 (unlikely to have ILA) to 1 (likely to have ILA). A multivariable Cox proportional hazards model, adjusting for age, sex, body mass index, smoking history, and cancer stage, was used to assess the association between AI-predicted ILA probability and five-year overall survival. The best-performing model was selected using the Akaike Information Criterion. The probabilities derived from this model were compared among the non-ILA, indeterminate for ILA, and ILA groups using the Kruskal-Wallis test.

RESULTS

A total of 452 patients (median age, 68 years; interquartile range, 61-73 years; 61 women) were included. Among them, 251 (56%) were classified as non-ILA (score 0), 118 (26%) as indeterminate for ILA (score 1), and 83 (18%) as ILA (score 2). All 12 AI-predicted probability models demonstrated a statistically significant association with shorter survival in the multivariable Cox proportional hazards model ($p < 0.05$). The best-performing model yielded a hazard ratio (HR) for mortality of 7.3 (95% confidence interval: 2.7-19.2; $p < 0.001$). The mean probability scores for the non-ILA, indeterminate ILA, and ILA groups in this model were 0.18 ± 0.07, 0.20 ± 0.07, and 0.35 ± 0.23, respectively, with significant differences among groups (all $p < 0.001$).

CONCLUSION

AI-derived ILA probability on CT was a significant predictor of shorter survival in patients with esophageal cancer. The AI-predicted probability was well correlated with visually assessed ILA classification, demonstrating its potential as a reliable, automated diagnostic tool.

CLINICAL RELEVANCE/APPLICATION

Automated AI-based ILA detection provides a reproducible and objective method for diagnosing ILA. This approach may be valuable for prognostication and patient management in esophageal cancer.

M5B-SPCH-13 AI-ASSISTED CT PATTERN CLASSIFICATION FOR NTM LUNG DISEASE: TOWARD PRECISION DIAGNOSIS USING 3D DEEP LEARNING

Liu Shu Yu, MS, RT (*Presenter*)
Pin-Yi Chiang, MD (*Abstract Co-Author*)
Yuan-Chung Cheng (*Abstract Co-Author*)
Yu-Jie Shen (*Abstract Co-Author*)
RUEYMING HWANG (*Abstract Co-Author*)
Yeun-Chung Chang, MD (*Abstract Co-Author*)
Shyh-Jye Chen, MD, PhD (*Abstract Co-Author*)
YI-CHENG HSIAO (*Abstract Co-Author*)

PURPOSE

Non-tuberculous mycobacterial lung disease (NTM-LD) presents with distinct CT patterns linked to different prognoses and treatments. As imaging volume increases, manual interpretation may not always provide timely clinical support. This study aimed to develop a 3D deep learning model to enable efficient and standardized classification of NTM-LD patterns.

METHODS AND MATERIALS

We retrospectively collected chest CT scans from patients with NTM-LD treated between 2015 and 2024 at a single tertiary medical center in Taiwan. A modified 3D EfficientNetB0 pretrained on ImageNet was used for classification. Data were randomly split (60:20:20) into training, validation, and test sets. The model was trained using cross-entropy loss and the Adam optimizer (learning rate = 1e-4) over 100 epochs (batch size = 4). Performance was continuously monitored for convergence and generalizability.

RESULTS

The dataset included 211 CT scans, categorized into fibrocavitary (n=63), bronchiectasis with cavitation (n=46), and bronchiectatic-only (n=112) subtypes. The proposed model achieved a test accuracy of 75.68%, with weighted precision, recall, and F1-score of 0.77, 0.76, and 0.76, respectively. Class-specific recall was 70% for fibrocavitary, 57% for bronchiectasis with cavitation, and 85% for bronchiectatic-only. Training accuracy exceeded 90%, while validation accuracy plateaued at approximately 75%, indicating minor overfitting. Loss curves demonstrated convergence around epoch 60.

CONCLUSION

We developed a 3D deep learning model to classify imaging patterns of NTM-LD on chest CT.Given the prognostic and therapeutic variability across NTM subtypes, accurate radiologic differentiation is essential for guiding clinical decision-making. This automated classification system may enhance diagnostic precision and promote consistency in interpretation.By supporting timely identification of imaging subtypes, the model has potential to serve as a clinical decision-support tool that informs appropriate treatment selection and improves workflow efficiency in daily radiology practice.

CLINICAL RELEVANCE/APPLICATION

This 3D deep learning-based classification model assists in distinguishing radiologic patterns of NTM-LD on chest CT, helping clinicians tailor treatment strategies based on imaging subtypes. It supports precision medicine by improving diagnostic consistency and reducing subjective interpretation.

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Nov. 30 – Dec. 4
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M5B-SPER

Emergency Radiology Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPER-1 POSTMORTEM CT ATTENUATION VALUES OF ORGANS IN BURNED AND NON-BURNED BODIES: A FORENSIC COMPARATIVE STUDY

Norihiro Shinkawa, MD, PhD (*Presenter*)

PURPOSE

In burned cadavers, PMCT is primarily used to detect injuries or pathologies unrelated to the fire, identify anatomical variations, surgical alterations, or medical devices used for personal identification, and determine optimal sampling sites for DNA analysis or toxicological examination. In this study, "burned bodies" refer to those discovered at fire scenes, including both true burn fatalities and cases where death occurred prior to fire exposure. Radiologists often interpret PMCT using the same criteria as in living patients. This study aims to clarify the CT attenuation values of various organs in burned cadavers.

METHODS AND MATERIALS

We analyzed 47 forensic autopsy cases with PMCT: 19 burned and 28 non-burned bodies. Severely decomposed cases were excluded. CT scans were acquired using a 64-detector-row scanner (SOMATOM Definition AS+, Siemens Medical, Erlangen, Germany), with 120 kVp and automatic exposure control (AEC). The PMCT image data consisted of 5-mm axial sections through the head and abdominal region. The window level and window width settings were the same as those used for living patients in our institution: head images with WL 30 and WW 80, and abdominal images with WL 55 and WW 350. CT attenuation values (Hounsfield Units, HU) were measured in the liver, spleen, kidneys, iliopsoas muscles, and cerebral corona radiata. Bilateral measurements were performed for all organs except the spleen. The regions of interest (ROIs) were maximized, avoiding areas with endogenous disease, trauma unrelated to burns, gas, or artifacts from the upper limbs in the trunk region. The Mann-Whitney U test was used to compare the CT values between the burned and non-burned groups.

RESULTS

The mean (±SD) CT values in burned versus non-burned groups were as follows (in HU): liver, 73±11 vs. 56±19; spleen, 52±9 vs. 46±9; kidneys, 51±9 vs. 38±8; iliopsoas muscles, 53±5 vs. 49±7; cerebral corona radiata, 42±3 vs. 42±4. Statistically significant differences ($p < 0.05$) were observed in the liver, spleen, kidneys, and iliopsoas muscles.

CONCLUSION

CT attenuation values in burned bodies were significantly higher than those in non-burned bodies for the liver, spleen, kidneys, and iliopsoas muscles. Compared to the brain, which is enclosed by the skull, abdominal organs are more susceptible to thermal effects. We hypothesize that heat exposure causes water loss and thermal coagulation of proteins, leading to increased CT values.

CLINICAL RELEVANCE/APPLICATION

Radiologists should be aware that CT attenuation values of abdominal organs may be elevated in burned cadavers. This finding also highlights the need for the development of CT imaging techniques optimized for burned bodies.

M5B-SPER-2 EFFECTS OF A HIGH-FIDELITY ON-CALL SIMULATION FOR PGY-2 DIAGNOSTIC RADIOLOGY RESIDENTS

Alind Amedi, MD (*Presenter*)
Ann Packard, MD (*Abstract Co-Author*)
Julie B. Guerin, MD (*Abstract Co-Author*)
Nathan C. Hull, MD (*Abstract Co-Author*)

PURPOSE

Preparing residents for on-call responsibilities remains one of the most important duties of a radiology training program. Programs have devised varying methods for educating residents and assessing their competence before starting call. These include didactic lectures, case conferences, and flipped-classroom models. Simulation learning has been a focus of increased interest in radiology, often for promoting procedural or interpersonal skills. We sought to develop a high-fidelity simulation of the on-call experience for our PGY-2 radiology residents. While other institutions have previously incorporated forms of simulation in their pre-call curriculum, these simulations often lack elements that could provide a higher-fidelity experience. These elements include native PACS functionality, dictation software integration, exposure to normal exams, and the introduction of workroom interruptions.

METHODS AND MATERIALS

We asked each division of radiology to collect cases that were representative of those residents might encounter on-call. Our goal was to simulate a specific call shift that begins in PGY3, where the resident has the responsibility of independently reading ultrasounds and radiographs that occur after-hours. 120 cases were collected, including normal exams. We deidentified these cases and hosted them on our native PACS. Residents were tasked with dictating preliminary reports. There was a time-limit of 3 hours and residents would be periodically interrupted by administrative staff to better simulate the call experience. Preliminary reports were graded on a score of 0-2, with full marks given to reports that correctly interpreted all major and pertinent findings. Cases were graded by a single examiner to remove inter-observer variance. Pre- and post- surveys were given to residents to assess subjective feelings of confidence and anxiety regarding taking this specific call shift. The Mann-Whitney U test was used to compare responses between pre- and post- simulation groups.

RESULTS

There was a statistically significant reduction in the anxiety of residents in reading ultrasound ($p = 0.02$) and radiographs ($p = 0.019$) on call. Residents also reported increased confidence with detection ($p = 0.035$) as well proper interpretation of major and pertinent findings on call ($p < 0.001$). 90% of residents recommended the simulation be given to future classes.

CONCLUSION

High-fidelity simulation allows radiology trainees to practice and refine clinical judgment in a realistic environment, and can result in decreased resident anxiety and increased confidence when taking call.

CLINICAL RELEVANCE/APPLICATION

This simulation can be used as a model for other training programs seeking to improve their call-related curriculum.
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M5B-SPGI

Gastrointestinal Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPGI-1 AUTOMATED AI-ENABLED CT BIOMARKERS FOR POPULATION-BASED OPPORTUNISTIC DETECTION OF PATIENTS AT RISK FOR UNSUSPECTED ADVANCED HEPATIC FIBROSIS AND CIRRHOSIS

Ravi Chandra Yada (*Presenter*)
Meghan G. Lubner, MD (*Abstract Co-Author*)
John W. Garrett, PhD (*Abstract Co-Author*)
Lu Mao (*Abstract Co-Author*)
Ronald M. Summers, MD, PhD (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)

PURPOSE

Chronic liver disease affects hundreds of millions worldwide, with early intervention during fibrosis stages offering the best outcomes. Despite this opportunity, advanced disease often remains undetected until complications arise. Liver biopsy remains the gold standard for confirming fibrosis but has significant limitations including invasiveness, sampling error, cost, and poor patient acceptance. Non-invasive alternatives like elastography require prospective planning. Meanwhile, approximately 30 million CT scans including the upper abdomen are performed annually in the US for various indications. As fibrosis progresses, characteristic morphologic changes in hepatic and splenic morphology often precede clinical symptoms, potentially allowing for opportunistic detection using AI. This study aimed to determine the utility of automated AI-enabled CT biomarkers in assessing risk for hepatic fibrosis and cirrhosis.

METHODS AND MATERIALS

AI-enabled CT tools assessing liver segmental volume ratio (LSVR; ratio of Couinaud segments I-III/IV-VIII) and splenic volume were applied to 30,940 adults (mean age 51.5 years; 14,459 men, 16,481 women) who underwent abdominal CT with available retrospective FIB-4 scores within 1 year. Established high-risk thresholds of 0.347 for LSVR and 315 ml for splenic volume were applied. Cohorts were analyzed according to FIB-4 levels and correlated with clinical outcome data regarding chronic liver disease and cirrhosis.

RESULTS

Among 2,943 patients (10.3%) with both elevated LSVR and splenic volume, mean FIB-4 score was 2.97 ($p < 0.0001$), whereas among 13,759 patients (48.3%) below both thresholds, mean FIB-4 score was 0.89. Patients with elevated LSVR only (5,359; 18.8%) had mean FIB-4 score of 0.91 ($p = 0.2397$), while those with elevated splenic volume only (6,437; 22.6%) had mean FIB-4 score of 1.14 ($p < 0.0001$). Among patients below both thresholds, 5.6% had FIB-4 score >2.67, versus 46.7% among patients above both. The likelihood of having chronic liver disease recorded in the EMR (e.g., downstream from CT) was 76% for patients above both thresholds and 6.5% for those below both.

CONCLUSION

AI-enabled automated hepatosplenic CT biomarkers demonstrate strong correlation with both FIB-4 scores and clinical liver disease outcomes. Patients exceeding both LSVR and splenic volume thresholds were nearly 12x more likely to have chronic liver disease compared to those below both thresholds.

CLINICAL RELEVANCE/APPLICATION

This opportunistic screening approach could identify at-risk patients who would benefit from hepatology referral without requiring additional testing, potentially enabling timely interventions that could slow or reverse fibrosis progression before cirrhosis becomes established.

M5B-SPGI-3 ARTERIAL PHASE HYPOINTENSE VOLUME ON GADOXETIC ACID-ENHANCED MRI: A POOR PROGNOSTIC FACTOR IN HCC PATIENTS UNDERGOING HEPATIC RESECTION

Jun Gu Kang, MD (*Presenter*)
Seohyun Park (*Abstract Co-Author*)
Dasom Kim (*Abstract Co-Author*)
Hyungjin Rhee, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the prognostic significance of arterial phase hypointense volume (APHIV) measured on gadoxetic acid-enhanced MRI in patients undergoing hepatic resection for hepatocellular carcinoma.

METHODS AND MATERIALS

This retrospective study included 482 patients with Barcelona Clinic Liver Cancer(BCLC) stage 0/A HCC who underwent hepatic resection and preoperative gadoxetic acid-enhanced MRI within 3 months at a single institution between January 2009 and December 2014. Patients were temporally divided into training(n=272, 2009-2011) and validation(n=210, 2012-2014) sets by surgery date. After registering arterial and hepatobiliary phase images, an abdominal radiologist performed volumetric tumor segmentation on hepatobiliary phase images and placed a 1-cm^2 peritumoral non-tumor region-of-interest (ROI) in the on arterial phase image. APHIV was determined by the tumor volume showing lower intensity than the mean non-tumor ROI intensity in the arterial phase. Overall survival (OS) was defined by the time from surgery to death within 5 years, and early recurrence (ER) was defined by the time from surgery to intrahepatic or extrahepatic recurrence within 2 years. The optimal cutoff value for APHIV to predict survival outcomes was determined using maximally selected rank statistics in the training set. Clinical, pathological, and imaging factors were analyzed using Cox regression.

RESULTS

In the training set, an APHIV cutoff of =6.5 cm^3 was optimal for predicting both ER and OS. HCCs with APHIV =6.5 cm^3 were associated with higher serum alpha-fetoprotein (AFP) and protein induced by vitamin K absence or antagonist-II (PIVKA-II), higher albumin-bilirubin (ALBI) grade, and adverse pathological features—including larger tumor size, poorer differentiation, more frequent microvascular invasion (MVI), and larger necrotic areas—in both sets, than those with APHIV <6.5 cm^3

(all P <0.05). In the training set, APHIV =6.5 cm³ (hazard ratio [HR], 2.261; P =0.001) was an independent factor for ER along with ALBI grade 2 or 3, MVI, and arterial phase rim-like enhancement (rim-APHE), and APHIV =6.5 cm³ (HR, 3.240; P <0.001) was independently associated with OS, along with hepatitis B, ALBI grade 2 or 3, MVI, and rim-APHE. In the validation set, APHIV =6.5 cm³ was also an independent factor for ER (HR, 2.345; P =0.013) and OS (HR, 2.900; P =0.014), along with MVI.

CONCLUSION

A higher APHIV on gadoxetic acid-enhanced MRI is a novel prognostic biomarker associated with adverse clinicopathological factors and poorer ER and OS in patients undergoing hepatic resection for HCC.

CLINICAL RELEVANCE/APPLICATION

A higher APHIV is a relatively simple, objective, and non-invasive prognostic factor that may help guide tailored treatment decisions in patients with HCC.

M5B-SPGI-4 QUANTITATIVE MRI INDICATORS FOR ASSESSING RISK OF IPMN WITH CONCOMITANT VERSUS ASSOCIATED INVASIVE CARCINOMA

Akihiko Kanki, MD (*Presenter*)
Kazuya Yasokawa, MD, PhD (*Abstract Co-Author*)
Yuki Sato (*Abstract Co-Author*)
Akira Yamamoto, MD, PhD (*Abstract Co-Author*)
Yoshihiko Fukukura, MD, PhD (*Abstract Co-Author*)
Tsutomu Tamada, MD, PhD (*Abstract Co-Author*)

PURPOSE

Intraductal papillary mucinous neoplasm (IPMN) related pancreatic carcinoma includes two distinct types: IPMN with associated invasive carcinoma (IPMN-AIC), in which the IPMN itself undergoes malignant transformation, and IPMN with concomitant invasive carcinoma (IPMN-CIC), where pancreatic cancer develops independently from IPMN lesions. Current management guidelines primarily address IPMN-AIC, while strategies for IPMN-CIC remain limited due to insufficient risk prediction methods. This study aims to perform a morphological and quantitative MRI comparison among IPMN-CIC, non-invasive IPMN, and IPMN-AIC to identify novel biomarkers for risk assessment.

METHODS AND MATERIALS

Ninety-four patients who underwent abdominal 3-T MRI were classified into three groups: IPMN (n=60), IPMN-AIC (n=11), and IPMN-CIC (n=23). Morphological evaluation by MRCP assessed the number and maximum diameter of cystic lesions and the caliber of the main pancreatic duct (MPD). Quantitative evaluations included proton density fat fraction (PDFF), T2* relaxation time, and T1 relaxation time in the pancreatic parenchyma using multi-echo 3D Dixon and T1 mapping sequences. Group comparisons were analyzed using the Kruskal-Wallis test followed by the Mann-Whitney U test with Bonferroni correction.

RESULTS

No significant difference was found in the number of cystic lesions (p=0.509). The maximum cystic lesion diameter and MPD caliber were significantly larger in the IPMN-AIC group compared with the IPMN (both p<0.001) and IPMN-CIC groups (both p<0.001), while no significant differences were observed between the IPMN and IPMN-CIC groups (p=0.462 and p=1.000, respectively).No significant difference was found in T2* relaxation time across groups(p=0.530). PDFF and T1 relaxation time were significantly higher in the IPMN-CIC group than in the IPMN (p<0.001 and p<0.001) and IPMN-AIC groups (p=0.017). No significant differences were observed between the IPMN and IPMN-AIC groups (p=0.220 and p=1.000, respectively).

CONCLUSION

PDFF and T1 relaxation time within pancreatic parenchyma may be useful markers for distinguishing IPMN-CIC from IPMN-AIC and could serve as novel indicators for IPMN-CIC risk assessment.

CLINICAL RELEVANCE/APPLICATION

Pancreatic PDFF and T1 relaxation time may serve as potential biomarkers for the development of IPMN with concomitant invasive carcinoma.

M5B-SPGI-7 INADVERTENT BOWEL SAMPLING AT PERCUTANEOUS OMENTAL AND MESENTERIC CORE BIOPSY

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Zeynep Nur Akyol Sari, MD (*Abstract Co-Author*)
Bettina Siewert, MD (*Abstract Co-Author*)
Olga R. Brook, MD, MBA (*Abstract Co-Author*)

PURPOSE

Assess the incidence and clinical outcomes of inadvertent bowel sampling with 17G introducer, 18G biopsy device omental and mesenteric CT and US-guided biopsy.

METHODS AND MATERIALS

In this HIPAA-compliant, IRB-approved study, consecutive patients undergoing omental and mesenteric CT and US-guided biopsy with 17G introducer, 18G biopsy device performed at a single tertiary academic institution between March 1, 2005, and March 1, 2024, were included to assess the incidence and clinical outcomes of inadvertent bowel sampling. Descriptive statistics were used.

RESULTS

Among 265 omental and mesenteric biopsies performed during the study period, there were six cases (6/265, 2.3%) with inadvertent bowel sampling identified on pathology. The median age was 83.5 years (IQR 65.6-85.3 years) in patients with inadvertent bowel sampling, and 66 years (IQR 58-74 years) in patients with inadvertent bowel sampling, p: 0.02. The median body mass index was 25.1 (IQR 23.4-28.8) in inadvertent bowel sampling group, and 28.6 (IQR 24.2-33.8) for patients without, p: 0.25. In patients with inadvertent bowel sampling, 4/6 (66.7%) of biopsies were from mesentery and 33.3% (2/6) from omentum, in contrast to the patients without inadvertent bowel sampling with a distribution of 49/259 (18.9%) mesenteric and 210/259 (81.1%) omental biopsies, p: 0.04. No patients underwent bowel preparation or were treated with antibiotics prior to or after the procedure. In retrospective review, the bowel mucosa on pathology was arising from colon in 3/6 (50%), duodenum 2/6 (34%) and distal ileum in 1/6 (17%). The median procedure length was 22.5 minutes (IQR: 20.0-25.0) in patients with inadvertent bowel sampling, and 30 minutes (IQR: 20.0-38.8) in patients without inadvertent bowel involvement, with no significant differences, p: 0.48. All patients underwent standard post-procedure observation time of one hour, during which no signs or symptoms of clinically significant bowel perforations were identified. No patients were admitted after the procedure and no patients required admission within 30 days after the procedure for bowel-related indications.

CONCLUSION

Inadvertent bowel sampling during percutaneous omental and mesenteric biopsy with 17G introducer, 18G biopsy device is a rare, but likely benign event, even in patients without bowel preparation or antibiotic coverage.

CLINICAL RELEVANCE/APPLICATION

Inadvertent bowel sampling is rare, more common in elderly patients and mesenteric biopsies, and likely benign, even without preparatory measures. However, given the potential for serious complications reported in the literature, meticulous technique remains crucial to minimize the risk.

M5B-SPGI-8 COMPARISON OF IMAGE QUALITY AND RADIATION EXPOSURE BETWEEN REDUCED-DOSE ABDOMINOPELVIC CT USING A SILVER FILTER AND DEEP LEARNING RECONSTRUCTION AND STANDARD-DOSE CT WITH ITERATIVE RECONSTRUCTION

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Jin Woo Kim (*Abstract Co-Author*)
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JEON SANG HYUN (*Abstract Co-Author*)
Hackjoon Shim, PhD (*Abstract Co-Author*)
Jhii-Hyun Ahn (*Abstract Co-Author*)

PURPOSE

To evaluate and compare image quality and radiation exposure between reduced-dose abdominopelvic computed tomography (CT) employing a SilverBeam filter with deep learning-based reconstruction (DLR) and standard-dose CT utilizing iterative reconstruction (IR).

METHODS AND MATERIALS

A total of 182 patients were included in this retrospective study. Standard-dose CT was acquired using a tube voltage of 100 kVp, automatic tube current modulation, and IR. Reduced-dose CT was performed with a tube voltage of 120 kVp, implementation of the SilverBeam filter, and DLR. Additionally, a contrast-enhanced (CE) boost image was generated in the reduced-dose group. Radiation dose metrics, along with both objective and subjective image quality assessments, were analyzed across different body mass index (BMI) categories.

RESULTS

The mean effective dose was significantly lower in the SilverBeam + DLR group compared to the standard-dose IR group, with an average dose reduction of 59.0% (1.87 mSv vs. 4.57 mSv). There was no significant difference in image noise between the two protocols (standard IR: 10.59 ± 1.75; SilverBeam + DLR: 10.60 ± 1.08; p = 0.99). In the obese subgroup (BMI > 25 kg/m²), signal-to-noise ratios (SNRs) of the liver, pancreas, and spleen were comparable between protocols. The SilverBeam + DLR + CE-boost images demonstrated significantly higher SNRs and contrast-to-noise ratios (CNRs) compared to both the standard-dose IR and SilverBeam + DLR alone.

CONCLUSION

Reduced-dose abdominopelvic CT utilizing a SilverBeam filter and deep learning reconstruction significantly lowers radiation exposure while maintaining image quality comparable to standard-dose IR. The addition of CE-boost further enhances contrast attenuaton, supporting the clinical feasibility of this approach for routine imaging.

CLINICAL RELEVANCE/APPLICATION

The SilverBeam protocol combined with deep learning reconstruction (DLR) achieved comparable image quality to standard-dose CT with iterative reconstruction (IR), while yielding a substantial reduction in radiation dose—averaging 59.0%—across all body mass index (BMI) categories in abdominopelvic CT.

M5B-SPGI-12 HEPATIC FAT QUANTIFICATION VIA THREE-MATERIAL DECOMPOSITION IN DUAL-LAYER CT: REPRODUCIBILITY AND INTEROBSERVER AGREEMENT

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Stephan Skornitzke (*Abstract Co-Author*)
David C. Maintz, MD (*Abstract Co-Author*)
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PURPOSE

This study investigates the reproducibly and interobserver agreement of a previously published three-material decomposition (3MD) algorithm for hepatic fat quantification using dual-layer dual-energy CT (dlDECT). Prior research demonstrated good correlation in hepatic fat fraction between dlDECT and MR fat quantification. As a next step toward clinical integration, we aim to evaluate the consistency and reliability of this dlDECT-based approach.

METHODS AND MATERIALS

dasdasdIn this retrospective study, we evaluated contrast-enhanced abdominal dual-layer CT scans (IQon, Philips Healthcare) of 58 patients obtained twice within a maximum interval of 60 days (mean interval: 34.3 ± 20.2 days) for clinical indications. Patients with severe changes in clinical status, such as initiation of chemotherapy, or new findings in CT scans affecting liver perfusion were not included. Fat fraction maps were generated using the previously published 3MD algorithm for native, arterial, venous and delayed phase acquisitions. Two radiologists, with 2 and 5 years of experience in abdominal imaging, respectively, independently placed five circular ROIs per scan, four in the right and one in the left hepatic lobe, avoiding vessels. Reproducibility between the two scans and interobserver agreement were assessed using Pearson's correlation, Bland-Altman analysis, repeated measures analysis of variances (ANOVA), and intraclass coefficients (ICC).

RESULTS

The mean hepatic fat fraction across all patients with all contrast medium phases was 4.91% ±5.91 and no significant difference was found between contrast medium phases (p=0.07). Averaging across contrast phases and both readers, there was a strong correlation between measurements at the two time points (4.87% ±6.04 vs. 4.94% ±6.13, R^2=0.78) with a low mean difference of 0.34 ± 3.09 percentage points (not significant, p=0.61) indicating good reproducibility. Interobserver agreement was also excellent, with an ICC of 0.92 and a mean difference between the two readers of 0.62 ± 1.3 percentage points, consistent across different contrast phases.

CONCLUSION

The 3MD algorithm enabled through dlDECT provides reproducible and consistent hepatic fat quantification with excellent interobserver agreement, supporting its potential role in clinical practice.

CLINICAL RELEVANCE/APPLICATION

Metabolic disorders associated with hepatic steatosis are increasingly prevalent. While MRI and ultrasound are currently considered the gold standards for hepatic fat assessment, novel dual-energy CT technologies using 3MD algorithm offer promising, reliable alternatives for quantifying hepatic fat fractions in clinical settings.

M5B-SPGI-13 BEYOND CT LIMITATIONS: COLON MRI UNLOCKS ACCURATE IMMUNOLOGICAL COMPLETE RESPONSE EVALUATION IN MSI-H COLORECTAL CANCER

Zhen Guan (*Presenter*)
Ying-shi Sun, PhD (*Abstract Co-Author*)

PURPOSE

This study establishes MRI as a superior imaging modality for evaluating immunological complete response (iCR) in microsatellite instability-high (MSI-H) colon cancer patients undergoing immunotherapy, addressing the critical limitations of CT in accurately assessing treatment response and guiding clinical decisions.

METHODS AND MATERIALS

We conducted a prospective single-center study enrolling 43 consecutive MSI-H colon cancer patients receiving neoadjuvant immunotherapy between 2023-2024, utilizing paired 3T MRI (with DWI sequences) and CT scans to quantitatively compare image quality (CNR, ERD), tumor characteristics (T2WI signal, DWI patterns). And

response criteria, including MRI detected immunological complete response (mr-iCR) and CT detected immunological complete response (ct-iCR), against endoscopic and pathological gold standards for complete response assessment.

RESULTS

MRI demonstrated significantly superior performance to CT, with higher contrast-to-noise ratio (4.71±2.03 vs 1.32±0.72, p<0.001), sharper tumor margins (ERD 2.94±2.22 vs 5.23±1.91, p<0.001), and improved diagnostic accuracy (81.4% vs 51.2%), while correctly identifying 85% of pathological complete responses and reducing false positives by 62% compared to CT assessment.

CONCLUSION

Colon MRI provides technically superior and clinically more accurate response assessment than CT in MSI-H colon cancer immunotherapy, offering objective quantitative biomarkers for immunological complete response that can reliably guide treatment decisions and potentially enable non-operative management for complete responders.

CLINICAL RELEVANCE/APPLICATION

This MRI-based assessment protocol addresses a critical clinical need in immuno-oncology by enabling reliable non-operative monitoring of immunotherapy response, reducing overtreatment through precise iCR identification, and providing a validated alternative to CT with superior soft-tissue contrast, with ongoing validation further establishing its role in personalized treatment strategy for MSI-H colon cancer patients.

M5B-SPGI-14 COMBINATION OF RADIOMIC FEATURES AND RESECTABLE ASSESSMENT BASED ON CONTRAST-ENHANCED CT PROVIDES AN OPTIMAL OPTION TO TREAT BORDERLINE RESECTABLE PANCREATIC CANCER

Bin Wang (*Presenter*)
Wei Wei (*Abstract Co-Author*)

PURPOSE

To select the optimal treatment of borderline resectable pancreatic cancer (BRPC) via combining radiomic features and resectable assessment based contrast-enhanced CT.

METHODS AND MATERIALS

A total of 261 patients (median age, 49 years; IQR, 36-72 years; 166 male and 95 female) with BRPC who underwent abdominal enhanced CT from January 2019 to April 2022 were enrolled for the study, including 168 patients with surgery and 93 patients with surgery after neoadjuvant therapy. Seventy percent of the cases were randomly selected for the training dataset, and 30% of the cases were independently used for testing. We retrospectively analyzed clinical data (gender,age, gender, preoperative CA125, CA19-9) and imaging resectable assessment (tumor size, location, distal common bile duct amputation/dilation, lymph vascular space invasion (LVSI), wrapping angle between lesion and superior mesenteric artery (SMA), pancreatic parenchyma atrophy). Radiomic features were extracted from portal venous-phase CT of the BRPC lesion. LASSO regression algorithm and mRMR were used for feature dimension reduction. Multivariable logistic regression was used to build radiomics model, clinical model, and integrated model. The receiver operating characteristic (ROC) curve, decision curve, and nomogram were plotted to assess the differentiating performance of the three models.

RESULTS

Pathological grade, tumor location, tumor size(>3cm) LVSI, and wrapping angle between lesion and SMA indicated significant differences (P<0.1) Pathological grade (P=0.000) and LVSI(P=0.017) were the independent factors to select the optimal clinical treatment. The area under the ROC curve (AUC) of the clinical model, radiomics model, and integrated model was 0.75, 0.70, and 0.80 in the training dataset and 0.67, 0.58 and 0.70 in the testing dataset, respectively. The nomogram indicated that radiomic features helped to select treatment method and showed a better efficiency. DCA curve indicated that the integrated model yielded a higher benefit than the clinical model in the threshold range of 0.1~0.8.

CONCLUSION

The treatment strategy for patients with BRPC was accurately predicted by the combination of radiomic features and resectable assessment, and the combination could help to make treatment choice.

CLINICAL RELEVANCE/APPLICATION

The combination of imaging features and resectability assessment can accurately predict treatment strategies for BRPC patients, aiding in the selection of optimal therapy for clinically borderline resectable pancreatic cancer (BRPC) cases, thereby improving patient survival rates and quality of life.

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M5B-SPGU

Genitourinary Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPGU-1 DIFFERENTIATING BENIGN VS MALIGNANT RENAL CYSTS IN HEREDITARY LEIOMYOMATOSIS AND RENAL CELL CANCER (HLRCC) SYNDROME UTILIZING QUALITATIVE MRI SIGNATURES

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PURPOSE

Patients with Hereditary Leiomyomatosis and Renal Cell Cancer (HLRCC) face an aggressive renal carcinoma that often mimics benign cysts on imaging leading to potentially unnecessary surgeries. We aimed to identify MRI features that reliably distinguish benign from malignant complex renal cysts in this high-risk cohort, with the goal of safely reducing unneeded surgical interventions.

METHODS AND MATERIALS

In this retrospective study, we identified 42 HLRCC patients (mean age 46 ± 14 years; 22 men, 20 women) who underwent partial or radical nephrectomy between June 2002 and May 2022. Seventy-six histologically confirmed renal lesions were reviewed independently by two abdominal radiologists blinded to pathology. Recorded features included lesion size (maximum 3D diameter), location, internal composition, cyst-wall characteristics (septations, nodules), enhancement patterns (including combined areas of enhancement on T1-weighted nephrogenic-phase images), and diffusion characteristics (ADC, b-2000). Inter-reader agreement was quantified by Cohen's ?. Univariable GEE logistic regression (exchangeable correlation, binomial logit) identified candidate predictors ($p < 0.10$). Those predictors entered a multivariable GEE model with backward elimination guided by sequential Wald tests ($p < 0.05$) and QIC.

RESULTS

Of 76 lesions, 44 (58%) were benign and 32 (42%) malignant. Twelve MRI features demonstrated at least moderate inter-reader agreement (? > 0.4). Univariable GEE screening yielded eight significant predictors of malignancy: combined nephrogenic-phase enhancement area, endophytic/exophytic location, nodular presence, number of septations, septation caliber, Septation T1-nephrogenic enhancement, b500/800 signal, and non-solid T2 signal. The final multivariable GEE (Reader 1) included nodules, combined enhancement area, and endophytic/exophytic configuration (AUC 0.86); for Reader 2 these same three features achieved AUC 0.91. At a predicted-probability threshold of 0.13, the nomogram identified all malignant lesions and would have spared 57% of patients with benign cysts from unnecessary surgery.

CONCLUSION

Key qualitative MRI features robustly distinguish benign from malignant complex renal cysts in HLRCC patients. By applying a predicted-probability cutoff of 0.13, this approach maintains 100% sensitivity for malignancy while potentially avoiding surgery in 57% of benign cases, markedly reducing unnecessary interventions.

CLINICAL RELEVANCE/APPLICATION

Applying these MRI criteria with a 0.13 risk threshold may reduce unnecessary surgeries in over half of benign cases while maintaining 100% sensitivity for malignancy, thereby improving patient management in this high-risk cohort.

M5B-SPGU-2 COMPARING THE NOVEL TARGET AND PI-FAB SCORING SYSTEMS FOR THE EVALUATION OF THE LOCAL RECURRENCE OF PROSTATE CANCER AFTER HIFU

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Ashima Kundu, BS (*Abstract Co-Author*)
Saira Arora (*Abstract Co-Author*)
Christopher Liu (*Abstract Co-Author*)
Kasha Chen (*Abstract Co-Author*)
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Akash C. Joshi, MD (*Abstract Co-Author*)
James Shi, MD (*Abstract Co-Author*)
Amir Imanzadeh, MD (*Abstract Co-Author*)
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PURPOSE

Focal high-intensity focused ultrasound (HIFU) has recently emerged as a safe, noninvasive treatment for prostate cancer. However, HIFU transforms the appearance of prostatic tissue. To better assess prostatic tissue after treatment with focal ablation for the recurrence of prostate cancer, two novel scoring systems have been developed: the Transatlantic Recommendations for Prostate Gland Evaluation with Magnetic Resonance Imaging After Focal Therapy (TARGET) and Prostate Imaging after Focal Ablation (PI-FAB). However, evidence of their diagnostic accuracy to detect recurrence in patients treated with HIFU is limited. In this study, we aim to compare the diagnostic accuracy of radiologists using the TARGET versus PI-FAB scoring systems, as well as inter-reader agreement with both.

METHODS AND MATERIALS

Patients with and without the local recurrence of prostate cancer who underwent HIFU and received both post-treatment multiparametric MRI (mpMRI) and biopsy were included. Two board-certified radiologists independently reviewed mpMRI scans to grant each case a TARGET and PI-FAB score. A TARGET score of 5 and a PI-FAB score of 3 were considered positive for recurrence. Histopathologic analysis was used as the reference standard to assess radiologist accuracy. The sensitivity, specificity,

accuracy, positive predictive value (PPV), and negative predictive value (NPV) for both the TARGET and PI-FAB scoring systems were calculated. Inter-reader agreement was assessed using quadratic weighted Cohen's kappa.

RESULTS

Of the 48 cases reviewed, 33 were identified to have local recurrence of prostate cancer on biopsy. Our results demonstrated that for each case a participating radiologist assigned a TARGET score of 5 (considered positive for recurrence), a PI-FAB score of 3 was also assigned by that participant, and vice-versa for both radiologists. Thus, the overall specificity (80.8%), sensitivity (40.0%), PPV (84.9%), and NPV (33.3%) were identical for both scoring systems. One radiologist achieved an accuracy of 58.3% with both scoring systems, while the other had an accuracy of 43.8%. The inter-reader agreement with both TARGET and PI-FAB was 0.407.

CONCLUSION

Both radiologists achieved perfect intra-rater concordance when grading cases for local recurrence using the TARGET and PI-FAB systems. Despite this consistency, neither scoring system achieved a high diagnostic accuracy in detecting the local recurrence of prostate cancer following HIFU treatment.

CLINICAL RELEVANCE/APPLICATION

Our findings underscore the need for improved imaging criteria to reliably detect local prostate cancer recurrence in patients treated with HIFU.

M5B-SPGU-4 EARLY DIFFUSION-WEIGHTED MRI CHANGES AS PREDICTIVE BIOMARKER AFTER SINGLE-DOSE ABLATIVE RADIATION THERAPY IN LOCALIZED UNFAVOURABLE PROSTATE CANCER

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Cammillo R. Talei Franzesi (*Abstract Co-Author*)
Davide G. Gandola, MD (*Abstract Co-Author*)
Cesare Maino, MD (*Abstract Co-Author*)
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Davide Ippolito, MD (*Abstract Co-Author*)

PURPOSE

To investigate the diagnostic value of diffusion-weighted (DWI) MRI early changes, 1 hour after treatment, in patients with organ-confined unfavourable prostate cancer (PCa) treated with Single-Dose Ablative Radiation Therapy (SDART), in comparison with biochemical markers.

METHODS AND MATERIALS

We prospectively enrolled 30 patients with intermediate unfavourable or high-risk organ-confined PCa treated with SDART of 21 Gy on the entire prostate (with boost up to 24 Gy on the focal lesion) associated with hormone therapy. Each patient was examined with a 3T scanner four times: 1-2 weeks before RT for treatment planning (t0); 1 hour after treatment (t1); 3 months after treatment (t2); 2 years after treatment (t3). Regions of interest (ROIs) were plotted on ADC maps and T2 HR sequences on neoplasm lesions, benign peripheral zone and the entire prostate gland. Patients' laboratory data (PSA and testosterone levels) was collected.

RESULTS

Apparent diffusion coefficient (ADC) values significantly increased in neoplastic lesions at t1 (+22%) and at t2 and t3 (+43% and +53%, respectively). On the other hand, no significant changes were observed at the level of the benign peripheral zone and the entire prostate gland. On T2 sequences, signal intensity progressively decreased at the benign peripheral zone (t1: -1%; t2: -33%; t3: -42%) and the entire prostate gland (t1: - 6%; t2: -24%; t3: -31%), while no significant changes were observed at the level of the lesion. 28 patients (93.3%) had a complete biochemical response.

CONCLUSION

The study findings showed high diagnostic value of DWI imaging and a good correlation between early (t1) changes in ADC values after SDART and later (t2 and t3) tumour response (both biochemical and imaging) in patients with unfavourable PCa. Early DWI changes can represent a useful parameter to evaluate treatment response and predict patients' outcomes.

CLINICAL RELEVANCE/APPLICATION

Early diffusion-weighted MRI changes observed just one hour after single-dose ablative radiotherapy offer a non-invasive imaging biomarker correlated with long-term biochemical response. This early marker could support timely treatment evaluation and guide clinical decision-making in patients with localized high-risk prostate cancer.

M5B-SPGU-5 MULTI-READER EVALUATION OF THE PROSTATE IMAGING QUALITY SCORE SYSTEM VERSION 2 AND ITS CLINICAL APPLICATION

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Zhenghan Yang (*Abstract Co-Author*)
Liting Shen (*Abstract Co-Author*)
Yao Niu (*Abstract Co-Author*)
Qian Liao (*Abstract Co-Author*)

PURPOSE

Currently, while emphasizing the importance of high-quality images for appropriate interpretation of prostate MRI and subsequent management decisions, various quality scoring methods have emerged in succession, among which the Prostate Imaging Quality (PI-QUAL) Scoring System is the most widely used. Several studies have revealed some inconsistencies and limitations in PI-QUAL. Therefore, an updated version of PI-QUAL was proposed in May 2024, which applies to prostate MRI performed with or without intravenous contrast medium using a simplified 3-point scale focused on critical technical and qualitative image parameters. Thus far, the clinical application of PI-QUAL V2 has not been investigated and verified. Therefore, the aim of our analysis was: (1) to assess the inter-reader agreement in PI-QUAL V2; (2) to investigate the differences in diagnostic performance for clinically significant prostate cancer (csPCa) between different quality scores.

METHODS AND MATERIALS

This retrospective study included 581 patients who underwent prostate MRI exams and had definitive pathological reports between January and December 2023. All histopathological specimens were evaluated, and an ISUP Grade Group = 2 was considered as csPCa. Four radiologists independently assigned PI-QUAL V2 scores to each patient, with one of the readers re-scoring after a three-month interval. Cohen's and Fleiss' Kappa were used to determine inter-reader agreement, and the area under the receiver operating characteristics curve (AUC-ROC) was used to compare diagnostic performance. A $p < 0.05$ was considered statistically significant.

RESULTS

The study comprised 581 individuals (median [IQR] age, 70 [66-75] years). The consistency was moderate for T2WI, DWI, and PI-QUAL V2, substantial for DCE. For PI-RADS V2.1 categorization tasks, the proportion of PI-RADS 3 gradually decreased with improving image quality, and a statistical difference was found between PI-QUAL 1 and 3 ($p < 0.001$). However, regardless of whether PI-RADS =3 or =4 was used as the "suspicious for cancer" threshold, there was no significant difference in overall diagnostic performance for csPCa among different PI-QUAL V2 scores (AUC 0.741-0.844).

CONCLUSION

PI-QUAL V2 plays a positive role in inter-reader reproducibility and radiologists' MRI diagnosis. Regarding the limited value of PI-QUAL V2 in overall diagnosis of csPCa, further exploration with larger sample sizes and studies may be needed in the future.

CLINICAL RELEVANCE/APPLICATION

While simplifying the scoring system, PI-QUAL V2 retains high inter-reader agreement. A suboptimal PI-QUAL V2 score may undermine radiologists' confidence in image interpretation, resulting in a decreased detection rate of clinically significant prostate cancer.

M5B-SPGU-6 ENHANCED PREOPERATIVE DETECTION OF PERIRENAL FAT INVASION IN RENAL CELL CARCINOMA: INTEGRATING CT AND RADIOMICS

Hyojeong Lee, MD, PhD (*Presenter*)
Taekmin Kim, MD, PhD (*Abstract Co-Author*)
Sang Youn Kim (*Abstract Co-Author*)

PURPOSE

To evaluate conventional CT imaging features and develop a radiomics-based model for predicting perirenal fat invasion (PFI) in renal cell carcinoma (RCC), with the intent of enhancing preoperative staging accuracy.

METHODS AND MATERIALS

This retrospective case-control study included patients with pathologically proven PFI and size-matched non-PFI controls who underwent nephrectomy between January 2016 and December 2020. Two radiologists independently evaluated qualitative imaging features and measured quantitative parameters. Furthermore, 107 radiomics features were extracted from semiautomatically segmented tumors using Pyradiomics. Feature selection, based on interobserver agreement, correlation analysis, and analysis of variance, facilitated the construction of a conventional-radiomics model that integrates conventional CT features with selected radiomics features.

RESULTS

The study comprised 86 participants in PFI group (66 men, mean age: 63.3±11.1 years) and 169 in non-PFI group (119 men, mean age: 58.8±12.1 years). Multivariate analysis of conventional features identified four independent predictors of PFI: lobulated shape (odds ratio [OR]=2.03, p = 0.042), irregular margin (OR=3.40, p = 0.007), perirenal fascial thickening (OR=4.20, p < 0.001), and contact length (>154.2 mm; OR=3.82, p = 0.019). The combination of these predictors exhibited moderate diagnostic performance (sensitivity, 61.6%; specificity, 79.3%; accuracy, 73.3%). The conventional-radiomics model incorporating five selected radiomics features demonstrated superior performance (area under the curve [AUC]=0.979) with statistically significant improvements in sensitivity (91.9%), specificity (95.9%), and accuracy (94.5%).

CONCLUSION

The integration of quantitative CT parameters and radiomics with conventional imaging features yielded enhanced predictions of PFI in RCC.

CLINICAL RELEVANCE/APPLICATION

This study identified four independent imaging predictors and developed a conventional-radiomics model, achieving an impressive area under the curve of 0.979 for predicting perirenal fat invasion. The enhanced diagnostic model aids in more accurate preoperative staging of renal cell carcinoma, ultimately improving surgical decision-making and patient prognostication.

M5B-SPGU-7 MR FINGERPRINTING (MRF) FOR THE EVALUATION OF CHRONIC ALLOGRAFT NEPHROPATHY: A PROSPECTIVE STUDY WITH HISTOPATHOLOGIC CORRELATION

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Pranit Chotai (*Abstract Co-Author*)
Meghan Kapp (*Abstract Co-Author*)
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Mark A. Griswold, PhD (*Abstract Co-Author*)
Chris A. Flask, PhD (*Abstract Co-Author*)
Yong Chen (*Abstract Co-Author*)
Sreeharsha Tirumani, MD (*Abstract Co-Author*)

PURPOSE

Kidneys are the most commonly transplanted organ worldwide. All renal allografts will develop chronic dysfunction and eventually fail, which is referred to as chronic allograft nephropathy (CAN). The current standard of care to diagnose and monitor CAN is invasive allograft biopsy as there is no reliable, non-invasive testing alternative. In this prospective study, we aim to determine if there is a correlation between the MRF-derived quantitative T1 and T2 maps of renal allograft cortex and medulla with renal function and the histopathologic fibrotic changes in CAN patients.

METHODS AND MATERIALS

Seven kidney transplant patients underwent both MRF and allograft biopsy (M:F 4:3, Mean age - 57, Median time from transplant - 3 months). Inclusion criteria were age >18 years, >3 months post-transplant and scheduled for transplant kidney biopsy within one month after MRI. Coronal T1 and T2 maps were acquired using breath-hold kidney MRF. Respiratory-triggered diffusion-weighted imaging and arterial spin labeling MRI were further applied to measure apparent diffusion coefficient (ADC) and renal blood flow (RBF), respectively. Freehand region of interest (ROI)-based measurements were then made in the cortex and medulla in the upper, inter polar and lower pole regions of transplant kidney to obtain quantitative parameters (T1, T2, ADC and RBF). Clinicopathologic data was extracted from electronic medical records, including renal biopsy Banff scores. Statistical analysis was performed to determine correlation between quantitative parameters and Banff scores.

RESULTS

Distribution of the Banff scores are shown in Figure. Preliminary evaluation using Spearman rank correlation showed that T2cortex had strong negative correlation with composite chronic Banff lesions (ct,ci,cv,cg) [r=-.81; p=.05]. Among individual Banff lesions, T2cortex had strong negative correlation with intimal fibrosis (cv; r=-..90; p=.04). Additionally, ADC values correlated positively with interstitial inflammation (i; r=.83;p=.04) while RBF had negative correlation with interstitial fibrosis (ci; r=-.89; p=.04). Meanwhile, eGFR at time of biopsy was not correlated with any of the Banff lesion categories (p>.05). T2cortex was also strongly negatively correlated with eGFR (r=-.81, p=.05). Allosure was not correlated with Banff lesions or MRF parameters.

CONCLUSION

Our preliminary evaluation suggests that MRF derived quantitative T1, T2 maps correlate strongly with chronic Banff lesions derived from the “gold standard” histopathology of transplant renal biopsies.

CLINICAL RELEVANCE/APPLICATION

MRF is a potential non-invasive imaging technique to predict CAN in kidney transplant patients.

Abstract Archives of the RSNA, 2025

M5B-SPHN

Head & Neck Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPHN-3 IDENTIFYING MICROSTRUCTURAL ALTERATIONS FOR OCCULT METASTATIC LYMPH NODES WITH IN-VIVO ADVANCED DIFFUSION-RELAXATION MR SPECTROSCOPY

Yingwei Wu, MD, PhD (*Presenter*)

PURPOSE

To explore the feasibility of using in-vivo diffusion-T2 (D-T2) MR spectroscopy to noninvasively identify OLNM by characterizing microstructural peak morphology changes in lymph nodes.

METHODS AND MATERIALS

A prospective study enrolled 57 oral tongue squamous cell carcinoma (OTSCC) patients and 25 healthy controls. D-T2 MR spectroscopy was performed using multi-b-value and multi-TE DR-CSI sequences to generate normalized spectra. Lymph nodes were categorized into benign (BLN, from healthy controls), occult metastatic (OLNM, MR-negative but pathology-positive), and clinically metastatic (CLNM, MR-positive and pathology-confirmed). Apparent diffusion coefficient (ADC), T2 values, and spectral peak characteristics were analyzed.

RESULTS

Among 79 lymph nodes (38 BLN, 16 OLNM, 25 CLNM), ADC and T2 values showed limited discriminative power ($p > 0.05$). However, D-T2 spectra consistently revealed three characteristic peaks (A-C).BLNs displayed a saucer-like spectrum with sharp Peak A (short T2) and broad flat Peak B (medium-to-long T2).OLNMs showed a 23.4% decrease in Peak A fraction, and a notable spatial separation between Peaks A and B. Peak B became rounder and shifted upward and rightward, indicating microstructural alterations not visible on conventional MRI. CLNMs exhibited further Peak A reduction (31.7%), and Peak B developed a distinct double-angle morphology with upward and rightward deflections, respectively.

CONCLUSION

D-T2 MR spectroscopy reveals distinctive spectral peak morphology in OLNM, which remains undetectable by conventional imaging. This noninvasive method holds promise as a novel diagnostic tool for early detection of occult metastases in head and neck cancer.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that in-vivo diffusion-T2 MR spectroscopy enables noninvasive identification of OLNMs by revealing distinctive peak morphology alterations—particularly the separation of Peaks A and B and upward-rightward shift of Peak B. These spectral signatures could serve as early diagnostic biomarkers for OLNM, guiding more accurate clinical decision-making and potentially reducing the need for invasive diagnostic procedures or overtreatment.

M5B-SPHN-4 COMPARATIVE STUDY OF NON-ENHANCED 3D-FLAIR AND CONTRAST-ENHANCED 3D-FLAIR SEQUENCES IN THE DIAGNOSIS OF ENDOLYMPHATIC HYDROPS USING 5T MRI

Mengqiu Liu (*Presenter*)
Ying Liu (*Abstract Co-Author*)
Jiang Fan (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic value of non-enhanced 5T MRI 3D-FLAIR sequences for endolymphatic hydrops.

METHODS AND MATERIALS

Fourteen patients (7 males, 7 females; mean age 59.05±8.04 years) clinically suspected of Meniere's disease underwent 5T inner ear MRI with gadolinium contrast. All patients underwent pre-contrast conventional inner ear MRI, internal auditory canal hydrography, and 3D-FLAIR sequences (parameters: TR: 10000.00 ms, TI: 2500.00 ms, TE: 455.40 ms, slice thickness: 0.5 mm, flip angle: 54.00°). Four hours after double-dose contrast injection, contrast-enhanced 3D-FLAIR and thin-slice T1WI fat-suppressed sequences were performed. Two head and neck radiologists with 10 years of experience independently reviewed the images; discrepancies were resolved by consensus.

RESULTS

Using contrast-enhanced 3D-FLAIR as the reference standard, all 14 patients exhibited varying degrees of endolymphatic hydrops: 7 had vestibular hydrops, 14 had cochlear hydrops, 2 had concurrent vestibular neuritis, and 2 had labyrinthitis. Non-enhanced 3D-FLAIR detected 7 cases of vestibular hydrops, 13 cases of cochlear hydrops, and hyperintensity in 1 vestibular neuritis case but failed to visualize labyrinthitis. The diagnostic concordance rates for non-enhanced 3D-FLAIR were 100% for vestibular hydrops and 92.9% (13/14) for cochlear hydrops.

CONCLUSION

Non-enhanced 5T 3D-FLAIR demonstrates high diagnostic accuracy for endolymphatic hydrops and may partially replace contrast-enhanced sequences. For patients suspected of Meniere's disease without hydrops on non-enhanced 3D-FLAIR, contrast-enhanced imaging is recommended to exclude labyrinthitis or vestibular neuritis.

CLINICAL RELEVANCE/APPLICATION

Meniere's disease

M5B-SPHN-6 RELIABILITY ASSESSMENT OF MANUAL AND ARTIFICIAL INTELLIGENCE TECHNIQUES IN ANALYZING SKELETAL FACIAL ASYMMETRY

Wojciech Kazimierczak, MD, PhD (*Presenter*)
Natalia Kazimierczak (*Abstract Co-Author*)
Pawel Nowicki (*Abstract Co-Author*)
Natalia Chwarscianek (*Abstract Co-Author*)
Zbigniew Serafin (*Abstract Co-Author*)

PURPOSE

To compare artificial intelligence (AI)-driven web-based platform and manual measurements for analysing facial asymmetry in craniofacial CT examinations.

METHODS AND MATERIALS

The study included 95 craniofacial CT scans from patients aged 18-30 years. The degree of asymmetry was measured based on AI platform-predefined anatomical landmarks: sella (S), condylion (Co), anterior nasal spine (ANS), and menton (Me). The concordance between the results of automatic asymmetry reports and manual linear 3D measurements was calculated. The asymmetry rate (AR) indicator was determined for both automatic and manual measurements, and the concordance between them was calculated. The repeatability of manual measurements in 20 randomly selected subjects was assessed. The concordance of measurements of quantitative variables was assessed with interclass correlation coefficient (ICC) according to the Shrout and Fleiss classification.

RESULTS

Erroneous AI tracings were found in 16.8% of cases, reducing the analysed cases to 79. The agreement between automatic and manual asymmetry measurements was very low (ICC < 0.3). A lack of agreement between AI and manual AR analysis (ICC type 3 = 0) was found. The repeatability of manual measurements and AR calculations showed excellent correlation (ICC type 2 > 0.947).

CONCLUSION

The results indicate that the rate of tracing errors and lack of agreement with manual AR analysis make it impossible to use the tested AI platform to assess the degree of facial asymmetry.

CLINICAL RELEVANCE/APPLICATION

Accurate assessment of skeletal facial asymmetry is critical for diagnosing craniofacial discrepancies and planning orthodontic and orthognathic interventions. This study evaluates and compares the reliability of traditional manual analysis with emerging AI-driven approaches, providing valuable insights into their clinical utility.

M5B-SPHN-8 COMPUTED TOMOGRAPHIC FINDINGS PREDICTIVE OF SUCCESSFUL DRAINAGE OF PERITONSILLAR ABSCESSES

Shaun Aciu, MD (*Presenter*)
Andrew Li (*Abstract Co-Author*)
Huaqing Zhao, PhD (*Abstract Co-Author*)
Neelu Jain, MD (*Abstract Co-Author*)

PURPOSE

Prompt diagnosis of a peritonsillar abscess (PTA) is critical to inform clinical management as bedside drainage and/or medical therapy are the mainstay of treatment to prevent complications such as airway compromise. Diagnosis of PTA is typically accomplished by CT scanning after infusion of intravenous contrast. There is a lack of research into the radiologic markers that are predictive of successful PTA drainage. In this study, we sought to identify those factors.

METHODS AND MATERIALS

Following IRB approval, we retrospectively analyzed the CT scans of all patients older than 18, who presented to our Emergency Department from January 2013 to December 2023 with PTA for whom a CT neck was obtained. Characteristics of the PTA obtained on each CT included the following: size dimensions in three planes with volume calculation, Hounsfield Units (HU), presence or absence of rim enhancement, continuous vs discontinuous rim enhancement, extension of PTA to the patient midline, laterality (left or right). The review was blinded to all clinical data including patient demographics, medical history, procedures performed, and clinical course. A multivariable analysis was run to determine which factors were predictive of successful PTA drainage. A post hoc analysis was performed to determine if radiologic features predicted physical exam findings.

RESULTS

One hundred thirty-two patients met inclusion criteria of which 72 were males, with an overall mean age of 41 years. There were 139 peritonsillar abscesses included in the final analysis (7 patients with bilateral PTA). Patients who had successful PTA drainage had larger abscesses (PTA mean volume 5.95 vs. 2.78 cm 3 , p < 0.001), continuous ring enhancement (75.00% vs 50.91%, p = 0.003). If an abscess reached midline on imaging, there was no statistically significant association with clinical findings of soft palate effacement, trismus, or uvular deviation.

CONCLUSION

CT parameters were useful in predicting successful PTA drainage. Larger abscess size and continuous ring enhancement were statistically significant predictors and can be used to guide management.

CLINICAL RELEVANCE/APPLICATION

Radiologist may be able to help guide treatment for peritonsillar abscess based on radiographic features of contrast enhanced CT neck.

Nov. 30 – Dec. 4
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M5B-SPIN

Imaging Informatics Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPIN-1 AUTOMATED DETECTION OF CRITICAL RESULTS IN RADIOLOGY REPORTS: PUBMEDBERT VS. ZERO-SHOT PROMPTING APPROACH

Victor Agwu, MD, MS (*Presenter*)
Eshan Joshi (*Abstract Co-Author*)
Aanya Khatri (*Abstract Co-Author*)
Dave A. Roy, MD (*Abstract Co-Author*)
Jeannie K. Kwon, MD, MBA (*Abstract Co-Author*)
Yin Xi, PhD (*Abstract Co-Author*)
Yee Seng Ng, MD (*Abstract Co-Author*)

PURPOSE

Radiology reports often contain critical results that necessitate prompt communication to ensure patient safety, as mandated by the Joint Commission and the American College of Radiology. Manual identification of critical results by radiologists is time-intensive and variable, prompting interest in automation to improve efficiency and support quality assurance. Advances in natural language processing have enabled high-precision automated extraction of text. This study compares PubMedBERT, a domain-specific language model, with a zero-shot prompting approach using Llama 3.1, an open-source LLM, for detecting critical results in pediatric radiology reports.

METHODS AND MATERIALS

This retrospective case-control study included 3,798 de-identified pediatric radiology reports collected from the PACS over a five-year period (2018 - 2023). Report impressions were reviewed for 14 predefined critical results, per institutional standards. Non-critical reports served as controls. PubMedBERT was fine-tuned on 80% of the reports and tested on the remaining 20%. Final predictions were based on the highest category probability >0.5; otherwise, "No critical result identified" was assigned. A zero-shot prompting method using Llama 3.1-8B-instruct with a structured prompt strategy was also applied to the test set. All outputs were dichotomized into "Critical result identified" or "No critical result identified". Model performance was assessed using sensitivity, specificity, and per-finding F1 scores (harmonic mean of sensitivity and positive predictive value), with 95% bootstrap confidence interval. McNemar’s test was used for comparisons.

RESULTS

Of the 754 test reports, 190 included at least one predefined critical result and 564 had none. PubMedBERT achieved 96% sensitivity and 79% specificity, while Llama 3.1 achieved 97% sensitivity and 90% specificity for the detection of any critical result ($p = 0.8$ and $p < 0.001$, respectively). Zero-shot prompting with Llama 3.1 demonstrated higher F1 scores than PubMedBERT across all individual critical results. Performance in rare categories was limited by small sample sizes.

CONCLUSION

PubMedBERT and Llama 3.1 performed comparably in detecting any of the predefined critical results; however, Llama 3.1 showed superior detection of individual critical results without needing fine-tuning. These findings underscore the utility of compact, open-source LLMs as a resource-efficient and scalable solution for automated critical result detection in radiology reports.

CLINICAL RELEVANCE/APPLICATION

Scalable open-source large language models enable automated critical result detection without task-specific training, streamlining radiology communication workflows and compliance monitoring.

M5B-SPIN-2 FROM FASTER FRAMES TO FLAWLESS FOCUS: DEEP LEARNING HASTE IN POST-OPERATIVE SINGLE SEQUENCE MRI

Clarissa Hosse (*Presenter*)
Uli Fehrenbach, MD (*Abstract Co-Author*)
Johannes Kolck, MD (*Abstract Co-Author*)

PURPOSE

This study evaluates the feasibility of a novel deep learning-accelerated half-Fourier single-shot turbo spin-echo sequence (HASTE-DL) compared to the conventional HASTE sequence (HASTE S) in postoperative single-sequence MRI for the detection of fluid collections following abdominal surgery. As small fluid collections are difficult difficult to visualize using other techniques, HASTE-DL may offer particular advantages in this clinical context.

METHODS AND MATERIALS

A retrospective analysis was conducted on 76 patients (mean age 65 ± 11.69 years) who underwent abdominal MRI for suspected septic foci following abdominal surgery. Imaging was performed using 3-T MRI scanners, and both sequences were analyzed in terms of image quality, contrast, sharpness, and artifact presence. Quantitative assessments focused on fluid collection detectability, while qualitative assessments evaluated visualization of critical structures. Inter-reader agreement was measured using Cohen's kappa coefficient, and statistical significance was determined with the Mann-Whitney U test.

RESULTS

HASTE-DL achieved a 46% reduction in scan time compared to HASTE S , while significantly improving overall image quality ($p < 0.001$), contrast ($p < 0.001$), and sharpness ($p < 0.001$). The inter-reader agreement for HASTE-DL was excellent (? = 0.960), with perfect agreement on overall image quality and fluid collection detection (? = 1.0). Fluid detectability and characterization scores were higher for HASTE-DL, and visualization of critical structures was significantly enhanced ($p < 0.001$). No relevant artifacts were observed in either sequence.

CONCLUSION

HASTE-DL offers superior image quality, improved visualization of critical structures, such as drainages, vessels, bile and pancreatic ducts, and reduced acquisition time, making it an effective alternative to the standard HASTE sequence, and a promising complementary tool in the postoperative imaging workflow.

CLINICAL RELEVANCE/APPLICATION

The deep learning-accelerated HASTE-DL sequence provides significantly improved image quality and reduced acquisition time compared to the conventional HASTE sequence, enhancing the detection and characterization of postoperative fluid collections. This makes HASTE-DL a valuable tool for rapid, high-quality imaging in patients with suspected postoperative complications, potentially improving diagnostic confidence and guiding timely clinical management.

M5B-SPIN-3 MULTI-ENERGY SPECTRAL PHOTON-COUNTING CT FOR LIVER LESION CLASSIFICATION: A MULTICENTER STUDY

Friedrich Pietsch (*Presenter*)
Abhinay Krishna Vellala (*Abstract Co-Author*)
Florian Haag, MD (*Abstract Co-Author*)
Alexander Hertel, MD (*Abstract Co-Author*)
Javier Contreras Yametti, MD (*Abstract Co-Author*)
Anushree M. Burade, MBBS (*Abstract Co-Author*)
Parisa Kaviani, MD (*Abstract Co-Author*)
Stefan O. Schoenberg, MD, PhD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)
Matthias F. Froelich, MD (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic performance of radiomics-based machine learning in differentiating benign from malignant hepatic lesions using Photon-Counting CT scans, and to investigate model generalizability across multiple spectral reconstructions.

METHODS AND MATERIALS

This retrospective, multi-center study included patients with confirmed hepatic lesions who underwent contrast-enhanced photon-counting CT. Lesions were segmented automatically using a 3D nnU-Net model and manually reviewed. Volumetric segmentations were used to extract radiomic features on a lesion basis from nine image reconstructions: 40 keV, 50 keV, 70 keV, 90 keV, 110 keV, 140 keV, 180 keV, Virtual Non-Contrast (VNC), and Iodine Density Maps (IDM). A patient-based classification analysis was conducted by training multiple machine learning models separately for each reconstruction, with lesion-level predictions aggregated to the patient level. The best-performing model (Random Forest) was further evaluated by assessing classification performance across all train-test reconstruction combinations.

RESULTS

The study cohort comprised 378 patients (median age: 62 years; 40.5% male), including 190 with benign and 188 with malignant hepatic lesions. The Random Forest Model trained on 180 keV achieved the highest classification performance, with an AUC of 0.878 and accuracy of 85.7%. All training energy levels achieved similar mean AUCs (range: 0.75-0.83), indicating consistent model transferability. However, evaluation performance varied across test levels. Models tested on 110 keV, 140 keV, 180 keV, and VNC showed the highest stability (median AUC = 0.84), while 40 keV, 50 keV, and IDM resulted in lower and more variable AUCs.

CONCLUSION

Radiomics-based machine learning enables reliable differentiation between malignant and benign hepatic lesions on PCCT. This study demonstrates the feasibility of applying such models across multiple spectral reconstructions. While training on different energy levels resulted in comparable average AUCs, the choice of test level substantially influenced performance: higher energy levels and VNC reconstructions consistently yielded more accurate and stable results. These findings support the integration of multi-energy PCCT radiomics into oncologic lesion assessment workflows, particularly when high-energy reconstructions are available.

CLINICAL RELEVANCE/APPLICATION

Radiomics-based lesion classification on photon-counting CT is feasible across multiple spectral domains. The consistent performance observed at higher energy levels and Virtual Non-Contrast reconstructions support their preferential use for stable, cross-spectral application of machine learning models in hepatic oncology.

M5B-SPIN-4 DUAL-SEQUENCE MRI RADIOMICS WITH A SUPPORT VECTOR MACHINE FOR PREDICTING POST-PANCREATITIS DIABETES IN PATIENTS WITH METABOLIC SYNDROME

Yanting Li (*Presenter*)

PURPOSE

To evaluate the clinical utility of a support-vector-machine (SVM) model that combines clinical variables with dual-sequence MRI radiomics for predicting post-pancreatitis diabetes mellitus after acute pancreatitis (PPDM-A) in patients with metabolic syndrome (MetS).

METHODS AND MATERIALS

This retrospective study enrolled 121 consecutive MetS patients who experienced a first episode of acute pancreatitis (January 2016 - February 2021). According to follow-up, 50 developed PPDM-A (MetS-PPDM-A) and 71 did not (MetS-nPPDM-A). Patients were randomly assigned (7:3) to training and test cohorts. Metabolic indices (BMI, fasting glucose, lipid profile, blood pressure) and MRI scans—fat-suppressed T2-weighted imaging (T2WI) and late-arterial-phase contrast-enhanced T1-weighted imaging (CE-T1WI)—were collected. Regions of interest were manually delineated on both sequences; radiomic features were extracted and reduced with variance thresholding, k-best selection, and LASSO regression. Three SVM classifiers were built: (i) a clinical model, (ii) a dual-sequence radiomics model, and (iii) a combined model. Discrimination was quantified by the area under the receiver-operating-characteristic curve (AUC); DeLong's test compared AUCs. Incremental performance was evaluated with integrated discrimination improvement (IDI), and net clinical benefit with decision-curve analysis (DCA).

RESULTS

n the training cohort, AUCs for the clinical, radiomics, and combined models were 0.792, 0.859, and 0.927, respectively; in the test cohort they were 0.739, 0.842, and 0.927. The combined model significantly outperformed the clinical model in both cohorts (training $p = 0.002$; test $p = 0.023$). Compared with the radiomics model, the combined model performed better in the training cohort ($p = 0.040$) but not in the test cohort ($p = 0.113$). IDI confirmed incremental discrimination for the combined approach, and DCA demonstrated consistently greater net benefit across all reasonable risk thresholds.

CONCLUSION

An SVM-based model that fuses clinical parameters with radiomic features from T2WI and late-arterial CE-T1WI achieves high accuracy for early prediction of PPDM-A in MetS patients. The model offers a reliable tool for individualized risk stratification and has substantial potential for clinical application.

CLINICAL RELEVANCE/APPLICATION

It predicts the risk of diabetes in patients with acute pancreatitis in the state of metabolic syndrome, and can detect and prevent diabetes early

M5B-SPIN-5 CT-BASED SWIN TRANSFORMER MODEL COMBINED WITH 3D U-NET FOR PREDICTING SPREAD THROUGH AIR SPACES IN CLINICAL STAGE I LUNG ADENOCARCINOMA: COMPARISON WITH VARIOUS DEEP LEARNING MODELS AND CLINICAL-SEMANTIC MODEL

Xiao-Ling Ma (*Presenter*)

PURPOSE

Spread through air spaces (STAS) is a unique tumor invasion pattern and a well-established independent prognosticator for lung adenocarcinoma, assisting in risk stratification and directing surgical options. This study aims to develop and validate a deep learning signature for noninvasive prediction of spread through air spaces (STAS) in clinical stage I lung adenocarcinoma and compare its predictive performance with various deep learning models and conventional clinical-semantic model.

METHODS AND MATERIALS

A total of 386 patients with pathologically-confirmed stage I lung adenocarcinoma in Center 1 were retrospectively enrolled in training cohort. Besides, 127 eligible patients from Center 2 constituted the independent validation cohort. The 3D U-Net was employed to achieve tumor automatic segmentation. The Swin Transformer architecture was adopted to develop a deep learning signature predictive of STAS. Furthermore, ResNet-50, EfficientNet and ConvNeXt were also applied for modeling denoted as Model ResNet-50 , Model EfficientNet and Model ConvNeXt to compare the efficacy of different deep learning methods in predicting STAS. Clinicopathological data were collected and CT semantic features were evaluated. Multivariate logistic regression analyses were conducted to construct a clinical-semantic model.

RESULTS

The proposed deep learning signature achieved an AUC of 0.869 (95% CI: 0.831, 0.901) in training cohort and 0.837 (95% CI: 0.831, 0.901) in validation cohort, surpassing clinical-semantic model both in training and validation cohort (all P <0.01). Encouragingly, Swin Transformer based deep learning signature achieved significantly higher AUC than Model ResNet-50 , Model EfficientNet and Model ConvNeXt in training cohort (0.869 vs. 0.800, 0.797 and 0.783; all P < 0.001), as well as than Model EfficientNet and Model ConvNeXt in validation cohort (0.837 vs. 0.775 and 0.795; P = 0.025 and 0.027). Deep learning signature showed an improvement in predictive performance than Model ResNet-50 in validation cohort, but it did not reach statistical significance (0.837 vs. 0.799, P = 0.087).

CONCLUSION

The end-to-end deep learning signature based on Swin Transformer combined with 3D U-Net automatic segmentation offers a promising predictive performance, surpassing clinical-semantic model and other deep learning models in predicting STAS.

CLINICAL RELEVANCE/APPLICATION

The deep learning signature based on Swin Transformer harbors the potential as a noninvasive tool for preoperative estimation of STAS, thereby directing surgical strategy and facilitating individual therapeutic scheduling.

M5B-SPIN-6 AN AI-BASED DISEASE CLASSIFICATION TOOL FOR SPINE X-RAYS

Vikash Gupta, PhD (*Presenter*)

PURPOSE

Deep learning approaches, particularly convolutional neural networks, have emerged as powerful tools for automated disease detection in medical imaging, offering promising solutions to assist radiologists in their diagnostic workflow. So far, very few spinal disease classification tools are available to the research community [1]. In this paper we are leveraging DenseNet121 for classifying spine diseases using the VinDr-SpineXR [2] dataset. In the future, we intend to expand this work for disease localization.

METHODS AND MATERIALS

DenseNet-121 [3] is a powerful convolutional neural network architecture known for its dense connectivity pattern, where each layer is directly connected to every other layer in a feed-forward fashion. This unique structure allows for improved information flow throughout the network, leading to better feature reuse, reduced parameter count, and enhanced gradient flow. We used this model for spine x-ray classification due to its ability to maintain and propagate fine-grained features throughout the network. We trained the model for 100 epochs, with a batch size of 32 and a learning rate of 0.001. We minimized the cross-entropy loss using an Adam optimizer. The images in the dataset were normalized and resized to 256 X 256. The dataset consisted of 8389 training images from 4000 studies. The trained model was tested on 2077 testing images.

RESULTS

The results show very high accuracy on the test data. We achieved an AUC score above 0.95 for all the categories. See figure 1 for more details.

CONCLUSION

In this work, we have shown a highly accurate disease classification algorithm based on a large dataset provided by [1]. We are working on disease localization as our next logical step in this research. We would like to point out that, in this experience we find managing and training a large number of narrow AI models much more efficient than training a single large foundation models. We are working on a suite of disease localization models which can then be deployed in a clinical workflow.

CLINICAL RELEVANCE/APPLICATION

This system enhances diagnostic support and workload distribution through an agent-based orchestration system. The architecture employs a cascading analytical pipeline, where initial classification triggers disease-specific localization models via automated routing. This distributed approach offers superior scalability and efficiency compared to large language models, while maintaining granular control over individual diagnostic tasks. The modular design facilitates continuous integration of new models and independent optimization, aligning with distributed computing paradigms and addressing clinical deployment constraints.

M5B-SPIN-7 AN ANATOMICAL LANDMARK-BASED INTENSITY PROFILE ANALYSIS FOR KNEE RADIOGRAPH CROPPING

Seyed Mohammadreza Chavoshi, MD (*Presenter*)
Theodorus Dapamede, MD, PhD (*Abstract Co-Author*)
Hari Trivedi, MD (*Abstract Co-Author*)
Keana Aitcheson (*Abstract Co-Author*)
Frank Li, PhD (*Abstract Co-Author*)
Aawez Mansuri, BS, MS (*Abstract Co-Author*)
Rohan Satya Isaac (*Abstract Co-Author*)
Janice M. Newsome, MD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)

PURPOSE

To develop and evaluate an explainable image processing approach for knee radiograph cropping based on anatomical landmarks, providing an alternative to black-box machine learning methods while maintaining comparable performance for downstream assessment.

METHODS AND MATERIALS

We implemented an anatomical feature-based algorithm to crop the left and right knees from bilateral knee radiographs using classical image processing techniques including adaptive thresholding, edge detection, and intensity profile analysis. The approach was evaluated against the cropping performance of a convolutional neural network and a support vector machine. Cropping performance was evaluated using two complementary strategies. First, we assessed spatial accuracy by comparing each method's output to ground truth annotations on 1,000 manually cropped bilateral knee radiographs (2,000 individual knees) randomly selected from our institutional database, using Intersection over Union (IoU) and Dice similarity scores. Second, we tested the downstream utility of the cropped images of each method by training a ConvNeXt model for Kellgren-Lawrence grade (KLG) prediction on knee radiographs from the NIH Osteoarthritis Initiative dataset.

RESULTS

Our approach successfully cropped 1,999/2,000 knee images (99.95% completion rate), compared to 100% for the deep learning method and 96.1% for the SVM-based approach. For downstream KLG prediction, our method achieved 69.38% accuracy and 0.874 kappa score, comparable to the deep learning approach (70.43%, 0.880) and SVM method (68.94%, 0.872). Spatial accuracy metrics showed our method achieved mean IoU of 0.976 (±0.025) and Dice score of 0.988 (±0.014), closely approaching the deep learning (IoU: 0.983 ±0.017, Dice: 0.991 ±0.009) and surpassing the SVM (IoU: 0.971 ±0.053, Dice: 0.985 ±0.031). Visual comparison of the challenging cases demonstrated that our method maintains clinically relevant joint structures even in lowest-performing crops.

CONCLUSION

Our anatomical feature-based approach offers comparable performance to deep learning methods while providing full explainability, reduced computational requirements, and adaptability to different imaging datasets without retraining. The processing speed of our method significantly outperforms deep learning approaches, particularly when handling large datasets, making it more suitable for large-scale studies and time-sensitive clinical applications.

CLINICAL RELEVANCE/APPLICATION

This transparent, fast and computationally efficient approach enables knee cropping in resource-limited clinical settings without GPU requirements. Its explainable nature provides understandable process, critical for clinical adoption in various datasets.

M5B-SPIN-8 INTRAVENOUS CONTRAST MEDIUM IMPACTS CT-BASED MUSCLE QUALITY BUT NOT QUANTITY ANALYSIS: A LARGE-ANIMAL STUDY WITH HUMAN VALIDATION

Luca Salhofer, MD (*Presenter*)
Gregor Jost, PhD (*Abstract Co-Author*)
Mathias Holtkamp, MD (*Abstract Co-Author*)
Marcel Opitz, MD (*Abstract Co-Author*)
Sebastian Zensen, MD (*Abstract Co-Author*)
Rene Hosch, MSc, BSc (*Abstract Co-Author*)
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Lale Umutlu, MD (*Abstract Co-Author*)
Michael Forsting, MD (*Abstract Co-Author*)
Felix Nensa, MD (*Abstract Co-Author*)
Hubertus Pietsch, VMD, PhD (*Abstract Co-Author*)
Johannes Haubold, MD (*Abstract Co-Author*)

PURPOSE

CT-based body composition analysis (BCA) has emerged as a valuable tool to extract new imaging biomarkers such as sarcopenia or myosteatosis. Myosteatosis can be assessed by muscle radiodensity analysis and the quantification of Inter- and Intramuscular Adipose Tissue (IMAT). Despite its potential, the integration of BCA into routine clinical practice has been hindered by concerns over the comparability of Non-contrast and contrast-enhanced CT scans. This study assessed the influence of various contrast phases on a fully automated, volumetric BCA.

METHODS AND MATERIALS

10 Göttingen minipigs were subjected to a Non-contrast (NC) and five contrast-enhanced ([CE], Early Arterial, Late Arterial, Vascular Portal Venous, Parenchymal Portal Venous, Late) CT scans on three occasions. For human validation, 114 tri-phasic (NC, Arterial, Venous) aortic CT scans were analyzed. An open-source and validated BCA network (Body and Organ Analysis [BOA]) extracted the following features as volumes: Muscle, Subcutaneous Adipose Tissue (SAT), IMAT, Visceral Adipose Tissue (VAT), and Total Adipose Tissue (TAT). Statistical significance was assessed by a one-way ANOVA with Tukey's multiple comparisons or Kruskal-Wallis with Dunn's post-hoc tests.

RESULTS

In the animal model, volumetric analysis of all BCA features in both NC and CE scans showed no significant changes. However, there was a tendency toward reduced IMAT volumes after CM injection. Muscle radiodensity was significantly higher following CM administration compared to the NC scan (NC: 51.1 HU (1.9 HU); Late: 56.6 HU (2.4 HU), $p < 0.001$). In the human validation, there was also a tendency toward reduced IMAT after CM injection (NC: 1651 ml (1254-2250 ml); Arterial: 1567 ml (1120-2073 ml); Venous: 1463 ml (1047-1970 ml); $p = 0.10$). Human muscle radiodensity deviated by -4.86% (-8.04-0.37%) in the Arterial phase and 7.65% (3.35-15.5%) in the Venous phase, compared to the NC scan.

CONCLUSION

Volumetric BCA provides consistent results for quantifying Muscle, VAT, and SAT volume. Myosteatosis metrics, both muscle radiodensity and IMAT, are susceptible to interference by CM.

CLINICAL RELEVANCE/APPLICATION

The consistent results of Muscle, VAT, and SAT volume by fully automated, volumetric CT-based BCA across NC and multiple CE phases foster its integration into clinical workflows and may enable longitudinal monitoring. However, CM alters muscle radiodensity and IMAT volume. Therefore, standardized imaging protocols or phase-specific correction factors are crucial when using CT-derived myosteatosis metrics to evaluate muscle quality for prognosis, therapy guidance, or treatment response.

M5B-SPIN-9 MULTI-ORGAN RADIOMICS PHENOTYPING REVEALS LUNG AND LIVER AS KEY PROGNOSTIC MARKERS IN ADVANCED NSCLC TREATED WITH IMMUNOTHERAPY

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Mendel Lebowitz (*Abstract Co-Author*)
Juyoung Lee (*Abstract Co-Author*)
GOURAV MODANWAL (*Abstract Co-Author*)
Mohammadhadi Khorrami, PhD (*Abstract Co-Author*)
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PURPOSE

Radiomics-based prognostic models for non-small cell lung cancer (NSCLC) have traditionally focused on tumor features, with limited exploration of the prognostic role of nearby organs and tissues. However, organs such as the lung and liver may reflect systemic physiological states and immune status, potentially influencing disease progression and treatment response independently from tumor characteristics. This study investigated whether radiomic features from the lung and liver were independently associated with overall survival (OS) in patients with advanced-stage NSCLC treated with immunotherapy.

METHODS AND MATERIALS

Baseline CT scans from 231 patients with Stage III-IV NSCLC across three immunotherapy-treated cohorts were retrospectively analyzed. Regions of interest included organs (lungs, liver, spleen, airway) as well as tissues (subcutaneous fat, torso fat, and skeletal muscle). A standardized segmentation pipeline was applied: LungMask was used for lung segmentation, TotalSegmentator was used for liver, spleen, and fat/muscle regions, and NaviAirway was used for airway extraction. From these segmentations, 15 handcrafted radiomic features (shape, intensity, and texture) were extracted per organ, resulting in 105 features. The dataset was split into 70% training and 30% testing sets. Highly correlated features (Pearson $r > 0.95$) were first removed. Feature selection was performed using the Boruta algorithm and

bootstrapped Cox proportional hazards modeling (with ElasticNet regularization) across 50 iterations to identify most stable and discriminative features. Association between the radiomic features and OS was evaluated using C-index, hazard ratios (HR), p-values, and Kaplan-Meier (KM) survival analysis.

RESULTS

Liver and lung features were consistently identified as the topmost strongly associated factors with OS across 50 bootstrap iterations. In contrast, features from the airway, spleen, skeletal muscle, subcutaneous fat, and torso fat did not present an association with OS. KM analysis based on median risk score threshold within a 5-year survival window demonstrated significant survival-based stratification in the test cohorts (HR = 2.99; 95% CI: 1.26-7.11; p = 0.013).

CONCLUSION

Radiomic features of the liver and lung, independent of tumor characteristics, were found to be associated with OS in patients with advanced stage NSCLC undergoing immunotherapy. These initial results warrant additional multi-site independent validation.

CLINICAL RELEVANCE/APPLICATION

Multi-organ radiomic phenotyping on standard-of-care CT imaging could complement tumor-specific biomarkers to enhance survival prediction and treatment response assessment in NSCLC patients undergoing immunotherapy

M5B-SPIN-10 FEASIBILITY OF VARIATIONAL AUTOENCODER-BASED CLASSIFICATION OF PERIPHERAL ARTERY DISEASE LESIONS USING CLINICAL 3T UTE MRI

Eniko Pomozi, MD (*Presenter*)

PURPOSE

Peripheral artery disease (PAD) involves complex lesions with both soft and hard components, requiring accurate tissue assessment for effective treatment planning. Previous work demonstrated the potential of a convolutional variational autoencoder (VAE) for classification of PAD lesions using 9.4T MRI and multi-contrast pseudo-histological imaging (T2-weighted + UTE), enabling precise separation of concentric/eccentric calcifications and soft/hard occlusions. Imaging was extended to 7T MRI, showing that multi-contrast datasets (T1w, T2w, UTE) could be effectively encoded and classified by VAE. However, both approaches rely on ultra-high-field scanners, long acquisition times, and research-specific protocols. The purpose of the present study is to bring this methodology into the clinical setting.

METHODS AND MATERIALS

A total of 797 arterial cross-sections were obtained from 5 amputated lower limbs of patients with chronic limb-threatening ischemia (CLTI). The cross-sections were generated by imaging the harvested arterial segments using a 3T clinical MRI scanner (Siemens Healthineers) using a dedicated UTE sequence with total scan time under 15 minutes. Axial images perpendicular from a user-defined centerline were from UTE data were the only input into a custom 2D convolutional VAE, trained to encode image features into the 2D latent space and to classify lesions by a tissue score proportional to lumen occlusion. The tissue score defined by emphasizing the spatial separation of the images in latent space by their Euclidian distance.

RESULTS

The VAE successfully separated soft and hard lesion components using UTE images alone. Classification outputs closely aligned with visual assessments of plaque morphology. Compared to prior ex vivo 9.4T and 7T-based models using multi-contrast input, this 3T UTE-only approach maintained comparable performance with substantially reduced acquisition time and scanner burden. Tissue scores ranged from 1.26 to 0 for mostly occluded to patent tissues.

CONCLUSION

UTE MRI alone at 3T enables effective AI-based classification of PAD lesions using a variational autoencoder. This approach removes the dependency on longer, research-grade protocols and offers a rapid, clinically feasible imaging solution for pre-interventional planning. These findings support the broader adoption of AI-driven PAD lesion assessment in standard care.

CLINICAL RELEVANCE/APPLICATION

Clinical 3T UTE MRI combined with a variational autoencoder enables rapid, automated classification of PAD lesion components, offering shorter imaging time and more precise decision planning.

M5B-SPIN-11 EVALUATING LARGE LANGUAGE MODELS FOR ASCITES SEVERITY LABELING IN RADIOLOGY REPORTS

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Arjun Jain (*Abstract Co-Author*)
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Andrew Johnston, MD, MBA (*Abstract Co-Author*)
Carl F. Sabottke, MD (*Abstract Co-Author*)
Luke S. Yoon, MD (*Abstract Co-Author*)
Jason Hom, MD (*Abstract Co-Author*)
Laura Derry (*Abstract Co-Author*)
David Svec (*Abstract Co-Author*)
Akshay Chaudhari, PhD (*Abstract Co-Author*)

PURPOSE

Radiology reports contain rich clinical detail, but current natural language processing (NLP) methods struggle to extract nuanced, structured findings at scale—especially for tasks requiring ordinal severity labels rather than binary classification. One such task is qualitative ascites severity grading, an important imaging feature in diagnosing and managing abdominal pathologies such as liver disease, malignancy, and systemic illness. This study evaluates whether a large language model (LLM) can accurately classify ascites severity from free-text radiology reports as a proxy for expert annotation.

METHODS AND MATERIALS

We developed a zero-shot ascites severity classifier using DSPy (an automated prompt optimization framework) with LLaMA 3.1 8B. The LLM used rule-based text cues—such as "no free fluid" for no ascites—to assign severity levels from free-text abdominal CT reports.The model was applied to 200 de-identified reports from a tertiary care center, evenly stratified across four severity levels (none, small, moderate, large). Each report was independently reviewed by a board-certified body radiologist and a body imaging fellow using a standardized rubric incorporating report findings and imaging appearance.

RESULTS

Expert inter-rater agreement yielded a linear-weighted Cohen's Kappa of 0.772. The LLM achieved Kappa scores of 0.716 (vs. Reader 1) and 0.652 (vs. Reader 2), with exact matches in 67% and 59% of cases, respectively. Over 93% of disagreements with Reader 1 and 89% with Reader 2 were off by only one severity level, suggesting most misclassifications were clinically minor. Additionally, 83% and 77% of the LLM's misclassifications overestimated severity compared to Reader 1 and Reader 2, respectively, indicating an upward bias that may be correctable.

CONCLUSION

This study showed that large language models can approximate expert interpretation in assigning ordinal severity labels from radiology reports, addressing a key challenge in extracting structured clinical detail at scale. Despite operating in a zero-shot setting and using only free-text input, the model demonstrated strong agreement with human readers, highlighting its promise for scalable, reliable annotation without image access.

CLINICAL RELEVANCE/APPLICATION

Automatically labeling free-text radiology reports with high fidelity enables scalable dataset curation, which is critical for both training high-performance AI models and continuously monitoring their behavior. This approach is easily adaptable to other imaging findings, paving the way for safer and more reliable integration of AI into clinical radiology workflows.

M5B-SPIN-12 TEXTURE-BASED SUPER-RESOLUTION GAN FOR SYNTHESIZING 3T T1-WEIGHTED MRI FROM 1.5T SCANS

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Ketki Kinkar (*Abstract Co-Author*)
Bino A. Varghese, PhD (*Abstract Co-Author*)
Dighvijay Giri (*Abstract Co-Author*)
Nasim Sheikh-Bahaei (*Abstract Co-Author*)
Jeiran Choupan (*Abstract Co-Author*)
Kirsten Lynch (*Abstract Co-Author*)
Steven Cen, PhD (*Abstract Co-Author*)

PURPOSE

Develop a texture-based super-resolution GAN model to evaluate its effectiveness in generating synthetic whole-brain 3T T1-weighted (T1W) images from 1.5T MRI scans.

METHODS AND MATERIALS

This study used data from the Alzheimer's Disease Neuroimaging Initiative (ADNI) to evaluate super-resolution methods on 163 subjects with both 1.5T and 3T MRI scans from GE, Siemens, and Philips, excluding cross-manufacturer cases to avoid confounding from reconstruction differences. All 1.5T images were realigned to their 3T counterparts using SPM12 for precise comparison. We introduced a novel Texture-GAN model that incorporates GLCM-based texture features—specifically "Contrast "into the GAN loss function. This model was compared against Five other approaches: Bicubic, Lanczos, Efficient Sub-pixel CNN (ESPCN), SRGAN and TCGAN. Performance was evaluated using PSNR, SSIM and a custom metric, Intensity Difference in Points (IDP), which quantifies pixel-wise differences between 1.5T and 3T images to assess resolution enhancement.

RESULTS

TextureGAN and TCGAN showed notable improvement in IDP compared to Bicubic, Lanczos, SRGAN, ESPCN, and the original 1.5T images. Pixel-wise comparisons of axial T1-weighted slices between 1.5T and 3T scans revealed that TextureGAN and TCGAN substantially reduced pixel disparities relative to the original 1.5T images. We have counted the number of pixels with >25% intensity difference. To control repeated measurement error, we used data from 9 subjects who underwent two same-day 1.5T scans. The average pixel difference from these repeated scans was treated as baseline noise with 1.45% of pixels reached >25% intensity difference. TextureGAN and TCGAN had only 2.07% and 2.05% pixels with >25% intensity different from 3T scans respectively which is about 2% lower than the original 1.5T-3T difference, and close to the baseline noise of 1.45%. We also evaluated SSIM and PSNR with consistent results for all the super-resolution models.

CONCLUSION

Our experiment showed a significant enhancement in super-resolution's capacity to generate synthetic 3T images from 1.5T scans using TextureGAN and TCGAN.

CLINICAL RELEVANCE/APPLICATION

This approach offers a cost-effective alternative to 3T MRI, especially beneficial for patients with implants who cannot undergo high-field imaging.

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M5B-SPIR

Interventional Radiology Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPIR-1 BUBBLE ENHANCED THERMALLY INSULATING HYDROGEL FOR HYDRODISSECTION DURING PERCUTANEOUS CRYOABLATION

Miles B. Conrad, MD (*Presenter*)
Subhajit Pal (*Abstract Co-Author*)
Isabelle Pummill (*Abstract Co-Author*)
Clarissa Jacobo Hernandez (*Abstract Co-Author*)
Jisoo Shin (*Abstract Co-Author*)
Sparshika Chhaperia (*Abstract Co-Author*)
Vinayak Tuteja (*Abstract Co-Author*)
Daniel Shi (*Abstract Co-Author*)
Phillip Messersmith (*Abstract Co-Author*)

PURPOSE

Cryoinjury to adjacent healthy tissues remains a significant limitation of percutaneous cryoablation, a minimally invasive and targeted tumor ablation technique. Although hydrodissection with fluids such as saline or dextrose is employed to displace tissues and minimize thermal injury, the thermal insulating properties of these solutions are limited. This study proposes a novel, thermally insulating, injectable hydrogel to enhance tissue protection via hydrodissection during percutaneous cryoablation.

METHODS AND MATERIALS

To facilitate minimally invasive injection, shear-thinning alginate-based hydrogels were developed by dynamically crosslinking alginate with boronic acid-functionalized multi-arm polyethylene glycol or other biopolymers. Additional ionic crosslinks were incorporated to enhance the hydrogel's stability under physiological conditions. Furthermore, CO2 microbubbles were introduced through in situ generation by reacting hydrochloric acid with sodium bicarbonate to enhance the thermal insulation properties of the developed hydrogels.

RESULTS

The dual crosslinked hydrogels exhibited shear-thinning and rapid recovery properties due to the dynamic covalent nature of the network, facilitating precise localization after injection. Moreover, the microbubble-enhanced hydrogel demonstrated exceptional thermal insulation and exhibited a gradient from the surface of the cold bath, -60? at 0 mm, -6.2? at 5 mm, and 3.7? at 10 mm. This indicates effective thermal shielding (53.8? across the first 5 mm distance) and significantly outperforms standard hydrodissection fluids. The developed hydrogel shows excellent biocompatibility, tunable degradability, and stability at ambient conditions.

CONCLUSION

Together, the mechanical, thermal, and biological properties of the developed hydrogel confirm the potential of the designed hydrogels as effective hydrodissectants, facilitating tissue displacement while minimizing thermal injury during percutaneous cryoablation.

CLINICAL RELEVANCE/APPLICATION

Future research will focus on validating clinical applicability through comprehensive in vivo studies assessing thermal shielding efficacy, migration over clinically relevant timeframes, and evaluations of the safety profile.

M5B-SPIR-2 LUNG RADIOFREQUENCY ABLATION USING AN18-GAUGE RADIOFREQUENCY ELECTRODE: FEASIBILITY, SAFETY, AND TREATMENT OUTCOMES

Kosuke Matsuda (*Presenter*)
Haruyuki Takaki, MD, PhD (*Abstract Co-Author*)
Hiroshi Kodama, MD (*Abstract Co-Author*)
Atsushi Ogasawara (*Abstract Co-Author*)
Reona Wada, MD, PhD (*Abstract Co-Author*)
Yasukazu Kako (*Abstract Co-Author*)
Sayuri Nishimoto (*Abstract Co-Author*)
Koichiro Yamakado, MD, PhD (*Abstract Co-Author*)

PURPOSE

Although lung radiofrequency ablation (RFA) is a useful therapeutic option for the treatment of malignant lung tumors, adverse events occur and some of them can be fatal. The use of thinner RF electrode may reduce the risk of adverse events. This retrospective study compared the safety and efficacy between lung RFA using 18-gauge (G) electrodes and that using 17-G electrodes.

METHODS AND MATERIALS

Lung RFA was performed to treat lung tumors from March 2024 to April 2025 in 61 patients with 175 lung tumors. Technical feasibility, therapeutic response and safety after lung RFA were evaluated in 57 patients having lung tumors 25 mm or smaller in a maximum diameter. Thirty-six patients (21 female /15 male) with 83 tumors were treated by using 18-G RF electrode (VIVARF system, Century Medical, Inc, Tokyo, Japan), and 32 patients (16 female /16 male) with 81 tumors by using 17-G RF electrode (VIVARF system in 76 tumors, Cooltip RFA system, Covidien Japan, Tokyo, Japan, in 5 tumors). The mean tumor size was 9.2 ± 3.8 mm in the 18-G group, and 10.6 ± 5.0 mm (p=0.054) in the 17-G group.

RESULTS

RFA was successfully technically performed in 98.8% (82/83 tumors) of tumors in the 18-G group, and 98.8% (80/81 tumors) of tumors in the 17-G group (p= 0.99). The overall incidence of adverse events did not differ significantly between the 18-G and 17-G groups (75.0% vs. 73.8%, p=0.88). However, the incidence of grade-2 or

-3 pneumothorax requiring drainage was significantly lower in the 18-G group (13.3% vs. 27.9%, p<0.05). The local tumor progression rates were similar between the 18-G and 17-G groups [0% (0/83) vs. 2.5% (2/81), p=0.15] during the follow-up of 177 ± 91 days in the 18-G group and 342 ± 70 days in the 17-G group.

CONCLUSION

Lung RFA with an 18-G RF electrode reduces the risk of clinically significant pneumothorax while maintaining equivalent therapeutic efficacy compared to lung RFA with 17-G RF electrode.

CLINICAL RELEVANCE/APPLICATION

Lung RFA using an 18-G RF electrode reduces clinically significant pneumothorax without compromising treatment efficacy, offering a safer and more patient-friendly approach in clinical practice.

M5B-SPIR-3 DIFFUSION MRI AS THE LEADING TECHNIQUE FOR TARGETED PROSTATE BIOPSY GUIDANCE

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Emanuele Messina, MD (*Abstract Co-Author*)
Antonella Borrelli, MD (*Abstract Co-Author*)
Luca De Giacomo (*Abstract Co-Author*)
Maurizio Del Monte (*Abstract Co-Author*)
Valeria Panebianco, MD (*Abstract Co-Author*)

PURPOSE

To explore the potential role of DWI in identifying the "core" of lesions in the prostate peripheral zone and to assess whether targeting biopsies specifically on the DWI-defined “lesion’s core” can improve the diagnostic performance in detecting clinically significant prostate cancer (csPCa).

METHODS AND MATERIALS

Prospective single center study; patients with MRI suspicious of PCa (PI-RADS 5, 4 and PI-RADS 3 with PSA-density =0.15) with a mismatch between DWI and T2 in terms of lesion extension, undergoing transrectal-fusion-targeted-biopsy(TBx). During the pre-biopsy segmentation phase performed by an experienced uro-radiologist, the “lesion-core” was indicated as the most restricting area on DWI, while the “penumbra” as the exceeding area visible on T2WI. During the procedure, 2 biopsy cores were sampled from the “lesion-core” (DWI-defined), while 2 cores from the “penumbra”(T2WI-defined); they were separately stored.For clinically significant PCa-DR, contingency tables were tested (Pearson’s chi-squared). To compare the outcomes, we compared the number of positive cores and the percentage of positive tissue within cores. ROC-curves were implemented.

RESULTS

54 patients underwent TBx. 75 biopsy-targets were identified. 17/54 (31.5%) overall patients resulted negative for PCa. Among “lesion-cores”, csPCa-DR was 43/75(57.3%), while among “penumbra” 25/75(33.3%) (p=0.02); on 18/75(24%) of “penumbra-areas” we found inflammatory changes. The percentage of positive tissue within cores resulted different, with better performance on “lesion-core” (median percentage of 61.6%) vs “penumbra” (median percentage of 38.7%)(p<0.01). We witnessed higher Gleason Score within “lesion-cores”, compared to “penumbra”(p=0.03).

CONCLUSION

These results show significant differences between the “lesion-core” and “penumbra”. Indeed, this of DWI-defined “lesion-core” allowed us to achieve a better biopsy performance in terms of DR and percentage of positive tissue within cores. Therefore, DWI should be used as main sequence during the TBx, identifying the “lesion-core”.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that targeting the "lesion-core"(DWI-defined), improves the detection rate of csPCa during MRI-targeted biopsy. Compared to the broader T2-defined “penumbra”areas, the DWI-defined core yielded a higher proportion of positive biopsy cores, greater tumor burden within those cores, and higher Gleason Scores. Clinically, these findings support prioritizing DWI as the primary sequence for lesion characterization and biopsy guidance in suspicious prostate lesions, potentially leading to more accurate diagnoses, reduced overdiagnosis of indolent disease, and optimized patient management.

M5B-SPIR-5 A COMPARATIVE META-ANALYSIS AND TRIAL SEQUENTIAL ANALYSIS ON PERCUTANEOUS THERMAL ABLATION VS PARTIAL NEPHRECTOMY FOR THE TREATMENT OF STAGE 1 RENAL CELL CARCINOMA:RESULTS FROM 49 STUDIES AND 30,944 PATIENTS

Dimitrios-Marios Chalmoukis, MD (*Presenter*)
Andreas K. Papadopoulos, MD, MSc (*Abstract Co-Author*)

PURPOSE

Accumulating evidence support the notion that partial nephrectomy (PN) and percutaneous thermal ablation (pTA) offer similar overall survival (OS), while the latter is linked to a better safety profile. We undertook a systematic review and meta-analysis with the aim to compare the two techniques, among patients with stage 1 Renal Cell Carcinoma (RCC). Additionally, we sought to address the consistency of the currently available literature.

METHODS AND MATERIALS

Following the PRISMA guidelines, PubMed, Embase and the Cochrane Library were systematically searched for published reports comparing PN and pTA. Comparative studies reporting OS and/or complication rates were considered eligible. Random effect meta-analyses and trial sequential analyses (TSA) were performed.

RESULTS

Eligible were 49 studies encompassing a total of 30,944 patients (pTA/PN, 6,571/24,373). All grades of complication rates were significantly higher for patients undergoing PN Vs pTA (Risk Ratio [RR], 1.78; 95% CI, 1.47 to 2.16, and RR, 1.9; 95% CI 1.27 to 2.71, p -value<0.001, respectively). TSA indicated that no additional trials were needed to reach this conclusion. OS was shown to be similar for patients undergoing either pTA or PN both at 1-year (RR 0.68; 95% CI 0.45 to 1.03, p -value>0.05) and 5-years (RR 0.76; 95% CI 0.58 to 1.01, p -value>0.05). For 1- and 5- year OS, TSA analysis revealed that -at a minimum- an additional 4,335 and 63,720 patients, respectively, might be needed for stable conclusions.

CONCLUSION

Our results indicate that there is no difference in OS between pTA vs PN; a significant number of additional large-scale studies would be needed to detect an identifiable potential difference. However, we found pTA to be associated with a superior safety profile when compared to PN, with future studies being unlikely to alter this conclusion.

CLINICAL RELEVANCE/APPLICATION

This study shows that while partial nephrectomy and percutaneous thermal ablation offer similar overall survival for stage 1 RCC, the latter has a significantly better safety profile.

M5B-SPIR-6 POST-HOC ANALYSIS OF THE COVER-ALL TRIAL: THERMAL ABLATION OUTCOMES IN PATIENTS WITH COLORECTAL LIVER METASTASES

Noreen Siddiqi, MD (*Presenter*)
Jessica A. Marques Silva, MD (*Abstract Co-Author*)
Iwan Paolucci, PhD (*Abstract Co-Author*)
Caleb Oconnor (*Abstract Co-Author*)
A. Kyle Jones, PhD (*Abstract Co-Author*)
Kristy K. Brock, PhD (*Abstract Co-Author*)
Bruno C. Odisio, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate oncologic outcomes of software-based versus visual assessment of minimal ablative margins (MAM) in patients with colorectal liver metastases (CLM) undergoing thermal ablation.

METHODS AND MATERIALS

This post hoc analysis used data from patients with CLM enrolled in the COVER-ALL randomized phase 2 trial (NCT04083378), conducted at a single center between June 2020 and October 2023. Patients underwent CT-guided percutaneous thermal ablation with the goal of achieving =5 mm MAM. Fifty patients were randomized 1:1 to software-based (experimental) or visual (control) MAM assessment using Pocock-Simon dynamic allocation. Following a planned interim analysis confirming superiority of the software-based method, enrollment to the control arm was halted, and subsequent 50 patients were assigned to the experimental group. Only CLM cases were included. Outcomes included post-ablation MAM, 2-year local tumor progression (LTP), LTP-free survival, overall survival, and intra-/extrahepatic progression-free survival. Follow-up will be completed by October 2025. Time-to-event analyses were performed using Kaplan-Meier and Fine-Gray methods. Adverse events were recorded per CTCAE.

RESULTS

Eleven patients were included in the control group (mean age 54.6 years, 91% male; median tumor diameter 1.8 cm [IQR 1.3-2.2]) and 40 patients were included in the entire experimental group (mean age 54.0 years, 55% male; median tumor diameter 1.5 cm [1.2-1.9]). The mean MAM was 2.5 mm in the control group versus 7.4 mm in the experimental group. Median follow-up was 22.7 months overall (25.1 months control vs. 21.0 months experimental). Local tumor progression occurred in 1/11 (9.1%) control vs. 1/40 (2.5%) entire experimental group. One grade 2 adverse event occurred in the experimental group (1/40, 2.5%). No grade 4-5 events or treatment-related deaths were reported.

CONCLUSION

In this subset of CLM patients, software-based MAM assessment was safe and, with a low LTP rate. These findings support the integration of AI-driven tools in ablation planning for CLM, aligned with updated NCCN guidelines endorsing ablation as an alternative to resection for small lesions.

CLINICAL RELEVANCE/APPLICATION

This study reinforces the clinical value of software-based MAM assessment for guiding thermal ablation in CLM. Its adoption may help standardize margin evaluation, improve tumor control, and support NCCN-endorsed practice of ablation as a curative-intent option for small resectable CLMs.

M5B-SPIR-7 COMPARATIVE ANALYSIS OF ULTRASOUND GUIDED MICROWAVE ABLATION VERSUS PAROTIDECTOMY FOR BENIGN PAROTID TUMORS

Min Zhuang (*Presenter*)
Man Lu, PhD (*Abstract Co-Author*)

PURPOSE

To compare the clinical efficacy of ultrasound-guided microwave ablation (MWA) and parotidectomy in treating benign parotid tumors.

METHODS AND MATERIALS

A total of 40 patients with benign parotid tumors treated in our hospital from 2021 to 2023 were enrolled and divided into two groups based on treatment modality: the MWA group (n=18) and the surgery group (n=22). Perioperative indicators, cosmetic score changes, and complication rates were compared between the two groups.

RESULTS

No statistically significant difference in recurrence rates was observed between the two groups at 6 months and 1 year post-treatment (P>0.05). The MWA group exhibited shorter operative time, smaller surgical scars, reduced hospital stays, and less intraoperative blood loss compared to the surgery group (P<0.05). The complication rate in the MWA group was significantly lower than that in the surgery group (P<0.05). Post-treatment cosmetic scores in the MWA group showed a significant decrease and continued to improve over time, although 2 patients with larger pre-treatment tumors exhibited no notable improvement at the 1-year follow-up. In contrast, the surgery group demonstrated immediate cosmetic score reduction, but 5 cases developed noticeable facial depression and asymmetry.

CONCLUSION

Compared to parotidectomy, ultrasound-guided MWA for benign parotid tumors results in smaller scars, shorter hospitalization, and fewer postoperative complications. For patients with smaller tumors, MWA can prevent surgery-induced facial depression and asymmetry, yielding superior clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

Ultrasound-guided MWA presents a minimally invasive alternative to traditional parotidectomy for benign parotid tumors, particularly in small to medium-sized tumors.

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M5B-SPMK

Musculoskeletal Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPMK-1 GRADING CERVICAL NEURAL FORAMINAL STENOSIS VIA 3T MRNERVE/BONE FUSION IMAGING COMPARED WITH T2-WEIGHTED IMAGING

Dongmei Jiang (*Presenter*)
Yuwei Pan (*Abstract Co-Author*)
Shuyi Lei (*Abstract Co-Author*)
Dejun She (*Abstract Co-Author*)
Yingying Xie (*Abstract Co-Author*)
Dairong Cao, MD (*Abstract Co-Author*)

PURPOSE

To investigate the value of 3T MR nerve/bone fusion imaging in grading cervical neural foraminal stenosis (CNFS).

METHODS AND MATERIALS

58 healthy participants and 23 patients with suspected cervical radiculopathy were prospectively enrolled. MR nerve and bone sequences including 3D-T2-weighted fast field echo (3D-T2-FFE) and fast field echo resembling a CT using restricted echo-spacing (FRACTURE) were performed. The agreements of overall image quality, image artifacts, the width of cervical neural foramen (WCNF) and the width of extraforaminal nerve root (WENR) were assessed on 3D-T2-FFE/FRACTURE fusion image in healthy participants. The detection rate, visibility score of extraforaminal nerve root (ENR), and the CNFS grade were compared for patients between 3D-T2-FFE/FRACTURE fusion image and T2WI. The correlation between CNFS grade and the neck disability index (NDI) and numerical pain scale (NPS) was assessed.

RESULTS

The agreements were moderate to good for overall image quality and image artifacts (?=0.614-0.867), and good to excellent for WCNF and WENR (ICC=0.755-0.931) . The detection rate of ENR on 3D-T2-FFE/FRACTURE fusion (184/184, 100%) was higher than that on T2WI (116/184, 63.04%). The visibility score for ENR was also higher on 3D-T2-FFE/FRACTURE fusion. The proportion of grade 1 and grade 2 on T2WI was higher than that on 3D-T2-FFE/FRACRURE fusion. The overall CNFS grade on T2WI was slightly higher than that on 3D-T2-FFE/FRACRURE fusion. The intra-reader and inter-reader agreement for CNFS grading was substantial to nearly perfect on 3D-T2-FFE/FRACTURE fusion (?=0.774-0.837), and moderate on T2WI (?=0.436-0.624). The correlation between the CNFS grade based on 3D-T2-FFE/FRACTURE fusion and NDI (? = 0.4317, P<0.05) /NPS (? = 0.4212, P < 0.05) was moderate, respectively. But no correlation was found between CNFS grade based on T2WI and NDI/NPS (P > 0.05).

CONCLUSION

Compared with T2WI, 3D-T2-FFE/FRACTURE fusion provides a more reliable and reproducible evaluation of the severity of CNFS. The CNFS grade based on 3D-T2-FFE/FRACTURE fusion is associated with clinical symptoms.

CLINICAL RELEVANCE/APPLICATION

3D-T2-FFE/FRACTURE fusion provides a more reliable evaluation of the severity of CNFS. The CNFS grade based on 3D-T2-FFE/FRACTURE fusion is associated with clinical symptoms. 3D-T2-FFE/FRACTURE fusion imaging may facilitate a one-stop-shop and radiation-free approach to comprehensively evaluate CNFS.

M5B-SPMK-2 HIGH RESOLUTION MRI EVALUATING PRE-SURGERY PLANNING IN NON-MELANOMA SKIN CANCER

XIAOQIONG LI (*Presenter*)
Yueyou Peng (*Abstract Co-Author*)
Yanfeng Meng, MD, PhD (*Abstract Co-Author*)

PURPOSE

To assess the value of high-resolution MRI (HR-MRI) in pre-surgery evaluation of non-melanoma skin cancer.

METHODS AND MATERIALS

The study enrolled patients with non-melanoma skin cancer and underwent Mohs micrographic surgery (MMS) from January 2022 to April 2025. Patients who eligible for MRI were performed skin HR-MRI on a 3T scanner before surgery. The MRI sequence included T1WI, T2WI, T2WI fat suppression(FS-T2), and T1 dynamic contrast enhancement (DCE). DCE scan was conducted utilizing a gadolinium-based contrast agent, via a high-pressure injector at a flow rate of 2 ml/s into the elbow vein. The dosage of the contrast agent was 0.1 mmol/kg. Following the injection of contrast agent, five consecutive dynamic enhanced images were acquired, with a time resolution of 76s per phase. Tumor characteristics including size, shape, invasion, signal intensity, and enhancement curve were assessed by two radiologists. Patients received both MRI and surgery were assigned in Group 1, while those who received surgery only were assigned in Group 2. The number of post-surgery tissue sections, positive tumor margins on histopathology sections, and cases requiring secondary surgery were recorded. A Chi-square test was employed to compare the differences of tumor invasion levels between MRI and pathology findings.

RESULTS

A total of 134 cases were enrolled, in which 76 cases in Group 1 and 59 cases in Group 2. There were 54 basal cell carcinoma (BCC) and 22 squamous cell carcinoma (SCC) cases in Group1. The observation results between the two radiologists showed no statistical difference. T1WI showed hypointensity or isointensity for both BCC and SCC, while T2WI and FS-T2 showed hyperintensity. T2WI effectively showed the relationship between tumors and nearby structures, while FS-T2 highlighted tumor contours. DCE scans were performed for 15 BCC and 3 SCC cases, revealing plateau or washout patterns for BCC and plateau patterns for SCC. In Group 1, the positive rates for pathological sections and secondary resections were 12.6% and 25%, respectively, compared to 23.1% and 44.1% in Group 2. Group 1 showed a lower secondary resection rate than Group 2. There was a high consistency between tumor invasion levels observed by HR-MRI and pathological results in the group 1 (p>0.75).

CONCLUSION

Skin HR-MRI is valuable for non-melanoma skin cancers, providing accurate pre-surgery tumor scope assessment and reducing the secondary surgeries rate.

CLINICAL RELEVANCE/APPLICATION

MMS is most commonly used for skin tumorectomy with a high possibility of secondary surgery without HR-MRI. MRI clearly depicts the size of tumor and the invaded layer. The application of HR-MRI pre-surgery precisely determine the surgical range and reduce the possibility of secondary operations.

M5B-SPMK-4 GENERATION OF SYNTHETIC PET/MR FUSION IMAGES FROM MR IMAGES USING A COMBINATION OF GENERATIVE ADVERSARIAL NETWORKS AND CONDITIONAL DENOISING DIFFUSION PROBABILISTIC MODELS BASED ON SIMULTANEOUS 18F-FDG PET/MR IMAGE DATA OF PYOGENIC SPONDYLODISCITIS

IKCHAN JEON, MD, PhD (*Presenter*)

PURPOSE

This study aims to generate synthetic PET/MR fusion images from MR images using a combination of generative adversarial networks (GANs) and conditional denoising diffusion probabilistic models (cDDPMs) based on simultaneous 18F-fluorodeoxyglucose (18F-FDG) PET/MR image data.

METHODS AND MATERIALS

We used paired spinal sagittal T2FS and PET/T2FS fusion images of simultaneous 18F-FDG PET/MR imaging examination in patients with PSD, which were employed to generate synthetic PET/T2FS fusion images from T2FS images using a combination of Pix2Pix (U-Net generator + Least Squares GANs discriminator) and cDDPMs algorithms. In the analyses of image similarity between the real and synthetic PET/T2FS fusion images, we adopted the values of mean peak signal to noise ratio (PSNR), mean structural similarity measurement (SSIM), mean absolute error (MAE), and mean squared error (MSE) for quantitative analysis, while the discrimination accuracy by three spine surgeons was applied for qualitative analysis.

RESULTS

Total 2082 pairs of T2FS and PET/T2FS fusion images were obtained from 172 examinations on 94 patients, which were randomly assigned to training, validation, and test data sets in 8:1:1 ratio (1664, 209, and 209 pairs). The quantitative analysis revealed PSNR of 30.634 ± 3.437, SSIM of 0.910 ± 0.067, MAE of 0.017 ± 0.008, and MSE of 0.001 ± 0.001, respectively. The values of PSNR, MAE, and MSE significantly decreased as FDG uptake increase in real PET/T2FS fusion image, with no significant correlation on SSIM. In the qualitative analysis, the overall discrimination accuracy between real and synthetic PET/T2FS fusion images was 47.4%.

CONCLUSION

The combination of Pix2Pix and cDDPMs demonstrated the potential for cross-modal image generation from MR to PET images, with reliable quantitative and qualitative image similarities.

CLINICAL RELEVANCE/APPLICATION

Cross-modality image generation from magnetic resonance (MR) to positron emission tomography (PET) using the generative model can be expected to have complementary effects by addressing the limitations and maximizing the advantages inherent in each modality.

M5B-SPMK-5 MRI-BASED OSSEOUS TUMOR REPORTING AND DATA SYSTEM (OT-RADS): CLINICAL EXPERIENCE OF PROSPECTIVE IMPLEMENTATION AND DIAGNOSTIC ACCURACY

Garrett Croley (*Presenter*)
Atul K. Taneja, MD,PhD (*Abstract Co-Author*)
Flavio Duarte Silva, MD, PhD (*Abstract Co-Author*)
Avneesh Chhabra, MD, MBA (*Abstract Co-Author*)

PURPOSE

To evaluate the clinical performance and diagnostic accuracy associated with the prospective implementation of the MRI-based Osseous Tumor Reporting and Data System (OT-RADS) in comparison to the traditional descriptive reports.

METHODS AND MATERIALS

Following prospective implementation of the OT-RADS scoring in the electronic dictation system, several fellowship-trained musculoskeletal radiologists classified the bone tumors routinely using this system. This retrospective auditing and analysis included 352 consecutive patients evaluated using OT-RADS from July 2021 to May 2024. Inclusion criteria encompassed patients aged 14-100 years with osseous lesions of the extremities, thoracic or abdominopelvic walls evaluated by MRI, confirmed by surgery, biopsy, and/or follow-up for benign lesions. Data on patient demographics, imaging findings, lesion characteristics, biopsy results, treatment modalities, and clinical outcomes were collected. Diagnostic accuracy was statistically evaluated using McNemar's test.

RESULTS

The cohort included 352 patients (60.2% females, mean age 54.7 ± 15.7 years). Most lesions (66.1%) were managed conservatively. Surgical and chemotherapy interventions each accounted for 8.4%. Biopsy was performed selectively (18.8%). OT-RADS I,II, III were 4.8%, 46.1% and 18.2%, respectively. Suspicion categories for malignancy (OT-RADS IV-VI) collectively comprised 36.1% of cases. Clinical outcomes were favorable, with improvement in 60.8% of patients. OT-RADS demonstrated superior overall accuracy (95.4%) compared to descriptive reporting (88.0%) ($p<0.0001$), especially in biopsy-confirmed cases (OT-RADS 84.6% vs. descriptive 61.5%; $p<0.0001$). In addition, OT-RADS accuracy remained consistently higher across all categories: grouped analysis showed using McNemar tests demonstrated significant differences favoring OT-RADS for both benign (II-III) ($p = 0.003$) and malignant lesions (IV-V) ($p < 0.001$), as well as in OT-RADS IV ($p = 0.0078$) and V ($p = 0.0156$) when analyzing the subgroups separately.

CONCLUSION

OT-RADS provides significantly improved diagnostic accuracy compared to the traditional descriptive reporting both for benign and malignant bone tumors These findings highlight further validation of the scoring system for broader applicability to stratify lesion risk, guide appropriate clinical management, and positively impact patient outcomes.

CLINICAL RELEVANCE/APPLICATION

The implementation of OT-RADS significantly enhances diagnostic accuracy in osseous tumor evaluation, enabling standardized lesion stratification and more informed clinical decision-making, ultimately improving patient care pathways.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

M5B-SPNMMI

Nuclear Medicine & Molecular Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPNMMI-1 THE DIFFERENCES OF CEREBRAL HYPERPERFUSION IN PATIENTS WITH MOYAMOYA DISEASE AND ATHEROSCLEROTIC OCCLUSIVE CEREBROVASCULAR DISEASE EVALUATED BY ^{99M}TC-ECD SPECT ONE DAY AFTER REVASCULIZATION SURGERY

Koichiro Kaneko, MD, PhD (*Presenter*)
Kengo Yoshimitsu, MD, PhD (*Abstract Co-Author*)
Michinobu Nagao, MD, PhD (*Abstract Co-Author*)
Shuji Sakai, MD, PhD (*Abstract Co-Author*)

PURPOSE

To examine the relation between postoperative cerebral hyperperfusion (CHP) and preoperative cerebral blood flow (CBF) SPECT findings in patients with moyamoya disease (MMD) and atherosclerotic occlusive cerebrovascular disease (AOCD).

METHODS AND MATERIALS

99mTc-ethyl cysteinate dimer SPECT studies were performed for 100 cerebral hemispheres in the 77 MMD/AOCD patients one day after revascularization surgery. We calculated the pre-postoperative regional CBF (rCBF) ratio and postoperative increase rate (IR) in frontal, temporal, and parietal lobes using a three-dimensional stereotaxic region of interest (ROI) template. We compared the patterns, severities of CHP, and major complications among the adult onset MMD (AMMD), pediatric onset MMD (PMMD), and AOCD patients. We also investigated the association among CHP, preoperative rCBF ratio, and cerebrovascular reactivity (CVR) for acetazolamide activation.

RESULTS

A total of 300 ROIs were analyzed in 100 revascularized hemispheres. CHP (?30% in IR) occurred in 27 hemispheres mainly with frontal lobe dominant pattern (19/27), and the incidence (19.0%) was significantly higher than those of temporal and parietal lobe dominant pattern (4.0% in each, $p < 0.001$). Severe CHP (?50 % in IR) more frequently occurred in the AMMD patients than in the PMMD and AOCD patients (21.5% vs. 2.9%, $p = 0.01$), and major complications occurred only in the 2 AMMD patients with severe CHP. In the ROC analyses, preoperative rCBF ratio more correctly differentiated the regions with mild/severe or severe CHP from those without CHP than CVR (area under curves of 0.84 vs. 0.67, 0.81 vs 0.73, respectively) in the MMD patients, while neither preoperative rCBF ratio nor CVR did not significantly correlated in the AOCD patients. The AMMD and AOCD patients showed significantly lower preoperative rCBF ratio in all lobes than the PMMD patients ($p < 0.0001$ for all), while the all types of patients showed similar CVR. In the 13 subsequent CBF SPECT studies for the patients with definite or equivocal CHP beyond postoperative day 2, rCBF reduced in 12 hemispheres while one hemisphere developed to severe CHP.

CONCLUSION

CHP in the frontal lobe occurred more often and with greater severity in AMMD patients. Reduction of preoperative CBF was more closely associated with CHP than CVR in MMD patients, and non-activated ECD SPECT was suitable for pre/postoperative CBF evaluation.

CLINICAL RELEVANCE/APPLICATION

CHP after revascularization surgery was mainly observed in the frontal lobe of AMMD patients. CHP tended to be more severe in AMMD patients than in PMMD or AOCD patients. Reduced preoperative CBF more accurately predicted the occurrence of CHP than CVR in the MMD patients.

M5B-SPNMMI-2 INITIAL RESULTS OF ^{68}GA-BED003 FAP-TARGETED PET/MRI TO ASSESS THE EXTENT OF ENDOMETRIOSIS

Jonas Brandt (*Presenter*)
Philipp Backhaus, MD (*Abstract Co-Author*)
David Ventura (*Abstract Co-Author*)
Stephanie Eltrop (*Abstract Co-Author*)
Philipp Schindler, MD (*Abstract Co-Author*)

PURPOSE

Endometriosis is a common gynecologic disorder often associated with chronic pelvic pain, infertility and reduced quality of life. Conventional imaging modalities such as transvaginal ultrasound and MRI may underestimate the extent of disease, particularly in deep infiltrating endometriosis (DIE). Fibroblast activation protein (FAP) is highly expressed in remodeling endometrium and has been implicated in endometriosis lesions. This study investigates the feasibility of integrating FAP-targeted PET with MRI to improve endometriosis detection.

METHODS AND MATERIALS

In this retrospective study, nine premenopausal women with confirmed endometriosis (test group) and nine premenopausal women without known endometriosis (reference group) underwent PET/MRI or PET/CT with 68 Ga-OncoFAP (now under development as 68 Ga-BED003). 7 patients in the test group underwent PET/MRI, while 2 patients in the test group and all patients in the reference group underwent PET/CT. Standard MRI sequences were combined with PET and tracer uptake was assessed semi-quantitatively. Lesions were categorized based on a modified #ENZIAN segmentation. Clinical assessment or laparoscopy (when available) served as the reference standard. Statistical comparisons of tracer uptake and lesion counts between groups were performed using the Mann-Whitney U test.

RESULTS

In the test group, at least one endometriosis-related finding was identified in 6 of 7 patients who received PET/MRI when only MRI was evaluated, compared to all patients when combined PET/MRI was reviewed. In the test group, PET/MRI identified 45 of 91 segments (49.5%) as likely endometriotic compared with 17 of 91 segments (18.7%) with MRI alone. PET/CT and PET/MRI datasets showed focal tracer uptake in 44 of 108 segments (40.7%) in the test group, significantly higher than the 14 of 108 segments (13.0%) in the reference group ($p<0.01$). Combined PET/MRI improved lesion conspicuity for peritoneal and tubo-ovarian locations. Mean

uterine SUV max was not significantly different between groups (p=0.489). In patients who underwent laparoscopy, PET/MRI findings largely correlated with surgical results.

CONCLUSION

These initial findings suggest that 68 Ga-BED003 FAP-directed PET/MRI may improve the detection and characterization of endometriosis, particularly in anatomically challenging regions where conventional MRI is limited. As a potential adjunct to existing imaging strategies, 68 Ga-BED003 FAP-PET/MRI may refine noninvasive assessment and guide personalized management of endometriosis.

CLINICAL RELEVANCE/APPLICATION

Larger prospective studies are warranted to validate these findings, establish standardized imaging protocols, and determine the diagnostic accuracy of this novel technique.

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Nov. 30 – Dec. 4
RSNA® 2025
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Abstract Archives of the RSNA, 2025

M5B-SPNPM

Noninterpretive Skills (Beyond Imaging) Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPNPM-1 ACADEMIC AND NON-ACADEMIC RADIOLOGIST COMPENSATION AND CLINICAL PRODUCTIVITY TRENDS OVER THE LAST DECADE

Dheeman Futela, MBBS (*Presenter*)
Ajay Malhotra, MD, MMM (*Abstract Co-Author*)

PURPOSE

Physician shortages have been reported across multiple specialties, particularly in radiology, as imaging utilization increases. Despite increased imaging volumes, collections and unit prices may not keep up with increased workloads. This study aimed to assess recent trends in financial compensation and clinical productivity of radiologists in academic and nonacademic settings.

METHODS AND MATERIALS

We studied deidentified data from the Medical Group Management Association for both Diagnostic and Interventional (DR and IR) physicians in academic and nonacademic practices from 2014 to 2023. Median, 25th and 75th percentiles, and mean values were analyzed for compensation, collections, and work relative value units (wRVUs). Compensation and productivity data were compared by radiology subspecialty (DR versus IR), practice type (academic versus nonacademic provider), geographical region of the United States, and practice size. Trends were analyzed with linear regression and by comparing growth rates with market inflation.

RESULTS

The Medical Group Management Association Survey data for 2023 included responses from 3,769 radiologists (2,883 in DR and 886 in IR). In 2023, nonacademic radiologists had greater total median compensation than academic faculty in both DR (by 27%) and IR (by 32%). From 2014 to 2023, median compensation increased faster for academic DR physicians (3.2% annually) than for nonacademic DR physicians (1.9% annually). In 2023, DR physicians produced greater median wRVUs than IR physicians (by 53% for nonacademic and 46% for academic radiologists) with higher collections, but IR physicians had higher compensation (by 16% in nonacademic and 10% in academic settings). Over the last decade, IR physician compensation increased by 3.9% and 3.4% annually for nonacademic and academic IR physicians, respectively, whereas median wRVUs trended downward (by -1.5% for nonacademic and -2.4% for academic physicians) with declining collections (by -4.4% annually for nonacademic and -2.1% for academic physicians).

CONCLUSION

Over the last decade, the salary gap between academic and nonacademic radiologists has narrowed. Physician compensation has increased at a faster pace in IR, despite relatively lower clinical productivity and declining collections.

CLINICAL RELEVANCE/APPLICATION

This study shows compensation and clinical productivity trends over the last decade to inform both practice managers and newly graduating or early career radiologists. Using this data could help in address staffing, ensuring access to care for patients, and negotiations for subsidies, or additional sources of funding, especially in the face of decreasing reimbursements.

M5B-SPNPM-2 ROLEX, KODAK, AND THE RADIOLOGY VIRTUAL READING ROOM: NAVIGATING DISRUPTIVE INNOVATION ACROSS INDUSTRIES

Khushboo Jhala, MD, MBA (*Presenter*)

PURPOSE

The traditional radiology reading room has long been a hub for image interpretation and interdisciplinary collaboration. However, the COVID-19 pandemic prompted workflow restructuring to minimize in-person interactions, leading to the development of virtual reading rooms (VRRs). This talk reviews the ongoing digital evolution of VRRs in a post-PACS, post-COVID era, updating our 2020 utility hypothesis with insights from 2025. By examining how industries have adapted to disruptive digital innovations, radiology can apply these lessons to shape its role in multidisciplinary care.

METHODS AND MATERIALS

This Institutional Review Board-exempt study assessed VRR usage at a large academic center. Focus groups conducted one year after VRR inception gathered feedback from radiologists and consulting providers regarding VRR effectiveness, communication preferences, and future utilization. Predictive utilization was based on workflow characteristics and provider question types. Automated user data were analyzed using chi-squared tests, and regression analysis evaluated correlations between predictive utilization and actual engagement from 2020 to 2022. Utilization was reassessed in 2025.

RESULTS

VRR engagement remained steady despite easing social distancing (average daily users: 73 in 2020 vs. 65 in 2022, P=0.09). Divisions with standardized workflows, such as subspecialties (body, neuro), maintained the highest VRR usage. Divisions with disrupted workflows, like the ED, faced challenges due to inconsistent staffing. Communication preferences varied: focused questions were handled by phone, while multidisciplinary discussions favored VRR or in-person consultations. Predictive utilization from 2020 correlated with actual engagement in 2022 ($R^2=0.88$, P=0.002 for radiology workflow; $R^2=0.75$, P=0.004 for provider question type). By 2025, there were no active drop-in VRRs, though 235 users engaged with the technological platform for daily one-to-one consultations, education, and scheduling.

CONCLUSION

Virtual Reading Room platforms mark a transformative shift in radiology workflows, offering a sustainable model for interdisciplinary collaboration in the post-COVID era. This talk underscores the critical importance of technological innovation adaptability and strategic implementation in enhancing patient care, radiology's value proposition, and practice efficiency. It draws valuable insights from industries that have navigated similar "disruptive innovation" challenges, such as the experiences of companies like Rolex and Kodak.

CLINICAL RELEVANCE/APPLICATION

Virtual reading room platforms can enhance interdisciplinary collaboration, improve workflow efficiency and patient care.

M5B-SPNPM-3 USING THE A3 FRAMEWORK TO INCREASE MAMMOGRAPHY SCREENING PERCENTAGES IN PATIENT POPULATIONS LIVING IN AREAS WITH HIGH NEIGHBORHOOD DEPRIVATION

Lewis A. Jordan, MD,MPH (*Presenter*)
Tyler M. Prout, MD (*Abstract Co-Author*)
Dania Daye, MD,PhD (*Abstract Co-Author*)
Robin Lankton (*Abstract Co-Author*)
Mai A. Elezaby, MD (*Abstract Co-Author*)
Anand K. Narayan, MD, PhD (*Abstract Co-Author*)

PURPOSE

Quality improvement initiatives use data-driven, rigorous approaches to plan, execute, and study the delivery of healthcare. There have been limited studies using quality improvement methods to address health disparities. We describe the initial results of an initiative to increase mammography screening percentages in patient populations living in high levels of neighborhood deprivation using the A3 Framework.

METHODS AND MATERIALS

A3 Framework is a quality improvement tool to identify problems, synthesize data, and propose solutions to achieve goals. A3 framework for a multicenter academic medical center in the Upper Midwest is outlined by FOCUS-PDCA: F - Find process to improve, O - Organize stakeholders, C - Clarify current state, U - Understand sources of variation that contribute to the problem, S - Select change ideas, P - Plan and do the improvement, C - Check results, A - Act. Quantitative data was derived from the EMR to determine if women living in areas with high neighborhood deprivation have received a screening mammogram following intervention. PDCA cycle - improve mammography screening percentage by 5% in women living in the 5 highest deciles of neighborhood deprivation, as measured by the Area Deprivation Index.

RESULTS

A3 Framework starting in 2022 yielded the following initial results: F - Increase percentage of patients aged 50-74 years who have undergone mammography screening within the last two years. O - Multidisciplinary team of managers, directors, students, and physicians including surgeons, radiologists, and primary care doctors. C - Decreased screening mammography percentages in medically underserved patient populations, SMART Goal: We will increase mammography percentages by 5% by December 2023 for medically homed patients within the health system accountable care organization. U - Clinical staff time has been limited time for outreach, Patients don’t realize they're due for mammograms, Access issues including scheduling and transportation. S -Hire Outreach Coordinators for culturally responsive outreach. PDCA - Mammography screening percentages increased from 65% to 71% for women living in the highest 5 deciles of neighborhood deprivation by December 2023, while mammography screening percentages increased from 73% to 76% for women living in the lowest 5 deciles of neighborhood deprivation.

CONCLUSION

A3 Framework was associated with achieving target improvements in mammography screening percentages in patient populations living in areas with high neighborhood deprivation.

CLINICAL RELEVANCE/APPLICATION

Structured quality improvement methods can be used to drive quantitative improvements in imaging outcomes for medically underserved patient populations.

Abstract Archives of the RSNA, 2025

M5B-SPNR

Neuroradiology Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPNR-2 LONGITUDINAL ANALYSIS OF TOTAL WHITE MATTER HYPERINTENSITIES IN PATIENTS UNDERGOING CARDIAC SURGERY: PRELIMINARY FINDINGS FROM THE PASCAL STUDY

Moreno Zanardo, PhD (*Presenter*)
Martina Anguissola (*Abstract Co-Author*)
Chiara Arduino (*Abstract Co-Author*)
Vlasta Bari (*Abstract Co-Author*)
Giacomo Bortolussi (*Abstract Co-Author*)
Beatrice Cairo (*Abstract Co-Author*)
Pavandeep Singh (*Abstract Co-Author*)
Paolo Vitali, MD,PhD (*Abstract Co-Author*)

PURPOSE

White matter hyperintensities (WMH) are common MRI findings in patients undergoing cardiac surgery and may reflect cerebrovascular vulnerability. For these preliminary results, the PASCAL study investigates short-term WMH evolution in relation to postoperative cerebrovascular events in patients undergoing surgery with cardiopulmonary bypass (CPB).

METHODS AND MATERIALS

The first thirty-seven consecutive adult patients undergoing elective cardiac surgery with CPB were included. The cohort consisted of 25 males (68%) and 12 females (32%) with a median age of 65 years (interquartile range, IQR: 56-70). Brain MRI was performed preoperatively and within a median of 7 days postoperatively (IQR: 6-8 days). WMH segmentation was performed automatically using Brain Health (Quantib® ND in Europe) manufactured for DeepHealth by Quantib B.V. software platform. Total and regional WMH volumes and lesion counts were extracted. Patients were classified as subcortical stroke if new or enlarging WMH lesions were detected on follow-up MRI.

RESULTS

Eight patients (22%) were classified in the subcortical stroke group and 29 (78%) in the no-subcortical stroke group. Median lesion count increased slightly from 19 to 20. The overall median WMH volume change was +0.10 mL. No statistically significant difference in total volume was observed pre- vs. post-surgery ($p=0.541$), nor between subcortical stroke and no-subcortical stroke groups ($p=0.251$). However, subcortical stroke patients showed significantly greater lesion burden in specific regions at follow-up. In particular, deep WMH volume was higher in the subcortical stroke group compared to the no-subcortical stroke group (0.855 mL vs. 0.150 mL, $p<0.001$), as well as deep WMH new lesion volume (0.110 mL vs 0.010 mL, $p<0.001$) and deep WMH enlarging lesion volume (0.570 mL vs. 0.050 mL, $p<0.001$). Moreover, differences were found also for the juxtacortical WMH volume (0.185 mL vs. 0.010 mL, $p<0.001$).

CONCLUSION

Although total WMH burden remained stable in the short term following cardiac surgery, patients with early postoperative lesion progression exhibited significantly increased deep and juxtacortical WMH volumes, both preoperatively and in terms of new and enlarging lesions. Regional WMH patterns may indicate cerebrovascular fragility and help identify patients at risk for postoperative brain injury.

CLINICAL RELEVANCE/APPLICATION

These findings support the potential utility of regional WMH analysis, particularly in deep white matter, as a marker of cerebrovascular vulnerability. Incorporating WMH metrics into preoperative assessment may improve risk stratification. Future integration of cerebral autoregulation indices is expected to further enhance predictive modeling.

M5B-SPNR-3 DIFFUSION TENSOR IMAGE ANALYSIS ALONG THE PERIVASCULAR SPACE (DTI-ALPS) DERIVED GLYMPHATIC INDEX CORRELATIONS IN PROFESSIONAL FIGHTERS

Dhanush J. Amin, MD,MBBS (*Presenter*)
Gaurav Nitin Rathi, MS (*Abstract Co-Author*)
Charles Bernick (*Abstract Co-Author*)
Virendra Mishra, PhD (*Abstract Co-Author*)

PURPOSE

Sports-related TBIs account for 1.2-30.3% of all TBI cases in the USA, with boxing and martial arts being major contributors. Repeated head impacts (RHI) have been indicated as a risk factor for neurodegenerative and neuropsychiatric disorders. The recently discovered glymphatic system, vital for clearing brain waste like amyloid-ß and tau proteins, are shown to be affected in participants experiencing cognitive decline. The glymphatic system is evaluated using Diffusion Tensor Imaging (DTI) through the Along the Perivascular Space (ALPS) method, by measuring the ALPS index. We hypothesized that RHI will affect the glymphatic system causing lower ALPS in cognitively impaired fighters as compared to non-impaired fighters and total ALPS will show a significant correlation with the total number of knockouts in the impaired fighters.

METHODS AND MATERIALS

This longitudinal study included 280 male professional fighters (boxers and MMA) and 20 age-matched healthy controls. Recorded variables included age, race, and intracranial volume. 95 fighters were identified as impaired fighters based on neuropsychological testing of processing and psychomotor speed. 3T Verio Siemens MRI scanner with a 32-channel head coil was used. 71 directions DTI was acquired with b = 0 and b = 1000s/mm 2 . Using FSL software, diffusion metric images were generated, including FA and directional diffusivity maps along the x-, y-, and z-axes. Using the diffusivity values along the direction of the perivascular space compared with those of projection fibers and association fibers on a slice at the level of the lateral ventricle body, we computed DTI-ALPS. PALM in FSL was used to compare DTI-

ALPS among the groups and understand the correlation between the DTI-ALPS index and the total number of knockouts. The results were considered at familywise error corrected p-value <0.05.

RESULTS

The non-impaired fighters had a significantly lower right and total glymphatic index as compared to the impaired fighters. The relationship between the glymphatic index and the knock-out history was significantly different between the two groups and that the impaired fighters had a non-significant negative correlation with the total number of knockouts.

CONCLUSION

Contrary to our hypothesis, though our results show that impaired fighters had a significantly higher glymphatic index, it deteriorated significantly with the total number of knockouts.

CLINICAL RELEVANCE/APPLICATION

Understanding RHI's impact on the glymphatic system is crucial for early detection and management of neurodegenerative risk in contact sport athletes. This study uses the DTI-derived ALPS index as a noninvasive biomarker to assess glymphatic dysfunction and guide early intervention.

M5B-SPNR-4 PROGNOSTIC VALUE OF CT CONTRAST STAINING AFTER ENDOVASCULAR THERAPY IN BASILAR ARTERY OCCLUSION STROKE

Matthias P. Fabritius, MD (*Presenter*)
Paul Reidler, MD (*Abstract Co-Author*)
Daniel Puhr-Westerheide, MD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Wolfgang G. Kunz, MD, MBA (*Abstract Co-Author*)

PURPOSE

Contrast staining signifies prolonged tissue absorption of iodinated contrast media following endovascular therapy (EVT) for large vessel occlusion stroke, indicating blood-brain barrier disruption. With EVT becoming the standard for treating basilar artery occlusion (BAO) stroke, considering the substantial variability in outcomes, our study aimed to determine the prognostic significance of post-interventional contrast staining in BAO stroke cases.

METHODS AND MATERIALS

We included BAO patients who received postinterventional noncontrast CT within 24h after EVT. Expert radiologists confirmed the presence of contrast staining on CT and its volume was quantified. Functional outcomes were assessed on the modified Rankin (mRS) scale at 90 days and unfavorable outcome was defined as mRS =4. A multivariable LASSO-penalized logistic regression analysis was used to determine association of contrast staining and other clinical and imaging parameters with functional outcome.

RESULTS

Forty-two patients fulfilled the inclusion criteria (15 female, 35,7%). Contrast staining on postinterventional CT was present in 18 patients (42.9%) with a median [interquartile range / IQR] volume of 7.9 mL [3.7-14.6]. Patients with contrast staining had a worse outcome with higher mRS after 90 days (median [IQR]: 6 [4-6] vs. 2 [1-4], p<0.001). Multivariable LASSO analysis revealed significant association of contrast staining with clinical outcome.

CONCLUSION

Contrast staining on postinterventional CT after EVT for BAO is a strong predictor of unfavorable functional outcome, outperforming other pre- and post-interventional imaging parameters.

CLINICAL RELEVANCE/APPLICATION

Our finding could help identify patients who may benefit from closer and more intensive monitoring at an early stage, potentially improving overall outcomes. Moreover, early identification of a poor prognosis is highly relevant for transparent communication with patients' families and for aligning expectations regarding further treatment strategies and goals of care.

M5B-SPNR-7 CORRELATION ANALYSIS BETWEEN THE ENHANCEMENT INTENSITY OF T2 FLAIR IN BRAIN METASTASES AND VASCULAR PERMEABILITY PARAMETERS INDYNAMIC CONTRAST-ENHANCED MRI

YU ZHANG (*Presenter*)
Zong Fang Li (*Abstract Co-Author*)

PURPOSE

To investigate the correlation between the degree of contrast-enhanced T2-weighted fluid-attenuated inversion recovery (CE-T2 FLAIR) enhancement and dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) parameters in patients with brain metastases.

METHODS AND MATERIALS

This retrospective analysis included 43 patients (80 cerebral metastatic lesions) pathologically or follow-up confirmed at our institution between January 2018 and July 2024. All participants underwent standardized MRI protocols: T1-weighted imaging (T1WI), T2-weighted imaging (T2WI), T2-FLAIR, DCE-MRI, CE-T2 FLAIR, and contrast-enhanced T1WI (CE-T1WI). DCE-MRI parameters were systematically quantified, including volume transfer constant (Ktrans) and reflux rate constant (Kep). Concurrently, lesion enhancement characteristics on CE-T2 FLAIR were evaluated using two metrics: contrast ratio (CR) and percentage increase (PI). Lesions were classified into three groups based on the degree of enhancement on CE-T2 FLAIR compared to CE-T1WI: Group A (CE-T2 FLAIR hyperenhancement), Group B (both enhancements were similar), and Group C (CE-T2 FLAIR hypoenhancement).

RESULTS

A total of 80 metastatic lesions were categorized into Group A (n=17), Group B (n=45), and Group C (n=18). Group A demonstrated significantly higher CR and PI values and lower Ktrans and Kep values compared to Groups B and C (all P <0.05). Group B showed higher CR and PI but lower Ktrans and Kep than Group C (all P <0.05). The maximum lesion diameter (TD) was significantly smaller in Groups A and B compared to Group C (both P <0.05), with no significant difference between Groups A and B (P>0.05). Ktrans and Kep were negatively correlated with CR (r =-0.467 and-0.526, respectively; both P <0.001) and PI (r =-0.658 and -0.716, respectively; both P <0.001).

CONCLUSION

Vascular permeability plays a pivotal role in the differential enhancement observed betweenCE-T2 FLAIR and CE-T1WI. Our findings demonstrate that CE-T2 FLAIR exhibits superior sensitivity in detecting brain metastases with low vascular permeability, which may be underrepresented on CE-T1WI. Incorporating CE-T2 FLAIR into standard neuroimaging protocols can enhance diagnostic confidence, particularly in the assessment of subtle or early-stage metastatic lesions.

CLINICAL RELEVANCE/APPLICATION

Integrating CE-T2 FLAIR into standard MRI protocols can enhance the diagnostic detection of brain metastases, particularly those with low vascular permeability that may be missed on CE-T1WI. This approach may improve early lesion identification, guide treatment planning, and ultimately contribute to better clinical outcomes in patients with metastatic brain tumors.

M5B-SPNR-8 PROTON BEAM THERAPY-ASSOCIATED RADIATION CHANGES IN THE SUBEPENDYMAL PERIVENTRICULAR REGION - A MIMICKER OF RECURRENT TUMOR?

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Kirby Quinn, MD (*Abstract Co-Author*)
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Natalya Nagornaya, MD (*Abstract Co-Author*)
Gaurav M. Saigal, MBBS (*Abstract Co-Author*)

PURPOSE

Proton beam radiation treatment (PBT) is a relatively recent form of therapy for brain cancers. PBT, like other forms of radiation therapies, can result in post radiation changes that are visible on imaging. PET/CT or MR Perfusion are the imaging tests of choice to help differentiate between post radiation changes and recurrent tumor. In this study, we demonstrate a relatively unknown effect of proton therapy predominantly seen in the periventricular regions of the brain, resulting in false positive MR Perfusion and/or PET/CT findings.

METHODS AND MATERIALS

Sixty-one patients with resected high grade oligodendroglioma or astrocytoma who received PBT and had follow-up MRI Perfusion and/or PET/CTs were evaluated.

RESULTS

Of the evaluated patients, thirty-one demonstrated nodular enhancement in and around the surgical bed on follow-up MR studies. Of these, 13 patients demonstrated positive correlates on MR Perfusion and/or PET/CT studies suggesting recurrence, and subsequently underwent biopsy. Of these, 8 cases were true positives for tumor whereas the other 5 were false positives (negative for tumor recurrence). Four additional patients who did not undergo biopsy of the suspected recurrence were deemed to be false positives due to decrease/resolution of enhancement on follow-up imaging. Of note, the enhancement seen in all of the 9 false positive cases was periventricular/subependymal in location. Of the 8 true positive cases, none showed enhancement in the periventricular region ($p<0.05$).

CONCLUSION

Non-tumor periventricular enhancement can be seen on follow-up imaging in patients who have undergone PBT following glioma resection, and can be falsely positive on MR perfusion and/or PET CT. The cause is not entirely clear but might be related to the higher sensitivity of the subependymal region to PBT resulting in an intense inflammatory reaction. Such a finding should be treated with caution and followed up with short interval imaging rather than surgery. Further studies are needed to investigate the mechanistic differences between PBT and other radiation therapies, regarding their propensity to affect the periventricular region.

CLINICAL RELEVANCE/APPLICATION

When seen, periventricular enhancement following PBT therapy in the post operative setting for glioma patients should be further evaluated with short interval follow up imaging as opposed to surgery.

M5B-SPNR-9 PREDICTING MOLECULAR TYPES OF ADULT-TYPE DIFFUSE GLIOMAS BASED ON MRI REPORTS WITH LARGE LANGUAGE MODELS

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Byung-Hoon Kim (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of large language models (LLMs) in predicting molecular types of adult-type diffuse gliomas according to the 2021 WHO classification using MRI radiology reports.

METHODS AND MATERIALS

This retrospective study included 2,201 patients diagnosed with adult-type diffuse gliomas (294 oligodendrogliomas, 300 IDH-mutant astrocytomas, and 1,608 IDH-wildtype glioblastomas) between July 2005 and March 2024 from four hospitals in Asia and Europe. Six different LLMs were assessed: GPT-4o-mini, GPT-4.1-mini, Llama 3.1 8b, Llama 3.1 70b, Qwen2.5 7b, and Deepseek-r1 8b. The performance of LLMs in classifying molecular types was compared based on the provision of relevant knowledge of glioma imaging findings (knowledge-based vs. naïve prompt). The impact of radiologists' subspecialization in neuro-oncology, report quality, length, and reporting language on LLMs' performance was also evaluated.

RESULTS

LLMs achieved significantly higher (naïve vs. knowledge-based; GPT-4o-mini, 76.6% vs. 78.3%, $P < 001$; Qwen2.5 7b, 75.9% vs. 79.5%, $P < .001$; deepseek-r1 8b, 66.0% vs. 73.2%, $P <.001$) or comparable accuracy (GPT-4.1-mini, 78.7% vs. 78.6%; Llama 3.1 70b, 78.0% vs. 78.1%) using knowledge-based prompt compared to naïve prompt, except for Llama 3.1 8b (65.4% vs. 44.6%, $P<.001$). Differences in accuracy were more pronounced in smaller size LLMs. Additionally, the accuracy was significantly higher with reports by neuro-oncology specialists and high-quality reports in all LLMs ($P<.001$).

CONCLUSION

LLMs may provide preoperative information on tumor types of adult-type diffuse gliomas from MRI reports by providing relevant knowledge in the prompt. Informative and descriptive reports could further enhance LLMs' performance.

CLINICAL RELEVANCE/APPLICATION

Our findings highlight the potential supportive role of large language models in predicting molecular types of gliomas, underscoring the importance of informative and descriptive reports in enhancing their performance.

M5B-SPNR-10 DISTINCT BRAIN ATROPHY PATTERNS IN LEWY BODY DISEASE: THE IMPACT AND INTERACTION OF COMORBID NEUROPATHOLOGIES REVEALED BY VOXEL-BASED MORPHOMETRY

Shohei Inui, MD, PhD (*Presenter*)
Keita Sakurai, MD, PhD (*Abstract Co-Author*)

Osamu Abe, MD, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the impact of neuropathological comorbidities—including Alzheimer's disease neuropathological change (AD-NC), TAR DNA-binding protein 43 (TDP-43), argyrophilic grain disease (AGD), and small vessel disease (SVD)—on brain atrophy patterns in Lewy body disease (LBD) patients using voxel-based morphometry (VBM).

METHODS AND MATERIALS

From 2013-2023, 34 patients diagnosed with LBD at autopsy underwent comprehensive neuropathological assessments using hematoxylin-eosin, Klüver-Barrera, and Gallyas-Braak staining methods. Immunohistochemical analyses included phosphorylated tau, ß-amyloid, phospho-TDP-43, and phosphorylated a-synuclein. Antemortem MRI scans (3D-T1WI, T2WI, susceptibility-weighted imaging) were obtained using a 1.5 T MRI system (MAGNETOM Aera®, Siemens). Small vessel disease was graded using a simple scoring system based on Fazekas scale, lacunar infarcts, and microbleeds (score range: 0-3). Voxel-wise correlations of gray matter (GM) atrophy with each neuropathological comorbidity were analyzed, adjusting for age, sex, MRI-to-death interval, intracranial volume, and SVD severity.

RESULTS

Neuropathological examination revealed co-occurring pathologies: AD-NC (n=11), TDP-43 (n=13), AGD (n=8), and MRI-identified SVD (n=25). VBM analyses demonstrated distinct atrophy patterns: AD-NC correlated significantly with extensive GM volume reductions in bilateral anterior, temporal, parietal lobes, and posterior cingulate; TDP-43 pathology correlated with focal atrophy in the right amygdala and hippocampus; AGD correlated with atrophy predominantly in bilateral temporal lobes, notably anterior temporal poles; SVD scores correlated with GM atrophy in anterior lobes, cerebellum, and temporal regions, distinctly sparing temporal regions typically involved in neurodegeneration.

CONCLUSION

This study demonstrates distinct atrophy patterns in LBD patients associated with specific neuropathological comorbidities. AD-NC is linked to widespread GM atrophy, while AGD and TDP-43 show more localized temporal lobe involvement. SVD-related atrophy differs notably, sparing typical neurodegeneration-related regions. Recognizing these patterns can enhance diagnostic accuracy and understanding of disease progression in LBD.

CLINICAL RELEVANCE/APPLICATION

Identifying characteristic MRI patterns associated with neuropathological comorbidities in LBD aids in early recognition, differential diagnosis, and tailored management, emphasizing the importance of comprehensive imaging and neuropathological evaluation.

M5B-SPNR-11 ALTERED CEREBROSPINAL FLUID DYNAMICS AND NEURAL RECOVERY IN POST-STROKE APHASIA: INSIGHTS FROM GBOLD-CSF COUPLING

Chao Zhang, MD (*Presenter*)
Hu HU Sr, MD (*Abstract Co-Author*)
Kai Xu, MD, PhD (*Abstract Co-Author*)

PURPOSE

To investigate whether rehabilitation in patients with post-stroke aphasia (PSA) enhances global blood-oxygen-level-dependent (gBOLD)-cerebrospinal fluid (CSF) coupling, a potential biomarker of glymphatic clearance, and to examine its association with language recovery.

METHODS AND MATERIALS

Twenty patients with PSA and thirty-five healthy controls (HCs) underwent multimodal MRI, including resting-state functional MRI and standardized language assessment using the Chinese version of the Western Aphasia Battery (WAB). Fourteen PSA patients completed both baseline and one-month post-treatment scans following a standardized speech-language therapy program. gBOLD signals were extracted from gray matter regions defined by the Harvard-Oxford cortical and subcortical atlases, and CSF signals were derived from the bottom fMRI slice adjacent to the cerebellum. A priori power analysis was conducted in MATLAB using Cohen's d to confirm adequate sample size. Group comparisons and linear regression analyses were performed to assess associations between imaging metrics and language performance.

RESULTS

Power analysis confirmed that the sample size was sufficient to achieve 80% power at a = 0.05. The gBOLD and CSF signals exhibited a characteristic negative peak with a lag of approximately +4 seconds, consistent with prior studies. WAB scores significantly improved in PSA patients after therapy ($P < 0.05$). Baseline gBOLD-CSF coupling was significantly reduced in PSA patients compared to HCs ($P < 0.01$), and showed significant improvement following rehabilitation ($P < 0.05$). Notably, baseline coupling strength predicted improvement in word fluency ($ß = -0.016$, $P = 0.0018$, $R^2 = 0.570$).

CONCLUSION

Rehabilitation enhances gBOLD-CSF coupling in PSA patients, indicating improved glymphatic function. This coupling may serve as a functional biomarker reflecting neurovascular and metabolic recovery following stroke.

CLINICAL RELEVANCE/APPLICATION

GBOLD-CSF coupling reflects dynamic interactions between cerebrospinal fluid and brain activity. It may provide a noninvasive marker for monitoring post-stroke recovery and evaluating the effectiveness of rehabilitation in patients with post-stroke aphasia.

M5B-SPNR-13 RADIOMICS PREDICTION OF MGMT PROMOTER METHYLATION IN ADULT DIFFUSE GLIOMAS: A COMBINATION OF STRUCTURAL MRI, DCE AND DTI

Zhengyang Zhu, MD (*Presenter*)
Huiquan Yang, PhD (*Abstract Co-Author*)
Mengying Xu, MD (*Abstract Co-Author*)
Xin Zhang (*Abstract Co-Author*)
Bing Zhang, PhD (*Abstract Co-Author*)

PURPOSE

To assess the predictive value of radiomics features extracted from Structural MRI, dynamic contrast enhanced (DCE), and diffusion tensor imaging (DTI) in detecting O6-methylguanine-DNA methyltransferase (MGMT) promoter methylation in patients with diffuse gliomas.

METHODS AND MATERIALS

Retrospective MRI data of 110 patients were enrolled in this study. The training dataset included 88 patients (mean age 52.84±14.71, 47 females). The test dataset included 22 patients (mean age 50.64±12.58, 12 females). A total of 2782 radiomic features were extracted from Structural MRI, DCE and DTI within two region of interests (ROIs). Feature section was conducted using Pearson correlation and least absolute shrinkage and selection operator. Principal component analysis was utilized for dimensionality reduction. Support vector machine was employed for model construction. Two radiologists with 1 year and 5 years of experience evaluated the MGMT status in the test dataset as a comparison with the models. The chi-square test and independent samples t-test were used for assessing the statistical differences in patients' clinical characteristics.

RESULTS

On the training dataset, the model Structural MRI + DCE achieved the highest AUC of 0.906. On the test dataset, the model Structural MRI + DCE + DTI achieved the highest AUC of 0.868, outperforming two radiologists.

CONCLUSION

The radiomics models have obtained promising performance in predicting MGMT promoter methylation status. Adding DCE and DTI features can provide extra information to structural MRI in detecting MGMT promoter methylation.

CLINICAL RELEVANCE/APPLICATION

This research may help radiologists evaluate the sensitivity to TMZ and prognosis of glioma patients.

M5B-SPNR-14 FRACTAL ANALYSIS OF MRI-BASED INTRATUMOR AND PERITUMORAL EDEMA IN PREDICTING RECURRENCE/PROGRESSION IN HIGH-GRADE MENINGIOMAS

Xianwang Liu, MD (*Presenter*)

PURPOSE

To investigate the feasibility of fractal analysis of MRI-based intratumor and peritumoral edema in predicting recurrence/progression in high-grade meningiomas.

METHODS AND MATERIALS

We retrospectively analyzed 65 patients with pathologically confirmed high-grade meningiomas. According to the follow-up results, they were divided into a recurrence/progression group (n=20, P/R) and a non-recurrence/progression group (n=45, nP/R). Fractal features (fractal dimension and lacunarity) were extracted from the intratumor, peritumoral edema, and the whole tumor (intratumor+peritumoral edema), respectively. Fractal features were recorded and compared between the two groups. Diagnostic performance was identified by the receiver operating characteristic curves.

RESULTS

P/R exhibits higher fractal dimension and lacunarity of the intratumor, peritumoral edema, and the whole tumor, compared to nP/R (all $p<0.05$). The fractal dimension of the whole tumor showed the highest AUC of 0.820 among all the fractal parameters. The combined variable integrating fractal features from intratumor and peritumoral edema yielded optimal diagnostic performance with an AUC of 0.877.

CONCLUSION

Fractal analysis of MRI-based intratumor and peritumoral edema is a promising potential biomarker, which may be helpful in noninvasive predicting the recurrence/progression in high-grade meningiomas.

CLINICAL RELEVANCE/APPLICATION

Accurate prediction of recurrence/progression in high-grade meningiomas holds significant clinical value. Fractal analysis of MRI-derived intratumoral and peritumoral edema features provides quantitative characterization of these aggressive tumors. The combined fractal signature integrating both regions demonstrated optimal diagnostic performance.

M5B-SPNR-15 MRI-BASED RADIOMICS COMBINED WITH ELASTIC MODULUS FOR PREOPERATIVE PREDICTION OF MENINGIOMA CONSISTENCY: A PILOT STUDY

Chaoyang Wang (*Presenter*)
Jianguo Xu (*Abstract Co-Author*)

PURPOSE

Meningioma is the most common primary intracranial tumor, often treated surgically. Recent studies have shown that tumor consistency affects resection extent, surgical planning, and morbidity risk. Several studies have attempted preoperative prediction using imaging, but definitions of consistency were inconsistent and often based on subjective or semi-quantitative criteria. This lack of an objective standard limits generalizability. We propose using elastic modulus (EM), a physical parameter reflecting tissue stiffness, as an objective reference. EM has been applied in assessing normal tissues and tumors. This study aims to develop a radiomics model to preoperatively predict meningioma consistency using EM.

METHODS AND MATERIALS

This retrospective study included 98 patients with pathologically confirmed meningioma. The excised tumors were tested using a tensile tester to calculate the elastic modulus (EM); tumors were then classified into low EM (<10 kPa) and high EM (=10 kPa) groups. Patients were randomly divided into training (n=68) and testing (n=30) cohorts.Contrast-enhanced T1-weighted MRI scans were reviewed by a neurosurgeon and a radiologist. Regions of interest (ROIs) were manually segmented on each slice using 3D Slicer. To reduce inter-scanner variability, N4ITK bias correction and histogram matching were applied. Radiomics features were extracted using PyRadiomics. Features with an intraclass correlation coefficient (ICC) <0.75 were excluded. The remaining features were z-score standardized.Predicting models were developed using logistic regression, random forest, and support vector machine. Model performance was assessed using AUC, sensitivity, specificity, PPV, NPV, and accuracy. Decision curve analysis was conducted to evaluate clinical utility.

RESULTS

In total, 851 radiomics features were extracted from each lesion, and three features were considered important. The SVM demonstrated the best performance, with an AUC of 0.850 (95% CI: 0.753-0.947) and accuracy of 0.765 in the training cohort, and AUC of 0.804 (95% CI: 0.628-0.980) and accuracy of 0.800 in the testing cohort. The DCA also showed SVM model has potential clinical utility.

CONCLUSION

MRI-based radiomics models may provide good performance for preoperatively predicting the consistency of meningioma based on elastic modulus.

CLINICAL RELEVANCE/APPLICATION

This study provides an objective, imaging-based method to predict meningioma stiffness, potentially improving the precision and safety of tumor resection.

M5B-SPNR-16 MRI-BASED DEEP LEARNING FOR PATHOLOGY PREDICTION IN ADULT-TYPE DIFFUSE GLIOMA

Yangyang Li (*Presenter*)
Xiaoming Hong (*Abstract Co-Author*)
Zhizheng Zhuo (*Abstract Co-Author*)
Renlong Zhang (*Abstract Co-Author*)
Yaou Liu, MD,PhD (*Abstract Co-Author*)

PURPOSE

Pathology evaluation of adult diffuse gliomas (ADGs) is crucial for tumor classification and treatment planning, which typically requires tissue obtained through invasive biopsy. A comprehensive consensus is still lacking on whether MRI-based deep learning can predict the pathology of ADGs and how well it performs. In this study, we

aimed to develop an MRI-based molecular neuropathology system (MRI-MNP) to predict two histological features— WHO grading and Ki-67 proliferation — as well as nine molecular pathological biomarkers, including IDH, 1p/19q, ATRX, CDKN2A/B, TERT, +7/-10, EGFR, TP53 and MGMT.

METHODS AND MATERIALS

We collected T1-weighted (T1w), T2-weighted (T2w), fluid attenuated inversion recovery (FLAIR), and T1 contrast enhanced (T1ce) images, with clinical data from 11,513 ADG patients across 20 datasets of 29 medical centers. These MR images (2D, 2.5D or 3D), with tumor masks, positional vectors, radiomics features, and demographics data were fed into deep learning models to predict histopathological and molecular features. We usd different network architectures, with different input compositions, and pretrained weights. Finally, we presented the MRI-MNP outputs in a structured report format as a clinical reference, and evaluated the performance in facilitating clinical neuroradiologists diagnosis.

RESULTS

Based on area under the curve (AUC), we revealed that WHO grade IV (AUC 0.852), Ki-67 proliferation (AUC 0.823), IDH mutation (AUC 0.825), 1p/19q codeletion (AUC 0.819), and +7/-10 alteration (AUC 0.805) can be effectively predicted. WHO Grading II/III/IV (AUC 0.754), CDKN2A/B homozygous deletion (AUC 0.773), and TERT promoter mutation (AUC 0.715), EGFR amplification (AUC 0.713) can be moderately predicted. In contrast, ATRX mutation, MGMT promoter methylation, and TP53 mutation can be poorly predicted (AUC<0.6). We developed a structured report to support clinical translation. With the assistance of MRI-MNP, neuroradiologists' diagnostic performance in tumor classification and pathological features improves. The ViT model utilizing 2.5D input with pretrained weights achieved the highest AUC among all architectures evaluated.

CONCLUSION

This is the first international multicenter study to develop a multimodal MRI-based system for comprehensive prediction of histopathological and molecular features in ADGs.

CLINICAL RELEVANCE/APPLICATION

MRI-MNP offers a viable alternative to traditional tissue biopsy, reducing patient risk, lowering healthcare costs, and conserving medical resources. It outputs structured reports that can be integrated into clinical practice, and significantly enhance the diagnostic performance of neuroradiologists.

M5B-SPNR-17 DIFFERENTIATING TUMOR RECURRENCE AND PSEUDOPROGRESSION IN POSTOPERATIVE GLIOMAS USING PSEUDO-CONTINUOUS ARTERIAL SPIN LABELING (PCASL) TECHNIQUE

Peiquan Liu (*Presenter*)
Yujie Chen (*Abstract Co-Author*)
Ning Zheng (*Abstract Co-Author*)
Jiaxuan Zhang (*Abstract Co-Author*)
Zhu Wenzhen, MD, PHD (*Abstract Co-Author*)

PURPOSE

To assess whether the pCASL technique and its radiomics features can enhance the differentiation between Tumor Recurrence(TR) and Pseudoprogression(PsP) in postoperative glioma patients.

METHODS AND MATERIALS

This retrospective study collected MRI data (T1WI, T2WI, T2flair, T1WI+C, pCASL) and clinical information from 123 glioma patients (WHO CNS5 grades 2-4) treated at Tongji Hospital, Wuhan. 97 patients were selected based on new/enlarged enhancing lesions post-radiotherapy/chemotherapy and good image quality. Among them, 56 had recurrence, and 41 had PsP confirmed by surgery or follow-up. PsP was defined as stable or regressing enhancing lesions over 6 months, while TR was defined as lesion progression with clinical worsening or confirmed recurrence. pCASL images were processed for CBF mapping, followed by normalization. The largest lesions were outlined, and ROI mean values calculated. Statistical analysis included Mann-Whitney U test and ROC curve analysis. Radiomics features were extracted from CBF maps, with ICC < 0.75 features excluded. Lasso was used for further feature selection. Machine learning models (SVM, logistic regression, random forest, Gaussian Naive Bayes) were developed and validated.

RESULTS

No statistically significant differences were found between the TR and PsP groups in terms of age, gender, and WHO classification in both the internal comparison within the training and independent testing sets, as well as in the separate comparisons between the two groups. The Mann-Whitney U test showed a significant difference in mean CBF values between TR and PsP groups (P < 0.001). ROC analysis revealed an AUC of 0.859 (95% CI: 0.778-0.927), sensitivity of 0.839, specificity of 0.829, PPV of 0.870, and NPV of 0.791(Figure 4_A-B). Following selection, 7 features were retained. Among the four machine learning models tested, the logistic regression yielded the best performance with an AUC of 0.946, sensitivity of 0.812, specificity of 0.857, PPV of 0.867, and NPV of 0.800 (Figure 4_C-D).

CONCLUSION

pCASL and its radiomics model accurately differentiate TR and PsP in postoperative glioma patients, with CBF as a key distinguishing parameter for prognosis.

CLINICAL RELEVANCE/APPLICATION

Postoperative differentiation of high-grade glioma recurrence and pseudoprogression is of significant clinical importance for patient management. Measuring rCBF using PCASL technique can provide valuable insights in this regard.

M5B-SPNR-18 PREDICTION OF DIFFERENT ETIOLOGICAL SUBTYPES OF ACUTE ISCHEMIC STROKE USING A COMBINED MRI BASED RADIOMICS AND CLINICAL MODEL

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Tuxunjiang Pahati (*Abstract Co-Author*)
Yunling Wang (*Abstract Co-Author*)

PURPOSE

To investigate the application value of a combined model integrating MRI-based radiomics and multiparameter features in the subtype classification.of acute ischemic stroke(AIS)between small artery occusion(SAO)and cradioembolism(CE)

METHODS AND MATERIALS

A retrospective study was conducted on 731 AIS patients admitted to the neurology department of a hospital from April 2023 to April 2024, with MRI diffusion-weighted imaging (DWI) performed. After applying inclusion and exclusion criteria, 384 patients were enrolled and randomly divided into a training set (n=268) and a test set (n=116) at a 7:3 ratio. Differences in clinical and imaging features between the two groups were analyzed. MRI-DWI images were segmented using ITK-SNAP software to delineate hyperintense infarct regions. Radiomics feature extraction and dimensionality reduction were performed to identify optimal features associated with AIS subtypes. Z-score normalization was applied for standardization. Three models were constructed: a clinical model, a radiomics model, and a combined clinical-radiomics model. Receiver operating characteristic (ROC) curves and area under the curve (AUC) were used to evaluate model performance in distinguishing SAO and CE subtypes

RESULTS

The radiomics model achieved an AUC of 0.9268 in the training set and 0.8786 in the test set. The clinical model yielded AUCs of 0.9186 (training) and 0.8483 (test). The combined clinical-radiomics model demonstrated superior performance, with AUCs of 0.9919 (training) and 0.909 (test). Statistically significant differences in AUC were observed among the models (P<0.05).

CONCLUSION

The combined model integrating DWI-based radiomics and clinical features effectively predicts SAO and CE subtypes of AIS, providing accurate and quantifiable objective evidence to support clinical decision-making

CLINICAL RELEVANCE/APPLICATION

The integration of clinical and radiomics models provide an automated solution for clinicians to implement etiologic staging diagnosis, and provide a reference value for patient prognosis and good medical decision-making, which can help clinicians choose appropriate diagnostic and management methods.

M5B-SPNR-19 INVESTIGATING GLYMPHATIC FUNCTION IN HIV USING RESTING-STATE FMRI: ASSOCIATIONS WITH COGNITION AND IMMUNOLOGICAL STATUS

Ke Xue (*Presenter*)
Fei Shan (*Abstract Co-Author*)
Yuxin Shi, PhD (*Abstract Co-Author*)
Zhiyong Zhang (*Abstract Co-Author*)
Yi Zhan, MD (*Abstract Co-Author*)

PURPOSE

To investigate glymphatic dysfunction in people living with HIV (PLWH) and its associations with immunological status and cognitive function, utilizing the coupling strength of global blood-oxygen-level-dependent (gBOLD) and cerebrospinal fluid (CSF) inflow signals as a non-invasive marker

METHODS AND MATERIALS

Seventy-five PLWH and 52 healthy controls (HCs) underwent a battery of neuropsychological tests, MoCA test and resting-state functional magnetic resonance imaging (rs-fMRI) to assess cognitive function and gBOLD-CSF coupling. Data of CD4 counts were collected. Demographic information and neuropsychological performance between PLWH and HCs were compared. A general linear model assessed group differences in gBOLD-CSF coupling strength, adjusting for age, sex, and education. Partial correlation analyses were performed to examine the associations of neurological tests and clinical data with gBOLD-CSF coupling, controlling for age, sex, and education. Multivariate regression analysis was utilized to further evaluate the associations of gBOLD-CSF coupling with cognition.

RESULTS

PLWH exhibited significantly weaker gBOLD-CSF coupling than HCs ($p = 0.018$) and revealed impairments in attention/working memory, speed of information processing, and abstract/executive function (all $p<0.05$). Importantly, the reduced strength of gBOLD-CSF coupling was associated with deficits in MoCA scores ($r=-0.332$, $p=0.004$), verbal fluency ($r=0.245$, $p=0.038$), attention/working memory ($r=0.240$, $p=0.042$), speed of information processing ($r=0.245$, $p=0.038$), and abstract/executive function ($r=0.241$, $p=0.042$) in PLWH, while no significant associations were observed in HCs (all $p>0.05$). Multivariate regression analysis showed gBOLD-CSF coupling was the sole independent predictor for speed of information processing (ß=0.410, $p=0.031$) and MoCA scores (ß=-0.399, $p=0.037$). Weaker gBOLD-CSF coupling was correlated with lower nadir and current CD4 counts ($r=-0.379$, $p=0.019$; $r=-0.321$, $p=0.049$, respectively).

CONCLUSION

Reduced gBOLD-CSF coupling in PLWH suggests glymphatic dysfunction and was correlated with cognitive performance and HIV-related immunological status, underscoring its potential as a biomarker for cognitive disturbances in HIV.

CLINICAL RELEVANCE/APPLICATION

gBOLD-CSF coupling could serve as a useful tool for monitoring glymphatic dysfunction in PLWH, offering potential as a biomarker for cognitive impairment and immune suppression.

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M5B-SPOB

OB/Gynecology Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPOB-1 DEVELOPING INTERPRETABLE MACHINE LEARNING MODEL FOR DIFFERENTIATING UTERINE SARCOMA AND ATYPICAL LEIOMYOMA USING MRI AND RADIOMICS FEATURES

Zhong Yang (*Presenter*)
Chao Wei (*Abstract Co-Author*)

PURPOSE

This study aims to develop interpretable machine learning (ML) models based on magnetic resonance imaging (MRI) and radiomics features for differentiating uterine sarcoma (US) and atypical leiomyoma (ALM) preoperatively.

METHODS AND MATERIALS

This retrospective study enrolled 47 patients with US and 113 patients with ALM, who were randomly allocated into training (n=112) and test (n=48) cohorts. Two independent radiologists assessed 10 MRI features derived from pelvic MRI examinations. Radiomic features were extracted from axial T2-weighted imaging (T2WI) and axial diffusion-weighted imaging (DWI) sequences. Univariable and multivariable logistic regression analyses were performed to identify statistically significant MRI features. The least absolute shrinkage and selection operator (LASSO) regression was implemented to select optimal radiomic features, and the radiomic score (radscore) was calculated via linear combination of selected features. Five ML models were constructed by integrating significant MRI features and radscore. Receiver operating characteristic (ROC) curves were generated to evaluate model performance, with predictive efficacy quantified by the area under the curve (AUC). Decision-curve and calibration-curve analyses assessed clinical utility, while the SHapley Additive exPlanation (SHAP) was applied to interpret the optimal model, enhancing transparency in feature contribution.

RESULTS

The selected MRI features comprised signal intensity on T2WI, border, uterine endometrial cavity, and apparent diffusion coefficient (ADC) value. Four radiomic features were ultimately selected to compute the radscore. These features and radscore were utilized to construct five ML models: Logistic regression (LR), Random forest (RF), Extreme gradient boosting (XGBoost), Support vector machine (SVM), and Gaussian Naive Bayes (GNB). The XGBoost model demonstrated superior performance in both the training cohort (AUC: 0.991; 95% CI: 0.978-1.000) and test cohort (AUC: 0.909; 95% CI: 0.822-0.995). Decision-curve and calibration-curve analyses further validated the model's clinical applicability. The SHAP analysis elucidated the XGBoost model's prediction process at both local and global scales, identifying the ADC value as the most discriminative feature for distinguishing US from ALM.

CONCLUSION

Interpretable ML models integrating MRI and radiomic features demonstrated robust predictive efficacy in distinguishing US from ALM.

CLINICAL RELEVANCE/APPLICATION

These models assist clinicians in devising precise, personalized therapeutic strategies while offering transparent insights into individual feature contributions via SHAP, thereby enhancing clinical decision-making transparency.

M5B-SPOB-3 IDENTIFYING INTIMATE PARTNER VIOLENCE THROUGH OBSTETRIC AND GYNAECOLOGIC IMAGING: A RETROSPECTIVE CASE-CONTROL STUDY

Saurabh Pallod, MD,DMRD (*Presenter*)
Bharti Khurana, MD, MBA (*Abstract Co-Author*)

PURPOSE

To investigate whether distinct patterns of obstetric and gynecologic (OB/GYN) findings on imaging are associated with a history of intimate partner violence (IPV), and to explore how these patterns can inform early identification, clinical decision-making, and referral pathways.

METHODS AND MATERIALS

This retrospective case-control study included 341 patients (cases) reporting IPV and 921 control patients who never reported IPV, with 9,091 OB/GYN imaging reports analyzed over 29,828 person-years. Demographics, imaging frequency, and complication rates were compared using linear regression and overall chi-square test adjusted for age and race. OB/GYN imaging utilization and findings were compared.

RESULTS

Cases underwent significantly more OB/GYN imaging (median 7 vs. 3 studies; $p<0.0001$), with markedly higher ultrasound utilization (445.3 vs. 247.8 studies per 1,000 person-years; IRR 1.72, 95% CI 1.64-1.80, $p<0.0001$). Cases also showed significantly higher obstetric complications, including subchorionic hematoma (IRR 3.57, 95% CI 2.32-5.52, $p <0.0001$), oligohydramnios (IRR 3.33, 95% CI 1.98-5.61, $p <0.0001$), intrauterine growth restriction (IUGR) (IRR 2.66, 95% CI 1.61-4.38, $p =0.0001$), retained products of conception (IRR 2.11, 95% CI 1.13-3.95, $p =0.02$), and failed pregnancies (IRR 1.54, 95% CI 1.03-2.31, $p =0.035$). Among gynecologic conditions, ectopic pregnancy was more frequent in the cases (IRR 1.80, 95% CI 0.76-4.24, $p =0.18$), while tubo-ovarian abscess (TOA) showed a higher but borderline-significant increase (IRR 3.13, 95% CI 0.81-12.08, $p =0.1$), though nothing came close to significant. No significant differences were observed in major gynecologic trauma such as pelvic fractures or vaginal injuries.

CONCLUSION

Women with a history of IPV demonstrate a significantly increased incidence of obstetric complications on imaging, especially subchorionic hematoma, oligohydramnios, IUGR, and retained products of conception. In the absence of other clear etiologies, these imaging patterns may serve as early radiologic indicators of IPV.

CLINICAL RELEVANCE/APPLICATION

Radiologists should recognize that certain Obstetric imaging findings occur more frequently in patients with a history of IPV. Integrating this awareness into radiological interpretation may support early IPV detection and facilitate timely intervention.

M5B-SPOB-4 BETTER ALGORITHM IN THE DIFFERENTIAL DIAGNOSIS OF ATYPICAL UTERINE LEIOMYOMA VS LEIOMYOSARCOMA: AN ADDED VALUE FOR RADIOLOGISTS WITH DIFFERENT EXPERIENCE?

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Gregorio Chierchia, MD (*Abstract Co-Author*)
Constanze Husen, MD (*Abstract Co-Author*)
Pietro A. Bonaffini, MD (*Abstract Co-Author*)
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Sandro Sironi, MD (*Abstract Co-Author*)

PURPOSE

To evaluate whether the BETTER algorithm proposed by J. Smith et al. can help relatively inexperienced radiologists in the differential diagnosis between atypical uterine leiomyomas and uterine leiomyosarcomas at preoperative MRI investigation.

METHODS AND MATERIALS

Patients who underwent preoperative 1.5T or 3T pelvic MRI due to ultrasound suspicion of atypical uterine leiomyoma vs leiomyosarcoma were retrospectively included. MRI images were independently evaluated by three observers: (1) a radiologist specialized in gynecologic imaging with three years of experience; (2) a radiology resident with two years of experience in pelvic MRI; and (3) a radiology resident at the initial stage of training in pelvic MRI. Each observer independently assessed the images following the checklist of the BETTER algorithm: B (irregular Border), E (heterogeneous Enhancement), T1 (presence of hemorrhage on T1-WI), T2 (areas of hypointensity on T2-WI), E (Endometrial involvement), and R (Restricted diffusion on DWI/ADC). The presence of two or more criteria was considered indicative of suspicion for uterine sarcoma. Interobserver agreement regarding the diagnostic suspicion of sarcoma vs. atypical leiomyoma, and the evaluation of each BETTER parameter was assessed using Cohen's Kappa.

RESULTS

Eleven patients (mean age: 50 years) were included. Histopathological analysis following hysterectomy, considered the gold standard, revealed uterine leiomyosarcoma in 2/11 patients, smooth muscle tumor of uncertain malignant potential (STUMP) in 1/11 patient, and benign leiomyoma in 8/11 patients. Interobserver agreement in suspecting atypical leiomyoma vs leiomyosarcoma was moderate between Observer 1 and Observer 2, and fair between Observer 1 and Observer 3. The imaging parameters most frequently misinterpreted as suspicious by Observer 3, in comparison to Observers 1 and 2, were: T2, due to signal inhomogeneity on T2-weighted images; and R, related to the evaluation of restricted diffusion on DWI and corresponding hypointense areas on ADC maps.

CONCLUSION

Application of the BETTER algorithm in the evaluation of MRI images may allow identification of suspicious criteria for leiomyosarcoma vs atypical leiomyoma particularly for less experienced radiologists. However, specific parameters remain challenging to interpret for less experienced readers, underscoring the need for targeted training in these areas.

CLINICAL RELEVANCE/APPLICATION

The BETTER algorithm provides a structured approach for differentiating atypical uterine leiomyomas from leiomyosarcomas on preoperative MRI, though certain parameters remain challenging to interpret reliably, particularly to radiologists with limited experience in pelvic imaging.

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M5B-SPPD

Pediatric Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPPD-4 INCREASED RISK OF NEURODEVELOPMENTAL IMPAIRMENT ASSOCIATED WITH REDUCED BRAIN VOLUME AT TERM-EQUIVALENT AGE IN PRETERM INFANTS WITH GERMINAL MATRIX HEMORRHAGE

Chanyoung Rhee, MD (*Presenter*)
Jae-Yeon Hwang, MD (*Abstract Co-Author*)
Young Hun Choi, MD, PhD (*Abstract Co-Author*)
Sun Won Park, MD, PhD (*Abstract Co-Author*)

PURPOSE

Germinal matrix hemorrhage (GMH) is common in preterm infants and affects neurodevelopment, especially in high-grade intraventricular hemorrhage (IVH). However, the effects of low-grade GM-IVH on brain volume and neurodevelopment remain unclear. This study aimed to investigate the effect of low-grade GM-IVH on supratentorial and white matter volumes at term-equivalent age and their association with neurodevelopmental impairment (NDI) in preterm infants.

METHODS AND MATERIALS

This retrospective study included preterm infants (gestational age < 37 weeks) who underwent three-dimensional T1-weighted brain magnetic resonance imaging at 34-50 weeks' postmenstrual age from December 2020 to August 2024. The preterm infants were categorized into the control, GMH (Papile grades 1-2), punctate white matter lesion (PWML), or other severe condition (Papile grades 3-4 or other major anomalies) groups. A U-Net-based algorithm was used to automatically segment supratentorial and white matter volumes. NDI was defined as a motor score = 85 or cognitive and language scores both = 85 on the Bayley-III. Standardized residuals were calculated to assess volume deviation from the reference (control group) and compared according to low-grade GM-IVH and NDI status. Two-way ANOVA with Tukey's post hoc test was used to compare standardized residuals across the subgroups.

RESULTS

We included 203 infants (102 girls; gestational age: 28.46 ± 2.90 weeks, postmenstrual age: 38.22 ± 2.84 weeks), with 120 in the control, 42 in the GMH, and 11 in the PWML group. The other infants had severe conditions. Supratentorial volume growth was lower in the GMH ($P = 0.02$) and PWML ($P = 0.07$) groups than in the control group. Standardized residuals of supratentorial and white matter volumes showed that low-grade GM-IVH with volume reduction was associated with a higher risk of NDI. In the GMH group, significant differences were observed between the NDI and non-NDI subgroups for supratentorial volume (NDI, -1.12 ± 0.58; non-NDI, 0.35 ± 0.69; $P < 0.001$) and white matter volume (NDI, -0.95 ± 0.68; non-NDI, 0.29 ± 0.92; $P < 0.001$). In contrast, no significant differences were found in the control group for supratentorial volume (NDI, 0.14 ± 1.21; non-NDI, 0.11 ± 0.95; $P = 0.95$) or white matter volume (NDI, 0.49 ± 1.31, non-NDI, 0.17 ± 0.94; $P = 0.57$).

CONCLUSION

Low-grade GM-IVH with reduced supratentorial or white matter volume is associated with an increased risk of NDI in preterm infants.

CLINICAL RELEVANCE/APPLICATION

Deep learning-based volumetric analysis can identify preterm infants with low-grade GM-IVH at risk of NDI, enabling closer monitoring and early intervention.

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M5B-SPPH

Physics Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPPH-3 AI-DRIVEN AUTOMATED QUANTIFICATION OF BONE LESION BURDEN IN SYSTEMIC CANCER: A MULTI-PARAMETRIC WB-MRI TOOL FOR FAST AND REPRODUCIBLE TDV AND ADC MEASUREMENTS USING DIXON AND DWI SEQUENCES

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Matthew Blackledge, MSc, PhD (*Abstract Co-Author*)
Richard P. Holbrey, PhD (*Abstract Co-Author*)
Alina D. Dragan, MRCS,FRCR (*Abstract Co-Author*)
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PURPOSE

WB-MRI demonstrates high sensitivity in detecting malignant bone lesions, which show low relative fat fraction (rFF) on T1w Dixon and high signal on high b-value (b=900 s/mm 2 , b900) DWI. DWI can also be used to quantify two response biomarkers: (i) Apparent Diffusion Coefficient (ADC), which inversely correlates with tumour cellularity, and (ii) Total Diffusion Volume (TDV, in millilitres). We developed an AI-driven algorithm to delineate suspected bone lesions and quantify ADC and TDV from WB-MRI scans within 90 sec using T1w Dixon and DWI images as inputs.

METHODS AND MATERIALS

A previously developed weakly supervised Residual U-Net (ResU-Net) model generates a skeleton probability map and spinal cord mask from calculated b0 and ADC images to (i) isolate bone from image background and (ii) compute a signal-normalised b900 image to reduce inter-patient signal variability. Skeleton map, signal-normalised b900, and calculated ADC and rFF maps are input to a multi-channel ResU-Net with multi-head dilated encoders. This architecture helps mitigate false positives from T2 shine-through and Dixon-DWI lesions misalignment due to EPI-induced geometric distortion. The resulting lesion mask is applied to the ADC map to extract ADC statistics and TDV. The model was developed using an IRB-approved retrospective dataset of patients with Advanced Prostate Cancer (APC, 110/13 training/testing) and Multiple Myeloma (MM, 90/12 training/testing). Ground-truth manual lesion delineations were performed by experienced radiologists.

RESULTS

The multi-channel model showed good agreement with expert manual delineations of malignant bone lesions across test cases. Dice score, precision, and recall averaged 0.65/0.66/0.71, respectively, with a mean surface distance below 5mm. Relative differences in median ADC and log-transformed TDV were below 3% and 6%, respectively. Delineation accuracy improved in patients with extensive disease burden. Compared to a DWI-only model, our approach improved dice score by 25% and reduced TDV error by 33% relative to expert annotations.

CONCLUSION

This pilot study demonstrates the performance of a new AI-driven algorithm combining Dixon and DWI sequences to automatically delineate suspected bone lesions and quantify ADC and TDV, showing good concordance with radiologists. This solution could support a shift toward a quantitative paradigm for staging and treatment response assessment, potentially improving clinical decision-making for APC and MM patients.

CLINICAL RELEVANCE/APPLICATION

Our AI-driven algorithm automatically processes WB-MRI to provide fast, reproducible ADC and TDV measurements from delineated bone lesion masks, potentially supporting clinical decision-making in patients with systemic cancer.

M5B-SPPH-4 MOBILE HEADCT NOISE REDUCTION USING IMPLICIT IMAGE-TO-IMAGE SCHRöDINGER BRIDGE

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Rajiv Gupta, PhD, MD (*Abstract Co-Author*)
Dufan Wu, PhD (*Abstract Co-Author*)

PURPOSE

Mobile head computed tomography (CT) needs to tackle high noise levels due to hardware constraints including limited radiation and motions. To address this, we proposed a generative AI model for noise reduction based on Implicit Image-to-Image Schrodinger Bridge (I3SB).

METHODS AND MATERIALS

I3SB is the state-of-the-art diffusion model for image restoration, which builds an accelerated Schrodinger Bridge between the noisy and clean images. Physics-based simulated noise was added 92 brain CT volumes acquired with fixed CT scanners and a 2D I3SB model was trained to map noisy images to clean ones. In evaluation, the trained model was first evaluated on 20 brain CT volumes with simulated noise and then applied to 19 brain CTs acquired with a mobile CT scanner. One radiologist and two image specialists independently assessed each volume before and after noise reduction and scored the image quality regarding six different brain structures on a scale from -2 to +2.

RESULTS

I3SB took 8 seconds per slice for inference on an A100 and demonstrated significant noise reduction. In the evaluation of 20 CT scans with simulated noise, the model improved RMSE from 8.34±1.38 HU to 3.59±1.11 HU and SSIM from 0.88±0.04 to 0.92±0.02. In the evaluation of mobile CT scans, the denoised images achieved equal or better scores than the original CT images across all 19 cases and all six evaluation criteria, based on the average scores of three readers. For Reader 1, the average scores for the six criteria—cerebrum, cerebellum, gray/white matter separation, ventricles, CSF, and overall quality—were +1.47, +1.05, +1.26, +1.21, +1.26, and +1.26, respectively. Reader 2 reported average scores of +1.42, +1.21, +1.05, +1.05, +1.32, and +1.21. Reader 3 reported average scores of +0.89, +0.89, +1.00, +0.89, +1.00, and +0.79. Importantly, gray/white matter differentiation, a common limitation in mobile CT due to reduced dose, was consistently improved across all readers.

CONCLUSION

The I³SB framework demonstrates substantial noise suppression and consistent reader score improvement for mobile brain CT imaging.

CLINICAL RELEVANCE/APPLICATION

High levels of image noise remain a major challenge in portable brain CT imaging due to low-dose acquisition and hardware limitations. Our proposed approach significantly reduces noise, thereby improving image clarity and enhancing the diagnostic utility of portable brain CT.

M5B-SPPH-5 PATIENT-SPECIFIC POST TRIGGER TIMING PROTOCOL FOR IMPROVED CONTRAST ENHANCEMENT IN CT PULMONARY ANGIOGRAPHY

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Alireza Shojazadeh, MD (*Abstract Co-Author*)
Neda Ziaei (*Abstract Co-Author*)
Lynn Duong (*Abstract Co-Author*)
Justin Truong (*Abstract Co-Author*)
Dale Black, BS (*Abstract Co-Author*)
Katherine Hyde, BS (*Abstract Co-Author*)
Liqiang Ren, PhD (*Abstract Co-Author*)
Cecelia Brewington, MD (*Abstract Co-Author*)
Sabee Y. Molloi, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate a patient-specific post-trigger delay (PTD) protocol estimating peak contrast enhancement timing in the main pulmonary artery (MPA) and all lobar branches during CT pulmonary angiography (CTPA).

METHODS AND MATERIALS

Thirty-nine patients with suspected lung lesions underwent CT perfusion imaging every 2 seconds for 28 seconds after receiving 40-50 mL of Isovue 370 and 20 mL saline chaser at 5 mL/s. Contrast enhancement curves (CEC) were generated using a gamma variate function to measure peak contrast enhancement (CE), contrast-to-noise ratio (CNR), and time to peak enhancement for the MPA and all lobar branches. CECs were then used to simulate peak CE and CNR for the patient-specific (PS) and fixed-delay protocols (4-7 seconds). We used the hypothesis that the PTD timing correlates directly with contrast injection duration, with the MPA peak CE occurring at half the injection time plus a 1-second dispersion constant. Statistical significance between protocols was tested using Friedman's test with post-hoc Wilcoxon signed-rank comparisons.

RESULTS

The patient-specific PTD demonstrated the smallest difference from the reference for both CE and CNR for all the measurements. For the MPA the CE differences (reference - PS) were -10.55, -63.43, -13.61, -36.69, and -113.85 and corresponding CNR differences were -0.19, -1.14, -0.24, -0.68, and -2.11 (PS, 4s, 5s, 6s, and 7s), respectively. For the left lower lobe, the CE differences were -14.68, -78.17, -17.45, -32.03, and -109.72 and CNR differences were -0.27, -1.41, -0.32, -0.61, and -1.98. For the left upper lobe, the CE differences were -14.09, - 80.52, -16.6, -30.65, and -101.78 and CNR errors were -0.25, -1.48, -0.29, -0.50, and -1.81. The right lower lobe had CE differences of -17.22, -90.21, -19.82, -28.57, and -101.74 and CNR errors of -0.31, -1.66, -0.35, -0.53, and -1.92. The right middle lobe CE differences were -14.35, -90.29, -17.09, -22.03, and -91.14 and CNR differences were -0.26, -1.72, -0.31, -0.39, and -1.68. The right upper lobe CE differences were -9.91, -87.34, -12.26, -18.29, and -86.56 and CNR differences were -0.18, -1.62, -0.22, -0.33, and -1.56. Statistically significant differences were observed between the PS and 4,6, and 7 second fixed-delay protocols ($p < 0.05$), with no significant differences observed between the PS and 5s protocol.

CONCLUSION

This study demonstrates that a patient-specific PTD protocol accurately captures peak contrast enhancement and improves visualization of pulmonary arteries at peak contrast, with potential clinical benefit through enhanced CNR.

CLINICAL RELEVANCE/APPLICATION

The proposed protocol overcomes limitations of test bolus and bolus tracking by using patient-specific timing, improving CTPA consistency and diagnostic accuracy.

M5B-SPPH-6 GLOBAL TUBE CURRENT MODULATION CONFIGURATIONS: A COMPARATIVE STUDY BETWEEN PHOTON-COUNTING AND ENERGY-INTEGRATING CT IN ONCOLOGICAL CLINICAL SETTING

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Ke Li, PhD (*Abstract Co-Author*)
Frank Dong, PhD (*Abstract Co-Author*)
Corey T. Jensen, MD (*Abstract Co-Author*)
Xiujiang J. Rong, PhD (*Abstract Co-Author*)
Megan C. Jacobsen, PhD (*Abstract Co-Author*)
Xinming Liu, PhD (*Abstract Co-Author*)

PURPOSE

Siemens CT tube current modulation (CAREDose4D) global implementation can be specified at 5 possible levels for different patient sizes and anatomical regions. The purpose of this study is to compare the x-ray output (CTDI vol) and reconstructed image noise power spectrum (NPS) in a diameter-varying phantom imaged with a Siemens photon-counting detector (PCD) CT and energy-integrating detector (EID) CT.

METHODS AND MATERIALS

A Sun Nuclear Mercury 4.0 phantom was first imaged using a customized abdomen protocol on a NAEOTOM Alpha PCD-CT. Data was acquired in helical mode from largest to smallest diameter regions [water-equivalent diameters (WED): 15, 20, 25, 30, and 35 cm] and repeated twice per CAREDose4D level (Very Weak, Weak, Average, Strong, Very Strong). Virtual monoenergetic 67 keV images were acquired/reconstructed using 140 kVp, 0.8 pitch, 3.0 mm slices, 2.5 mm slice interval, Br40f kernel, and no iterative reconstruction. Acquisitions at each CAREDose4D level were then made on a SOMATOM Force EID-CT using a comparable routine abdomen protocol (120 kVp and Br40d kernel instead), after matching CTDI vol of the Average CAREDose4D setting across both systems. Mean CTDI vol values (mGy) and 2D NPS curves (HU 2 mm 2) per CAREDose4D level were calculated within 3 homogeneous slices per WED region. To facilitate comparisons, NPS curves were normalized by multiplying by their corresponding WED CTDI vol .

RESULTS

With Average CAREDose4D, reported overall CTDI vol was 9.0 mGy for both PCD and EID CTs and increased with WED from 4.2 to 16.2 mGy (PCD-CT) and from 2.3 to 19.7 mGy (EID-CT). CTDI vol for all CAREDose4D settings and both systems converged at approximately 32 cm WED, with Very Strong CAREDose4D resulting in the highest output >32 cm but lowest output <32 cm. Beyond that similarity, the relationship between tube output and WED differed between systems and was notably higher in the EID at the 35 cm WED (>3 mGy differences). After normalization, NPS curves for a given WED and CT model were effectively equivalent across all CAREDose4D levels. Overall, PCD-CT images had higher noise but comparable noise texture than counterpart EID-CT images.

CONCLUSION

This initial comparison of global tube current modulation settings of abdomen protocols in Siemens NAEOTOM Alpha and SOMATOM Force systems has highlighted possible dose-sparing by using PCD-CT in larger patients and also noise differences in PCD-CT images that warrant further evaluation.

CLINICAL RELEVANCE/APPLICATION

Differences in tube output, noise characteristics, and other image quality metrics in PCD and EID CT systems necessitate separately optimizing acquisition and reconstruction protocols for oncological disease staging, diagnosis, and management.

M5B-SPPH-7 EFFECTS OF DTI DEEP LEARNING RECONSTRUCTION ON CLINICAL TRACTOGRAPHY IN PATIENTS WITH BRAIN TUMORS

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Jun Hong (*Abstract Co-Author*)
Vinodh A. Kumar, MD (*Abstract Co-Author*)
Ping Hou, PhD (*Abstract Co-Author*)
Alexander M. Khalaf, MD (*Abstract Co-Author*)
Max Wintermark, MD (*Abstract Co-Author*)
Ho-Ling Anthony Liu, PhD (*Abstract Co-Author*)

PURPOSE

Preoperative MRI with diffusion tensor imaging (DTI) tractography is routinely used for brain tumor surgical planning. DTI fiber tracking relies on voxel-level diffusion estimates, making the technique sensitive to image noise and artifacts. Deep learning-based reconstruction (DL Recon) has demonstrated improved SNR and reduced artifacts. This study evaluates its impact on clinical DTI tractography in a single institution.

METHODS AND MATERIALS

Preoperative DTI from 8 brain tumor patients was acquired on a 3T GE Premier XT scanner (48-channel head coil, EPI, 64 directions, b=1000 s/mm², 2-mm isotropic voxels) with and without DL Recon ('high' setting). Two datasets per patient (with/without DL Recon) were analyzed. Tractography was manually performed using DynaSuite software by three experienced MRI physicists, generating 27 tracts (2-5 per patient). The corticospinal tract (CST) and arcuate fasciculus (AF) were constructed for all subjects. Additionally, inferior fronto-occipital fasciculus, optic radiation, frontal aslant, inferior longitudinal fasciculus, and uncinate fasciculus tracts were obtained in selected cases based on tumor location. Two independent, experienced radiologists, blinded to randomly ordered images and each other's assessments, qualitatively compared the tracts, which were post-hoc labeled using a 3-point Likert scale (1 = preference for DL Recon, 0 = no preference, -1 = preference for non-DL Recon). Quantitative metrics included tract volume, fractional anisotropy (FA), apparent diffusion coefficient (ADC) and SNR.

RESULTS

DL Recon significantly increased SNRs ($p < .01$) in uniform regions in deep white matter (100-200 cm²): median values at b = 0 were 64.7 (IQR: 63.1-73.7) with DL Recon and 44.9 (IQR: 37.9-45.7) without; median values at b = 1000 s/mm² were 6.5 (IQR: 3.8-8.1) vs. 3.0 (IQR: 2.3-3.2) without. Visual assessment showed moderate inter-rater agreement (44% concordance), with no strong consensus favoring one reconstruction method ($p=0.01$). Median volume differences (DL Recon - no DL Recon) for all tracts is 15.6% (IQR: -10.9% to 12.7%), CST -1.8% (IQR: -4.7% to 2.8%), AF -2.5% (IQR: -12.7% to 9.5%), none statistically significant. Similarly, average FA and ADC values show no significant differences across all tracts.

CONCLUSION

DL Recon improves image SNR but did not significantly impact clinical tractography qualitatively or quantitatively with the DTI protocol used in this study.

CLINICAL RELEVANCE/APPLICATION

DTI tractography is vital for neurosurgical planning. Though DL Recon enhances SNR, it does not meaningfully alter tractography under standard protocols. Its impact may be greater with lower-quality DTI (e.g., low SNR, fewer directions) or more advanced tractography methods.

M5B-SPPH-8 QUANTITATIVE COMPARISON OF CT METAL ARTIFACT REDUCTION (MAR) ALGORITHMS AMONG RADIATION ONCOLOGY

James J. Sohn, PhD (*Presenter*)
Beechui Koo (*Abstract Co-Author*)
Hyunuk Jung, PHD (*Abstract Co-Author*)
Indra Das, PhD (*Abstract Co-Author*)
Siyong Kim, PhD (*Abstract Co-Author*)

PURPOSE

Metal artifacts in computed tomography (CT) significantly compromise image quality and dose calculation accuracy in radiation oncology. This study provides a quantitative comparison of four commercial metal artifact reduction (MAR) algorithms using standardized metrics and a novel analytical framework, offering radiation oncology physicists transparent, vendor-neutral performance data.

METHODS AND MATERIALS

A custom 3D-printed solid water phantom with interchangeable inserts (solid water, aluminum, titanium, and stainless steel) was scanned using four CT systems: Canon, GE, Philips, and Siemens. Each system's proprietary MAR algorithm was evaluated using acquisition parameters matched as closely as possible across scanners. Quantitative analysis employed multiple complementary methods: (1) Circular profile analysis measuring mean HU deviations from solid water reference at concentric distances from metal inserts; (2) geometric accuracy assessment of metal objects; and (3) volumetric artifact characterization using bad voxel analysis and a composite M Error index that integrates both artifact extent and intensity. ?HU color maps and accumulated histograms were used to characterize artifact patterns and MAR performance.

RESULTS

Significant performance differences were observed across the MAR algorithms. All four methods yielded consistently low |?HU| values at mid (2.80 cm) and far (3.80 cm) radial distances. Meanwhile, at the nearest distance (1.27 cm), |?HU| increased significantly for all MAR techniques. Smart-MAR exhibited the highest |?HU| for aluminum (16.83 HU), while O-MAR showed the greatest deviations for titanium and stainless steel (42.40 HU and 42.60 HU, respectively). SEMAR and i-MAR maintained high geometric accuracy across all materials, with percent diameter errors below 5%. In contrast, O-MAR produced a 9.17±0.29% error for aluminum, and Smart-MAR showed substantial deviations for titanium (20.39±0.84%) and stainless steel (19.03±0.63%). M Error values were lowest for SEMAR, Smart-MAR, and i-MAR (range: 0.00-0.83), while O-MAR displayed significantly elevated values (2.66-3.64), reflecting more severe residual artifacts.

CONCLUSION

This study provides a quantitative, slice-level evaluation of four commercial MAR techniques using a uniform phantom, offering insights to guide clinical decision-making and future system benchmarking in radiation oncology.

CLINICAL RELEVANCE/APPLICATION

By providing a standardized, quantitative comparison of four widely used commercial MAR techniques, this study enables clinicians and medical physicists to make informed decisions when selecting imaging protocols or systems for patients with metal implants.

M5B-SPPH-9 CONJUGATE GRADIENT AND DEEP LEARNING RECONSTRUCTIONS: SCAN TIME REDUCTION WITHOUT AFFECTING THE IMAGE QUALITY AND NODULE DETECTION CAPABILITY ON LUNG MRI WITH ULTRASHORT TE

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Masahiko Nomura, MD, PhD (*Abstract Co-Author*)
Natsuka Yazawa (*Abstract Co-Author*)
Maiko Shinohara (*Abstract Co-Author*)
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Yuichiro Sano, RT (*Abstract Co-Author*)
Masato Ikedo (*Abstract Co-Author*)
Masanori Ozaki (*Abstract Co-Author*)
Masao Yui (*Abstract Co-Author*)
Daisuke Takenaka, MD (*Abstract Co-Author*)

PURPOSE

Conjugate gradient reconstruction (CG Recon) and deep learning reconstruction (DLR) for magnetic resonance imaging (MRI) with ultra-short echo time (UTE-MRI) have been developed or clinically set to shorten scan time without image quality reduction instead of grid reconstruction (Grid Recon). The purpose of this study was to determine the utility of CG Recon and DLR to reduce scan time while maintaining the image quality and nodule detection capability on lung UTE-MRI obtained using 1.5- and 3-T MR systems.

METHODS AND MATERIALS

In the in vitro and in vivo studies, the NEMA phantom and 35 patients with pulmonary nodules were scanned by UTE-MRI with original (TE original), 1/2 (UTE 1/2), and 1/4 (UTE 1/4) spoke numbers obtained by both methods and reconstructed with and without DLR. The signal-to-noise ratios (SNR) of the phantom, lung (SNR Lung), and lesion (SNR Lesion) on UTE-MRI were assessed. In in vivo study, the overall image quality, artifact, lesion conspicuity, and nodule detection capability were assessed using five-point systems on UTE-MRI. Quantitative and qualitative indices were then compared between the standard MR protocol and others using Dunnett's post-hoc test or Wilcoxon’s signed-rank test. Finally, a receiver operating characteristic (ROC) analysis was performed to compare the standard MR protocol and other protocols.

RESULTS

In in vitro and in vivo studies, all SNRs were significantly different between the standard MR protocol and each UTE-MRI with CG Recon and DLR ($p<0.05$). Each qualitative index of the standard MR protocol differed significantly from those of all UTE 1/2 s and UTE 1/4 s, except for UTE 1/4 reconstructed with CG Recon and DLR ($p<0.05$). The area under the curve (AUC) of each UTE Original obtained by CG Recon was significantly larger than that of the standard MR protocol ($p<0.05$).

CONCLUSION

CG Recon and DLR can reduce scan time while maintaining image quality and nodule detection capability on lung UTE-MRI obtained using 1.5- and 3-T MR systems in patients with pulmonary nodules.

CLINICAL RELEVANCE/APPLICATION

CG Recon and DLR can reduce scan time while maintaining the image quality and nodule detection capability on lung UTE-MRI obtained using 1.5- and 3-T MR systems in patients with pulmonary nodules.

M5B-SPPH-10 NOISE REDUCTION PERFORMANCE OF NEWLY DEVELOPED DEEP LEARNING IMAGE RECONSTRUCTION FOR HIGH RESOLUTION KERNELS: A PHANTOM STUDY SIMULATING CHEST CT

Kazuma Fujimoto, MS (*Presenter*)
Hiroki Kawashima, PhD (*Abstract Co-Author*)
Katsuhiro Ichikawa, PhD (*Abstract Co-Author*)

PURPOSE

A deep learning CT image reconstruction (DLR) applicable for high-resolution kernels has been newly developed and clinically available. We aimed to characterize the noise reduction performance of the developed DLR technique in a chest phantom experiment, comparing filtered back projection (FBP) and iterative reconstruction (IR).

METHODS AND MATERIALS

An anthropomorphic chest phantom was used as a base phantom. After removing the default bronchial parts of the phantom, we packed cotton balls that simulated the density of ground-glass opacity into the right lung of the phantom to make a non-uniform region. The left lung remained the uniform air region. The axial scanning was repeated 30 times at CTDI of 2.9 mGy. CT images were reconstructed with a field of view of 200 mm in each lung. Three types of kernels (Standard, Lung, and Bone plus) and three types of reconstruction techniques [FBP, True Fidelity Deep Learning (DLR) with low, medium, and high settings, and ASiR-V (IR) with 50% and 100% blending levels] were evaluated. The region of interest with 128×128 pixels was placed at the uniform air region. The standard deviation (SD) of the CT number in the ROI was measured as an index of noise magnitude. The noise power spectrum (NPS) was also measured using the same ROI. For the non-uniform region, the noise magnitude map was generated by calculating the pixel-wise inter-image SD across the 30 images at the same table position.

RESULTS

The SD values of FBP, IR50%, IR100%, DLR-low, DLR-medium, and DLR-high were 17, 13, 9, 8, 6 and 5 HU for Standard kernel, respectively; 66, 46, 25, 30, 21 and 13 HU for Lung kernel; 82, 70, 59, 49, 38 and 25 HU for Bone plus kernel. Unlike IR, the NPS values of DLR decreased from the low spatial frequency. For the noise magnitude map of high-resolution kernels (Lung and Bone Plus), IR showed little difference between uniform and non-uniform regions; however, DLR showed lower noise reduction magnitude at the non-uniform regions, suggesting quasi-intelligent behavior to efficiently improve visibility of the region.

CONCLUSION

Noise reduction performance depends on the combination of filter kernels and reconstruction techniques. When using the high-resolution kernels, DLR demonstrated adaptive noise reduction while preserving the details of low-contrast signals.

CLINICAL RELEVANCE/APPLICATION

The newly developed DLR for high-resolution kernels has higher noise reduction performance than IR and the potential to improve the image quality of high-resolution chest CT. The noise map we used efficiently presented the DLR's performance that is clinically relevant.

M5B-SPPH-11 FEASIBILITY OF BIOLOGY-GUIDED RADIOTHERAPY BASED ON GALLIUM 68-LABELED FIBROBLAST ACTIVATION PROTEIN INHIBITOR PET IMAGING

Chunhui Han, PhD (*Presenter*)
Grant Gibbard (*Abstract Co-Author*)
Heather McGee (*Abstract Co-Author*)
Yi-Chun Wang (*Abstract Co-Author*)
Terence M. Williams, MD, PhD (*Abstract Co-Author*)
An Liu, PhD (*Abstract Co-Author*)

PURPOSE

A medical linac (X1, RefleXion Medical Systems, Hayward, CA) uses real-time PET signals from the tumor to guide beam delivery in biology-guided radiotherapy (BgRT). This study aims to evaluate the feasibility of using the Gallium 68-labeld fibroblast activation protein inhibitor (FAPI) radiotracer as a bio-guide for BgRT to treat tumors in different anatomical sites.

METHODS AND MATERIALS

Sequential patients who received diagnostic FAPI PET/CT scans at a single institution were reviewed. Fifty patients with malignancies in the head and neck, lung, liver, pancreas, and cervix sites were selected with ten patients for each disease site. The gross tumor volume (GTV) was drawn based on a standard uptake value (SUV) threshold of 40% of the maximum SUV for the lesion. The planning target volume (PTV) was created by adding a site-specific margin to the GTV. A biology tracking zone (BTZ) was created by adding a margin to the PTV to encompass the range of tumor motion. Each case was first screened for BgRT eligibility based on GTV size and FAPI uptake in the surrounding tissue. For candidate BgRT cases, the diagnostic PET images were first converted to simulated PET images on the X1 machine. The BgRT plans used a jaw width of 2 cm and a prescription dose of 9 to 10 Gy per fraction for 3 to 5 fractions. The activity concentration (AC) and normalized target signal (NTS) were calculated to evaluate BgRT feasibility on the X1.

RESULTS

Patients received an average FAPI injection dose of 3.19±0.76 mCi (range: 1.97 - 5.18 mCi) prior to FAPI PET/CT scans. Thirty cases were excluded in pre-plan screening due to GTV length and/or high FAPI uptake surrounding the tumor. Clinically acceptable BgRT plans were generated for thirteen cases while planning failed for seven cases due to inadequate FAPI PET characteristics in the tumor. In the BgRT plans, the average AC and NTS were 10.1± 3.8 kBq/ml (range: 6.0 - 19.3 kBq/ml) and 12.3±4.0 (range: 5.2 - 20.7), respectively. The average PTV dose coverage, conformity index, and homogeneity index were 94.4±1.6%, 1.33±0.23, and 1.28±0.11, respectively. With an average PTV volume of 53.4±30.0 cm 3 (range: 22.4 - 120.0 cm 3), the average treatment beam-on time was 1985±566 sec (range: 1,200 - 2,956 sec).

CONCLUSION

With proper patient selection based on tumor size and uptake characteristics, the Gallium 68-labeled FAPI radiotracer could be potentially used as a bio-guide for BgRT on the X1 for various disease sites. Suitable thresholds for AC and NTS to ensure delivery accuracy have not yet been established for this bio-guide.

CLINICAL RELEVANCE/APPLICATION

As FAPI tracers offer high sensitivity and specificity for certain tumor types, the use of FAPI tracers may allow more precise targeting in BgRT treatments compared to other tracers.

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M5B-SPRO

Radiation Oncology Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPRO-1 HYBRID INTELLIGENCE IN ONCOLOGY: COMPARING HUMAN EXPERTS AND LARGE LANGUAGE MODELS IN INTERPRETING COMPLEX CANCER TREATMENT GUIDELINES

Gorkem Durak, MD (*Presenter*)
Berna Yildirim (*Abstract Co-Author*)
Baver Bunyamin Tutun (*Abstract Co-Author*)
Emre Batuhan Yildirim (*Abstract Co-Author*)
Emre Uysal (*Abstract Co-Author*)
Sukru Mehmet Erturk, MD (*Abstract Co-Author*)
Ulas Bagci, MSc, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate and compare the accuracy and convergence of medical specialists and large language models (LLMs) in interpreting the complex recommendation details within ASTRO and ASCO-SNO-ASTRO (ASCO) guidelines for brain metastases management.

METHODS AND MATERIALS

In this study, we assessed the performance of neurosurgeons, radiation oncologists, and four state-of-the-art LLMs (ChatGPT-4o, Gemini 2.0, Microsoft Bing Pro, and Deepseek R1) in interpreting guideline recommendations. Accuracy, near-answer rates, and Cohen's weighted kappa coefficients were calculated to evaluate convergence on the strength of recommendation (SoR) and quality of evidence (QoE). Statistical analysis was performed using Microsoft Excel 2024 and SPSS v26.

RESULTS

For the ASTRO guideline SoR evaluation: Medical experts achieved accuracy of 35.29-58.82%, near-answer rates of 58.82-94.11%, with poor to moderate convergence (? = 0.504). LLMs demonstrated superior performance with 94.11-100% accuracy and near-answer rates, showing near-perfect to perfect convergence (? = 0.881-1.000). For the ASTRO guideline QoE evaluation: Medical experts showed accuracy of 29.41-58.82%, near-answer rates of 47.05-94.11% with poor to moderate convergence (? = 0.406). LLMs achieved accuracy of 29.41-70.58%, near-answer rates of 88.23-94.11%, and fair to moderate convergence (? = 0.227-0.595). For the ASCO guideline SoR evaluation: Medical experts demonstrated accuracy of 15.38-53.84%, near-answer rates of 38.46-92.30%, with poor to moderate convergence (? = 0.428). LLMs showed accuracy of 7.69-61.53%, near-answer rates of 76.92-100%, and poor to moderate convergence (? = 0.428). For the ASCO guideline QoE evaluation: Medical experts achieved accuracy of 15.38-69.23%, near-answer rates of 46.15-100%, with poor to substantial convergence (? = 0.644). LLMs demonstrated accuracy of 7.69-46.15%, near-answer rates of 69.23-84.61%, and poor to fair convergence (? = 0.286). Among the LLMs, Gemini 2.0 and Deepseek R1 consistently demonstrated the highest performance in evaluating guideline details.

CONCLUSION

This pioneering study comprehensively analyzes the interpretation of complex oncology guidelines by both multidisciplinary medical experts and various LLMs. While both groups faced challenges with the complex details of recommendations, LLMs exhibited higher overall accuracy and convergence than medical experts, particularly for strength of recommendation assessments.

CLINICAL RELEVANCE/APPLICATION

Ambiguity in clinical guidelines can disrupt interdisciplinary coordination and affect patient management. LLMs integrated into clinical workflows may promote consistent guideline interpretation, thereby improving clinical outcomes.

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M5B-SPVA

Vascular Imaging Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-SPVA-3 CLINICAL APPROACH TO CATEGORIZING THE HELICAL MORPHOLOGY OF TYPE B AORTIC DISSECTIONS USING CT

Fikunwa Kolawole, PhD (*Presenter*)
Christopher Cheng (*Abstract Co-Author*)

PURPOSE

Characterizing Type B aortic dissection (TBAD) helicity can aid in diagnosis and treatment planning. Surface-based algorithms for quantifying TBAD helicity are time-intensive, limiting clinical utility. Thus, we developed a streamlined centerline-based method and compared TBAD helicity categorization with a validated surface-based approach.

METHODS AND MATERIALS

The 3D surface-based approach for quantifying the helical morphology of TBAD utilized 3D segmentation of the aorta, true lumen, left common carotid artery (LCCA), and celiac artery (CA) using SimVascular (SV) {1}. The centerline-based approach used semi-automatically extracted centerlines of these same structures in TeraRecon (TR). Orthogonal planes along the aorta centerline were constructed, and the LCCA ostium was projected onto these planes to define the LCCA's circumferential position along the length of the aorta. On each normal plane, the angular position of the true lumen was computed relative to the LCCA position. The true lumen helical angle (HA) was defined as the change in angular position of the true lumen from the intimal tear to the CA. Both surface- and centerline-based methods categorized TBADs into right-hand (<-90° HA), left-hand chiral (>90° HA), non-helical (-90° to 90° HA & <22.5°/cm peak twist), and mixed-helical (-90° to 90° HA & >22.5°/cm peak twist in one direction, with a reversal of twist direction) groups.

RESULTS

The centerline-based approach correctly classified 92% of subjects in this study (79 out of 86), demonstrating excellent agreement with the surface-based method (Cohen's kappa = 0.88, $p < 0.001$). The few discrepancies (7 out of 86) involved adjacent categories: one left-hand chiral misclassified as non-helical, one left-hand chiral as mixed-helical, one non-helical as left-hand chiral, two non-helical as mixed-helical, one mixed-helical as non-helical, and one mixed-helical as right-hand chiral. Right-hand chiral classifications had no errors.

CONCLUSION

The centerline-based approach we developed shows favorable correspondence in categorizing TBAD helicity compared to a more onerous surface-based approach.

CLINICAL RELEVANCE/APPLICATION

This characterization of aortic dissection helicity, using a simple method integrated into clinical workflows, offers the potential for improved patient-specific diagnostics, treatment planning, surveillance, and large population studies to investigate the helical pathology and progression of TBAD. In addition, widespread helical characterization of TBAD can spur the development of asymmetric aortic endografts to treat asymmetric dissections. Reference : {1} doi:10.1152/ajpheart.00778.2020

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R2-SPBR

Breast Imaging Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPBR-1 EXTERNAL VALIDATION OF BREAST CANCER RISK ASSESSMENT MODEL MIRAI ON DIVERSE SCREENING COHORT

Hari Santhanam (*Presenter*)
Walter Mankowski (*Abstract Co-Author*)
Despina Kontos, PhD (*Abstract Co-Author*)
Sachin Jambawalikar, PhD (*Abstract Co-Author*)
Katherine Crew, MD (*Abstract Co-Author*)
Julia McGuinness (*Abstract Co-Author*)

PURPOSE

The purpose of this study is to evaluate the performance of MIRAI, a deep learning model for breast cancer risk prediction, using screening mammograms collected from a racially and ethnically diverse population at our institution. Assessing MIRAI's performance on an external cohort is critical to understanding its generalizability and potential for real-world clinical deployment.

METHODS AND MATERIALS

We retrospectively analyzed mammogram data from 1,024 unique women (race: 9% non-Hispanic Black, 23% non-Hispanic White, 43% Hispanic, 5% Asian and Pacific Islander, 20% other), of which 34 were diagnosed with breast cancer. We externally validated this cohort on MIRAI, a deep learning architecture that takes the four standard mammographic views as input for each patient. MIRAI integrates a convolutional neural network, a transformer, and a risk factor predictor to estimate breast cancer risk over one- to five-year horizons. The model outputs a probability risk score between 0 and 1 for each time point, representing the likelihood of cancer. We assessed validation performance using standard machine learning metrics, such as the area under the receiver operating characteristic curve (AUC).

RESULTS

We achieved AUCs of 0.731, 0.731, 0.597, and 0.605 for the two-year, three-year, four-year, and five-year time horizons, respectively. As an AUC of 1.0 indicates perfect discrimination, these results demonstrate moderate to strong validation performance, particularly at shorter time horizons.

CONCLUSION

We performed an external validation of MIRAI on a racially and ethnically diverse cohort, demonstrating its effectiveness in predicting breast cancer risk across multiple time horizons using standard machine learning metrics.

CLINICAL RELEVANCE/APPLICATION

These results support MIRAI's potential in accurate breast cancer risk estimation and contribute to the growing body of work highlighting MIRAI's robust performance across heterogeneous populations.

R2-SPBR-2 DUAL-ENERGY CONTRAST-ENHANCED SPECTRAL MAMMOGRAPHY IMPROVES DIAGNOSTIC ACCURACY FOR BI-RADS 4 MICROCALCIFICATIONS: A SURGICAL PATHOLOGY-VALIDATED STUDY

Jie Liu (*Presenter*)
Fan Yang, MD (*Abstract Co-Author*)
Juan Tao (*Abstract Co-Author*)
Shuyi Peng (*Abstract Co-Author*)
Peng Sun, MD,MD (*Abstract Co-Author*)

PURPOSE

To evaluate whether dual-energy contrast-enhanced spectral mammography (CESM) enhances diagnostic accuracy for BI-RADS 4 microcalcifications by providing functional vascular information in calcified regions.

METHODS AND MATERIALS

From June 2022 to October 2023, all patients who were diagnosed with suspicious malignant calcification (BI-RADS 4) on full-field digital mammography(FFDM) were included in this study. All diagnoses were subsequently confirmed via surgical pathology. Two experienced radiologists independently evaluated both FFDM images and the CEM silhouette images. The FFDM images characterized calcifications by their morphology and distribution type, categorizing them into low-risk (BI-RADS 4). The CEM silhouette images documented whether or not the calcified area exhibited enhancement. The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of diagnosing malignant calcification based on FFDM images alone or in combination with CEM images were compared between groups. The additional diagnostic performance of CEM images for BI-RADS 4 calcifications was also evaluated.

RESULTS

Of the 67 pathologically confirmed lesions, 32 were malignant and 35 were benign. Using histopathology as the gold standard, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of diagnosing malignant calcifications based solely on FFDM images were 68.7% (22/32), 88.5% (31/35), 53.6% (22/41), 86.1% (31/36), and 79.1% (53/67), respectively. The sensitivity, specificity, PPV, NPV, and accuracy of diagnosing malignant calcifications using a combination of CEM silhouette images were 90.6% (29/32), 97.1% (34/35), 82.8% (29/35), 97.1% (34/35), and 94.0% (63/67), respectively. The sensitivity, PPV, and accuracy of DE-CESM in diagnosing malignant calcifications were significantly higher than those of FFDM images alone ($P<0.05$).

CONCLUSION

CEM can enhance the diagnostic efficiency of BI-RADS 4 calcifications, particularly for calcifications with low-risk morphology or distribution. CEM can also accurately locate calcification points and areas of enhancement, providing reliable clinical value for preoperative stereotactic localization of suspicious calcifications.

CLINICAL RELEVANCE/APPLICATION

CEM can furnish information regarding the blood supply to breast tissue in calcified regions and enhance the diagnostic efficiency of calcifications with low-risk morphology or distribution(BI-RADS 4). Enhancement of calcified areas suggested a high likelihood of malignancy lesion.

R2-SPBR-3 PREDICTING NEOADJUVANT RESPONSE IN HER2+ BREAST CANCER: A RADIOMIC-PATHOLOGY FEATURE SELECTION APPROACH

Alae Eddine Mrani (*Presenter*)
Veronique Debien (*Abstract Co-Author*)
Alexandre De Wind (*Abstract Co-Author*)
Rabie Najem (*Abstract Co-Author*)
Paulus Kristanto (*Abstract Co-Author*)
Stylianos Drisis, MD (*Abstract Co-Author*)

PURPOSE

Neoadjuvant therapy (NAT) is increasingly used in early-stage breast cancer (BC), though some patients may experience toxicity or limited benefit. While radiomics may predict response, the biological basis of these features remains unclear. This study aims to refine the selection process by prioritizing only radiomic features significantly associated with pathology/molecular markers to enhance biological explainability.

METHODS AND MATERIALS

Patients with early HER2+ BC treated with NAT (2015-2020) were retrospectively included based on: age =18, early-stage HER2+ BC, baseline H&E WSI and MRI. Immune microenvironment was assessed by an expert breast pathologist. Associations with response (RCB 0-1 vs. 2-3) were assessed using ?²/Fisher's and U/t-tests. Tumor and peritumoral segmentation and feature extraction used MMRadiomics (SyngoVia). Feature selection involved U test, Pearson correlation and LASSO in 5-fold CV; stability was defined as frequency across folds. Radiomic-pathology correlations were assessed via Spearman's/U tests. Only significantly correlated features ($p<0.05$) trained a Random Forest (RF) classifier.

RESULTS

Among 43 patients, median age was 56yo (IQR 17.9), median tumor size was 31.5 mm (IQR 26.3), 76% were HR+ (n=31); 55.8% had LN+ on MRI (n=24). RCB 0-1 response rate was 55.8% (24/43). HER2 3+ (p= 0.001), intratumoral Tumor Infiltrating Lymphocytes (TIL) (p = 0.03) and inflammatory pattern (IP) (p=0.03) were significantly higher in responders.Feature selection identified 14 radiomic features linked to response and pathology, the 4 most stable were selected for modeling. Among them, features from subtraction images were texture-based (GLSZM) and correlated more with molecular markers—HER2 (ES = -0,51), ER (ES = -0,32), and Ki-67 (ES = -0,4). In contrast, T1W features included one texture (GLDM) and one first-order feature, both correlated with immune infiltration: GLDM feature was associated with intra-tumoral TILs (ES= -0.33), tertiary lymphoid structures (TLS) (ES= -0.33), and IP (ES= -0.4), while first-order median was associated with total TILs (ES=-0.31), intra-tumoral TILs (ES=-0.35), TLS (ES=-0.33), and IP (ES= -0.35).An RF model using the 4 features achieved AUC 0.78 (TPR 0.68, TNR 0.69).

CONCLUSION

Linking feature selection to biology improves radiomic model explainability, enabling tumor microenvironment characterization from a glance at their macroscopic imaging.

CLINICAL RELEVANCE/APPLICATION

Incorporating biological explainability into radiomic models supports clinical integration and facilitates customized treatment. Emphasizing explainability—whether in traditional ML or DL—is key to building trustworthy AI tools.

R2-SPBR-4 ALGORITHM TO ENABLE MORE ACCURATE BREAST CANCER DETECTION RATE ESTIMATION WHEN REGISTRY OUTCOMES ARE NOT AVAILABLE

Elizabeth S. Burnside, MD, MPH (*Presenter*)
Hong Li (*Abstract Co-Author*)
Brian L. Sprague, PhD (*Abstract Co-Author*)
Janie M. Lee, MD, MSc (*Abstract Co-Author*)
Michael Lasarev (*Abstract Co-Author*)
Diana Miglioretti, PhD (*Abstract Co-Author*)
Robert A. Smith, PhD (*Abstract Co-Author*)

PURPOSE

Cancer detection rate (CDR), an important screening mammography audit metric ensuring adequate sensitivity, is typically determined using facility records of biopsy results (CDR-biopsy). Though resource-intensive, practices can also link with cancer registries (CDR-registry), a method used for establishing benchmarks. Using CDR-biopsy as a reference standard, which often has incomplete outcomes capture, can artificially lower CDR measurements, increasing the chance that facilities fall below the ACR benchmark of 2.5 cancers per 1000 screening mammograms. We developed an algorithm to estimate CDR-registry when registry linkage is not available.

METHODS AND MATERIALS

Using Breast Cancer Surveillance Consortium (BCSC) data, we calculated facility-specific ascertainment rate (AR) by dividing biopsies with available (ascertained) pathology arising from screen-detected findings by all biopsies recommended from screening (with or without available pathology). BCSC data enabled analysis of both facility level CDR-biopsy and CDR-registry; determination of the number of facilities erroneously below the benchmark of 2.5/1000 using CDR-biopsy; and development of an algorithm to compensate for non-ascertained biopsies to estimate CDR-registry using facility level data other than registry-linkage. To measure algorithm performance, we used discrepancy thresholds of 0.5/1000 and 1/1000 and concordance correlation coefficient between the algorithmically estimated CDR vs. CDR-registry.

RESULTS

Across 105 BCSC facilities, AR ranged from 17.1—100% (median [IQR] of 84.9 [70.8—89.8]%). Using CDR-registry, all facilities exceeded the ACR CDR benchmark. Using CDR-biopsy, 11 facilities (10.5%) fell below 2.5/1000. 66 facilities (62.9%) were within 0.5/1000 and 88 facilities (83.8%) were within 1.0/1000 of their CDR-registry measurement. Using our algorithm, 94 facilities (89.5%) were within 0.5/1000 and 102 facilities (97.1%) were within 1.0/1000 of their CDR-registry measurement. Our algorithm corrected the 11 facilities with CDR-biopsy below the benchmark, to accurately meet the 2.5/1000 threshold. The concordance correlation coefficient between algorithmically estimated CDR vs. CDR-registry was 0.923.

CONCLUSION

One tenth of BCSC facilities erroneously fell below ACR CDR benchmarks when following the common clinical practice of using CDR-biopsy as a reference standard. Our algorithm successfully corrected this phenomenon.

CLINICAL RELEVANCE/APPLICATION

Our algorithm identified and corrected all facilities that inaccurately missed CDR benchmarks, demonstrating the potential to improve mammography audits at facilities that do not link to cancer registries.

R2-SPBR-5 SELF-REQUESTED MAMMOGRAPHY: UTILIZATION TRENDS AT AN ACADEMIC INSTITUTION

Julia Liu (*Presenter*)
Katherine H. Cavallo Hom, MD (*Abstract Co-Author*)

PURPOSE

Self-requested mammograms allow eligible patients to undergo screening without requiring an order from a referring provider. This study investigates utilization of self-requested screening and subsequent true positive rates within provider-referred and self-requested patients.

METHODS AND MATERIALS

This retrospective review analyzed screening mammograms performed at our academic institution between 2020 and 2023 (N=33,500). True positive (TP) results, defined as a diagnosis of breast malignancy within 365 days of screening, were calculated. These cases were then categorized as provider-referred or self-requested. Local availability of self-requested screening mammography was assessed (N= 5).

RESULTS

Of 33,500 total screening mammograms, 18,947 (56.6%) were self-requested. The total number of screening mammograms steadily increased from 6,151 to 10,358 per year throughout the study period, while the percentage of self-requested mammograms also notably increased from 53.1% in 2020 to 59.4% in 2023. There were 236 TP screening mammograms, of which 117 (49.6%) were provider-referred and 119 (50.4%) were self-requested. Locally, 40% of institutions offer self-requested screening mammography for patients meeting ACR screening guidelines, without requiring additional criteria.

CONCLUSION

The raw number and percentage of self-requested screening mammograms demonstrate a consistent upward trend. Approximately half of all screening-detected breast malignancies originated from a self-requested mammogram by the patient. This pathway for patient access to screening mammograms is critical for early detection of breast cancer.

CLINICAL RELEVANCE/APPLICATION

Self-requested screening mammography usage continues to rise, which improves access to preventive screening by reducing scheduling barriers. 50.4% of all cancers found during the study period originated from self-requested screening mammography. This pathway model highlights an opportunity to improve access to patient care, as only 40% of local institutions currently offer this option without additional criteria.

R2-SPBR-6 MRI-GUIDED BIOPSY AFTER CONTRAST-ENHANCED MAMMOGRAPHY FOR OCCULT LESIONS

Maya Grisaru Kacen, MD, MBA (*Presenter*)
Alexander Tsibulski, MD (*Abstract Co-Author*)
Kristopher McKenzie, MD (*Abstract Co-Author*)
Anat Kornecki, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility of MRI-guided biopsy (MRB) directly following the detection of mammographically and sonographically occult lesions using contrast-enhanced mammography (CEM).

METHODS AND MATERIALS

We retrospectively reviewed the records of 2,599 patients who underwent CEM at our institution between October 2017 and December 2020. Patients with suspicious lesions (BI-RADS category 4 or 5) detected by CEM, which were otherwise occult and required MRB, were eligible for the trial. The patients were divided into two cohorts: 1. those who had MRB directly after CEM and 2. those who had MRI prior to MRB. Data collection included histopathology, MRB cancellation rates, and time-to-diagnosis. Statistical analysis was performed using Microsoft Excel.

RESULTS

A total of 55 patients with 61 lesions detected by CEM were eligible for the study. Of these, 44 patients with 47 lesions proceeded directly to MRB, while 11 patients with 14 lesions underwent MRI prior to MRB. Of the 47 lesions that underwent MRB directly following CEM, biopsy was canceled for 4 patients due to non-visualization of the lesion at the time of MRB. Of the remaining 43 lesions, 13 (30.2%) were malignant, including 11 invasive cancers and 2 cases of high-grade ductal carcinoma in situ (DCIS). Of the 14 lesions detected by both CEM and MRI that underwent MRB, 3 (21.4%) were invasive cancers. For patients who had an MRI following CEM, the average time to diagnosis was extended by 8 days.

CONCLUSION

Direct MRB following CEM demonstrated a 91.5% biopsy success rate (43 out of 47) with 30.2% malignancy yield, comparable to MRI-detected lesion biopsy performance. CEM alone can sufficiently localize lesions for MRB without the need for a prerequisite MRI, thereby avoiding diagnostic delays.

CLINICAL RELEVANCE/APPLICATION

Omitting pre-MRB MRI for CEM-detected lesions streamlines workflow, reduces delays by 8 days, and maintains diagnostic accuracy. This approach optimizes resource utilization while ensuring timely cancer diagnosis.

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R2-SPCA

Cardiac Imaging Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPCA-1 NECESSITY AND OPTIMAL TIMING OF DELAYED IMAGING IN PULMONARY VEIN CTA FOR LEFT ATRIAL APPENDAGE THROMBUS EVALUATION PRIOR TO ATRIAL FIBRILLATION ABLATION

Tuo He (*Presenter*)
Xiaohui Li (*Abstract Co-Author*)
Wei Huang (*Abstract Co-Author*)
Yue Yao (*Abstract Co-Author*)
Baobin Guo (*Abstract Co-Author*)

PURPOSE

To evaluate the necessity and optimal timing of delayed-phase imaging in pulmonary vein CT angiography (PVCT) for accurate assessment of left atrial appendage (LAA) thrombus prior to atrial fibrillation (AF) radiofrequency ablation.

METHODS AND MATERIALS

In this prospective and IRB-approved study, 93 patients scheduled for AF ablation underwent multiphase PVCT and transesophageal echocardiography (TEE). TEE served as the reference standard for detecting LAA thrombus and assessing emptying velocity; CHA2DS2-VASc scores were retrieved from clinical documentation. All patients received a low-dose helical PVCT scan, followed by low-dose ECG-triggered axial LAA scans at 10s, 20s, and 35s delays on a 256 CT scanner. Four imaging groups were generated for each patient for analysis: single-phase, +10s, +20s, and +35s delay. CT attenuation values of the left atrium (LA), LAA, and ascending aorta were measured. Image interpretation was performed independently by three radiologists, classifying LAA findings as negative or indeterminate for thrombus.

RESULTS

Delayed-phase imaging significantly improved diagnostic performance, with the +10s delay achieving the highest specificity (97.7%) and accuracy (97.8%), and 100% sensitivity and negative predictive value (NPV). The LAA/LA attenuation ratio moderately correlated with LAA emptying velocity ($r=0.420$, $p<0.05$), and when =1.14, indicated significantly reduced flow. Linear regression analysis revealed a stronger correlation ($R = 0.502$) when combining LAA/LA ratio from the +10s group with CHA2DS2-VASc scores in predicting LAA flow velocity. ROC analysis confirmed optimal diagnostic value at a cutoff of 1.14 for the +10s group. Multivariate logistic regression incorporating the +10s LAA/LA ratio and CHA2DS2-VASc score showed the strongest predictive power for thrombus ($R^2 = 0.319$). Diagnostic consistency improved with delayed imaging, with the +10s group yielding the highest interobserver agreement (? = 0.982).

CONCLUSION

A 10-second delayed-phase PVCT markedly improves specificity and accuracy while preserving 100% sensitivity for LAA thrombus exclusion, and offers a valuable, noninvasive alternative to TEE in pre-ablation thrombus screening. Lower LAA/LA ratios indicate higher thrombus risk, especially when combined with CHA2DS2-VASc scores.

CLINICAL RELEVANCE/APPLICATION

Implementing 10-second delayed PVCT in routine pre-ablation assessment may reduce reliance on invasive TEE, streamline clinical workflows, and improve patient comfort—while maintaining high diagnostic confidence in LAA thrombus exclusion and risk stratification.

R2-SPCA-2 MBSS-T1: AN AI-BASED MOTION CORRECTION TECHNIQUE FOR ROBUST CARDIAC T1 MAPPING IN BREATH-HOLD AND FREE-BREATHING CONDITIONS - TEST-RETEST REPEATABILITY ASSESSMENT

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PURPOSE

Cardiac T1 mapping is essential for assessing myocardial tissue characteristics and detecting conditions such as fibrosis and edema, critical for diagnosing and managing heart diseases. However, motion artifacts, especially in free-breathing, can impact the accuracy and reproducibility of myocardial T1 mapping. This study evaluates the test-retest repeatability of MBSS-T1, an AI-based motion correction technique, for myocardial T1 mapping using the MOLLI protocol in both breath-hold and free-breathing conditions, compared to scanner-based standard motion correction and uncorrected data.

METHODS AND MATERIALS

Twelve healthy male volunteers (aged 20-36) underwent myocardial T1 mapping on a 3T MRI using the 5(3)3 MOLLI protocol. Breath-hold and free-breathing datasets were acquired before and after a 20-minute rest. T1 maps were reconstructed using MBSS-T1, scanner-based motion correction, and uncorrected data. Test-retest repeatability was assessed with intraclass correlation coefficients (ICC), Bland-Altman analysis, within-subject coefficient of variation (CV w), and repeatability coefficients (RC).

RESULTS

MBSS-T1 had mean±std T1 values of 1127.72±99.33 (BH) and 1049.60±92.41 (FB). The scanner-based method yielded 1230.69±78.71 (BH) and 1131.60±88.78 (FB), while uncorrected data showed 1195.44±71.56 (BH) and 1099.92±101.87 (FB). MBSS-T1 showed superior repeatability compared to scanner-based motion correction and uncorrected data. Under breath-hold, MBSS-T1 had an ICC of 0.953 (excellent), vs. 0.829 (good) for scanner-based and 0.804 (good) for uncorrected data. In free-breathing, MBSS-T1 outperformed with an ICC of 0.636 (moderate), compared to 0.531 (moderate) for scanner-based and 0.240 (poor) for uncorrected data. MBSS-T1 also had the lowest CVw and RC: 3.6% and 14.2% (breath-hold), and 5.1% and 19.9% (free-breathing). Bland-Altman analysis showed narrower limits of agreement for MBSS-T1.

CONCLUSION

MBSS-T1 improves myocardial T1 mapping reproducibility compared to standard motion correction and uncorrected data. It shows significant improvements under breath-hold conditions and enhances repeatability in free-breathing acquisitions. These results suggest MBSS-T1 could improve cardiac MRI reliability, especially for patients unable to perform breath-holds.

CLINICAL RELEVANCE/APPLICATION

MBSS-T1 provides an AI-based solution for more accurate and reproducible myocardial T1 mapping. Its performance under both breath-hold and free-breathing conditions makes it suitable for patients with respiratory limitations, enabling more precise cardiac assessments and benefiting the diagnosis and monitoring of cardiac conditions.

R2-SPCA-4 MYOCARDIAL STRAIN ASSESSMENT IN CINE SEQUENCES ACQUIRED USING ARTIFICIAL INTELLIGENCE TECHNIQUES

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PURPOSE

Cardiac Magnetic Resonance (CMR) with cine imaging is the gold standard for evaluating ventricular function and myocardial structure. Recent advancements in deep learning (DL) have enabled accelerated acquisition protocols, potentially reducing scan time without compromising diagnostic accuracy. This study aimed to evaluate the diagnostic performance and efficiency of different DL-accelerated cine acquisition schemes compared to the standard protocol.

METHODS AND MATERIALS

Between September 2024 and January 2025, twenty adult patients referred for CMR were prospectively enrolled. All underwent cine imaging on a 1.5T scanner (Signa Voyager, GE HealthCare) using both standard (5 cardiac cycles, DL factor 6) and three DL-accelerated protocols: 2/12 (2 cycles, DL factor 12), 4/6 (4 cycles, DL factor 6), and 8/3 (8 cycles, DL factor 3). Quantitative analysis included left ventricular (LV) volumes, mass, ejection fraction (EF), and global strain parameters (GLS, GCS, GRS). Image quality was rated using a 5-point Likert scale. Acquisition times were recorded. Statistical comparisons were performed using paired tests and Bland-Altman analysis.

RESULTS

Compared to the standard 5 RR acquisition, GLS was significantly overestimated in the 2/12 configuration ($p = 0.0096$, mean bias = -1.69%). EF was significantly overestimated in the 8/3 configuration ($p = 0.021$). No significant differences were found for EDV, ESV, SV, LV mass, GCS, or GRS across protocols. The 4/6 configuration demonstrated optimal agreement with the standard protocol across all parameters. Acquisition time was reduced by 25% with 2/12 and 12.5% with 4/6, whereas 8/3 resulted in a 133% increase. Image quality was rated highest in 8/3 (mean score 4.5), comparable in 4/6 and 5 RR (score 4), and slightly lower in 2/12 (score 3.5).

CONCLUSION

DL-accelerated cine CMR can significantly reduce acquisition time while maintaining diagnostic accuracy. However, the choice of acquisition scheme impacts specific functional parameters. GLS and EF showed significant variability with certain protocols, highlighting the importance of protocol selection in clinical and research settings. The 4/6 configuration offers the best balance between scan time, image quality, and parameter reliability.

CLINICAL RELEVANCE/APPLICATION

The application of artificial intelligence is rapidly changing the diagnostic and prognostic pathway in radiology. Optimal compromise between image quality and diagnostic reliability will be crucial. In this abstract we identify the best combination of DL accelerated cine images in order to reduce time of acquisition and preserve reliable images.

R2-SPCA-5 DUAL ORGAN IMAGING BIOMARKERS: HEPATIC STEATOSIS AND BREAST ARTERIAL CALCIFICATION INDEPENDENTLY PREDICT INCIDENT HEART FAILURE AND ENHANCE RISK STRATIFICATION

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PURPOSE

Early identification of women at risk for heart failure (HF) is crucial. This study assessed if MRI-derived hepatic fat fraction (HFF) and mammographic breast arterial calcification (BAC), two potentially opportunistic imaging findings, are independent predictors of incident HF and improve risk stratification beyond traditional cardiovascular risk factors.

METHODS AND MATERIALS

This retrospective study included 653 women (mean age 59.0 ± 9.9 years) with screening mammograms and abdominal MRI between 2012 and 2020. HFF was quantified from MRI (in-phase/out-of-phase sequences) on liver volumes segmented using TotalSegmentatorMR. Hepatic steatosis was defined as >5%. BAC was automatically quantified from mammograms using a validated in-house AI model. Incident HF was identified via EHR ICD codes post-imaging studies. Univariate associations were initially explored with Kaplan-Meier analysis. Multivariable Cox models were employed to determine the independent predictive strength of HFF and BAC, after adjusting for age, diabetes, smoking, hypertension, and hyperlipidemia. The incremental value of these imaging biomarkers was further evaluated by comparing C-indices of models with and without their inclusion.

RESULTS

Over a median follow-up of 7.5 years, 33 (5.0%) women developed incident HF. Steatosis and BAC were each present in 25.7% (168/653) of participants. Kaplan-Meier analysis demonstrated that women with hepatic steatosis ($p=0.026$) or with BAC ($p=0.016$) had a significantly higher incidence of HF. Importantly, after adjusting for traditional risk factors, multivariable Cox models confirmed both steatosis (Adjusted Hazard Ratio [aHR]: 2.56; 95%CI: 1.23-5.30; $p=0.01$) and the presence of BAC (aHR: 2.52; 95%CI: 1.21-5.25; $p=0.01$) as robust independent predictors of incident HF. Adding HFF and BAC to a model with traditional risk factors significantly improved risk discrimination, increasing the C-index from 0.66 (traditional factors alone) to 0.71.

CONCLUSION

MRI-identified hepatic steatosis and BAC quantified on mammography are significant independent predictors of incident heart failure in women. These biomarkers offer incremental prognostic information, substantially enhancing risk prediction beyond traditional cardiovascular risk factors.

CLINICAL RELEVANCE/APPLICATION

Opportunistic assessment of hepatic fat on abdominal MRI and BAC on routine mammography can identify women at elevated risk for future heart failure, facilitating targeted preventative strategies and enhanced cardiovascular risk stratification.

R2-SPCA-6 ARTIFICIAL INTELLIGENCE DENOISING ENHANCES ULTRA-HIGH-RESOLUTION PHOTON-COUNTING-DETECTOR CCTA IMAGE QUALITY BEYOND QUANTUM ITERATIVE RECONSTRUCTION

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PURPOSE

Ultra-high-resolution (UHR) coronary CT angiography (CCTA) with photon-counting detector CT (PCD-CT) provides exceptional detail but is associated with increased image noise. Quantum iterative reconstruction (QIR), a denoising algorithm specifically developed for PCD-CT, can improve image quality without compromising sharpness. However, even with the highest QIR strength setting, UHR CCTA images still exhibit substantial noise. This study aims to evaluate whether an artificial intelligence (AI)-based denoising algorithm can further enhance UHR CCTA image quality

METHODS AND MATERIALS

We retrospectively analyzed CCTA scans from 25 patients with coronary artery disease, all of whom underwent PCD-CT with an in-plane resolution of 0.11 mm. Image sets were reconstructed with 0.2 mm slice thickness, both without QIR and with all QIR strength levels (1-4). Subsequently, each image set was processed using a CE-marked AI-based denoising tool (ClariACE, ClariPi). Two radiologists, trained in assessing CCTA images, evaluated overall image quality, sharpness, noise, and vessel wall contour delineation using a 5-point Likert scale. Differences between image sets were analyzed using Wilcoxon signed-rank tests.

RESULTS

Both radiologists rated AI-denoised images significantly higher ($P < 0.001$) across all parameters compared to those without denoising. For overall image quality, AI-denoised images at all QIR levels scored better (2 [IQR, 2-3] vs. 4 [IQR, 3-5], $P < 0.001$). The best results were observed for AI-denoised images at the highest QIR strength (level 4), with vessel wall contour delineation showing a notable improvement (AI-denoised QIR 4: 5 [IQR, 4-5] vs. QIR 4: 4 [IQR, 3-4]). Inter-reader agreement was good.

CONCLUSION

AI-denoising significantly improves the quality of UHR CCTA images compared to QIR alone, enhancing image sharpness and reducing noise. The most prominent benefits were observed in AI-denoised images at the highest QIR strength level, suggesting that AI-based denoising could be a valuable tool in optimizing CCTA image quality.

CLINICAL RELEVANCE/APPLICATION

Existing AI-based tools for improved image quality to be used on increased spatial resolution PCD-CCTA

R2-SPCA-10 COMPARISON OF NON-GATED AND TRADITIONAL GATED TECHNIQUES IN AUTOMATED CORONARY ARTERY CALCIUM SCORING

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PURPOSE

To investigate the differences between traditional electrocardiogram (ECG)-gated calcium scoring and non-ECG-gated calcium scoring using lung/mediastinum window parameters.

METHODS AND MATERIALS

This prospective study enrolled subjects who underwent both coronary artery calcium (CAC) scoring scans and non-contrast chest CT scans at our institution between January 2025 and March 2025.Inclusion criteria: (1)Interval between non-contrast chest CT and ECG-gated CAC scans =3 months; (2)Age =18 years; (3)No history of cardiac surgery.Exclusion criteria: Severe artifacts or poor image quality. (1)Imaging was performed using a Canon Aquilion ONE Genesis Edition 320-detector row CT scanner.ECG-gated scans (Group A): Non-gated scans (Group B).All datasets were reconstructed using Adaptive Iterative Dose Reduction 3D (AIDR 3D) with 3-mm slice thickness and interval. CAC scores were measured using the Neusoft Coronary Artery Calcium Automated Analysis System (Neusoft CCSpro). CAC scores were categorized into five risk levels: very low (0), low (1-10), moderate (11-100), high (101-400), and very high (>400).Objective Metrics: CT attenuation values of the aortic root and left ventricular myocardium; Standard deviation (SD) of regions of interest (ROI) to quantify noise; Signal-to-noise ratio (SNR = CT attenuation/SD).

RESULTS

Among 27 initially enrolled patients, 3 were excluded due to severe coronary calcification artifacts, leaving 24 patients (mean age 66.9 ± 6.9 years; male-to-female ratio 1.7:1).Image Quality ComparisonAortic root: Group A: CT attenuation = 48.41 ± 1.86, SD = 11.30 ± 1.27, SNR = 4.33 ± 0.44Group B: CT attenuation = 43.99 ± 1.10, SD = 17.10 ± 1.11, SNR = 2.59 ± 0.22 (all $p < 0.05$).Agatston Score ComparisonGroup A (491.46 ± 890.02) showed higher Agatston scores than Group B (481.67 ± 837.64, $p = 0.025$).Subgroup AnalysisNo significant differences were observed between Group A and Group B in very low-, low-, and moderate-risk CAC categories ($p = 0.254$). However, significant differences were found in high- and very high-risk categories ($p = 0.023$).

CONCLUSION

Non-gated coronary artery calcium (CAC) scoring using lung/mediastinum window parameters demonstrates significant correlation with traditional ECG-gated CAC scoring. However, the agreement between the two methods is stronger in low- to moderate-risk populations, suggesting that non-gated CAC scoring can serve as a preliminary screening tool for these groups.

CLINICAL RELEVANCE/APPLICATION

The non-gated CAC scoring technique, when applied to low- to moderate-risk populations, helps avoid unnecessary additional ECG-gated CAC examinations, thereby reducing radiation exposure while maintaining diagnostic utility.

R2-SPCA-12 FEASIBILITY OF ULTRA-LOW FLOW CORONARY CT ANGIOGRAPHY USING PHOTON-COUNTING CT: A PROSPECTIVE TRIAL

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PURPOSE

This study evaluates the feasibility of coronary CT angiography (CCTA) using photon-counting detector CT (PCD-CT) at ultra-low flow contrast rates, while maintaining diagnostic image quality.

METHODS AND MATERIALS

In this prospective trial, 292 patients underwent CCTA using one of three protocols: ultra-low flow rate (1.5-1.8 mL/s) with PCD-CT, routine flow rate (4.0-5.0 mL/s) with PCD-CT and energy-integrating detector CT (EID-CT). All scans employed ECG-gated high-pitch acquisition (pitch 3.2) with heart rate-based phase selection. PCD-CT images were reconstructed with 45 keV virtual monoenergetic algorithms. A total of 4,672 segments were analyzed. Objective image quality was measured by CT attenuation values, contrast-to-noise ratio (CNR), and signal-to-noise ratio (SNR). Subjective image quality was assessed by a 4-point Likert scale.

RESULTS

Objective analysis showed comparable attenuation, CNR (24.1-26.8), and SNR (18.3-19.4) across all groups (P >0.05). Subjectively, ultra-low flow PCD-CT showed more Score-3 ratings (55.2% in posterior descending right coronary artery (RCA), 77.1% in distal LCX), while routine flow PCD-CT and EID-CT had more Score-4 ratings (70.7% and 72.2%, P <0.05). Significant differences were noted in the posterior descending, distal LCX, and obtuse marginal branches.

CONCLUSION

Ultra-low contrast flow rates in PCD-CT maintain objective image quality comparable to standard protocols. Despite minor reductions in subjective quality, diagnostic performance remains acceptable, offering a viable option for patients with limited venous access.

CLINICAL RELEVANCE/APPLICATION

PCD-CT provides comparable objective image quality at reduced contrast flow rates, with clinically acceptable diagnostic performance. This supports its use in patients with renal impairment or fragile veins, where low contrast loads are preferred.

R2-SPCA-13 THE VALUE OF WIDE DETECTOR CT ANGIOGRAPHY IN EVALUATING LEFT VENTRICULAR FUNCTION AND STRAIN IN PATIENTS WITH AORTIC STENOSIS

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PURPOSE

This study aimed to evaluate the clinical value of wide-detector cardiac computed tomography angiography (CTA) in assessing left ventricular (LV) function and strain changes in patients with aortic stenosis (AS), using cardiac magnetic resonance (CMR) as the reference standard.

METHODS AND MATERIALS

A total of 42 AS patients who underwent both wide-detector cardiac CTA and CMR from January 2020 to October 2024 were retrospectively enrolled. Structural parameters, functional parameters and strain parameters derived from CTA and CMR were measured and compared. LV morphology was classified based on LV mass (LVM) index and mass-to-volume ratio from both modalities.

RESULTS

For structural parameters, four-chamber LV end-diastolic diameter (LVEDD), LV end-systolic diameter (LVESD) and short-axis LVEDD from CTA showed no significant differences with CMR (all P>0.05). Correlation analysis showed that structural parameters obtained by CTA were all strongly positively correlated with the corresponding CMR parameters (r=0.907, r=0.951, r=0.949, r=0.970, all P<0.001). In terms of function, LV stroke volume (LVSV) and LV ejection fraction (LVEF) from CTA had no significant differences with CMR (all P>0.05). Correlation analysis showed that the LV end-diastolic volume (LVEDV), LV end-systolic volume (LVESV), LVSV, LVEF, and LVM obtained by CTA were all strongly positively correlated with the corresponding CMR parameters (r = 0.998, r = 0.997, r = 0.974, r = 0.995, r = 0.998, all P<0.001). CTA showed excellent intra-observer consistency in the measurement of all LV structural and functional parameters (all ICC>0.9). When measuring LV strain, correlation analysis showed that 2D GRPS, 2D GCPS, and 2D GLPS obtained by CTA were strongly positively correlated with the corresponding CMR parameters (r = 0.792, r = 0.774, r = 0.713, all P<0.001). In addition, CTA and CMR had a high degree of consistency in the classification of LV hypertrophy in AS patients (Kappa = 0.892, P<0.001).

CONCLUSION

Wide-detector CTA demonstrates good consistency with CMR in evaluating LV structure, function, and 2D global strain in AS patients. It can accurately classify LV hypertrophy and serve as an alternative to CMR, especially for patients ineligible for CMR.

CLINICAL RELEVANCE/APPLICATION

This study's results have important clinical value. Wide - detector cardiac CTA, highly consistent with CMR in assessing LV function and structure, provides a viable alternative. For patients unsuitable for CMR due to metallic implants, claustrophobia, etc., CTA can offer reliable data for diagnosis and treatment planning, guiding surgical and long - term management decisions to enhance patient care.

R2-SPCA-14 NOVEL PHOTON COUNTING CT SPECIFIC AI DENOISING SIGNIFICANTLY IMPROVES IMAGE QUALITY IN CARDIAC CT

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PURPOSE

Photon Counting CT (PCCT) has substantially enhanced coronary artery calcium (CAC) scoring and coronary computed tomography angiography (CCTA). However, the influence of modern AI-based denoising (AID) algorithms on image quality and their clinical interchangeability with quantum iterative reconstruction (QIR) has not been established. This study evaluated the impact of an AID algorithm on subjective and objective image quality and clinical interchangeability compared to QIR in cardiac PCCT.

METHODS AND MATERIALS

We retrospectively analyzed 100 patients (57±12 y, 26 female) who underwent CAC and CCTA scans using the same PCCT scanner. Scans were reconstructed with both QIR and AID, resulting in 400 datasets. Three radiologists independently assessed all dataset combinations for subjective image quality (-1 = inferior, 0 = equal, 1 = superior). Scores were averaged to obtain semiquantitative evaluations, with intra-rater reliability and inter-rater agreement assessed using Spearman's correlation coefficients. Objective image quality metrics included CT attenuation stability, noise (via Noise Power Spectrum, NPS), and edge-rise distance measurements at

cartilage-muscle interfaces (CAC) and contrast-enhanced chamber-muscle borders (CCTA). Clinical interchangeability was evaluated by comparing Agatston scores, coronary age assessments, manual correction times (CAC), and left ventricular end-diastolic volume (LVED) and muscle mass (CCTA) between QIR and AID datasets. Mixed-effects modeling, adjusted for relevant factors, analyzed pooled subjective and objective image quality results.

RESULTS

AID significantly improved subjective image quality compared to QIR ($p<0.001$), with very strong reliability/agreement ($r=0.76$). Objective analyses showed significantly reduced edge-rise distances and lower average NPS with AID compared to QIR for both CAC and CCTA (each $p<0.001$), while maximum and minimum CT attenuation values remained unchanged ($p=0.901$). Clinical interchangeability analyses revealed no significant differences between QIR and AID regarding Agatston scores, coronary age, manual correction times (each $p=0.532$), LVED volume ($p=0.153$), or muscle mass ($p=0.632$).

CONCLUSION

The AID algorithm is clinically interchangeable with QIR for cardiac PCCT applications while providing significantly enhanced subjective and objective image quality, particularly regarding noise reduction and improved sharpness.

CLINICAL RELEVANCE/APPLICATION

AID enhance PCCT by improving image sharpness and reducing noise. Clinicians can safely replace QIR with AID without compromising clinical usability. High consistency and reliability of image quality assessments across radiologists support widespread adoption.
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R2-SPCH

Chest Imaging Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPCH-1 SHARPER THAN EVER: OPTIMIZING KERNEL SELECTION FOR ULTRA-HIGH RESOLUTION PHOTON-COUNTING DETECTOR CT PULMONARY ANGIOGRAPHY

Pauline Pannenbecker, MD, BA (*Presenter*)
Philipp Gruschwitz, MD (*Abstract Co-Author*)
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PURPOSE

To identify the convolution kernel offering the best trade-off between image noise and vessel sharpness in ultra-high resolution CT pulmonary angiography (CTPA) with Photon-Counting Detector (PCD) at two dose levels.

METHODS AND MATERIALS

In this IRB-approved study, 152 CTPAs between April and October 2024 acquired on a dual-source PCD-scanner at two dose levels were retrospectively analyzed (76 PCD-CT at IQ level 50 with a CTDIvol of 6.7 mGy, 76 at IQ level 25 with a CTDIvol of 3.0 mGy). Scans were performed using flash mode (pitch 3.0, 140 kV tube voltage) and reconstructed at 55 keV in three vascular kernels (Bv48, Bv56, Bv64) and three quantitative kernels (Qr48, Qr56, Qr64). For each kernel, objective image quality parameters (vessel attenuation, signal-to-noise and contrast-to-noise (SNR, CNR)) were assessed using standardized ROIs. Subjective image quality was assessed using a browser-based, pairwise comparison tool with 8 radiologists performing 18,240 comparisons (9,120 per dose level), resulting in a preference-based ranking.

RESULTS

Attenuation in the main pulmonary artery peaked with intermediate sharpness kernels (Bv56 and Qr56) at both dose levels (e.g., Bv56: 640.5 HU at IQ25; 598.4 HU at IQ50; both $p < 0.001$), followed by Bv64/ Qr64 and Bv48/Qr48. Both, SNR and CNR decreased with increasing kernel levels, as is exemplified with a median CNR within the pulmonary trunk of 13.4 in Bv48 vs. 10.5 in Bv56 vs. 6.7 in Bv64 at IQ50 (all $p<0.001$). In subjective image ratings, Bv56 kernel was ranked highest, followed by Bv64, Bv48, Qr64, Qr56 and Qr48 respectively across both dose levels. Interreader reliability was substantial, indicated by a Kendall's W of 0.67.

CONCLUSION

Among all tested convolution kernels, Bv56 achieved the most favorable balance of vessel sharpness and image noise in ultra-high resolution CTPA using PCD-CT. This finding was consistent across both objective metrics and reader preference, independent of dose level.

CLINICAL RELEVANCE/APPLICATION

Selecting the appropriate reconstruction kernel for UHR CTPAs with PCD can have a relevant impact on both, subjective and objective image quality. Using Bv56 allows for excellent vascular visualization in the diagnosis of pulmonary embolism even at lower radiation dose levels.

R2-SPCH-2 EVALUATION OF THE LABORATORY D-DIMER TEST IN DETECTION OF PULMONARY EMBOLISM IN POST-OPERATIVE AND FRACTURE PATIENTS

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Teresa Wilson (*Abstract Co-Author*)
Kristin Delfino (*Abstract Co-Author*)

PURPOSE

Recent surgery and lower limb fractures are risk factors for pulmonary embolism (PE). The risk of developing a PE post-operatively is 5 to 20-fold. Incidence among those with lower limb fracture is 0.35% to 24%. The consensus of the utility of the laboratory D-dimer test prior to a diagnostic computed tomography pulmonary angiogram (CTPA) varies. Currently, there are no D-dimer guidelines for ordering a CTPA at HSHS St. John's Hospital, a regional medical center in the rural Midwest. The aim of this study was to evaluate D-dimer levels and presence of PE in patients with recent surgery and lower limb fracture.

METHODS AND MATERIALS

This retrospective chart review included patients that presented to HSHS St. John's Hospital in Springfield, IL and underwent CTPA for suspected PE between January 1, 2022 and December 31, 2022. Data included clinical factors, D-dimer levels, and CTPA results. Continuous variables were compared using the T-test or Mann Whitney U test. Associations with categorical variables were analyzed with Fischer's Exact test. P-values < 0.05 were considered statistically significant.

RESULTS

A total of 660 patients were included in this study, with 8% positive for PE. Among these patients, 55 had either underwent surgery with general anesthesia or had a lower limb fracture within a month of presentation. Compared to those without recent surgery or fracture, this subgroup had a significantly higher incidence of PE (22% vs. 7%, $p < 0.001$). D-dimer levels were higher (elevated > 500 ng/mL) in the surgical-fracture cohort (1363 ng/mL [533-11781]) compared to the non-surgical cohort (911 ng/mL [81-19518]), but not statistically significant ($p = 0.0682$). Within the surgical-fracture cohort, patients with PE had a significantly lower oxygen saturation on presentation (96% [84-98]) compared to those without PE (98% [73-100], $p = 0.034$), and a significantly higher Wells Scores (6 [3-10.5]) compared to those without PE (4.5 [0-9], $p = 0.011$).

CONCLUSION

Significant association was found between history of recent surgery or lower limb fracture and presence of PE. The Wells Score was significantly greater among the surgical-fracture cohort patients with PE. Furthermore, the oxygen saturations among the surgical-fracture cohort were significantly lower in those with PE. Thus, the Wells Score and oxygen saturation may help facilitate clinical suspicion and detection of PE in patients with recent surgery or lower limb fracture. Future work will investigate potential differences in pulmonary involvement between the surgical-fracture and non-surgical-fracture PE cohorts utilizing CTPA scan results

CLINICAL RELEVANCE/APPLICATION

This study analyzes the D-dimer and other clinical factors in formulating clinical suspicion for PE prior to diagnostic CTPA.

R2-SPCH-4 THE CHARACTERISTICS OF PULMONARY ARTERY INVOLVEMENT IN TAKAYASU ARTERITIS BASED ON CTPA

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PURPOSE

Takayasu arteritis (TA) with pulmonary artery involvement (PAI) often leads to pulmonary hypertension (PH) and poor outcomes, but diagnosis remains challenging due to nonspecific symptoms. This study aimed to characterize TA-PAI using computed tomography pulmonary angiography (CTPA)-based quantitative analysis of pulmonary arterial volume (PAV) and compare imaging features between TA-PAI patients and controls, as well as between TA-PAI subgroups with and without PH.

METHODS AND MATERIALS

This retrospective study included 90 TA-PAI patients and 47 controls who underwent CTPA. PAV was automatically segmented and categorized by arterial diameter (=0.8, 0.8-1.6, 1.6-2.4, 2.4-3.2, 3.2-4.0, >4.0 mm). Imaging findings (stenosis, occlusion, dilation, aneurysm, wall thickening, thrombosis) and main pulmonary artery diameter were assessed. PH was defined echocardiographically. Clinical and laboratory data were collected.

RESULTS

TA-PAI patients showed significant PAV reductions in arteries =2.4-4.0 mm compared to controls ($p<0.001$), with the most pronounced loss in 1.6-3.2 mm vessels ($p=0.001$). The PH subgroup (n=17) had larger main pulmonary artery diameters ($p<0.001$) and higher frequencies of stenosis ($p=0.045$), dilation ($p=0.001$), and aneurysms ($p=0.007$) than the non-PH subgroup. No significant PAV differences were observed between PH and non-PH groups.

CONCLUSION

TA-PAI is characterized by significant volume loss in intermediate-sized pulmonary arteries (1.6-3.2 mm), detectable via CTPA. PH-associated TA-PAI exhibits more severe structural changes (stenosis, dilation, aneurysms), but PAV alone did not differentiate PH status, possibly due to sample size limitations.

CLINICAL RELEVANCE/APPLICATION

Quantitative CTPA analysis of PAV, particularly in 1.6-3.2 mm arteries, may aid early TA-PAI diagnosis and monitoring. The association of PH with arterial dilation/aneurysms underscores the need for vigilant hemodynamic assessment in TA-PAI. Further studies should validate PAV thresholds for disease stratification and explore longitudinal changes.

R2-SPCH-5 MULTICENTER EXTERNAL VALIDATION OF CT-BASED AI TOOL FOR ESTIMATING BONE MINERAL DENSITY

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PURPOSE

To perform an external validation study of an AI tool for opportunistic osteoporosis detection on non-contrast chest CT in a real-world, multinational, multicenter setting, using spine DEXA as the reference standard.

METHODS AND MATERIALS

With IRB approval, 556 consecutive, non-contrast chest CT exams (mean age 65 ± 12 years; M:F 91:464) from 16 sites in Brazil and US were retrospectively identified either through manual review or an Epic-based clinical data warehouse. Adult patients (>/=21 years) with CT chest and spine DEXA performed within 12 months were included. Multivendor thin-section CT images (1-1.25 mm) were deidentified and processed with an AI tool (Claripi.Inc) for volumetric BMD estimation. Ground truth T-scores, Z-scores, and BMD values were extracted from corresponding DEXA reports. Statistical analysis included Kruskal-Wallis and median tests to assess non-normal BMD distributions across diagnostic categories.

RESULTS

DEXA-BMD values differed significantly across all three BMD categories (Normal BMD, Osteopenia, Osteoporosis) based on Kruskal-Wallis and median tests ($p < 0.001$). Post-hoc comparisons confirmed significant differences between all diagnostic groups ($p < 0.001$). AI-predicted BMD values also showed significant variation across categories, with higher medians in normal BMD subjects. AI-predicted BMD values significantly differentiated normal BMD from both osteopenia ($p < 0.001$) and osteoporosis ($p < 0.001$), however it failed to distinguish between osteopenia and osteoporosis ($p = 1.00$). Distribution analysis revealed greater variability in AI-

predicted CT-BMD values (mean = 88.5 mg/cc, SD = 41.9) compared to DEXA-BMD value (mean = 0.93 g/cm2, SD = 0.17), suggesting calibration or scaling limitations.

CONCLUSION

AI-based opportunistic assessment of bone mineral density from non-contrast chest CT demonstrates statistically significant differentiation between normal and osteoporosis groups. However, the AI model shows limited ability to distinguish between osteopenia and osteoporosis group and exhibits a higher variability in BMD estimations as compared to DEXA.

CLINICAL RELEVANCE/APPLICATION

CT-BMD estimation with non-contrast chest CT AI can provide an accessible, cost-effective screening tool for detecting low bone mineral density in a real-world, multi-institutional setting. Integration of such tools into clinical workflows could enable earlier identification and management of osteoporosis, especially in patients who may not otherwise undergo dedicated DEXA screening.

R2-SPCH-7 QUANTITATIVE EVALUATION OF PULMONARY PERFUSION AND VENTILATION IN PULMONARY HYPERTENSION PATIENTS USING PHASE-RESOLVED FUNCTIONAL LUNG MRI

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PURPOSE

Recent advances have established phase-resolved functional lung MRI (PREFUL MRI) as a novel, noninvasive imaging technique for assessing regional pulmonary ventilation and perfusion. This study aimed to evaluate the value of quantitative PREFUL MRI parameters in distinguishing Group 1 pulmonary arterial hypertension (PAH) from Group 4 chronic thromboembolic pulmonary hypertension (CTEPH), with a particular focus on the correlation between pulmonary perfusion/ventilation parameters and hemodynamic indices, as well as their diagnostic performance.

METHODS AND MATERIALS

This prospective cohort study recruited patients with suspected pulmonary hypertension who underwent right heart catheterization and PREFUL MRI between January 2024 and January 2025. Pulmonary perfusion and ventilation parameters were obtained using PREFUL MRI. The K-W test was used to compare perfusion and ventilation parameters among different PH subgroups. Spearman correlation was applied to assess the relationships between PREFUL MRI parameters and hemodynamic measurements.

RESULTS

52 patients were included: 21 with Group 1 PAH, 22 with Group 4 CTEPH, and 9 with normal pulmonary arterial pressure (non-PH controls). The total ventilation defect percentage (VDPtotal) did not significantly differ among the three groups ($P > 0.05$). In contrast, the total perfusion defect percentage (QDPtotal) was significantly higher in PH patients (combining PAH and CTEPH) compared to non-PH controls (42.90% [23.90%-61.10%] vs. 10.20% [4.40%-20.10%], $P < 0.001$). QDPtotal was also significantly higher in the CTEPH group than in the PAH group (58.40% [39.52%-66.62%] vs. 31.00% [23.10%-47.00%], $P = 0.019$). QDPtotal was positively correlated with mean pulmonary arterial pressure (? = 0.544, $P < 0.001$), mean right ventricular pressure (? = 0.482, $P < 0.001$), and pulmonary vascular resistance (? = 0.505, $P < 0.001$). The area under the ROC curve (AUC) of QDPtotal for differentiating PAH from CTEPH was 0.709 ($P < 0.05$).

CONCLUSION

QDPtotal derived from PREFUL MRI effectively reflects the degree of pulmonary vascular pathology in PH patients, with more pronounced perfusion defects in CTEPH than in PAH. It correlates with hemodynamic parameters and shows moderate value for distinguishing PAH from CTEPH (AUC = 0.709), suggesting its potential as a noninvasive imaging biomarker for pulmonary hypertension.

CLINICAL RELEVANCE/APPLICATION

PREFUL MRI offers a noninvasive way to assess lung perfusion and ventilation, aiding in the diagnosis and classification of pulmonary hypertension. Its correlation with hemodynamics suggests potential for clinical monitoring and treatment guidance.

R2-SPCH-8 EMPHYSEMA ON BASELINE LOW-DOSE CT STRONGLY PREDICTS DEATH DUE TO CHRONIC PULMONARY OBSTRUCTIVE DISEASE AND CARDIOVASCULAR DISEASE UP TO 25 YEARS OF FOLLOW-UP OF ASYMPTOMATIC PARTICIPANTS IN PROGRAMS OF CT SCREENING FOR LUNG CANCER

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Jessica Gonzalez (*Abstract Co-Author*)
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PURPOSE

The usefulness of assessing baseline visual emphysema in lung cancer screening (LCS) cohorts is unknown. Our study aims to determine whether assessment of emphysema on low-dose chest CT (LDCT) is a predictor of death up to 25 years later from all-causes, chronic obstructive pulmonary disease (COPD), and cardiovascular (CVD).

METHODS AND MATERIALS

Prospective cohort of smokers aged 40-85 years underwent baseline LDCT screening for LC between June 2000 and December 2008 and were followed until December 31, 2024.Visual emphysema was classified as none(0), mild(1), moderate(2), or severe(3). Self-reported smoking history and comorbidities were documented at baseline. Date and cause of death (ICD-10) were obtained from the National Death Index, physicians, and family. Adjusted Cox proportional hazards regression models and Fine-Gray subdistribution hazard model analyzed emphysema and mortality outcomes.

RESULTS

Among 9047 participants (51.2% women, 48.8% men; median age: 65 years [IQR:61-69]; median pack-years: 43[IQR:28-64]), 2637(29.1%) had emphysema. It was mild(1908;21.1%), moderate(512; 5.7%), and severe(217; 2.4%). After adjusting for sex, age, pack-years, and years since quitting, emphysema remained a significant predictor of all-cause mortality (HR: 1.29; 95%CI: 1.21-1.38), COPD mortality (HR: 3.28; 95%CI: 2.58-4.17), and CVD mortality(HR:1.14; 95%CI: 1.01-1.30). A dose-response relationship was observed between emphysema severity and both all-cause and COPD mortality, but not CVD mortality, with greater emphysema severity associated with higher risk. Adjusted Fine-Gray subdistribution hazard model, which accounts for competing risks, the association between emphysema and COPD mortality remained significant but was attenuated(HR: 3.01; 95%CI: 2.36-3.84), while the association with CVD mortality was no longer significant (HR: 1.02; 95%CI: 0.89-1.16).

CONCLUSION

Baseline emphysema on LDCT in asymptomatic participants of a LCS cohort predicts all-cause, COPD, and CVD mortality up to 25 years later, underscoring the importance of emphysema diagnosis in comprehensive LCS programs.

CLINICAL RELEVANCE/APPLICATION

Visual emphysema on baseline LDCT is a strong predictor of long-term mortality, particularly from COPD and cardiovascular disease. Incorporating emphysema assessment into lung cancer screening may improve risk stratification and guide preventive interventions beyond cancer detection.

R2-SPCH-9 PERFORMANCE OF ENSEMBLE DEEP LEARNING FOR DETECTION OF SURGICALLY-CONFIRMED CTEPH ON CT ANGIOGRAPHY

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Jenny Yang (*Abstract Co-Author*)
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Seth J. Kligerman, MD, MS (*Abstract Co-Author*)
Albert Hsiao, MD, PhD (*Abstract Co-Author*)

PURPOSE

Chronic thromboembolic pulmonary hypertension (CTEPH) is a surgically-treatable form of pulmonary hypertension associated with prior pulmonary embolism. Computed tomography angiography (CTA) is an essential diagnostic tool which can be used to confirm CTEPH diagnosis and disease extent. However, the features of CTEPH on CTA can be subtle and are often overlooked and misdiagnosed. Deep learning algorithms have potential to support diagnosis of rare and treatable diseases such as CTEPH. We therefore sought to evaluate a newly-developed algorithm to identify patients with surgically-confirmed CTEPH, and compare this performance against subspecialty radiologists.

METHODS AND MATERIALS

With IRB-approval and HIPAA-compliance, we evaluated the deep learning algorithm-an ensemble of eight convolutional neural networks (CNN)-to detect CTEPH in a composite population of 356 patients who underwent CTA. This included 211 patients who underwent CTA who had no clinical or radiologic evidence of CTEPH, and 145 patients who underwent pulmonary thromboendarterectomy (PTE). Three subspecialty radiologists with cardiovascular or thoracic subspecialty training each independently reviewed at least 100 CTAs for findings of CTEPH, including pulmonary arterial and right ventricular morphologic characteristics, blinded to clinical data, and overlap of at least 27 patients. Statistical analyses included Cohen's Kappa, area under the receiver operating characteristic curve (AUROC), sensitivity, and specificity for detection of disease.

RESULTS

In the 145 patients who underwent PTE surgery, the most proximal level of disease found surgically was 33%, 42%, 21%, and 4% for levels 1-4, respectively. Overall, there was strong agreement between the algorithm and readers (?=0.73-0.82) and between readers (?=0.73-0.83). The algorithm showed similar performance for detection of CTEPH (AUROC 0.96) to subspecialty radiologists (AUROC 0.91-0.98). At the Youden index, the algorithm had 90% sensitivity and 95% specificity for detecting CTEPH. Radiologists varied from 82-93% sensitivity and 95-98% specificity. For each disease level 1-4, the algorithm had 92-100% sensitivity and 91-99% specificity. In aggregate, radiologists showed 83-96% sensitivity and 95-98% specificity with slightly greater performance on proximal disease.

CONCLUSION

An ensemble convolutional neural network is capable of detecting surgically-confirmed CTEPH on CTA with performance comparable to subspecialty radiologists.

CLINICAL RELEVANCE/APPLICATION

A specialized deep learning algorithm may aid radiologists in identifying patients with CTEPH to facilitate medical or surgical management.

R2-SPCH-11 HEPATOPULMONARY SYNDROME - CHEST CT FINDINGS IN A LARGE COHORT

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PURPOSE

Hepatopulmonary syndrome (HPS) is a complication of liver disease characterized by pulmonary vascular dilations and impaired oxygenation. On computed tomography (CT), parenchymal changes seen in HPS can overlap with features of pulmonary fibrosis, raising the risk of misdiagnosis and potentially excluding patients from liver transplantation, the only definitive treatment for HPS. We evaluated CT findings in a large cohort of HPS patients before and after liver transplantation.

METHODS AND MATERIALS

The retrospective study included consecutive patients from a multi-center academic institution with clinically confirmed HPS and chest CT. 99mTc-MAA lung perfusion scintigraphy and pulmonary function testing was recorded when available. A subset of patients had a post-operative chest CT scan (>6 months after transplantation). CTs were reviewed for subpleural reticulation and peripheral ground-glass (features hypothesized to relate to HPS) and for findings of fibrosis, including traction bronchiectasis and honeycombing (unrelated to HPS). Measurements were recorded of the pulmonary vasculature.

RESULTS

A total of 246 patients met inclusion criteria. The mean age was 58 years, and 29% were female. Mean PaO2 was 54.7 mmHg and mean MAA lung scintigraphy shunt fraction was 25.2%. PFTs demonstrated abnormal diffusion capacity (mean DLCO was 50.6%). The mean main pulmonary artery diameter was normal (26.5 mm). Subsegmental pulmonary veins were enlarged (mean 7.1 mm), compared to arteries (5.7 mm) and bronchi (5.0 mm), resulting in an elevated vein-to-bronchus ratio of 1.4. Subpleural reticulation and peripheral ground-glass were present in 70% and 21%, respectively. Findings consistent with fibrosis, including moderate/severe traction bronchiectasis and honeycombing, were observed in 4% and 1%, respectively. Following transplantation, subsegmental pulmonary veins and arteries decreased in diameter by 1.3 mm ($p < 0.001$) and 0.3 mm ($p < 0.001$), respectively. Subpleural reticulation also decreased ($p = 0.04$).

CONCLUSION

Subpleural reticulation and ground-glass opacities, often present in HPS, can mimic pulmonary fibrosis, and that an increased subsegmental vein-to-bronchus ratio serves as a useful distinguishing feature. Post-transplant CT showed improvement in vascular abnormalities and a reduction in subpleural reticulation.

CLINICAL RELEVANCE/APPLICATION

CT findings in HPS may be misinterpreted as pulmonary fibrosis, potentially leading to inappropriate exclusion of patients from transplantation. Our results demonstrate that many of these imaging abnormalities improve following transplantation, suggesting that recognition of these distinct features could expand transplant eligibility.

R2-SPCH-12 HOW CONCURRENT BOUNDING-BOX DISPLAY AFFECTS VISUAL SEARCH IN CHEST X-RAY READING: AN EYE-TRACKING PILOT STUDY

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PURPOSE

To quantify how concurrent-reader-style bounding-box (BB) highlighting affects radiologist behavior during chest-radiograph interpretation and to obtain preliminary insights that may guide its clinical use.

METHODS AND MATERIALS

A total of 180 chest radiographs were extracted from the VinDR-CXR data set: 120 contained a single solitary pulmonary nodule or mass and 60 contained neither. BBs were manually placed to achieve overall display sensitivity and specificity of 80%. Correct BBs were applied to 96 of the 120 lesion-positive images, defining the true-positive (TP) group.Three radiologists (11-, 5- and 1-years' experience) interpreted every case twice. Images were first shown with BBs (simulated concurrent-read AI support) and, after a wash-out interval of =10 days, were reread without BBs. Readers assessed only the lung fields. To emulate routine AI use, they were falsely informed that the boxes came from an algorithm reporting 80% sensitivity and specificity. They were told that eye-tracking would be performed, but its purpose was not disclosed.Gaze data were recorded with an EyeTech VT3 Mini. Analysis focused on the TP group. Outcomes were the percentage change between readings with and without BBs in (i) interpretation time, (ii) time to first fixation on the lesion, (iii) dwell time on the lesion, (iv) gaze-path length and (v) lung-field coverage, defined as the percentage of 50-pixel lung-field grid cells crossed by the gaze path. Each outcome was modelled with a generalized linear mixed model (GLMM) that treated reading condition as a fixed effect and both case and tester as random intercepts to test for significant changes.

RESULTS

Without BBs, the lowest-highest per-reader means were 6.1-12.0 s for interpretation time, 2.2-2.6 s for time to first fixation on the lesion, 0.8-3.9 s for dwell time on the lesion, 2.8-7.0 × 10 3 pixels for gaze-path length, and 45-69 % for lung-field coverage.GLMM estimates (BB-assisted ÷ unassisted) were: interpretation time = 1.45× (95 % CI 1.32-1.60; $p < 0.001$); time to first fixation on the lesion = 0.70× (0.53-0.93; $p = 0.014$); dwell time on the lesion = 4.31× (2.94-6.32; $p < 0.001$); gaze-path length = 1.42× (1.30-1.54; $p < 0.001$); and lung-field coverage = 1.21× (1.18-1.25; $p < 0.001$).

CONCLUSION

Within the TP group, concurrent lesion highlighting accelerates initial localization yet prolongs overall reading by encouraging additional verification, producing a "find fast, verify thoroughly" workflow.

CLINICAL RELEVANCE/APPLICATION

Because concurrent BB prompts can simultaneously hasten detection and extend verification, recognizing their net impact on individual reading styles is essential for radiologists aiming to integrate AI tools judiciously into clinical practice.

R2-SPCH-13 DIFFERENCES IN PULMONARY ARTERIAL AND VENOUS VOLUMES BETWEEN SUPINE AND UPRIGHT CT SCANS

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Yoshitake Yamada, MD, PhD (*Abstract Co-Author*)
Minoru Yamada, RT (*Abstract Co-Author*)
Yoichi Yokoyama, MD (*Abstract Co-Author*)
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PURPOSE

Postural changes affect pulmonary blood flow and vascular volume; however, no prior study has quantitatively assessed these effects by separately evaluating pulmonary arteries and veins. The recently developed upright 320-detector-row CT and advances in 3D imaging have made such evaluation feasible. This study aimed to quantify changes in pulmonary vascular volume (PVV), arterial volume (PAV), and venous volume (PVnV) from the supine to standing position across the whole lung, individual lobes, and the upper, middle, and lower regions, to characterize gravity-dependent vascular distribution.

METHODS AND MATERIALS

This prospective study was approved by the IRB. CT scans performed between January and December 2018 were included. Sixty-two healthy adults underwent both supine and upright CT within 2 h. Twelve participants were excluded owing to peripheral abnormalities (e.g., nodules and atelectasis) or technical issues (e.g., motion or poor inspiration), leaving 50 participants for analysis. Arteries and veins were semi-automatically segmented using Synapse Vincent (Fujifilm). PVV, PAV, and PVnV were measured for the whole lung, each lung, and regions defined as upper (above the carina), middle (below the carina), and lower (below left B8/B9+10). Vascular density was calculated as vessel volume divided by lung volume. Paired t-tests were used for comparisons.

RESULTS

From supine to standing, PVV decreased by 18.8±8.5%, PAV by 11.1±6.8%, and PVnV by 25.4±7.4% (all $p < 0.001$), with venous reductions exceeding arterial ones. By region, PVV decreased by 25.2±8.1% in the upper lung, 20.9±6.7% in the middle, and 12.0±9.6% in the lower. PAV decreased by 20.1±9.2%, 10.3±7.2%, and 6.0±10.9%, while PVnV decreased by 30.0±11.2%, 32.6±8.5%, and 16.7±11.3%, respectively (all $p < 0.001$). Vascular density showed a similar pattern, with greater reductions in the upper and middle lungs.

CONCLUSION

Transitioning from supine to standing significantly reduced both PAV and PVnV, with a more pronounced decrease in PVnV. Reductions in PAV and PVnV were greater in the upper and middle lung regions, with the smallest decreases observed in the lower regions.

CLINICAL RELEVANCE/APPLICATION

This study provides the first quantitative assessment of postural changes in pulmonary arterial and venous volumes in healthy individuals, demonstrating vascular redistribution in the upright position. These findings establish a physiological baseline that may inform future investigations into pathologic vascular alterations, such as those in pulmonary hypertension or heart failure.

Nov. 30 – Dec. 4
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R2-SPER

Emergency Radiology Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPER-1 ACTIVE BLEEDING ON ADMISSION CT CORRELATES WITH BLOOD TRANSFUSION NEEDS IN THE SETTING OF MULTI-SYSTEM TRAUMA

Abigail Abernathy, MD (*Presenter*)
Greg Gaski, MD (*Abstract Co-Author*)
Todd McKinley, MD (*Abstract Co-Author*)
Katherine Frey (*Abstract Co-Author*)
Scott D. Steenburg, MD (*Abstract Co-Author*)

PURPOSE

To evaluate if trauma patients with active bleeding detected on CT scan had different transfusion needs than trauma patients without active bleeding.

METHODS AND MATERIALS

Data were extracted from the database from large, prospective multi-center trial comprised of trauma centers participating in the Major Extremity Trauma and Rehabilitation Consortium (METRC). Active bleeding was identified on deidentified whole body computed tomography scans by a trauma radiologist. The patient cohort was divided into two groups: patients with and those without active bleeding detected on admission CT. Clinical data from each patient was collected including number of transfusions and transfusion volume. Shock index (SI) was calculated for each patient using admission heart rate (HR) and systolic blood pressure (SBR, SI=HR/SBP). Data were analyzed using unpaired T-tests, with a P value of < 0.05 considered to be statistically significant. P values of < 0.05 was considered to be statistically significant.

RESULTS

The study cohort consisted of 321 patients, of which 37 (11.5%) were found to have active bleeding on admission CT. Patients with active bleeding on initial CT were found to have significantly higher mean number of transfusions (4.46 vs 1.81, $p<0.0001$), mean transfusion volume (2.57L vs 1.05L, $p=0.0008$), and mean shock index scores (1.00 vs 0.888, $p=0.0329$) compared to patients without active bleeding detected on admission CT. The active bleeding rate for patients who received blood transfusions was higher than those who did not receive a blood transfusion, though the difference was not statistically significant (4.72 mL/min vs 1.56 mL/min $p=0.1869$).

CONCLUSION

Trauma patients with active bleeding identified on admission CT had greater transfusion needs than patients without active bleeding, requiring a higher mean number of transfusions and transfusion volume. Additional larger studies are needed to confirm the findings of this pilot study and further investigate the role of using admission CT as a tool to potentially prospectively predict trauma patient transfusion needs.

CLINICAL RELEVANCE/APPLICATION

Early detection of active bleeding on CT in the patient evaluation process may prospectively identify patients who require blood transfusions.

R2-SPER-2 ARTIFICIAL INTELLIGENCE-BASED SOFTWARE DETECTION OF MISSED HEMORRHAGES ON BRAIN CTS IN THE EMERGENCY DEPARTMENT

Dongyeong Kim, MD (*Presenter*)
Narae Yang (*Abstract Co-Author*)
Sujeong Kwon, BA (*Abstract Co-Author*)
Eunjee Youk (*Abstract Co-Author*)
Jihwan Kim, BSc, MSc (*Abstract Co-Author*)
Taehyun Kim (*Abstract Co-Author*)
Gil-Sun Hong, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the sensitivity of artificial intelligence (AI)-based software in detecting missed intracranial hemorrhages (ICH) on non-enhanced head CTs (NECT) in the emergency department (ED), and to assess the potential impact on patients' clinical outcomes.

METHODS AND MATERIALS

In this retrospective study, we identified 240 patients who underwent NECT for traumatic or non-traumatic headaches in the ED of a single urban tertiary academic center between January 2010 and February 2024. All patients were initially discharged with a diagnosis of "no ICH," but were later confirmed with ICH based on final radiology reports. After excluding 47 patients who either lacked follow-up or had follow-up shorter than a week, 193 patients were included in the final analysis. We applied a commercial AI software to detect missed ICH in this cohort and evaluated its per-patient sensitivity using two modes: standard (A mode) and high-sensitivity (B mode), as provided by commercial AI software. We also examined patients' adverse clinical outcomes, including hospitalization, delayed surgery, and in-hospital mortality.

RESULTS

Overall, the per-patient sensitivity for detecting missed ICH was 74.6% (144 of 193) in A mode and 82.4% (159 of 193) in B mode. Among the 193 patients included in the final cohort, 75.6% (146 of 193) had a history of trauma, while 24.4% (47 of 193) had no history of trauma. In trauma-related cases, the AI detected 76.7% (112 of 146) of missed ICH in A mode and 85.6% (125 of 146) in B mode. In non-trauma cases, the detection rates were 68.1% (32 of 47) in A mode and 72.3% (34 of 47) in B mode. There were two adverse events in the cohort: one hospitalization for a traumatic ICH and one delayed surgical intervention for a non-traumatic ruptured aneurysm. The AI software detected only the traumatic ICH in A mode, but detected both events in B mode. Accordingly, the number of potentially preventable adverse events was one with A mode and two with B mode.

CONCLUSION

Depending on the operational mode and trauma status, the AI software demonstrated moderate-to-high sensitivity in detecting missed ICH on NECTs performed in the ED. The high-sensitivity mode improved detection performance and successfully identified all ICH associated with adverse clinical outcomes in this cohort.

CLINICAL RELEVANCE/APPLICATION

Integration of AI into the ED workflow may help reduce missed ICH diagnoses and potentially prevent adverse events. However, the trade-off between sensitivity and specificity in high-sensitivity modes necessitates careful implementation to avoid overdiagnosis and alarm fatigue.

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R2-SPGI

Gastrointestinal Imaging Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPGI-2 DEVELOPMENT OF A CT RADIOMICS MODEL TO PREDICT LOCALLY ADVANCED DISEASE IN GASTRIC ADENOCARCINOMA

Sk Rahatul Jannat, PhD, MS (*Presenter*)
Kyle Klingbeil, MD,PhD,BS (*Abstract Co-Author*)
Dighvijay Giri (*Abstract Co-Author*)
Ketki Kinkar (*Abstract Co-Author*)
Steven Cen, PhD (*Abstract Co-Author*)
Anokh Pahwa, MD (*Abstract Co-Author*)
Maitraya K. Patel, MD (*Abstract Co-Author*)
Karoly Viragh, MD (*Abstract Co-Author*)
Mariam Thomas, MD (*Abstract Co-Author*)
Brian Kadera (*Abstract Co-Author*)
Bino A. Varghese, PhD (*Abstract Co-Author*)

PURPOSE

Gastric adenocarcinoma often requires computed tomography (CT), endoscopic ultrasound (EUS) and diagnostic laparoscopy (DL) to define clinical TNM staging. Patients with locally advanced disease (T2+ or N1+) benefit from neoadjuvant chemotherapy prior to gastrectomy. Development of a CT radiomics model that accurately predicts clinical TNM staging may reduce the reliance on invasive diagnostic procedures, thereby streamlining diagnosis and optimizing treatment decisions.

METHODS AND MATERIALS

A retrospective cohort of patients diagnosed with gastric cancer from a single hospital system who underwent CT imaging at time of diagnosis were included for analysis. Clinical TNM staging was defined by EUS and DL, serving as the gold standard. Automated stomach segmentation was performed using 3DSlicer (v4.11.0) software with the Total Segmentator extension and validated by an expert radiologist. A total of 120 radiomic features were extracted using PyRadiomics software. Random Forest was used to predict TNM staging with a 10-fold cross validation. Performance was reported as area under the ROC curve (AUC). SAS 9.4 was used for all statistical analyses.

RESULTS

Ninety-nine patients were included, with distributions of T1 (n=19), T2 (n=24), T3 (n=46), N0 (n=52), N1 (n=18), N2 (n=19), M0 (n=89) and M1 (n=10) disease. The cohort comprised 58 males and 41 females, with a mean age of 68 ± 15.85 years. Tumors were predominantly located in the distal stomach (n=71, 71.7%). Histologically, 38 tumors were diffuse subtype, and 42 were intestinal subtype. Automated segmentation of the stomach accurately outlined the stomach. Performance by 10-fold cross validation showed AUCs of 0.88 (95% CI: 0.81-0.95) for T1 vs T2/T3; 0.99 (95% CI: 0.97-1.00) for N0 vs N1/ N2; and 0.84 (95% CI: 0.76-0.93) for M0 vs M1, indicating very good to excellent discrimination ability. The clinical relevance of radiomic features was assessed through univariate analysis, revealing differing proportions of metrics with statistically significant associations across various clinical stage comparisons: 28% for T1 vs (T2, T3), 42% for (T1, T2) vs T3, 24% for T2 vs (T3, T1), 47% for N0 vs (N1, N2), 42% for (N0, N1) vs N2, and 13% for M0 vs M1.

CONCLUSION

We developed a CT radiomics model capable of accurately predicting clinical TNM staging in patients with gastric adenocarcinoma. The model demonstrated excellent performance, particularly in identifying locally advanced disease.

CLINICAL RELEVANCE/APPLICATION

The use of radiomic models to predict clinical TNM staging in gastric adenocarcinoma may reduce the reliance on invasive procedures, which are not universally available, thereby streamlining and expanding access to cancer care.

R2-SPGI-4 PREDICTING NEUROENDOCRINE TUMOR SSTR POSITIVITY AND GRADE USING RADIOMICS AND PHOTON-COUNTING DETECTOR CT

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PURPOSE

To predict somatostatin receptor (SSTR) positivity and grade of neuroendocrine tumors using radiomic features on photon-counting detector CT (PCD-CT) images of neuroendocrine tumor (NET) metastatic focal liver lesions.

METHODS AND MATERIALS

Retrospectively, 82 liver lesions (29 M; 53 F; mean age 67 ± 9 years) from metastatic pancreatic (n=25), small bowel (n = 31), and lung NETs (n = 26) with dual phase protocol on PCD-CT were assessed. SSTR positivity was recorded from pathology reports, with 66 positive cases and 16 negative cases. Grades (G) were assigned using Ki-67 index, with 14 G1, 44 G2, and 26 G3 cases. Axial single photon processing (SPP) arterial and venous phase images were exported and processed on a standalone prototype (Radiomics V1.5.0, Siemens Healthineers, Forchheim, Germany) which allowed automatic generation of features for virtual monoenergetic (VM), iodine maps (I) and virtual non-contrast (VNC) images of each phase within the prototype. 854 radiomic features (110 original and 744 wavelet) were extracted. Multivariate logistic regression and receiver operating characteristics were performed.

RESULTS

When comparing SSTR positive and negative arterial images, virtual non-contrast and iodine images had the greatest AUC of 0.87. Combining the best features from multiple series resulted in an AUC of 0.93. For venous images, SPP images had the greatest AUC of 0.94 followed by VM 60 keV and iodine images (both AUC 0.93). The combination of best features resulted in an AUC of 0.95. When comparing the grades of tumors, the greatest AUC for arterial images series were iodine (0.86), virtual non-contrast (0.85), and VM 40 keV (0.85). For venous images, the greatest AUCs were also found in iodine (0.92) and VM 40 keV (0.91). Combining the best features from multiple series resulted in AUCs of 0.90 and 0.93 for arterial and venous images, respectively.

CONCLUSION

Radiomic features of liver lesions on photon counting detector CT (PCCT) virtual non-contrast, virtual monoenergetic and iodine images can potentially differentiate SSTR positivity and grade of lesions in the liver.

CLINICAL RELEVANCE/APPLICATION

Radiomics holds promise as a non-invasive tool for stratifying metastatic neuroendocrine tumors. As SSTR serves as a drug target and SSTR positivity is correlated to increased survival in NET patients, determining a patient's SSTR status has great prognostic value. Additionally, neuroendocrine tumor grade impacts the accuracy of diagnostic PET scans and also has prognostic value. Incorporating radiomic analysis into clinical practice may enhance treatment decision-making and monitoring in patients with neuroendocrine tumor metastases, optimizing therapeutic strategies and patient care.

R2-SPGI-5 DYNAMICS OF INTRAHEPATIC FAT AND IRON FOLLOWING SVR IN PATIENTS WITH CHRONIC HEPATITIS C: ANALYSIS USING MULTI-ECHO CHEMICAL-SHIFT-ENCODED MR IMAGING

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PURPOSE

The purpose of this study was to evaluate the transition of liver fat and liver iron concentration (LIC) using the R2* value of MR imaging to investigate the influence of intrahepatic fat and iron on carcinogenesis after sustained virological response (SVR) in patients with chronic hepatitis C.

METHODS AND MATERIALS

This retrospective study included 21 patients (9 men and 12 women) who underwent MR imaging for evaluation of hepatocellular carcinoma before and after SVR of hepatitis C virus. Of the 21 patients, 15 had chronic hepatitis C and six had cirrhosis caused by hepatitis C virus. The examinations were performed with a 3.0-T MR system, and proton density fat fraction (PDFF) maps and R2* maps were obtained using confounding factor-corrected multi-echo chemical-shift-encoded MR imaging (IDEAL-IQ; TR: 6.7 ms, TE: 1.0, 1.8, 2.6, 3.4, 4.2, 5.0 ms, FA: 3°) together with other images. Approximately 1.5-cm 2 regions of interest were placed in eight segments of the liver, from S1 to S8, avoiding blood vessels, bile ducts, and focal lesions. The PDFF and R2* values of the liver parenchyma were respectively measured on the maps, and the LIC was calculated from the R2* values using the method of d'Assingnies et al. The PDFF and LIC before and after SVR were compared using paired t -tests. P values less than 0.05 were considered significant.

RESULTS

The period between SVR and subsequent MR imaging ranged from 1.3 to 9.6 years (mean, 5 years). The PDFF before SVR ranged from 0.54% to 9.36% (mean, 2.82%) and the PDFF after SVR ranged from 0.64% to 4.93% (mean, 2.32%; P = .32). Of the 21 patients, seven had an increase in PDFF of 10% or more and nine had a decrease of 10% or more after SVR. The LIC before SVR ranged from 538 μg/g to 1047 μg/g (mean, 779 μg/g) and the LIC after SVR ranged from 489 μg/g to 1321 μg/g (mean, 731 μg/g; P = .84). Of the 21 patients, six had an increase in LIC of 10% or more and seven had a decrease of 10% or more after SVR.

CONCLUSION

Intrahepatic fat and iron fluctuated in individual patients after SVR in hepatitis C virus, although no significant changes were observed on average.

CLINICAL RELEVANCE/APPLICATION

Given the finding that intrahepatic fat and iron levels change after sustained virological response in patients with chronic hepatitis C, further investigation of the impact of these dynamics on the development of hepatocellular carcinoma is imperative.

R2-SPGI-6 FEASIBILITY OF HIGH-RESOLUTION 3D MRI OF THE MESOESOPHAGUS IN HEALTHY VOLUNTEERS - FIRST IN VIVO QUANTIFICATION

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Emily Hoffmann (*Abstract Co-Author*)
Jens Peter Holzen (*Abstract Co-Author*)
Mazen Juratli (*Abstract Co-Author*)
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PURPOSE

To proof the feasibility of establishing normative volume values for the esophagus and mesoesophagus using 3T MRI in healthy volunteers and to explore the correlation between the esophagus volume and the mesoesophagus volume.

METHODS AND MATERIALS

In a single-center study, 25 healthy volunteers were examined using a 3T MRI scanner. The esophagus and extra-esophageal mesoesophagus volumes were semiautomatically segmented using Slicer 3D software. The volumes were extracted in both voxel count and cubic millimeters. Spearman's rank correlation was applied to assess the relationship between the esophagus and mesoesophagus volumes. Subgroups of male and female healthy volunteers have been created and the Spearman's rank correlation was applied again.

RESULTS

In all healthy volunteers (100%), the aortopleural ligamant and the ductus thoracicus were detected and used to accurately define the dorsal mesoesophagus. The median volume of the infracarinal esophagus was 6739.03 mm^3 (25th percentile: 5768.29 mm^3; 75th percentile: 8946.31 mm^3), and for the mesoesophagus 5866.9 mm^3 (25th percentile: 3610.74 mm^3; 75th percentile: 7763.04 mm^3). The study revealed a correlation between the esophagus and mesoesophagus volumes, with a Spearman rank correlation coefficient of 0.758 (p = 1.12 × 10?5). In male volunteers, the Spearman rank correlation was significant in male participants with 0.770 (p = 0.009) and in female participantswith 0.593 (p = 0.020). There was no significant correlation to Age, BMI and pack years (p>0.05).

CONCLUSION

This is the first in vivo study to visualize and quantify the mesoesophagus using high-resolution 3T MRI. The technique proves feasible and reveals a strong volumetric relationship with the esophagus. These normative data provide a foundation for future studies and may support individualized staging and treatment monitoring in esophageal cancer.

CLINICAL RELEVANCE/APPLICATION

Establishing normative volume data for the esophagus and mesoesophagus using 3T MRI enables more precise anatomical assessment, which may enhance staging accuracy and preoperative planning in esophageal cancer.

R2-SPGI-7 PREOPERATIVE PREDICTION OF TUMOR BUDDING GRADE IN RECTAL CANCER BY MULTI-FREQUENCY MAGNETIC RESONANCE ELASTOGRAPHY AND TIME-DEPENDENT DIFFUSION MRI:A PRELIMINARY STUDY

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PURPOSE

To investigate whether multi-frequency magnetic resonance elastography and time-dependent diffusion magnetic resonance imaging techniques can be used to predict tumor budding grade in rectal cancer preoperatively.

METHODS AND MATERIALS

This prospective study enrolled 107 patients with pathologically confirmed rectal cancer between April 2023 and December 2024. Preoperative conventional MRI, multi-frequency MRE and t d -dMRI were performed in all patients who underwent tumor resection surgery. The clinical data ,imaging features of conventional MRI, mechanical parameters c,f) of mMRE and the quantitative parameters of t d -dMRI (diameter , f in , D ex , cellularity , D 50Hz , D 25Hz , D 0Hz) of the patients were collected. The patients were categorized into the low-intermediate grade tumor budding group (BD 1+2) and the high grade tumor budding group (BD 3) according to the postoperative HE staining results. Three models were constructed respectively based on mMRE parameter (Model1), t d -dMRI parameter (Model2) and combination of mMRE and t d -dMRI parameters (Model3).

RESULTS

(1)Analysis of clinical data.The mMRE mechanical parameters (c and f), and t d -d MRI quantitative parameters (f in and cellularity) in the high grade tumor budding group of rectal cancer were significantly higher than those in the low-intermediate grade tumor budding group (P = 0.006, <0.001, <0.001, 0.001, <0.001, respectively)(Table1 ,Table2). The t d -dMRI quantitative parameter (D 0Hz) in the high grade tumor budding group of rectal cancer was significantly lower than that in the low-intermediate grade tumor budding group (P = 0.002)(Table 2).(2) Predicting tumor budding grade in rectal cancer based on mMRE parameter, t d -dMRI parameter and a combination of mMRE and t d -dMRI parameter.Three separate multivariate logistic regression were performed to construct three models. The nomogram based on Model 1 was constructed using cN staging and tumor shear wave speed (c)(Table 3, Figure1) .The nomogram based on Model2 was constructed using cN stage and cellularity (Table 4, Figure 2) .The nomogram based on Model 3was constructed using tumor shear wave speed (c) and cellularity (Table 5, Figure 3) .

CONCLUSION

The model based on the combination of mMRE and t d -dMRI parameter showed higher diagnostic and clinical decision-making value compared to the single quantitative models for preoperative prediction of tumor budding grade in rectal cancer.

CLINICAL RELEVANCE/APPLICATION

The model based on the multi-frequency magnetic resonance elastography and time-dependent diffusion MRI is a potential tool for noninvasively evaluating tumor budding grade in rectal cancer ,which may contribute to personalized treatment strategies for patients withrectal cancer.

R2-SPGI-8 IMAGING CHARACTERISTICS OF PORTOSINUSOIDAL VASCULAR DISEASE: A RETROSPECTIVE COHORT FROM A TERTIARY CENTER IN MEXICO CITY WITH IMPLICATIONS FOR DIAGNOSTIC ACCURACY AND QUALITY OF CARE

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PURPOSE

Portosinusoidal vascular disease (PSVD) is a rare and underrecognized liver disorder characterized by portal hypertension without cirrhosis and with preserved liver function. Misdiagnosis can lead to inappropriate management. Despite increasing use of cross-sectional imaging in liver disease, the radiologic features of PSVD are poorly defined. This study aimed to describe the imaging characteristics of PSVD on contrast-enhanced CT and Doppler ultrasound to improve diagnostic accuracy and support clinical decision-making.

METHODS AND MATERIALS

We performed a retrospective study of patients evaluated for abnormal liver tests or signs of portal hypertension who underwent liver biopsy at the Instituto Nacional de Ciencias Médicas y Nutrición "Salvador Zubirán" (2010-2024). PSVD diagnosis was based on high-quality biopsy excluding cirrhosis and meeting at least one of the following: (1) specific portal hypertension signs (varices, bleeding, collaterals), (2) PSVD-specific histology (obliterative portal venopathy, nodular regenerative hyperplasia), or (3) non-specific signs of PH (ascites, thrombocytopenia, splenomegaly) plus non-specific histological lesions. Patients without multiphasic CT within three months of diagnosis or with incomplete data were excluded. We analyzed clinical, histologic, and imaging features including portal vein thrombosis, collateral vessels, ascites, hepatic nodules, spleen volume, and portal vein flow velocity. Overall survival was calculated from the date of portal hypertension or abnormal tests to last follow-up.

RESULTS

Fifty-six patients were included (57.1% female; median age 42.6 years). Most presented with portal hypertension complications (62%), primarily hemorrhagic (54.2%). Comorbidities were identified in 51.8%, predominantly immune-mediated diseases (48.2%).CT revealed splanchnic vein thrombosis in 35.7%, portosystemic collaterals in 53.6%, ascites in 30.4%, and hepatic nodules in only 7.1%. Mean splenic volume was 766.4 cc and splenic length 16.6 cm.On Doppler, mean portal vein velocity was 13.5 cm/s. Splenomegaly was observed in 46.4%.Mean overall survival was 7.6 years, with 92.9% of patients alive at last follow-up.

CONCLUSION

PSVD imaging overlaps with cirrhosis but shows key distinctions: relatively preserved portal flow, fewer hepatic nodules, and frequent vascular abnormalities (thrombosis, collaterals). Recognizing these patterns is essential since PSVD does not require HCC surveillance and often follows a benign course. Incorporating imaging findings may improve diagnostic algorithms and patient care.

CLINICAL RELEVANCE/APPLICATION

Identifying imaging predictors of progression may enable earlier intervention and reduce morbidity in PSVD patients.

R2-SPGI-10 PREOPERATIVE PREDICTION OF PERINEURAL INVASION IN PANCREATIC DUCTAL ADENOCARCINOMA USING DUAL-LAYER SPECTRAL DETECTOR CT

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PURPOSE

This study aimed to evaluate the value of dual-layer spectral CT (DLCT) parameters in perineural invasion (PNI) in pancreatic ductal adenocarcinoma (PDAC).

METHODS AND MATERIALS

This study included patients with pathologically confirmed PDAC who underwent DLCT between August 2019 and March 2024. Risk factors were identified using univariate and multivariate logistic regression analyses. Receiver operating characteristic and precision-recall curves accessed diagnostic performance.

RESULTS

We included 100 patients (mean age: 60.88 ± 11.39 years old, 59 males). There were 71 patients with PNI and 29 without PNI. Relevant factors for PNI included tumour diameter, normalised CT attenuation during the pancreatic parenchymal phase in conventional CT (nCTa), normalised CT attenuation during the pancreatic parenchymal phase in DLCT at 40 keV, and normalised iodine concentration during the pancreatic parenchymal phase (nDIa) (odds ratio [OR], 1.34; 95% confidence interval [CI]: 1.19, 1.51; $p < 0.001$). Of these, nDIa was the only independent predictor ($p < 0.001$; adjusted OR, 1.41; 95% CI: 1.19, 1.68) and demonstrated superior diagnostic performance compared to nCTa, with a cutoff value of 0.16, a higher area under the curve (0.93 vs 0.84, $p < 0.001$), higher accuracy (77% vs 52%, $p = 0.048$), an F 1 score of 0.90, higher sensitivity (72% vs 37%, $p = 0.03$), and the same specificity of 90% ($p = 0.13$).

CONCLUSION

The DLCT parameter nDIa allows for non-invasive prediction of PNI in PDAC with superior diagnostic efficacy compared to conventional CT parameters.

CLINICAL RELEVANCE/APPLICATION

The DLCT parameter may serve as an effective and convenient tool for the preoperative prediction of PNI in PDAC.

R2-SPGI-14 PHOTON-COUNTING DETECTOR CT WITH IODINE QUANTIFICATION: IMPROVED DISTINCTION BETWEEN BLAND AND NEOPLASTIC PORTAL VEIN THROMBOSIS

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PURPOSE

Neoplastic portal vein thrombosis (PVT) has significant prognostic implications in patients with hepatocellular carcinoma (HCC) yet distinguishing it from bland PVT remains challenging. Photon-counting detector CT (PCD-CT) enables iodine density (ID) quantification with every scan. This study evaluated the diagnostic value of ID in differentiating bland from neoplastic PVT.

METHODS AND MATERIALS

This retrospective study included 104 patients with suspected PVT who underwent PCD-CT between 09/2022 and 08/2024. Patients were classified into four groups: (1) HCC with neoplastic or (2) bland PVT, (3) non-malignant bland PVT, or (4) neoplastic PVT in malignancies other than HCC. ID was measured in the late arterial phase (LAP) and portal venous phase (PVP) by two raters and compared to an established CT feature-based diagnostic score (including direct infiltration, vessel extension, and arterial hyperenhancement).

RESULTS

ID measurements showed excellent inter- and intra-rater agreement (ICC=0.99). ID was significantly higher in neoplastic PVT in both phases, achieving 100% and 93.1% sensitivity and 95.9% and 100% specificity in LAP and PVP, respectively. The CT score reached 89.7%/86.2% sensitivity and 81.6%/95.5% specificity for thresholds of =1/=2 features. In non-HCC malignancies, ID in LAP had a sensitivity of 69.2% and a specificity of 95.9 %, while ID in PVP achieved 92.3% sensitivity and 100% specificity, supporting its diagnostic utility.

CONCLUSION

This study highlights ID as a valuable imaging biomarker for differentiating bland from malignant PVT in HCC, supporting its role in complementing established CT features. Regarding contrast phases, ID achieved high accuracy in both late arterial and portal venous phases for HCC. Looking into PVT in patients with non-HCC malignancy ID was an effective discriminator in the portal venous phase.

CLINICAL RELEVANCE/APPLICATION

Iodine density quantification with photon-counting detector CT enables highly accurate differentiation between bland and neoplastic portal vein thrombosis in hepatocellular carcinoma and other malignancies, complementing established CT features and supporting improved diagnostic confidence and treatment planning.

R2-SPGI-16 PROGNOSTIC VALUE OF MUSCLE-FAT RATIO QUANTIFIED BY PHOTON-COUNTING CT IN DIABETIC GASTRIC CANCER PATIENTS

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PURPOSE

This study aimed to access the prognostic value of muscle-to-fat ratio (MFR), measured by photon-counting CT (PCD-CT), in patients with diabetic gastric cancer, with a specific focus on predicting major postoperative complications and improving risk stratification. We hypothesized that abnormal muscle-to-fat ratio is significantly associated with adverse clinical outcomes in this population.

METHODS AND MATERIALS

We retrospectively analyzed 134 type 2 diabetic gastric cancer patients who underwent preoperative PCCT. Body composition parameters, including skeletal muscle and fat areas, were quantified. Logistic regression identified predictors of poor prognosis, defined as major postoperative complications. We developed predictive models based on clinical variables alone and models integrating clinical variables with MFR. Model performance was evaluated using ROC curves, area under the curve (AUC), integrated discrimination improvement (IDI), and net reclassification improvement (NRI).

RESULTS

Patients with poor prognosis (n = 35) had significantly lower skeletal muscle and higher fat accumulation. An abnormal MFR (0.34 - 0.57) was strongly associated with poor outcomes (OR = 1.94, 95% CI: 1.17-2.58, $p < 0.01$). The combined model including clinical variables and MFR showed superior predictive accuracy (AUC = 0.75, sensitivity = 0.74, specificity = 0.71) compared to models using clinical variables alone. Predictive improvements were significant, with NRI of 0.52 ($p < 0.01$) and an IDI of 0.09 ($p < 0.01$).

CONCLUSION

Muscle-to-fat ratio quantified by PCD-CT, is a robust and non-invasive predictor of poor prognosis in diabetic gastric cancer patients. Incorporating this metric into clinical evaluation improves risk stratification and supports individualized postoperative management.

CLINICAL RELEVANCE/APPLICATION

An abnormal MFR, derived from PCD-CT, is significantly associated with adverse outcomes such as infections and delayed wound healing. PCCT-based body composition analysis provides a non-invasive tool to identify high-risk patients early, aiding surgical planning and postoperative care. The integration of this imaging biomarker into routine preoperative assessment may improve patient outcomes.

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R2-SPGU

Genitourinary Imaging Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPGU-1 DIAGNOSIS OF FIBROSIS WITH MAGNETIZATION-PREPARED GOLDEN-ANGLE RADIAL SPARSE PARALLEL (MP-GRASP) T1 MAPPING IN RENAL ALLOGRAFTS

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Octavia Bane, PhD, MS (*Abstract Co-Author*)
Li Feng, PhD (*Abstract Co-Author*)
Ding Xia (*Abstract Co-Author*)
Mira M. Liu, PhD (*Abstract Co-Author*)
Thangamani Muthukumar (*Abstract Co-Author*)
Jonathan P. Dyke,, PhD (*Abstract Co-Author*)
Madhav Menon (*Abstract Co-Author*)
Samira Farouk (*Abstract Co-Author*)
Bachir Taouli, MD (*Abstract Co-Author*)
Sara Lewis, MD (*Abstract Co-Author*)

PURPOSE

To compare T 1 mapping values and diagnostic performance for identification of renal transplant fibrosis of novel inversion-recovery with stack-of-stars readout [Golden-angle RAdial Sparse Parallel T 1 mapping (GraspT1)] acquisitions against variable flip angles (VFA) acquisitions.

METHODS AND MATERIALS

In our IRB-approved, prospective ongoing study, 61 patients [37 M, age 50±12y] with renal transplant had multiparametric MRI at 3T (Skyra, Siemens). Patients were scanned in controlled hydration conditions with 2 matched, B1-corrected VFA (20 3-mm slices, FOV=380x380, matrix=192x154, TE=1.13, FA=2,10,TR=4.29, AT=12s and FA=2,5,9,TR=3.45, AT=16s), 2D single-slice GraspT1 and 3D GraspT1 (20 3-mm slices, FOV=360x360, matrix=256x256, TR/TE/FA=2.75/1.35/5, 60 TI's:11xTR-11xTR+59x24xTR, 25 trajectories/TI, AT=4min:21s) T1 mapping coronal acquisitions, centered on the renal allograft hilum. An abdominal radiologist selected 6 circular ROIs in the renal allograft cortex and medulla (2 each in the upper, mid- and lower pole) at the allograft hilum. Mean and standard deviation T 1 and cortico-medullary difference [?T 1 =100x (T 1 Cortex-T 1 Medulla)/T 1 Cortex] were reported. Serum eGFR was collected and interstitial fibrosis/tubular atrophy (IFTA score) was evaluated on biopsy using Banff 2017 criteria.

RESULTS

57 of 61 patients had indication biopsy 6±15 days from MRI, with no (IFTA 0; n=15), mild-to-moderate (IFTA 2; n=16), moderate (IFTA 4; n=11) and severe fibrosis (IFTA 6; n=15). There were slight discrepancies between the GraspT1 and the VFA measurements, with significantly higher cortical and medullary 2FA and 3FA VFA T 1 than 3DGraspT1 (Figure 1a). ?T1 measured with the 3D GraspT1 sequence identified dysfunctional allografts (eGFR<45ml/min/1.73m 2) with AUC(CI)=0.67(0.52-0.81) (Figure 1b). ?T1 with the 2FA VFA sequence (Figure 1c) identified allografts with severe fibrosis, [IFTA=6; AUC(CI)= 0.72 (0.57-0.88), and any fibrosis [IFTA>0; AUC(CI)=0.68 (0.53-0.85)], with good and fair diagnostic performance, respectively. Medulla T 1 measured with 2D GraspT1 [AUC(CI)=0.81(0.64-0.99)] and Stdev of medulla T 1 measured with 3 FA VFA sequence [AUC(CI)=0.77(0.59-0.95)] identified functional allografts (eGFR=45ml/min/1.73m 2) with fibrosis with very good diagnostic performance.

CONCLUSION

Native T1 values showed sensitivity to the presence of fibrosis, prior to eGFR decline, and can be easily measured clinically with one breath-hold pulse sequences.

CLINICAL RELEVANCE/APPLICATION

Renal T1 showed diagnostic sensitivity to the presence of renal allograft fibrosis, even in patients with preserved renal function, and thus can potentially be useful to select patients for biopsy or other interventions before serum eGFR decline.

R2-SPGU-2 INTEROBSERVER AGREEMENT AND DIAGNOSTIC SENSITIVITY OF DOPPLER AND CONTRAST-ENHANCED ULTRASOUND IN CHARACTERIZING INDETERMINATE RENAL LESIONS

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Sai Dhanush Reddy Jeggari, MBBS (*Abstract Co-Author*)
Theodore T. Pierce, MD, MPH (*Abstract Co-Author*)

PURPOSE

To estimate inter-reader agreement for assessment of color Doppler vascularity and ultrasound contrast enhancement of indeterminate renal lesions and to compare their sensitivity for detecting renal neoplasm.

METHODS AND MATERIALS

Retrospective search of the electronic medical record of two tertiary care hospitals was performed from 1/1/2019 to 3/15/2025 to identify patients with contrast enhanced ultrasound (CEUS) of indeterminate renal lesions. Vascularity was assessed on color Doppler images and enhancement by CEUS following intravenous injection of sulfur hexafluoride microbubble contrast by 2 board certified subspecialty trained radiologists blinded to the final diagnosis. Cohen's kappa assessed inter-reader agreement of vascularity and enhancement. Discordant cases between readers were considered negative. Frequency of features were compared by McNemar's test. Pathology results were documented, if available, as the reference for diagnosing neoplasm. Sensitivity and 95% confidence intervals were reported.

RESULTS

45 renal lesions (12 solid, 33 cystic) in 38 patients (mean age 66.7 years; 21 male) were identified. There was strong inter-reader agreement for assessment of vascularity (Kappa 0.738) and presence and type of enhancement (Kappa 0.814). Lesions were more likely to enhance (n=34,76%) than show vascularity (n=13, 29%), p<0.001. Only 6 (18%) enhancing lesions showed vascularity. 9 lesions assessed by biopsy were neoplasms (8 renal cell carcinoma, 1 oncocytoma); all 9 demonstrated enhancement (100% sensitivity; 95% CI: 66-100%), but only 5 demonstrated vascularity (56% sensitivity; 95% CI: 21-86%).

CONCLUSION

Enhancement on CEUS is more sensitive than color Doppler vascularity in detecting renal neoplasms, allowing for the small sample size of this study. Most enhancing lesions do not demonstrate Doppler vascularity.

CLINICAL RELEVANCE/APPLICATION

In the evaluation of renal masses, CEUS demonstrates superior sensitivity to Doppler ultrasound for detecting neoplasms. All biopsy-proven cancers enhanced, despite nearly half demonstrating no flow with color Doppler. These results highlight the limitations of color Doppler US to assess for solid components and support integrating CEUS into routine imaging protocols for characterization of indeterminate renal lesions.

R2-SPGU-3 NOMOGRAM COMBINING CONTRAST-ENHANCED CT-DERIVED EXTRACELLULAR VOLUME FRACTION AND CLINICAL PROGNOSTIC FACTORS TO PREDICT DISEASE-FREE SURVIVAL IN PATIENTS WITH CLEAR CELL RENAL CELL CARCINOMA POSTOPERATIVELY

Wangyang Sun (*Presenter*)

PURPOSE

This study aims to develop a nomogram incorporating the extracellular volume (ECV) fraction, the Mayo Clinic stage, size, grade, and necrosis score(SSIGN score), along with various clinical prognostic factors(CPFs), for predicting disease-free survival (DFS) in patients with clear cell renal cell carcinoma (ccRCC) after the operation.

METHODS AND MATERIALS

This retrospective study was conducted involving 195 patients with ccRCC from February 2019 to December 2021. The ECV fraction was measured using preoperative contrast-enhanced CT equilibrium images. Clinical data, including age, gender, surgical approach, systemic immune-inflammation index (SII), prognostic nutritional index (PNI), the SSIGN score, and the Mayo Adhesive Probability score (MAP score), were collected. Tumor size, grading, and staging were derived from postoperative pathological findings. Independent prognostic factors affecting DFS were identified using univariate and multivariate Cox regression analysis. Kaplan-Meier curves and log-rank tests were used to draw survival curves. The performance of the nomogram was assessed using calibration curves, receiver operating characteristic (ROC) curves, concordance index (C-index), and decision curve analysis (DCA).

RESULTS

Multivariate Cox regression analysis revealed that the ECV fraction [hazard ratio (HR): 6.685, P <0.001], SII [HR: 2.916, P =0.027], WHO/ISUP grade [HR: 2.835, P =0.034], tumor stage (P <0.05), and SSIGN score (P <0.05) were independent factors influencing DFS in patients with ccRCC. The nomogram based on ECV fraction combined with SSIGN score and CPFs demonstrated high predictive accuracy (C-index = 0.835), with area under the curve (AUC) values for predicting 2-year and 3-year DFS of 0.914 and 0.892, respectively. DCA indicated that the nomogram provided good clinical benefit. Calibration curves showed that the predicted DFS closely aligned with the actual DFS outcomes.

CONCLUSION

The nomogram based on ECV fraction, the SSIGN score, and CPFs effectively predicts DFS in patients with ccRCC postoperatively, providing a valuable reference for individualized treatment strategies.

CLINICAL RELEVANCE/APPLICATION

In conclusion, our study indicated that the ECV fraction, SSIGN score, SII, WHO/ISUP grade, and TNM staging were independent prognostic factors for patients with ccRCC. Moreover, we have constructed a prognostic nomogram that integrating these factors alongside CPFs, demonstrating its efficacy in predicting DFS following surgical intervention. This nomogram facilitated the adoption of personalized follow-up and therapeutic strategies, ultimately improving the prognostic outcomes for individuals with ccRCC.

R2-SPGU-4 RADIATION DOSE REDUCTION USING PHOTON-COUNTING DETECTOR CT IN POST-ABLATION FOLLOW-UP OF RENAL TUMORS: A COMPARATIVE STUDY WITH ENERGY-INTEGRATING DETECTOR CT

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PURPOSE

To compare radiation dose and image quality of follow-up imaging after renal tumor ablation between photon-counting detector (PCD) computed tomography (CT) and conventional energy-integrating detector (EID) CT.

METHODS AND MATERIALS

This retrospective study included 60 patients (median age, 69 years; 47 males, 13 females) who underwent CT-guided cryoablation for renal cell carcinoma and were followed up with periodic contrast-enhanced CT. The radiation dose and image quality of follow-up CT examinations using PCD- and EID-CT scanners were compared in the same patients. The CT dose index volume (CTDIvol) and dose length product (DLP) of the corticomedullary phase were recorded for radiation dose assessment. CT values (Hounsfield unit [HU]) of the renal cortex were measured on corticomedullary-phase images, and the signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) were calculated. Two board-certified radiologists subjectively evaluated the image quality using a five-point Likert scale, focusing on the conspicuity of the ablation zone. Data are summarized as medians and interquartile ranges (IQR). The Wilcoxon signed-rank test was used for comparison.

RESULTS

The median time interval between EID-CT and PCD-CT examinations was 200 days (IQR, 182-357). The radiation dose was significantly lower in PCD-CT than in EID-CT (CTDIvol: 7.8 mGy [IQR, 7.1-9.0] vs. 14.5 mGy [IQR, 11.5-17.1], p < 0.001; DLP: 258.5 mGy*cm [IQR, 225.0-311.5] vs. 503.7 mGy*cm [IQR, 348.3-579.8], p < 0.001). The CT value of the renal cortex on corticomedullary phase images was significantly higher in PCD-CT than in EID-CT (249 HU [IQR, 207-278] vs. 222 HU [IQR, 190-246], p < 0.001). The SNR and CNR were not significantly different between PCD-CT and EID-CT (SNR: 15 [IQR, 12-18] vs. 14 [IQR, 12-18], p = 0.546; CNR: 17 [IQR, 13-20] vs. 15 [IQR, 12-18]; p = 0.057). The qualitative image analysis scores were not significantly different between PCD-CT and EID-CT for either radiologist (p = 0.336 and p = 0.095 for radiologists 1 and 2, respectively).

CONCLUSION

PCD-CT reduced the radiation dose by nearly half compared to EID-CT in follow-up imaging after renal tumor ablation, with increased contrast enhancement of the renal cortex, comparable image noise levels, and comparable subjective image quality.

CLINICAL RELEVANCE/APPLICATION

Patients undergoing CT-guided renal tumor ablation may receive high cumulative radiation exposure owing to repeated CT scans during the procedure and periodic follow-up after treatment. Regular PCD-CT follow-up imaging in clinical care may contribute to reducing the lifetime radiation dose in these patients without compromising the diagnostic capability.

R2-SPGU-5 ACCURATE PREDICTION OF KIDNEY IMAGING BIOMARKERS FROM NON-CONTRAST MRI USING DEEP NEURAL PATCHWORKS COMBINED WITH KNOWLEDGE TRANSFER FROM CONTRAST-ENHANCED ARTERIAL PHASE MRI

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Fabian Bamberg, MD, MPH (*Abstract Co-Author*)
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PURPOSE

Quantifying structural dimensions of various organs, including total kidney volume (TKV) and corticomedullary differentiation can aid in better detection and monitoring of pathologies such as chronic kidney disease. However, the application of contrast agents for enhancing corticomedullary differentiation is not always possible for example in presence of reduced kidney function. This study used modern deep learning approaches to generate imaging-based biomarkers in non-contrast sequences reflecting characteristics of contrast-enhanced sequences.

METHODS AND MATERIALS

The retrospective study included 200 patients (mean age: 53.4, age range: 20 - 82 years, 50% female) who underwent abdominal MRI scans with axial 3D T1w GRE FS sequences, both contrast-enhanced (CE) and non-contrast enhanced (NCE). Manual subsegmentation of the kidneys (cortex, medulla and sinus; ground truth [GT]) was performed on the CE-T1w sequences. Using multi-mask coregistration, the segmentations were transferred to the NCE-T1w images. A subset of 100 patients was randomly selected to train a Deep Neural Patchworks framework. The trained algorithm was applied to the NCE data of the remaining 100 patients and compared with the GT from the arterial phase. The imaging biomarkers cortex volume (CV), medulla volume (MV), sinus volume (SV) and TKV were calculated and comparative correlations were performed.

RESULTS

The automated prediction accurately delineated kidney cortex, medulla, and sinus structures. High correlations between automated predictions and GT were observed with Spearman correlation coefficients of 0.98 (TKV), 0.94 (CV), 0.88 (MV), and 0.95 (SV), respectively. Bland-Altman analyses indicated no major systematic deviations, although predicted volumes were on average slightly higher compared to GT measurements.

CONCLUSION

The deep learning-based method applied to non-contrast MRI achieved high correlations between the predicted and the contrast-based manually segmented kidney volumes, demonstrating its utility as a viable alternative for situations where contrast agents are contraindicated or unavailable.

CLINICAL RELEVANCE/APPLICATION

Our method removes the need for contrast agents to obtain relevant image-based biomarkers, improving the detection, monitoring and treatment management of kidney disorders and enabling deeper insights into a wide range of diseases.

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R2-SPHN

Head & Neck Imaging Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPHN-1 FEASIBILITY OF IMPROVING NECK CT IMAGE QUALITY USING WIDE-DETECTOR HIGH-RESOLUTION SCANNING MODE COMBINED WITH DEEP LEARNING IMAGE RECONSTRUCTION ALGORITHM: A HUMAN CADAVER STUDY

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Wenjun Qiao (*Abstract Co-Author*)
Ge Wen (*Abstract Co-Author*)
Yanbing Li (*Abstract Co-Author*)
HU ZHI (*Abstract Co-Author*)
Tong Su, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to investigate the potential of a high-resolution(HT) scanning mode integrated with the ClearInfinity deep learning image reconstruction algorithm to enhance image quality in neck CT scans.

METHODS AND MATERIALS

A wide-detector CT system (NeuViz Epoch Elite CT) was employed to perform neck CT scans on a human cadaver specimen under standard-resolution mode (SRCT, 0.625mm collimation) and high-resolution mode (HRCT, 0.3125mm collimation). Six groups of reconstructed images were generated from these two scanning modes. Both modes utilized an iterative reconstruction algorithm (ClearView 40%CV), while the high-resolution dataset additionally applied a ClearInfinity deep learning image reconstruction algorithm(DLIR-CI) with varying weighting factors. This resulted in six groups of reconstructed images: SRCT-CV40%, HRCT-CV40%, HRCT-CI20%, HRCT-CI40%, HRCT-CI60%, and HRCT-CI80%. The CT values and noise (SD values) of the left thyroid gland and the semispinalis cervicis muscle were measured, with the SD value of the muscle serving as an indicator of the image noise level. Measurements were performed at five layers centered on the isthmus of the thyroid gland, with each region of interest (ROI) measured three times. The signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) of the thyroid gland were subsequently calculated for all six sets of images.

RESULTS

Image noise (SD) decreased progressively with higher CI strength, whereas SNR and CNR exhibited gradually increased. The group HRCT_CI40% algorithm achieved noise levels equivalent to the group SRCT_CV40% (20.03±2.11 vs. 19.52±4.34, P>0.05), HRCT_CI60% (14.12±1.36) and HRCT_CI80% (8.72±1.21) exhibited significantly lower SD values (P < 0.001). The group HRCT_CI60% and HRCT_CI80% demonstrated significantly higher SNR compared to Group SRCT_CV40%(11.66 ±3.61 vs. 7.98±0.78, P < 0.001; 19.71±1.24 vs. 7.98±0.78,P<0.001)with46.11% and 146.99% increase, and The group HRCT_CI80% demonstrated a 97.93% higher CNR(8.61±1.10 vs. 4.35±0.92, P < 0.001).

CONCLUSION

Integrating a high-resolution scanning mode with the ClearInfinity deep learning reconstruction algorithm (DLIR-CI) significantly enhances neck CT image quality.

CLINICAL RELEVANCE/APPLICATION

Cervicothoracic CT imaging is prone to artifacts that may impair radiologists' assessment of anatomical structures. This study demonstrates that integrating a high-resolution scanning mode with a deep learning reconstruction algorithm (ClearInfinity, DLIR-CI) significantly improves neck CT image quality.

R2-SPHN-2 EVALUATION OF DEEP LEARNING BASED IMAGE NOISE REDUCTION AND IMAGE ENHANCEMENT IN DENTAL CBCT

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PURPOSE

To assess the impact of a vendor-agnostic deep learning model (DLM) on image quality parameters and noise reduction in dental cone-beam computed tomography (CBCT) reconstructions.

METHODS AND MATERIALS

This retrospective study was conducted on CBCT scans of 93 patients (41 males and 52 females, mean age 41.2 years, SD 15.8 years) from a single center using the inclusion criteria of standard radiation dose protocol images. Objective and subjective image quality was assessed in three predefined landmarks through contrast-to-noise ratio (CNR) measurements and visual assessment using a 5-point scale by three experienced readers. The inter-reader reliability and repeatability were calculated.

RESULTS

Eighty patients (30 males and 50 females; mean age 41.5 years, SD 15.94 years) were included in this study. The CNR in DLM reconstructions was significantly greater than in native reconstructions, and the mean CNR in regions of interest 1-3 (ROI1-3) in DLM images was 11.12 ± 9.29, while in the case of native reconstructions, it was 7.64 ± 4.33 ($p < 0.001$). The noise level in native reconstructions was significantly higher than in the DLM reconstructions, and the mean noise level in ROI1-3 in native images was 45.83 ± 25.89, while in the case of DLM reconstructions, it was 35.61 ± 24.28 ($p < 0.05$). Subjective image quality assessment revealed no statistically significant differences between native and DLM reconstructions.

CONCLUSION

The use of deep learning-based image reconstruction algorithms for CBCT imaging of the oral cavity can improve image quality by enhancing the CNR and lowering the noise.

CLINICAL RELEVANCE/APPLICATION

This research demonstrates the potential of artificial intelligence in reducing noise in clinical CBCT workflows as a tool to improve diagnostic performance, enhance patient care, and standardize imaging quality in a variety of dental settings.

R2-SPHN-7 PERFORMANCE OF CHATGPT IN HEAD AND NECK CANCER STAGING USING MULTIMODAL DATA ACCORDING TO THE AJCC 8TH EDITION

Daniel Weitz, MD (*Presenter*)
Sevcan Turk, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the accuracy and limitations of ChatGPT in predicting head and neck cancer staging using multimodal radiology data, based on the AJCC 8th Edition criteria.

METHODS AND MATERIALS

A total of 66 radiology reports derived from computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography-computed tomography (PET-CT) were included. These reports were composed to simulate diverse clinical scenarios and anatomical sites, including the pharynx, larynx, oral cavity, maxillofacial structures, cutaneous surfaces, head and neck soft tissues, and thyroid gland, with varying presentations of lymph node involvement and distant metastasis. The dataset included 46 ChatGPT-generated reports, 10 attending-generated reports, and 10 resident-generated reports. Each report was manually staged according to AJCC 8th Edition to establish a reference standard. ChatGPT was then prompted to assign TNM staging for each case, and its outputs were compared with manual staging to determine accuracy and identify error patterns.

RESULTS

The overall staging accuracy of ChatGPT across all reports was 83%. Stratified by report source, ChatGPT achieved a success rate of 93% with its own generated reports, 80% with attending-generated reports, and 60% with resident-generated reports. Errors were most observed in evaluating lymph node characteristics, particularly in assessing nodal size and distinguishing suspicious features such as loss of the fatty hilum or rounded morphology.

CONCLUSION

ChatGPT demonstrates promising performance in staging head and neck cancers using multimodal radiology data, particularly when interpreting well-structured reports. However, variability in performance across report types highlights the need for careful oversight, especially in complex or ambiguously described cases.

CLINICAL RELEVANCE/APPLICATION

While ChatGPT shows potential as a decision support tool in oncologic staging, its limited reliability with different type of report quality underscores the importance of clinician review prior to clinical application.

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Sub-Events

R2-SPIN-1 INTRA-RATER REPRODUCIBILITY OF MANUAL MRI LESION SEGMENTATION AND HEMORRHAGE CLASSIFICATION IN ACUTE CERVICAL TRAUMATIC SPINAL CORD INJURY

Maxime Bouthillier, MD (*Presenter*)
Jan Valosek (*Abstract Co-Author*)
Naama Rotem-Kohavi (*Abstract Co-Author*)
Suzanne Humphreys (*Abstract Co-Author*)
Nader Fallah (*Abstract Co-Author*)
Mathieu Guay-Paquet (*Abstract Co-Author*)
Kalum Ost (*Abstract Co-Author*)
David Cadotte (*Abstract Co-Author*)
Laurent Letourneau-Guillon, MD, MSc (*Abstract Co-Author*)
Julien Cohen-Adad (*Abstract Co-Author*)

PURPOSE

Manual segmentation and classification labels are commonly used as ground truth references for developing automatic medical image analysis models. While radiology literature frequently reports generally intra- and inter-rater variability depending on the task, this has not been thoroughly investigated in the context of acute cervical traumatic spinal cord injury (tSCI). This study assesses intra-rater reproducibility in manual lesion segmentation and hemorrhage classification as a biomarker in acute cervical tSCI MRI.

METHODS AND MATERIALS

Sagittal T2-weighted MRIs from 127 individuals with acute cervical tSCI (preoperative within 72 hours post-injury, Level 1 trauma center) have been manually segmented twice by a third-year radiology resident using 3D Slicer, six months apart under identical working conditions. Lesion segmentation masks included both edema—i.e. intramedullary T2w hyperintensity relative to normal-appearing spinal cord—and, when present, presumed hemorrhage—i.e. intramedullary T2w hypointensity. Dice similarity coefficients were computed for both labels at once and separately. Hemorrhage identification on sagittal T2w MRI was further evaluated via count of non-empty hemorrhage masks across both sessions. Hemorrhage was also assessed on axial T2* MRIs across two sessions three months apart. Cohen's kappa was used to measure reproducibility. 95% confidence intervals (CI) were reported. Sensitivity and specificity of hemorrhage identification on sagittal T2w imaging were calculated against corresponding T2* axial MRI assessments at both sessions, considered as the reference standard.

RESULTS

On sagittal T2w MRI, the mean (CI) Dice coefficient for total lesion is 0.69 (0.66-0.71). For edema: 0.68 (0.65-0.70); for hemorrhage: 0.37 (0.29-0.45). Hemorrhage was initially diagnosed on T2w in 21 participants, then 31 at 6 months (kappa: 0.66; CI: 0.49-0.84). On axial T2* MRI (n=115), hemorrhage was classified in 27 and 31 participants at initial and final sessions, respectively (kappa: 0.77; CI: 0.61-0.90). Sensitivity and specificity for hemorrhage detection using sagittal T2w versus axial T2* imaging are 0.56 and 0.86 initially, and 0.55 and 0.98 on second evaluation.

CONCLUSION

Intra-rater agreement in sagittal T2w hemorrhage identification was good, whereas axial T2* shows good to very good agreement and stable reproducibility. While sensitivity is low for identifying hemorrhage from sagittal T2w imaging, specificity is high.

CLINICAL RELEVANCE/APPLICATION

Intramedullary hemorrhage is a recognized prognostic imaging biomarker in acute cervical tSCI, associated with poor neurological outcomes. Improving classification reproducibility supports its integration into automated imaging analysis.

R2-SPIN-2 DO LARGE LANGUAGE MODELS (LLM) HAVE A ROLE IN PROVIDING FEEDBACK FOR RADIOLOGY EDUCATION?

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PURPOSE

To evaluate the role of a large language model (LLM) in the assessment and correction of radiology reports generated by medical students as part of their core clerkship in radiology.

METHODS AND MATERIALS

32 radiology reports generated in a simulated PACS reading environment over a 4-month period by 2nd year medical students were extracted from an Institutional database and anonymized. These represented two versions of 8 reports from a high-complexity case (CTA torso with aortic dissection), and 8 reports from a low-complexity case (chest radiograph with misplaced endotracheal tube). Reports generated prior to and following feedback from an attending radiologist were labeled as "A" and "B", respectively. Student reports were compared with a gold standard official radiology report. Using a few-shot prompting technique, reports were evaluated using Claude Sonnet 3.7 (Anthropic) on the Bedrock platform (AWS). The LLM was asked to provide a comparison between the two versions of the student reports ("A" and "B"), and to compare with the official report. The LLM analysis was assessed by three board-certified radiologists, with questions ranked on a 5-point Likert scale. The model output was assessed on identifying discrepancies, missed findings, professional tone, formatting and other factors. All data were collected using a secure web-based survey tool, tabulated and statistical analysis performed in Stata IC v14.

RESULTS

48 surveys were completed, comprising 3 assessors each reviewing 16 pairs of medical student reports. With regard to the questions addressing the comparsion between the two student versions of the report, the mean score of the LLM-provided analysis was 4.9 (range 4.85 - 4.94). There was no statistical difference between the high and low complexity cases (p = 0.43). For the LLM-analysis between the student and official reports, higher mean scores were noted for the low-complexity cases (4.99, range 4.8 - 5) versus for high complexity cases (4.94, range 4.6 - 5), p = 0.04. No hallucinations were detected. Examples of serious discrepancies detected include laterality errors and missing critical findings. When asked if the LLM-feedback could be used for medical student education, the assessors reported that they "Strongly Agreed" in 94% of cases.

CONCLUSION

An LLM can provide valuable feedback on medical student radiology reports generated during a simulated reading session, and may serve as a complementary tool for educators.

CLINICAL RELEVANCE/APPLICATION

Near instantaneous actionable feedback on preliminary medical student reports is possible with LLMs. Further work will assess implementation barriers, and potential expansion to resident feedback.

R2-SPIN-3 OFTEN WRONG, NEVER IN DOUBT: GPT-4OV'S PERFORMANCE VS. CONFIDENCE AND EXPLANATIONS FOR HEAD CT HEMORRHAGE INTERPRETATION

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Andrew D. Smith, MD, PhD (*Abstract Co-Author*)
Paul H. Yi, MD (*Abstract Co-Author*)

PURPOSE

Vision-language models (VLMs) like GPT-4oV can interpret medical images and generate free-text reports, but the reliability of their reasoning is unclear. We evaluated GPT-4oV's diagnostic accuracy for intracranial hemorrhage (ICH) on non-contrast head CT, along with the quality of its visual localization and explanatory logic.

METHODS AND MATERIALS

We tested GPT-4oV on 72 head CT slices (52 ICH-positive) annotated by radiologists with bounding boxes for ICH, including subtype labels (intraparenchymal, intraventricular, subarachnoid, epidural, and subdural). For each image, the model was prompted to provide a binary hemorrhage classification (yes/no), hemorrhage subtype, bounding box coordinates for ICH location, and a free-text explanation of its reasoning. Outputs were compared to radiologist ground truth. We evaluated 1) Diagnostic performance (accuracy, sensitivity, precision, F1-score), 2) Localization accuracy (IoU and containment rate, i.e., whether predicted boxes overlapped with ground truth), and 3) Explanation quality (speculative word ratio and Flesch-Kincaid [FK] readability grade level). To probe reasoning structure, we embedded the explanations using BioBERT, performed unsupervised clustering, and assessed subtype-level consistency.

RESULTS

GPT-4oV showed suboptimal performance in detecting ICH (accuracy: 39%, sensitivity: 39%, F1-score: 0.40). Localization was poor: ICH bounding boxes had large spatial errors (mean IoU: 0.006), with just 3.6% fully contained within ground truth and 10.7% with centers inside. Bounding boxes were also consistently smaller than ground truth, underestimating lesion size. Despite this, the model's free-text explanations clustered cleanly by ICH subtype (100% intra-cluster purity), suggesting distinct reasoning patterns. Textual explanations were linguistically confident (speculative word ratio: 0.06%, i.e., no hedging) and aligned with radiology reporting complexity levels (median FK readability grade: 17), though often factually incorrect (evidenced by incorrect ICH predictions).

CONCLUSION

GPT-4oV was often wrong but seldom in doubt—showing suboptimal diagnostic accuracy, poor localization, and confidently incorrect explanations. Though its language clustered cleanly by hemorrhage subtype, this masked flawed reasoning. The model 'speaks radiology' fluently, but fluency without factual grounding is risky. For informatics, this highlights the need to assess not just what models say about images, but how—and why—they say it.

CLINICAL RELEVANCE/APPLICATION

Fluent AI explanations can mask diagnostic errors, highlighting the need for caution when integrating vision-language models into clinical radiology.

R2-SPIN-4 USING AN AI BASED INFORMATICS APPROACH FOR VISUALIZATION OF CONTRAST ENHANCEMENT IN MULTIPHASE CT PROTOCOLS AT SCALE

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Rachel Bladorn, BS, RT (*Abstract Co-Author*)
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Meghan G. Lubner, MD (*Abstract Co-Author*)
Timothy P. Szczykutowicz, PhD (*Abstract Co-Author*)

PURPOSE

To assess contrast opacification on a renal donor multiphase CT protocol using an AI-driven auto-segmentation approach to enable evaluation of deviations in scan timing and patient-size on CT enhancement.

METHODS AND MATERIALS

The OSCAR toolkit, an AI-based pipeline, was used to segment the liver and extract median CT numbers. Of 6,079 renal donor multiphase CT scans, 3,723 with three phases were included. The vascular phase auto-triggered at 70 seconds post-injection; the delayed phase was manually started at 180 seconds. Delayed phase scan delay times and patients' water equivalent diameter (WED) were calculated using DICOM metadata and images. Mean, standard deviation, and coefficient of variation (CV) of scan delay were calculated. Vascular and delayed phase liver CT numbers were plotted against baseline (unenhanced) CT numbers, with color coding by scan delay and WED (i.e. a surrogate for patient size). Mann-Whitney U tests were performed to compare vascular and delayed phase CT numbers between groups with baseline liver CT numbers <50 HU vs. =50 HU, and WED <340 mm vs. =340 mm.

RESULTS

Actual delayed phase timing ranged from 100-300 s (median 182 ± 24 s; CV = 13%). Vascular and delayed phase CT numbers increased with higher baseline CT numbers but showed no correlation with scan delay. Significant differences were found between groups with baseline CT numbers <50 HU vs. =50 HU: vascular phase 76 HU vs. 104 HU, delayed phase 89 HU vs. 119 HU ($p < 0.05$). Similarly, significant differences were observed between patients with WED <340 mm vs. =340 mm: vascular phase 105 HU vs. 83 HU, delayed phase 120 HU vs. 96 HU ($p < 0.05$).

CONCLUSION

Despite protocol guidance, manual initiation of delayed phase scans resulted in substantial variability in scan timing. Larger patients exhibited lower liver CT numbers in both vascular and delayed phases, likely due to fixed contrast dosing of the protocol, inadequate for body size, and increased beam hardening. Patients with low baseline liver CT numbers (<50 HU) (either small or large patients), potentially due to hepatic steatosis or other pathology, also showed reduced CT number values. Optimizing image quality in these populations may require patient-specific contrast dosing and protocol adjustments, such as reducing tube potential or increasing contrast volume.

CLINICAL RELEVANCE/APPLICATION

Liver enhancement in multiphase CT is significantly affected by patient size and baseline liver attenuation and very weakly dependent on delayed phase scan timing (i.e., 180 seconds). Enhancement remained relatively flat for tens of seconds variation in delayed scan timing. This AI-based, data-driven approach enables data visualization at scale allowing optimization of iodine contrast protocols across diverse patient populations.

R2-SPIN-5 INVESTIGATE THE ROLE OF INTRASACCULAR THROMBUS IN ABDOMINAL AORTIC ANEURYSMS (AAA): A HEMODYNAMIC PERSPECTIVE

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Seyedmostafa Rezaeitaleshmahalleh (*Abstract Co-Author*)
Xiaoming Zhang, PhD (*Abstract Co-Author*)
Robert McBane, MD (*Abstract Co-Author*)

PURPOSE

Intrasaccular thrombus presents a large fraction of abdominal aortic aneurysms. The role of intrasaccular thrombus is controversial. In this study, we quantify the differences in aneurysmal hemodynamics with or without the intrasaccular thrombus during “patient-specific” computational fluid dynamics (CFD) simulations of a cohort of human AAAs.

METHODS AND MATERIALS

This study utilized computed tomography angiography (CTA) images from a research database at the Mayo Clinic, comprising 63 patients with thrombosed AAAs. Specifically, two geometrical models (i.e., the pre- and post-thrombus models) were generated for each patient in this cohort. CFD simulations were performed to understand the aneurysmal hemodynamic differences in the pre- and post-thrombosed AAA geometries. This study used a combined qualitative and quantitative approach. In addition to wall shear stress-related stressor prediction indices, novel indices derived from quantifying spatiotemporal characteristics of aneurysmal flow vortices and velocity informatics were also obtained by post-processing CFD data. Qualitatively, gross hemodynamic patterns were assessed visually to identify helical flow patterns, a marker for increased rupture risk (Qiu et al., European Journal of Vascular and Endovascular Surgery, 2022).

RESULTS

The number of flow vortices/eddies and helical flow patterns was considerably higher in the pre-thrombosed AAAs than in post-thrombosed AAAs (p-value < 0.05). Moreover, more helical flow patterns were found in the pre-thrombosed AAA group compared to the post-thrombosed AAA group.

CONCLUSION

Overall, we found increased aneurysmal flow disturbance in pre-thrombosed AAAs. Consequently, our preliminary results suggest that the formation of intrasaccular thrombus may be a protective mechanism from the perspective of hemodynamics. Our future work includes considering aneurysmal wall compliance to understand the stress in the aneurysmal wall with and without the presence of intrasaccular thrombus.

CLINICAL RELEVANCE/APPLICATION

This research's insights are promising for identifying specific flow patterns associated with heightened AAA rupture risk, facilitating personalized risk assessments and contributing to personalized management strategies, including timely interventions for high-risk patients with small-sized AAAs.

R2-SPIN-6 AUTOMATED LOCALIZATION OF LINES, DRAINS, AND AIRWAYS ON CHEST RADIOGRAPHS USING YOLO OBJECT DETECTION MODELS

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Steve Standage (*Abstract Co-Author*)
Gary R. Schooler, MD (*Abstract Co-Author*)
Lili He, MD (*Abstract Co-Author*)
Alex Towbin, MD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a deep learning object detection algorithm for automated localization of five common Lines, Drains, and Airways (LDAs) on chest X-rays (CXRs), including endotracheal tubes (ETTs), left peripherally inserted central catheters (PICCs), right PICCs, lower extremity PICCs, and tracheostomy tubes.

METHODS AND MATERIALS

This study retrospectively analyzed single-view CXRs performed in 2021 from adult and pediatric patients. Under the supervision of a pediatric radiologist, two image analysts manually annotated ETTs, left PICCs, right PICCs, lower extremity PICCs, and tracheostomy tubes using 3D Slicer. The radiologist reviewed all annotated images and made corrections as needed. Bounding boxes for each LDA device were automatically generated from the manual segmentation masks and used as ground truth. All CXRs were normalized to a resolution of 512×512. A You Only Look Once (YOLO) object detection framework was used to localize the five LDA devices by predicting bounding boxes directly from CXRs. The YOLO framework represents a family of real-time object detection models that use fully convolutional networks to divide the input image into a grid and simultaneously predict bounding boxes and class probabilities for each region. In this study, we implemented four versions of YOLO models, including YOLOv8, YOLOv9, YOLOv10, and YOLOv11. We randomly split the dataset into 7:1:2 for model training, validation, and testing at the subject level. Model performance was evaluated using class-specific Average Precision (AP), and overall mean AP (mAP) across all classes.

RESULTS

1,024 CXRs from 551 pediatric and adult patients [mean ± standard deviation age of 4.7 ± 7.8 years, age range: 0.0 to 54.7 years, 238 (43.2%) females] were included. 611 CXRs contain at least one of five targeted LDAs, while 413 CXRs do not contain any of the targeted LDAs. Among the evaluated models, YOLOv9 achieved the highest overall performance with a mAP of 0.72. YOLOv8, YOLOv10, and YOLOv11 achieved mAPs of 0.69, 0.67, and 0.70, respectively. The best-performing YOLOv9 model achieved class-specific AP values of 0.68 for ETT, 0.75 for left PICC, 0.78 for right PICC, 0.68 for lower extremity PICC, and 0.71 for tracheostomy tube. We visualized the ground truth annotations alongside the predicted bounding boxes from the best-performing YOLOv9 model.

CONCLUSION

YOLO-based object detection models demonstrated strong performance in localizing common LDAs on chest radiographs, with YOLOv9 achieving the highest overall accuracy.

CLINICAL RELEVANCE/APPLICATION

Automated bounding box localization of LDAs on adult and pediatric CXRs provides a foundation for real-time clinical decision support tools, aiding device presence verification and workflow efficiency.

R2-SPIN-7 MULTIREADER MULTICASE COMPARISON OF STANDALONE AI VERSUS RADIOLOGISTS FOR DETECTION OF 24 ACUTE FINDINGS ON CT ABDOMEN PELVIS EXAMINATIONS

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Michael Moritz (*Abstract Co-Author*)
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PURPOSE

Artificial intelligence (AI) systems capable of detecting acute findings on abdominal and pelvic CT scans at a level comparable to radiologists could enhance diagnostic accuracy, improve clinical workflows for emergent cases, and reduce variability in clinical practice. This study aimed to evaluate the standalone performance of a CT abdomen-pelvis (CTAP) foundation model (a2z-3) in detecting 24 acute radiologic findings, benchmarked against radiologist performance in a multi-reader, multi-case analysis.

METHODS AND MATERIALS

For each of the selected 24 potentially acute findings identifiable on CTAP exams, cases were selected based on initial radiologist reports, including an average of 6.4 definitive cases per finding (standard deviation [SD] 5.1) and 2.8 possibly present cases per finding (SD 1.4). Each CTAP was re-evaluated for quality and accuracy by an abdominal-fellowship trained attending radiologist uninvolved in the reader study, resulting in 121 total cases for review. Cases were loaded onto the RedBrick AI annotation platform and independently reviewed by three attending radiologists. Radiologists assigned a likelihood rating from 1 (unlikely) to 5 (likely), and indicated whether each finding could be definitely ruled out or definitely diagnosed. Each CTAP was also evaluated independently by a transformer-based deep learning model. F1 scores for each of the 24 findings were calculated for the model and radiologists across all 121 cases and compared.

RESULTS

Across the 24 findings, the mean model F1 score was 0.61 (SD 0.19) compared to a mean radiologist F1 score of 0.52 (SD 0.18; p=0.04 via a paired t-test). The AI model outperformed the average radiologist in 19 of 24 findings (79%) and surpassed all radiologists for 13 findings (54%). The model performed best for ureteral stones and diverticulitis (F1=0.84) and had the lowest performance for colitis (F1=0.20).

CONCLUSION

The a2z-3 CTAP foundation model demonstrated robust standalone performance in identifying acute radiologic findings, achieving comparable or superior accuracy relative to experienced radiologists across multiple acute conditions. These results support the model's potential as a reliable tool to aid in CTAP image interpretation and prioritization.

CLINICAL RELEVANCE/APPLICATION

Incorporating a high-performing foundation model into clinical workflows has the potential to enhance diagnostic accuracy, minimize interpretation variability among radiologists, and expedite the recognition and management of acute abdominal and pelvic pathologies.

R2-SPIN-8 ORGAN-BASED TUMOR DISTRIBUTION FOR PREDICTING PROGNOSIS IN SMALL-CELL LUNG CANCER USING FLUORODEOXYGLUCOSE POSITRON EMISSION TOMOGRAPHY/COMPUTED TOMOGRAPHY

Jiwoo Park, MD, PhD (*Presenter*)
Young Han Lee, MD (*Abstract Co-Author*)

PURPOSE

To validate and compare conventional metabolic tumor burden measurements with comprehensive metabolic tumor distribution patterns using [18F] fluorodeoxyglucose positron emission tomography/computed tomography (FDG PET/CT) to predict small-cell lung cancer (SCLC) prognosis.

METHODS AND MATERIALS

This retrospective study included 520 patients with SCLC (mean age±standard deviation, 67±5.6 years; 84.8% men) who underwent PET/CT for staging. Of these, 364 scans were used for training (n=291) and internal (n=73) tests, while 156 other scans were used for external testing. Clinical data (age, sex, and stage) were reviewed. Volumes of interest were manually drawn using a threshold standard uptake value of 2.5 for total lesion glycolysis (TLG) for all tumor lesions on PET. TLG with distribution (TLGd) and Organ-based tumor distribution (metastasis in organs, METAORG) was analyzed from CT-based automatic organ segmentation and overlaid on PET. Four survival prediction models (event and duration) were developed using a Random Forest classifier: (1) clinical factors, (2) tumor TLG, (3) TLGd and METAORG, and (4) combined models.

RESULTS

The top 11 features were selected for prediction models. In the internal test, C-indices for overall survival were 0.611, 0.592, 0.721, and 0.753 for tumor TLG, clinical, METAORG, and combined model, respectively. External test C-indices were 0.637, 0.326, 0.706, and 0.740, respectively. The combined model demonstrated the highest predictive power for both test sets.

CONCLUSION

The combined model outperformed the other models in predicting survival. Application of tumor distribution (TLGd and METAORG) to whole-body tumor distribution pattern analysis shows promise for improving prognosis evaluation, with advantages of quantifiable metastasis stratification.

CLINICAL RELEVANCE/APPLICATION

Integrating organ-based tumor distribution (TLGd + METAORG) with traditional metabolic burden metrics elevates PET/CT-based survival prediction in SCLC, boosting C-index to ~ 0.74 in external validation—substantially better than clinical data or TLG alone. The model's quantifiable, organ-specific metastasis read-out allows clinicians to classify patients into clearer risk tiers, informing decisions on intensified systemic therapy, prophylactic cranial irradiation, or earlier clinical-trial referral. The workflow relies on routine FDG-PET/CT plus automated organ segmentation, making the technique readily adoptable in most oncology centers without extra scans or bespoke software.

R2-SPIN-10 SURGICAL TWIN OF ORTHOGNATHIC SURGERY RESULTS AS POSTOPERATIVE LATERAL CEPHALOGRAMS USING GRAPH NEURAL NETWORKS AND DIFFUSION MODELS

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Namkug Kim, PhD (*Abstract Co-Author*)
JiHeon Jeong (*Abstract Co-Author*)
Jisup Lim (*Abstract Co-Author*)

Su-Jung Kim (*Abstract Co-Author*)
Seung-Hak Baek, DDS,PhD (*Abstract Co-Author*)
Junsik Kim (*Abstract Co-Author*)
Yoon-Ji Kim, PhD,DDS (*Abstract Co-Author*)

PURPOSE

Orthognathic surgery (OGS) is increasingly sought for cosmetic purposes. The prediction of OGS is important in patient's decision to receive treatment. Traditionally, the prediction of OGS has been done by tracing lateral cephalograms, which showed low accuracy. We developed a surgical twin using generative prediction for orthognathic surgery using ceph network (GPOSC-Net) for synthetic post-operational lateral cephalogram (spost- ceph).

METHODS AND MATERIALS

707 OGS patients from ten university hospitals were enrolled. We employed graph convolutional neural network (GCNN) to predict appropriate surgical movements from the pre-operational lateral cephalogram (pre-ceph). And, we took the surgical movements, other information from pre-ceph and profile line as inputs to generate spost-cephs using a diffusion model, which was initially trained by using 30k cephalograms. Spost-cephs were validated as follows. A visual Turing test (VTT) was performed with four dentists (DDSs) to differentiate real post-operational lateral cephalograms (post-ceph) from spost-cephs. Landmarks were compared between the post-cephs and corresponding spost-cephs. Spost-cephs were generated with various surgical planning scenarios and evaluated by four DDSs. After being shown spost-cephs generated at guidance of the intended amount of surgical movement (IASM) ranging from under to over setback amounts, they selected the most appropriate images. A survey was performed to evaluate the clinical utility.

RESULTS

VTT achieved an average accuracy of 48%, which indicated that the spost-cephs were plausible. The mean error of the landmarks was 1.5 mm, and the successful prediction rate (errors < 2.0 mm) averaged at approximately 90%. Among various surgical scenarios, DDSs selected images generated at guidance of an average IASM of 1.03±0.31 as the most appropriate. Survey showed the usability of spost-ceph in OGS prediction and patient consultation despite the limitation of surgical planning.

CONCLUSION

We proposed GPOSC-Net using pre-ceph for OGS prediction. The spost-ceph not only accurately predicted the landmark positions but also generated accurate image.

CLINICAL RELEVANCE/APPLICATION

Accurate synthetic cephalograms enhance orthognathic surgery prediction, improving surgical planning and patient consultation by visualizing post-operative outcomes with high realism and landmark precision.

R2-SPIN-11 DECODING IMAGING BIOMARKERS: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RADIOMICS FOR PREDICTING RESPONSE TO TARE

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Mohammadreza Hosseini-Siyanaki (*Abstract Co-Author*)
Ehsan Ranjbar, MD, MPH (*Abstract Co-Author*)

PURPOSE

Radiomics offers a noninvasive means to predict outcomes after transarterial radioembolization (TARE), yet its reproducibility and performance remain unclear. This systematic review and meta-analysis assesses predictive accuracy, imaging modalities, and modeling strategies, providing tumor type and modality pooled metrics.

METHODS AND MATERIALS

Following PRISMA guidelines, PubMed, Embase, Scopus, and Web of Science were searched through April 2024. Studies using radiomics to predict treatment response or survival after TARE were included. Quality was assessed via QUADAS-2 and Radiomics Quality Score (RQS). Data on tumor type, imaging modality, model type, validation, and performance metrics were extracted. Meta-analysis of 11 externally validated studies was performed using a random-effects model to estimate pooled sensitivity, specificity, and AUC, with subgroup analyses by imaging type and tumor origin.

RESULTS

Out of 608 screened articles, 14 studies (1,423 patients) were included. Tumors studied included HCC (n=9), iCC (n=2), and mCRC (n=3). Imaging sources included CT (n=3), MRI (n=6), and PET (n=2), with some using hybrid or multiparametric inputs. Meta-analysis of 11 studies with quantitative outcomes revealed a pooled AUC of 0.82 (95% CI: 0.78-0.86), sensitivity of 79% (95% CI: 72-85%), and specificity of 75% (95% CI: 67-82%), with moderate heterogeneity (I^2 = 52%). Subgroup analysis demonstrated superior performance in PET-derived models (AUC = 0.87) compared to CT (0.81) and MRI (0.78). Studies integrating radiomics with clinical features (e.g., AFP, tumor burden) achieved higher AUCs (0.85) than radiomics-only models (0.76). Meta-regression showed that studies using external validation and those with higher RQS (>12) had significantly better model robustness ($p < 0.01$). Temporal resolution (e.g., baseline vs. follow-up imaging), feature reduction strategies (e.g., LASSO vs. PCA), and inclusion of shape descriptors were key moderators of model performance. Notably, studies using 3D radiomics and those focusing on texture heterogeneity features (e.g., entropy, GLCM contrast) had better predictive metrics across tumor types. Predicting complete or partial response was more accurate than predicting stable/progressive disease.

CONCLUSION

Radiomics models effectively predict treatment response after TARE, particularly when combined with clinical data and PET imaging. However, methodological variability and reporting gaps underscore the need for standardization and prospective validation.

CLINICAL RELEVANCE/APPLICATION

Radiomics can serve as a noninvasive biomarker to stratify TARE candidates, reduce ineffective treatments, and personalize interventional oncology workflows.

R2-SPIN-12 ENABLING EARLIER DETECTION OF SPINAL LESIONS IN CT IMAGING WITH ARTIFICIAL INTELLIGENCE: A CASE STUDY

Christian Wiedemeyer (*Presenter*)
Marlene Fritzsche (*Abstract Co-Author*)
Patrick Schmidt (*Abstract Co-Author*)
Matthias Kirchler (*Abstract Co-Author*)
Kenneth Schroder (*Abstract Co-Author*)
Lea-Elena Braunschneider (*Abstract Co-Author*)

PURPOSE

To evaluate the potential benefits of integrating an artificial intelligence (AI)-based tool as a second reader for detecting malignant bone lesions on spinal computed tomography (CT) scans.

METHODS AND MATERIALS

Bone is the third most common site of metastasis, signaling poor prognosis. Early detection is critical as osseous metastases impact symptoms, disease progression and therapeutic decisions. Missing skeletal metastases at initial diagnosis can result in suboptimal treatment strategies, impacting patient outcomes, increasing morbidity, and reducing quality of life. AI, especially deep learning algorithms such as CNNs can improve the detection of bone lesions on CT scans. Our nnU-Net segmentation model was trained on 653 cases (516 with malignant lesions) to detect malignancies in the bone. We analysed 200 patients with reported malignant bone lesions in their

spine, identified on CT scans. Retrospectively, we examined earlier scans for each patient where no lesion had been diagnosed. We applied our model to these prior scans, assessing whether AI could have detected the lesion at that earlier time point. A board-certified radiologist independently evaluated AI-flagged cases without, then with, access to AI predictions, confirming lesion visibility and malignancy status. The primary outcome was the proportion of missed cases in which AI successfully identified the lesion before baseline. The secondary outcome was the mean lead time for the AI to detect lesions while they were still not apparent to radiologists.

RESULTS

The AI identified 12 malignant lesions not reported in the original radiology reports. In retrospective review, a board-certified radiologist confirmed that they were not visible without AI assistance at the time. This demonstrates that AI enables true early detection, identifying malignancies on average 228 days earlier—and up to 671 days earlier. An additional 25 malignant lesions detected by AI were also not included in initial reports. Retrospectively, a board-certified radiologist verified that these lesions were visible at the time. This suggests that although they were detectable then, they were missed in the original documentation, indicating reporting gaps.

CONCLUSION

Our AI model shows the potential to detect lesions up to 22 months before they become visible to radiologists, enabling earlier intervention and potentially improving patient outcomes.

CLINICAL RELEVANCE/APPLICATION

Integrating an AI-based second reader into spinal CT interpretation can enhance early detection of malignant bone lesions, influencing therapeutic decisions and improving patient prognosis. Furthermore, AI provides a valuable prompt to radiologists, ensuring comprehensive reporting and enabling earlier intervention.

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R2-SPIR

Interventional Radiology Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPIR-1 EFFICACY OF LOW-INTENSITY FOCUSED ULTRASOUND-AUGMENTED CHEMOTHERAPY AS SECOND-LINE TREATMENT FOR METASTATIC PANCREATIC CANCER

Shuhui Dong (*Presenter*)
Tianqi Zhang (*Abstract Co-Author*)
Xue Han (*Abstract Co-Author*)
Yi-Quan Jiang (*Abstract Co-Author*)
Zhimei Huang (*Abstract Co-Author*)
Jinhua Huang (*Abstract Co-Author*)

PURPOSE

Low-intensity focused ultrasound (LIFU), a lower-energy form of high-intensity focused ultrasound (HIFU), has been reported to enhance the efficacy of chemotherapy and reduce intraoperative pain. The role of LIFU-enhanced chemotherapy in the second-line treatment of metastatic pancreatic cancer (PC) remains unclear. The aim of this study was to evaluate the efficacy and safety of LIFU combined with chemotherapy for patients with metastatic PC after failure of first-line chemotherapy.

METHODS AND MATERIALS

Patients with metastatic PC whose disease progressed after receiving first-line chemotherapy between 2021 and 2024 were included in this retrospective study. Patients were divided into a LIFU combination chemotherapy group and a standard chemotherapy group according to the second-line treatment received. The primary study endpoint was overall survival (OS), and the secondary endpoint was change in pain scores, assessed using the numeric rating scale (NRS). OS was estimated by the Kaplan-Meier method, and paired t-tests were used for comparison of NRS scores.

RESULTS

A total of 108 patients were included in the study, comprising 28 in the LIFU combination chemotherapy group and 80 in the standard chemotherapy group. The baseline characteristics were comparable between the two groups, including gender (male: 20 vs. 46), age =60 years (15 vs. 52), ECOG score 0-1 (26 vs. 74), hepatic metastasis (64.3% vs. 67.5%), number of metastatic organs =2 (67.9% vs. 68.8%), CA19-9 positive (85.7% vs. 82.5%) and tumor size (4.57 ± 1.09 cm vs. 4.68 ± 1.18 cm), all with $P > 0.05$. The median OS was 8.20 months (95% CI: 6.48-9.91) in the LIFU plus chemotherapy group, which was significantly higher than that of the standard chemotherapy group, which was 4.93 months (95% CI: 4.67-5.20) ($P < 0.01$). Regarding pain relief, patients in the LIFU combination chemotherapy group experienced a significant decrease in NRS score from 6.44 before treatment to 0.56 after treatment ($P < 0.001$).

CONCLUSION

LIFU combined with chemotherapy can significantly prolong overall survival and effectively relieve cancer pain in patients with metastatic PC in the second-line setting. Further validation through prospective studies is required.

CLINICAL RELEVANCE/APPLICATION

The findings of this study indicate that adding LIFU to second-line chemotherapy could improve outcomes for patients with metastatic PC after failure of initial therapy. The findings provide preliminary evidence for its clinical use as a second-line treatment strategy, especially for patients with limited treatment options.

R2-SPIR-3 ANALYSIS OF PORTAL VEIN TO INFERIOR VENA CAVA RELATIONSHIP FOR TRANSFEMORAL TRANSCAVAL PORTAL ACCESS

Samad Ashraf (*Presenter*)
Kai Jones, MD (*Abstract Co-Author*)
Kapil Wattamwar, MD (*Abstract Co-Author*)
Yuli Zhu, MD (*Abstract Co-Author*)
Jacob Cynamon, MD (*Abstract Co-Author*)

PURPOSE

Portal vein (PV) access using a transfemoral transcaval (TFTC) approach has been described for PV intervention, serving as an alternative to transsplenic, transhepatic, or transmesenteric access where routine transjugular portal vein access is difficult or impossible. The relationship between the extrahepatic PV (EPV) and the inferior vena cava (IVC) has not previously been studied. This study evaluates the broader applicability of TFTC access in patients requiring PV intervention through an analysis of variables that enable transfemoral access between the IVC and EPV using a 21-guage Chiba needle.

METHODS AND MATERIALS

Since the majority of patients requiring PV access are for TIPS, we reviewed CT scans in patients who underwent TIPS from 2018-2024 at an urban academic center. Inclusion criteria required the availability of pre-procedural scans. Patients were excluded if their CT scans revealed tumors or artifacts that obscured visualization of the EPV and IVC. Initially artificial intelligence (AI) was used to determine the distance between the IVC and EPV. We then reviewed all cases. Two interventional radiologists with experience in TFTC techniques independently reviewed each CT scan in axial, sagittal and coronal views to determine pre-procedural eligibility for TFTC access into the PV. Eligibility criteria included the distance between the EPV and IVC, the presence of intervening blood vessels, organs or tissues preventing direct access, and the length over which the IVC and EPV run parallel. Patients deemed eligible were classified into Types 1,2,3,4 or Not Eligible reflecting increasing levels of difficulty in achieving transcaval access.

RESULTS

105 patients met the inclusion criteria. 6 of the patients had TFTC access to the PV to assist in TIPS procedures. Distances between the IVC and EPV were measured using AI. In the 6 patients who had TFTC access, the median distance was 8.75 mm (range 2.40-18.80). The median distance in the 99 patients who had routine PV access was 11.10 mm (range 2.85-24.89). Among the 99 eligible routine TIPS patients, 4 (4.0%) were classified as Type 1, 9 (9.1%) as Type 2, 6 (6.1%) as Type 2.5,

22 (22.2%) as Type 3, 18 (18.2%) as Type 4 and 20 (20.2%) as Not Eligible. Overall, 85 (81.0%) out of the 105 total patients analyzed met criteria that would allow TFTC access of the PV if needed.

CONCLUSION

TFTC PV access shows potential for facilitated PV intervention in a broader population of patients where conventional access is challenging or unfeasible.

CLINICAL RELEVANCE/APPLICATION

TFTC PV access can be used in situations where routine PV access is difficult or impossible. This study looks at the anatomical applicability of this procedure in the wider population.

R2-SPIR-4 THE EFFICIENCY AND SAFETY OF HEPATIC ARTERIAL INFUSION CHEMOTHERAPY PLUS TYROSINE KINASE INHIBITORS OR IMMUNE CHECKPOINT INHIBITORS FOR ADVANCED HEPATOCELLULAR CARCINOMA

Yu Lei (*Presenter*)

PURPOSE

This retrospective study aimed to evaluate the efficiency and safety of combining hepatic arterial infusion chemotherapy (HAIC) with tyrosine kinase inhibitors (TKIs) or immune checkpoint inhibitors (ICIs) versus HAIC alone for the treatment of advanced hepatocellular carcinoma (HCC).

METHODS AND MATERIALS

A total of 52 consecutive patients with advanced HCC who underwent HAIC and (or) TKIs/ICIs treatments from July 2021 to July 2023 were included in this retrospective study. Based on the different treatment regimens, these patients were divided into HAIC group (n=22) and HAIC+T/I group (n = 30). The laboratory indexes, progression-free survival (PFS), overall survival (OS) and adverse events (AEs) were analyzed. Potential factors affecting PFS and OS were evaluated by univariate and multivariate analyses.

RESULTS

Compared to the HAIC group, the HAIC+T/I group achieved a higher overall response rate (ORR) (56.7% vs. 18.2%, P=0.005), disease control rate (DCR) (93.3% vs. 68.2%, P=0.046) and overall survival (OS) (median OS: 9 vs. 6 months, P=0.006). On multivariate analysis, Prothrombin Time (PT) (hazard ratio [HR]=0.42; 95% confidence interval [CI]: 0.19-0.91; P=0.028), Alanine aminotransferase (ALT) (hazard ratio [HR]=1.03; 95% confidence interval [CI]: 1.01-1.05; P=0.009) and treatment (HAIC+T/I treatment vs. HAIC treatment) (HR=0.25;95% CI:0.10-0.67; P=0.005) were independent prognostic factors of OS. The incidence and severity of AEs related to the treatment between the two groups showed no significant difference.

CONCLUSION

The combination therapy of HAIC with TKIs/ICIs demonstrated good efficiency and safety in patients with advanced HCC.

CLINICAL RELEVANCE/APPLICATION

This study underscores the clinical relevance of combining hepatic arterial infusion chemotherapy (HAIC) with targeted therapies or immunotherapy for advanced hepatocellular carcinoma (HCC). The results highlight improved overall response rates, disease control, and survival outcomes with the combination approach, compared to HAIC alone. This suggests a promising direction for personalized treatment strategies in HCC, potentially offering better efficacy and safety profiles. Further research is needed to optimize and validate these findings in larger, prospective studies.

R2-SPIR-5 ESTABLISHING SELECTION CRITERIA FOR NEW ZEALAND WHITE RABBITS IN INTERVENTIONAL RADIOLOGY RESEARCH: CORRELATIONS OF ORGAN VOLUMES, VESSEL DIAMETERS, AND BODY WEIGHT

Selma Saclier (*Presenter*)
Yubei He (*Abstract Co-Author*)
Justus Klockner (*Abstract Co-Author*)
Justus Ramtke (*Abstract Co-Author*)
Julius Chapiro, MD, PhD (*Abstract Co-Author*)
Richard Ruppel (*Abstract Co-Author*)
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Friederike Hesse (*Abstract Co-Author*)
Salma A. Abosabie (*Abstract Co-Author*)
Robin Schmidt (*Abstract Co-Author*)
Lynn J. Savic, MD (*Abstract Co-Author*)

PURPOSE

The VX2 tumor model in New Zealand White (NZW) rabbits is widely used in interventional radiology research due to its reproducibility and suitability for human-sized diagnostic and interventional equipment. However, criteria for animal selection are lacking, leading to increased procedural complications and dropout rates. This study aims at defining selection criteria by correlating body weight and age with abdominal organ and vessel dimensions to identify rabbits anatomically suited for specific radiological research, thereby improving animal welfare and research quality.

METHODS AND MATERIALS

This multi-institutional study included a total of 92 NZW rabbits that underwent cross-sectional imaging of the abdomen between 2017 and 2025, with a subset of scans additionally including the thorax. Specifically, 53 CT and 39 MRI scans were analyzed using the image computing platform 3D Slicer, in combination with an in-house developed segmentation algorithm using the nnU-Net framework for automated liver segmentation. Imaging-based measurements were confirmed by gross anatomy after necropsy in 3 animals and correlated with body weight and age at the time of imaging. Statistical analysis included normality testing and Pearson correlation coefficient.

RESULTS

Body weight ranged from 2.0 to 4.5 kg. Abdominal imaging was available for all, thoracic imaging for 22 animals. Body weight correlated with the volume of the left kidney ($r = 0.70$, $p < 0.01$), right kidney ($r = 0.65$, $p < 0.01$), and liver ($r = 0.42$, $p = 0.00$), as well as the diameters of the a. iliaca interna dextra ($r = 0.58$, $p = 0.01$), a. iliaca interna sinistra ($r = 0.53$, $p = 0.01$), a. iliaca communis sinistra ($r = 0.54$, $p < 0.01$), a. carotis communis dextra ($r = 0.52$, $p = 0.01$), vena cava inferior ($r = 0.52$, $p < 0.01$), a. mesenterica superior ($r = 0.45$, $p < 0.01$), truncus coeliacus ($r = 0.35$, $p < 0.01$), a. hepatica communis ($r = 0.34$, $p = 0.01$), and a. renalis dextra ($r = 0.32$, $p = 0.03$). The segmentation algorithm was trained on 53 manually segmented liver masks over 3 iterative rounds and achieved a Pseudo Dice score of 0.96.

CONCLUSION

These results demonstrate significant correlations between body weight and anatomical structures relevant to interventional procedures in the VX2 model, suggesting a weight-based selection to improve standardization, reduce complications, and enhance animal welfare in preclinical research.

CLINICAL RELEVANCE/APPLICATION

Accurate pre-procedural selection of NZW rabbits based on body weight may improve the success and reproducibility of image-guided interventions by ensuring appropriate anatomical conditions for catheter-based access. This approach contributes to better modeling of human interventions and supports the refinement of preclinical animal research standards.

R2-SPIR-6 ANTECUBITAL VERSUS PECTORAL PLACEMENT OF TOTALLY IMPLANTABLE VENOUS ACCESS PORTS - ANALYSIS OF IMAGE-GUIDED SUPPORT REQUESTS IN CASES OF MALFUNCTION

Kristina Krompass, MD (*Presenter*)
Jan P. Grunz, MD (*Abstract Co-Author*)
Annette Thurner (*Abstract Co-Author*)
Thorsten A. Bley, MD (*Abstract Co-Author*)
Ralph Kickuth, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to analyze functional controls of antecubital and pectoral totally implantable venous access ports, focusing on reasons for referrals for image-guided support and the effectiveness of interventional radiologic management in restoring port function.

METHODS AND MATERIALS

In this retrospective monocentric study, 1,432 functional port controls (751 antecubital, 681 pectoral) performed between January 1, 2008, and June 15, 2022, were evaluated. Patient characteristics, port-specific data, and referral reasons were documented. Additionally, the frequencies of simple puncture errors, thrombotic and mechanical complications, and infections were analyzed and compared between implantation sites.

RESULTS

In the antecubital group, malfunctions occurred later compared with pectoral ports (median 120 days [IQR 43-354] vs. 96 days [IQR 22-404] after implantation; P =.003). Injection resistance was more frequent in antecubital systems (72.2% vs. 62.2%; P <.001), whereas puncture difficulties (2.1% vs. 10.6%; P <.001) and failure to draw blood (2.4% vs. 5.7%; P =.014) were observed more frequently with pectoral ports. Thrombosis represented the most common diagnosis in both groups (35.1% vs. 34.6%; P =.774). Puncture errors were significantly more prevalent in pectoral ports (11.3% vs. 5.2%; P <.001), while infections were diagnosed more often in antecubital systems (4.1% vs. 1.0%; P<.001). Following image-guided management, ports could be used for their intended purpose in the majority of cases (86.2% antecubital vs. 85.5% pectoral; P =.499).

CONCLUSION

Thrombosis and mechanical complications were the predominant causes of impaired port function, irrespective of the implantation site. Image-guided control examinations proved highly effective in restoring port function, underlining the crucial role of interventional radiology in port maintenance.

CLINICAL RELEVANCE/APPLICATION

Functional port controls offer a minimally invasive, yet effective approach to restore venous access and ensure uninterrupted therapy or nutritional support in port patients.

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R2-SPMK

Musculoskeletal Imaging Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPMK-1 CLARIFYING DOUBTFUL FRACTURES ON X-RAY WITH AI SUPPORT: A CT-VALIDATED PERFORMANCE STUDY

Marta Epis, MD (*Presenter*)
Francesco Rizzetto, MD (*Abstract Co-Author*)
Caterina B. Monti, MD, PhD (*Abstract Co-Author*)
Gianluca Folco, MD (*Abstract Co-Author*)
Luca A. Carbonaro, MD (*Abstract Co-Author*)
Angelo Vanzulli, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of a commercial artificial intelligence (AI) tool to resolve diagnostic uncertainty in radiographs flagged as "doubtful" for fracture, using computed tomography (CT) as the reference standard.

METHODS AND MATERIALS

In this retrospective study, we included radiographs from the Emergency Department flagged as "doubtful fracture" in the radiology report and followed by CT within 10 days. The AI software (BoneView, Gleamer) categorized each case as "fracture," "doubt fracture," or "no fracture." Diagnostic performance was assessed under two scenarios: treating "doubt fracture" as either positive or negative. An experienced radiologist first reviewed X-rays independently, then re-evaluated them with AI support. CT served as the reference standard. Sensitivity and specificity were calculated, and statistical comparisons were made using the McNemar test.

RESULTS

A total of 96 patients were included, accounting for 689 bone segments, 150 (22%) with and 539 (78%) without fractures on CT. When "doubt fractures" were considered positive, standalone AI sensitivity increased from 55% to 61%, while specificity decreased from 98% to 94% (both $p < 0.001$). Radiologist sensitivity improved from 57% to 64% with AI support ($p = 0.003$), with specificity remaining stable at 98% ($p = 1.00$). The combination of AI assistance and radiologist interpretation yielded the highest overall diagnostic accuracy.

CONCLUSION

In radiographs flagged as "doubtful" for fracture, the integration of AI support significantly improved diagnostic sensitivity while preserving high specificity. The combined assessment by radiologists and AI yielded the most accurate results, reinforcing the utility of AI as a valuable second reader in challenging fracture evaluations.

CLINICAL RELEVANCE/APPLICATION

Artificial intelligence can enhance radiologist performance in cases of equivocal fractures on X-ray, potentially reducing diagnostic uncertainty and improving early fracture detection, especially in emergency settings where CT may not be immediately available.

R2-SPMK-2 SOFT TISSUE, HARD FACTS: ELASTOGRAPHY REDEFINES NEUROMA IMAGING

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Giovanni Sussan, MD (*Abstract Co-Author*)
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PURPOSE

Morton's neuroma is a painful forefoot neuropathy, typically affecting the second and third intermetatarsal spaces. While B-mode ultrasound supports diagnosis, it often lacks specificity in distinguishing neuromas from adjacent bursitis. Strain and shear-wave elastography offer added value by quantifying tissue stiffness. This study assesses their role in improving diagnostic accuracy through enhanced lesion differentiation .

METHODS AND MATERIALS

Sixty-nine suspected Morton's neuromas in 51 patients (45F, 6M; median age 60, range 32-67) were prospectively evaluated. All lesions underwent ultrasound (US) with a linear probe 2-14MHz equipped with strain and shear-wave elastography. The protocol included dorsal and plantar approaches with lateral compression (Mulder sign). B-mode US assessed lesion morphology, size, echotexture, compressibility, Doppler signal, and nerve continuity. Strain elastography provided qualitative assessment via color-coded maps and strain ratio (lesion vs adjacent soft tissue). Shear-wave elastography offered quantitative stiffness measurements in kilopascals (kPa), based on shear wave velocity within defined regions of interest (ROIs).

RESULTS

Of the analyzed cases, 51 were confirmed neuromas and 18 intermetatarsal bursitis. Strain Ratio (SR) was higher in neuromas (median 1.38; IQR: 0.685-2.005) vs bursitis (median 0.895; IQR: 0.670-0.980). Mann-Whitney: $p = 0.0090$; ?median = 0.530 (95% CI: 0.150-0.890). Shear Wave (SW) stiffness was greater in neuromas (median 90.0 kPa; IQR: 78.0-110.75) vs bursitis (median 66.5 kPa; IQR: 49.0-92.0). Mann-Whitney: $p = 0.0090$; ?median = 22.0 kPa (95% CI: 7.0-36.9).

CONCLUSION

Strain and shear-wave elastography significantly improve the diagnostic characterization of intermetatarsal lesions. Both techniques effectively differentiate Morton's neuroma from intermetatarsal bursitis, with neuromas showing greater stiffness. These findings support the integration of elastography into routine ultrasound protocols to enhance diagnostic confidence, especially in inconclusive B-mode cases.

CLINICAL RELEVANCE/APPLICATION

Elastography adds meaningful diagnostic value to conventional ultrasound in the evaluation of Morton's neuroma. By quantifying tissue stiffness, strain and shear-wave techniques enhance the ability to distinguish neuromas from intermetatarsal bursitis, supporting more accurate, non-invasive diagnosis and guiding appropriate clinical management.

R2-SPMK-4 MRI-BASED SOFT-TISSUE TUMOR REPORTING AND DATA SYSTEM (ST-RADS): CLINICAL EXPERIENCE OF PROSPECTIVE IMPLEMENTATION AND DIAGNOSTC ACCURACY

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Enzo Mesarick (*Abstract Co-Author*)
Yasir Mian (*Abstract Co-Author*)
Asim Mohamed (*Abstract Co-Author*)
Flavio Duarte Silva, MD, PhD (*Abstract Co-Author*)
Atul K. Taneja, MD,PhD (*Abstract Co-Author*)
Avneesh Chhabra, MD, MBA (*Abstract Co-Author*)

PURPOSE

To assess the clinical performance associated with implementation of the ST-RADS scoring system and determine its comparison to the traditional descriptive reports.

METHODS AND MATERIALS

Following prospective implementation of ST-RADS scoring in the electronic dictation system, several fellowship-trained musculoskeletal radiologists classified the bone tumors routinely using this system. This retrospective IRB-approved audit study included 238 such consecutive patients who underwent MRI evaluation for soft tissue tumors between January 2023 and May 2024 at a tertiary academic center. Data on patient demographics, imaging findings, lesion characteristics, biopsy results, treatment modalities, and clinical outcomes were collected. Diagnostic accuracy of ST-RADS versus descriptive reporting was compared using McNemar tests, with final pathology and/or clinical follow-up serving as the reference standard.

RESULTS

The cohort (mean age: 54.3 years; 60.8% female) primarily presented with lower extremity (48.3%) and upper extremity (38.7%) tumors. ST-RADS classification distribution included ST-RADS I (2.1%), ST-RADS II (36.9%), ST-RADS III (22.0%), ST-RADS IV (5.9%), ST-RADS V (4.2%), and ST-RADS VI (28.8%). ST-RADS demonstrated superior diagnostic accuracy compared to descriptive reporting overall (99.15% vs. 92.80%, $p = 0.00073$) and also within biopsy-confirmed cases (97.73% vs. 82.95%, $p = 0.00098$). For benign tumors (ST-RADS I-III), ST-RADS achieved 100% accuracy compared to 94.27% for descriptive reporting ($p = 0.0039$). For malignant tumors (ST-RADS IV-VI), ST-RADS also showed higher accuracy compared to descriptive reporting (97.44% vs. 89.74%), although this difference did not reach statistical significance ($p = 0.1094$).

CONCLUSION

Prospective application of the ST-RADS scoring system demonstrated significantly superior accuracy compared to traditional descriptive methods. These results advocate for broader implementation of ST-RADS in clinical practice as a standardized method for classifying musculoskeletal soft tissue tumors , to enhance interdisciplinary communications, and longitudinal data collection for tracking patient outcomes.

CLINICAL RELEVANCE/APPLICATION

Implementation of the ST-RADS system in clinical practice enhances diagnostic accuracy, improves interdisciplinary communication, and supports standardized reporting for musculoskeletal soft tissue tumors.

R2-SPMK-5 MRI CHARACTERISTICS OF PLANTAR FIBROMAS: A LARGE CONSECUTIVE SERIES FROM A TERTIARY CARE CENTER

Natalie Velez (*Presenter*)
Anish Goel (*Abstract Co-Author*)
Avneesh Chhabra, MD, MBA (*Abstract Co-Author*)

PURPOSE

Plantar fibroma or fibromatosis is a painful and dysfunctional benign disorder in which fibrous tissues infiltrate the plantar aponeurosis and, occasionally, the overlying skin. There is a paucity of literature on its MRI characteristics, with the largest study published on only 16 patients to date. The aim is to systematically evaluate MRI characteristics of plantar fibromas from the database of our tertiary care center imaged over a decade with outcomes analysis.

METHODS AND MATERIALS

This retrospective cross-sectional study included 196 cases of MRI-confirmed plantar fibromas interpreted by fellowship trained MSK radiologists and were all re-reviewed by an independent MSK radiologist. The topography of the lesions with respect to cords of plantar fascia, number of lesions, MRI characteristics, largest size, and enhancement characteristics were systematically reviewed. Regional findings of local fracture deformity, regional muscle denervation, and plantar fasciitis were noted. Electronic chart analysis was performed with analysis of clinical findings. Statistical tests included Wilcoxon rank sum test, Chi-squared test, and Fisher exact test.

RESULTS

The most common location was in the central cord (83%) followed by medial cord (15%) and lateral cord (1.5%) with 14% involving multiple cords and only 0.5% involving all 3 cords. 32% of cases showed multiple lesions with 5% showing 4-5 lesions. The majority (68%) were isointense on T1WI and 43-45% lesions were hypointense on fsT2WI and T2WI, respectively. 66% of lesions were heterogeneous with 8.7% showing cystic-necrotic areas, and 64% had solid contrast enhancement. 29% were associated with plantar muscle denervation and 53-56% had plantar spur and fascial thickening. 52% had pain and 9.2% had sensory symptoms with 54% with diabetes mellitus and 4.5% with Charcot neuroarthropathy. No significant correlations were seen with sensory symptoms or foot swelling ($q>0.05$), while T2W and fsT2W signal alterations, enhancement characteristics, and plantar muscle denervation were significant for pain symptoms ($q<0.05$).

CONCLUSION

This large systematic study adds to the body of literature on plantar fibromas, which can affect different fascial cords, can be multiple in up to 1/3 cases, and have contributory MRI features that correlate with foot pain symptoms.

CLINICAL RELEVANCE/APPLICATION

Using MRI features that correlate with foot pain symptoms enables clinicians to use specific imaging characteristics to aid in diagnosing the source of patients' pain.

R2-SPMK-6 A MAMBA-BASED MULTIMODAL DEEP LEARNING FRAMEWORK FOR PRE-TREATMENT PREDICTION OF DISEASE-FREE SURVIVAL IN OSTEOSARCOMA

Ping Yin (*Presenter*)

PURPOSE

Osteosarcoma is an aggressive bone malignancy with high clinical and biological heterogeneity, making prognostic assessment challenging. Conventional markers often fail to capture this complexity. This study aims to develop and validate a novel multimodal deep learning framework (MambaSurv) that integrates pre-treatment MRI, whole-slide histopathology images (WSIs), and clinical data to predict disease-free survival (DFS) in osteosarcoma patients. Additionally, it seeks to explore underlying molecular mechanisms through transcriptomic analysis and in vivo validation.

METHODS AND MATERIALS

A retrospective cohort of 421 osteosarcoma patients from Center 1 was divided into training and internal test sets (70:30 split). An external validation cohort of 70 patients from Center 2 was used to assess generalizability. MambaSurv extracted modality-specific features from pre-neoadjuvant MRI, WSIs, and clinical variables, and fused them via a Bridge Attention mechanism. The model generated DFS risk scores, enabling stratification into high- and low-risk groups. Predictive performance was evaluated through five-fold cross-validation and ROC analysis. Model interpretability was assessed using SHapley Additive exPlanations (SHAP). To investigate biological relevance, transcriptomic analysis (n=20) identified differentially expressed genes and enriched pathways between risk groups. TP53 was functionally validated in an osteosarcoma xenograft mouse model.

RESULTS

MambaSurv achieved an AUC of 0.91 in the internal test set and 0.86 in the external cohort, significantly outperforming unimodal models (MRI: 0.81; WSI: 0.78; Clinical: 0.73; all $p < 0.01$). Kaplan-Meier analysis demonstrated clear separation in DFS between high- and low-risk groups (log-rank $p < 0.001$). SHAP analysis identified tumor volume and peritumoral edema (MRI), nuclear density (WSI), and Enneking stage (clinical) as top contributors. Transcriptomic profiling revealed that high-risk patients exhibited upregulation of TP53, MYC, VEGFA, and CDK4, enriched in cell cycle and angiogenesis pathways. In vivo overexpression of TP53 promoted tumor growth and neovascularization, confirming its functional relevance.

CONCLUSION

The MambaSurv framework enables accurate and interpretable prediction of DFS in osteosarcoma using multimodal pre-treatment data. This approach offers a clinically applicable tool for early risk stratification and individualized treatment planning, supported by molecular and experimental validation.

CLINICAL RELEVANCE/APPLICATION

MambaSurv provides an accurate tool for predicting disease-free survival in osteosarcoma patients, helping with early risk stratification and personalized treatment.

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R2-SPMS

Multisystem Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPMS-1 PHARMACOKINETICS, SAFETY AND EFFICACY OF GADOPICLENOL IN PEDIATRIC PATIENTS UNDER 2 YEARS OLD UNDERGOING MRI

Donna Roberts, MD, MS (*Presenter*)
Justin Chetta, MD (*Abstract Co-Author*)
Jonathan R. Dillman, MD, MSc (*Abstract Co-Author*)
Mathieu Felices (*Abstract Co-Author*)

PURPOSE

To evaluate the pharmacokinetic (PK) profile, safety and efficacy of a single intravenous injection of gadopiclenol at 0.05 mmol/kg body weight, a high-relaxivity gadolinium-based contrast agent for MRI, in children under 2 years old.

METHODS AND MATERIALS

This phase II open-label, multicenter trial included children scheduled to undergo contrast-enhanced MRI of any body region into 3 age groups (3-23 months, 28-89 days and 0-27 days). Three blood samples were collected after gadopiclenol administration, one within each time window (10-60 min, 2-4 hours, 6-8 hours). This pediatric population was integrated into a population pharmacokinetic (popPK) model previously developed for gadopiclenol and including adults and children aged 2 to 17 years with normal renal function and adults with renal impairment, to determine the PK parameters. The efficacy and safety of gadopiclenol, assessed up to 3 months following administration, were evaluated by the on-site radiologists.

RESULTS

A total of 36 patients underwent MRI with gadopiclenol: 33 aged 3-23 months, two aged 28-89 days and one aged 0-27 days (for whom no PK samples could be analyzed). The two-compartment popPK model developed in adults and older children was suitable for children aged <2 years with adjustment for renal function maturation and for proportionally higher extracellular and total body water. Terminal half-life (t 1/2) was comparable across all age groups (median of 1.6 to 1.8 h for adults and pediatric patients 2-17 years and 1.5 to 2.1 h for patients <2 years). Median clearance ranged from 0.08 to 0.10 L/h/kg for adults and 2-17 years and 0.10 to 0.13 L/h/kg for patients <2years. Simulations of plasma concentrations showed minor differences and median area under the curve (AUC 0-8) was 572 mg.h/L for adults, 465 - 638 mg.h/L for pediatrics 2-17 years and 375-495 mg.h/L for children <2 years. One patient (2.8%) experienced a non-serious adverse reaction to gadopiclenol (erythema of mild intensity resolved within 24 h). Lesions visualization (border delineation, internal morphology, and degree of contrast enhancement) was improved with paired (pre-+ post-contrast) images.

CONCLUSION

Gadopiclenol PK in children under 2 years old appears similar to that observed in adults and older children. No adjustment to the dosing regimen is deemed necessary for this population. This study showed no specific safety concerns and confirmed the efficacy of gadopiclenol at 0.05 mmol/kg in this younger pediatric population.

CLINICAL RELEVANCE/APPLICATION

There is no indication for adaptation of gadopiclenol dose based on age, and body weight-based dosing is also suitable for children under 2 years old.

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R2-SPNMMI

Nuclear Medicine & Molecular Imaging Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPNMMI-1 VISION-LANGUAGE MODEL-DRIVEN AUTOMATIC WHOLE-BODY MULTI-ORGAN ABNORMALITY DETECTION AND LOW-HALLUCINATION REPORT GENERATION USING FINE-GRAINED PSMA PET/CT DATA

Mingze Tang (*Presenter*)
Yitao Mao, MD (*Abstract Co-Author*)
Linmei Zhao, MD, PhD (*Abstract Co-Author*)
Jeffrey P. Leal, BA (*Abstract Co-Author*)
Junyu Chen (*Abstract Co-Author*)
Moe S. Sadaghiani, MD (*Abstract Co-Author*)
Andrei Gafita, MD (*Abstract Co-Author*)
Bennett B. Chin, MD (*Abstract Co-Author*)
Zhicheng Jiao, PhD, BS (*Abstract Co-Author*)
Lilja B. Solnes, MD, MBA (*Abstract Co-Author*)
Harrison X. Bai, MD (*Abstract Co-Author*)

PURPOSE

To develop and validate a finely tuned vision-language model (VLM) for automatic whole-body abnormality detection and low-hallucination report generation from PSMA PET/CT.

METHODS AND MATERIALS

We curated a dataset of 344 [^18F]DCFPyL PSMA PET/CT scans from an institution in the United States from 172 patients, with 13 organs manually segmented and abnormalities fully annotated by expert radiologists, yielding 1,327 organ-level image-report pairs. A novel multi-stage fine-tuning pipeline was applied: first, organ-level alignment of visual and textual features using a vision encoder pre-trained on the CT-RATE dataset[1]; second, extension to whole-body multi-organ abnormality detection; and finally, fine-tuning a projection layer integrated with Mistral-Inference 7B for report generation. Model performance was benchmarked against zero-shot, few-shot, and conventional fine-tuning approaches using metrics for organ detection accuracy, benign-versus-malignant classification, and report quality. Report quality was evaluated by F1 score and a fine-grained hallucination evaluation that assesses conceptual accuracy and completeness, detects hallucinations and omissions, and computes a concept-level F1 score. [2]

RESULTS

In the 43-patient test set (675 organs), the proposed model achieved 84.5% accuracy in distinguishing healthy versus abnormal status, outperforming zero-shot (53.2%) and few-shot (62%) baselines. Organ detection accuracy reached 82.4% overall, with lymph node detection at 94.6%. Report generation quality improved modestly over standard fine-tuning (F1 score 0.340 vs. 0.311) while significantly reducing hallucinations (hallucination rate 0.457 vs. 0.408). Notably, zero-shot models failed at organ-level detection, highlighting the importance of fine-grained alignment for modality-specific tasks.

CONCLUSION

Fine-grained, organ-level tuning of VLMs on a modest high-precision dataset enables robust whole-body abnormality detection and trustworthy report generation for PSMA PET/CT, substantially reducing hallucinations and enhancing clinical reliability.

CLINICAL RELEVANCE/APPLICATION

This cross-modal fine-tuning strategy offers a scalable solution for deploying VLMs in specialized imaging domains, delivering clinically meaningful improvements in whole-body assessment with minimal data, and supporting seamless integration into radiology workflows to ease physician workload. References: [1]Lu, Z., et al. Developing Generalist Foundation Models from a Multimodal Dataset for 3D Computed Tomography . arXiv:2403.17834. [2]Lu, Z., et al. (2024). Developing Generalist Foundation Models from a Multimodal Dataset for 3D Computed Tomography. arXiv preprint arXiv:2403.17834 .

R2-SPNMMI-2 HARMONIZATION OF QUANTITATIVE PET DATA ON PET/MR AND PET/CT SYSTEMS

Delphine L. Chen, MD (*Presenter*)
Peter Muzi (*Abstract Co-Author*)
William Hunter (*Abstract Co-Author*)
Robert Miyaoka, PHD (*Abstract Co-Author*)
Alireza Ghodsi, MD (*Abstract Co-Author*)
Amir Iravani, MD (*Abstract Co-Author*)
Paul E. Kinahan, PhD (*Abstract Co-Author*)

PURPOSE

Lack of harmonization has limited the ability to use PET/MR and PET/CT scanners from different vendors together in the same clinical trial for quantitative tumor response assessment. The purpose of this phantom study was to establish the quantitative differences in reconstructions from these scanners to test potential harmonization approaches.

METHODS AND MATERIALS

Phantoms containing 10 mm to 37 mm-diameter spheres that were filled with activity at a concentration of 72.5 kBq/mL and contrast to background of 10:1 were imaged on a United Imaging uPMR PET/MR scanner for 10 minutes then on a GE Discover MI 5-ring PET/CT 30 minutes later for 10 minutes 30 minutes later. The phantom was reimaged on both scanner after activity was added to create a background contrast of 3:1. Images were reconstructed using default parameters for vendor-specific ordered subset expectation maximization (OSEM) with time-of-flight correction and Bayesian penalized likelihood (BPL) reconstruction. Adjusted parameters included simulated scan duration (150 to 600 seconds), filter cutoffs of 3 and 6 mm, and matrix size (150 x150 to 256x256). Size-matched regions were placed over spheres, and 10 6.5 cm-diameter spheres were placed randomly over the background. Standard deviation (SD) characterized background noise, with ANOVA

and Tukey-Kramer post-hoc analysis used to assess for differences. Standard uptake value (SUV) maximum, mean, and peak were measured in all spheres and summarized graphically.

RESULTS

The background SD for the BPL PET/CT images, 0.02±1E-03 for 3:1 and 0.026±6E-06 for 10:1 contrast, was significantly different from BPL PET/MR (0.04±2E-04 for 3:1, 0.04±2E-04 for 10:1). BPL PET/CT and OSEM PET/CT SDs were not significantly different. Background SD for BPL PET/MR images was not different from OSEM PET/MR. The longer duration images reduced background SD to a greater degree for PET/CT than PET/MR (0.02±4E-03 10:1 PET/CT vs 0.04±1E-03 10:1 PET/MR, similar to that observed with 3:1 contrast). Figure 1 shows that variability within the spheres was lowest with SUVpeak for both PET/MR and PET/CT 3:1 contrast data as well as SUVmean with 3:1 contrast. SUVmax was the most variable for all conditions.

CONCLUSION

BPL reconstructions appear effective at minimizing variability in background noise in all tested conditions. Future research will explore whether additional tuning of BPL reconstructions can minimize quantitative measurement differences from both scanners.

CLINICAL RELEVANCE/APPLICATION

BPL reconstructions can reduce variability in quantitative metrics obtained from PET data obtained on PET/CT and PET/MRI scanners, potentially enabling the inclusion of both scanner types in clinical trials for quantitative response assessment.

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R2-SPNPM

Noninterpretive Skills (Beyond Imaging) Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPNPM-1 EMPOWER LATINX: EMPOWERING HISPANIC PATIENT'S LUNG CANCER SCREENING UPTAKE

Mahnur Bharucha (*Presenter*)
Omar Gutierrez (*Abstract Co-Author*)
Richard Echeverria (*Abstract Co-Author*)
Leonardo Aguilar-Lopez (*Abstract Co-Author*)
Michael Hoyt (*Abstract Co-Author*)
Sunmin Lee (*Abstract Co-Author*)
Tan Nguyen (*Abstract Co-Author*)
Hari Keshava (*Abstract Co-Author*)
Gelareh Sadigh, MD (*Abstract Co-Author*)

PURPOSE

Lung cancer screening (LCS) rates remain lower among Hispanic populations compared to non-Hispanic whites, despite established guidelines and proven benefits for early detection. This study evaluated the preliminary efficacy of a multi-level, culturally tailored intervention (Empower Latinx) versus enhanced usual care (EUC) to increase LCS uptake among Hispanic patients in a randomized controlled trial.

METHODS AND MATERIALS

Patients aged 50-80 years, identifying as Hispanic or Latino, English or Spanish speaking, with a primary care provider and meeting LCS criteria, were enrolled. Participants completed baseline surveys and were randomized to: (A) EUC, receiving a one-page brochure on LCS risks and benefits; or (B) Empower Latinx, receiving a culturally tailored decision aid, financial support brochure, and reminders for both patients and providers to discuss LCS. Primary outcomes at 4 months included patient- and EMR-reported discussions with primary care providers (PCP) about LCS, LCS orders, and LCS completion.

RESULTS

Thirty-nine patients were enrolled (mean age 61.6 years; 56.4% male; 28% Spanish speaking). Most had Medicaid (64.1%), with others on Medicare (25.6%) or private insurance (7.7%). Key barriers to LCS included scan cost (46.2%), anticipated post-scan expenses (38.5%), and concern about abnormal findings (33.3%). At 4 months, the Empower Latinx group had significantly higher rates of LCS discussions with PCPs (45.0% vs. 10.5%; P=0.01) and LCS orders (50.0% vs. 10.5%; P=0.008) compared to EUC. LCS completion was higher in Empower Latinx (25.0% vs. 10.5%; P=0.24), though not statistically significant, likely due to small sample size.

CONCLUSION

Culturally tailored, multi-level interventions show promise for improving LCS engagement among Hispanic patients, addressing key barriers and supporting guideline-based care. Further research with larger samples and patient navigation may help increase LCS completion and reduce disparities.

CLINICAL RELEVANCE/APPLICATION

A multi-level, culturally tailored intervention can increase lung cancer screening discussions and orders among Hispanic patients, a group with historically lower screening rates. Addressing barriers such as cost and providing targeted support may help reduce disparities and promote earlier lung cancer detection in this population.

R2-SPNPM-2 BIONICLM: MULTI-TIER AI AGENTIC WORKFLOW FOR RADIOLOGY REPORT QUALITY AND EFFICIENCY ENHANCEMENT

Sivasailam Kalyan (*Presenter*)
Harini T (*Abstract Co-Author*)
Vasantha Kumar Venugopal, MD (*Abstract Co-Author*)

PURPOSE

This study introduces BionicLM, an AI-powered two-tier workflow that enhances radiology report quality and efficiency. Deployed across 1,200+ radiologists generating 4,000+ daily reports, BionicLM leverages a dual-agent system for real-time clinical enrichment and quality validation.

METHODS AND MATERIALS

BionicLM operates with two tiers: Tier 1 (Clinical Enrichment Agent) Enhances findings and impressions by cross-referencing clinical history and lab data. Tier 2 (Quality Validation Agent) Detects and corrects errors, ensuring accuracy and aligning with RADPEER criteria.

RESULTS

Descriptive Accuracy (Tier 1) increased from 78.3% to 89.2%, marking a 10.9% improvement. The RADPEER Error Rate (Tier 2) dropped from 9.4% to 2.1%, reflecting a decrease of 7.3%. Report Turnaround Time was reduced from 21 minutes to 10 minutes, a 52% decrease. Clinician Satisfaction rose from 82.5% to 93.4%, showing a 10.9% improvement. Patient Report Readiness increased from 70.8% to 90.5%, an improvement of 19.7%. Tier 1 (Clinical Enrichment Agent): Enhanced descriptive clarity and completeness in 97% of reports. Standardized terminology across 250+ pathologies. Tier 2 (Quality Validation Agent): Identified and corrected 86% of critical errors before final sign-off. Reduced error-related callbacks by 62%.

CONCLUSION

The two-tier AI agentic workflow implemented by BionicLM showcases a scalable model for enhancing radiology report quality and consistency. Its deployment across 1,200+ radiologists and 4,000+ daily reports not only drives efficiency but also standardizes clinical language, minimizes error rates, and accelerates diagnostic timelines—contributing to improved patient outcomes and streamlined clinical operations.

CLINICAL RELEVANCE/APPLICATION

BionicLM integrates AI agents into the radiology reporting process to address issues like inconsistent language, missed findings, and diagnostic delays. By enhancing report quality in real-time and detecting errors, it improves the accuracy, clarity, and speed of reports. Deployed across thousands of radiologists in high-volume centers, it reduces error rates and turnaround times, contributing to better patient safety, faster diagnoses, and more efficient clinical workflows, particularly in resource-constrained environments.

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R2-SPNR

Neuroradiology Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPNR-1 DISTINGUISHING BETWEEN PARKINSON'S DISEASE AND ESSENTIAL TREMOR THROUGH DTI-BASED BRAIN STRUCTURAL CONNECTIVITY MATRICES USING A GRAPH NEURAL NETWORK

Ahmed Shalaby, PhD (*Presenter*)
Amirreza Alijanpourotaghsara (*Abstract Co-Author*)
Sahil Chilukuri (*Abstract Co-Author*)
Krishna Chitta (*Abstract Co-Author*)
Koorosh Mirpour (*Abstract Co-Author*)
Nader Pouratian (*Abstract Co-Author*)
Jeon Lee (*Abstract Co-Author*)

PURPOSE

Differentiating between Parkinson’s disease (PD) and essential tremor (ET) can pose a challenge in some cases as tremor can be a presenting symptom for both. Facilitating accurate diagnoses can ensure optimal initial treatment. Identifying relative differences between white matter (WM) microstructural changes between PD and ET can aid in differentiating these conditions as well as provide insights into underlying neurobiology. In this study, we developed a graph neural network (GNN) model combined with recursive feature elimination to distinguish between PD and ET subjects using brain structural connectivity matrices derived from diffusion tensor imaging (DTI).

METHODS AND MATERIALS

The study included 57 PD and 43 ET subjects that had deep brain stimulation (DBS) surgery due to moderate to severe motor symptoms. Pretreatment diffusion tensor imaging (DTI) with 64 directions was performed and all scans were acquired at UT Southwestern Medical Center at Dallas, USA (with IRB: STU-2024-0337). As shown in Fig. 1, imaging data were pre-processed and brain structural connectivity matrices were computed using the FMRIB Software Library (FSL) and probabilistic tractography based on the Automated Anatomical Labeling 3 (AAL3) atlas, incorporating 90 regions of interest. These matrices quantified the number of white matter streamlines connecting each pair of regions. A GNN model with recursive feature elimination was developed to identify the most discriminative connections and classify subjects.

RESULTS

The proposed GNN model achieved an area under the receiver operating characteristic curve (AUROC) of 0.86 and a balanced accuracy of 82.5% in distinguishing PD from ET subjects. Feature selection identified key white matter regions contributing most significantly to classification performance, notably connections between the thalamus and supplementary motor area, putamen and primary motor cortex, and cerebellum and prefrontal cortex.

CONCLUSION

Our study effectively investigated WM connections in subjects with PD and ET using a GNN-based model, suggesting the presence of distinct WM microstructural differences in several brain regions, highlighting their potential as discriminatory biomarkers in movement disorder diagnosis.

CLINICAL RELEVANCE/APPLICATION

Accurate differentiation between PD and ET using noninvasive neuroimaging biomarkers can support more precise diagnosis, guiding appropriate treatment strategies and improving patient outcomes.

R2-SPNR-3 EXPLORATION OF CEREBELLUM-SENSORIMOTOR CORTEX DYNAMIC CAUSAL CONNECTIVITY AND FUNCTIONAL REORGANIZATION IN PATIENTS WITH CHRONIC ANKLE INSTABILITY

Yajie Li (*Presenter*)
Hanqiu Liu (*Abstract Co-Author*)
Weiwei Wang (*Abstract Co-Author*)

PURPOSE

To investigate alterations in effective connectivity (EC) between the cerebellum and the cerebral sensorimotor cortex in patients with chronic ankle instability (CAI) during dorsiflexion and plantarflexion tasks using dynamic causal modeling (DCM).

METHODS AND MATERIALS

A total of 26 right-sided CAI patients and 42 age- and education-matched healthy controls were included. Task-based functional magnetic resonance imaging (fMRI) combined with DCM analysis was used to compare alterations in brain network connectivity between the two groups during dorsiflexion and plantarflexion tasks. Based on group-level activation results, the following regions of interest were selected: the left primary somatosensory cortex (S1), bilateral primary motor cortex (M1), bilateral supplementary motor area (SMA), bilateral premotor cortex (PMC), and the right cerebellum. Twelve different connectivity models were systematically constructed, and the optimal EC model was identified using random-effects Bayesian model selection.

RESULTS

For endogenous connectivity, both the patients and control groups exhibited extensive excitatory feedback connections among the sensorimotor cortex ($P < 0.05$, FDR-corrected), with more pronounced positive effects from the left M1 and bilateral SMA to the ipsilateral S1. However, CAI patients showed partial disruption of EC from the sensorimotor cortex to the cerebellum. Under task-related stimulation, the right cerebellum produced an activating effect on the contralateral cortex, and this effect was more pronounced in the CAI group. During the plantarflexion task, CAI patients demonstrated stronger excitatory EC from the left SMA to the ipsilateral M1 (? = 0.297 Hz). Additionally, the bilateral PMC exhibited excitatory inhibition toward other motor cortical areas during task stimulation ($P < 0.05$, FDR-corrected). During dorsiflexion, the right PMC in CAI patients showed a stronger excitatory inhibitory effect on the right SMA and left M1 ($P < 0.01$, uncorrected).

CONCLUSION

The cerebellum plays a dynamic regulatory role in ankle movement tasks in CAI patients. Enhancing cerebellar modulation of the motor cortex and strengthening intrahemispheric coordination between the SMA and M1 may improve movement stability and control.

CLINICAL RELEVANCE/APPLICATION

Incorporating task-oriented dynamic balance training could help optimize cerebellar-cortical neuroregulatory strategies in CAI patients, facilitating personalized rehabilitation.

R2-SPNR-6 CBV-INFORMED MR FINGERPRINTING FOR IMPROVED CLASSIFICATION OF INTRATUMORAL HETEROGENEITY IN POST-TREATMENT GLIOBLASTOMAS

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PURPOSE

High-grade glioma (HGG) are highly aggressive brain tumor, with tumor recurrence (TR) occurring in 95% of patients after treatment. Differentiating TR from similarly appearing radiation necrosis (RN) on follow-up MRI scans is difficult but offers significant potential for guiding longitudinal therapy. While dynamic susceptibility contrast (DSC)-MRI has shown some success in distinguishing TR from RN (e.g., with an area under the curve (AUC) of 0.64-0.92), this technique fails in patients with hemorrhage, calcification, metals, and mixed tumor lesions. Thus, we explored the utility of the quantitative MRI technique known as MR fingerprinting (MRF) to differentiate between TR and RN regions in these patients.

METHODS AND MATERIALS

We analyzed 27 post-treatment high-grade glioma (HGG) patients in this IRB-approved retrospective study. The diagnoses included 5 patients with TR, 9 with RN, and 13 with mixed tumor types. All the patients underwent multiparametric MRI, DSC-MRI, and MRF scans at the time of imaging progression. The MRF scans were reconstructed to generate T1 and T2 maps. Image preprocessing was conducted using the Cancer Imaging Phenomics Toolkit (CaPTk), and delta relaxometry maps were generated using MATLAB (version R2022b). Statistical analyses, including descriptive statistics, generalized linear modeling (GLM), and Youden's index, were performed using R (version 4.3.2).

RESULTS

The voxel distribution in the RN group was found to be more skewed compared to the TR group. Reflectively, the mode voxel values across different MRF contrast maps showed vast differences between TR and RN groups (Mode values were as follows: for T1-Pre, TR-1312.7 ms, RN-846 ms; T2-Pre, TR-100.3 ms, RN-78.3 ms). A single parametric GLM analysis conducted on image contrast-based descriptive statistics yielded an AUC, sensitivity, and specificity of 0.88, 0.9, and 0.75, respectively, with T2-Pre skewness. Additionally, a multiparametric GLM prediction analysis achieved a higher AUC of 0.92, along with a sensitivity of 0.81 and a specificity of 0.91. This multiparametric prediction model utilized four parameters: T2-Pre skewness, T2-Pre kurtosis, delta-T2 kurtosis, and delta-R2 maximum values.

CONCLUSION

This preliminary analysis demonstrates the promising ability to distinguish between TR and RN regions in post-treatment HGG patients using MRF, and achieving an impressive sensitivity of 0.81 and specificity of 0.91

CLINICAL RELEVANCE/APPLICATION

Accurate differentiation between TR and RN significantly aids in early and effective clinical decisions in post-treatment glioma patients, such as aggressive treatments for TR versus a conservative approach for RN patients.

R2-SPNR-7 EFFECT OF BASELINE BRAIN HEALTH ON SURVIVAL OUTCOMES IN GLIOBLASTOMA PATIENTS

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George Wang (*Abstract Co-Author*)
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PURPOSE

Structural and volumetric changes across different brain regions during glioblastoma treatment have been noted in prior studies. However, the effect of baseline brain health on survival outcomes is unknown. To address this gap, we assessed the association between baseline quantitative imaging-based brain health metrics, clinical parameters, and glioblastoma survival outcomes.

METHODS AND MATERIALS

This IRB-approved retrospective study was performed on 223 IDH1-wildtype glioblastoma patients. Clinical and molecular parameters were collected through chart reviews. Pre-surgical multiparametric MR images were used to measure quantitative brain metrics including include gyrification index (GI), cortical thickness, sulcal depth, and both grey (GM) and white matter (WM) volumes of the brain. Preprocessing, tumor volume segmentation, volumetric, and surface-based segmentations were performed using Cancer Imaging Phenomics Toolkit (CaPTk) and Computational Anatomy Toolbox (CAT12), respectively. Statistical analysis was performed using MATLAB(R2022b) and R version 4.3.2.

RESULTS

In comparison to elderly, non-elderly patients had significantly higher GM volumes (Median (in mL) - 162.12 vs 140.47 in elderly, $p<0.001$). No differences were noted in WM volumes (Median (in mL) - 139.93 vs 140.02 in elderly, $p = 1$). Significant differences among elderly and non-elderly were also seen in GI (median (in mm) 27.92 vs 27.59 in elderly, $p<0.001$), but not in thickness (median (in mm) 1.68 vs 1.70 in elderly, $p=0.56$) and depth (median (in mm) 10.1 vs 10.38 in elderly, $p=0.82$). Multivariable Cox analysis showed that larger GI, larger thickness, and smaller sulcal depth significantly decreased the mortality risk in glioblastoma patients, irrespective of age.

CONCLUSION

This study suggests that the baseline brain health of glioblastoma patients contributes to survival outcomes, irrespective of patient age. In particular, parameters indicating better cortical health are associated with improved survival outcomes.

CLINICAL RELEVANCE/APPLICATION

Baseline brain health parameters show significant potential as biomarkers for predicting and understanding the prognosis of glioblastoma patients.

R2-SPNR-8 ATYPICAL MRI FEATURES OF PRIMARY CNS LYMPHOMA IN IMMUNOCOMPETENT PATIENTS - A RETROSPECTIVE DESCRIPTIVE STUDY

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PURPOSE

Primary central nervous system lymphoma (PCNSL) in immunocompetent patients typically exhibits characteristic magnetic resonance imaging (MRI) features. In contrast, atypical features—such as absent or heterogeneous enhancement, lack of diffusion restriction, hemorrhagic components, and elevated perfusion parameters—are commonly described in immunocompromised individuals but are considered rare in the immunocompetent. This study aims to evaluate the prevalence of these atypical MRI features in immunocompetent, compare it to the prevalence of typical imaging findings, and reassess the assumption that atypical features are indeed rare in this group.

METHODS AND MATERIALS

A retrospective review was conducted using electronic medical records at a tertiary care center from 2007 to 2024. Inclusion criteria were: immunocompetent status, biopsy-proven PCNSL, no evidence of secondary CNS lymphoma, and availability of pre-treatment MRI. MRI features were evaluated by a senior neuroradiologist and included diffusion restriction, enhancement pattern, susceptibility-weighted imaging (SWI) findings for hemorrhage, and MR perfusion parameters.

RESULTS

Preliminary analysis identified 53 patients who met the inclusion criteria, all with histological diagnosis of diffuse large B-cell lymphoma. Of these, 25 (47.2%) showed typical MRI features (mean age 65), while 28 (52.8%, 95% CI: 39.8%-65.6%) presented with at least one atypical feature (mean age 66). Among the atypical cases, two were intravascular PCNSL and one presented with isolated leptomeningeal involvement. Nine had one atypical feature; 16 had two or more. Across the entire cohort, 17 (32%) showed non-classical enhancement patterns, 17 (32%) showed no restricted diffusion, and 12 (43%) exhibited hemorrhagic foci on SWI. Of the eight patients who underwent MR perfusion, three (38%) demonstrated increased perfusion parameters.

CONCLUSION

Atypical MRI features in immunocompetent PCNSL are significantly more prevalent than previously reported, comprising over half of the cases in our cohort. This challenges the traditional assumption that such findings are rare in immunocompetent individuals.

CLINICAL RELEVANCE/APPLICATION

PCNSL in immunocompetent patients may frequently present with atypical imaging features that may mimic other neoplastic or infectious processes. While histopathology remains the gold standard for diagnosis, recognizing this broader imaging spectrum is essential for neuroradiologists to refine differential diagnosis and guide timely and appropriate clinical management.

R2-SPNR-9 AUTOMATED DELTA RADIOMICS-BASED MRI ANALYSIS FOR RISK STRATIFICATION OF DISEASE PROGRESSION IN POST-RESECTION GLIOBLASTOMA MULTIFORME

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PURPOSE

To develop (1) a fully automated approach integrating clinical, genetic, and radiomics models with whole tumor deep learning segmentation for risk-stratification of post-resection glioblastoma multiforme (GBM) patients, and (2) to explore delta radiomics (post-radiotherapy (RT) minus pre-RT features) and its prognostic value compared to single-timepoint radiomics.

METHODS AND MATERIALS

Retrospective analysis included GBM patients from Emory University who underwent resection and RT. Clinical (age, sex) and genetic (MGMT promoter methylation, IDH status) data were collected. Whole-tumor segmentation was automatically performed on post-resection MRI using nnUNet (trained on 1621 post-resection patients from BraTS 2024). 1502 radiomic features for pre-RT, post-RT, and delta radiomics (post-RT - pre-RT) were extracted via PyRadiomics. After features underwent initial univariable screening, LASSO Cox regression identified predictive features for progression-free survival (PFS). Models were evaluated using concordance index (C-index) for radiomics alone (C R -index) and combined with clinical and genetic variables (C R+C -index). Radiomic scores were used to stratify patients (median split) for Kaplan-Meier survival analysis, along with calculated Hazard ratios with 95% confidence intervals. P values were calculated using log-rank tests.

RESULTS

A total of 114 GBM patients (69 training, 45 testing) were analyzed. Delta radiomics showed best prognostic performance using T1-contrast features: test C R -index=0.63, p=0.023; C R+C -index=0.70, p<0.001; training C R -index=0.815, C R+C -index=0.66. Post-RT radiomics optimal model used only FLAIR features: test C R -index=0.64, p=0.003; C R+C- index=0.66, p=0.107; training C R -index=0.79, C R+C -index=0.79. Pre-RT radiomics best performance occurred with features from FLAIR+T1+T2+ADC: test C R -index=0.62, p=0.014; C R+C -index=0.67, p=0.001; training C R -index=0.83, C R+C -index=0.91. Median risk scores enabled significant Kaplan-Meier risk stratification for all of the best models for pre-RT, post-RT and delta radiomics.

CONCLUSION

A fully automated approach combining nnUNet-based segmentation with clinical, genetic, and delta radiomics enables objective, manual-free prognostic risk stratification in post-resection GBM patients.

CLINICAL RELEVANCE/APPLICATION

PFS is crucial for assessing GBM treatment response, yet clinical adoption of radiomics is limited by manual segmentation. This study integrates deep learning automation and clinical-radiomic modeling incorporating the novel concept of delta radiomics to add post-resection prognostic information to guide therapeutic planning.

R2-SPNR-12 VASARI FEATURES TO PREDICT CDKN2A/B HOMOZYGOUS DELETION IN IDH-MUTANT ASTROCYTOMAS:A MULTICENTER STUDY

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PURPOSE

Cyclin-dependent kinase inhibitor (CDKN) 2A/B homozygous deletion holds an important value in the prognostic analysis of IDH-mutant astrocytomas. This study aimed to develop and validate a prediction model based on Visually AcceSAble Rembrandt Images (VASARI) MRI features for identifying CDKN2A/B homozygous deletion status in IDH-mutant astrocytomas.

METHODS AND MATERIALS

Preoperative MRI images of 122 astrocytoma patients (101 without CDKN2A/B homozygous deletion, and 21 with CDKN2A/B homozygous deletion) were retrospectively collected as training set. Eighteen patients with astrocytomas from another center (14 without CDKN2A/B homozygous deletion, and 4 with CDKN2A/B homozygous deletion) were enrolled as external test set. VASARI features in MRI images of astrocytoma patients were evaluated by radiologists. Prediction models for identifying CDKN2A/B homozygous deletion status based on clinical and VASARI features were constructed using logistic regression.

RESULTS

Multivariate regression analysis showed that age (OR: 1.057, p = 0.038) and definition of enhancing margin (OR: 15.672, p = 0.001) were independent predictors of CDKN2A/B homozygous deletion in IDH-mutant astrocytomas. The prediction model in the training set exhibited an AUC of 0.84 (95% CI: 0.73-0.95), 89.3% accuracy, 52.4% sensitivity, and 97.0% specificity. The prediction model in the external test set showed an AUC of 0.86 (95% CI: 0.63-1.00), 83.3% accuracy, 50.0% sensitivity, and 92.9% specificity.

CONCLUSION

The prediction model based on the VASARI MRI features was useful for preoperative identification of CDKN2A/B homozygous deletion status in IDH-mutant astrocytomas.

CLINICAL RELEVANCE/APPLICATION

This research may help radiologists identify CDKN2A/B homozygous deletion status of astrocytomas in the reading room.

R2-SPNR-13 INTEGRATING GLOBAL RISK AND LOCAL PRECISION: A DUAL-MODEL RADIOMICS STRATEGY FOR POSTOPERATIVE GLIOBLASTOMA RECURRENCE

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PURPOSE

To develop a dual-model radiomics framework that predicts early glioblastoma (GBM) recurrence at the patient level and spatially maps high-risk regions on postoperative Magnetic resonance imaging (MRI) at pixel level, overcoming the limitations of conventional imaging in distinguishing tumor infiltration from edema.

METHODS AND MATERIALS

This retrospective multi-center study analyzed postoperative MRI scans from 184 GBM patients. The dual-model framework integrated two components: a patient-level model predicting early recurrence (=6 months) using radiomic features from the entire tumor region on postoperative Fliud Attenuated Inversion Recovery (FLAIR) sequences, and a pixel-level model localizing high-risk subregions through supervoxel analysis (9×9×9 voxel cubes) within peri-cavity areas defined by contrast-enhanced T1-weighted imaging to ensure anatomical correspondence with recurrence regions. Radiomic features extracted from FLAIR images underwent a three-step feature selection process. First, the Mann-Whitney U test ($p < 0.05$) retained features with significant group differences. Second, Spearman correlation analysis (SCC > 0.9) excluded redundant features. Finally, feature contributions were quantified using SHapley Additive exPlanations (SHAP) values derived from a trained Random Forest classifier, with the top 10 most impactful features retained for model construction. Eight machine learning classifiers were trained on 116 patients and validated on 29 patients. The optimal Random Forest model was evaluated on an independent test set (n=39), with supervoxel-based predictions aggregated to generate spatial heatmaps for recurrence localization.

RESULTS

The patient-level model achieved an Area Under Curve (AUC) of 0.76, while the pixel-level model demonstrated robust performance with an AUC of 0.80 in the independent test set. Spatial heatmaps generated by the pixel-level model showed clinically meaningful alignment with ground-truth recurrence regions. The dual-model framework exhibited strong overall performance, providing both risk stratification and spatial guidance.

CONCLUSION

This study establishes a novel dual-model framework that integrates patient-level recurrence risk prediction with voxel-wise spatial mapping, offering a practical tool for personalized radiotherapy targeting and high-risk patient management.

CLINICAL RELEVANCE/APPLICATION

By simultaneously identifying high-risk patients and recurrence-prone subregions, this framework may enhance precision in adjuvant therapy planning, reduce unnecessary interventions, and improve postoperative surveillance efficiency.

R2-SPNR-14 A COMPARATIVE ANALYSIS OF DEEP LEARNING QUANTITATIVE NETWORKS AND GAUSSIAN MODELS FOR IDH MUTATION STATUS IN ADULT DIFFUSE GLIOMAS

Jiamin LI (*Presenter*)
Dairong Cao, MD (*Abstract Co-Author*)

PURPOSE

Isocitrate dehydrogenase (IDH) mutations are pivotal biomarkers for molecular classification and prognosis in adult diffuse gliomas . However, accurately determining IDH mutation status before surgery remains a major challenge in neuro-oncology. To address this, we compared conventional Gaussian modeling with a novel deep learning-based metabolite quantification network (DM) to develop a magnetic resonance spectroscopy (MRS)-based framework for non-invasive IDH prediction.

METHODS AND MATERIALS

This retrospective study involved 285 adult patients with diffuse gliomas (WHO grades II-IV) who had preoperative 3T MRS data (TE = 30 ms). Metabolite ratios were quantified using deep learning-based DM and Gaussian decomposition (Gauss). The DM model identified 19 metabolite ratios, including 2HG/tCr and GPC/tCr, while the Gauss model quantified 9 ratios. Significant metabolites were determined via univariate analysis ($P < 0.05$). Three models were compared: Model 1: 9 ratios from Gauss; Model 2: Subset of DM ratios matching Gauss; Model 3: 19 DM-exclusive ratios plus 10 additional biomarkers. Statistical analyses were performed using IBM SPSS Statistics 25.0, while ROC analysis and DeLong's test were performed in R 4.2.1 using the pROC package.

RESULTS

The DM model detected 29 metabolites, whereas the Gauss model identified 10 metabolites. In the individual analysis of metabolite ratios within the DM model, the AUC value for Glu/tCr was the highest, reaching 0.811. The AUC value for the key metabolite 2HG/tCr was also substantial, at 0.728. In the Gauss model, the AUC value for GSH/tCr was the most robust, reaching 0.761. When comparing the predictive performance of the models, Model 1 (AUC = 0.888) and Model 2 (AUC = 0.847) exhibited

comparable performance (P = 0.109). In contrast, Model 3 (AUC = 0.929) significantly outperformed Model 2 (P = 0.004), highlighting the superior predictive capacity of the DM model for IDH mutation status.

CONCLUSION

The DM model demonstrated superior performance in detecting a broader spectrum of metabolites compared to the Gaussian model, while both models exhibited comparable predictive accuracy for overlapping metabolites. The enhanced sensitivity and predictive capacity of the DM model suggest its potential for improving non-invasive IDH mutation prediction in adult diffuse gliomas.

CLINICAL RELEVANCE/APPLICATION

By enabling the identification of a broader range of metabolites, DM provides more comprehensive metabolic profiling, thereby improving the accuracy of preoperative molecular diagnosis. These advancements hold important implications for personalized treatment planning and more effective clinical management of glioma patients.

R2-SPNR-15 ASSOCIATION OF MRI SURVEILLANCE FREQUENCY ON OVERALL & PROGRESSION-FREE SURVIVAL IN GLIOBLASTOMA: A REAL-WORLD COMPARATIVE EFFECTIVENESS STUDY

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PURPOSE

MRI surveillance is central to post-treatment management of glioblastoma (GBM), yet the optimal frequency remains unclear. We compared clinical outcomes across varying MRI intervals, every 4 weeks (q4), 8 weeks (q8), and 12 weeks (q12), in surgically treated GBM patients who received chemoradiation therapy using a multi-institutional real-world dataset.

METHODS AND MATERIALS

Using a de-identified electronic health record network, we identified adult patients with GBM who received radiation and chemotherapy. Three cohorts were formed based on post-RT MRI surveillance frequency: q4 (every 4 weeks, n=217), q8 (every 8 weeks, n=343), and q12 (every 12 weeks, n=220) for at least 9 months. Outcomes included salvage surgery, all-cause mortality, composite palliative care/mortality, subsequent chemotherapy, and a composite progression-free survival proxy. During sensitivity analysis, the index date was redefined from completion of chemoradiation to the date of last known follow-up MRI, to evaluate for immortal time bias. We further validated our outcomes by matching for multifocal disease, MGMT methylation status, TERT and EGFR alterations. Kaplan-Meier analysis and Cox proportional hazards models assessed time-to-event outcomes.

RESULTS

All-Cause Mortality : Similar mortality across comparisons (q4: 77.5%; q8: 75.4%; q12: 77.6%), with no survival advantage observed (q4 vs q8 HR 0.99, p =0.92; q4 vs q12 HR 1.00, p =0.74). Palliative Care / Mortality Composite : Outcomes were nearly identical between groups (q4 vs q8: 85.1% vs 83.2%, p =0.58; q4 vs q12: 85.1% vs 84.9%, p =0.97). Progression-Free Survival Proxy : High rates of composite progression events in all cohorts (q4: 90.3%, q8: 88.3%, q12: 88.2%) with no statistical difference in time to event (p >0.39 for all comparisons). Sensitivity Analysis After redefining the index event to the last known follow-up MRI, survival and treatment outcomes remained non-significant across all cohorts. Genomic/Multifocal Matching After matching on MGMT, TERT, EGFR, and multifocal status, outcome differences across cohorts remained non-significant.

CONCLUSION

In this multi-cohort, real-world study of GBM patients, more frequent post-RT MRI surveillance (every 4 weeks) was not associated with survival, progression, or treatment escalation benefit compared to surveillance every 8 or 12 weeks. These findings could suggest that extending MRI intervals may offer similar clinical outcomes while reducing healthcare costs associated with frequent imaging.

CLINICAL RELEVANCE/APPLICATION

Optimizing imaging frequency to every 2-3 months may maintain clinical efficacy while potentially curbing frequent imaging and reducing healthcare costs.

Nov. 30 – Dec. 4
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R2-SPPD

Pediatric Imaging Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPPD-1 EVALUATION OF A NOVEL 4D MOTION-RESOLVED MRI TECHNIQUE FOR PEDIATRIC CONTRAST ENHANCED ABDOMINAL IMAGING: A COMPARATIVE STUDY WITH STANDARD NON-CARTESIAN FREE-BREATHING T1-WEIGHTED SEQUENCES

Navaira Shoaib, MBBS (*Presenter*)
Sebastian Gallo-Bernal, MD (*Abstract Co-Author*)
Valeria Pena-Trujillo, MD (*Abstract Co-Author*)
Teresa Victoria, MD, PhD (*Abstract Co-Author*)
Eugene Milshteyn, PhD (*Abstract Co-Author*)
Xinzeng Wang (*Abstract Co-Author*)
Patricia Lan (*Abstract Co-Author*)
Evan J. Zucker, MD (*Abstract Co-Author*)
Michael S. Gee, MD, PhD (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic quality of a novel 4D motion-resolved technique compared to a standard free-breathing, non-cartesian post-contrast T1-weighted sequence for pediatric abdominal MRI.

METHODS AND MATERIALS

This IRB-approved study prospectively recruited 11 pediatric patients (median age 9±5.7 years; range 12-16 years) undergoing clinically indicated contrast-enhanced abdominal MRI. All patients underwent free-breathing (FB) post-contrast T1-weighted imaging using an FDA-approved non-cartesian steady-state gradient echo sequence with intermittent fat suppression and 3D stack-of-stars encoding (LAVA Star, GE Healthcare). Scans were performed on a 1.5T SIGNA Artist or 3T SIGNA Premier MRI scanner (GE Healthcare). For the experimental 4D motion-resolved technique, respiratory motion was addressed by deriving a motion surrogate signal from k-space center data, which was retrospectively divided into ten respiratory-correlated phases, offering a comprehensive anatomical view throughout the respiratory cycle. Three fellowship-trained pediatric radiologists blindly and independently evaluated the image quality of both sequences on a 1-5 Likert scale based on five criteria: motion artifacts, sharpness of small hepatic structures, ability to detect liver/pancreatic lesions, overall diagnostic quality, and the ability to assess small subdiaphragmatic anatomical structures like adrenal glands and vessels. The results were pooled and statistically compared using nonparametric tests.

RESULTS

The 4D motion-resolved sequence demonstrated significantly fewer motion artifacts (median 5 ± 1 vs. 4 ± 1, $p<0.001$, with images showing fewer disruptions than the standard sequence. For evaluating small anatomical structures like the adrenal glands, the 4D sequence provided more precise visualization (median 5 ± 1 vs. 4 ± 1, $p=0.012$). There was a trend towards improved ability to detect liver and pancreatic lesions (median 4 ± 1 vs. 4 ± 2, $p=0.074$) and overall diagnostic quality (median 4 ± 1 vs. 4 ± 2, $p=0.054$. No significant differences were observed in the sharpness of small hepatic structures such as bile ducts and vessels (median 4 ± 1 vs. 4 ± 2, $p=0.245$).

CONCLUSION

4D motion-resolved images displayed significantly reduced motion artifacts and improved the visualization of small subdiaphragmatic structures (i.e., adrenal) compared to the standard free-breathing T1-weighted sequence, with promising trends in lesion detection and overall diagnostic quality.

CLINICAL RELEVANCE/APPLICATION

4D motion-resolved MRI enables high-quality imaging in children by reducing motion artifacts and improving diagnostic accuracy without additional acquisition time, sedation or breath-holding.

R2-SPPD-2 DOSE OPTIMIZATION FOR PEDIATRIC CHEST CT: A COMPARATIVE STUDY OF ENERGY-INTEGRATING AND PHOTON-COUNTING DETECTOR CT USING 100 KV PROTOCOLS WITH TIN FILTRATION REGARDING IMAGE QUALITY AND DOSE EXPOSURE

Greta Thater (*Presenter*)
Stefan O. Schoenberg, MD, PhD (*Abstract Co-Author*)
Meike Weis (*Abstract Co-Author*)

PURPOSE

Pediatric chest imaging is particularly challenging due to small body size and the need for minimized radiation exposure. Photon-counting CT (PCCT), the latest CT technology, promises substantial dose reduction while maintaining high image quality. This study compares radiation dose and image quality between PCCT and energy-integrating CT (EICT) using clinical data.

METHODS AND MATERIALS

139 pediatric chest CT scans (PCCT: n = 72; EICT: n = 67), acquired from 2021-2024 with 100Sn protocols, were retrospectively analyzed. Patients ranged from 1 to 213 months. Radiation exposure was assessed via CTDIvol and DLP. Image quality was evaluated objectively (signal-to-noise ratios for lung and soft tissue) and subjectively using a 4-point Likert scale.

RESULTS

The PCCT group was younger (mean age 54.7 months) than the EICT group (76.6 months). CTDIvol was comparable (PCCT: 0.26 ± 0.12 mGy; EICT: 0.22 ± 0.18 mGy), Fig.1. PCCT showed significantly better image quality: SNR for lung (-6.93 vs. -4.28) and soft tissue (1.03 vs. 0.35), $p<0.05$. Subjective evaluation favored PCCT for lung ($p<0.0001$) and soft tissue ($p=0.0009$) visualization, Fig.2.

CONCLUSION

PCCT achieves significantly improved image quality at similar radiation doses compared to EICT. Ongoing protocol adjustments are essential in pediatric radiology to optimize the balance between dose and diagnostic quality.

CLINICAL RELEVANCE/APPLICATION

This study highlights how PCCT can enhance pediatric chest imaging by improving image quality and enabling potential dose reduction compared to conventional EICT.

R2-SPPD-3 APPLICATION OF TWO CT-BASED MACHINE LEARNING (ML) ALGORITHMS FOR ASSESSING ACUTE PULMONARY EMBOLI IN CHILDREN

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PURPOSE

Most ML algorithms target adult patients and do not have regulatory clearance for use in children. Therefore, we compared the performance of two ML algorithms for detecting pulmonary emboli on routine chest CT (rCT) and pulmonary embolism CT (peCT) in pediatric and adult patients.

METHODS AND MATERIALS

Our retrospective human subject study included two consecutive cohorts of rCT and peCT examinations in 259 children (age range 3- 20 years; female: male 146:113) and 400 consecutive adults (age =>20 years; female: male 158:242) from multiple primary outpatient- to quaternary inpatient- care settings. All thin-section, anonymized, CT DICOM image datasets were processed with two ML algorithms (from Avicenna.ai and Siemens Healthineers) to obtain information on the presence and absence of emboli. Two radiologists (one independent of ML outputs; the other with ML-aided findings) established the ground truth on the presence of emboli using an AI validation platform (CARPL.ai, India). For all ML-failure cases, we assessed the presence of artifacts and the level of contrast enhancement. We obtained descriptive statistics, F1 scores and ROC AUCs for different comparison groups, stratifying between age groups and rCT and peCT.

RESULTS

There was 45/259 emboli-positive CT (17%) in children and 5% (21/400) emboli-positive CT in adult patients. The relative performance of the two ML algorithms in children: ML1 - 0.71 F1-score, AUC of 0.91 (95% CI: 0.88-0.97), 88.8 % accuracy; ML2 - 0.78 F1-score, AUC of 0.86 (95% CI:0.78-0.94), 93% accuracy; and adult patients: ML1 - 0.63 F1-score, AUC of 0.9 (95% CI:0.82-0.97), 89% accuracy; ML2 - 0.48 F1-score, AUC of 0.82 (95% CI:0.69-0.94), 96% accuracy. Although there was a significant difference in the two ML performances ($p=0.02$), there was no performance difference in the two ML algorithms between children and adults, or between rCT and peCT exams ($p>0.1$). Most missed emboli were subsegmental, and in patients with marked motion artifacts or poor contrast enhancement.

CONCLUSION

Although ML algorithms can effectively detect emboli on chest CT in adults and children, there is a substantial variation in the performance between the two algorithms.

CLINICAL RELEVANCE/APPLICATION

ML algorithms are trustworthy in detecting emboli on chest CT in children, with limitations related to chest CT with suboptimal contrast enhancement and motion artifacts.

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R2-SPPH

Physics Thursday Morning Poster Discussions

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Sub-Events

R2-SPPH-2 IMPROVED DUAL-ENERGY SEGMENTATION OF IODINE AND CALCIFIED PLAQUE WITH AI-BASED SPECTRAL RECONSTRUCTION

Nathan Huber, PhD (*Presenter*)
Karst Adriaansens (*Abstract Co-Author*)
Enas Ahmed, MD (*Abstract Co-Author*)
Christopher P. Favazza, PhD (*Abstract Co-Author*)
Tim Leiner, MD, PhD (*Abstract Co-Author*)

PURPOSE

The purpose of this study is to test the feasibility of dual-energy segmentation of calcified atherosclerotic plaque and iodine while using an AI-based spectral reconstruction technique.

METHODS AND MATERIALS

Dual-energy ratio (DER) is defined here as low-energy signal divided by high-energy signal (DER = Signal 50keV / Signal 150keV). A routine body protocol (120 kVp, 200 mAs) was used to scan a multi-energy phantom (Gammex) with inserts containing human equivalent adipose, liver, blood mixed with iodine (4.0 mg/ml), and calcium (50 mg/ml). Phantom data was reconstructed using filtered back projection (FBP), the current clinical standard iterative reconstruction (IR: iDose-6, Philips) and an experimental AI-based spectral reconstruction (Spectral AI Reconstruction-Smooth, Philips). For each insert, 50 keV and 150 keV virtual monoenergetic images (VMI) were generated for direct calculation of DER. One reader selected on a sliding scale a near optimal DER threshold of 4.7 for image-based segmentation of iodine (DER > 4.7) and calcified plaque (DER < 4.7). For reader assessment, DER segmentation of plaque and iodine was applied to five arterial phase contrast-enhanced patient exams. Two readers rated conventional image quality and segmentation quality on a 5-point Likert scale (1: very poor, 5: very good) for FBP, IR and AI reconstruction conditions.

RESULTS

Phantom measurements were conducted to assess the impact of FBP, IR, and AI reconstruction on DER calculation. Adipose tissue and liver had the lowest DER of 1.5 and 1.6, respectively. The calcium insert had a DER of 2.0. The iodine insert had the highest DER of 5.3. Relative to FBP, standard deviation variability of DER was reduced by 66% using AI. Both readers rated AI (4.2±0.6) higher than IR (2.9±0.9) and FBP (2.6±0.7) with regard to conventional CT image quality for vascular assessment. Readers also rated AI (3.9±0.6) higher than IR (2.8±0.8) and FBP (2.9±0.6) for iodine and calcium segmentation quality.

CONCLUSION

This study indicates that AI-based spectral reconstruction has potential to improve vascular assessment and dual-energy segmentation capabilities of Spectral CT. Phantom measurements indicated increased precision of DER calculation when using AI, relative to IR and FBP. DER precision is critical when employing DER-based segmentation techniques. Reader assessment of patient exams indicated that AI-based spectral reconstruction outperformed IR and FBP for image quality as well as segmentation quality.

CLINICAL RELEVANCE/APPLICATION

AI-based spectral reconstruction has the potential to improve vascular characterization and automatic segmentation of calcified plaque, which may aid in the diagnosis and monitoring of atherosclerotic disease.

R2-SPPH-3 DEEP LEARNING IMAGE RECONSTRUCTION IN ULTRA-LOW-DOSE CHEST CT FOR LUNG CANCER SCREENING: COMPARISON WITH STANDARD-DOSE CT IN LUNG-RADS ASSESSMENT

Siqi Qu (*Presenter*)
Zhiming Xiang (*Abstract Co-Author*)
Qiuxing Chen (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To explore the feasibility of different reconstruction techniques in ultra-low-dose chest CT for improving image quality and ensuring accurate Lung-RADS assessment

METHODS AND MATERIALS

This prospective study included patients with suspected pulmonary nodules who underwent both standard-dose CT (SDCT; 100 kVp/smart MA) and ultra-low-dose CT (ULDCT). The ULDCT scans were subdivided into two groups, UL-A and UL-B, based on different dose settings. SDCT served as the reference standard and was reconstructed using adaptive statistical iterative reconstruction at 50% (ASIR-V50%). ULDCT images were reconstructed using four different techniques: ASIR-V50%, filtered back projection (FBP), and two variations of deep learning image reconstruction (DLIR) at medium (DLIR-M) and high (DLIR-H) strengths. Lung-RADS classifications were determined by computer-aided detection (CAD) software. Image quality was evaluated using the Kruskal-Wallis one-way analysis, and agreement with the reference was assessed through weighted kappa (Kw) statistics.

RESULTS

A total of 193 patients (mean age 58 ± 14 years; 99 males) with 869 pulmonary nodules were enrolled. The effective dose (ED) for SDCT was 3.62 ± 1.40 mSv, while for UL-A and UL-B, the ED was 0.88 ± 0.19 mSv and 0.48 ± 0.11 mSv, respectively, corresponding to dose reductions of 73.58% and 85.96% ($P < 0.001$). DLIR significantly outperformed both ASIR-V50% and FBP in reducing lung tissue and background noise (standard deviation, SD) and improving both signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) ($P < 0.001$). Among the DLIR methods, DLIR-H showed superior performance compared to DLIR-M in decreasing SD and enhancing both SNR and CNR ($P < 0.001$). Additionally, image quality was notably better in the UL-A group than in the UL-B group ($P < 0.001$). There were no significant differences in Lung-RADS classification agreement (weighted kappa, Kw) between SDCT and the ULDCT reconstructions across both dose groups ($P > 0.001$):

for the UL-A group, the values were ASIR-V50% (0.971), DLIR-M (0.971), DLIR-H (0.957), and FBP (0.957); for the UL-B group, the values were ASIR-V50% (0.981), DLIR-M (0.981), DLIR-H (0.975), and FBP (0.970).

CONCLUSION

ULDCT showed high agreement with SDCT in Lung-RADS classification, with no significant effect of dose on nodule risk. DLIR improved image quality at ultra-low doses, with a positive correlation between dose and quality. DLIR-M outperformed DLIR-H and FBP in Lung-RADS assessment.

CLINICAL RELEVANCE/APPLICATION

Lung-RADS standardizes CT-based lung cancer screening and management. ULDCT reduces radiation exposure while maintaining high consistency in Lung-RADS classification, supporting its use in clinical practice.

R2-SPPH-4 APPLICATION OF DEEP LEARNING IMAGE RECONSTRUCTION IN ULTRA-LOW-DOSE CHEST CT FOR PULMONARY NODULE SCREENING BASED ON BMI STRATIFICATION

Siqi Qu (*Presenter*)
Zhiming Xiang (*Abstract Co-Author*)
Qiuxing Chen (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

This study aims to assess the feasibility and effectiveness of an ultra-low-dose chest CT (ULDCT) protocol for pulmonary nodule screening in adults, where scan doses are optimized based on body mass index (BMI) categories. The focus is on evaluating image quality and nodule detection performance using a deep learning image reconstruction (DLIR) algorithm across various BMI groups, with the goal of confirming its ability to maintain high detection sensitivity while significantly reducing radiation exposure.

METHODS AND MATERIALS

A prospective cohort of 95 adult patients underwent both standard-dose CT (SDCT; 100 kVp/smart MA)and ULDCT. The tube current for ULDCT was adjusted based on the patients' BMI categories as follows: underweight (L: <18.5 kg/m², 25 mAs), normal weight (M: 18.5-23.9 kg/m², 35 mAs), overweight (H: 24-27.9 kg/m², 45 mAs), and obese (F: =28 kg/m², 55 mAs), while all other scan parameters were consistent with those used for SDCT. SDCT scans served as the reference and were reconstructed using adaptive statistical iterative reconstruction-Veo (ASIR-V). ULDCT images were reconstructed with ASIR-V, DLIR at medium and high strengths, and filtered back projection (FBP). Pulmonary nodule detection and image quality

RESULTS

The effective dose (ED) of SDCT was 2.48±0.42 mSv for the L group, 2.86±0.54 mSv for the M group, 3.83±1.02 mSv for the H group, and 5.07±1.38 mSv for the F group. ULDCT achieved significant reductions in radiation dose compared to SDCT across all BMI groups: by 76.78%, 71.47%, 73.12%, and 76.13%, respectively, with effective doses of 0.57±0.07 mSv, 0.79±0.06 mSv, 0.98±0.10 mSv, and 1.14±0.08 mSv (P<0.001). SDCT detected a total of 680 pulmonary nodules, serving as the reference. The detection rates for ASIR-V, DLIR-M, DLIR-H, and FBP were 99.85% (679/680), 99.85% (679/680), 100% (680/680), and 99.71% (678/680), respectively. Across all BMI groups, ULDCT maintained a nodule detection rate of over 99%, with DLIR-H demonstrating the highest detection rate among the reconstruction methods. DLIR-H also significantly reduced the standard deviation (SD) of lung and subcutaneous fat tissues and enhanced both the signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) compared to ASIR-V and FBP (P<0.001) across all BMI categories.

CONCLUSION

In a BMI-stratified ULDCT protocol, DLIR-H consistently provides superior image quality across all BMI categories and achieves the highest pulmonary nodule detection rate, reaching 100% in adult patients.

CLINICAL RELEVANCE/APPLICATION

Adjusting ULDCT parameters based on BMI reduces radiation exposure while maintaining detection sensitivity. The application of DLIR enhances image quality, underscoring its value in ULDCT.

R2-SPPH-5 IMPACT OF POSITION AND BIT-DEPTH ON CT NUMBER VARIATIONS FOR HIGH-Z MATERIALS

James J. Sohn, PhD (*Presenter*)
Gyujin Seo (*Abstract Co-Author*)
Hyunji Kim (*Abstract Co-Author*)
Indra Das, PhD (*Abstract Co-Author*)
Siyong Kim, PhD (*Abstract Co-Author*)

PURPOSE

This study aims to investigate how Computed Tomography (CT) number (i.e., Hounsfield Unit, HU) varies dependent on both scan position and bit-depth, especially for high atomic number (high-Z) materials.

METHODS AND MATERIALS

A Gammex 467 phantom containing tissue-equivalent rods and high-density inserts (e.g., titanium, stainless-steel) was scanned at nine different positions within the CT bore: center, ±6.5 cm, and ±10.5 cm in both lateral and anterior-posterior directions, by physically shifting the phantom. This setup allowed the inserts to be positioned at varying locations across the field of view (FOV), ranging from the isocenter to the periphery. Scans were performed using a clinical CT simulator (Philips Brilliance Big Bore RT), and images were reconstructed using both 12-bit and 16-bit settings under identical acquisition parameters. HU values were extracted for each material and position to evaluate variability associated with position and bit-depth.

RESULTS

For high-Z materials, 12-bit reconstructions exhibited clear HU saturation (maximum 3071 HU), limiting their ability to capture actual density differences between titanium and stainless-steel. In contrast, 16-bit reconstructions preserved HU fidelity. Notably, the stainless-steel insert showed HU variations up to 1,532.42 HU across positions in 16-bit images, compared to only 2.34 HU due to saturation in 12-bit images. Similarly, titanium showed up to 368.13 HU variability in 16-bit compared to only 64.94 HU in 12-bit.

CONCLUSION

In 12-bit images, saturation limited the visibility of position-dependent HU variations. In contrast, 16-bit reconstructions better preserved these differences. Accordingly, the use of 16-bit imaging and accurate patient centering may be important factors in improving the precision of relative electron density conversion for increased dose calculation accuracy in radiotherapy planning.

CLINICAL RELEVANCE/APPLICATION

This study supports the adoption of 16-bit CT imaging and precise patient positioning in radiotherapy planning, particularly for patients with metallic implants. By minimizing HU saturation and capturing position-dependent density variations more accurately, these practices can improve the reliability of relative electron density conversion and enhance dosimetric accuracy.

R2-SPPH-6 ANALYSIS OF CT IMAGE QUALITY AND RADIATION DOSE FOR PANCREATIC DUCTAL ADENOCARCINOMA PATIENTS IN ABDOMINAL DUAL ENERGY AND SINGLE ENERGY CT EXAMINATIONS

Keisuke Fujii, PhD (*Presenter*)
Keiichi Nomura, PhD (*Abstract Co-Author*)
Yoshihisa Muramatsu, PhD, RT (*Abstract Co-Author*)
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Hiroyuki Ota, RT (*Abstract Co-Author*)
Yutaka Chiba (*Abstract Co-Author*)
Yuichi Nagai (*Abstract Co-Author*)

PURPOSE

The aims of this study are to determine the virtual monochromatic (VM) energy that provides higher contrast-to-noise ratio (CNR) for late arterial phase images of pancreatic ductal adenocarcinoma (PDAC) patients in abdominal dual energy CT (DECT) examinations, and to compare CNR and patient doses in the DECT examinations with them in the conventional single energy CT (SECT) examinations.

METHODS AND MATERIALS

We evaluated image quality of 40-100 keV VM and SECT images of late arterial phase for each 20 PDAC patient (average BMI for the both: 22.8 kg/m 2) with the administration of iodine contrast agent (Iopamidol 370, Bayel) in abdominal 80/135 kVp DECT examinations (effective energy: 66 keV) using Aquilion ONE / PRISM Edition (Canon Medical Systems) and the 120 kVp SECT examinations (effective energy: 50 keV) using Aquilion ONE / ViSION Edition, respectively. VM and SECT images were reconstructed with deep learning reconstruction algorithm of Spectral Body and adaptive iterative dose reduction (AIDR) 3D algorithm, respectively. We set region of interests (ROIs) of 20×20 pixels on normal pancreatic and PDAC region of the VM and SECT images, and evaluated image contrast from the differences between CT values of the two regions. We also set ROIs of 40×40 pixels on the liver region, and evaluated apparent noise from standard deviation of the mean CT values calculated using moving average filters in the ROIs. Apparent CNR was defined as the ratio of image contrast and apparent noise. Next, Monte Carlo (MC) simulation was performed to evaluate patient doses in abdominal SECT and DECT examinations using ImpactMC (Advanced Breast CT, GmbH) software, and liver doses were evaluated from the dose distribution images obtained by MC simulation.

RESULTS

Image contrast of VM images decreased as VM energy increased, and image contrast of 70 keV VM images was similar to that of SECT images. Apparent noise of 70 keV VM images was approximately 40% lower than SECT images. Apparent CNR of 70 keV VM images was higher than the other keV VM images, which was approximately 75% higher than SECT images. Liver doses in abdominal DECT examinations were 19 mGy, which were approximately 25% lower than in the SECT examinations.

CONCLUSION

70 keV VM images from abdominal DECT examinations provided 75% higher apparent CNR than SECT images while the DECT examinations provided 25% lower liver doses than SECT examinations.

CLINICAL RELEVANCE/APPLICATION

This study can be useful for the determination of VM energy which provide higher CNR for PDAC patients in abdominal DECT examinations, and shows that DECT examinations provide higher CNR and lower patient doses than SECT examinations.

R2-SPPH-7 QUANTITATIVE ANALYSIS OF LIVER FAT DISTRIBUTION BY SPECTRAL CT IN PATIENTS WITH IMPAIRED GLUCOSE TOLERANCE

He Qing Wang, MSc (*Presenter*)
Anjie Xie (*Abstract Co-Author*)
Jinhui Zhang (*Abstract Co-Author*)
Suping Chen (*Abstract Co-Author*)
Jianjun Zhou (*Abstract Co-Author*)

PURPOSE

To compare the abdominal fat distribution measured on spectral CT imaging between patients with and without impaired glucose tolerance (IGT) from the health-screen population.

METHODS AND MATERIALS

This study retrospectively included 48 individuals who underwent upper abdominal spectral CT scan and fasting plasma glucose (FPG) examination. According to FPG results, they were divided into two groups: IGT group (n=17), normal glucose tolerance (NGT) group (n=31). On spectral CT images, fat volume fractions (FVF) in left lobe of liver (FVF L), right anterior lobe of liver (FVF RA) and right posterior lobe of liver (FVF RP) were measured using multi-material decomposition (MMD) technique, the mean value was calculated as liver fat fraction (FVF liver). FVFs of pancreas (FVF PH for head, FVF PN for neck, FVF PB for body and FVF PT for tail) were also measured using MMD and the mean value (FVF panc) was calculated. Abdominal visceral fat area (FA AV), fat fraction (FF AV) and abdominal wall fat area (FA AW) at the level of L3 transverse process were measured by an auto software, and the ratio of FA AV to FA AW (FA AV /FA AW) was also calculated. Two-sample t test was used for comparison, statistical difference was determined by $p<0.05$. Receiver operating curves were used for analyzing diagnostic efficacy.

RESULTS

There was no statistical difference in age and BMI between IGT and NGT groups. For liver fat quantification, IGT group had higher FVF RP (IGT vs. NGT: 6.2±6.8% vs. 1.4±3.2%, p=0.015), FVF RA (6.1±7.7% vs. 1.1±2.9%, p=0.019), FVF liver (5.3±6.7% vs. 1.1±2.6%, p=0.021) than NGT group, while FVF L was not statistically different between the two groups. In addition, FVF PH , FVF PN , FVF PB , FVF PT and FVF panc for pancreas fat quantification, FA AV , FF AV for abdominal visceral, FA AW for abdominal wall and FAAV/FAAW for both visceral and wall showed no statistical difference between two groups (all $p>0.05$). To identify IGT, FVF RP , FVF RA and FVF liver showed sensitivities of 80.0%, 60.0% and 80.0%, specificities of 89.5%, 84.2% and 78.9%, at optimal thresholds of 1.68%, 0.5% and 0.59%, respectively.

CONCLUSION

IGT patients had a higher MMD-measured liver fat volume fraction, which could be used to diagnose IGT, with good performances.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the association between a higher liver fat fraction and impaired glucose tolerance, which is valuable for better understanding the underlying mechanism for diabetes. In addition, liver fat fractions measured using the MMD technique may be novel radiological markers for identifying IGT, which is an early symptom of diabetes, providing valuable information for diabetes diagnosis, therapy, and follow-up.

R2-SPPH-8 INVESTIGATION OF THE DIFFERENT KEV MONOCHROMATIC ENERGY IMAGE QUALITY OF ABDOMINAL KV/MA DUAL-SWITCH ENERGY SPECTRAL SCANNING WITH DIFFERENT ADAPTIVE STATISTICAL ITERATIVE RECONSTRUCTION-VEO ALGORITHM

Chunlong Yan (*Presenter*)

PURPOSE

To explore effects on the different keV monochromatic energy image quality of abdominal kV/mA dual-switch energy spectral scanning with different Adaptive Statistical Iterative Reconstruction-Veo Algorithm.

METHODS AND MATERIALS

A prospective study enrolled 18 patients who required abdominal CT scans. The GE Apex CT scanner was used for energy spectral imaging mode scanning, using a new kV/mA dual-switch energy spectral scanning mode, with rapid switching of tube voltage 80-140 kV, tube current using Assist mA, and noise index (NI=9). After scanning, three sets of images were reconstructed using different weights of ASiR-V (0%, 40%, and 80%) with a slice thickness of 1.25 mm. The venous phase images of abdomen were selected, and regions of interest (ROI) of area 50-150 mm2 were drawn on the same level of the abdominal CT images. The CT values and noise of the spleen, aorta abdominali, portal vein, and left vertical muscle in 50 keV, 70 keV and 90 keV monochromatic energy images were measured and post-processed to obtain using GSI Viewer post-processing software, and to calculate the signal-to-noise ratio further. One-way ANOVA was used to compare the differences in SD and SNR among the groups of the different keV monochromatic energy images reconstructed with different weights of ASiR-V, with a statistically significant difference defined as $P < 0.05$.

RESULTS

In the same monochromatic energy images, there was no statistical difference in CT values $P>0.05$, with the ASiR-V weight increased. For ASiR-V 0%, ASiR-V 40%, and ASiR-V 80%, the CT values of the liver for 70keV monochromatic energy images were (65.58±5.18)Hu, (65.52±5.01)Hu and (65.16±4.66) Hu, respectively. Meanwhile, the SD value showed a progressive decrease, and the SNR showed an increase, and the image quality improved. For ASiR-V 0%, ASiR-V 40% and ASiR-V 80%, the SD values of the liver for 70keV monochromatic energy images were (23.57±2.55) Hu, (17.41±2.32) Hu, and (9.90±1.76) Hu, respectively; SNRs were (4.65± 0.66), (6.51±0.58), and (11.50±1.77), respectively. And the differences in SD and SNR were statistically significant between groups $P<0.05$. 50 keV and 90 keV monochromatic energy images showed similar trends and statistical results as 70 keV $P<0.05$.

CONCLUSION

Adaptive Statistical Iterative Reconstruction-Veo Algorithm based on a new kV/mA dual-switch energy spectral scanning mode can optimize the different keV monochromatic energy spectral image quality in abdomen.

CLINICAL RELEVANCE/APPLICATION

The abdominal monochromatic energy spectral image quality can be further improved without increasing the radiation dose and changing the image CT value using an Adaptive Statistical Iterative Reconstruction-Veo Algorithm based on a new kV/mA dual-switch energy spectral scanning mode.

R2-SPPH-9 ENHANCED INTRAMURAL HEMATOMA CHARACTERIZATION USING SUBTRACTION-BASED DARK-BLOOD IMAGING: A COMPARATIVE CT STUDY

Ke Wei, MD (*Presenter*)

PURPOSE

To evaluate a novel subtraction-based dark-blood imaging (DBI) technique for improving intramural hematoma (IMH) assessment, comparing its diagnostic performance against true non-contrast (TNC) and arterial phase (AP) CT.

METHODS AND MATERIALS

Twenty-four IMH patients undergoing whole-aorta spectral CTA (August 2023-2024) were retrospectively analyzed (mean age 65.8±10.2 years; 75% male). Subtraction-based DBI is derived from weighted subtraction of virtual non-contrast and contrast-enhanced images. Image contrast-to-noise ratio (CNR image), image signal-to-noise ratio (SNR image) and wall thickness (WT) were quantified across TNC, subtraction-based DBI, and AP. Two radiologists independently graded lesion visualization (4-point Likert scale). Interobserver agreement was assessed via Cohen’s kappa. Regions of interest (ROIs) were propagated across modalities using a copy-paste protocol, with statistical analysis performed via Friedman tests.

RESULTS

Subtraction-based DBI and AP demonstrated superior CNR i mage (IQR: 12.01 [8.88, 15.75] and 24.41 [16.01, 31.29] vs. 0.39 [0.11, 1.16], respectively) and SNR image (IQR: 18.15 [11.79, 22.00] and 33.98 [21.19, 39.91] vs. 8.38 [5.43, 10.57], respectively) compared to TNC ($P<0.05$). Qualitatively, subtraction-based DBI outperformed both TNC and AP in lesion visualization ($P<0.05$). DBI yielded significantly larger WT measurements (IQR 9.62 [7.79, 10.78] mm vs. TNC: 8.06 [6.58, 9.58] mm and AP: 7.85 [6.86, 9.71], $P<0.05$). Interobserver agreement was moderate to substantial (?=0.63-0.778).

CONCLUSION

Subtraction-based DBI enhances IMH evaluation through superior quantitative metrics and qualitative visualization, enabling precise aortic wall thickness measurements unachievable with conventional CT.

CLINICAL RELEVANCE/APPLICATION

By mitigating beam-hardening artifacts inherent to AP imaging, DBI improves IMH lesion delineation accuracy, offering critical advantages for vascular pathology diagnosis and monitoring.

R2-SPPH-10 QUANTITATIVE ASSESSMENT OF PARASPINAL MUSCLE DEGENERATION AND GENDER DIFFERENCES IN AGING USING THE MUSCLE-WATER DECOMPOSITION TECHNIQUE WITH RAPID KVP SWITCHING DECT

Muqing Luo (*Presenter*)
Suping Chen (*Abstract Co-Author*)
Kun Zhang, MD (*Abstract Co-Author*)

PURPOSE

To quantitatively assess paraspinal muscle degeneration and gender-related differences during aging in adults using rapid kVp switching dual-energy computed tomography (DECT).

METHODS AND MATERIALS

A total of 156 healthy adults underwent lumbar DECT scans were prospectively grouped into young (20-39 years), middle-aged (40-59 years), and elderly (60-79 years) groups. Muscle density (MD), cross-sectional area (CSA), muscle content (MC), and water content (WC) were measured using virtual monoenergetic images and muscle-water decomposition images for the bilateral erector spinae (ES) at the L1/2 to L4/5 levels and bilateral multifidus (MF) and psoas (PS) at the L2/3 to L5/S1 levels. The Kruskal-Wallis H test and one-way ANOVA were used to compare paraspinal muscle parameters among different age groups. Spearman correlation analysis was used to evaluate the relationship between paraspinal muscle parameters and age.

RESULTS

Across age groups, significant differences in paraspinal muscle MD and WC were observed ($P <0.01$), with MD negatively and WC positively correlated with age at lower lumbar levels for both MF and ES ($P <0.001$). In females, except for the L5/S1 PS, WC differences between the middle-aged and elderly groups were significant ($P<0.05$), but not between the young and middle-aged groups ($P >0.05$). In males, multifidus MC at L4/5 decreased with age ($P <0.05$), while in females, multifidus MC at L3/4 and L5/S1 were the highest in the middle-aged group and lowest in the elderly group ($P <0.05$). PS CSA at L4/5-L5/S1 showed a moderate negative correlation with age ($P <0.001$).

CONCLUSION

The muscle-water decomposition technique using rapid kVp switching dual-energy CT enables noninvasive, quantitative assessment of lumbar paraspinal muscle degeneration. Metrics such as muscle density (MD), cross-sectional area (CSA), and muscle content (MC)—which may reflect alterations in the extracellular matrix—

decreased with age, while water content (WC) increased, serving as potential early imaging biomarkers. In females, MC peaked in middle age and declined in older age.

CLINICAL RELEVANCE/APPLICATION

Our results highlight the value of DECT as a potential noninvasive modality for early identification of muscle degeneration, with possible practical value in high-risk screening, sex-specific intervention planning, and preoperative assessments. The age- and sex-specific reference values derived from healthy individuals may provide valuable clinical benchmarks for evaluating muscle deterioration in sarcopenia or degenerative spinal disorders.

R2-SPPH-11 EFFICIENT AND ROBUST AUTO-IDENTIFICATION OF 3D CEPHALOMETRIC LANDMARKS USING TWO-STAGE SEGMENTATION MODEL IN CONE-BEAM COMPUTED TOMOGRAPHY

Sangah Park (*Presenter*)
Jongjun Won, BS (*Abstract Co-Author*)
Jae-Woo Park (*Abstract Co-Author*)
Hyunseok Lim, MS (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

Cone-beam computed tomography (CBCT) has become increasingly prevalent in dental fields, particularly for orthodontics, orthognathic surgery and temporomandibular joint (TMJ) evaluation. However, methods for comprehensive 3D craniofacial analysis using CBCT remain underexplored. Conventional analysis relies on manual identification of cephalometric landmarks, making the process time-consuming and labor-intensive. We propose a deep learning method for automatically detecting cephalometric landmarks in CBCT scans, enabling more efficient and reproducible analysis.

METHODS AND MATERIALS

A total of 268 CBCT scans were used for training and 40 for testing. Thirty cephalometric landmarks were manually annotated by an expert orthodontist. To train the segmentation framework with nnUNet, two sets of spherically diluted masks with radii of 4 mm and 1.8 mm were generated for each landmark and used in a two-stage cascade approach, progressing from the first stage with large-radius labels to the second stage with small-radius labels. Final landmarks were extracted as the centroids of the predicted masks. Intra-observer variability was assessed by having the same orthodontist annotate 40 randomly selected scans. Model performance was evaluated by the mean absolute error (MAE) of landmark coordinates, Euclidean distance, angular measurements (AM), and linear measurements (LM).

RESULTS

For the 30 landmarks, the intra-observer MAEs (mean ± SD in mm) were 0.547 ± 0.474, 0.437 ± 0.451, 0.438 ± 0.502, and 0.996 ± 0.757 for the x-, y-, z-axes, and Euclidean distance, respectively. The corresponding MAEs of AI prediction were 0.529 ± 0.438, 0.420 ± 0.374, 0.474 ± 0.435, and 0.978 ± 0.640, respectively. For AM, errors of the intra-observer and AI prediction were 1.062° ± 0.205° and 0.956° ± 0.295°, respectively. For LM, those were 0.822 ± 0.430 mm and 0.851 ± 0.400 mm, respectively.

CONCLUSION

The proposed AI approach using nnUNet segmentation achieved landmark detection accuracy comparable to human intra-observer variability, demonstrating its feasibility for three-dimensional cephalometric analysis using CBCT.

CLINICAL RELEVANCE/APPLICATION

This AI model could accurately predict automatic cephalometric landmark detection in CBCT scans. By enabling consistent evaluation of craniofacial malformations and reducing the manual burden of landmark annotation, this system has the potential to streamline clinical workflows for cephalometric analysis for orthodontic diagnosis, orthognathic surgical planning, and postoperative assessment.

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Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-SPVA-1 ENLARGE WHAT REALLY COUNTS: SPATIAL RESOLUTION. SHARPER CONVOLUTION KERNELS IMPROVE FIBULAR PERFORATOR ARTERIES ASSESSMENT IN ULTRA-HIGH RESOLUTION PHOTON-COUNTING DETECTOR CT ANGIOGRAPHIES

Philipp Gruschwitz, MD (*Presenter*)
Kristina Krompass, MD (*Abstract Co-Author*)
Jan-Lucca Hennes, MD (*Abstract Co-Author*)
Henner Huflage, MD (*Abstract Co-Author*)
Pauline Pannenbecker, MD, BA (*Abstract Co-Author*)
Viktor Hartung (*Abstract Co-Author*)
Thorsten A. Bley, MD (*Abstract Co-Author*)
Jan P. Grunz, MD (*Abstract Co-Author*)

PURPOSE

Aim was to evaluate the influence of the convolutional kernel used on the objective image quality and delineation of perforator arteries (PA) in photon-counting detector CT angiograms (PCD-CTA) performed preoperatively before fibular transplantation surgery (FTS).

METHODS AND MATERIALS

All PCD-CTAs performed between Jan 2023 and Dec 2024 prior to scheduled FTS were investigated. Scans were performed in ultra-high resolution mode (120×0.2mm) with tube voltage of 140kVp, pitch factor of 1, and rotation time of 0.5s with IQ64 (˜50mAs). Images were reconstructed using three different vessel-specific convolution kernels of increasing sharpness (Bv36, Bv48, and Bv56) with a slice thickness/increment of 1mm. For objective evaluation, the attenuation within the arterial lumen, the musculature and the standard deviation in the fat tissue were measured and the contrast-to-noise ratio was calculated. Overall image quality, arterial contrast/sharpness, and delineation of PA were subjectively assessed by five radiologists, and diagnostic confidence was rated (5-point scale, 1=poor; 5=excellent). Interrater agreement was calculated using Kendall W.

RESULTS

During two years 14 preoperative PCD-CTAs were performed and 9 patients (60+/-8years; 3 females) were included (4 patients underwent alternative surgery; 1 patient incomplete data set). The remaining. Average radiation dose used was 6.3±0.4mGy. The mean absolute attenuation values in arterial lumen, muscle and fat tissue showed no kernel-dependent differences (p>.050), while the noise increased significantly with increasing sharpness (Bv36 7.9±1.0HU vs. Bv5: 18.0±2.3HU; p<.001). Correspondingly, the CNR decreased significantly (Bv36 57.3±11.5 vs. Bv58 26.2±5.4; p<.001). In contrast to the objective results, the sharp kernel (Bv56) was subjectively rated the best in terms of vessel contrast/sharpness (5; 4-5 vs. Bv48 3; 3-4 / Bv36 3; 3-3; p<.050) and delineation of perforating vessels (5; 4-5 vs. Bv48 3; 3-3/Bv36 3; 2-3; p<.050) with excellent diagnostic confidence (5; 5-5 vs. Bv48 3; 3-4/Bv36 3; 3-3; p<.050). Interrater agreement was good (W=0.65-0.76)

CONCLUSION

Despite objectively lower CNR, a sharp kernel (Bv56) with higher spatial resolution is preferred due to the improved vessel sharpness and delineation of the perforator arteries, resulting in excellent diagnostic confidence.

CLINICAL RELEVANCE/APPLICATION

Ultra-high resolution PCD-CTA combined with sharp kernels allows excellent delineation of the fibular perforators, optimizing preoperative diagnostic with the option of 3D planning/printing.

R2-SPVA-2 OUTCOMES AND CLINICAL VALUE OF IVUS GUIDED SALVAGE CENTRAL VENOUS MAPPING FOR HEMODIALYSIS ACCESS IN HIGH-RISK END STAGE RENAL DISEASE PATIENTS

Daniel Raskin, MD (*Presenter*)
Mia Zivkovic (*Abstract Co-Author*)
Abraham Levitin, MD (*Abstract Co-Author*)
Jon Quatromoni, MD (*Abstract Co-Author*)
Jennifer Montgomery, MD,PhD (*Abstract Co-Author*)
Sasan Partovi, MD (*Abstract Co-Author*)

PURPOSE

Certain end-stage renal disease (ESRD) patients are considered unsuitable for arteriovenous fistula (AVF) or graft (AVG) creation after standard venous mapping with duplex and venography. These patients remain dependent on tunneled dialysis catheters for hemodialysis, which poses significant risks and is associated with long term unfavorable outcomes. This research study quantified the added value of intravascular ultrasound (IVUS) as a secondary central venous mapping tool in this high-risk patient population.

METHODS AND MATERIALS

Medical records and imaging data of ESRD patients deemed "no-option" for AVF/AVG who underwent combined venography and IVUS between January 2024 and February 2025 were retrospectively analyzed in this study. Those who received IVUS for indications other than presurgical planning were excluded. The final cohort included 14 patients, 8 male and 6 female, with a mean age of 56 years. It was determined whether each individual patient went on to receive surgical dialysis circuit vascular access creation after salvage mapping with IVUS. Short- and long-term surgical outcomes of the vascular access were assessed as well. Functionality of the access site was monitored for up to 13 months post-AVF or AVG creation, with functional maturation defined as use of the access for dialysis within 3 to 6 months.

RESULTS

8/14 patients (57%) proceeded to access surgery after IVUS. The remaining six patients opted out of vascular access surgery or remained not suitables candidates for AVF or AVG. All eight AVF/AVG creations were technically successful, with thrill noted in the postoperative vascular surgery report. Functional maturation within 3 to 6 months was documented in 5/8 (63%) of surgically created AVF or AVGs. Two accesses are still within the maturation window at the time of analysis. One graft failed and was later explanted secondary to infection and thrombosis.

CONCLUSION

In “no vascular access option” ESRD patients, IVUS enabled successful AVF/AVG creation in 57% of patients, with 63% of those accesses reaching the maturation stage for functional use by 6 months. Without the use of IVUS in venous mapping, none of these patients would have been candidates for surgical AVF or AVG creation. Therefore, IVUS has the potential to improve dialysis access and decrease catheter dependence in high risk ESRD patients deemed previously unsuitable for surgical AVF/AVG creation with standard venous mapping techniques.

CLINICAL RELEVANCE/APPLICATION

IVUS adds valuable anatomic detail for central venous mapping, while decreasing contrast and and radiation exposure. As such, it should be considered in salvage central venous mapping algorithms aimed at reducing long-term catheter dependence in “no vascular access option” ESRD patients.

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RSNA® 2025
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R5A-SPBR

Breast Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPBR-1 MODELING THE UTILITY OF BREAST IMAGING IN SYMPTOMATIC PATIENTS WITH NORMAL CLINICAL BREAST EXAM

Matthew Common, BEng, MD (*Presenter*)
Cathal McCarthy, BMBS, BMedSc (*Abstract Co-Author*)
Pat Rohan, MBBS (*Abstract Co-Author*)
Niamh Hambly, MBBCh, FFR(RCSI) (*Abstract Co-Author*)
Neasa Ni Mhuircheartaigh, MBBCh, FFR(RCSI) (*Abstract Co-Author*)
Jennifer Kerr, MBBCh,FFR(RCSI) (*Abstract Co-Author*)
Arnold D. Hill (*Abstract Co-Author*)
Nuala A. Healy, MD, MEd (*Abstract Co-Author*)
Deirdre M. Duke, MBBCh (*Abstract Co-Author*)

PURPOSE

Attendance at symptomatic breast centres has increased exponentially over the last 10 years. While many of these patients have a normal clinical breast examination, the majority undergo breast imaging. The purpose of this study is to examine the current use of breast imaging in symptomatic patients with normal clinical breast examinations, and to devise a clinical decision rule to guide the referral of patients for imaging.

METHODS AND MATERIALS

This retrospective observational study examines consecutive patients attending the Beaumont Breast Centre symptomatic service over 8 years who have a normal examination at clinical assessment. Logistic regression modelling was performed in order to predict cancer risk based on age and symptom.

RESULTS

Over the 8-year period 16,696 consecutive symptomatic patients who presented for imaging with a normal clinical breast examination. After application of exclusion criteria, 12212 were included in the study, 81% of whom (9870/12212) had imaging. Radiology results were as follows: benign [R1/2] - 9293/9870 (94%), warranting biopsy but likely benign [R3] - 578/9870 (5%), and suspicious [R4/5] - 117/9870 (1%). A total of 85 pathologically confirmed breast cancers were diagnosed following surgical management, yielding a cancer detection rate (CDR) of 0.86% (95% CI: 0.68 - 1.04) in patients undergoing imaging. Subgroup analysis for <45yrs yields a CDR of 0.35% (0.17 - 0.53) and a benign biopsy rate of 95%. Age was the only statistically significant predictor of malignancy (OR 1.65 [1.38 - 1.97]), whereas mastalgia (OR 0.31 [0.17-0.58]) and reported lump (OR 0.48 [0.25-0.92]) were protective. Model-based risk prediction to determine need for imaging was shown to have fair discriminative ability (Receiver Operator Characteristic area under the curve = 0.70), and decision curve analysis demonstrated a net benefit of 0.03 vs imaging all/none.

CONCLUSION

This study demonstrates that patients <45 years-of-age with a normal breast exam are unlikely to benefit from breast imaging and are more likely to experience over-investigation and overtreatment, including benign biopsy and excision. The proposed model-driven approach reduces the number needed to image and biopsy, thereby reducing harms to patients and improving healthcare resource allocation.

CLINICAL RELEVANCE/APPLICATION

Results suggest that a model-driven imaging strategy could improve efficiency by applying a risk threshold that aligns with existing screening benchmarks. For example, selectively imaging patients with predicted risk >0.71% may reduce unnecessary investigations in low-risk groups (e.g., mastalgia <45 years) while preserving sensitivity in higher-risk symptom-age profiles.

R5A-SPBR-2 PERFORMANCE OF DIAGNOSTIC MAMMOGRAPHY AND ULTRASOUND FOR PREGNANT PATIENTS

Abigail Keller (*Presenter*)
Bowman Brown (*Abstract Co-Author*)
Mai A. Elezaby, MD (*Abstract Co-Author*)
Lonie R. Salkowski, MD, PhD (*Abstract Co-Author*)
Amy M. Fowler, MD, PhD (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic accuracy of mammography (MG) and/or breast ultrasound (US) in detecting pregnancy-associated breast cancer (PABC) for symptomatic pregnant patients at a single academic institution.

METHODS AND MATERIALS

An IRB-approved, HIPAA-compliant retrospective chart review was performed, which included pregnant patients who underwent MG and/or breast US from 2013 to 2024 at a single academic institution. Diagnostic performance was assessed in patients with histopathologic confirmation or =2 years of clinical or radiologic follow-up. Rates of BI-RADS 3 (probably benign) assessments, biopsies, and follow-up adherence were also analyzed. Patients without histopathology or <2 years of clinical or radiologic follow-up were excluded from diagnostic performance calculations.

RESULTS

Of 241 pregnant patients who underwent imaging, 216 met inclusion criteria (mean age 32 ± 5 years, range 19-48). The most common symptom was a palpable lump (80%, 173/216), followed by breast pain (15%, 33/216). Most were evaluated with ultrasound (US) alone (95%, 206/216; mean age 31 ± 5), while 5% (10/216; mean age 37 ± 5) underwent combined mammography and ultrasound (MG+US), with 3 biopsies and one false positive. Breast density was extremely dense in 60% (130/216) and heterogeneously dense in 30% (65/216). Imaging most often occurred in the second trimester (median gestational age 20 ± 10 weeks). Two cases of pregnancy-associated breast cancer (PABC) were detected (ages 36 and 37) during the first and second trimesters, both BI-RADS 5 on MG+US. BI-RADS 3 was assigned

in 12% (26/216) with a 77% follow-up rate. Biopsies were performed in 19% (41/216). For US-alone, specificity was 82% and NPV 100%. For MG+US, sensitivity was 100%, specificity 75%, PPV 50%, and NPV 100%.

CONCLUSION

This study demonstrates that diagnostic breast imaging in symptomatic pregnant patients has high sensitivity and NPV for detecting PABC. Despite established safety guidelines, mammography remains underutilized in this population, likely due to ongoing misconceptions regarding radiation exposure to the fetus. The limited number of patients receiving mammography in this cohort underscores the need for increased awareness of the American College of Radiology's appropriate use guidelines among referring providers and patients.

CLINICAL RELEVANCE/APPLICATION

Diagnostic mammography and ultrasound are effective for detecting PABC, even with pregnancy-related increased breast density. The underuse of mammography highlights the need for greater clinical awareness and clarification of its safety during pregnancy. Educating providers on evidence-based imaging is crucial for timely diagnosis and appropriate care in pregnant patients with breast symptoms.

R5A-SPBR-4 PREDICTIVE FACTORS OF AXILLARY PATHOLOGICAL COMPLETE RESPONSE IN HER2 POSITIVE BREAST CANCER PATIENTS TREATED WITH NEOADJUVANT CHEMOTHERAPY

Marta Rodriguez De Trujillo, MD (*Presenter*)

PURPOSE

To identify predictive factors for axillary pathologic complete response (pCR-axillary) in HER2-positive (HER2+) breast cancer patients with biopsy-confirmed axillary involvement, treated with neoadjuvant chemotherapy (NAC) followed by surgery, aiming to avoid unnecessary axillary lymph node dissection (ALND).

METHODS AND MATERIALS

This retrospective cohort study included HER2+ breast cancer patients with biopsy-confirmed axillary involvement, treated with NAC followed by surgery between October 2015 and November 2022 at Reina Sofía University Hospital (Córdoba, Spain). Data were collected from medical records, radiology, and pathology reports. The variables analyzed included age, tumor size, tumor grade, hormone receptor status, Ki67 index, radiologic and pathologic response in the breast (rCR-breast, pCR-breast) and axilla (rCR-axillary, pCR-axillary), number of suspicious lymph nodes and type of axillary surgery. Statistical analysis was performed using univariate and multivariate logistic regression models to identify independent predictors of pCR-axillary.

RESULTS

This pCR-axillary was achieved in 85% of patients. In univariate analysis, only rCR-axillary was significantly associated with pCR-axillary (OR = 5.83; 95% CI 1.30-26.12; p=0.021). Multivariate analysis identified both rCR axillary (OR = 17.98; 95% CI: 1.43-225.93; p = 0.025) and Ki67 index (OR = 0.90; 95% CI: 0.82-0.99; p = 0.045) as independent predictors of pCR-axillary. The predictive model showed excellent discrimination (AUC = 0.92; p < 0.001).

CONCLUSION

Our rCR-axillary and Ki67 index are independent predictors of axillary pCR-axillary in HER2+ breast cancer patients treated with NAC. The identification of these factors may allow clinicians to avoid unnecessary ALND in patients with complete radiologic response, reducing surgical morbidity without compromising oncologic outcomes.Incorporating imaging response and tumor biologil into clinical decision-making may help identify candidates for axillary surgery de-escalation and safely avoid ALND in selected patients.

CLINICAL RELEVANCE/APPLICATION

Our findings reinforce the growing body of evidence supporting the de-escalation of axillary surgery in patients achieving pCR-axillary. The use of targeted axillary dissection (TAD) instead of ALND in patients with rCR-axillary could significantly reduce surgical morbidity while maintaining oncologic safety.

R5A-SPBR-5 HIGH-RESOLUTION ULTRAFAST DCE-MRI HETEROGENEITY FEATURES-BASED MACHINE LEARNING MODEL FOR PREDICTING AXILLARY LYMPH NODE METASTATIC BURDEN IN BREAST CANCER

Wenlong Yang (*Presenter*)
Hong Bing Luo, MD (*Abstract Co-Author*)

PURPOSE

To analyze intratumoral and peritumoral heterogeneity features from high-resolution ultrafast DCE-MRI and develop a machine learning model for preoperative predicting axillary lymph node metastatic burden in breast cancer.

METHODS AND MATERIALS

A retrospective analysis was conducted on breast cancer cases with preoperative MRI and postoperative pathology data. Patients were categorized into low-burden (=2 metastatic lymph nodes) and high-burden (>2 metastatic lymph nodes) groups based on postoperative pathological findings. Quantitative heterogeneity features of intratumoral and peritumoral regions were extracted from all high-resolution ultrafast DCE-MRI dynamic sequences through voxel clustering. Combined with conventional MRI features, machine learning algorithms including LR, SVM, RF, k-nearest neighbors, decision trees, neural networks, XGBoost, and LightGBM were evaluated. The optimal algorithm was selected via 5-fold cross-validation to build the final model, with performance assessed using ROC curves.

RESULTS

A total of 368 invasive breast cancer patients were included, of whom 71 (19.3%) had high-burden axillary lymph node metastasis. The final maching learning model, constructed using the optimal LR algorithm based on 5-fold cross-validation, achieved AUCs of 0.900 and 0.839 in the training and testing cohorts, respectively. On the entire dataset, the model’s AUC was 0.882, significantly outperforming the conventional MRI model (AUC 0.754). Furthermore, the model demonstrated superior calibration and higher clinical benefit in decision curve analysis.

CONCLUSION

The machine learning model based on high-resolution ultrafast DCE-MRI heterogeneity features enables accurate prediction of axillary lymph node metastatic burden in breast cancer, providing valuable guidance for personalized axillary surgical strategies.

CLINICAL RELEVANCE/APPLICATION

This study developed a machine learning model based on intratumoral and peritumoral kinetic heterogeneity features derived from high-resolution ultrafast DCE-MRI, which provides a non-invasive and more accurate preoperative prediction of axillary lymph node metastatic burden in breast cancer. Building on these findings, this approach could further offer imaging-based guidance for tailoring axillary surgical strategies in breast cancer patients.

R5A-SPBR-6 CONTRAST ENHANCED MAMMOGRAPHY -A PROBLEM SOLVING TOOL WHEN NO CURRENT PROCEDURE HELPED

Nidhi Sibal, FRCR, MBBS (*Presenter*)
Eman Hafez, MBBCh, FRCR (*Abstract Co-Author*)
Chao Jin Ho, MBBCh, BSc (*Abstract Co-Author*)
Claire Taylor, BSc, MSc (*Abstract Co-Author*)

PURPOSE

Contrast-enhanced mammography (CEM) is an emerging, viable alternative to breast MRI. MRI breast remains the gold standard for identifying occult disease in dense breast. However, there are occasions when MRI imaging is either not feasible or accessible or limitation of non-contrast conventional mammogram and ultrasound imaging. This study aims to share situations where CEM can help to provide a better diagnostic outcome by reviewing several examples of CEM use in our breast unit.

METHODS AND MATERIALS

Retrospective study of the uses of CEM over a 12 months trial phase period since July 2023. Case were abstracted from PACS. 54 CEM are evaluated for the use as an alternative study to MRI.

RESULTS

Our trial found CEM to be useful in: 1. Patients with Pacemaker or MRI incompatible devices: CEM provides a valuable alternative contrast study to assess the extent of breast malignancy in patients with dense breasts. 2. Patients unable to tolerate MRI: Claustrophobic or have physical limitations (patients with back problems, overweight or unable to lie still). MRI imaging will be affected by motion artefact or inability to complete the study. 3. Post MRI Second Look US: CEM will be useful if done before 2 nd look US of additional lesion identified on MRI staging. CEM aid in identifying the location of the enhancing lesions especially that CEM images are static and show depth and relation of lesions. The site of additional enhancing lesions was more comparable to CEM on MLO and CC views as opposed to MRI. 4. Magnetic pre-surgical localiser: we have moved to using Magnetic seeds as our breast cancer localisers. However, magnetic seeds create huge MRI artefacts and can hinder the assessment of post NAC (neoadjuvant chemotherapy) treatment response on MRI. Thus, magnetic localisers are recommended to be inserted only after post NAC MRI. In contrast, magnetic localiser does no create artefacts on CEM and can be inserted before NAC treatment. 5. CEM guided biopsy as an alternative to MRI Biopsy: MRI guided biopsy is expensive, difficult to organise, time consuming and uncomfortable for the patient. Instead, lesions can be identified on CEM and then cross referenced for Stereo/Tomosynthesis-guided biopsy.

CONCLUSION

CEM has potential use in many situations particularity when standard imaging has limitations. CEM was found to be the only alternative contrast study for staging claustrophobic patients or patients who cannot tolerate MRI.

CLINICAL RELEVANCE/APPLICATION

CEM can be a problem-solving tool to improve diagnostic accuracy and confidence of diagnosis especially in cases with dense breast or multifocal disease and patients who can't have an MRI.

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R5A-SPCA

Cardiac Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPCA-1 ROLE OF 4D FLOW MRI ESTIMATION FOR CONNECTIVE TISSUE DISEASE ASSOCIATED PULMONARY ARTERIAL HYPERTENSION (CTD-PAH); A PROSPECTIVE ANALYSIS BASED ONTHE 2022 ESC/ERS GUIDELINE

Toshihiro Sakamoto, MD (*Presenter*)
Yoshiko Hayashida, MD (*Abstract Co-Author*)
Koshi Setoyama (*Abstract Co-Author*)
Sho Shin (*Abstract Co-Author*)
Masaharu Kataoka (*Abstract Co-Author*)
Takatoshi Aoki, MD, PhD (*Abstract Co-Author*)

PURPOSE

In the 2022 ESC/ERS guideline, the definition of pulmonary hypertension (PH) was changed from mean pulmonary arterial pressure (mPAP) >25 mmHg to 20 mmHg and a new definition of exercise PH (mPAP <20mmHg, mPAP/cardiac output (CO) slope >3mmHg/L/min) was proposed. The purpose of this study is to evaluate the utility of 4D flow MRI in classifying patients with connective tissue disease-associated pulmonary arterial hypertension (CTD-PH) into three groups based on exercise stress right heart catheterization (RHC) results according to the new ESC/ERS guideline.

METHODS AND MATERIALS

In this prospective study, from November 2022 to January 2025, consecutive CTD patients clinically suspected PH were included. They all examined with exercise-stressed RHC and underwent 4D flow MRI at 3T. Based on the RHC data, the patients were divided into PH group, exercise PH group, and non-PH group. Eight 4D flow MRI parameters were analyzed, including the absolute volume, the area, wall shear stress (WSS), and oscillatory shear index (OSI) both at the pulmonary trunk (PT) and bilateral main pulmonary arteries (mPA). Absolute volumes and areas were set 20 mm proximal to the pulmonary artery bifurcation and 15 mm distal for bilateral mPA branches. WSS and OSI were measured using cylindrical volumes of interest (VOIs): a 30 mm VOI at PT 20 mm proximal and 20 mm VOIs distal to the bifurcation for bilateral mPA branches. Spearman's rank correlation analysis and Kruskal-Wallis test with post hoc DSFC multiple comparison analysis used for statistical analysis.

RESULTS

Total of 54 CTD patients (mean age 65.9, 4 male) were evaluated. The PH, exercise PH, and non-PH groups consisted of 26, 20, and 8 patients, respectively. Correlation analysis revealed significant correlations between mPAP and both the absolute volume and area measurements:Significant correlations were found for the absolute volume of the PT (rho = 0.299, P = 0.02) and the mPA (rho = 0.34, P = 0.01), as well as the areas of the PT (rho = 0.32, P = 0.01) and the mPA (rho = 0.36, P < 0.01). Comparisons among the three patient groups demonstrated a significant difference in the area of the PT between the PH group and the non-PH group (P < 0.05). Although there was no statistical difference, the average WSS value of mPA in the exercise PH tended to be smaller than that in non-PH, and the average OSI value of mPA in the exercise PH tended to be larger than that of non-PH.

CONCLUSION

Quantification using 4D flow MRI may be useful for predicting PH groups in CTD-PH patients according to the new ESC/ERS guideline.

CLINICAL RELEVANCE/APPLICATION

Parameters derived from 4D flow MRI could be a new noninvasive screening biomarker for PH, and may minimize the need for invasive exercise-stressed RHC.

R5A-SPCA-3 ASSOCIATION OF OBESITY WITH MYOCARDIAL FIBROSIS AND ADVERSE CARDIAC OUTCOMES IN DUCHENNE MUSCULAR DYSTROPHY: A CMR BASED PROSPECTIVE COHORT STUDY

Xinyuan Zhang (*Presenter*)
Shan Huang, MD (*Abstract Co-Author*)
Huayan Xu (*Abstract Co-Author*)

PURPOSE

Cardiomyopathy progression remains the predominant cause of mortality in Duchenne muscular dystrophy (DMD), with myocardial fibrosis serving as its central pathological hallmark. While obesity is highly prevalent in DMD patients and correlates with clinical outcomes, its specific role in cardiac deterioration remains undetermined. Therefore, our study aims to investigate the association between obesity and myocardial fibrosis, as well as its prognostic impact on clinical cardiac outcomes in Chinese DMD patients.

METHODS AND MATERIALS

A prospective cohort study was conducted using cardiac magnetic resonance imaging (CMR) assessment. Obesity was defined by BMI z-scores =95th percentile for age. Myocardial fibrosis was determined through late gadolinium enhancement (LGE) on CMR. Composite cardiac endpoints included dilated cardiomyopathy, left ventricular ejection fraction (LVEF) <50%, heart failure hospitalization, recurrent angina, ventricular arrhythmias, or all-cause mortality. Multivariable linear regression and Cox proportional hazards models were employed to identify independent predictors.

RESULTS

A total of 198 boys with DMD (age: 8.0 years [IQR 7.0, 10.0]) were included, of whom 26.3% were classified as obese (median BMI: 21.3 [IQR 20.4-23.0]). Multivariable linear regression analysis revealed a significant association between obesity and LGE (adjusted OR: 3.57, 95% CI: 1.66, 7.71, p = 0.001). During a mean follow - up period of 38.3 ± 14.1 months, 28 boys reached cardiac endpoint. Multivariable Cox model analysis indicated that obesity (adjusted HR: 3.75, 95% CI: 1.57, 8.97, p = 0.003) and baseline LVEF (adjusted HR: 0.90, 95% CI: 0.85, 0.97, p = 0.003) were independently associated with cardiac endpoint.

CONCLUSION

Obesity independently associates with myocardial fibrosis and adverse cardiac outcomes in Chinese DMD patients. These findings underscore the imperative for early weight management strategies in multidisciplinary DMD care.

CLINICAL RELEVANCE/APPLICATION

Obesity independently predicts myocardial fibrosis and adverse cardiac outcomes in DMD, highlighting the need for early weight management in multidisciplinary care.

R5A-SPCA-4 VIABILITY BEYOND SCAR: PREDICTING CARDIAC RECOVERY IN STEMI PATIENTS WITH NON-VIABLE MYOCARDIUM ON LGE MRI USING FDG PET

Eun-Jung Kong, MD (*Presenter*)

PURPOSE

Late gadolinium enhancement (LGE) magnetic resonance imaging (MRI) is widely used to assess myocardial viability in patients with acute myocardial infarction (AMI), yet it may overestimate non-viable myocardium in the acute phase. ^18F-fluorodeoxyglucose (FDG) positron emission tomography (PET) offers a metabolic assessment of viability, but data directly comparing its prognostic utility to MRI remain scarce. To investigate whether FDG PET can predict cardiac functional recovery in ST-segment elevation myocardial infarction (STEMI) patients with non-viable myocardium identified on LGE MRI following successful primary percutaneous coronary intervention (PCI).

METHODS AND MATERIALS

This retrospective study included 36 STEMI patients (mean age 62 ± 11 years) who underwent FDG PET/MRI within 7 days after successful PCI between 2016 and 2023. All patients exhibited non-viable myocardium in the culprit territory on LGE MRI. Patients were classified based on FDG PET into three groups: viable myocardium (n=19), non-viable myocardium (n=9), and paradoxical uptake (n=8). Cardiac function was evaluated by transthoracic echocardiography at baseline and at 3-9 months post-PCI, assessing regional wall motion score index (RWMSI), number of abnormal segments (NoRWS), and left ventricular ejection fraction (LVEF).

RESULTS

The viable group demonstrated significantly greater improvements in RWMSI (?RWMS: -0.3 ± 0.4 vs. 0.1 ± 0.2, p=0.003), NoRWS (?NoRWS: -3.4 ± 3.4 vs. -1.6 ± 3.6, p=0.042), and LVEF (?EF: 7.5 ± 6.1% vs. 2.8 ± 4.0%, p=0.061) compared to the non-viable group. The paradoxical uptake group showed a functional trajectory more similar to the viable group, with notable improvements in RWMSI, NoRWS, and LVEF. BMI was higher and diabetes more frequent in the paradoxical group, though without significant impact on overall outcomes.

CONCLUSION

FDG PET provides important complementary viability assessment in STEMI patients, even when LGE MRI suggests non-viability. Preservation of FDG uptake in infarcted myocardium is associated with significant recovery of cardiac function. The paradoxical FDG uptake pattern also appears to portend favorable outcomes, warranting further investigation.

CLINICAL RELEVANCE/APPLICATION

FDG PET provides critical prognostic information in STEMI patients with LGE-defined non-viable myocardium, guiding post-MI management by identifying patients likely to experience meaningful functional recovery.

R5A-SPCA-5 INCREMENTAL DIAGNOSTIC VALUE OF HEART FAILURE WITH PRESERVE EJECTION FRACTION IN HYPERTENSIVE HEART DISEASE PATIENTS BY CARDIC MR FEATURE-TRACKING

Xiaolin Mu (*Presenter*)

PURPOSE

To investigate the incremental value of cardiac magnetic resonance feature tracking (CMR-FT) for diagnosing HHD-HEpEF, and to ascertain optimal diagnostic parameter.

METHODS AND MATERIALS

30 HHD-HFpEF patients, 32 HHD patients, and 30 healthy controls who met the enrollment criteria were retrospectively analyzed.Myocardial strain and rate were measured and compared among the three groups by CMR-FT(Figure 1). Logistic regression method was employed to analyze the factors influencing HHD-HFpEF, and the optimal strain parameters for its identification were ascertained by using ROC curve.

RESULTS

Compared to the HHD and healthy controls, the HHD-HFpEF group demonstrated significantly impaired of LVGPLS (-12.0%±3.5%), LV d GLSR (0.6±0.21/s), LV s GLSR (-0.71/s , IQR -0.9to -0.61/s), LA es (17.7%±6.9%), ee (9.2%, IQR 6.4% to 10.5%), ea (8.6%±3.4%), SRs (1.0±0.3 1/s), SRe (-0.7 1/s , IQR -1.1to-0.5 1/s), SRa (-1.1±0.41/s)(all p-values <0.001). LA es (p=0.020), ee (p=0.004), SRs (p=0.015), SRe (p<0.001) were significantly impaired in the HHD group when compared with healthy controls(Table1,Figure 2). Linear regression analysis revealed moderately correlations between LA es, ee, LVGPLS and NT-proBNP (all p-values<0.001),as well as between LA es, ee, ea and LVGPLS (all p-values<0.001)(Figure 3).LA es showed the highest diagnostic efficacy for identifying HHD-HFpEF, with an AUC of 0.873, sensitivity of 71.4%, specificity of 93.3%, and cut-off value of 19.25%(Table2,3,Figure 4).

CONCLUSION

CMR-FT is a reliable and promising tool for evaluating subtle dysfunction in HHD-HFpEF. Notably, LA es demonstrates potential incremental value for identifying HFpEF.

CLINICAL RELEVANCE/APPLICATION

CMR-FT proves to be a reliable and promising tool for evaluating subtle dysfunction in HFpEF.

R5A-SPCA-6 MULTIPARAMETRIC CARDIAC MRI FOR THE DETECTION OF CHIMERIC ANTIGEN RECEPTOR T-CELL THERAPY ASSOCIATED MYOCARDIAL CHANGES

Dmitrij Kravchenko, MD (*Presenter*)
Alexander Isaak, MD (*Abstract Co-Author*)
Narine Mesropyan, MD (*Abstract Co-Author*)
Leon Bischoff, MD (*Abstract Co-Author*)
Muhammad Taha Hagar, MD (*Abstract Co-Author*)
Giuseppe Tremamunno, MD (*Abstract Co-Author*)
Milan Vecsey-Nagy, MD, PhD (*Abstract Co-Author*)
Akos Varga-Szemes, MD, PhD (*Abstract Co-Author*)
Tilman S. Emrich, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)

PURPOSE

New chimeric antigen receptor (CAR)-T cell therapy has demonstrated advantages over traditional cancer therapies for treatment of highly refractory or relapsing hematological malignancies. Unfortunately, there is a paucity of data regarding cardiotoxic cardiac MRI (CMR) findings of therapy associated cytokine release syndrome

(CRS).

METHODS AND MATERIALS

Consecutive patients were enrolled for CAR-T cell therapy and received a standard 1.5 T CMR examination consisting of functional cines, parametric mapping, late gadolinium enhancement (LGE), and featuring tracking strain, before therapy (baseline), during acute cytokine release syndrome (CRS; as determined by treating oncologist and lab parameters), and at 6-month follow-up (mean 184±20 days). Data was compared using RM-ANOVA with Tukey's posthoc test.

RESULTS

29 patients were available for analysis (mean age 60±15 years, 23 males [79%]). The most common malignancy was diffuse large B-cell lymphoma (13 [45%]). CRS was observed at a median time of one day (IQR 1-2 days) after CAR T-cell therapy and reached a median degree of 1 (IQR 1-2). One patient passed away due to non-cardiac related CRS. One patient developed therapy associated heart failure. No new instances of LGE were observed in any cases. There were no differences from baseline to CRS or to follow-up scans for left ventricular ejection fraction (61±5 vs 60±6 vs 59±7%, p =0.39), T1 relaxation times (969±18 vs 988±26 vs 972±22 ms, p =0.11), T2 relaxation times (53.3±2.4 vs 54.0±3.0 vs 52.9±1.8 ms, p =0.36), global longitudinal strain (-16.3±2.2 vs -15.6±2.4 vs -14.9±2.8, p =0.18), global circumferential strain (-12.5±2.9 vs -13.0±2.7 vs -12.2±1.8, p =0.51), or global radial strain (28.3±12.5 vs 29.2±8.1 vs 30.5±6.0, p =0.67).

CONCLUSION

CAR T-cell therapy related low degree CRS does not produce significant myocardial changes on multiparametric CMR from baseline to acute CRS or follow-up.

CLINICAL RELEVANCE/APPLICATION

Current CAR-T cell therapies may induce low-grade CRS but do not cause significant myocardial changes on CMR, supporting their classification as a cardiologically safe treatment option.

R5A-SPCA-7 BEYOND CAC: INSIGHTS FROM A LARGE-SCALE CCTA STUDY OF CAD RISK IN OVER 1200 WOMEN

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PURPOSE

To evaluate the association between coronary artery plaque characteristics, stenosis severity, coronary artery calcium (CAC) score and clinical risk factors in women undergoing coronary CT angiography (CCTA), and to assess the diagnostic limitations of CAC in identifying high-risk plaque and significant coronary artery disease (CAD).

METHODS AND MATERIALS

This HIPAA-compliant, IRB-approved study reviewed data from 2,296 women who underwent CCTA between 2006 and 2022, with 1,241 patients included after excluding those with coronary artery bypass surgery, coronary stenting, or non-diagnostic image quality. Clinical risk factors were extracted from medical records. Images were reviewed by two radiologists, with a third resolving discrepancies. Coronary arteries were analyzed using a 10-segment model (LM-1, LAD-3, RCA-3, LCX-3 segments) for stenosis severity (CAD-RADS; significant stenosis defined as =50%), plaque type (non-calcified, partially calcified, calcified), and high-risk features (low attenuation, napkin-ring sign, spotty calcifications, positive remodeling). A subset of 1181 patients with CAC scores, quantified using the Agatston method were evaluated to assess the association between CAC and CADRADS. ROC curve analysis evaluated the diagnostic performance of CAC in detecting significant stenosis.

RESULTS

Of 1241 women, 241 (19.4%) had significant coronary stenosis (CAD-RADS >2). Among plaques, 43.5% (230) were calcified, 32.8% (174) partially calcified, and 23.6% (125) non-calcified. 32.8% (174) of stenotic plaques showed =2 high-risk features. The average CAD-RADS was highest for partially calcified plaques (3.6), compared to calcified (3.3) and non-calcified (3.4) demonstrating a potential association between plaque composition and stenosis severity. CAC significantly correlated with CAD-RADS ($r = 0.36$, $p < 0.0001$), and showed strong predictive value for CAD-RADS >2 (AUC = 0.87). Patients with calcified plaques were older (69 years) than those with partially (61 years) or non-calcified plaques (63 years). Younger women had more partially and non-calcified plaques with higher CADRADS despite low calcium. Among 366 patients with CAC score 0, 23 (6.3%) had CAD-RADS >2. Clinical risk factors did not improve prediction over CAC alone.

CONCLUSION

CAC score may underestimate CAD in women by failing to detect non-calcified, high-risk plaques. CCTA-based plaque analysis adds valuable information in risk stratification, especially when CAC scores are low or zero.

CLINICAL RELEVANCE/APPLICATION

Our findings suggest a potential limitation of the CAC score in identifying women at risk for CAD and support the growing importance of detailed qualitative plaque analysis to improve risk stratification in women.

R5A-SPCA-8 ARTIFICIAL INTELLIGENCE-BASED ASSESSMENT OF CORONARY ARTERY CALCIFICATION GROWTH AND ITS IMPACT ON ADVERSE EVENTS: INSIGHTS FROM NATIONAL LUNG CANCER SCREENING

Won Gi Jeong, MD, PhD (*Presenter*)
Gongyoung Jin, MD, PhD (*Abstract Co-Author*)
Yun-Hyeon Kim, MD (*Abstract Co-Author*)

PURPOSE

Coronary artery calcification (CAC) growth is a crucial but underexplored factor in cardiovascular risk assessment. This study aimed to evaluate the CAC growth rate and its association with adverse cardiovascular events (ACEs) in individuals undergoing lung cancer screening (LCS).

METHODS AND MATERIALS

Participants who underwent LCS low-dose chest computed tomography (LDCT) between April 2017 and December 2023 with available follow-up LDCT scans were included. CAC score was assessed using AI-based software (AVIEW CAC, Coreline Soft, South Korea) following the Agatston method. The annual CAC progression rate was estimated using a mixed-effects linear regression model with an interaction term. CAC growth was defined as either incident CAC in participants with negative baseline CAC or an annual progression of >15% in those with positive baseline CAC, based on baseline and last LDCT scans. ACEs were categorized into major and minor events. Cox regression analysis was conducted to evaluate the association between CAC growth and ACEs, adjusting for baseline age and CAC status.

RESULTS

A total of 193 participants (mean age: 61.6 ± 5.2 years, all male) were included. ACEs occurred in 15.5% of participants (major: 4.1%, minor: 11.4%) during follow-up. The annual CAC progression rates according to baseline severity were: 0.406 (none), 6.789 (mild), 54.907 (moderate), and 54.249 (severe). A significant correlation was observed between CAC severity and its growth rate ($p<0.001$). CAC growth was independently associated with a higher incidence of total ACEs (adjusted HR: 2.4,

95% CI: 1.13-5.09, p=0.023). Participants with moderate or severe baseline CAC had a significantly higher incidence of ACEs compared to those with no baseline CAC (adjusted HR: 2.86, 95% CI: 1.11-7.38, p=0.030).

CONCLUSION

The study underscores the strong association between CAC growth and ACEs, emphasizing the need for monitoring CAC progression in individuals undergoing LCS.

CLINICAL RELEVANCE/APPLICATION

AI-based CAC growth assessment serves as a predictive tool for cardiovascular risk in LCS participants. Integrating CAC growth evaluation in routine LCS programs may enhance risk stratification and facilitate early cardiovascular interventions.

R5A-SPCA-10 ASSOCIATION BETWEEN CORONARY MONOSODIUM URATE DEPOSITS AND HIGH-RISK CORONARY PLAQUE PHENOTYPES IN GOUT PATIENTS USING DUAL-ENERGY CT AND CT-ANGIOGRAPHY

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Andrea Klauser, MD (*Abstract Co-Author*)
Gerlig Widmann, MD, MSc (*Abstract Co-Author*)
Gudrun Feuchtner, MD (*Abstract Co-Author*)

PURPOSE

Dual-energy computed tomography (DECT) detects monosodium urate (MSU) deposits in joints. However, the correlation between coronary atherosclerosis phenotypes and MSU-positive (+) lesions in the cardiovascular system remains unclear. The aim of our study was to correlate coronary MSU+ plaques on non-enhanced DECT with the coronary atherosclerosis profile assessed by coronary CT angiography (CTA).

METHODS AND MATERIALS

150 rheumatologic were enrolled into our prospective gout-study. A subset underwent non-enhanced DECT and 128-dual source coronary CTA. CTA analysis included coronary stenosis severity (CADRADS), high-risk-plaque (HRP) phenotypes, and the coronary artery calcium (CAC) score.

RESULTS

Of the 60 patients included (mean age 63.7 +/- 8.09 years, 7 (11.7%) females), 37 (61%) had gout, 9 (15%) had hyperuricaemia, and 14 (23.3%) had other rheumatological diseases. By using DECT, 11 (18.3%) had coronary MSU+ lesions (24 lesions in total: LAD=12, RCA=10, CX=1, LM=1). HRP phenotypes were identified in 14 of 60 patients (23.3%). Among the coronary MSU+ patients, 7/11 (63.6%) had HRP, compared to 7 of 49 (14.2%) MSU-negative patients. The prevalence of HRP was higher in MSU+ than MSU-negative patients (63.3% vs.14.2%; p=0.003; OR 9.911; 95% CI: 2.297-48.41). CADRADS and CAC were correlated with the number of MSU lesions (r=0.412;p<0.001; 95% CI: 0.167-0.609) and r=0.412; (95% CI:0.169-0.609)p<0.001). None of the major cardiovascular risk factors (smoking, hypertension, dyslipidemia or diabetes) were associated with MSU+ lesions.

CONCLUSION

There is an association between coronary MSU+ lesions and HRP-phenotypes, and a correlation with stenosis severity and calcium burden. MSU+ lesions may serve as biomarkers from non-enhanced spectral CT scans for increased cardiovascular risk.

CLINICAL RELEVANCE/APPLICATION

The clinical implications of these findings might be following. Incorporating advanced imaging techniques, such as DECT, into the routine cardiovascular risk assessment of gout and hyperuricemia patients could aid in the early identification of those at heightened risk of adverse cardiovascular outcomes and, consecutively, prompt more aggressive primary preventive measures with regards to the management of cardiovascular risk factors and the implementation of targeted therapies to mitigate this risk.

R5A-SPCA-11 ECV DEPENDS ON CARDIAC FUNCTION REGARDLESS OF MYOCARDIAL IODINE VALUE

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PURPOSE

To evaluate whether cardiac function correlates with the blood pool iodine value used to calculate the CT-derived extracellular volume fraction (ECV).

METHODS AND MATERIALS

We selected patients who underwent a delayed phase scan at 7 minutes after contrast injection, intended to evaluate cardiac amyloidosis, between March 2023 and October 2024. A dual-source photon-counting detector CT scanner was used, employing a dual-source rapid-pitch scan protocol with a contrast dose of 550 mgI/kg. From the acquired data, an iodine map was reconstructed with both the section thickness and increment set to 1 mm. We then selected the section where the left ventricular blood pool area was visually largest and measured the iodine values of the blood pool (iodine BP) and the interventricular septum of the left ventricle (iodine Myo) using elliptical ROIs. Using these measured values along with the hematocrit value obtained closest to the time of the CT examination, we calculated the ECV. To compare with cardiac function, we recorded the left ventricular ejection fraction (LVEF) from the echocardiogram performed closest to the CT examination. We then assessed the correlation between iodine BP and iodine Myo with LVEF using Spearman's correlation analysis.

RESULTS

A total of 95 patients were enrolled, with a median age of 84.0 years (IQR [80.0-88.0]) and 17 men (15.8%). The LVEF, iodine BP , iodine Myo , and ECV were 63.3 ± 12.0%, 1.87 ± 0.37 mgI/mL, 0.85 ± 0.22 mgI/mL, and 29.1 ± 6.4%, respectively. While significant correlations were observed between LVEF and iodine BP , as well as between LVEF and ECV (r = 0.30 and -0.29; p = 0.013 and 0.015), the correlation between LVEF and iodine Myo was not significant (r = 0.01, p = 0.93).

CONCLUSION

At 7 minutes after contrast injection, there is a negative correlation between cardiac function and ECV. This correlation likely arises from low iodine values in the blood pool, indicating that we may be measuring reduced contrast agent perfusion due to impaired cardiac function, rather than accurately evaluating the true ECV.

CLINICAL RELEVANCE/APPLICATION

An ECV assessment performed at 7-minutes scan may not accurately reflect the true state of normal myocardium. In the iodine-based method, myocardial fibrosis and edema should be evaluated using the iodine value of the myocardium itself—without involving the blood pool—under standardized conditions such as a uniform scanning phase and contrast agent dosage.

R5A-SPCA-14 EXTRACELLULAR VOLUME FRACTION FROM DUAL-ENERGY CT PREDICTS RECURRENCE OF NON-PAROXYSMAL ATRIAL FIBRILLATION AFTER ABLATION

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PURPOSE

To determine whether myocardial extracellular volume fraction (ECV) derived from preoperative delayed-phase cardiac computed tomography angiography (CTA) can predict recurrence of non-paroxysmal atrial fibrillation (AF) following radiofrequency ablation (RFA).

METHODS AND MATERIALS

This retrospective study included 399 patients with non-paroxysmal AF who underwent RFA. Preprocedural dual-energy cardiac CTA was performed, with delayed-phase images acquired five minutes post-contrast. Left ventricular ECV was calculated. Patients were stratified by an ECV cutoff identified through receiver operating characteristic (ROC) analysis. Cox proportional hazards models and Kaplan-Meier curves assessed associations between ECV and AF recurrence. Predictive models incorporating ECV and clinical variables were evaluated using concordance index (C-index), net reclassification index (NRI), and integrated discrimination improvement (IDI).

RESULTS

During a median follow-up of 10.1 months (IQR, 8.1-13.6), 91 patients (22.8%) experienced AF recurrence after post-ablation. Higher ECV was significantly associated with recurrence (37.6% ± 5.05% vs. 32.6% ± 2.05%; $p < 0.01$). An ECV cutoff of 34.69% achieved an AUC of 0.85 (95% CI: 0.79-0.90). Multivariate Cox analysis confirmed ECV as an independent predictor of recurrence (HR = 1.59; 95% CI: 1.36-1.85; $p < 0.01$). The inclusion of ECV in clinical risk models significantly improved predictive performance, with a C-index of 0.82 (95% CI: 0.74-0.86), an IDI of 0.66 (95% CI: 0.41-0.91), and an NRI of 0.55 (95% CI: 0.26-0.61).

CONCLUSION

Left ventricular ECV measured by dual-energy CT is an independent predictor of AF recurrence after RFA in patients with non-paroxysmal AF. ECV assessment may enhance pre-ablation risk stratification and inform clinical management.

CLINICAL RELEVANCE/APPLICATION

Incorporating ECV assessment into pre-ablation imaging protocols improves risk assessment in patients undergoing RFA for non-paroxysmal AF, potentially guiding personalized treatment strategies.
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Nov. 30 – Dec. 4
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R5A-SPCH

Chest Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPCH-2 CT RADIOMICS-BASED MODEL FOR PREDICTING PULMONARY INVASIVE MUCINOUS ADENOCARCINOMA SPREAD THROUGH AIR SPACES

Shaoqing Jia (*Presenter*)
Qian Xu (*Abstract Co-Author*)
Miao Miao Yu (*Abstract Co-Author*)

PURPOSE

This study aimed to develop and validate a CT radiomics model for predicting the spread through air spaces (STAS) as well as stratifying the STAS risk in pulmonary invasive mucinous adenocarcinoma (IMA).

METHODS AND MATERIALS

This retrospective study included 168 pathologically confirmed IMA patients (84 STAS-positive, 84 STAS-negative) from January 2017 to July 2024, matched 1:1 by age and sex via propensity score matching. The patients were randomized into a training set (n=117) and a validation set (n=51, 7:3 ratio). The traditional imaging features (tumor location, density, lobulation, spiculation, pleural indentation, pleural attachment, air bronchogram, and bronchial cut-off signs) were extracted. Using the 3D-slicer, the region of interest included the primary tumor and a 5-mm peritumoral margin on the thin-section arterial-phase CT. Pyradiomics extracted 1,037 radiomics features, which were selected via the max relevance-min redundancy and least absolute shrinkage and selection operator algorithms. Logistic regression models were constructed for the primary tumor (PT) and peritumoral (PTM) radiomics. The combined model also integrated the traditional features. The performance was evaluated via ROC curves (AUC), with net reclassification improvement (NRI) and integrated discrimination improvement (IDI) assessing the incremental value. A nomogram was developed for the optimal model, with calibration and decision curve analyses.

RESULTS

The solid tumor density and air bronchogram sign were independent risk factors for STAS (multivariate logistic regression, P <0.05). Feature selection identified 14 PT and 18 PTM radiomics features. The model performance was as follows:PT radiomics model: training AUC=0.723; validation AUC=0.722.PTM radiomics model: training AUC=0.802; validation AUC=0.804.PT combined model (radiomics+traditional features): training AUC=0.732; validation AUC=0.735.PTM combined model: training/validation AUC=0.810 (both sets), with the highest NRI (0.60 P <0.01) and IDI (0.12, P <0.01) versus other models.

CONCLUSION

The CT-based radiomics model (PTM combined model)demonstrated the highest predictive values among all investigated models for the STAS status of pulmonary IMA.

CLINICAL RELEVANCE/APPLICATION

Clinically, the CT-based radiomics model (PTM combined model) can offer essential data for thoracic surgeons and pulmonologists during the preoperative evaluation of pulmonary invasive mucinous adenocarcinoma. It enables a more precise prediction of STAS status, facilitating personalized treatment strategies.

R5A-SPCH-3 FUNCTIONAL LUNG MRI WITH 3D UTE IN SYSTEMIC SCLEROSIS: CORRELATION WITH PULMONARY FUNCTION TESTS

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Simona Rose (*Abstract Co-Author*)
Johannes Kaes (*Abstract Co-Author*)
Viktor Hartung (*Abstract Co-Author*)
Michael Gernert (*Abstract Co-Author*)
Thorsten A. Bley, MD (*Abstract Co-Author*)
Herbert Koestler, PhD (*Abstract Co-Author*)
Julius F. Heidenreich, MD (*Abstract Co-Author*)

PURPOSE

Pulmonary involvement is a frequent and clinically significant manifestation of systemic sclerosis, contributing substantially to morbidity and mortality. Diagnosis of interstitial lung disease relies on pulmonary function tests and high-resolution computed tomography (HRCT), which assess function and structure separately. This separation creates a diagnostic gap, as CT cannot directly evaluate functional impairment. Functional lung MRI offers the potential to bridge this gap by providing regional, noninvasive assessment of pulmonary function alongside structural imaging. This project aims to assess the feasibility of functional lung MRI in systemic sclerosis and its correlation with pulmonary function tests.

METHODS AND MATERIALS

Fourteen patients with systemic sclerosis (mean age: 59 ± 14 years) underwent lung MRI using a breath-hold 3D ultra-short echo time (UTE) sequence with spiral acquisition trajectory in inspiration and expiration. Lung tissue was segmented using a previously trained nnUNet model. Non-rigid image registration (elastix toolbox) was performed to align images from inspiration and expiration. Signal-based fractional ventilation was calculated alongside with, MR-based ventilation inhomogeneity (VI) and ventilation defect percentage (VDP). These quantitative metrics were compared to pulmonary function test results (forced expiratory volume [FEV1%], forced vital capacity [FVC%], diffusing capacity of carbon monoxide [DLCO%], carbon monoxide transfer coefficient, [KCO%]).

RESULTS

Lung MRI was performed successfully in all patients. VI correlated negatively with DLCO% (Pearson’s r=-0.73, 95% confidence intervals [-0.92, -0.26], p=0.007) and KCO% (r=-0.78, 95% CI[-0.94, -0.38], p=0.003), but not with FEV1% or FVC% (r=-0.16 and 0.10, respectively). Similar correlations were observed between VDP and DLCO% (r=-0.70, 95% CI [-0.910, -0.219], p=0.01).

CONCLUSION

Breath-held functional lung MRI was successfully performed in patients with systemic sclerosis albeit their known respiratory limitations and breath-hold compliance. Functional analysis revealed a negative correlation between MRI-based ventilation inhomogeneity and DLCO. Although proton-based lung MRI cannot directly measure gas exchange, this is an important finding emphasizing the potential of functional lung MRI in imaging of interstitial lung diseases.

CLINICAL RELEVANCE/APPLICATION

By enabling visualization of regional ventilation deficits, functional lung MRI may bridge the diagnostic gap between structural imaging and pulmonary function testing, supporting earlier detection and monitoring of pulmonary involvement in systemic sclerosis.

R5A-SPCH-4 CT-BASED RADIOMICS MODEL FROM SOLID COMPONENTS TO PREDICT SPREAD THROUGH AIR SPACES IN SOLID-PREDOMINANT STAGE I LUNG ADENOCARCINOMA: A MULTICENTER STUDY

Xiao-Ling Ma (*Presenter*)

PURPOSE

Spread though air spaces (STAS) is an independent prognosticator for lung adenocarcinoma, signifying a higher risk of relapse and a worse outcome. We aim to investigate the value of CT-based radiomics and clinical-semantic risk predictors for identifying STAS in solid-predominant stage I lung adenocarcinoma.

METHODS AND MATERIALS

This retrospective study enrolled 409 patients pathologically-confirmed stage I lung adenocarcinoma with consolidation-to-tumor ratio greater than 0.5 from three independent institutions. The CT-based radiomics signature predictive of STAS was developed to extract radiomics features from solid components of tumors in training cohort (n=237), and verified in independent validation cohort (n=102) and external test cohort (n=70). Patients' clinical characteristics and CT semantic features were documented. Clinical-semantic (CS) risk predictors were incorporated to construct a CS model and a clinical-semantic-radiomics (CSR) model along with radiomics signature using univariate and multivariate logistic regression analysis. Model performance was evaluated by AUC, sensitivity, specificity, calibration curve, and decision curve analysis.

RESULTS

The radiomics signature achieved the AUC of 0.817 (95% CI: 0.762, 0.864) in training cohort, 0.803 (95% CI: 0.713, 0.875) in independent validation cohort and 0.716 (95% CI: 0.596, 0.818) in external test cohort. The AUC for CS model was 0.786 (95% CI: 0.728, 0.836), 0.788 (95% CI: 0.696, 0.863) and 0.727 (95% CI: 0.608, 0.827) across the respective cohorts, inferior to those of radiomics signature. Encouragingly, the combined CSR model achieved the highest AUC of 0.837 (95% CI: 0.783, 0.881), 0.829 (95% CI: 0.741, 0.896) and 0.748 (95% CI: 0.630, 0.844) across all three cohorts, indicating the incorporation of radiomics signature provided an incremental benefit over CS model. The calibration curves and decision curve analysis further verified the clinical utility of CSR model.

CONCLUSION

The CSR model based on clinical-semantic risk predictors and radiomics signature offers a promising predictive performance in predicting STAS, offering a valuable complement to individual CS model.

CLINICAL RELEVANCE/APPLICATION

The proposed model combining clinical-semantic risk predictors and radiomics signature holds significant potential as a noninvasive tool for preoperative assessment of STAS, which might serve as a helpful tool in directing surgical strategy and informing therapeutic decision-making.

R5A-SPCH-5 PROFILING THE INTRATUMOR SPATIAL HETEROGENEITY OF RESECTABLE NSCLC PATIENTS TREATED WITH NEOADJUVANT CHEMOIMMUNOTHERAPY BASED ON A NOVEL HABITAT-BASED RADIOMICS MODEL

Qin Peng (*Presenter*)
Jing Gong, PhD (*Abstract Co-Author*)

PURPOSE

Non-small cell lung cancer (NSCLC) is a highly heterogeneous disease with complex tumor microenvironments, which poses significant challenges for treatment efficacy. Neoadjuvant chemoimmunotherapy has emerged as a promising approach to enhance the response to surgery in resectable NSCLC patients. However, the intratumoral spatial heterogeneity (ISH) within NSCLC tumors can significantly influence treatment outcomes. This multi-center study aims to investigate the association between habitat-based radiomics profiling and ISH in NSCLC patients undergoing neoadjuvant chemoimmunotherapy.

METHODS AND MATERIALS

The study utilized advanced radiomics techniques to analyze pre-treatment computed tomography (CT) scans of 394 resectable NSCLC patients from three different centers. Habitat-based radiomics profiling was performed to identify distinct tumor habitats within the tumors and to quantify their spatial distribution and heterogeneity. The primary outcome was the association between radiomics features and ISH, while secondary outcomes included the correlation of these features with pathological response and overall survival.

RESULTS

Our results demonstrated that habitat-based radiomics profiling could effectively delineate ISH in NSCLC tumors. Specific radiomics features were significantly associated with ISH, including the complexity of tumor habitats and their spatial arrangement. Furthermore, these radiomics features were found to be predictive of pathological response and survival outcomes in patients treated with neoadjuvant chemoimmunotherapy.

CONCLUSION

This study highlights the potential of habitat-based radiomics profiling as a non-invasive tool for assessing ISH in NSCLC, which could aid in the stratification of patients for personalized treatment strategies. Future research will focus on validating these findings in larger cohorts and exploring the integration of radiomics with other omics data to further enhance predictive accuracy.

CLINICAL RELEVANCE/APPLICATION

As radiomics and multi-omics approaches continue to evolve, they may play a pivotal role in the future of precision oncology.

R5A-SPCH-6 UTILITY OF PREOPERATIVE CT-BASED RADIOMICS FOR PREDICTION OF MATURE TERTIARY LYMPHOID STRUCTURES FOLLOWING NEOADJUVANT IMMUNOTHERAPY IN NSCLC

Fangyuan Qu, MD (*Presenter*)
Fan Liu (*Abstract Co-Author*)
Jingyi Yang (*Abstract Co-Author*)
Xiaoting Cai (*Abstract Co-Author*)
Qiliang Wang (*Abstract Co-Author*)
Ying Liu (*Abstract Co-Author*)
Zhaoxiang Ye (*Abstract Co-Author*)

PURPOSE

To develop a radiomics model based on preoperative CT images to identify mature tertiary lymphoid structures (TLS) status in patients with IB-IIIA non-small-cell lung cancer (NSCLC) following neoadjuvant immunotherapy.

METHODS AND MATERIALS

Eligible patients who had undergone neoadjuvant immunotherapy followed by radical surgery were recruited from two institutions. The maturation and abundance of TLS were assessed using immunohistochemistry (IHC) staining. Based on the degree of TLS maturation, patients were stratified into low-maturation group (=5 mature TLS) and high-maturation group (>5 mature TLS). Preoperative CT images after 2-4 cycles of neoadjuvant immunotherapy were used to extract radiomics features. Tumor/tumor bed boundary was delineated manually on nonenhanced CT images using 3D-slicer software. A total of 1834 radiomics features were extracted from the preoperative CT. Radiomics signature was constructed using LASSO regression analysis, with 5-fold cross-validation. Model performances were evaluated using area under the curve (AUC), sensitivity (SEN), and specificity (SPE).

RESULTS

Between November 2018 and May 2024, 238 patients were retrospectively recruited (Training set=119 and internal testing set=52 from institution A; external testing set= 57 from institution B). High-maturation TLS were identified in 48.74%, 48.08%, and 45.61% of patients across the three datasets. The radiomics model incorporating seven radiomics features demonstrated favorable predictive performance in assessing mature TLS status across the training cohort (AUC 0.719, 95% CI 0.628-0.810; SEN, 0.638; SPE, 0.689), internal validation cohort (AUC 0.738, 95% CI 0.597-0.878; SEN, 0.720; SPE, 0.667), and external validation cohort (AUC 0.736, 95% CI 0.606-0.866; SEN, 0.385; SPE, 0.835).

CONCLUSION

The preoperative CT-based radiomics model demonstrated robust predictive capability in determining the status of mature TLS among NSCLC patients undergoing neoadjuvant immunotherapy, thereby providing a novel tool to facilitate personalized therapeutic strategies.

CLINICAL RELEVANCE/APPLICATION

The preoperative CT-based radiomics model demonstrated considerable potential for clinical utility in assessing the status of mature TLS for NSCLC patients receiving neoadjuvant immunotherapy regimens.

R5A-SPCH-9 ANATOMIC CORRELATION OF 0.55T LUNG MRI TO CHEST CT FOR COMMON THORACIC ABNORMALITIES: A READER PERFORMANCE STUDY

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Yang Yang, PhD (*Abstract Co-Author*)
Jae Ho Sohn, MD, MS (*Abstract Co-Author*)

PURPOSE

MRI has seen limited adoption in lung imaging due to inherently weak signals caused by the lung’s low proton density and susceptibility artifacts at air-tissue interfaces, hindering visualization of the pulmonary parenchyma. However, the development of mid-field MRI (0.55T) offers theoretical advantages in reducing these artifacts, presenting a potential radiation-free alternative for lung imaging. The clinical diagnostic utility of 0.55T MRI in thoracic imaging, however, remains uncertain. This study aims to compare the image quality and diagnostic performance of 0.55T MRI with chest CT in detecting common lung pathologies.

METHODS AND MATERIALS

28 participants were prospectively enrolled and underwent same-day chest CT and 0.55T MRI using respiratory-triggered T2-weighted axial BLADE and T1-weighted ultra-short echo time sequences. 6 radiologists assessed 0.55T MRI images using a Likert-type scale for overall image quality and evaluated for common lung abnormalities (nodule, consolidation, ground-glass opacity, reticulation, lymphadenopathy, bronchiectasis, emphysema, and pulmonary artery dilation). Pathology visibility was categorized as excellent (detected by =4 readers), intermediate (detected by >2 to <4 readers), or poor (detected by =2 readers). Fleiss’ ? was calculated to measure interreader agreement.

RESULTS

28 participants (mean age, 59 ± 19 years; 17 women) were analyzed. Of 168 total image quality scores, 79.8% (134/168) were rated as "good" or higher. 0.55T MRI achieved excellent visibility for consolidations, large nodules (>7 mm), and pulmonary artery dilation; intermediate visibility for pleural effusions, ground-glass opacities, reticulation, lymphadenopathy, and bronchiectasis; and poor visibility for small nodules (=7 mm) and emphysema. Interreader agreement for pathology detection using MRI was moderate (? = 0.51; 95% CI: 0.37-0.61). Ground-glass opacities and lymphadenopathy showed the greatest variability between readers and had the highest false-positive detection rates.

CONCLUSION

0.55T MRI demonstrated excellent diagnostic performance for consolidation and large nodules (>7 mm), and intermediate performance for several other pathologies. Detection of small nodules and emphysema remains limited.

CLINICAL RELEVANCE/APPLICATION

0.55T MRI shows promise as a complementary imaging modality to chest CT, particularly for soft tissue characterization in patients who are radiation-sensitive and require frequent follow-up and cancer surveillance. However, detection limitations for nodules =7 mm—especially when ground-glass or located near the lung bases—highlight the need for further protocol optimization and sequence development to improve spatial resolution at 0.55T.

R5A-SPCH-11 THE DIAGNOSTIC PERFORMANCE OF AN AI-BASED CADX SYSTEM FOR PULMONARY NODULES WITH LOCALIZATION AND MEASUREMENT: A MULTI-CENTER CLINICAL TRIAL AND VALIDATION STUDY

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Yeon Joo Jeong, MD, PhD (*Abstract Co-Author*)

PURPOSE

We evaluated the diagnostic performance of a CADx system, which provides information on the type (solid, ground-glass opacity and part-solid), size, malignancy classification, lung-RADS category, localization and measurement of pulmonary nodules in LDCT images.

METHODS AND MATERIALS

We conducted two retrospective multi-center studies in South Korea to evaluate the CADx system, involving a total of 804 participants. The clinical trial included 455 participants across three institutions from 2019 to 2023. The validation study included 349 participants across four institutions from 2023 to 2024. In both studies, the reference standard was established by eight board-certified thoracic radiologists, with two radiologists independently assigned to each participating institution. The CADx system (DEEP:LUNG, DEEPNOID Inc., Seoul, Korea) then analyzed the LDCT images. Primary endpoints were localization-adjusted sensitivity and specificity for nodule detection and sensitivity and specificity for malignancy classification. Secondary endpoints included performance stratified by lung-RADS category and nodule size comparison between CADx predictions and radiologist annotations. Additionally, we performed an analysis of sensitivity across different Dice similarity coefficient thresholds.

RESULTS

In the clinical trial, the CADx system achieved a localization-adjusted sensitivity of 91.7% and specificity of 93.1%. Malignancy classification sensitivity and specificity were 85.7% and 87.5%, respectively. In the validation study, sensitivity and specificity were 90.6% and 80.0%, while malignancy classification sensitivity and specificity were 92.2% and 91.0%. The sensitivities for lung-RADS categories 1, 2, 3, 4A and 4B were 86.9%, 68.9%, 17.1%, 50.7% and 84.7%, respectively, across both studies. The intraclass correlation coefficient (ICC) for nodule size between CADx and radiologists was 0.86 (95% CI, 0.84-0.87) and Bland-Altman analysis demonstrated acceptable agreement.

CONCLUSION

The CADx system demonstrated robust and consistent diagnostic performance in both the clinical trial and real-world validation settings. It offers reliable support for pulmonary nodule localization and malignancy risk classification in LDCT screening, although further improvement is warranted for part-solid nodules. However, performance for Lung-RADS category 3 was relatively suboptimal, likely due to the heterogeneous and borderline nature of such nodules.

CLINICAL RELEVANCE/APPLICATION

An AI-based CADx system can consistently assist pulmonary nodule detection and malignancy classification across clinical and real-world settings.

R5A-SPCH-13 POPULATION GRAPH MODEL TO PREDICT THE CLINICAL BENEFITS OF IMMUNOTHERAPY IN PATIENTS WITH NON-SMALL CELL LUNG CANCER

Jiangdian Song, PhD (*Presenter*)

PURPOSE

Image-based models have emerged as supplements to tissue biomarkers for predicting immunotherapy outcomes in non-small cell lung cancer (NSCLC). However, their high computational and operational demands limit the involvement of clinicians in their development, and methods to integrate baseline clinical data with computed tomography (CT) images for prognostic assessment remain unexplored.

METHODS AND MATERIALS

We developed and externally validated a clinician-operable population graph model for immunotherapy prognosis that operates on cost-effective processing hardware. Patients with NSCLC who underwent immunotherapy at six hospitals between January 1, 2014, and June 30, 2023, were enrolled. A pairwise association encoder (PAE) was introduced to convert the patients' baseline clinical characteristics into graphical edges to quantify the similarities between them. We then created a DeepHypergraph for NSCLC (DHGN) that incorporated pre-treatment CT imaging features as node attributes to enhance survival outcome predictions. Our approach was evaluated by ten clinicians for accuracy and clinical deployment potential.

RESULTS

The training dataset included 1,049 patients from two centers in China. External validation was performed on two datasets comprising 194 patients from three Chinese hospitals and 136 patients from the Memorial Sloan-Kettering Cancer Center. The DHGN achieved C-indexes (with 95% CI) in the training and two external test datasets of 0.70 (0.68-0.71), 0.71 (0.67-0.75), and 0.67 (0.61-0.72), respectively, for predicting progression-free survival (PFS). Compared with the patients with PD-L1 expression level of >49% (28.9%), those identified as the top 28.9% most likely to benefit from immunotherapy by DHGN had significantly higher median PFS (13.5 vs 9.4 months, p=0.003). Similarly, compared with the patients with tumor mutation burden of >10 (40.3%), those predicted to fall within the top 40.3% most likely to benefit from immunotherapy by DHGN had higher median PFS (12.8 vs 8.3 months, p<0.0001). Based on the ten clinicians' evaluation, DHGN significantly reducing the operational complexity and computational requirements (p<0.01) for clinical deployment.

CONCLUSION

Our population graph model provided enhanced prognostic assessments of the potential benefits of immunotherapy in patients with NSCLC, facilitating the future development of deep learning-based biomarkers using cost-effective hardware in clinical settings.

CLINICAL RELEVANCE/APPLICATION

The clinician-inspired, two-step prognostic model based on the sequential evaluation of baseline clinical data followed by CT image assessment can more accurately identify which patients with NSCLC are most likely to benefit from immunotherapy.

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R5A-SPER

Emergency Radiology Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPER-1 PATTERNS OF THORACIC INJURY IN BOMB BLAST VICTIMS: A RETROSPECTIVE RADIOLOGICAL REVIEW

Uffan Zafar, MD (*Presenter*)
Zohaib Mallick, MBBS (*Abstract Co-Author*)
Muhammad Abdullah (*Abstract Co-Author*)
Muhammad N. Ahmad, MBBS (*Abstract Co-Author*)

PURPOSE

To characterize the spectrum of thoracic injuries in bomb blast victims using a retrospective radiological review, aiming to improve diagnostic and management strategies in mass casualty events.

METHODS AND MATERIALS

Retrospective analysis of 130 bomb blast patients treated at Aga Khan University Hospital (January 2004 - October 2024). Data included demographics, injury mechanisms (primary, secondary, tertiary, quaternary), symptoms, and initial and follow-up radiological findings (chest radiography and CT). Frequencies, percentages, medians, and interquartile ranges were used for analysis.

RESULTS

The cohort was predominantly male (94.6%, n=123), median age 32 years (IQR: 26-43.5). Initial chest radiography (85.4%) revealed common findings of foreign bodies (22.8%), emphysema (10.4%), and atelectasis (10.4%). In subsequent imaging, these findings persisted, with increased CT utilization. Primary blast injuries were most frequent (68.4%-78.8%). A significant portion (48.5%) required no third imaging.

CONCLUSION

Thoracic injuries, particularly primary blast injuries, are prevalent in bomb blast victims. Chest radiography is crucial for initial rapid assessment, with CT reserved for complex cases. A tiered imaging approach optimizes diagnostic accuracy and resource utilization in resource-limited settings.

CLINICAL RELEVANCE/APPLICATION

Understanding the patterns of thoracic injury in bomb blast victims, as revealed by radiological review, can inform the development of efficient triage and imaging protocols, ultimately improving the timeliness and effectiveness of care in mass casualty incidents.

R5A-SPER-2 ECG-LESS CORONARY CT ANGIOGRAPHY WITH SSF2: A RAPID, RELIABLE TOOL FOR EMERGENCY CHEST PAIN EVALUATION

Cheng Zhao (*Presenter*)
Zhongying Wang, MD (*Abstract Co-Author*)
Jinfu Bu (*Abstract Co-Author*)
Chong Zheng (*Abstract Co-Author*)
Xiaomeng Shi (*Abstract Co-Author*)
Jie Lu, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic performance and feasibility of electrocardiogram (ECG)-less coronary computed tomography angiography (CCTA) using advanced motion correction (Snapshot Freeze 2, SSF2) for rapid assessment of acute chest pain in the emergency department (ED).

METHODS AND MATERIALS

Seventy consecutive ED patients underwent non-ECG-gated CCTA on a wide detector CT (Revolution Apex Expert, GE Healthcare). Datasets were reconstructed using standard filtered back-projection (STD), first-generation motion correction (SSF1), and SSF2. Image interpretability (per-segment/vessel/patient), diagnostic accuracy for significant stenosis (>50%), objective (noise, SNR, CNR) and subjective image quality (5-point Likert scale, 2 readers, kappa), and total examination times were compared.

RESULTS

The kappa value between two radiologists on STD, SSF1 and SSF2 images was 0.78, 0.83 and 0.87. SSF2 reconstructions achieved significantly higher patient-level interpretability (100%) compared to SSF1 (92.9%) and STD (51.4%; $p<0.001$ vs STD). Visualization of distal coronary segments were significantly improved with SSF2 (97.2% interpretable) versus SSF1 (89.4%; $p<0.05$). Subjective image quality ratings were significantly superior for SSF2 (median score: 5.0 [IQR: 4.8,5.0]) compared to SSF1 and STD ($p<0.001$). SSF2 demonstrated the highest diagnostic accuracy (84.3%) compare with the final interpretation by senior radiologist for stenosis assessment regarding to SSF1 (77.14%) and STD (68.57%). Objective analyses confirmed significantly reduced image noise and improved SNR/CNR with SSF2 compared to both alternative reconstructions (all $p<0.05$), facilitating definitive interpretation without reliance on ECG synchronization. Additionally, the examination time between ECG-less and conventional CCTA examination was significantly different (50.45±9.49 vs. 117.90 ±14.06).

CONCLUSION

The application of SSF2 motion correction enables high-diagnostic-quality, ECG-less CCTA with excellent interpretability, even in challenging distal segments. This technique significantly enhances diagnostic confidence and image quality compared to standard and earlier motion correction algorithms, offering a robust and efficient pathway for coronary artery evaluation during acute chest pain triage in the emergency department, potentially streamlining patient workflow.

CLINICAL RELEVANCE/APPLICATION

SSF2 motion correction enables rapid, ECG-less coronary CT angiography with diagnostic-quality imaging, particularly valuable for emergency chest pain evaluation. This innovation streamlines acute coronary syndrome assessment while reducing reliance on ECG gating and beta-blocker administration in time-sensitive settings.

R5A-SPER-3 REDUCTION OF REPEATED PULMONARY EMBOLISM CT WITH AN OPTIMIZED ACQUISITION PROTOCOL FOR PHOTON-COUNTING CT SCANNERS IN COMPARISON WITH ENERGY-INTEGRATING DETECTOR CT

Fides Schwartz, MD (*Presenter*)
Bryan Czajkowski, RT, ARRT (*Abstract Co-Author*)
Oliver Kenney, BS (*Abstract Co-Author*)
Aaron D. Sodickson, MD, PhD (*Abstract Co-Author*)

PURPOSE

To compare repeat injection rates for CT pulmonary angiograms (CTPA) between conventional energy-integrating detector (EID) CT scanners and an optimized photon-counting CT (PCCT) protocol.

METHODS AND MATERIALS

This HIPAA-compliant, IRB-approved retrospective study included all patients who received CTPA on 14 CT scanners from three vendors across two hospitals from 06/2024-03/2025. The standard CTPA protocol on EID CTs was: 50mL contrast (350mg/mL) + saline chaser using bolus tracking at a flow rate of 4.0-4.5 mL/sec, with acquisition at 100 kVp, using highest available pitch (up to 3.2 in flash mode where available), without dual-energy. The optimized PCCT protocol was performed with 50mL of contrast (350 mg/mL) diluted with 50mL of saline (total 100mL bolus) + saline chaser at a flow rate of 2.5 mL/sec and automated scan trigger at the end of bolus injection, acquired at 140 kVp, gantry rotation 0.25, pitch 3.2, and virtual monoenergetic reconstructions at 40 keV. Repeated CT scans were identified when injector data showed a second contrast injection (that was not due to extravasation or pressure limits). Statistical comparisons were made using two-tailed t-tests with unequal variance and ANOVA with post-hoc Tukey tests.

RESULTS

9,286 scans were included (4,424 males, mean age 62.2±19.1 years) from five scanner types (Siemens: NAEOTOM Alpha: 1,060 patients, SOMATOM Edge: 975, Force: 3615; Philips: IQon: 52; GE: Discovery CT HD750: 3584). Repeat scan rates were significantly lower on the PCCT scanner protocol (1/1060; 0.09%) than on EID CT scanners (1.4%-3.8%; $p<0.01$ for each PCCT-EID pair). The average repeat rate on PCCT was 54-fold to 76-fold lower than on the EID scanners.

CONCLUSION

Optimizing PCCT protocols to capitalize on spectral capabilities for low keV reconstructions can significantly reduce the number of repeat scans in CTPA over prior-generation CT scanners.

CLINICAL RELEVANCE/APPLICATION

An optimized PCCT contrast infusion and scanner protocol including low keV reconstructions can greatly reduce the number of repeat CTPA scans, thus avoiding the need for additional contrast material and radiation dose, and minimizing workflow inefficiency.

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R5A-SPGI

Gastrointestinal Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPGI-2 NONINVASIVE DIFFERENTIATION BETWEEN PANCREATIC NEURO ENDOCRINE TUMOR (NET) AND INTRAPANCREATIC ECTOPIC SPLEEN (IPES) USING SPIO-ENHANCED MRI

Paolo Maria Sbeghen, MD (*Presenter*)
Priska Summer, MD, PhD (*Abstract Co-Author*)
Sarah Poetter-Lang (*Abstract Co-Author*)
Nina Bastati, MD (*Abstract Co-Author*)
Ahmed Ba-Ssalamah, MD (*Abstract Co-Author*)
Ulrike I. Attenberger, MD (*Abstract Co-Author*)

PURPOSE

To compare the diagnostic efficacy of extracellular contrast media-enhanced MRI (ECCM-MRI) and superparamagnetic iron oxide enhanced MRI (SPIO-MRI) to differentiate between neuroendocrine tumor (NET) and intra pancreatic ectopic spleen (IPES).

METHODS AND MATERIALS

We evaluated 23 patients (15 men, mean age of 59.3 ± 13.6 years), 10 with histopathologically-proven NET and 13 with presumptive IPES by long-term follow-up, who underwent ECCM-MRI and then SPIO-MRI simultaneously.Two radiologists independently assessed MR images for the location and size of each lesion and compared its signal intensity (SI) on MRI before and after administration of ECCM-MRI and SPIO-MRI, with those of the adjacent pancreas and spleen. For quantitative analysis, both radiologists calculated the mean lesional, pancreatic, and splenic SIs on unenhanced and ECCM-MRI and SPIO-MRI in each patient by placing regions of interests (ROIs). For statistical analysis, the independent samples T-Test or Mann-Whitney U test for continuous variables and Chi-Square Test or Fisher's Exact Test for categorical variables were used as appropriate.

RESULTS

Apart from one NET which was in the pancreatic body, all other lesions were located in the pancreatic tail. The average lesion measured 1.5±0.5 cm. On unenhanced and dynamic ECCM-enhanced T1 imaging, the SIs in NET and IPES were similar ($p>0.05$). Likewise, T2-weighted images demonstrated similar SI between NET and IPES (246 ±144.2 vs. 238.8±134.3, $p>0.05$). However, on SPIO-enhanced images, the T2-weighted SI of NETs remained unchanged pre-and post-contrast (246.5 ± 144.2vs. 236.5±118.8) while there was significant SI loss noted in all IPES lesions (236.7± 118.8 vs. 121.5 ± 92.6) $p<0.001$. Quantitively and qualitatively, using dynamic ECCM-enhanced T1 imaging, neither reader could confidently differentiate between IPES and NET ($p> 0.5$). However, with SPIO-MRI, they found that the degree of SI loss in all IPES was similar to that of the spleen, allowing both readers to correctly diagnose all 13 ESs and 10 NETs ($p<0.001$).

CONCLUSION

SPIO-enhanced MRI allows a confident non-invasive differentiation between IPES and NET

CLINICAL RELEVANCE/APPLICATION

Accurate differentiation between NET and IPES is of high clinical relevance, as the diagnosis directly influences patient management strategies and impacts the prognosis.

R5A-SPGI-3 DEVELOPMENT OF A NOVEL DIAGNOSTIC METHOD FOR DIFFERENTIATING BENIGN AND MALIGNANT COLORECTAL ELEVATED LESIONS USING TEXTURE ANALYSIS

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MIURA RYOTA, MD (*Abstract Co-Author*)
Gaku Ohira (*Abstract Co-Author*)
Koichi Hayano, MD, PhD (*Abstract Co-Author*)
Atsushi Hirata (*Abstract Co-Author*)
Yoshihiro Kurata (*Abstract Co-Author*)
Ayano Kakimoto (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic performance of radiomic texture features extracted from CT colonography (CTC) for differentiating benign and malignant colorectal polypoid lesions using machine learning techniques.

METHODS AND MATERIALS

From 613 patients who underwent CTC between April 2021 and September 2024, a total of 214 colorectal polypoid lesions (=30 mm) from 82 patients were retrospectively analyzed. All lesions were histologically confirmed via surgical or endoscopic resection. A total of 484 radiomic features were extracted from manually segmented 3D volumes using Pixspace (Japan). Least Absolute Shrinkage and Selection Operator (LASSO) regression identified features most strongly associated with lesion malignancy, selecting 51 features for non-contrast CTC and 32 for contrast-enhanced CTC. Logistic regression (LR) and support vector machine (SVM) classifiers were trained with an 80:20 split and evaluated by AUC, accuracy, sensitivity, and specificity.

RESULTS

In non-contrast CTC, AUCs were 0.913 (LR) and 0.879 (SVM); accuracies were 87.5% and 84.4%, respectively. In contrast-enhanced CTC, AUCs were 0.942 (LR) and 0.910 (SVM); accuracies were 88.0% and 92.0%. The contrast-enhanced SVM model achieved 100% specificity and 84.6% sensitivity.

CONCLUSION

Radiomic analysis of CTC allows accurate, non-invasive discrimination of colorectal polypoid lesions. This technique may support more effective colorectal cancer screening and diagnosis.

CLINICAL RELEVANCE/APPLICATION

Radiomic texture analysis of CT colonography (CTC) images offers a promising, non-invasive tool for differentiating benign from malignant colorectal polypoid lesions. This approach can augment existing screening programs by reducing the need for invasive procedures in low-risk cases and improving early detection of colorectal cancer through advanced machine learning models. The superior diagnostic performance of contrast-enhanced CTC radiomics particularly suggests its practical utility in clinical settings for risk stratification and treatment planning.

R5A-SPGI-4 PROGNOSTIC VALUE OF CT-BASED BODY COMPOSITION CHANGES IN PANCREATIC CANCER PATIENTS UNDERGOING NEOADJUVANT THERAPY

Bang Bin Chen, MD (*Presenter*)

PURPOSE

To evaluate the prognostic impact of CT-based body composition changes, particularly subcutaneous adipose tissue (SAT) loss on overall survival in pancreatic cancer patients treated with neoadjuvant therapy.

METHODS AND MATERIALS

This retrospective single-center study included 127 patients with histologically confirmed pancreatic cancer who received neoadjuvant therapy between January 2018 and December 2023. The study was conducted at a tertiary referral hospital, with follow-up completed on April 30, 2025. The median age was 63 years (IQR: 52-71), and 59% were male. Body composition parameters were extracted from contrast-enhanced CT scans at the L3 vertebral level. Skeletal muscle volume (SM), skeletal muscle density, subcutaneous adipose tissue (SAT), and visceral adipose tissue (VAT) were automatically calculated using TotalSegmentator, an open-source AI-based segmentation tool. Relative changes between pre- and post-treatment values were computed as (Post - Pre) / Pre. Demographic data, tumor markers, staging information, and conversion surgery status were collected. Overall survival (OS) was measured from diagnosis to death or last follow-up. A multivariable Cox proportional hazards model was constructed using stepwise AIC-based selection to predict OS.

RESULTS

The median follow-up duration was 668 days (IQR: 252-1136). In the final Cox model, conversion surgery (HR 0.117, 95% CI 0.065-0.211, $p < 0.001$) and SAT relative change (HR 0.483, 95% CI 0.235-0.993, $p = 0.048$) were independently associated with overall survival after adjustment for other variables. Each 10% greater loss in SAT was associated with an increased risk of death. The model's concordance index was 0.736.

CONCLUSION

Subcutaneous fat loss during neoadjuvant therapy is an independent adverse prognostic factor in pancreatic cancer, potentially reflecting underlying treatment-related cachexia. Alongside conversion surgery, SAT change should be considered as a radiologic biomarker of treatment tolerance and long-term outcomes.

CLINICAL RELEVANCE/APPLICATION

These findings support the integration of quantitative body composition metrics in preoperative imaging assessments.

R5A-SPGI-5 CYSTIC NEUROENDOCRINE TUMORS OF THE PANCREAS: IMAGING FEATURES AND NATURAL EVOLUTION

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Giulia A. Zamboni, MD (*Abstract Co-Author*)
Paolo Maria Sbeghen, MD (*Abstract Co-Author*)
Matteo Bonatti, MD (*Abstract Co-Author*)
Giancarlo Mansueto, MD (*Abstract Co-Author*)

PURPOSE

To study a population of resected or followed-up cystic pNETs to determine specific imaging features and their natural evolution, to evaluate possible management of these rare lesions.

METHODS AND MATERIALS

This retrospective study from an IRB-approved registry (PAD-R registry, n1101CESC) included 62 patients (26 F, 36 M, mean age 60 yrs) with 68 cystic pNETs (5 had multiple lesions). Diagnosis was obtained with FNA or pathology (53 lesions):when biopsy was not feasible, the diagnosis was confirmed by positivity at DOTATOC-PET-CT (15 lesions). All lesions were non-functioning. At pathology, all lesions had a Ki-67<3% except for one patient (focal 4%). For each patient, the initial, preoperative and last available MRI were reviewed.

RESULTS

Lesions were located predominantly in the pancreatic tail (40/68) with a mean diameter of 22 mm (8-70 mm) and a mean wall thickness of 2,5 mm. 45 pNETs were associated with other pancreatic lesions. 37 lesions had thin or thick septa; 3 demonstrated a fluid-fluid level. Enhancement was seen in all lesions, in the arterial phase but also as constant or late enhancement. None of the 68 lesions showed macroscopic lymphatic or metastatic spread at any exam. 22 lesions were resected, with mean diameter of 32,5 mm. 10 lesions were resected after a follow-up >6 months: 2/10 were resected for size increase (final diameter 27 mm and 12 mm), 1/10 were disseminated at peri-pancreatic lymph nodes (lesion diameter of 44 mm). Of the total lesions resected, 3 lesions with an initial diameter >40 mm (44, 52, 70 mm), demonstrated peri-pancreatic lymph node spread. None of these showed signs of recurrence or metastatic spread.46 lesions underwent only follow-up, 38 for >6 months (mean 38.5 months). Mean lesion diameter was 17,6 mm, with 8 lesions >20 mm, 7/8 of which remained stable. Of the 38 patients that underwent follow-up for longer than 6 months, only 3 showed clinical or radiological signs of progression (2 with diameter <20 mm and 1 with diameter >20 mm) (progression was not statistically associated with the cut-off diameter of 20 mm). No difference was observed in terms of progression/recurrence between patients who underwent follow-up or surgery (p=0.54).

CONCLUSION

In our series, no significant difference was observed in terms of behaviour in cystic PNETs below 20 mm and below 40 mm. If results are confirmed by larger studies, follow-up could be safe also for larger lesions.

CLINICAL RELEVANCE/APPLICATION

Cystic pNETS are classically seen as a less aggressive form of neuroendocrine tumor from their solid counterpart. Follow-up could be considered a feasible option also for completely cystic pNET larger than 20 mm (below <40 mm in diameter) if no signs of progression are seen, but further multicentric studies are required.

R5A-SPGI-6 DEVELOPMENT AND VALIDATION OF A CT/PET RADIOMIC BIOMARKER PANEL FOR NON-INVASIVE ASSESSMENT OF IMMUNE CHECKPOINT INHIBITOR RESPONSE IN LOCALLY ADVANCED ESOPHAGEAL SQUAMOUS CELL CARCINOMA

Qin Peng (*Presenter*)
Jing Gong, PhD (*Abstract Co-Author*)

PURPOSE

To address the challenges posed by tumor spatial heterogeneity, we developed a radiomics-based intratumoral heterogeneity (ITH) model integrating PET-CT metabolic features and CT morphological characteristics in locally advanced esophageal squamous cell carcinoma (ESCC).

METHODS AND MATERIALS

A retrospective cohort of 179 patients receiving neoadjuvant immunotherapy followed by surgery was analyzed. Radiomic features were extracted by manual delineation for precise tumor segmentation and PyRadiomics for feature extraction. A prospective single-cell transcriptomic analysis of 10 treatment-naive surgical specimens validated the model's biological relevance, revealing key immune subsets and stromal interactions linked to ITH.

RESULTS

The multi-omics model demonstrated robust predictive accuracy for major pathological response (MPR) (AUC = 0.81), significantly surpassing conventional biomarkers. Single-cell RNA sequencing of 101,839 cells from 10 prospectively collected tumors revealed ITH-high tumors were enriched with immunosuppressive subsets and tumor-associated macrophages (CCL18+, IDO1+), alongside reduced memory/naïve T cells.

CONCLUSION

This study presents a radiomics-based framework integrating tumor heterogeneity and single-cell transcriptomics enables precision immunotherapy in ESCC.

CLINICAL RELEVANCE/APPLICATION

By linking imaging features to molecular dynamics, this approach enhances mechanistic understanding and refines clinical decision-making for patient stratification.

R5A-SPGI-7 TUMOR MUTATION BURDEN IN PANCREATIC DUCTAL ADENOCARCINOMA CORRELATES WITH PROGNOSIS AND CAN BE PREDICTED BY DUAL-LAYER SPECTRAL DETECTOR CT

Siya Shi (*Presenter*)
Jiawei Liu (*Abstract Co-Author*)
Yanji Luo (*Abstract Co-Author*)
Shi-Ting Feng (*Abstract Co-Author*)

PURPOSE

The aim of this study was to explore the relationship between tumor mutation burden (TMB) and prognosis of patients with pancreatic ductal adenocarcinoma (PDAC) and to explore the role of dual-layer spectral detector CT in predicting TMB.

METHODS AND MATERIALS

This retrospective study included patients with pathologically performed PDAC who underwent dual-layer spectral detector CT from June 1, 2019 to December 31, 2023. The relationship between TMB and progression-free survival (PFS) was analyzed using a survival function and the best cut-off value was calculated, and the patients were divided into high/low TMB groups accordingly. The Kaplan-Meier survival curves were used to compare the PFS between both groups. The least absolute shrinkage and selection operator (LASSO) regression was using to select for independent predictors. The evaluation performance of the models constructed with independent predictors were analyzed using the receiver operator characteristic (ROC) curve and the precision-recall (PR) curve.

RESULTS

There were 75 patients with PDAC (mean age 60.40 ± 11.24 years, 41 males) were enrolled. The optimal cutoff value was 5.03 mut/Mb according to the relationship between TMB and PFS. For the convenience of clinical application, an integer 5 around the optimal cutoff value was taken as the threshold, and PFS was worse in the low TMB group than in the high TMB group (median PFS: 5 months vs. 7 months, P = 0.02). Among 52 patients receiving combination immunotherapy, there were 9 patients in the high TMB group with better PFS (median PFS: 7 months vs. 4 months, P = 0.02). According to LASSO regression, only normalized iodine density in the pancreatic phase (nICa) was independent predictor (area under the curve [AUC] of ROC = 0.901, cut-off value: 0.089, accuracy: 0.893, sensitivity: 0.818, specificity: 0.906). The nICa model had the best efficacy in predicting TMB using ROC analysis, outperforming conventional CT quantitative parameter (nCTa, AUC = 0.834), radiological features (pancreatic tumor infiltration [PTI], AUC = 0.679) and the combined model (nCTa+PTI, AUC = 0.864). The PR curve analysis also showed that the nICa model had the best efficacy. The PFS of the TMB-positive prediction was better than that of the TMB-negative prediction (median PFS: 7 months vs. 5 months, P = 0.04).

CONCLUSION

Poor PFS were observed in patients with low TMB. nICa was an independent relevant factor of TMB in PDAC with superior predictive efficacy than conventional CT quantitative parameter and radiological features.

CLINICAL RELEVANCE/APPLICATION

nICa derived from dual-layer detector CT allows for non-invasive prediction of TMB and prognosis which aids in preoperative clinical decisions for patients with PDAC.

R5A-SPGI-9 DEEP LEARNING CT SIGNATURE FOR PREDICTING OCCULT LIVER METASTASES AND NEOADJUVANT THERAPY BENEFIT IN PANCREATIC DUCTAL ADENOCARCINOMA: A MULTICENTER RETROSPECTIVE STUDY

Ben Zhao (*Presenter*)
Shenghong Ju, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop a deep learning (DL) framework integrating tumor and liver imaging features to predict occult liver metastases (OLM) in pancreatic ductal adenocarcinoma (PDAC), thereby guiding personalized neoadjuvant therapy (NAT).

METHODS AND MATERIALS

In this multicenter retrospective study (2015-2022), 1,063 patients were included: a training cohort (n = 450), internal validation cohort (n = 113), external validation cohort (n = 342), and an NAT cohort (n = 158). We developed a Mamba-based model that integrates multi-phase imaging features from both primary tumors and liver regions. Its performance was evaluated using the area under the receiver operating characteristic curves (AUCs). To assess clinical utility, survival outcomes were compared between NAT followed by surgery and upfront surgery groups based on model-defined risk stratification. Finally, radiotranscriptomics analysis was employed to elucidate its biological insights.

RESULTS

The Mamba-based model demonstrated robust performance for predicting the OLM, with the AUCs of 0.890 (training), 0.820 (internal validation), and 0.806 (external validation), respectively. Model-defined high-risk patients had significantly shorter progression-free survival (PFS: HR = 1.95, P < .001) and overall survival (OS: HR = 1.96, P < .001), independent of clinicopathological factors. Notably, NAT conferred significant OS benefits exclusively in model-defined high-risk patients (17.43 vs. 34.10 months; P < .001), even after propensity score matching (P = .003), while low-risk patients showed no survival benefit. Furthermore, radiotranscriptomics also revealed the relative biological aggressiveness of high-risk patients.

CONCLUSION

The proposed Mamba framework enabled accurate prediction of OLM and may serve as a clinically actionable tool for identifying PDAC patients most likely to benefit from NAT.

CLINICAL RELEVANCE/APPLICATION

The proposed Mamba-based model can identify patients at high risk of OLM who may benefit from NAT and demonstrate significant value of prognosis stratification, showing its potential to optimize personalized management for PDAC.

R5A-SPGI-11 VALUE ADDITION OF SUBSPECIALTY TRAINED RADIOLOGISTS IN MULTIDISCIPLINARY TUMOR BOARDS FOR PANCREATIC ADENOCARCINOMA: A META-ANALYSIS & SYSTEMATIC REVIEW

Adam Caulfield, MD (*Presenter*)
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PURPOSE

Background : Pancreatic adenocarcinoma (PAC) has high morbidity and mortality, with a five-year survival of only 15-20% post-curative treatment. Management typically involves surgery, radiotherapy, and chemotherapy, coordinated through multidisciplinary team (MDT) reviews. Accurate determination of tumor resectability can enhance survival. Retrospective studies demonstrate MDT input, including imaging review, significantly alters management in up to 37% of cases. However, radiology's precise role in PAC MDT decision-making remains unclear. Purpose We aim to perform a meta-analysis reviewing the role of radiology in a pancreatic adenocarcinoma multidisciplinary team (MDT) evaluation and the impact on patient outcomes.

METHODS AND MATERIALS

A search of literature was conducted using Ovid MEDLINE, Ovid Epub, Cochrane Central, Embase, and Scopus to find original research from articles published before August 31, 2023, related to the study question. Two reviewers independently assessed the risk of bias (QUADAS-2). Random-effects meta-analysis was performed.

RESULTS

Ten studies (4 retrospective, 6 prospective, and 4 multicenter vs. 6 single center), including 2,067 patients, met inclusion criteria in a pool of 12,969 studies. Three studies with 977 patients showed that there were clear changes in how patients were managed (average estimate 0.53 (95% CI, 0.50-0.56)) after a radiology review at the MDT. A random-effects meta-analysis of these studies shows that, on average, about 44% of patients had their treatment plans changed after a meeting at the MDT that included a dedicated radiologist, but there is a large range of uncertainty (18%-74%) due to differences in the studies' groups, what they considered a "change," and local practices. Two studies highlighted an important nuance: while MDT input is valuable, the interpretations can vary between teams or even within the same team over time, reflecting the complex nature of PAC. None of the studies showed a statistically significant survival boost solely from MDT involvement, likely because overall survival depends on many downstream factors.

CONCLUSION

The presence of radiology review in the setting of multidisciplinary team meetings provides crucial information, leading to management changes. Future studies could explore imaging modalities such as MRI and PET and establish the impact of intra/inter-observer variability within the multidisciplinary team.

CLINICAL RELEVANCE/APPLICATION

This data supports the ongoing involvement of skilled abdominal radiologists in the multidisciplinary team for PAC, and it significantly influences clinical decisions. Applicability concerns exist due to a potential lack of resources for robust MDT initiatives outside of tertiary centers.

R5A-SPGI-13 FROM CLINICAL SCORES TO CT: RADIOMICS AS A NOVEL TOOL FOR SURVIVAL PREDICTION IN COLORECTAL LIVER METASTASES

Angela Ammirabile, MD (*Presenter*)
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Guido Costa (*Abstract Co-Author*)
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PURPOSE

Surgery with perioperative chemotherapy is the standard treatment for colorectal liver metastases (CRLM), yet a subset of resectable patients does not benefit from surgery. Patient selection should rely on survival prediction: available prognostic factors have limited reliability, and most biomarkers can only be assessed on surgical specimens. This study investigated the potential of pre-operative CT-based radiomics for survival prediction in CRLM patients, focusing on its performance by the CT-surgery interval and comparison with clinical scores.

METHODS AND MATERIALS

This single-center retrospective study included all consecutive patients undergoing liver resection for CRLM (2010-2020). The main inclusion criterion was the availability of a high-quality CT scan (=60 days before surgery) with a detectable CRLM =10 mm. Manual tumor segmentation (Tumor-VOI) and automatic 5-mm peritumoral ring (Margin-VOI) were performed on the portal phase of CT scans. From each VOI, 110 IBSI-compliant features were extracted with LIFEx. Predictive models (Clinical, Clinical+Tumor-radiomics, Clinical+Tumor/Margin-radiomics) were built to predict overall survival (OS) by a two-step approach: feature selection via Boruta algorithm and random forest with 10-fold cross-validation. Performance was assessed in the whole cohort and in a = 30-day CT-surgery subgroup. A per-lesion analysis (up to five lesions) was conducted for inter-tumour heterogeneity. Tree-Edit Distance and Hierarchical Clustering were applied to stratify patients, and the resulting clusters were integrated into survival models.

RESULTS

306 patients were included (mean age 63 years) with five-year OS=40.9% (mean follow-up 34 months). At internal validation, the clinical model had C-index=0.629. While in the entire cohort radiomics lead to a minor improvement of model performance, in the 212 patients with a CT-surgery interval =30 days, the Tumor-VOI model reached C-index=0.691 and combining Tumor+Margin-VOIs increased it to 0.717. The full clinical-radiomic model outperformed standard prognostic scores (c-indices Fong/GAME/c-MS=0.502-0.593). Indices reflecting tumor heterogeneity did not improve survival prediction.

CONCLUSION

Radiomic features of CRLM and peritumoral tissue from preoperative CT scans enhance survival prediction beyond standard clinical scores, with better performance observed at shorter CT-surgery intervals.

CLINICAL RELEVANCE/APPLICATION

By offering a more precise evaluation, the combined clinical-radiomic model can refine CRLM treatment strategies, acting as a pre-operative filter to exclude resectable patients unlikely to achieve long-term survival and identify those most likely to benefit from surgery.

R5A-SPGI-14 REVERSE PANCREAS DIVISUM: AN ANATOMICAL VARIANT ASSOCIATED WITH PARADUODENAL PANCREATITIS

Zeynep Nur Akyol Sari, MD (*Presenter*)
Abraham Fourie Bezuidenhout, MD (*Abstract Co-Author*)

PURPOSE

As lifestyle factors compounded by inherent abnormal pancreatic drainage at the minor papilla at a microscopic level are considered predisposing factors to developing paraduodenal pancreatitis, we aimed to investigate pancreatic duct anatomy at MRCP as a potential imaging biomarker for patients at risk of developing paraduodenal pancreatitis.

METHODS AND MATERIALS

A retrospective analysis of consecutive patients presenting with paraduodenal pancreatitis that undergone MRCP from 2014-2024 were included. The main pancreatic duct (MPD) anatomy were classified into 5 types based on their drainage patterns.The frequency of MPD variants in our cohort was compared to that of the general population. The association between common MPD variants in our study and the involvement of specific pancreatic segments in paraduodenal pancreatitis was analyzed.

RESULTS

The prevalence of MPD types 1, 2 ,3, 4 and 5 were 18%, 6%, 0%, 27%, 39% respectively versus 29.5%, 1.9%, 5.5%, 2.2%, 54.5%. The most common MPD variant in our study was Type 5(MPD as the only duct), observed in 13/33 (39%) patients. This variant was frequently associated with the pure subtype of paraduodenal pancreatitis involving the antero-superior pancreatic head 11/13(%85). Type 4 (Reverse pancreas divisum (RPD))—where the main pancreatic duct drains into the major papilla and the accessory pancreatic duct drains into the minor papilla without interconnection—was identified in 9/33 (27%) patients with paraduodenal pancreatitis, making it the second most common MPD variant. This represents a 12-fold increased frequency compared to the general population. A strong association was observed between RPD and the segmental subtype of paraduodenal pancreatitis, with antero-inferior pancreatic head involvement seen in all 9 (100%) RPD patients.

CONCLUSION

The two most common MPD variants in our study of patients with paraduodenal pancreatitis were Type 5 and Type 4. As Type 5 is the most common MPD morphology seen in the general population, it would make sense that this would be the most common MPD morphology in our study population. However RPD was seen as the second most common MPD morphology with a 12 fold increase as compared to the general population, suggesting that it may play a role in impaired pancreatic drainage at the minor papilla.

CLINICAL RELEVANCE/APPLICATION

MRI readily detects RPD, facilitating patient counseling to potentially prevent paraduodenal pancreatitis development and associated suffering. Our findings emphasize the importance of recognizing pancreatic ductal variations when evaluating these patients. RPD and other MPD variants may require specialized interventions, such as endoscopic sphincterotomy or stenting, to improve drainage and relieve symptoms.

R5A-SPGI-15 CHARACTERIZATION OF SUSPECTED PANCREATIC INTRADUCTAL PAPILLARY MUCINOUS NEOPLASM ON SINGLE PHASE HIGH RESOLUTION PHOTON-COUNTING CT

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Olga Sliwicka, MD, PhD (*Abstract Co-Author*)
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PURPOSE

Pancreatic intraductal papillary mucinous neoplasms (IPMN) are common incidental findings on portal venous phase CT and frequently require subsequent MRI for definitive characterization. The purpose of this study is to assess the utility of high-resolution thin-slice photon-counting CT (PCCT) to characterize such lesions as IPMN and reduce the need for MRI.

METHODS AND MATERIALS

All patients who received portal venous phase abdominal PCCT between 07/11/2023 - 03/272024 with hypoattenuating pancreatic lesions were retrospectively included. Exclusion criteria included absence of high-resolution PCCT images, no reference standard imaging (upper abdominal MRI or MRCP), and patients with active pancreatitis. All lesions were reviewed on 3 mm, 1.6 mm and 0.4 mm axial PCCT image series by three experienced Emergency Radiologists (Figs A, B). The readers assessed each image series for communication between the cyst and the pancreatic duct on a Likert scale: 1= no communication visualized; 2 = probable communication; 3 = definite communication. 0.4-mm iodine overlay images were used to assess enhancement. Comparison was made with reference standard MRI.

RESULTS

Within the 2,780 abdomen/pelvis PCCT scans, 78 patients with incidental hypoattenuating pancreatic lesions were identified, of which 46 were excluded. Within the included 32 patients, 34-47 pancreatic lesions (varying between readers) were identified by PCCT, ranging in size between 0.3 - 4.0 cm. Reader confidence in detecting duct communication (Fig C) was highest on 0.4 mm images (Friedman p-value = 0.001). By dichotomizing the Likert scale using 2-3 to indicate duct communication and 1 as none, communications were identified at 3.0 mm, 1.6 mm and 0.4 mm thickness respectively in 48.9%, 66.6% and 72.3% by reader 1; 23.5%, 32.4%, and 44.1% by reader 2; and 19.1%, 38.1%, and 54.8% by reader 3 (Chi-square $p<0.05$ between all slice thicknesses except between 1.6 and 3.0 mm for one reader). Agreement between CT and reference standard MRI was highest at 0.4 mm (Cochran's Q test p-value = 0.001) (Fig D).

CONCLUSION

High-resolution thin slice PCCT images show promise to characterize incidental IPMNs on single-phase scans. By revealing pancreatic duct communication and absent iodine uptake, thin slice PCCT may definitively characterize more IPMNs than at larger slice thickness.

CLINICAL RELEVANCE/APPLICATION

Characterization of IPMN by high resolution PCCT may reduce the need for follow-up MRI assessment.

R5A-SPGI-16 PREVALENCE AND IMAGING CHARACTERISTICS OF CHRONIC CALCIFIC PANCREATITIS IN PATIENTS WITH NEWLY DIAGNOSED PANCREATIC DUCTAL ADENOCARCINOMA

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Mahya Faghih, MD (*Abstract Co-Author*)
Vikesh Singh, MD (*Abstract Co-Author*)
Atif Zaheer, MD (*Abstract Co-Author*)

PURPOSE

Chronic pancreatitis (CP) is a risk factor for pancreatic ductal adenocarcinoma (PDAC), with a cumulative risk of approximately 4% over 20 years. Most prior studies have evaluated the risk of PDAC among patients with CP. Given the lack of data on CP frequency in patients with newly diagnosed PDAC and the associated clinical or imaging characteristics, our research addresses this knowledge gap.

METHODS AND MATERIALS

A retrospective review of the clinical history and staging CT scans of patients diagnosed with resectable or borderline resectable/locally advanced PDAC at a high-volume center between 2011-2022 was conducted. CP and ductal dilatation were defined by the presence of pancreatic calcifications and a maximal pancreatic ductal diameter > 5 mm on CT, respectively. Two attending abdominal radiologists independently reviewed the CT imaging to evaluate imaging features on all available phases according to a published consensus on CP imaging findings and discrepancies were adjudicated by a third radiologist.

RESULTS

Among 1008 patients with PDAC, CP was found in 34 (3.4%), with a mean age of 69.9±8 years, 50% men, 91% white, and 59% with a history of smoking with 26.95±18.5 pack-years. Only 7 (21%) patients had a documented history of chronic abdominal pain before PDAC diagnosis. Abdominal pain was the most common presenting symptom for PDAC in our cohort, though painless CP prior to PDAC diagnosis (79%) was more than three times as common as painful CP (21%). The presence of ductal dilation, pseudocysts, or pancreatic atrophy was observed in nearly 40%, 10%, and 40% of patients, respectively, and 7 (21%) showed none of these features. Ductal dilation was associated with higher levels of CA19-9 (349.8 U/mL [IQR; 238.3, 455.0] vs 90.0 U/mL [IQR; 58.3, 162.2], p=0.003). Intratumoral and extratumoral-only calcifications were found in 14 (41%) and 20 (59%) patients, respectively.

CONCLUSION

CP is found in approximately 3% of patients who present with PDAC and most have primary painless disease. While many patients in our cohort showed at least one predictive imaging feature of PDAC (PD dilation, atrophy, or pseudocyst), more than half lacked ductal dilation, and one-fifth showed none of these imaging features. It is important not to overlook the possibility of PDAC in CP patients without these imaging findings. Further studies are required to determine optimal PDAC screening and surveillance in patients with primary painless CP.

CLINICAL RELEVANCE/APPLICATION

A high index of suspicion for PDAC should be maintained for calcified and non-calcified areas of the pancreas in patients with CP as calcifications can obscure small tumors and many with CP and PDAC lacked imaging signs predictive of PDAC.

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R5A-SPGU

Genitourinary Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPGU-1 DIAGNOSTIC PERFORMANCE AND INTER-READER AGREEMENT OF THE TORONTO MRI SCORING SYSTEM FOR DETECTION OF RECURRENT PROSTATE CANCER AFTER FOCAL THERAPY

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Adriano Basso Dias, MD, MSc (*Abstract Co-Author*)
Katherine Lajkosz (*Abstract Co-Author*)
Harini Thevarajah (*Abstract Co-Author*)
Kateri Corr (*Abstract Co-Author*)
Sangeet Ghai, MD (*Abstract Co-Author*)

PURPOSE

Evaluate the diagnostic performance of a locally developed Toronto MRI scoring system post-Focal Therapy (FT) and compare with other published systems (PI-FAB and TARGET). Assess inter-reader agreement among three readers for Toronto, PI-FAB, and TARGET scores.

METHODS AND MATERIALS

This retrospective study included patients with intermediate-risk PCa treated with primary FT using US- or MR-guided high-frequency ultrasound or MR-guided focal laser ablation. Patients underwent 'protocol' or 'for cause' follow-up mpMRI and biopsy at 6-48 months after FT. Review of a training dataset of mpMRI scans after FT was used by three fellowship-trained radiologists (7,10,18 years of experience) to establish a set of 3-point imaging descriptors for T2-WI, DCE and DWI each. Thereafter, two separate 5-point scoring systems - one for the peripheral zone (PZ) and other for transition zone (TZ) were finalised. 148 mpMRI scans after FT were independently scored by the 3 radiologists using the Toronto, PI-FAB, and TARGET systems. Diagnostic performance metrics were calculated.

RESULTS

Results: 41/148 mpMRI scans (27.7%) had csPCa (=GG2 PCa). For the most experienced reader, the Toronto Score had an overall sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of 75.6%, 68.2%, 47.7% and 88% respectively. When using PI-FAB, the values were 61.0%, 77.6%, 51.0%, and 83.8%; and for TARGET, the values were 63.4%, 72.9%, 47.3% and 83.9% respectively. For baseline tumors in TZ, the sensitivity, specificity, PPV and NPV for the Toronto score was 71.4%, 71.4%, 38.5% and 91.9% compared to 28.6%, 92.9%, 50.0% and 83.9% for PI-FAB and 28.6%, 85.7%, 33.3%, 82.8% for TARGET. For tumors in the PZ, the sensitivity, specificity, PPV, and NPV for the Toronto score were 76.5%, 67.1%, 50%, and 86.9%; for PI-FAB score were 67.6%, 72.2%, 51.1%, and 83.8%, and for TARGET was 70.6%, 68.4%, 49%, and 84.4% respectively.Inter-reader agreement among the three readers showed a GWET's AC2 value as follows: Toronto score 0.782 (95% CI: 0.716-0.849; PI-FAB 0.789 (95% CI: 0.708-0.870) and TARGET 0.787 (95% CI: 0.714-0.860), p <0.001

CONCLUSION

Results suggest that a separate assessment of the PZ and TZ, as performed in Toronto score, may improve the mpMRI diagnostic performance after FT compared to PI-FAB and TARGET. Specifically, the Toronto score showed higher sensitivity for TZ tumors while maintaining a high NPV.

CLINICAL RELEVANCE/APPLICATION

The Toronto scoring system offers improved detection of PCa recurrence after FT, potentially providing a high sensitivity for detecting recurrent PCa while reducing the need for repeated biopsies after FT.

R5A-SPGU-3 99MTC-SESTAMIBI SPECT/CT DIFFERENTIATES RENAL ONCOCYTOMAS AND HYBRID TUMORS FROM MALIGNANT MIMICS

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PURPOSE

To determine the diagnostic performance of 99mTc-sestamibi single-photon emission CT/CT (SPECT/CT) in distinguishing benign renal oncocytomas and hybrid oncocytic-chromophobe tumors (HOCTs) from malignant renal masses.

METHODS AND MATERIALS

A retrospective study included 20 patients (71 renal masses) who underwent 99mTc-sestamibi SPECT/CT at the NIH Clinical Center. Radiotracer uptake was categorized as hot (suggesting oncocytoma/HOCT) or cold (suggesting other renal cell carcinoma subtypes). Two blinded abdominal radiologists interpreted scans independently; disagreements were resolved by consensus. Histopathology served as the reference standard. Diagnostic metrics (sensitivity, specificity, accuracy) and inter-reader agreement (?) were calculated.

RESULTS

Among the 71 renal masses evaluated, histopathology identified 31 oncocytomas (43.6 %), 24 hybrid oncocytic-chromophobe tumors (HOCTs; 33.8 %), 13 chromophobe or papillary renal cell carcinomas (RCCs; 18.6 %), and 3 clear-cell RCCs (4.2 %). 99mTc-sestamibi SPECT/CT correctly classified lesions with an overall accuracy of 91.5 %, achieving a sensitivity of 100 % for detecting oncocytomas and HOCTs but a specificity of 62.5 % for excluding malignant masses. Inter-reader agreement between the two radiologists was moderate (? = 0.465). Notably, unexpected radiotracer uptake ("hot" appearance) occurred in 66.7 % of chromophobe and papillary RCCs, contributing to false-positive findings and highlighting areas for potential refinement in image interpretation.

CONCLUSION

Our study confirms that 99mTc-sestamibi SPECT/CT is a highly sensitive tool for identifying mitochondria-rich benign renal masses, correctly classifying all oncocytomas and HOCTs and yielding an overall accuracy of 91.5 %. Specificity, however, remained moderate because substantial radiotracer uptake was also observed in chromophobe, papillary type 1 RCCs, and clear-cell RCCs. These false-positive findings, together with only moderate inter-reader agreement, highlight the need for standardized interpretation criteria, incorporation of quantitative uptake metrics, and consensus or double-reading to optimize diagnostic confidence.

CLINICAL RELEVANCE/APPLICATION

Implementing 99mTc-sestamibi SPECT/CT could substantially reduce unnecessary nephrectomies and overtreatment of benign renal masses, supporting more patient-tailored management while highlighting the need for strategies that improve specificity.

R5A-SPGU-4 QUANTITATIVE FLOW PARAMETERS DIFFERENTIATING ONCOCYTOMA AND PAPILLARY RENAL CANCER FROM CLEAR CELL RENAL CANCER WITH PERFUSION CT

Alex Chung, MD (*Presenter*)
Sara Babapour, MD (*Abstract Co-Author*)
James W. Sayre, PhD,MS (*Abstract Co-Author*)
Steven S. Raman, MD (*Abstract Co-Author*)

PURPOSE

To evaluate quantitative differences in perfusion CT (pCT) parameters for differentiation of clear cell renal cell carcinoma (ccRCC) from papillary RCC (pRCC) and oncocytoma (Onc)

METHODS AND MATERIALS

With IRB approval & HIPAA compliance, we derived a study cohort of 76 consecutive patients who underwent pCT (Force, Siemens Healthineers (SH), Erlangen, Germany) for a known or suspected indeterminate solid renal mass. Virtual reconstructions of the noncontrast, corticomedullary, & nephrographic phases were generated using Syngo Via (SH, Malvern, PA). Volumes of interest were drawn on the most enhancing portion of the mass as well as normal ipsilateral & contralateral renal cortex during the corticomedullary phase. Perfusion parameters of blood flow (BF), blood volume (BV), mean transit time (MTT), flow extraction (FE), time to peak (TTP), absolute peak Hounsfield Units (pHU) values were generated from the perfusion curves & normalized to the ipsilateral cortex (IpCx) except for pHU. Perfusion parameters were compared by ANOVA between tumors grouped by their pathology results & by two-tailed paired sample t test between tumors & ipsilateral cortex.

RESULTS

Of 76 patients who underwent pCT, 46, 13 & 17 were ccRCC, pRCC & Onc, respectively. Significant differences were as follows: Between ccRCC & pRCC in BF, BV, FE, pHU and TTP (all $p=0.01$); between ccRCC & Onc in BV ($p=0.01$), pHU ($p=0.04$) and TTP ($p=0.03$); between pRCC & Onc in BF, BV, FE and pHU (all $p<0.01$). MTT was similar among groups ($p>0.05$). Significant differences were as follows versus IpCx: For ccRCC in MTT ($p=0.02$), FE ($p=0.04$) and TTP ($p<0.01$); for pRCC in BF, BV, FE, pHU and TTP (all $p<0.01$); For Onc in BV ($p<0.01$) and pHU ($p=0.01$).

CONCLUSION

Significant differences were demonstrated in BF, BV, FE, pHU and TTP between ccRCC & pRCC, in BV, pHU and TTP between ccRCC and in BF, BV, FE & pHU between pRCC & onc. Relative enhancement parameters of ccRCC, pRCC & Onc compared to IpCx demonstrated significant differences in certain parameters.

CLINICAL RELEVANCE/APPLICATION

Relative CT perfusion parameters differ by renal mass histological subtype and may help characterize common solid renal lesions if validated.

R5A-SPGU-5 EVALUATING EXTRAPROSTATIC EXTENSION OF PROSTATE CANCER: PRAGMATIC INTEGRATION OF MRI AND PSMA-PET/CT

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Charlotte Charbel, MD (*Abstract Co-Author*)
Marius E. Mayerhoefer, MD, PhD (*Abstract Co-Author*)
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Angela Tong, MD (*Abstract Co-Author*)
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Michael J. Zelefsky, MD (*Abstract Co-Author*)
Hebert Alberto Vargas, MD (*Abstract Co-Author*)

PURPOSE

To explore pragmatic approaches integrating MRI and PSMA-PET/CT for evaluating extraprostatic extension (EPE) of prostate cancer (PCa).

METHODS AND MATERIALS

Consecutive patients with newly-diagnosed PCa that underwent multiparametric MRI and PSMA-PET/CT, followed by prostatectomy in 2021-2024 were included. Imaging parameters assessed on both modalities were: size, length of capsular contact (LCC), Likert scales (MRI EPE grade, PSMA Likert scale), PI-RADS/PRIMARY scores, and SUV max . Three pragmatic integrated approaches were tested: (1) Integration of Likert scales (positive if either or both MRI and PSMA-PET/CT were positive); (2) P score (framework combining PI-RADS+PRIMARY); and (3) combining MRI morphological information (LCC) with PSMA-PET/CT functional information (upgrading suspicion of lesions with LCC below cutoff if SUV max >12). Diagnostic performance was tested with receiver ROC curves and compared using DeLong and McNemar tests.

RESULTS

67 men (median age, 66 years) with EPE in 76.1% (51/67) were included. Area under ROC curves (AUC) were 0.61-0.82; MRI-based yielded the highest AUC 0.82 (0.71-0.92) with cutoff of =1.7 cm. Integrated Likert scale (MRI EPE grade/PSMA Likert scale) showed sensitivity of 80.4% (41/51) and specificity of 31.3% (5/16). P score (PI-RADS/PRIMARY) demonstrated sensitivity of 31.3% (16/51) and specificity of 87.5% (14/16). Combining morphological MRI information with functional PSMA-PET/CT yielded sensitivity and specificity of 80.4% (41/51) and 81.2% (13/16), respectively, which demonstrated significantly higher sensitivity but non-significantly different specificity compared with MRI-based LCC alone (66.7% [34/51, $p=0.02$] and 87.5% [14/16, $p>0.99$]). This approach upgraded suspicion in 8 patients with LCC<1.7 cm due to SUV max >12 among which 87.5% (7/8) were corrected upgraded and had pathological EPE.

CONCLUSION

Several pragmatic approaches were explored for integrating MRI and PSMA-PET/CT to assess EPE in PCa. Combining morphological information from MRI and PSMA expression on PET/CT demonstrated good diagnostic performance and may be a simple pragmatic integrated method that can be used.

CLINICAL RELEVANCE/APPLICATION

Accurate assessment of EPE at the time of PCa diagnosis is important for patient management. While prostate MRI is currently the recommended imaging modality for locoregional staging of PCa, there is also growing interest in using PSMA-PET/CT for primary tumor evaluation. However, it has not been well established how to

integrate information from both modalities. The results of this study show that combining morphological information from MRI and PSMA expression on PET/CT can be a simple and pragmatic solution for performing integrated EPE assessment.
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R5A-SPHN

Head & Neck Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPHN-1 DEEP LEARNING AND RADIOMICS-BASED ANALYSIS OF THE POSITIONAL RELATIONSHIP BETWEEN THE FIRST MOLAR AND THE MAXILLARY SINUS FLOOR

Aritrick Chatterjee, PhD (*Presenter*)
Bowen Liu (*Abstract Co-Author*)
Dianning He (*Abstract Co-Author*)
Nan Lei (*Abstract Co-Author*)
Guantian Huang (*Abstract Co-Author*)
Shouliang Qi (*Abstract Co-Author*)
Wei Qian (*Abstract Co-Author*)
Ting Liu (*Abstract Co-Author*)
Xin Shi (*Abstract Co-Author*)

PURPOSE

The spatial relationship between the maxillary first molar and the maxillary sinus floor is crucial for clinical diagnosis and sinus floor elevation procedures. However, current assessment methods largely rely on clinicians' subjective judgment. Therefore, this study aims to objectively classify and evaluate this anatomical relationship using deep learning and radiomics approaches based on CBCT and panoramic radiographic images.

METHODS AND MATERIALS

A total of 132 CBCT scans and 152 panoramic radiographs were collected from patients at the Stomatological Hospital of China Medical University. For CBCT data, the key lesion slice of each patient was selected, and the regions containing the maxillary sinus floor and the roots of the first molar were cropped separately for the left and right sides. For panoramic radiographs, the regions of interest (ROIs) containing the first molar roots and the maxillary sinus floor were also cropped bilaterally. Two analytical approaches were applied:The first method is that deep learning uses the ResNet18_CBAM model for classification. This model is based on the ResNet18 backbone network, integrates the Convolutional Block Attention Module (CBAM) and Dropout regularization, and finally outputs the classification results through the sigmoid function. The second method uses PyRadiomics to extract radiomics features, and then combines Support Vector Machine (SVM) and cross-validation for classification.

RESULTS

In CBCT image classification using the deep learning approach, the highest accuracy on the left validation set was 77%. For the right side, the highest accuracy on the right validation set was 86%.Using the machine learning approach, the average ACC and AUC were 74.24% and 0.73 for the left side, and 73.44% and 0.68 for the right side, respectively. For panoramic radiographs, in the deep learning classification, the highest validation accuracy was 80% on the left side and 74% on the right side. Using the machine learning approach, the average ACC and AUC were 72.43% and 0.68 for the left side, and 63.81% and 0.62 for the right side.

CONCLUSION

This study proposes a classification framework based on deep learning and radiomics to effectively identify the positional relationship between the maxillary first molar and the sinus floor. This framework is applicable to both volumetric imaging (CBCT) and projection imaging (panoramic radiographs), offering an objective diagnostic tool for clinical dentistry.

CLINICAL RELEVANCE/APPLICATION

T his study supports dental professionals in preoperative risk assessment and treatment planning, reducing surgical complications and improving patient outcomes.

R5A-SPHN-2 DIFIUSION-WEIGHTED IMAGING COMBINED WITH AMIDE PROTON TRANSFER WEIGHTED IMAGING WAS USED TO DIFFERENTIATE BENIGN AND MALIGNANT PAROTID GLAND TUMORSDIFIUSION-WEIGHTED IMAGING COMBINED WITH AMIDE PROTON TRANSFER WEIGHTED IMAGING WAS USED TO DIFFERENTIATE PLEOMORPHIC ADENOMA OF THE PAROTID GLAND FROM WARTHIN TUMOR

Feng Yu (*Presenter*)
Lijun Wang (*Abstract Co-Author*)

PURPOSE

To investigate the value of diffusion-weighted imaging (DWI) combined with amide proton transfer weighted imaging (APTw) sequences to identify pleomorphic adenoma of the parotid gland and Warthin tumor.

METHODS AND MATERIALS

We retrospectively analyzed the data of 38 patients with pleomorphic adenoma of the parotid gland and 24 patients with Warthin's tumor who underwent 3.0 TMRI and were pathologically confirmed at our hospital. The scanning sequences included TIWI, T2WI, DWI and APT sequences. Two observers measured the ADC values and APT values of the lesions in the two groups. Differences in ADC and APT values between the two groups of cases were analyzed using the independent samples t-test or Mann-Whitney U-test.Logistic regression was used to analyze parameters with statistically significant differences and their diagnostic models in conjunction with baseline information. Receiver operatingcharacteristic curves were used to assess the diagnostic efficacy of the differentiated parameters and the combined model. The DeLong test was used to compare the differences in the area under the ROC curves. Spearman's correlation coefficient was used to analyze the correlation between ADC values and T2 values.

RESULTS

The agreement between the measurements of the two observers was good (ICC>0.75). ADC values were higher in the pleomorphic adenoma group than in the Warthin tumor group, and APT values were lower than in the Warthin tumor group, and the differences were statistically significant (P<0.01).The ADC values, APT values, and

the AUC values of the two combined to differentiate pleomorphic adenomas from Warthin tumors were 0.878, 0.679, and 0.882, respectively.DeLong's test showed that the ADC values and the AUC for the combined differential diagnosis of pleomorphic adenoma of the parotid gland and Warthin tumor were greater than the APT values (Z=2.153, P=0.031; Z=2.315, ,P=0.021) ,and the difference between the ADC values and the AUC for the combination of the two was not statistically significant (Z=0.313, P=0.754).There was no correlation between the ADC values and the APT values (r=- 0.133, P=0.303).

CONCLUSION

DWI and APT sequences have good value in differentiating pleomorphic adenoma of the parotid gland from Warthin tumor, and the diagnostic efficacy of the two is improved when they are combined, which can provide good guidance for the non-invasive clinical diagnosis of pleomorphic adenoma and Warthin tumor.

CLINICAL RELEVANCE/APPLICATION

DWI and APT sequences have good value in differentiating pleomorphic adenoma of the parotid gland from Warthin tumor, and the diagnostic efficacy of the two is improved when they are combined, which can provide good guidance for the non-invasive clinical diagnosis of pleomorphic adenoma and Warthin tumor.

R5A-SPHN-7 EVALUATION OF BENIGN AND MALIGNANT CERVICAL LYMPHADENOPATHY: A COMPARATIVE STUDY OF SHEAR WAVE ELASTOGRAPHY AND GRAYSCALE ULTRASOUND

Gaurav Gaurav, MD, MBBS (*Presenter*)

PURPOSE

To evaluate role of shear wave elastography (SWE) using a novel methodology for differentiation of benign and malignant cervical lymph nodes.

METHODS AND MATERIALS

SWE was performed on 38 patients who presented with cervical lymphadenopathy. Color-coded elasticity maps were obtained, from which the stiffest region of interest (ROI) with a diameter of 2mm was chosen. Maximum and mean Young’s modulus values (Kpa) were calculated in selected 2-mm ROI. Finally, the results were correlated with the fine needle aspiration cytology findings in all patients to assess the diagnostic accuracy, sensitivity, and specificity at a defined cutoff value for distinguishing between benign and malignant lymphadenopathies.

RESULTS

There were 20 malignant cervical lymph nodes and 18 benign cervical lymphnodes. Malignant nodes showed significantly higher mean Young’s modulus value (154.2+-46.19 kPa) compared with benign nodes (70.39+-30.76 kPa), with a p-value of less than 0.0001. Our findings indicate that the mean Young modulus value within a standardized 2-mm ROI outperformed grayscale ultrasound in terms of diagnostic accuracy (92.1 vs. 78.9%), sensitivity (100 vs. 80%), and specificity (83.3 vs. 77.7%), with the established cutoff values for high diagnostic accuracy indicating malignancy as greater than 92 for mean Young’s modulus with an area under the curve of 0.964.

CONCLUSION

SWE using a standardized 2-mm ROI provides improved sensitivity anddiagnostic accuracy for differentiation of benign and malignant lymph node lesions.

CLINICAL RELEVANCE/APPLICATION

SWE can aid in the evaluation of lymph nodes and when integrated with clinical and imaging data, has the potential to reduce reliance on invasive procedures in selected cases.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

R5A-SPIN

Imaging Informatics Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPIN-1 AN EFFICIENT AND INTERPRETABLE BERT-BASED EVALUATION METRIC FOR FINE-GRAINED ASSESSMENT OF GENERATED RADIOLOGY REPORTS

Gihun Cho, BS (*Presenter*)
Seunghyun Jang, MEng (*Abstract Co-Author*)
Hanbin Ko (*Abstract Co-Author*)
Inhyeok Baek (*Abstract Co-Author*)
Chang Min Park, MD, PhD (*Abstract Co-Author*)

PURPOSE

Current evaluation metrics for radiology report generation (RRG) often lack interpretability or rely on computationally intensive large language models (LLMs). We introduce a novel BERT-based multi-target regression model for efficient quantification of error categories in generated radiology reports, aiming for high correlation with expert radiologist assessments.

METHODS AND MATERIALS

We developed a multi-target regression model using a pre-trained BERT model (PubMedBERT). The model features six regression heads, each predicting the count of each error category: 1. False prediction, 2. Omission of finding, 3. Incorrect location, 4. Incorrect severity of finding, 5. Erroneous comparison mentioned, and 6. Omission of comparison. The training dataset comprised 32,000 pairs of MIMIC-CXR reports and candidate reports generated by an RRG model (CheXagent). Error counts for these pairs, serving as labels for the six categories, were annotated by an LLM (gemini-2.5-pro-preview-03-25) using a structured prompting strategy. Evaluation was performed on the ReXVal dataset, comparing predicted total error counts against the average total error counts from six board-certified radiologists using Kendall's Tau coefficient.

RESULTS

Our model achieved a Kendall's Tau coefficient of 0.767 (95% CI: [0.724, 0.803]) when correlating its predicted total error counts with expert radiologist assessments on the ReXVal dataset. For reference, an LLM-based approach using gemini-2.5-pro-preview-03-25 for direct error counting (GREEN error count) on the same dataset yielded a Kendall's Tau of 0.756 (95% CI: [0.703, 0.803]). Our model demonstrated a significantly faster inference speed of approximately 20 ms per sample on a single GPU. Furthermore, the model provides a granular breakdown of error counts across the six predefined categories.

CONCLUSION

A BERT-based multi-target regression model can accurately and efficiently quantify fine-grained errors in generated radiology reports, showing strong correlation with expert radiologists. This approach offers substantial advantages in inference speed and computational efficiency compared to direct LLM-based evaluations, while providing interpretable, category-specific error counts.

CLINICAL RELEVANCE/APPLICATION

Our method provides a practical, efficient tool for the crucial task of evaluating AI-generated radiology reports. It enables rapid quality assessment and specific error identification, accelerating RRG system refinement for research and supporting quality assurance for clinical translation, ultimately aiming to improve diagnostic accuracy and workflow.

R5A-SPIN-2 MRI DEEP LEARNING RECONSTRUCTION IMPROVES RADIOMIC FEATURE STABILITY

Achraf Kanan, MD (*Presenter*)
Gabriel Ballout, MD (*Abstract Co-Author*)
Bruno Pereira (*Abstract Co-Author*)
Lucie Cassagnes, PhD (*Abstract Co-Author*)
Pascal Chabrot, MD, PhD (*Abstract Co-Author*)
Benoit Magnin, MD,MSc (*Abstract Co-Author*)

PURPOSE

Radiomic analysis is impacted by the parameters used in image acquisition and reconstruction. Deep Learning (DL) reconstruction methods are increasingly used in MRI to effectively reduce noise, leading to enhanced image quality. However, their impact on radiomic features, particularly regarding stability, has not yet been explored. To compare the reproducibility and repeatability of MRI radiomic features between conventional and DL reconstructions.

METHODS AND MATERIALS

An MRI protocol comprising seven sequences was conducted on a 1.5T GE Healthcare™ MRI scanner using 12 pieces of fruits as phantom models. Each sequence was acquired with four distinct protocols, repeated four times. Images were reconstructed using both conventional (non-DL) and DL techniques (AIR Recon DL, GE Healthcare™). After semi-automated segmentation, 107 radiomic features were extracted. Features were defined as reproducible if the intraclass correlation coefficient (ICC(3,1)) exceeded 0.9 and repeatable if the overall concordance correlation coefficient (OCCC) was above 0.9. Additional statistical criteria and a 0.75 threshold were also tested.

RESULTS

DL reconstruction yielded 53.27% reproducible features, compared to 43.52% with conventional reconstruction, i.e. a 9.75% improvement. Among the feature types, DL improved reproducibility by 7.94% for first-order features and by 12.00% for higher-order features. The difference in repeatability between reconstructions was 0.4% in favor of DL reconstruction. The use of other statistical criteria and threshold showed the same trend.

CONCLUSION

DL reconstruction improves the reproducibility of radiomic features relative to conventional methods, supporting the use of DL-based reconstruction in MRI radiomic studies.

CLINICAL RELEVANCE/APPLICATION

DL reconstruction improves the reproducibility of radiomic features relative to conventional methods, supporting the use of DL-based reconstruction in MRI radiomic studies.

R5A-SPIN-3 IMPROVING CT DETECTION OF SUBCENTIMETER LIVER METASTASES: AI-AUGMENTED CONTRAST BOOSTING ENHANCES SENSITIVITY AND CONSPICUITY IN CHOROIDAL MELANOMA

Fiona Mankertz, MD (*Presenter*)
Josephine Berger (*Abstract Co-Author*)
Nour Maalouf, MD (*Abstract Co-Author*)
Andreas Brendlin, MD, PhD (*Abstract Co-Author*)
Saif Afat, MD (*Abstract Co-Author*)

PURPOSE

To evaluate whether AI-based contrast boosting of single-phase CT improves the detection and visual conspicuity of subcentimetre liver metastases from choroidal melanoma, using liver MRI as the reference standard.

METHODS AND MATERIALS

This retrospective single-centre study included 68 patients (mean age, 69.6 years ± 11.2 [SD]; 46% men) with histologically confirmed choroidal melanoma and suspicion of liver metastases, included between January 2019 and July 2022. All patients underwent portal venous phase contrast-enhanced whole-body CT, as well as dedicated liver MRI. CT data was post-processed using a commercial AI-based contrast boosting algorithm (ClariACE, ClariPi, Seoul, South Korea). Liver metastases were identified on MRI and served as the reference standard. Lesions were stratified by size (<5 mm, 5-10 mm, >10 mm). Two radiologists independently evaluated each MRI-confirmed lesion for visibility on both standard and AI-boosted CT, recording binary detection (present/absent) and conspicuity on a five-point Likert scale. McNemar's test was used to compare paired detection rates between standard and boosted CT. Conspicuity scores were compared using the Wilcoxon signed-rank test. Inter-reader agreement was assessed using Cohen's kappa for detection and intraclass correlation coefficient (ICC) for conspicuity.

RESULTS

A total of 104 liver metastases were identified on MRI, including 58 <5 mm, 28 between 5-10 mm, and 18 >10 mm. Among these MRI-confirmed lesions, AI-boosted CT significantly improved detection sensitivity for sub-5 mm lesions, from 57% to 81% ($p < 0.001$, McNemar's test). A modest but non-significant increase was observed for 5-10 mm lesions (82% to 89%, $p = 0.09$), while detection of lesions >10 mm remained unchanged (100%). Median conspicuity scores for sub-5 mm lesions increased from 3.0 to 4.3 ($p < 0.001$, Wilcoxon test). Inter-reader agreement was excellent for both detection (? = 0.84) and conspicuity (ICC = 0.87). An increase in conspicuity was associated with improved detection for small lesions.

CONCLUSION

Contrast enhancement using an AI-based post-processing tool improved both sensitivity and conspicuity for detecting subcentimetre liver metastases from choroidal melanoma on CT. The largest benefit was observed in lesions smaller than 5 mm. While MRI remains the gold standard for liver lesions, added visibility without additional patient risk may support earlier recognition of metastatic disease on routine CT.

CLINICAL RELEVANCE/APPLICATION

Improved detection of small hepatic metastases by means of AI-augmented contrast post-processing may aid earlier staging and treatment planning in patients with choroidal melanoma and allow for earlier detection of incidental metastasis.

R5A-SPIN-4 CT-BASED RADIOMICS AND CLINICAL-SEMANTIC RISK PREDICTORS FOR SPREAD THOUGH AIR SPACES IN SOLID-PREDOMINANT STAGE I LUNG ADENOCARCINOMA: A MULTICENTER STUDY

Xiao-Ling Ma (*Presenter*)

PURPOSE

Spread though air spaces (STAS) is an independent prognosticator for lung adenocarcinoma, signifying a higher risk of relapse and a worse outcome. We aim to investigate the value of CT-based radiomics and clinical-semantic risk predictors for identifying STAS in solid-predominant stage I lung adenocarcinoma.

METHODS AND MATERIALS

This retrospective study enrolled 409 patients pathologically-confirmed stage I lung adenocarcinoma with consolidation-to-tumor ratio greater than 0.5 from three independent institutions. The CT-based radiomics signature predictive of STAS was developed to extract radiomics features from solid components of tumors in training cohort (n=237), and verified in independent validation cohort (n=102) and external test cohort (n=70). Patients' clinical characteristics and CT semantic features were documented. Clinical-semantic (CS) risk predictors were incorporated to construct a CS model and a clinical-semantic-radiomics (CSR) model along with radiomics signature using univariate and multivariate logistic regression analysis. Model performance was evaluated by AUC, sensitivity, specificity, calibration curve, and decision curve analysis. The comparisons of AUC were conducted by the DeLong test.

RESULTS

The radiomics signature achieved the AUC of 0.817 (95% CI: 0.762, 0.864) in training cohort, 0.803 (95% CI: 0.713, 0.875) in independent validation cohort and 0.716 (95% CI: 0.596, 0.818) in external test cohort. The AUC for CS model was 0.786 (95% CI: 0.728, 0.836), 0.788 (95% CI: 0.696, 0.863) and 0.727 (95% CI: 0.608, 0.827) across the respective cohorts, inferior to those of radiomics signature. Encouragingly, the combined CSR model achieved the highest AUC of 0.837 (95% CI: 0.783, 0.881), 0.829 (95% CI: 0.741, 0.896) and 0.748 (95% CI: 0.630, 0.844) across all three cohorts, indicating the incorporation of radiomics signature provided an incremental benefit over CS model. The calibration curves and decision curve analysis further verified the clinical utility of CSR model.

CONCLUSION

The CSR model based on clinical-semantic risk predictors and radiomics signature offers a promising predictive performance in predicting STAS, offering a valuable complement to individual CS model.

CLINICAL RELEVANCE/APPLICATION

The proposed model combining clinical-semantic risk predictors and radiomics signature holds significant potential as a noninvasive tool for preoperative assessment of STAS, which might serve as a helpful tool in directing surgical strategy and informing therapeutic decision-making.

R5A-SPIN-5 TRENDS IN THE UTILIZATION OF PERCUTANEOUS VERTEBROPLASTY AND KYPHOPLASTY AMONG MEDICARE PART B BENEFICIARIES FROM 2001-2022

Arsalan Nadeem, MBBS (*Presenter*)
Talha Iqbal, MBBS (*Abstract Co-Author*)

PURPOSE

To find and explain the trends in the utilization of percutaneous vertebroplasty and percutaneous kyphoplasty among Medicare Part B beneficiaries.

METHODS AND MATERIALS

Publicly available Centers for Medicare & Medicaid (CMS) Part B national summary data files from 2001 to 2022 were used for this study. For the 2001 to 2014 summary files, Current Procedural Terminology (CPT) codes 22520 and 22521 were used to identify vertebroplasty data. Codes 22510 and 22511 were used for the summary files from 2015 to 2022. CPT codes 22523 and 22524 were used to identify kyphoplasty data in the summary files from 2006 to 2014. Codes 22513 and 22514 were used for the summary files from 2015 to 2022. The annual count of the total Medicare Part B beneficiaries for these codes were extracted from the summary files. The total counts were converted to count per 10,000,000 of the total Medicare Part B beneficiaries for the respective year. This was done in order to make the counts comparable across different years. The data for the annual number of total Medicare Part B beneficiaries used for this conversion was obtained from the Harvey L. Neiman Health Policy Institute website. Joinpoint regression was used to identify the inflection points in the utilization of the two procedures. Significance level for the Annual Percent Changes (APCs) to be significantly different from 0 was set at 0.05.

RESULTS

The highest annual number of vertebroplasty beneficiaries per 10,000,000 were in 2008 (9512.45) and the lowest in 2022 (1664.80). For kyphoplasty, this value was the highest in 2009 (15897.62) and the lowest in 2006 (13016.90). Joinpoint regression identified three jointpoints at 2003, 2009 and 2012 for the vertebroplasty beneficiaries per 10,000,000 from 2001 to 2022. APCs obtained for 2001-2003, 2003-2009, 2009-2012 and 2012-2022 were 31.17 (P = 0.01), 3.80 (P = 0.08), -21.46 (P = 0.01) and -10.27 (P > 0.001) respectively. No joinpoint was identified for the kyphoplasty beneficiaries per 10,000,000 from 2006 to 2022 (APC = -0.18, P = 0.62).

CONCLUSION

Vertebroplasty beneficiaries peaked in 2008, with a notable inflection point in 2009 and significant decline afterwards.This was probably due to the publication of randomized controlled trials in 2009 that questioned vertebroplasty's efficacy and the subsequent 2010 American Academy of Orthopedic Surgeons (AAOS) guidelines advising against its routine use. In contrast, kyphoplasty utilization remained relatively stable, with only a modest decline during the COVID-19 pandemic years.

CLINICAL RELEVANCE/APPLICATION

The sustained use of kyphoplasty, despite the declining use of vertebroplasty, emphasizes its superiority in pain relief, better safety profile and vertebral height restoration.

R5A-SPIN-6 TRUST: A NOVEL FIVE-POINT SCALE FOR ASSESSMENT OF RELIABILITY AND REFERENCING INTEGRITY IN AI AGENT GENERATED RADIOLOGY REPORTS

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FURQUAN AHMAD (*Abstract Co-Author*)
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Bhavya Ratan Maroo, MBBS (*Abstract Co-Author*)
Sharwon Pius (*Abstract Co-Author*)
Abhiraj Baratam (*Abstract Co-Author*)

PURPOSE

Reference hallucination represents a critical patient safety concern in AI-generated radiology reports that existing quality metrics fail to address. While general draft quality assessments exist, no standardized metric specifically evaluates citation reliability. We introduce TRUST, a five-point Likert-type scale (Terrible, Risky, Usable, Supported, and Traceable), designed to objectively evaluate the reference integrity of grounded AI-generated drafts. Additionally, we analyze the reliability of distinct LLM augmented agentic pipelines to determine the robustness and reproducibility of agentic radiology workflows.

METHODS AND MATERIALS

Eighty preliminary drafts were generated using the novel RadNexus agentic pipeline (which generates references) utilising four popular and lightweight LLMs (GPT-4o, GPT-4o-mini, GPT-4.1-mini and GPT-4.1-nano), each applied to 20 unique multi-organ prompts. Four blinded radiologists independently rated each draft using the TRUST scale (1 to 5), focusing specifically on reference accuracy, completeness, and traceability. Score distributions across models were compared using the Friedman test. Inter-reader agreement was quantified for the two reader-pairs reviewing identical prompts (quadratic-weighted ?). Criterion validity was assessed through manual audit of citation errors in reports across TRUST score levels by a board certified radiologist.

RESULTS

Median TRUST scores varied descriptively (gpt-4.1-mini and gpt-4o-mini = 5; gpt-4.1-nano = 5; gpt-4o = 4), with differences approaching statistical significance (Friedman $?^2$ = 7.47, df = 3, p = 0.058). Inter-reader agreement showed improvement over general quality assessments: Pair A (Doctors 1 & 3): ? = -0.26 (poor); Pair B (Doctors 2 & 4): ? = 0.24 (fair). Manual audit confirmed strong correlation between TRUST ratings and actual citation error rates (? = -0.67, p < 0.001), validating the scale's specific focus on reference integrity.

CONCLUSION

TRUST provides a specialized, reproducible framework for evaluating citation integrity in AI-generated reports, a safety dimension not captured by existing NLP metrics. The scale successfully differentiates between reports with reliable references and those containing hallucinated citations. Reader calibration remains essential to strengthen inter-observer consistency.

CLINICAL RELEVANCE/APPLICATION

Reference hallucination represents a significant safety risk in AI-augmented reporting workflows, as we move towards semi-autonomous reporting. TRUST enables radiologists to efficiently evaluate citation reliability of grounded agentic workflows, supporting safer implementation of reporting systems while protecting against false or incomplete reference errors.

R5A-SPIN-7 VALIDATION OF RADAR AND TRUST METRICS: ANALYZING INTER-READER AGREEMENT AND DRAFT VARIABILITY IN AGENTIC RADIOLOGY REPORTING

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Devansh Lalwani (*Abstract Co-Author*)
Abhiraj Baratam (*Abstract Co-Author*)
Antarjot Kaur Rekhi (*Abstract Co-Author*)
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Kartik Vuthoo (*Abstract Co-Author*)
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Suvrankar Datta, MD, MBBS (*Abstract Co-Author*)
Sharwon Pius (*Abstract Co-Author*)

PURPOSE

Reliable interpretation of drafts from agentic radiology systems is crucial for workflow integration. Current evaluation frameworks lack systematic assessment of inter-reader agreement on standardized quality and reliability metrics, and model-specific output variability. This study introduces two new metrics: RADAR, which rates the quality and readiness of drafts on a 5-point scale, and TRUST, which evaluates draft reliability and reference integrity on a similar scale. It also analyzes lexical and factual variability across agents to assess the robustness and reproducibility of agentic radiology workflows.

METHODS AND MATERIALS

Eighty preliminary radiology drafts were generated using the RadNexus agentic pipeline across four lightweight LLMs (GPT-4o, GPT-4o-mini, GPT-4.1-mini and GPT-4.1-nano). Two independent reader pairs (1 & 3; 2 & 4) scored drafts using 5-point RADAR and TRUST scales. Inter-reader agreement was assessed using Cohen's kappa. To evaluate model reproducibility, each input was processed twice, and absolute differences in BLEU, ROUGE-L, and RaTEScore were computed. Dispersion was compared across models using Friedman and Wilcoxon tests.

RESULTS

Inter-reader agreement was poor for RADAR (? = -0.23, -0.04) and variable for TRUST (? = -0.18, 0.07). GPT-4.1-nano showed the highest output consistency (BLEU ? = 0.06, ROUGE-L ? ˜ 0.02, RATE ? = 0.14), whereas the other models displayed markedly larger spreads. No significant differences were detected in RaTEScore dispersion (Levene p = 0.43); by contrast, dispersion in BLEU and ROUGE-L was significant before multiple-comparison correction (both $p < 0.001$) and would be attenuated, though still the lowest for gpt-4.1-nano, after a strict adjustment.

CONCLUSION

RADAR and TRUST enable structured evaluation of agentic outputs, but inter-reader variability limits standalone reliability. While intra-model variability was comparable across architectures, GPT-4.1-nano demonstrated superior reproducibility across repeated runs. These results highlight the need to assess both report quality and reproducibility using both radiologist evals and automated metrics when benchmarking agentic systems.

CLINICAL RELEVANCE/APPLICATION

We present a dual-metric benchmarking framework combining human and automated assessments to evaluate agentic report quality and stability, critical for safe and scalable clinical deployment.

R5A-SPIN-8 THE DIAGNOSTIC ACCURACY OF ARTIFICIAL INTELLIGENCE MODELS IN DETECTING LYMPH NODE METASTASES IN LUNG CANCER USING ENDOBRONCHIAL ULTRASOUND (EBUS) IMAGES: A BIVARIATE DIAGNOSTIC META-ANALYSIS

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Victor Arthur Ohannesian (*Abstract Co-Author*)
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Isabelle Menezes (*Abstract Co-Author*)
Ricardo Suruagy-Motta (*Abstract Co-Author*)
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PURPOSE

To systematically evaluate the diagnostic accuracy of artificial intelligence (AI) models in detecting lymph node metastases in lung cancer using endobronchial ultrasound (EBUS) images. The objective was to estimate pooled sensitivity, specificity, likelihood ratios, diagnostic odds ratio (DOR), and area under the curve (AUC) across distinct AI architectures.

METHODS AND MATERIALS

A systematic review was conducted following PRISMA-DTA guidelines and registered in PROSPERO (CRD42025635581). Searches were performed in PubMed, Embase, Scopus, and Web of Science. Eligible studies applied AI models to classify metastatic lymph nodes using cytologic or histologic confirmation as the reference standard. Extracted outcomes included sensitivity, specificity, TP, TN, FP, FN, AUC, DOR, and likelihood ratios (LR+/LR-). AI models were categorized into four classes: CNN-A (Convolutional Neural Networks), BASM (Biomedical Application-Specific Models), AFP (Automated Frameworks and Platforms), and G-DDN (Generic Deep Neural Networks). A bivariate random-effects meta-analysis was conducted to pool estimates. Subgroup and sensitivity analyses were performed to assess heterogeneity.

RESULTS

Twenty-two studies were included. Pooled sensitivity was 87% (95% CI: 68-95%), specificity 90% (95% CI: 83-94%), and AUC 0.94 (95% CI: 0.92-0.96). The pooled DOR was 56 (95% CI: 17-182). CNN-A models showed the highest performance (AUC 0.97, DOR 182), while AFP models had the lowest (sensitivity 5.8%, DOR 5.1). Pooled likelihood ratios were LR+ 8.39 (95% CI: 4.93-14.28) and LR- 0.15 (95% CI: 0.06-0.39). Assuming a pre-test probability of 25%, this corresponds to post-test probabilities of 74% for a positive result and 5% for a negative result. Subgroup analyses revealed performance variation across architectures and study conditions.

CONCLUSION

AI models, especially CNN-A architectures, exhibit high diagnostic accuracy for detecting lymph node metastases via EBUS. However, performance heterogeneity suggests that clinical application requires model-specific validation and context-aware integration.

CLINICAL RELEVANCE/APPLICATION

Given their high sensitivity (87%) and specificity (90%), AI models—especially CNNs—can assist in biopsy decisions for lymph nodes with indeterminate sonographic features, support lung cancer staging in nodes <1 cm, necrotic, or with inconclusive PET-CT, and serve as alternatives when ROSE is unavailable. CNNs reduce operator dependency and diagnostic variability, enabling standardized interpretation. Clinical implementation should occur in expert centers with validated models, structured data pipelines, and integration into imaging workflows.

R5A-SPIN-9 MEDICAL IMAGING 2.0 - A NEW LOOK AT PHYSICAL MEASUREMENTS OF IN VIVO BIOLOGICAL SYSTEMS FOR EARLY CANCER DETECTION

Jerome Z. Liang, PhD (*Presenter*)
Shaojie Chang, PhD (*Abstract Co-Author*)
Weiguo Cao (*Abstract Co-Author*)
Yongfeng Gao (*Abstract Co-Author*)
Marc Pomeroy (*Abstract Co-Author*)
Li Cheng Kuo, MS (*Abstract Co-Author*)

Lihong Li (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)

PURPOSE

Expert interpretation of medical images for diagnosis of lesions may not always reflect the underlying in vivo tissue pathology, particularly those categorized as indeterminate lesions (IDLs) by the experts, and thus cannot be considered a definitive truth for malignancy or benignity. This discrepancy poses a major barrier to effective low dose computed tomography (LdCT) screening for the malignant lesions or cancers at early stages of development, where unnecessary follow-ups can be costly and risky. This study aims to address this diagnostic bottleneck.

METHODS AND MATERIALS

We hypothesize that the limitation arises from the static nature of image representations, which fail to capture the dynamic biological behavior of living or in vivo tissues. Current imaging technologies lack the spatial, temporal, and spectral/energy resolutions to resolve this gap. To test this, we treat physical measurements of in vivo biological systems as dynamic tissue responses to X-ray flux across a broad energy spectrum. These interactions of in vivo tissues with X-ray energy produce intrinsic image contrast (relative to water) for each tissue type (e.g. muscle, fat, lung and bone) and energy level, encoding tissue biological information into the contrast variations across the lesion space. We reconstruct multispectral image contrasts across lesion space, assuming each tissue type has a reproducible response pattern across energies from 5 to 50 keV (in 5 keV intervals). For lesion diagnosis task, the goal is to find tissue pathological characteristics from the reconstructed multispectral image contrast variations. An example of pathological characteristic merits is tissue elasticity. A machine intelligence (MI) model is developed to extract elastic characteristic features (ECFs) from these multispectral contrast variations and integrate them using an adaptive classifier to predict lesion malignancy. Experiments were performed using LdCT screening scans, including two sets of pulmonary nodules and three sets of small, large and mass colorectal polyps. All the lesions were categorized as IDLs, thus tissue biopsy was performed. Their pathological reports were used as the ground truth for malignancy or benignity.

RESULTS

Experimental outcomes show an area under the receiver operating characteristic curve (AUC) of 0.89 for small polyps and 0.97-0.99 for the other four sets of lesions.

CONCLUSION

The presented MI model significantly outperforms current state-of-the-art references, which typically yield AUCs between 0.60 and 0.95 for the same tasks.

CLINICAL RELEVANCE/APPLICATION

MI architecture that models the underlying tissue dynamics and extract task-relevant tissue biological features can substantially enhance diagnostic accuracy in medical imaging.

R5A-SPIN-10 OPTIMAL SAMPLE SIZES FOR INTERCHANGEABILITY STUDIES IN DIAGNOSTIC IMAGING: A SIMULATION-BASED STUDY

Kyunghwa Han, PhD (*Presenter*)
Ahram Kim (*Abstract Co-Author*)
Inkyung Jung (*Abstract Co-Author*)
Jiwoo Park, MD, PhD (*Abstract Co-Author*)
Young Han Lee, MD (*Abstract Co-Author*)

PURPOSE

Testing the interchangeability of new diagnostic tests with existing ones—such as comparing radiologists to medical artificial intelligence or standard to new imaging techniques—has become increasingly important, particularly when a valid reference standard is unavailable or unnecessary. Interchangeability is established when the 95% confidence interval (CI) of the individual equivalence index (IEI)—the difference in agreement between the new and existing methods versus within the existing methods—falls within a pre-specified interchangeability equivalence criterion (IEC). The statistical significance of interchangeability depends on both the IEC and the sample size. This study aimed to determine the optimal sample size required to yield reliable results in interchangeability testing under varying conditions (e.g., agreement level, number of readers, IEC) using simulation-based approaches.

METHODS AND MATERIALS

Monte Carlo simulations were conducted to evaluate type I error and statistical power. Test results were generated from a multivariate normal distribution with pairwise correlations (both between and within diagnostic methods) set to 0.6, 0.8, or 0.9 to reflect varying agreement levels. The number of readers was set to 2, 4, or 10, and total patient counts were set to 100 or 200.

RESULTS

When the IEC was set to 0.01 or 0.025, the statistical power was effectively zero. As sample size increased—through more patients or more readers—the power to detect interchangeability improved. For 2 readers, a power of 80 percent or greater was achieved when the IEC was equal to or greater than 0.1, except when the correlation was 0.6. With 4 readers and 100 patients, 80 percent power was reached when the correlation was 0.8. With 4 readers and 200 patients, 80 percent or greater power was observed when the IEC was equal to or greater than 0.05. A motivating example from a prospective lumbar spine MRI study involving 4 radiologists and 70 patients illustrated how the 95 percent CI of the IEI is influenced by the level of agreement.

CONCLUSION

Interchangeability testing depends on the number of readers and patients, the level of agreement among raters or methods, and the chosen IEC. Careful pre-specification of the IEC and adequate sample size planning are essential to ensure valid hypothesis testing.

CLINICAL RELEVANCE/APPLICATION

This study provides practical guidance for determining the necessary sample sizes of both readers and patients when designing studies to assess the interchangeability of new versus existing diagnostic tests.

R5A-SPIN-11 EVALUATING THE RELATIONSHIP BETWEEN AI-ESTIMATED PULMONARY ARTERY OBSTRUCTION INDEX AND PULMONARY EMBOLISM DISTRIBUTION ON ROUTINE CHEST CT AND CT PULMONARY ANGIOGRAM

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PURPOSE

Although quantification of pulmonary embolism (PE) burden helps predict outcome and treatment options, it is time-consuming and cumbersome, and thus, rarely reported. We performed external validation of an AI model that detects, localizes, and segments PE to estimate pulmonary artery obstruction index (PAOI), a semiquantitative measure of PE burden based on the previously Qanadli scoring system.

METHODS AND MATERIALS

Our IRB-approved study included 754 adult patients (mean age: 61±17 years; 314 males, 440 females) who underwent chest CT pulmonary angiography (CTPA) or contrast-enhanced chest CT at one of the seven hospitals. We processed the deidentified 1-1.25mm images with the AI model (UII, United Imaging Intelligence) to obtain outputs on the presence/absence and the location of the PE and PAOI. Radiology reports and an additional review from a thoracic radiologist established the ground truth. All discrepant AI and ground truth cases were reviewed by a thoracic radiologist. In addition to Student t-test s to estimate differences between the AI-generated PAOI and PE presence, and ROC AUC for assessing PE detection statistics, we performed stratified analyses for assessing PAOI with central vs. peripheral PE, and with main/lobar/segmental/subsegmental PE.

RESULTS

The AUC ROC of the model for detecting PE was 0.89 (95% CI: 0.84 - 0.94). There were 706 PE-negative CT (93.6%) and 48 CT exams (6.4%) with PE. The AI algorithm provided PAOI values for each case. The PAOI was significantly higher in PE-positive CT (mean±SD: 23±18) compared to PE-negative CT (mean±SD: 1.2±4.8) ($p < 0.001$). There was a large difference between the mean PAOI scores for central (mean±SD: 24.3±17.2) and peripheral PE (mean±SD: 7.08±8.8). The mean PAOI scores for the main-vessel, segmental, and subsegmental PE were 35.23±18.39, 19.85±15.48, and 8.5±9.1, respectively.

CONCLUSION

AI-derived PAOI can provide an estimate of PE burden in patients with central vs. peripheral PE, and main vs. segmental/subsegmental PE locations.

CLINICAL RELEVANCE/APPLICATION

Automating pulmonary embolism burden estimation with AI can augment PE reporting and decrease radiologists' effort in describing all PE locations.

R5A-SPIN-12 "OUT-OF-THE-BOX BUT NOT OUT-OF-THE-WOODS": EVALUATING PERFORMANCE OF SMALL MULTIMODAL GENERATIVE AI FOR CHEST X-RAY INTERPRETATION

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Charit R. Tippareddy, MD (*Abstract Co-Author*)
Komal M. Awan, MD (*Abstract Co-Author*)
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PURPOSE

Small multimodal large language models (LLMs), such as LLaVA-Rad, hold promise for automated radiological report generation, offering resource efficiency for local clinical deployment. Recent works demonstrate robust performance on controlled biomedical benchmarks, positioning it as a candidate for chest X-ray (CXR) interpretation in resource-constrained settings. However, vendor-reported metrics from controlled environments may not translate to real-world clinical scenarios. This study evaluates the out-of-the-box performance of LLaVA-Rad on diverse CXR datasets to assess its generalizability and clinical readiness.

METHODS AND MATERIALS

We evaluated LLaVA-Rad on two open-access CXR datasets: the Indiana University dataset (IU: 6,469 CXRs; 3,200 patients) and the ReXGradient dataset (ReX: 273,004 CXRs; 160,000 studies; 109,487 patients). LLaVA-Rad uses a pre-trained vision encoder and a multilayer perceptron adapter to align image and text modalities. Generated reports are compared against radiologist reports using automated metrics: ROUGE-L (RL: lexical similarity); RadGraph-F1 (RF1: factual accuracy); CheXprompt (cXp: error rate via GPT comparison). Results for ReX are pending and will be updated upon completion.

RESULTS

Result for the IU dataset: RL score of 0.241 (vs. 0.306 in controlled settings); RF1 score of 0.248 (vs. 0.294); cXp error-free rate of 28.2% (vs. 26.0%), the higher error-free rate due to alignment with templated educational reports. Preliminary results for the ReX dataset: RL score of 0.231; RF1 score of 0.244; cXp error-free rate of 19.2%. Performance declined on the ReX dataset, which represents complex real-world clinical environments.

CONCLUSION

LLaVA-Rad's performance degrades as dataset complexity and variability increase. The discrepancy between GPT-based scoring and factual accuracy suggests that CheXprompt may overestimate quality in templated settings. The parallel decline in ROUGE-L and RadGraph-F1 suggests a link between lexical and factual robustness. These findings reinforce the need for domain-specific fine-tuning, careful selection of evaluation metrics, and broad dataset validation.

CLINICAL RELEVANCE/APPLICATION

This study highlights critical generalizability gaps in generative multimodal AI for radiology. Relying solely on published benchmarks or GPT-based metrics may obscure performance limitations. Clinical readiness requires testing across heterogeneous datasets and alignment with radiologist expectations. As generative AI enters deployment, out-of-the-box models must be thoroughly tested before integration into patient care workflows.

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R5A-SPIR

Interventional Radiology Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPIR-1 HEMODYNAMICS BASED Q-DSA FOR NONINVASIVE EFFICACY ASSESSMENT IN PULMONARY VASCULAR INTERVENTIONS

Jiawei Long (*Presenter*)
Jielong Lin (*Abstract Co-Author*)
Cheng Hong (*Abstract Co-Author*)
Haowen Ye (*Abstract Co-Author*)
Xinye Xia (*Abstract Co-Author*)
Daibing Zhou (*Abstract Co-Author*)
Siyu He (*Abstract Co-Author*)
Yan XU (*Abstract Co-Author*)
Yuting Ling (*Abstract Co-Author*)
Xiaoyun Liang, PhD (*Abstract Co-Author*)

PURPOSE

In pulmonary vascular interventions, traditional pulmonary pressure assessment is invasive and increases procedural complexity and cost. Quantitative digital subtraction angiography (q-DSA), a hemodynamics-based extension of DSA, enables functional evaluation of pulmonary blood flow. This study aims to evaluate the diagnostic value of q-DSA parameters and their utility in assessing treatment efficacy.

METHODS AND MATERIALS

This retrospective study included patients who underwent balloon pulmonary angioplasty for chronic thromboembolic pulmonary hypertension or pulmonary artery stent implantation for fibrosing mediastinitis from July 2020 and April 2024. Sex, age, BMI, and mean and systolic pulmonary arterial pressures proximal and distal to the stenosis were collected. Pressure gradient (dPASP) was defined as proximal minus distal pulmonary arterial systolic pressures (PASP). Offline hemodynamic analysis used a research prototype software to extract time-density curves from pre- and post-treatment DSA images. Three regions of interest (ROI) were defined (Fig.1): stenosis (ROI1), proximal post-stenosis (ROI2), distal post-stenosis (ROI3). Parameters - time to peak (TTP), peak intensity (PEAK), area under the curve (AUC), mean transit time (MTT), first-pass intensity ratio (FIR), and full width at half maximum (FWHM) - were derived. Hemodynamic ratios (e.g., rTTP 21 = TTP ROI2 /TTP ROI1) and their correlations with dPASP changes were analyzed via Spearman.

RESULTS

Seventeen patients (mean age: 57.76 ± 12.76 years; 47.06% male; 88.2% with pulmonary hypertension), and 19 vessels were analyzed (Table 1). The dPASP decreased from 17.00 mmHg to 9.00 mmHg post-treatment ($p = 0.006$) (Table 2). Only the rTTP 21 changed significantly ($p = 0.015$) (Table 3); other ratios (rPEAK, rAUC, rMTT, rFIR, rFWHM) showed no significance (all $p > 0.05$) (Table 3). Relative changes in rTTP (rrTTP) correlated positively with the changes in pressure gradient (rdPASP) ($r = 0.486$, $p = 0.035$) before and after treatment (Fig. 2).

CONCLUSION

These findings suggest that angiography-derived TTP ratios reflect pressure gradient improvements and may serve as noninvasive markers of therapeutic efficacy.

CLINICAL RELEVANCE/APPLICATION

This study provides a noninvasive approach for the evaluation of pulmonary vascular pressure and interventional efficacy.

R5A-SPIR-2 DUCTS PRESERVED, TUMORS TARGETED: HISTOTRIPSY FOR CENTRALLY LOCATED LIVER LESIONS

Valerie Khaykin (*Presenter*)
Neehar Parikh, MD (*Abstract Co-Author*)
Nathan E. Loudon, MD (*Abstract Co-Author*)
Andrew Navarro, MD (*Abstract Co-Author*)
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Man Zhang, MD, PhD (*Abstract Co-Author*)
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Elaine M. Caoili, MD, MS (*Abstract Co-Author*)
Mishal Mendiratta-Lala, MD (*Abstract Co-Author*)

PURPOSE

Patients with centrally located liver tumors often have limited treatment options due to proximity to major biliary structures. Locoregional therapies such as thermal ablation, SBRT, and embolization carry significant risks of bile duct injury, including ischemia, strictures, and biloma formation. Surgical resection is often not feasible due to involvement of critical biliary and vascular anatomy. Histotripsy, a non-invasive, non-thermal ultrasound-based ablation modality, has a unique property of tissue selectivity, resulting in sparing of critical structures such as bile ducts, thus offering a potentially safer treatment alternative for centrally located tumors. This study evaluates the safety of biliary structures and early outcomes after histotripsy for centrally located liver tumors.

METHODS AND MATERIALS

An IRB-approved HIPAA-compliant retrospective review was conducted on 14 patients treated with histotripsy for centrally located liver tumors between February 2024 and April 2025. Central tumors were defined as those adjacent to the common hepatic duct or first-order right/left biliary radicles. Histotripsy was performed as part of routine clinical care using the Edison system. Imaging was reviewed at immediate, 30-day, and 6-month post-treatment timepoints using contrast-enhanced CT or MRI to assess tumor response and biliary complications. Demographics, tumor histology, and ablation parameters were recorded.

RESULTS

14 patients (11 male, 3 female; mean age 61 years (range 45-85)) had 15 centrally located tumors treated with histotripsy, including tumor types: colorectal (n=4), cholangiocarcinoma (CCA) (n=3), neuroendocrine (NET) (n=2), ovarian (n=2), hepatocellular (HCC) (n=1), pancreas (n=1), breast (n=1), and esophagus (n=1). Average pretreatment tumor size was 24.3 mm (9-56 mm), and average post-treatment ablation zone size was 37 mm (19-67 mm). Of 15 central tumors, 12 (80%) were non-enhancing immediately post-treatment and 3 (20%) remained viable (1 CCA, 1 HCC, 1 NET). At 30-day follow-up, 10 tumors (67%) were non-viable and 5 (33%) were viable. 6-month outcome data was only available for 8 patients. Regardless of outcomes data, there were no instances of bile duct ischemia, strictures, bilomas, abscesses, or biliary ductal dilatation across all timepoints.

CONCLUSION

Our data suggest histotripsy is a safe, feasible option for centrally located liver tumors. Absence of biliary complications supports its potential as a bile duct-sparing therapy in anatomically complex cases.

CLINICAL RELEVANCE/APPLICATION

Centrally located liver tumors limit many locoregional therapy options due to risk of biliary injury and anatomic complexity. Histotripsy offers a bile duct-sparing alternative in this high-risk setting.

R5A-SPIR-4 SHIFTING PARADIGMS IN INFERIOR VENA CAVA FILTER MANAGEMENT: FIVE-YEAR MEDICARE ANALYSIS OF PROVIDER-SPECIFIC TRENDS

Zain Hussain, MD (*Presenter*)
Yusuf Zaidi (*Abstract Co-Author*)
Hamza Masood (*Abstract Co-Author*)

PURPOSE

To quantify 2017-2021 national trends in IVC-filter placement and retrieval among Medicare beneficiaries and to determine how provider specialty has reshaped market share in response to FDA safety advisories and evolving guidelines.

METHODS AND MATERIALS

Annual CMS Medicare Part B Public-Use-File data (2017-2021) were queried for CPT 37191 (placement) and CPT 37197 (retrieval). Volumes were stratified by billing specialty, Radiology, Surgery, Cardiology, Other, and by year. Univariate linear regression estimated annual rate-of-change (ß, 95% CI). Market share was expressed as each specialty's percentage of all retrievals per year. Analyses were performed in SPSS v29.

RESULTS

A total of 25,509 placements and 870 retrievals were billed during the study window. Placements fell 57.7% (7,979?3,376); retrievals declined 61.2% (263?102). Radiology performed 78.8% of placements (ß = -917 procedures/year; p<0.01) and 60.2% of retrievals (ß = -10.9 retrievals/year; p<0.01). Cardiology's retrieval share plummeted from 46.4% in 2017 to 0% in 2021 (ß = -19.1; p<0.01). Radiology's retrieval dominance surged from 43.7% to 81.4%, while Surgery's share rose modestly from 9.9% to 18.6% (ß = -2.3; NS). Overall retrieval-to-placement ratio remained low (3.4%) and did not improve over time.

CONCLUSION

Medicare data confirm a sharp contraction in IVC-filter utilization but no parallel improvement in retrieval rates. Radiologists now perform >80% of retrievals, whereas other specialties have virtually exited this space. Persistent under-retrieval highlights an unmet need for coordinated, specialty-agnostic follow-up pathways.

CLINICAL RELEVANCE/APPLICATION

As IVC-filter management consolidates under Radiology, radiologists must lead system-level solutions to close the retrieval gap and align real-world practice with the 2005 FDA advisory statement.

R5A-SPIR-5 EFFICACY OF HEPATIC VEIN OCCLUSION FOR HEPATOPULMONARY SHUNT REDUCTION IN ^{90}Y RADIOEMBOLIZATION: QUANTITATIVE ANALYSIS OF PRE-TREATMENT ^{99M}TC-MAA SPECT/CT AND POST-TREATMENT ^{90}Y PET/CT

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Lynne N. Martin, MD (*Abstract Co-Author*)
Andrew Kesselman, MD (*Abstract Co-Author*)
Jagruti Shah, MD, MBBS (*Abstract Co-Author*)
Erin E. Grady, MD (*Abstract Co-Author*)
Andrei Iagaru, MD (*Abstract Co-Author*)
Matthew Hung, MD (*Abstract Co-Author*)
Kip E. Guja, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the efficacy of hepatic vein occlusion (HVO) in reducing hepatopulmonary shunt fraction (HPSF) in patients undergoing radioembolization by comparing pre-treatment 99m Tc-macroaggregated albumin (MAA) SPECT/CT and post-treatment 90 Y PET/CT.

METHODS AND MATERIALS

A single-center, retrospective analysis of hepatic 90 Y radioembolization between 2004-2024 identified 22 patients undergoing 25 treatments with HVO for high HPSF. Inclusion criterion was availability of post-treatment 90 Y PET/CT with full lung coverage (6 patients). Hepatic venography was evaluated for tumor-in-vein and collateral flow. Temporary or permanent HVO was performed at the discretion of IR. 90 Y PET/CT was acquired on a digital scanner over 20 mins in 2 bed positions. HPSF was calculated on both pre-treatment 99m Tc-MAA SPECT/CT and post-treatment 90 Y PET/CT using [(lung activity) / (liver activity + lung activity)] in an established workflow (MIM Software Inc, Cleveland OH). Pre-HPSF on 99m Tc-MAA planar imaging was similarly calculated using geometric mean. Absolute HPSF and relative change percentages were recorded between 99m Tc-MAA SPECT/CT and 90 Y PET/CT. Paired statistical analysis was performed with Wilcoxon signed-rank test.

RESULTS

Six patients (50% male; median age 74 years) met the inclusion criterion and underwent radioembolization treatments for primary hepatic malignancies (N=4, 67%) and metastases (N=2, 33%). Radioembolization (glass N=4 vs. resin N=2; lobar N=3 vs. segmental N=3) was performed in a median of 9 days after 99m Tc-MAA. HVO was performed with temporary balloon occlusion (N=5, 83%) and permanent vascular plugs (N=1, 17%). Median balloon occlusion time was 30 min (range, 5-60 min). Median pre-HPSF by 99m Tc-MAA planar imaging and SPECT/CT were 22.0% (range, 13.1% to 32.0%) and 11.1% (range, 6.2% to 18.4%) respectively. Post-HPSF by 90 Y PET/CT was 3.4% (range, 1.0% to 15.6%) (p=0.063). One patient with tumor in vein and large hepatic venous collaterals had increased HPSF 11.7% to 15.6%. All remaining 5 patients without large collaterals or tumor in vein had a reduction in HPSF: median relative change of -66.7% (range, -83.9% to -52.2%) and median absolute change of -6.9% (range, -9.6% to -4.4%) when comparing 99m Tc-MAA SPECT/CT to 90 Y PET/CT.

CONCLUSION

Hepatopulmonary shunting may be reduced with HVO during radioembolization in patients with high HPSF and without large hepatic venous collaterals or tumor in vein.

CLINICAL RELEVANCE/APPLICATION

Quantitative analysis of HPSF on pre-treatment 99m Tc-MAA SPECT/CT and post-treatment 90 Y PET/CT demonstrates reduction in HPSF by HVO during radioembolization. This technique may expand availability of radioembolization and allow higher treatment doses in patients with elevated HPSF.

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R5A-SPMK

Musculoskeletal Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPMK-3 DYNAMIC BLOOD POOL IODINE CORRECTION IMPROVES FULLY AUTOMATED OPPORTUNISTIC BONE MARROW DENSITY ASSESSMENT ON CONTRAST-ENHANCED DUAL-ENERGY CT

Nedim Beste, MD (*Presenter*)
Simon Lennartz, MD (*Abstract Co-Author*)
Thorsten Persigehl, MD (*Abstract Co-Author*)
Philipp C. Fervers, MD (*Abstract Co-Author*)

PURPOSE

Opportunistic bone mineral density (BMD) assessment on contrast-enhanced CT may reduce underdiagnosis of osteoporosis in oncologic patients. However, these measurements are biased by sampling variability and intravenous contrast. We aimed to evaluate an automated tool for thoracic CT-based BMD screening and propose dynamic adjustment based on iodine blood pool intensity.

METHODS AND MATERIALS

Patients without metastatic or primary bone disease undergoing contrast-enhanced dual-energy CT were retrospectively included. The thoracic spine was segmented using a pre-trained neural network. Mean attenuation of the cancellous bone was extracted in Hounsfield units (HU) and mapped to age- and sex-specific BMD reference values. Four linear regression models were fitted: (1) uncorrected, (2) corrected for vertebral iodine uptake, (3) corrected for portal vein iodine concentration, and (4) corrected for age-adjusted iodine blood pool. Model performance was assessed by r^2 and 95% confidence interval (CI) width. Intraindividual consistency was evaluated by histogram overlap across scans.

RESULTS

645 CTs from 179 patients (87 female; mean age 61.4 ± 16.0 years) were analyzed. Iodine blood pool correction improved model fit, most pronounced with age adjustment (r^2 from 0.88 and 0.47 to 0.93 and 0.65; CI width from 57/123 to 45/99 mg/ml for females/males). Vertebral iodine correction had no benefit (Fig.1).

CONCLUSION

We present an AI-based, fully automated method for BMD assessment on contrast-enhanced CT. Dynamic iodine correction based on blood pool intensity significantly improved accuracy and consistency.

CLINICAL RELEVANCE/APPLICATION

Automated BMD assessment on contrast-enhanced CT with dynamic iodine correction may enable reliable opportunistic osteoporosis screening in oncologic patients. The proposed method improves accuracy and consistency, offering a practical approach for secondary fracture prevention without additional imaging.

R5A-SPMK-4 INJURY PATTERNS IN KNEE MRI: IS THERE A GENDER GAP?

Ali Ghasemi, MD (*Presenter*)
Jenifer Pitman, MD (*Abstract Co-Author*)
Shivani Ahlawat, MD (*Abstract Co-Author*)
Laura M. Fayad, MD (*Abstract Co-Author*)

PURPOSE

To investigate the differences in structural knee injuries between female and male of different age groups

METHODS AND MATERIALS

Single Center Retrospective Study?This study is done using mPower application and done solely on the MRI reports that are reported in 4 outpatient radiology facilities affiliated with Johns Hopkins Hospital.?13,549 reports of consecutive routine knee MRI studies from 1/1/2019-9/30/2024 were included.? Inclusion criteria:?Knee MRI Scans done on outpatient individuals?Knee pain reported as chief complaint? Exclusion criteria:?History of cancer?Presence of a chronic illnessPrior knee surgery? Demographic data including age and gender were recorded.?The presence or absence of the following features were extracted from the report:?Medial meniscal (MM) tear?Lateral meniscal (LM) tear?Anterior cruciate ligament (ACL) tear?Posterior cruciate ligament (PCL) tear?Medial collateral ligament (MCL) tear?Lateral collateral ligament complex (LCL) tear?Extensor mechanism tear?Patellofemoral dislocation

RESULTS

There were significant differences between males and females for:?ACL tear alone (males > females in all age groups except for "=60," p=0.001),?ACL tear with MM tear (males > females in all age groups except for "=60," p=0.014)?ACL tear with LM tear (males > females in all age groups except for "=60," p=0.001).? There were also significant differences for MM tears and LM tears alone:?Males > females in age groups "=20" and "21-40," and females >males for age groups "41-60" and "=60" (p<0.001 for MM and LM).?MCL tears alone were also more commonly seen in males "=20" and "21-40," and females "41-60" and "=60" (p=<0.001).? There were no significant sex differences for any age group for PCL, ACL + PCL, ACL + MCL, ACL + LCL, LCL, patellar tendon tears, or for patellofemoral dislocation. ?

CONCLUSION

Differences in injury patterns exist between males and females, particularly for ACL, MCL, and meniscal as well as ACL alongside either medial or lateral meniscal tears. Overall, in younger patients, tears were more commonly seen in males, while in older patients, tears were more commonly seen in females. Contrary to available literature, our results showed a significantly higher prevalence of ACL injuries in male patients in both age-stratified and non-age-stratified comparisons.

CLINICAL RELEVANCE/APPLICATION

Sex- and age-specific patterns of knee injuries can inform personalized approaches to diagnosis, prevention, and rehabilitation strategies. Recognizing that younger males are more prone to ACL and meniscal injuries, while older females exhibit higher rates of these injuries, may aid clinicians in tailoring imaging protocols, risk assessment, and early intervention strategies to optimize patient outcomes.

R5A-SPMK-5 FEASIBILITY STUDY OF T2MAPPING AND FACT IN THE EVALUATION OF THIGH QUADRICEPS AFTER EXERCISE TRAINING

JIE HU (*Presenter*)
Xianfeng Yang, MBBCh (*Abstract Co-Author*)

PURPOSE

To explore the feasibility of evaluating T2 value, proton density fat fraction (PDFF), and cross-sectional area (CSA) of quadriceps femoris after exercise training based on T2 mapping and Fat Analysis and Calculation Technique (FACT).

METHODS AND MATERIALS

Thirty-two healthy volunteers were recruited and underwent MRI examination of thigh muscles, including axial T2 mapping and FACT sequence. The T2 value, PDFF, and CSA of quadriceps femoris, adductor magnus, and gracilis were measured. The peak torque (PT) of the quadriceps femoris was measured using an isokinetic muscle strength system. The differences in T2 value, PDFF, and CSA before and after countermovement jump(CMJ) were compared, as well as the differences between genders.

RESULTS

The T2 value and CSA of quadriceps femoris and adductor magnus increased and PDFF decreased after CMJ ($p<0.01$). The PDFF of the gracilis was significantly higher than that of the vastus lateralis, and the vastus lateralis had a significantly higher PDFF than the other muscles ($p < 0.01$).PT was highly correlated with CSA of quadriceps femoris ($p < 0.001$, $r = 0.906$). CSA and PT of males were higher than those of females ($p < 0.001$).

CONCLUSION

T2 mapping and FACT can quantitatively evaluate the differences of T2 value, PDFF and CSA of different muscles after exercise training, which is an important evaluation method for competitive sports training and disease rehabilitation.

CLINICAL RELEVANCE/APPLICATION

Apply quantitative magnetic resonance imaging to competitive sports and rehabilitation assessment, which helps to achieve individualized precision training.

R5A-SPMK-6 FAST KILOVOLTAGE-SWITCHING DUAL-ENERGY COMPUTED TOMOGRAPHY WATER-CALCIUM DECOMPOSITION AND VIRTUAL LOW-KEV MONOENERGETIC TECHNIQUE FOR THE ASSESSMENT OF THE EXTREME LATERAL LUMBAR DISC HERNIATION

Yang Menghua (*Presenter*)
Xuee Zhu, MD (*Abstract Co-Author*)
Tongbo Yu (*Abstract Co-Author*)
Rong Yao (*Abstract Co-Author*)
Rui Zhang (*Abstract Co-Author*)
Hanxiao Yu (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic performance of dual-energy CT (DECT) with reconstruction of water (calcium) images and virtual low-keV(50 keV) images for the detection of the extreme lateral lumbar disk herniation compared with conventional CT, with magnetic resonance imaging (MRI) serving as reference.

METHODS AND MATERIALS

A total of 25 consecutive patients with 125 intervertebral disks who underwent both DECT and MRI of the lumbar within 2 weeks from each other were retrospectively enrolled in our study. The patients were 34~90 years old, 11 males and 14 females. Three radiologists blindly and independently evaluated conventional grayscale CT series for the presence and type of lumbar disk herniation, and the focus was on the extreme lateral lumbar disc herniation. After the following 4 and 8 weeks, readers reevaluated examinations based on virtual 50-keV images and color-coded water (calcium) images, respectively. MR images were blindly assessed by an experienced ragiologist, serving as the reference standard. Sensitivity, specificity and accuracy were the primary metrics of diagnostic performance, which were compared by application of the Mc Nemar test.

RESULTS

Color-coded water (calcium) images showed higher sensitivity than virtual 50-keV and conventional CT images (75.68% vs 58.56% vs 56.75%) for detecting the extreme lateral lumbar disc herniation ($P = 0.001$). The sensitivity of virtual 50-keV images was similar to that of conventional CT($P>0.05$). The accuracy of virtual 50-keV images were higher than the other two (82.13% vs 81.07% vs 77.60%, $P< 0.001$).

CONCLUSION

Fast KV-switching DECT water (calcium) decomposition technique significantly improves the sensitivity of the extreme lateral lumbar disc herniation and reduces the rate of missed diagnosis. The virtual low-keV (50 keV) images significantly improve the diagnostic accuracy of the extreme lateral lumbar disc herniation.

CLINICAL RELEVANCE/APPLICATION

Extreme lateral lumbar disc herniation is a relatively rare clinical but may cause serious orthopedic symptoms. If not treated timely, quadriceps atrophy may even appear which seriously harm the quality of life of patients. However, due to the special location of the protrusion, it is often overlooked at conventional CT. Fast KV-switching DECT water (calcium) decomposition technique significantly reduces the rate of missed diagnosis for this type of lumbar disk herniation compared with conventional CT.

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Multisystem Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPMS-1 DEEP LEARNING FOR POST-CONTRAST T1-WEIGHTED MRI SEQUENCE SYNTHESIS: A SYSTEMATIC REVIEW

Emmy Y. Hu, MD,BA (*Presenter*)
Siddhant Dogra, MD (*Abstract Co-Author*)

PURPOSE

Gadolinium-based contrast agents for MRI expose patients to nephrogenic and tissue-retention risks, increase exam time and cost, and may cause patient discomfort. Recently, deep-learning (DL) models synthesizing post-contrast T1-weighted images from pre-contrast sequences have gained popularity. This systematic review catalogues and appraises studies using DL for post-contrast T1 synthesis, highlighting applications, architectures, inputs, quantitative and reader-based metrics, and data transparency to guide future research.

METHODS AND MATERIALS

This study was performed as per PRISMA guidelines. 5 databases (PubMed, Embase, Cochrane Central, Scopus, Web of Science) were searched on 1/16/25. The search strategy used keywords and synonyms related to "MRI," "post-contrast," "deep learning," and "synthesis." 2 reviewers independently screened titles, abstracts, and full texts, extracting subspecialty/organ/pathology, MRI inputs, DL architectures, quantitative metrics, reader study details if performed, datasets, code availability, and data characteristics.

RESULTS

268 articles underwent title-abstract screening, resulting in 54 studies whose full-texts were screened, and ultimately 43 studies included.Neuroradiology accounted for the majority of papers (n=25; 21 brain and 4 nasopharyngeal studies), followed by breast imaging (n=8, all breast cancer) and body applications (n=6; 3 liver, 2 prostate, and 1 uterus). Fundamental DL architectures included generative adversarial networks (GANs, n=20), convolutional neural networks (CNNs, n=19), transformers (n=3), diffusion models (n=2), and novel hybrids (n=2).13 studies (30%) included a reader assessment (mean 4.6 readers, standard deviation 3.1). Quantitative metrics commonly reported were structural similarity index, peak signal-to-noise ratio, and mean absolute error.

CONCLUSION

DL synthesis of post-contrast T1 MRI has primarily targeted neuroradiology, predominantly utilizing GAN and CNN models. Diffusion and transformer architectures require further exploration. The field faces limitations from heterogeneous evaluations and limited reader studies.

CLINICAL RELEVANCE/APPLICATION

DL synthesis of post-contrast T1 MRI shows promise but requires more consistent prospective reader evaluations and standardized, clinically relevant metrics to see if these models could be suitable for clinical applications.

Nov. 30 – Dec. 4
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R5A-SPNMMI

Nuclear Medicine & Molecular Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPNMMI-1 FMISO PET/MRI HYPOXIC FRACTION IS AN ACCURATE METRIC FOR DISTINGUISHING GLIOBLASTOMA PROGRESSION FROM PSEUDOPROGRESSION

Ramon F. Barajas JR, MD (*Presenter*)
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Laszlo K. Szidonya, MD, PhD (*Abstract Co-Author*)
Brian Thurston (*Abstract Co-Author*)
Ahmed Raslan (*Abstract Co-Author*)
Sushant Puri (*Abstract Co-Author*)
Anh Huan Vo (*Abstract Co-Author*)
Joshua M. Walker, MD,PhD (*Abstract Co-Author*)
William Rooney, PhD (*Abstract Co-Author*)
Rochelle Fu (*Abstract Co-Author*)
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PURPOSE

Hypoxia is a fundamental biological feature of Glioblastoma (GBM). 18F-fluoromisonidazole (FMISO) PET quantifies hypoxia, which portends a poor prognosis. MRI-based response assessment metrics lack diagnostic accuracy for definitively establishing therapeutic outcomes. This is especially true for immunotherapies that are likely to cause increased incidence of neuroinflammatory pseudoprogression (Psp). Therefore, we aimed to define the diagnostic utility of FMISO PET/MRI for differentiating Psp from therapy failure (Progression).

METHODS AND MATERIALS

A prospective clinical trial was undertaken in patients with newly diagnosed IDH-wildtype GBM or IDH-mutant astrocytoma grade 4 (NCT03649880). All patients received Stupp protocol temozolomide-based chemoradiotherapy following maximal safe resection. A subset of patients were concurrently enrolled in a phase II study (NCT03347617) of pembrolizumab immunotherapy (200 mg IV every 3 weeks) combined with Stupp protocol following maximal safe resection. FMISO PET/MRI (3.7 MBq/kg, 90 min uptake, 40-minute emission time) was performed at time of mRANO-presumed progression. Hypoxic volume (HV) was defined by voxels with FMISO uptake =1.2x that of the mean cerebellar white and grey matter uptake. MRI-Gd enhancing volume was segmented using a semi-automated approach. Hypoxic fraction (HF) was defined as the HV-to-MRI enhancing volume ratio. Disease progression or Psp was confirmed through surgery or follow-up MRI. T-test and receiver operator characteristic (ROC) analysis was performed. P< .05 denoted significance.

RESULTS

24 patients with IDH-wildtype GBM or IDH-mutant astrocytoma grade 4 (17 with pembrolizumab [12 Progression and 5 Psp] and 7 without pembrolizumab [5 Progression and 2 Psp]) provided evaluable disease. 3 patients had an IDH-mutation (1 progression and 2 Psp). HF for all patients (N= 24) and GBM (N= 21) was significantly elevated with progression compared to Psp (P< .01; Figure). HV was not different between progression and Psp (P> 0.09). No difference in HF or HV was observed based on therapy (P> 0.61). HF yielded an AUROC of .94 for all patients and .98 for patients with GBM with an optimal threshold cut-off of 0.88, to differentiate progression from Psp (Figure).

CONCLUSION

At time of mRANO presumed progression, HF with FMISO PET/MRI accurately distinguishes tumor progression from Psp irrespective of prior pembrolizumab immunotherapy.

CLINICAL RELEVANCE/APPLICATION

In this prospective clinical trial, HF served as a robust and noninvasive metric for treatment response assessment. The incorporation of FMISO PET/MRI in future therapeutic clinical trials is underway. If validated, HF is likely to improve upon current response assessment criteria for patients with GBM.

R5A-SPNMMI-2 DOES DOPAMINE D2/D3 RECEPTOR AVAILABILITY EXHIBIT SEASONAL VARIATIONS IN HEALTHY ADULTS? A [^{11}C]PHNO PET STUDY

Mahsa Mayeli, MD, MPH (*Presenter*)
Marc Potenza (*Abstract Co-Author*)
Kelly Cosgrove (*Abstract Co-Author*)
Richard E. Carson, MD, PhD (*Abstract Co-Author*)
David Matuskey (*Abstract Co-Author*)

PURPOSE

Dopamine is a neurotransmitter implicated in functions ranging from motor control to cognitive performance. In humans, dopaminergic markers have been associated with seasonal symptomatic fluctuations. Here, we investigated potential seasonal variations in dopamine D2/D3 receptor availability in healthy adults using [11 C]PHNO positron emission tomography (PET) imaging.

METHODS AND MATERIALS

Data were retrospectively extracted from a database at the Yale School of Medicine. All healthy participants with non-displaceable binding potential (BP ND) measurements from [11 C]PHNO over the past 20 years were included. Scan dates were used to group participants into spring, summer, fall, and winter, and daylight

hours and average daily temperatures on the scan date were extracted from appropriate sources. Mixed-effects models were used to investigate the predictive potential of daylight exposure and average daily temperatures for [11 C]PHNO BP ND .

RESULTS

Participants (n=124, 85 men; mean age = 34.77(9.52) years)-. demonstrated no significant differences in [11 C]PHNO BP ND levels between those scanned in different seasons. Additionally, mixed-effects analyses revealed no significant associations between daylight exposure and average daily temperatures and [11 C]PHNO BP ND after adjusting for age, sex, and body mass index as fixed effects and subject as a random effect.

CONCLUSION

Our findings do not provide strong evidence for significant seasonal variations in dopamine D2/D3 receptor availability in healthy individuals. However, variations in PET ligand, geographic latitude, and seasonal daylight exposure may affect findings. These factors should be carefully considered before including seasonal variation as a covariate in dopamine receptor imaging studies.

CLINICAL RELEVANCE/APPLICATION

Dopaminergic dysfunction is implicated in a range of neuropsychiatric conditions, including depression, schizophrenia, and seasonal affective disorder. Understanding whether dopamine receptor availability varies seasonally is important for the design and interpretation of PET imaging studies, particularly those assessing treatment effects or pathophysiological mechanisms in clinical populations. Our findings suggest that seasonal variation in dopamine D2/D3 receptor availability, as measured by [^{11}C]PHNO PET, may be less pronounced than previously reported with raclopride, underscoring the need to consider tracer sensitivity and geographic factors when using PET to investigate dopamine-related disorders.

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R5A-SPNPM

Noninterpretive Skills (Beyond Imaging) Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPNPM-1 DEMOCRATIZING LEADERSHIP: IMPLEMENTING A MERIT-BASED MODEL FOR RADIOLOGY CHIEF RESIDENT SELECTION:

Anam Khan, MBBS (*Presenter*)
Zainab Hussain, MBBS (*Abstract Co-Author*)
Shaista A. Saeed, MBBS (*Abstract Co-Author*)

PURPOSE

To develop and implement a structured, merit-based model for radiology chief resident selection. This model aims to enhance fairness, objectivity, and resident engagement, creating a transparent, standardized approach that identifies and appoints the most qualified residents, improving resident leadership and the educational experience.

METHODS AND MATERIALS

A five-step model was developed:1. Resident Voice: Gauging Awareness and Expectations Residents were surveyed to assess their awareness of the chief resident selection process and the leadership attributes they deemed important.2. Opening Doors: Formal Call for Applications Final-year residents were invited to formally submit applications for the chief resident position.3. 360° Feedback: Holistic Evaluation Across Stakeholders a) Resident Evaluation Peers rated candidates (scale 0-4) based on leadership, teaching participation, and professionalism.b) Staff Evaluation Allied health staff assessed candidates' communication, teamwork, and day-to-day clinical conduct.c) Faculty Assessment Faculty members evaluated academic performance, clinical competence, administrative skills, and research contributions.4. Leadership in Focus: Structured Candidate Interviews Candidates participated in interviews with program leadership (Program Director and Associate Program Director). 5. Objective Excellence: Scoring Grid and Final Selection A pre-defined evaluation grid assigned weighted scores (out of 100) across domains of academic achievements, leadership, professionalism, educational contributions, and research activities. A composite score combining feedback from all stakeholders determined the final selection.

RESULTS

The resident poll highlighted communication, leadership, and professionalism as key desired attributes. The multi-stakeholder feedback provided a nuanced evaluation of candidates. The final selection resulted in the appointment of two final-year residents for six-month chief tenures, demonstrating strong alignment with the merit-based criteria identified throughout the process.

CONCLUSION

This multi-step, merit-based model offers a transparent and comprehensive alternative to discretionary chief resident selection. By incorporating diverse perspectives and focusing on key competencies, it aims to foster leadership development and enhance resident engagement.

CLINICAL RELEVANCE/APPLICATION

This framework may serve as a scalable model for other radiology training programs seeking to optimize their leadership selection processes.

R5A-SPNPM-2 RELATIVE IMPORTANCE OF COMMUNITY FACTORS ON U.S. COUNTY-LEVEL CANCER SCREENING, PREVALENCE, AND MORTALITY

Elizabeth Y. Rula, PhD (*Presenter*)
Alexandra Drake (*Abstract Co-Author*)
Eric Christensen, PhD (*Abstract Co-Author*)
Jinel A. Scott, MD (*Abstract Co-Author*)
William Small JR, MD (*Abstract Co-Author*)

PURPOSE

This study assessed the relative importance of diverse community measures for explaining County-level variance in cancer outcomes—screening, prevalence, and mortality rates—for breast, colorectal, lung, and prostate cancers, and mapped regional patterns.

METHODS AND MATERIALS

Using random forest algorithms, we estimated the relative importance of 24 community measures - including health behaviors/lifestyle, socioeconomic, and environment factors - as explanatory factors for County-level cancer outcomes (screening, prevalence, and mortality rates) and for the four highest prevalence cancers in the U.S. (breast, colorectal, lung and prostate cancers). County-level cancer screening and prevalence rates were measured using the 5% sample of Medicare fee-for-service beneficiaries (2020) and 5-year (2016-2020) average mortality rates were from National Cancer Institute's State Cancer Profiles. County-level choropleth mapping of significant community-factor to outcome associations visualized geospatial patterns.

RESULTS

We found that the most important community factors for explaining outcomes varied by cancer type and by outcome measure. The strongest explanatory factors for mortality were smoking rate for lung and colorectal cancers, and the non-Hispanic Black population share for breast and prostate cancers. Poverty, severe housing problems, limited access to health foods, and insufficient sleep were the most important factors for breast, colorectal, lung, and prostate cancer prevalence, respectively. Hispanic population share, poverty, poor physical health, and air toxics cancer risk were the most important factors for screening rates, respectively, for each cancer. Broadly, across the outcome-cancer type combinations, smoking, poor physical health days, and poverty showed strong association with mortality, prevalence, and screening, respectively. The maps visually illustrate the association of community and outcome measures and how they are regionally concentrated throughout the U.S. The results provide evidence to inform population health initiatives tailored to community needs.

CONCLUSION

The relative explanatory importance of community measures on cancer screening, prevalence and mortality rate differed, both within and across cancers, and the rates of risk and outcome varied locally and regionally.

CLINICAL RELEVANCE/APPLICATION

The importance of community measures for population health cancer measures can better inform, prioritize, and target efforts to improve cancer outcomes, and drive prospective research on causal mechanisms and to test interventions. The choropleth maps help identify high-priority local and regional strategies to improve outcomes.
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R5A-SPNR

Neuroradiology Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPNR-1 DEEP LEARNING ARTIFACT REMOVAL IN SPECTROSCOPIC MRI TO ENHANCE METABOLIC MAPPING FOR HIGH-DOSE RADIOTHERAPY

Abinand Rejimon (*Presenter*)
Karthik K. Ramesh, BS (*Abstract Co-Author*)
Sulaiman Sheriff (*Abstract Co-Author*)
Nathan Hoang (*Abstract Co-Author*)
Brian J. Soher, PhD (*Abstract Co-Author*)
Hui-Kuo G. Shu, MD,PhD (*Abstract Co-Author*)
Harish Poptani, PhD (*Abstract Co-Author*)
Eric A. Mellon, MD, PhD (*Abstract Co-Author*)
Andrew Maudsley, PhD (*Abstract Co-Author*)
Lee Cooper (*Abstract Co-Author*)
Hyunsuk Shim, PhD (*Abstract Co-Author*)

PURPOSE

Glioblastoma (GBM) is the most aggressive brain cancer and demands precise radiotherapy (RT). Whole-brain 3D spectroscopic MRI (sMRI) noninvasively quantifies brain metabolites and serves as a precise biomarker for RT. However, spectral artifacts degrade metabolite maps. Effective artifact filtration ensures reliable maps for high-dose RT. Our prior convolutional neural network misclassified tumor spectra due to data imbalance with a high number of normal spectra. We introduce a deep learning (DL) model trained on T2-FLAIR hyperintense spectra to guide high-dose RT and enhance peritumoral artifact detection.

METHODS AND MATERIALS

Eighty-nine subjects from two trials were scanned on 3T Siemens systems using high-TE sMRI, T1-weighted, and T2-FLAIR sequences. Spectra were quantified with MIDAS and preprocessed via FLAIR segmentation. Eight experts labelled 5257 spectra as either "acceptable" or "unacceptable." We applied an 80/20 patient-level split, stratified by label, for training and testing. Our fusion ResNet1D model splits each spectrum into six tiles processed by shared ResNet1D blocks then passes the result through two dense layers to a sigmoid output. Test-set predictions were ensembled by averaging the outputs of the five-fold cross-validation models. Area under the ROC curve (AUC), average precision (AP), sensitivity and specificity at Youden-optimal threshold, and human-rater disagreement assessed model performance.

RESULTS

Reviewers reached unanimous agreement on 89% of spectra. Final model assessments were done with the four-channel model due to strong AUC (0.97), AP (0.93), sensitivity (92%), and specificity (90%). Model-human disagreement averaged 10%, ranging 6% to 24%, indicating strong inter-rater concordance. Our original model misclassified tumor spectra at a higher rate than the new model. For each representative patient, ~50 additional tumor spectra were recovered by the new model.

CONCLUSION

High inter-rater agreement and high AUC/AP indicate that the four-channel model reliably classifies tumor spectra. Providing the quantified spectra as channel inputs, fusion of multiple channels and ensemble averaging mitigated individual model biases and yielded performance gains over single-input configurations. We will apply active learning to our unlabeled spectral pool by soliciting annotations of spectra with high predictive uncertainty, further improving model generalization.

CLINICAL RELEVANCE/APPLICATION

DL artifact filtration delivers reliable peritumoral metabolite maps from sMRI, enabling more precise RT targeting and tighter margins in GBM patients. By improving accuracy, artifact filtration enhances treatment efficacy while minimizing normal-tissue toxicity.

R5A-SPNR-2 HYPOPERFUSION INTENSITY RATIO IS ASSOCIATED WITH FOLLOW-UP INFARCT VOLUME IN MEDIUM VESSEL OCCLUSIONS: A MULTICENTER MULTINATIONAL STUDY

Hamza A. Salim, MD (*Presenter*)
Dhairya Lakhani, MD (*Abstract Co-Author*)
Kambiz Nael, MD (*Abstract Co-Author*)
Gregory W. Albers, MD (*Abstract Co-Author*)
Jeremy J. Heit, MD, PhD (*Abstract Co-Author*)
Adrien Guenego, MD (*Abstract Co-Author*)
Adam A. Dmytriw, MD,FRCPC (*Abstract Co-Author*)
Max Wintermark, MD (*Abstract Co-Author*)
Vivek Yedavalli, MD, MS (*Abstract Co-Author*)

PURPOSE

Medium vessel occlusion (MeVO) accounts for a substantial proportion of acute ischemic strokes (AIS). The hypoperfusion intensity ratio (HIR), defined as the ratio of tissue volume with time-to-maximum (Tmax) >10 seconds to that with Tmax >6 seconds, serves as a surrogate of collateral circulation and has been associated with infarct progression in large-vessel occlusions. Its role in MeVO stroke remains unclear.

METHODS AND MATERIALS

This multicenter, multinational retrospective study evaluated consecutive patients with MeVO who underwent mechanical thrombectomy with or without intravenous thrombolysis. Inclusion required available follow-up imaging and pretreatment CT perfusion. Follow-up infarct volume (FIV) was measured on CT or MRI 12 to 36 hours post procedure. Univariable linear regression was used to identify predictors of FIV, with variables meeting a threshold of $p<0.1$ entering a multivariable model. HIR was the primary variable of interest.

RESULTS

Among 147 patients (median age, 75 years; 57% female), the M2 segment was the most common occlusion site (88%). The median National Institutes of Health Stroke Scale score was 11 (IQR, 7-16), baseline Alberta Stroke Program Early CT Score was 9 (IQR, 8-10), and median HIR was 0.32 (IQR, 0.20-0.57). Univariable analysis showed HIR to be associated with larger FIV (ß=80 mL; p<0.001). In multivariable analysis adjusting for age, sex, baseline NIHSS, and ASPECTS, HIR remained independently associated with FIV (ß=40 mL; p<0.001). Tmax >10 seconds showed the strongest correlation with final infarct volume (r=0.56; p<0.001).

CONCLUSION

In patients with MeVO, higher HIR correlates with larger final infarct volume, suggesting that compromised collateral flow plays a critical role in outcomes.

CLINICAL RELEVANCE/APPLICATION

This finding supports that HIR adds valuable information for prognostication and care for patients with distal occlusions.

R5A-SPNR-4 ALTERATIONS OF THE GLYMPHATIC SYSTEM IN ACUTE ISCHEMIC STROKE: A DIFFUSION KURTOSIS IMAGING STUDY

Feifei Zheng (*Presenter*)
Weiwei Cui (*Abstract Co-Author*)
Jun Liu, PhD (*Abstract Co-Author*)

PURPOSE

The DKI-ALPS (Diffusion Kurtosis Imaging along the Perivascular Space) method has been applied to assess glymphatic function in migraine patients. As a higher-order diffusion imaging technique, diffusion kurtosis imaging (DKI) employs a fourth-order statistical model to characterize water molecule diffusion, offering enhanced accuracy over conventional DTI-ALPS in resolving cross-fiber ambiguities. This study investigates glymphatic dysfunction in acute ischemic stroke (AIS) using DKI.

METHODS AND MATERIALS

This study enrolled a total of 29 patients with unilateral acute ischemic stroke (AIS) and 29 age- and sex-matched healthy controls. All participants underwent 3.0T MRI (MAGNETOM Prisma, Siemens Healthineers, Germany) with a 20-channel head/neck coil. Diffusion tensor and kurtosis tensor maps along the x-, y-, and z-axes were generated using PyDesigner. Regions of interest (ROIs) were placed within projection and association fiber tracts at the lateral ventricular body level using DSI Studio. Diffusion coefficients (Dxx, Dyy, Dzz) and kurtosis parameters (Kxxxx, Kyyyy, Kzzzz) were extracted to calculate DTI-ALPS and DKI-ALPS indices. Differences in ALPS indices between AIS patients and controls, as well as ipsilateral versus contralateral hemispheres in AIS patients, were statistically evaluated.

RESULTS

The DTI-ALPS index was significantly lower in AIS patients (1.243 ± 0.1101) compared to controls (1.438 ± 0.1371; p < 0.0001, 95% CI [0.1296-0.2604]). Similarly, DKI-ALPS indices were reduced in AIS (1.406 ± 0.2022 vs. 1.752 ± 0.2518 in controls; p < 0.0001, 95% CI [0.2253-0.4656]) . These findings suggest impaired glymphatic function in AIS. No significant differences were observed between ipsilateral (DTI-ALPS: 1.204 ± 0.1375; DKI-ALPS: 1.371 ± 0.3104) and contralateral hemispheres (DTI-ALPS: 1.282 ± 0.1567; DKI-ALPS: 1.442 ± 0.2837; p = 0.1017 and p = 0.6027, respectively) .

CONCLUSION

Reduced DKI-ALPS and DTI-ALPS indices in AIS suggest glymphatic dysfunction. The absence of hemispheric asymmetry implies global impairment of metabolic waste clearance during the acute phase of ischemic stroke, rather than unilateral deficits.

CLINICAL RELEVANCE/APPLICATION

The decreased DKI-ALPS and DTI-ALPS values in patients with acute ischemic stroke (AIS) suggest potential glymphatic system dysfunction, supporting clinical strategies targeting glymphatic restoration to improve patient outcomes.

R5A-SPNR-5 SIGNIFICANT IMPROVEMENT IN CHOROID PLEXUS SEGMENTATION ON PRE-CONTRAST 3D T1 MRI USING DEEP LEARNING

Woojin Jung, PhD (*Presenter*)
Seoyoung Lim, MS, BS (*Abstract Co-Author*)
Byungjun Kim, MD, PhD (*Abstract Co-Author*)
Sung-Hye You, MD (*Abstract Co-Author*)

PURPOSE

The choroid plexus (CP) is recognized as a key structure in the brain glymphatic system, involved in waste clearance and neurodegenerative disease. Thus, accurate CP segmentation on MRI is essential for investigating these processes. However, conventional methods (e.g., FreeSurfer) often show low accuracy due to algorithmic limitations and low contrast between CP and adjacent brain tissue. To address this challenge, we developed a deep learning-based algorithm that improves CP segmentation accuracy on 3D pre-contrast T1w MRI by leveraging paired pre- and post-contrast (CE-/CE+) scans during label generation.

METHODS AND MATERIALS

This retrospective study used paired CE-/CE+ 3D T1w MRI scans from 720 patients with cognitive decline, acquired on a 3T Siemens Prisma (MPRAGE: TR/TE/TI = 1800/2.52/904 ms, flip angle = 8°, and voxel size = 1×1×1 mm^3). Data from 100 patients were used for model development. Initial masks from FreeSurfer (FS) were refined using GMM-based segmentation on CE- images to generate labels for the pretraining phase. The output of the pretrained model was then intersected with an intensity-thresholded map from the CE+ images. Manual corrections were applied to selected cases, resulting in high-quality labels that were used to fine-tune the final model.For evaluation, both imaging and clinical validations were conducted. For imaging validation, expert-labeled maps on CE+ images from 20 subjects served as ground truth to compare FS and deep learning (DL) results via Dice coefficient and volume differences. For clinical validation, 574 subjects were grouped into SCI, early MCI, late MCI, and AD. Group-wise differences in CP volume were tested via ANOVA. Lastly, in a subset of 247 subjects with DTI scans, correlation between CP volume and ALPS index was assessed.

RESULTS

In imaging validation, DL model significantly outperformed FS in both Dice coefficient (0.8243 vs. 0.3671, P < 0.001) and absolute volume percentage errors (44.32% vs. 51.77%). Mean segmentation time was dramatically reduced (0.40 vs. 188.00 min, P < 0.001), highlighting its practical utility for large-scale or clinical applications. In clinical validation, CP volumes showed significant group-wise differences across cognitive stages for both FS (P = 0.0039) and DL (P = 0.0418). Lastly, CP volume was negatively correlated with ALPS index in the DTI subset for both methods (FS: ? = -0.4335; DL: ? = -0.3441; both P < 0.001).

CONCLUSION

Our deep learning-based algorithm enables fast and accurate CP segmentation on 3D T1w MRI, outperforming conventional methods and supporting clinical applicability.

CLINICAL RELEVANCE/APPLICATION

Accurate and efficient segmentation of the choroid plexus using 3D T1w MRI can enable large-scale studies on glymphatic dysfunction.

R5A-SPNR-6 SPATIALLY HETEROGENEOUS WHITE MATTER HYPERINTENSITY VOLUMES MEDIATE METABOLIC SYNDROME SEVERITY-COGNITION ASSOCIATIONS: A UK BIOBANK COHORT STUDY OF NEUROCOGNITIVE PATHWAYS

Xinxin Huo (*Presenter*)
Meng Li (*Abstract Co-Author*)

Boyao Chen (*Abstract Co-Author*)
Fushuai Zhang (*Abstract Co-Author*)
Xinyue Zhang (*Abstract Co-Author*)
Zhenyu Cheng (*Abstract Co-Author*)
Na Wang (*Abstract Co-Author*)
Yuanyuan Wang (*Abstract Co-Author*)
Pengcheng Liang (*Abstract Co-Author*)
Yiwen Chen (*Abstract Co-Author*)
Changhu Liang, MD, PhD (*Abstract Co-Author*)
Lingfei Guo, MD (*Abstract Co-Author*)

PURPOSE

Our investigation aimed to explore the associations of different distribution of white matter hyperintensity (WMH) volumes with metabolic syndrome (MetS) severity, as well as their impact on multiple cognitive domains.

METHODS AND MATERIALS

A total of 5549 participants were incorporated into our study, comprising 2271 MetS patients and 2823 healthy controls (HCs). Two independent samples t tests and multivariate regression analysis, adjusted for age, sex, ethnicity, education, smoking status, and alcohol status, evaluated the relationship between MetS characteristics and WMH volume. We examined the mediating role of WMH volume between the Mets severity and multiple cognitive domains. All cognitive test were z-transformed, and finally integrated into a global cognition score, defined as mean z score of all domains. 652 participants underwent longitudinal analysis via generalized estimating equations (GEE).

RESULTS

Participants with MetS exhibited significant higher WMH volume than HCs did ($P < 0.001$), including deep white matter hyperintensities (DWMH) and periventricular hyperintensities (PVH). Increased DWMH correlated well with enlarged waist circumference (WC)[95% CI (0.07, 0.219), $P<0.001$], elevated triglyceride [95% CI (0.033, 0.182), $P =0.004$], and elevated hypertension [95% CI (0.188, 0.359), $P<0.001$]; increased PVH correlated well with enlarged WC [95% CI (0.051, 0.146), $P<0.001$], elevated Hemoglobin A1c [95% CI (0.004, 0.011), $P<0.001$], elevated hypertension [95% CI (0.145, 0.254), $P<0.001$] and decreased high-density lipoprotein (HDL) [95% CI (0.014, 0.113), $P=0.012$]. DWMH volume partially mediated the relationship between MetS score and global cognition, processing speed, and fluid intelligence with the mediating effect accounted for 4.4%, 7.9%, and 6.4% of the total effect respectively. PVH partially mediated the relationship between MetS score and global cognition, processing speed, memory, and fluid intelligence with the mediating effect accounted for 9.6%, 9.6%, 3.3% and 12.5% of the total effect respectively. DWMH was correlated with the severity of MetS ($P=0.005$) and PVH was correlated with the severity of metabolic syndrome ($P<0.001$) and the follow-up time ($P=0.006$). And global cognition was also associated with the severity of metabolic syndrome ($P=0.025$) in GEE.

CONCLUSION

Spatially heterogeneous WMH volumes could medicate MetS severity and cognitive performance, revealed underlying pathophysiological mechanisms of cognitive decline due to metabolic syndrome.

CLINICAL RELEVANCE/APPLICATION

Increased WMH also suffered from obesity, hyperglycemia and hyperlipidemia. It provides a new idea for clinical prevention and diagnosis of cognitive decline caused by metabolic syndrome.

R5A-SPNR-7 PROPOSAL OF NOVEL MRI GRADING SYSTEMS FOR LUMBAR NEURAL FORAMINAL STENOSIS: SUPERIOR CLINICAL RELEVANCE OVER EXISTING MODELS

Tom Mishael Jolly, MBBS, MD (*Presenter*)
Anitha Jasper, MD,DMRD,MBBS (*Abstract Co-Author*)
Harshad Vanjare, MD (*Abstract Co-Author*)
Bernice T S (*Abstract Co-Author*)
Jayavelu H Prasad (*Abstract Co-Author*)

PURPOSE

This study evaluates the inter-observer agreement and clinical correlation of two new grading systems (NGS1 and NGS2) for lumbar neural foraminal stenosis, comparing their performance with the Wildermuth and Lee grading systems.

METHODS AND MATERIALS

This retrospective study included 200 patients who underwent lumbar spine MRI in June and July 2024. Exclusion criteria were cauda equina compression, prior spine surgeries, or coexisting spinal pathologies. MRI was performed using a 1.5T scanner with sagittal and axial T1- and T2-weighted sequences. Two experienced radiologists graded foraminal stenosis at L2-L3 to L5-S1 using the Wildermuth, Lee, NGS1, and NGS2 systems. NGS1 has 4 grades. Grade 0: Normal neural foramen. Grade 1: Mild circumferential foraminal stenosis with obliteration of perineural fat in at least one but less than four directions. Grade 2: Moderate stenosis with obliteration in four directions (two opposing directions) without nerve root deformation. Grade 3: Severe stenosis with morphological changes in nerve root. NGS2 simplifies NGS1 into three grades, combining Grade 2 and 3 into a single category termed "marked stenosis". Inter-observer agreement was assessed using kappa (K) statistics. Clinical correlation was determined by neurological symptoms (paraesthesia, numbness, weakness, radicular pain) and signs (denervation on EMG, Lhermitte sign, Spurling sign, reduced deep tendon reflexes).

RESULTS

Inter-observer agreement (K value) was substantial for Wildermuth (0.703) and almost perfect for Lee (0.828). NGS1 and NGS2 outperformed both, with K values of 0.886 and 0.924, respectively ($p < 0.001$). Clinical correlation was highest for NGS2 (94.5%), followed by NGS1 (93.5%), Wildermuth (90%), and Lee (81.5%) ($p < 0.001$). NGS2's simplified structure enhanced reproducibility, while NGS1's detailed grading supported better quantitative assessments.

CONCLUSION

NGS1 and NGS2 demonstrated superior clinical correlation and inter-observer agreement compared to existing systems, with NGS2 excelling in simplicity and reproducibility. These systems improve diagnostic clarity and radiologist-clinician communication.

CLINICAL RELEVANCE/APPLICATION

The novel grading systems (NGS1 and NGS2) enhance diagnostic precision, demonstrate superior clinical correlation and inter-observer agreement, and improve communication between radiologists and clinicians, offering a valuable tool for better management of lumbar neural foraminal stenosis.

R5A-SPNR-8 MIDLIFE METABOLIC HEALTH AND BRAIN PERFUSION: VISCERAL FAT AND INSULIN RESISTANCE AS PREDICTORS OF CEREBRAL BLOOD FLOW

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Farzaneh Rahmani, MD, MPH (*Abstract Co-Author*)
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John C. Morris, MD (*Abstract Co-Author*)
Cyrus A. Raji, MD, PhD (*Abstract Co-Author*)

PURPOSE

Midlife obesity and adiposity, linked to Alzheimer's disease (AD) risk, may contribute to neurodegeneration via vascular dysfunction and reduced cerebral perfusion. This study examined associations between metabolic markers (BMI, VAT, SAT, waist circumference, lipids, insulin resistance, and HbA1C) and cerebral blood flow (CBF) in cognitively normal midlife adults.

METHODS AND MATERIALS

Eighty-seven cognitively normal, middle-aged adults (mean age: 49.97 years; 66.7% female; 55.2% obese; mean BMI: 31.65 kg/m²) underwent abdominal/brain MRI, brain PET, and metabolic assessments. Visceral and subcutaneous fat were segmented using MATLAB-based software. Insulin resistance was indexed using HOMA-IR. Cerebral blood flow (CBF) was measured via 3D pCASL and processed in SPM12 to produce absolute CBF (aCBF) maps, normalized and smoothed (6 mm FWHM). ROI masks (AAL3 atlas) targeted limbic and cortical regions. Multiple linear regressions examined associations between metabolic metrics (e.g., BMI, VAT, HOMA-IR) and whole-brain/regional aCBF. Mediation models tested HDL, triglycerides, and HOMA-IR as mediators of BMI-aCBF relationships. Voxel-wise analyses were FDR-corrected and adjusted for age.

RESULTS

The results showed significant negative associations between several metabolic markers and aCBF in both the whole brain and specific ROIs. Higher BMI, VAT, triglycerides, and HOMA-IR were associated with lower CBF across multiple regions, including the hippocampus, amygdala, calcarine cortex, middle temporal gyrus, and posterior cingulate. Conversely, higher HDL levels were positively associated with aCBF in these regions. SAT, waist circumference, and LDL were not significantly associated with aCBF. The mediation analysis revealed that the association between BMI and aCBF both in whole brain and ROIs is significantly mediated by TG, HDL, and HOMA.IR. Voxel-wise analyses revealed that higher BMI, waist circumference, VAT, Chol/HDL ratio, HbA1C, and HOMA-IR were significantly associated with lower aCBF, while higher HDL was associated with higher aCBF in clusters located in the temporal, occipital, and frontal lobes.

CONCLUSION

Obesity, particularly increased visceral fat, is associated with reduced cerebral blood flow (CBF) in both whole brain and AD-related regions, suggesting early midlife brain hypoperfusion. Findings indicate that insulin resistance and VAT—but not SAT—drive this reduction, with HDL potentially mediating the BMI-CBF link through atherosclerotic pathways.

CLINICAL RELEVANCE/APPLICATION

Targeting and reducing visceral obesity and insulin resistance may help enhance brain perfusion and potentially lower the risk of developing AD.

R5A-SPNR-9 AUTOMATED SWI-BASED LESION QUANTIFICATION IMPROVES PROGNOSTICATION IN DIFFUSE AXONAL INJURY PATIENTS

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PURPOSE

Adams grading is a coarse, subjective measure of DAI severity, offering limited prognostic value. We automated 3D SWI-based quantitative lesion visualization, identified features with a) internal validity and b) predictive power for poor short-term outcomes, and compared the quantitative model's performance with blinded MRI-based Adams grading.

METHODS AND MATERIALS

Our cohort had 258 adults with DAI diagnosis and MRI performed w/in 30 days of admission (2008-2019). Two radiologists assigned Adams grades. DAI lesions in 7 regions— gray-white matter junction (GWJ), corpus callosum (CC), basal ganglia (BG), thalami (TH), parahippocampal gyri (PH), cerebellum (CB), and brain stem (BS) —were segmented manually from SWI-MRI and automated w/ nn-unet. Automated features w/ at least moderate correlation to manual were used to predict outcomes (coma/persistent vegetative state (PVS) or brain death (BD)) using bi- & multinomial regression. Association w/ GCS, AMPAC, and Los Ranchos scores was interrogated w/ F-statistics. Automated model and Adams grade AUCs were compared.

RESULTS

Poor short-term outcomes occurred in 59/258 (22.8%): coma/PVS in 38, BD in 21. Automated volumes had moderate to high correlation with manual for total lesion volume, GWJ, CC, TH, & BS (Pearson r: 0.7, 0.68, 0.44, 0.69, 0.72; ICC: 0.81, 0.79, 0.59, 0.79, 0.83; mean zero-adjusted volume similarity (ZAVS): 0.64, 0.61, 0.54, 0.74, 0.60, respectively). Logistic regression identified total and regional volumes (GWJ, CC, TH, BS), age, and arrival GCS as significant predictors. AUC for the quantitative total hemorrhage volume was 0.73 ($p<0.005$) vs. 0.65 for Adams grade 3 ($p<0.005$). In multinomial regression, risk of coma/PVS increased by 8%/mL for total lesion burden, 6%/mL for GWJ, 2.2×/mL for CC, 7.6×/mL for TH, and 9.9×/mL for BS. Total and regional hemorrhage burden (GWJ, CC, TH, BS) showed significant association with GCS at day 5 (highest/lowest) and at discharge ($p<0.05$). CC lesion volume showed significant association with Los Ranchos and AMPAC scores ($p<0.05$).

CONCLUSION

Manual-automated agreement in key regions supports using automated MRI metrics for precise and granular automated DAI prognostication. Lesion burden predicted catastrophic in-hospital outcomes and short-term functional outcome scores, supporting automated SWI-based quantitative visualization as an objective prognostic tool.

CLINICAL RELEVANCE/APPLICATION

Automated SWI lesion quantification improves DAI outcome prediction, outperforming subjective Adams grading. This pilot study initiates development of lesion burden metrics from admission and follow-up CT-based synthetic SWI (in progress) as an objective tool for evaluating early post-injury therapeutic trials.

R5A-SPNR-10 FROM CORE TO CORRIDOR: PERITUMORAL MRI METRICS DIFFERENTIATE TRUE PROGRESSION FROM TREATMENT EFFECT IN GLIOBLASTOMA

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Laiz Godoy, MD (*Abstract Co-Author*)
Steven Brem, MD (*Abstract Co-Author*)
Stephen Bagley (*Abstract Co-Author*)
Suyash Mohan, MD (*Abstract Co-Author*)
Sanjeev Schawla (*Abstract Co-Author*)

PURPOSE

Distinguishing pseudoprogression (PsP) from true tumor progression (TP) in glioblastoma (GBM) during the early post-treatment period remains a formidable diagnostic challenge. We evaluated whether quantitative diffusion- and perfusion-weighted MRI metrics derived not only from the contrast-enhancing core but also from the immediate (IPR) and distal (DPR) peritumoral regions can improve discrimination of PsP versus TP after standard of care chemoradiotherapy.

METHODS AND MATERIALS

Seventy consecutive GBM patients with new or enlarging enhancing lesions within six months post-concurrent chemoradiotherapy underwent anatomical, diffusion, and perfusion MRI at 3T. Quantitative parameters—including mean diffusivity (MD), fractional anisotropy (FA), linear (CL), planar (CP) and spherical (CS) anisotropy coefficients, relative cerebral blood volume (rCBV), maximal rCBV (rCBV_max), and minimal MD—were extracted from three spatial domains: (i) the contrast-enhancing region (CER), (ii) a 4-mm annulus immediately beyond the enhancement (IPR), and (iii) the remaining abnormal FLAIR signal (DPR). Patients were categorized as TP (n=52) or PsP (n=18) based on histopathology (>25% vs. <25% malignant cells, respectively) or modified RANO (mRANO) criteria on follow-up imaging when histology was unavailable. Inter-group differences between TP and PsP were assessed with the Mann-Whitney U test. A multivariate logistic regression model with receiver operating characteristic (ROC) analysis was used to determine diagnostic performance.

RESULTS

Relative to PsP, TP demonstrated significantly higher rCBVmax (CER: 3.88±1.62 vs. 2.72±1.40, p=0.03; IPR: 3.32±1.24 vs. 2.54±0.81, p=0.01), FA (0.14±0.04 vs. 0.12±0.03, p=0.02), and CL (0.05±0.02 vs. 0.03±0.01, p=0.015) from CER. A trend toward higher rCBVmax in DPR was also observed in TP (2.55±1.12 vs. 1.95±0.52, p=0.06). The multivariate model combining rCBV_max (CER + IPR), FA, and CL yielded an AUC of 0.83, with 77 % sensitivity and 74 % specificity for identifying TP.

CONCLUSION

A novel multiparametric model that interrogates both enhancing tumor and its peritumoral milieu, significantly improves differentiation of true progression from pseudoprogression in GBM compared with CER-only analyses.

CLINICAL RELEVANCE/APPLICATION

Early, reliable discrimination between TP and PsP can reduce unnecessary interventions and enable timely therapeutic adaptation. Incorporating quantitative multiparametric metrics from IPR and DPR may therefore enhance personalized management of patients with GBM in this era of precision neuro-oncology.

R5A-SPNR-11 COMPOSITE ARTERIAL AND VENOUS COLLATERAL SCORE ON SINGLE-PHASE CTA PREDICTS 90-DAY OUTCOMES IN ANTERIOR CIRCULATION LARGE-VESSEL OCCLUSION STROKE

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Tobias Faizy, MD (*Abstract Co-Author*)
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PURPOSE

Collateral circulation influences clinical outcomes in patients with acute ischemic stroke due to anterior circulation large-vessel occlusion (LVO). While both arterial and venous collateral assessments on single-phase CTA have prognostic value, they have traditionally been evaluated independently. We developed the CTA Collateral Impairment Score (CCIS), a composite measure incorporating arterial (Tan) and venous (COVES) scores, and investigated its association with 90-day functional outcomes.

METHODS AND MATERIALS

We conducted a retrospective cohort study including 1,080 patients with anterior circulation LVO stroke across four comprehensive stroke centers. Patients were assigned a CCIS of 0 (preserved), 1 (moderate impairment), or 2 (severe impairment) based on predefined thresholds for Tan and COVES scores.

RESULTS

Favorable outcomes (mRS 0-2) occurred in 66% of patients with CCIS 0, 32% with CCIS 1, and 17% with CCIS 2 ($p<0.001$). Mortality increased with higher CCIS (11%, 25%, and 36% for CCIS 0, 1, and 2 respectively; $p<0.001$). In multivariable models, CCIS 0 and 1 were independently associated with greater odds of favorable outcomes compared with CCIS 2 (adjusted OR 5.77 [95% CI, 3.78-8.82] and 1.72 [95% CI, 1.14-2.60], respectively). CCIS also predicted mortality (adjusted OR for CCIS 0 vs. 2: 0.39 [95% CI, 0.25-0.61]; $p<0.001$). The predictive performance of CCIS (AUC 0.73) exceeded that of ASPECTS and occlusion site and approximated NIHSS; inclusion of CCIS improved multivariable model discrimination (AUC 0.84).

CONCLUSION

CCIS, a composite arterial and venous collateral score derived from single-phase CTA, was strongly and independently associated with 90-day outcomes in anterior circulation LVO stroke.

CLINICAL RELEVANCE/APPLICATION

CCIS integration into acute stroke imaging assessment may improve risk stratification and guide therapeutic decisions.

R5A-SPNR-12 MICROSTRUCTURAL WHITE MATTER INJURY IN NON-ARTERITIC ANTERIOR ISCHEMIC OPTIC NEUROPATHY EVALUATED BY DIFFUSION TENSOR IMAGING

Lamei Zhao (*Presenter*)
Pengde Guo, MD (*Abstract Co-Author*)
Qiu Huan Zhang (*Abstract Co-Author*)
Weixin Wang (*Abstract Co-Author*)

PURPOSE

To assess the impairment of the microstructural white matter in NAION patients based on diffusion tensor image (DTI).

METHODS AND MATERIALS

The DTI data were acquired from a cohort consisting of 23 healthy control subjects (HCs) and 23 patients diagnosed with NAION. These data were preprocessed and analyzed to calculate the peak width of skeletonized mean diffusivity (PSMD) and skeletonized free water (FW) maps, which serve as measures of white matter microstructural injury. We compared the PSMD and skeletonized FW between the groups. We subsequently analyzed the correlations between PSMD and the DTI analysis along the perivascular space (DTI-ALPS) index, choroid plexus (CP) volume, Montreal Cognitive Assessment (MoCA) scores as well as clinical data within the NAION group.

RESULTS

In NAION patients, we observed significant increases in the right PSMD and skeletonized FW in the bilateral inferior longitudinal fasciculus, the bilateral inferior fronto-occipital fasciculus, and the right superior longitudinal fasciculus (temporal part). Within the NAION group, the PSMD was negatively correlated with the right retinal nerve fiber layer thickness. Furthermore, the PSDM was negatively correlated with the ALPS index, and positively correlated with the CP volume and MoCA score

CONCLUSION

This study reveals early subclinical white matter damage in patients with NAION, particularly in tracts associated with cognitive function. This injury may arise from impairment of the glymphatic system and disruptions in cerebrospinal fluid circulation, potentially contributing to subsequent cognitive dysfunction. Our findings suggest that NAION may represent a form of small vessel disease. Furthermore, PSMD shows promise as a potential biomarker for NAION in future studies.

CLINICAL RELEVANCE/APPLICATION

Non-arteritic anterior ischemic optic neuropathy (NAION) is the second most prevalent optic neuropathy that leads to visual impairment. There is presently no definitive and effective treatment or medication available. we identified that the microstructural white matter injury was existed in patients with NAION and associated with retinal nerve fiber layers. This study supports the theory that NAION may represent a form of small vessel disease and contribute to cognitive dysfunction.

R5A-SPNR-13 DEVELOPMENT OF A MULTIMODAL MRI-BASED PREDICTIVE MODEL FOR ASSESSING ISCHEMIC STROKE RISK IN INDIVIDUALS WITH INTRACRANIAL ATHEROSCLEROTIC DISEASE

Ming Ming Yang (*Presenter*)
Ling Li (*Abstract Co-Author*)

PURPOSE

This study aimed to construct a risk prediction model for ischemic stroke in patients with anterior circulation atherosclerosis based on high-resolution magnetic resonance imaging (HR-MRI) and arterial spin labeling (ASL)

METHODS AND MATERIALS

Patients with atherosclerosis with middle cerebral artery stenosis diagnosed by HR-MRI from September 2021 to December 2023 were retrospectively analyzed. According to clinical manifestations and diffusion weighted imaging (DWI), the patients were divided into stroke group and non-stroke group. Demographic data, atherosclerosis risk factors, and laboratory indicators were collected, plaque characteristics were extracted based on HRMRI, and the existence of 1.5 s-arterial transport artifacts (ATA) and 2.5 s-ATA was determined based on ASL images. Multivariate logistic regression analysis was used to screen the meaningful indicators, construct the prediction model, and establish the nomogram. The nomogram was evaluated for the degree of differentiation, calibration and clinical effectiveness.

RESULTS

128 cases were included in this study, including 68 in the stroke group and 60 in the non-stroke group. Multivariate analysis showed that age, hypertension, plaque enhancement rate, plaque length, positive remodeling, and the presence of 1.5s-ATA and 2.5s-ATA were important independent predictors of ischemic stroke in patients with intracranial atherosclerosis, and were used to establish predictive models. The area under the curve (AUC) was 0.936 (95%CI: 0.897-0.974), and the model showed good diagnostic performance. The calibration curves also show good agreement between the nomogram predictions and the observed curves. Decision curve analysis further showed that the nomogram had significantly higher clinical net benefit.

CONCLUSION

The nomogram constructed based on multi-modal MRI can accurately predict the risk of ischemic stroke, which is of great help to the risk stratification of stroke decision.

CLINICAL RELEVANCE/APPLICATION

This study developed a multimodal MRI-based nomogram integrating clinical, plaque, and ASL-derived arterial transit artifacts (ATA) features to effectively predict ischemic stroke risk in anterior circulation atherosclerosis, aiding personalized risk stratification and preventive decision-making.

R5A-SPNR-14 VALIDATION OF A DEEP LEARNING ALGORITHM IN DETECTING CERVICAL SPINE FRACTURES ON CT: PRELIMINARY RESULTS

Mohamed Hassan, MD (*Presenter*)

PURPOSE

Cervical spine fractures are devastating injuries that may result in permanent disability, and prompt diagnosis to direct treatment is essential to ensuring the best possible patient outcomes (1). Artificial intelligence (AI) algorithms are critical tools that can assist in triaging patients with specific acute findings to optimize worklist management and enhance patient care (2). This study analyzed the diagnostic accuracy and radiologist concordance with Aidoc cervical spine fracture tool, in detecting acute cervical spine fractures on computed tomography (CT).

METHODS AND MATERIALS

A retrospective review of CT cervical spine studies from multiple institutions performed on adult patients between November 2020 to March 2021 was performed. The interpretation of the Aidoc algorithm was compared to manual review of radiologist reports. For cases with discrepancies or any positive cases, a group of 3 radiologists reviewed the imaging to adjudicate the final diagnosis. Performance between AI and radiologist were compared

RESULTS

The study included 2653 CT spine studies 4.1% prevalence of acute cervical spine fractures. The Radiologist have a 95.4% sensitivity and 99.7% specificity, while the AI algorithm had sensitivity of 88.9% and specificity of 99.1%. The concordance between the radiologist report and the AI algorithm was 93.5%. Of 108 cervical spine fractures, AI correctly identified 96 fractures with 22 false-positive cases. Causes for AI false-positives included chronic spine fractures (6) and beam artifact (4).

CONCLUSION

Our study demonstrated moderate sensitivity and high specificity a commercial acute cervical spine fracture AI algorithm in identifying acute cervical spine fractures with a fracture detection rate comparable to attending radiologists in terms of specificity while radiologist performed better in terms of sensitivity.

CLINICAL RELEVANCE/APPLICATION

AI shows promise as a tool to detect acute cervical spine fractures on CT cervical spine exam.

R5A-SPNR-15 PREDICTION OF INDIVIDUAL TREMOR IMPROVEMENT AFTER MRGFUS THALAMOTOMY IN ESSENTIAL TREMOR VIA MACHINE LEARNING ON RESTING-STATE FMRI DATA

(*Presenter*)
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Haoxuan Lu (*Abstract Co-Author*)
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Xinyu Wang (*Abstract Co-Author*)
Xin Lou, MD, PhD (*Abstract Co-Author*)

PURPOSE

Magnetic resonance-guided focused ultrasound (MRgFUS) is an emerging non-invasive technique for the treatment of refractory essential tremor (ET). However, biomarkers that accurately predict a tremor response to MRgFUS have yet to be identified.This study was to develop a model for the prediction of the individual tremor improvement after MRgFUS from brain connectivity.

METHODS AND MATERIALS

In this cohort study, resting-state functional magnetic resonance imaging (rs-fMRI) data were collected using 3-T MRI and individual brain connectivity were calculated. Fifty-six patients with ET received unilateral MRgFUS thalamotomy and were followed up for 12 months. A support vector machine regressor (SVR) was used to predict tremor improvement at 12 months post-MRgFUS thalamotomy based on pretreatment brain connectivity. The nonparametric Spearman rank test was used to evaluate the relationship between the top-weighted preoperative FC and tremor improvement ratio.

RESULTS

Fifty-six patients (mean age 63.20 years, SD=9.99, 40 males) showed a 68% tremor improvement at 12 months after treatment. The application of SVR to brain connectivity matrices allowed prediction of tremor responses with statistically significant accuracy (r = 0.38, P-value = 0.03; mean sum of squares = 0.05, P-value = 0.02). The actual tremor improvement ratio was correlated with the top two weighted FCs (Top1: r =-0.39, P-value < 0.01; Top2: r =-0.41, P-value < 0.01). Compared to HCs, the FC with highest weight, decreased at baseline (T = -3.263, P-value = 0.002) and then elevated at 12 months post-operation (T = 3.09, P-value = 0.005) with reaching a normalized trend to HCs (T = -1.139, P-value = 0.257).

CONCLUSION

Preoperative intrinsic brain connectivity, as measured with rs-fMRI, can predict the individual therapeutic effectiveness of MRgFUS thalamotomy using a support vector machine method.

CLINICAL RELEVANCE/APPLICATION

In this cohort study of patients with essential tremor underwent MRgFUS thalamotomy, we achieved a successful prediction of tremor response, with a correlation of 0.38 and a mean sum of squares of 0.05. Furthermore, MRgFUS induced a massive increase in FC between left and right precentral gyrus, which was associated with the tremor responses. The prediction model based on preoperative functional connectivity has excellent predictive capability and holds promise for clinical use.

R5A-SPNR-16 RADIATION-INDUCED EXHAUSTED T CELL EVOLUTION: A CEST-BASED LONGITUDINAL PHENOTYPING STUDY IN GLIOBLASTOMA MOUSE MODELS

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Jiaxin Lin (*Abstract Co-Author*)
Yongzhou Xu (*Abstract Co-Author*)
Ruimeng Yang, MD,PhD (*Abstract Co-Author*)

PURPOSE

Radiotherapy may potentiate the efficacy of immune checkpoint inhibitor (ICI) treatment. However, the optimal timing for this combination therapy remains to be established. Early-exhausted T cells can be reinvigorated by PD-1 blockade, whereas terminally exhausted T cells cannot. This study aimed to determine the optimal timing for combination therapy and developed a CEST radiomics approach to visualize the status of T cell exhaustion.

METHODS AND MATERIALS

GL261-Luc cells were orthotopically implanted into the right striatum of 84 female C57BL/6 mice. Mice underwent whole brain radiotherapy (10 Gy). MRI was performed in indicated timepoints (12 mice per group) on a 9.4 T small animal MRI-scanner. The imaging protocol was composed of conventional sequences and CEST. After MRI scan, mice were euthanized, brains were harvested for flow cytometric analysis using a BD LSRFortessa™ flow cytometer system, and the data were analyzed using FlowJo V10 software (TreeStar). Machine learning was employed to select robust radiomic features and predict T cell exhaustion.

RESULTS

The infiltration of CD8+ T cells increased from day 3 to 5 following radiation, with terminally exhausted T cells becoming predominant in the late phase. This indicates that the period from day 3 to day 5 post-irradiation may represent an optimal therapeutic window for ICI treatment. Longitudinal evaluation of CEST parameters could differentiate the status of T cell exhaustion, which demonstrated good applicability in both ICI and irradiation settings. Moreover, increased heterogeneity in CEST image textures was associated with more advanced T cell exhaustion.

CONCLUSION

We introduce a non-invasive imaging biomarker that precisely evaluates the heterogeneous status of T cell exhaustion associated with ICI treatment and irradiation, potentially offering a reliable method to promptly gauge the immune responsiveness of the tumor microenvironment and pinpoint the optimal timing for combination therapy.

CLINICAL RELEVANCE/APPLICATION

The optimal window of radiotherapy in combination with immune checkpoint inhibitor (ICI) depends on the dynamic monitoring of distinct exhausted subpopulations of CD8+ T cells during peri-irradiation period, which is unavailable via repeated biopsies in clinical practice. This study identified an optimal 3-5 day post-irradiation window for ICI treatment, targeting early-exhausted T cells responsive to PD-1 blockade. The CEST-based signatures offers a non-invasive imaging biomarker to monitor the tumor microenvironment, assess immune responsiveness, and guide personalized treatment timing. Future work may focus on validating these findings in patient cohorts and exploring broader applications in other cancers.

R5A-SPNR-18 RISK FACTORS ASSOCIATED WITH SUBSEQUENT VASCULAR EVENTS IN PATIENTS WITH ACUTE ISCHEMIC CEREBROVASCULAR DISEASE: A HR-VWI STUDY

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Shu Wu (*Abstract Co-Author*)
Juan Huang, MMed (*Abstract Co-Author*)
Sheng Jiao, MD (*Abstract Co-Author*)
Yange Chang (*Abstract Co-Author*)
Yan Song, MD, PhD (*Abstract Co-Author*)

PURPOSE

Patients with acute ischemic cerebrovascular disease have a high long-term risk of recurrent vascular events. This study aimed to investigate the imaging characteristics of culprit plaques and clinical factors associated with one-year vascular events recurrence.

METHODS AND MATERIALS

Patients with acute ischemic stroke or TIA admitted to the Neurology Department of Beijing Hospital from January 2020 to August 2023 wereprospectively enrolled and underwent high-resolution vessel wall imaging (HR-VWI). Baseline plaque characteristics were measured, and clinical information was collected. Patients were followed up every three months to inquire about medication status, general conditions, worsening of original symptoms, new onset TIA or cerebral infarction symptoms, and myocardial ischemia or infarction. If any of the above conditions were present, head MRI and HR-VWI was performed. Based on the one-year follow-up results, patients were divided into recurrence and non-recurrence groups for comparison. Univariate and multivariate Cox regression analyses wereused to determine the risk factors for subsequent vascular event recurrence.

RESULTS

A total of 129 patients were recruited, with 97 males (75.19%) and 32 females (24.81%). The median follow-up time was 12.0 (9.95, 12.7) months. During the follow-up period, 29 patients (22.48%) experienced endpoint events. Compared with the non-recurrence group, the recurrence group had a higher proportion of females (41.38% vs. 20.00%, P=0.019), older age (67.38 ± 9.86 vs. 61.55 ± 11.23 years, P=0.013), higher prevalence of diabetes (68.97% vs. 43.00%, P=0.014), higher prevalence of coronary artery disease (31.03% vs. 12.00%, P=0.031), and higher NIHSS scores (4.00 [1.00, 6.00] vs. 1.50 [0.00, 3.00] , P=0.008). Multivariate Cox regression analysis showed that plaque length (HR 0.86, 95%CI 0.77-0.96), remodeling index (HR 7.50, 95%CI 2.15-26.15), intraplaque hemorrhage (HR 5.62, 95%CI 1.12-28.12), coronary artery disease (HR 3.26, 95%CI 1.31-8.11), and NIHSS scores (HR 1.22, 95%CI 1.07-1.39) were independent risk factors for one-year vascular event recurrence.

CONCLUSION

Plaque length, remodeling index, intraplaque hemorrhage, coronary artery disease, and NIHSS scores were independent risk factors for one-year vascular event recurrence in patients with acute ischemic cerebrovascular disease.

CLINICAL RELEVANCE/APPLICATION

Understanding these predictors may enhance patient management by informing personalized treatment strategies and improving long-term outcomes for individuals at high risk of future vascular events.

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Nov. 30 – Dec. 4
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R5A-SPPD

Pediatric Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPPD-1 FROM FIRST CASE TO REGIONAL PRACTICE: TEN YEARS OF HYDROSTATIC INTUSSUSCEPTION REDUCTION IN ETHIOPIA

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Hansel J. Otero, MD (*Abstract Co-Author*)

PURPOSE

Hydrostatic reduction is an effective non-operative treatment for pediatric intussusception, yet its adoption in low-resource settings remains variable. In Ethiopia, hydrostatic intussusception reduction was introduced in 2014 through a collaborative effort with international partners. Our aim is to assess national trends in training, implementation, and sustained practice of pediatric imaged-guided hydrostatic intussusception reduction in Ethiopia.

METHODS AND MATERIALS

A nationwide cross-sectional survey was conducted targeting all radiology graduates in Ethiopia from 2015 to 2024. This cohort, comprising 365 individuals, represents the entire decade following the introduction of the procedure in the country. The questionnaire assessed multiple aspects of hydrostatic reduction practice: exposure during residency, post-graduation practice, current availability at their institutions, perceived obstacles, personal confidence, and beliefs regarding the effectiveness of the technique.

RESULTS

Of 365 potential participants, 184 responded (response rate = 50.4%); 178 respondents from 75 different facilities provided complete data. Most respondents (150, 84.3%) had hydrostatic reduction training during residency, and nearly half (87, 48.9%) reported performing the procedure in routine clinical practice. Of 75 facilities represented, hydrostatic reduction was performed in 46, yielding an institutional adoption rate of 61.3%. Confidence was high, with (133, 75%) graduates expressing readiness to independently perform the procedure. Of the 19 radiologists (18%) who discontinued performing hydrostatic reduction, institutional and system-related factors were the leading causes, such as limited staffing, lack of surgical backup, and referral of cases to advanced care facilities. Eight respondents reported working outside of Ethiopia in 7 different countries, 5 of whom had successfully started and were still performing hydrostatic reduction in their institutions, demonstrating cross-border expansion of skills to Angola, Lesotho, Liberia, Namibia, and Tanzania.

CONCLUSION

A decade after its introduction, hydrostatic reduction has become a widely taught and increasingly practiced procedure among Ethiopian radiologists. Our findings highlight strong individual readiness and measurable clinical benefits yet underline the need for systemic improvements.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates how hydrostatic reduction has been adopted and expanded nationally and regionally, offering a non-operative solution for intussusception in resource-limited settings.

R5A-SPPD-2 ULTRASOUND-GUIDED ATTENUATION PARAMETER FOR ASSESSMENT OF STEATOSIS WITH REFERENCE TO MRI-PDFF IN PEDIATRIC METABOLIC DYSFUNCTION-ASSOCIATED STEATOTIC LIVER DISEASE

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Andrew Wang (*Abstract Co-Author*)
Jeffrey B. Schwimmer, MD (*Abstract Co-Author*)
Claude B. Sirlin, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the correlation, repeatability, and diagnostic accuracy of Ultrasound-Guided Attenuation Parameter (UGAP) for steatosis, with MRI proton density fat fraction (PDFF) as reference, in children with known or suspected metabolic dysfunction-associated steatotic liver disease (MASLD).

METHODS AND MATERIALS

Prospectively enrolled children with known or suspected MASLD underwent MRI (GE Discovery MR750 3.0T) and up to 2 ultrasound exams (GE LOGIQ E10) on the same day. In each ultrasound exam, a study-trained sonographer acquired at least 6 valid UGAP values in a homogeneous region of the right lobe via an intercostal approach; the median and interquartile range (IQR) values were recorded. The median value was considered reliable if the IQR/median < 0.30. Each MRI exam included a PDFF sequence. Study-trained MRI readers placed a region of interest in each right-lobe segment; the mean right-lobe PDFF value was recorded. The relationship between median right-lobe UGAP and mean right-lobe PDFF values were assessed by Spearman rank correlation rho, its p-value, and 95% confidence interval (CIs). Repeatability

was assessed by Bland-Altman analysis with calculation of 95% limits of agreement (LOA), repeatability coefficient (RC), and intraclass correlation coefficient (ICC). For classifying steatosis (defined as PDFF = 5%), area under the receiver operating characteristic curve (AUC) and performance at the Youden index were calculated.

RESULTS

34 children (11 female; age range, 8-18 years) were enrolled. 3 children could not tolerate MRI and were excluded. All median UGAP values were reliable. Median per-child right-lobe UGAP values ranged from 0.51 to 0.88 dB/cm/MHz (mean, 0.70). Mean per-child right-lobe PDFF values ranged from 1.4% to 41.2% (mean, 16.8%). Median right-lobe UGAP correlated positively and significantly with mean right-lobe PDFF (rho = 0.79, $p < 0.001$, 95% CI: 0.60, 0.89). 29 children had a second UGAP exam and were included in the repeatability study. Inter-exam LOA, RC, and ICC were -0.08 to 0.11, 0.1, and 0.889 (95% CI: 0.78 to 0.95), respectively. The diagnostic accuracy of UGAP was excellent (AUC = 0.95). Sensitivity and specificity at the Youden-based cutoff (0.62) were 0.89 and 0.70, respectively.

CONCLUSION

Right-lobe UGAP and MRI were significantly correlated in this pilot study in children with known or suspected MASLD, with high repeatability and diagnostic accuracy. The correlation is of similar strength to that reported previously for adults, but our sample size is small. Future studies with larger cohorts will be necessary to validate these findings.

CLINICAL RELEVANCE/APPLICATION

UGAP shows promising preliminary performance for assessing hepatic steatosis in children.
Printed on: 02/18/26

Abstract Archives of the RSNA, 2025

R5A-SPPH

Physics Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPPH-2 METAL ARTIFACTS REDUCTION USING TILT HELICAL SCAN TECHNIQUE IN CT EXAMINATION (METAL ARTIFACTS CAN BE REDUCED WITH RADIOGRAPHER'S INGENUITY)

Katsumi Tsujioka, RT (*Presenter*)

PURPOSE

In clinical CT examinations, metal artifacts caused by screw bolts fixed to the posterior lumbar interbody region are a problem. The occurrence of metal artifacts may prevent accurate diagnosis. In this case, the long axis of the bolt and the scan plane are often parallel. In this case, the long axis of the bolt and the scan plane are often parallel. In this report, we describe the reduction of metal artifacts by tilting the gantry during CT scanning.

METHODS AND MATERIALS

The phantom has brass rods of 8 mm diameter and different lengths, and an acrylic surface is placed on the tip of the brass rod. The gap between the brass rod and the acrylic surface can be changed to 0 mm and 2 mm. Scans of a homemade phantom were performed at tilt angles of 0 degrees and 30 degrees. Two image reconstruction techniques were used: conventional reconstruction and metal artifact reduction. Metal artifacts were visually evaluated on the MPR display, and the gap between the brass rod and the acrylic surface was measured.

RESULTS

Compared to conventional reconstruction, metal artifact reduction reduced artifacts from metal rods. However, when the direction of the metal rod was performed in the direction of the object, the artifacts were not completely eliminated. Therefore, it was not possible to accurately measure the gap between objects. By tilting the gantry and scanning, metal artifacts are reduced and it is now possible to accurately measure the gap between objects.

CONCLUSION

Metal artifacts are caused by beam hardening. By tilting the CT, metal artifacts can be reduced. Being able to accurately measure the gap at the tip of a metal rod is clinically useful.

CLINICAL RELEVANCE/APPLICATION

Recent CT scans are equipped with software such as metal artifact reduction (MAR). However, these are not perfect technologies. Tilting the gantry during CT scans is technically simple, but it is possible to greatly reduce metal artifacts. We can achieve better examinations by combining MAR and scanning technology. CT has made progress in terms of equipment, but it is also important to innovate in the imaging technique.

R5A-SPPH-3 IMPACT OF A PROTOTYPE, DEDICATED AI-BASED SPECTRAL IMAGE RECONSTRUCTION ALGORITHM ON THE QUALITY OF LOW-KEV MONOENERGETIC VIRTUAL IMAGES: A PHANTOM STUDY

Djamel Dabli (*Presenter*)
Joel Greffier, PhD (*Abstract Co-Author*)
Jean-Paul Beregi, MD, PhD (*Abstract Co-Author*)
Stephan Skornitzke (*Abstract Co-Author*)
Philippe Coulon, PhD (*Abstract Co-Author*)

PURPOSE

To assess the impact of a prototype, dedicated Spectral AI Recon (SAIR) reconstruction algorithm (DLR; Philips Healthcare) on image quality and dose reduction compared with a Hybrid Iterative Reconstruction (HIR) algorithm (Spectral, Philips Healthcare) on low-keV virtual monoenergetic images (VMIs).

METHODS AND MATERIALS

A Multi-Energy CT phantom (Sun Nuclear) was scanned on the dual-layer spectral CT system (Spectral CT 7500) at 120 kVp for three dose levels (3/6/12 mGy). VMIs at 40/50/60/70 keV were generated using the level 4 of HIR algorithm and the levels Standard, Smooth and Smoother of SAIR algorithm. Noise power spectrum (NPS) was computed to assess noise magnitude and noise texture (f av). Task-based transfer function (TTF) was calculated to assess spatial resolution (f 50) on blood-mimicking material plus iodine at 2 mg/mL insert. A detectability index (d') was computed to model the detection task of one contrast-enhanced lesion as function of keV.

RESULTS

For all dose and SAIR levels, noise magnitude was lower with SAIR than HIR and the difference increases from Standard (-13.8 ± 3.3%) to Smoother (-69.2 ± 2.8%) levels. Regarding noise texture, f av values decreased as the dose and energy levels decreased and from Standard to Smoother. For all dose and energy levels, f av values were higher with Standard (4.5 ± 5.4%) than HIR but lower with Smooth (-3.4 ± 5.0%) and Smoother (-24.0 ± 12.7%) levels. Regarding spatial resolution, f 50 values decreased as the dose and energy levels decreased and from Standard to Smoother. For all dose and energy levels f 50 values were higher with Standard level than HIR and were in the same range with Smooth level. For Smoother level, f 50 values were lower than HIR for all dose and energy levels, except at 40 keV and 6 mGy and at 70 keV at 12 mGy. For all dose levels and all keV, d' values were higher with SAIR levels than HIR and this difference increased from Standard (34.8 ± 5.2%) to Smoother (302.6 ± 37.0%).

CONCLUSION

Compared to HIR algorithm used in clinical practice for low-keV VMIs, the three levels of SAIR reduced image noise and improved the detectability for contrast-enhanced lesions. The impact on noise texture and spatial resolution depends on the SAIR level used.

CLINICAL RELEVANCE/APPLICATION

Compared to HIR algorithm used in clinical practice for low-keV VMIs, the three levels of SAIR reduced image noise and improved the detectability for contrast-enhanced lesions. The impact on noise texture and spatial resolution depends on the SAIR level used.

R5A-SPPH-4 EVALUATION OF RECONSTRUCTION KERNELS AND RESOLUTION TECHNIQUES FOR VOLUMETRIC ACCURACY OF GROUND-GLASS OPACITY NODULES IN LOW-DOSE PHOTON-COUNTING CT

Elsa Pimenta, MSc, MSc (*Presenter*)
Gisell Ruiz Boiset (*Abstract Co-Author*)
Alessandra Tomal, PhD (*Abstract Co-Author*)
Luuk J. Oostveen, DIPLPHYS (*Abstract Co-Author*)
Ioannis Sechopoulos, PhD (*Abstract Co-Author*)
Paulo Costa, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of reconstruction kernel and resolution techniques with a photon-counting computed tomography (PCCT) system on the volumetric accuracy of ground-glass opacity (GGO) nodule.

METHODS AND MATERIALS

A PCCT (photon-counting computed tomography) system (Canon Medical Systems Corporation) was used for image acquisition of the patient-based anthropomorphic lung phantom. Image acquisition protocols were performed at six CTDI vol (Computed Tomography Dose Index volume) dose levels from 0.3 to 2.7 mGy. The reconstruction techniques used included hybrid iterative reconstruction (HIR) methods (AIDR 3D, Canon Medical Systems Corporation) in combination with specific reconstruction kernels, such as FC52 and FC51 with normal resolution (NR; pixel size = 0.782 mm^2) and high resolution (HR; pixel size = 0.390 mm^2) settings, using a focal spot size of 0.4/0.5 mm. Ten acquisitions were performed for each protocol. The volume of the GGO-type synthetic nodule was measured based on CT images using 3D Slicer (version 5.6.2, Slicer Community) and compared with its ground truth (142 mm^3) determined by the µCT system (U-SPECT6CThr, MILabs B.V., Netherlands).

RESULTS

The FC51/HR protocol showed the most accurate performance, with median relative errors (RE%) below 5% and narrow interquartile ranges (IQRs), at low doses (0.3 and 0.5 mGy). The FC51/NR protocol had higher variability, with RE% over 10% at 0.3 mGy and doubling at 0.5 mGy. The FC52/HR had RE% of 5.8% (IQR: 2.8%) at 0.3 mGy, while the FC52/NR protocol had the highest RE%, surpassing 25% at 0.3 mGy and 30% at 0.5 mGy. As dose increased accuracy improved for all protocols. The FC51/HR protocol had RE% levels below 4% and the FC51/NR protocol reduced to around 5-7%. At 1.1 mGy, RE% for the FC52/HR protocol was close to 3%, while for the FC52/NR protocol, RE% ranged from approximately 6-8%. At 1.4 and 2.7 mGy, protocols became less distinguishable. The FC51/NR and FC52/HR protocols had similar performance at 1.4 mGy, while the FC51/NR protocol remained stable and the FC52/NR approached 10%, with reduced variability.

CONCLUSION

FC51/HR protocol exhibited consistent superior volumetric accuracy across all dose levels, particularly under low-dose conditions where precise measurements are most challenging. The differences among all protocols became less pronounced at higher dose levels. This finding underscores the benefits of high-resolution reconstruction in preserving measurement precision while minimizing radiation exposure.

CLINICAL RELEVANCE/APPLICATION

This study underscores the clinical significance of selecting suitable reconstruction protocols for precise volumetric evaluation of GGO-type nodules at low-dose CT.

R5A-SPPH-5 A DIRECT COMPARISON OF TWO ULTRASOUND CONTRAST AGENT'S PERFORMANCE IN SUBHARMONIC-AIDED PRESSURE ESTIMATION (SHAPE) FOR NONINVASIVE EVALUATION OF PORTAL HYPERTENSION

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Priscilla Machado, MD (*Abstract Co-Author*)
Trang Vu (*Abstract Co-Author*)
Michael C. Soulen, MD (*Abstract Co-Author*)
Susan M. Schultz, BA (*Abstract Co-Author*)
Antonina Antonenko (*Abstract Co-Author*)
Jaime Bosch, MD (*Abstract Co-Author*)
Annalisa Berzigotti (*Abstract Co-Author*)
Kirk Wallace, PhD (*Abstract Co-Author*)
Flemming Forsberg, PhD (*Abstract Co-Author*)

PURPOSE

Portal hypertension (PH) is the most common consequence of chronic liver disease and is marked by increased pressures in the portal venous system. Current invasive clinical standard to assess the degree of portal hypertension involves hepatic vein catheterization with a balloon-tip catheter to measure the wedged and free hepatic vein pressures after inflating and releasing the balloon. The difference between the two represents the hepatic venous pressure gradient (HVPG, in mmHg). HVPG measurement cannot be repeated frequently and thus limits real-time assessment of a patient's disease. Subharmonic-aided pressure estimation (SHAPE) is a novel ultrasound-based technique for non-invasive pressure estimation. SHAPE uses the subharmonic responses of ultrasound contrast agents (UCA's) to estimate changes in hydrostatic pressure. The objective of this study is to compare the ability of SHAPE to assess PH in patients undergoing hepatic vein catheterization, using both Sonazoid (GE HealthCare) and Definity (Lantheus Medical Imaging). The hypothesis is that Definity is not inferior to Sonazoid for SHAPE-based HVPG estimation.

METHODS AND MATERIALS

26 subjects undergoing hepatic vein catheterization have been enrolled in this ongoing, multi-center, IRB-approved study and had their data analyzed. Sonazoid and Definity were administered in random order, with a 30-minute washout period in between the two exams. SHAPE was performed using a LOGIQ E10 (GE HealthCare) with a C1-6 probe (tx: 2.5 MHz, rx: 1.25 MHz) in the commercially available subharmonic imaging mode. A calibration algorithm was used to allow for optimization of acoustic pressures on an individual subject basis, then 3-5 five second cine clips were obtained with the portal and hepatic vein at similar depths. Offline, an ROI was placed in both veins to acquire the subharmonic amplitude of each, and the SHAPE gradient was calculated as the difference in subharmonic signal between the two veins and was compared to the HVPG using linear regression. The slope of the linear models indicated that agent's SHAPE sensitivity for estimating HVPG. Analysis of covariance was performed to test for inferiority between the two agents.

RESULTS

Linear regression analysis resulted in a sensitivity of 0.43 dB/mmHg for both Sonazoid and Definity. ANCOVA revealed that there was no significant difference between the linear models for Sonazoid and Definity ($p = 0.98$).

CONCLUSION

These preliminary results suggest both Sonazoid and Definity are suitable for PH evaluation with SHAPE and that Definity is not inferior to Sonazoid in this application.

CLINICAL RELEVANCE/APPLICATION

SHAPE may be used as a reliable tool to estimate portal pressures, allowing for noninvasive evaluation as opposed to hepatic vein catheterization.

R5A-SPPH-7 LOW-DOSE HIGH RESOLUTION IMAGING IN MOBILE PHOTON-COUNTING DETECTOR CT: A VALIDATION STUDY FOR PEDIATRIC PROTOCOLS

Junyoung Park (*Presenter*)
Su-Jin Park (*Abstract Co-Author*)
Kwanhee Han (*Abstract Co-Author*)
Sukanya Iyer (*Abstract Co-Author*)
Raeef Istfan (*Abstract Co-Author*)
Yuechen Qian, PhD (*Abstract Co-Author*)
Jinwook Jung (*Abstract Co-Author*)

PURPOSE

The purpose of this study is to validate low-dose high resolution imaging using mobile photon-counting detector CT (PCD-CT) for pediatric protocols.

METHODS AND MATERIALS

To validate the performance of mobile PCD-CT, we conducted a comparative analysis with mobile EID-CT in pediatric imaging protocols. Using the OmniTom Elite with PCD and OmniTom Elite with EID, we acquired pediatric brain and lung scans at a tube voltage of 80 kV across various radiation dose levels. A 5-year-old phantom (CIRS Model 715) was used for this purpose. Quantitative parameters, including CNR and SNR, were measured and compared. Additionally, two radiologists qualitatively assessed the sharpness, overall image quality, and visibility of small anatomical structures. Radiation dose was compared by measuring CTDI vol for both PCD-CT and EID-CT. Furthermore, patient images from ICU were analyzed to evaluate the performance of both systems in clinical settings.

RESULTS

Quantitative analysis of the head scan revealed that PCD-CT achieved higher CNR (87.01 vs. 70.51) and SNR (139.86 vs. 102.07) than EID-CT at the same radiation dose (14.96 mGy) in pediatric protocols. To achieve equivalent CNR, the CTDI vol of PCD-CT and EID-CT were 10.27 mGy and 14.96 mGy, respectively, demonstrating a 31% dose reduction by PCD-CT. Qualitative assessment of the lung scan showed superior image quality for PCD-CT, with significantly higher spatial resolution in pediatric small anatomical regions, such as the temporal bone, pulmonary arteries, and lung nodules, compared to EID-CT. In ICU patient images, PCD-CT exhibited slightly lower CNR than EID-CT but achieved a 47% radiation dose reduction (white and gray matter: 1.66 vs. 2.09; ventricle: 5.12 vs. 6.06; hemorrhage: 8.23 vs. 9.16).

CONCLUSION

Our results demonstrate that mobile PCD-CT significantly reduces radiation dose compared to EID-CT while maintaining high-resolution imaging capabilities in pediatric protocols. This study highlights the potential of mobile PCD-CT as a valuable solution for pediatric imaging, particularly for critically ill patients who face risks associated with transportation and life-threatening conditions. By providing high-quality images at reduced radiation exposure, PCD-CT offers a promising approach for pediatric protocols.

CLINICAL RELEVANCE/APPLICATION

The low-dose high-resolution characteristics of mobile PCD-CT are critical for pediatric imaging protocols. Minimizing radiation exposure is essential for pediatric patients, who are highly sensitive to radiation. The high-resolution capabilities of PCD-CT enable precise delineation of anatomy and characterization of abnormalities in pediatric patients, where anatomical structures are significantly smaller than in adults.

R5A-SPPH-8 SIZE AND CONTRAST THRESHOLDS FOR LIVER LESION DETECTION IN REGULAR AND LOW-DOSE CT EXAMINATIONS: A READER STUDY OF 2,300 SYNTHETIC LESIONS ACROSS 100 PATIENTS

Paul Jahnke, MD (*Presenter*)
Li Yan (*Abstract Co-Author*)
Ulrich Genske (*Abstract Co-Author*)
Yang Peng (*Abstract Co-Author*)
Angelo Laudani (*Abstract Co-Author*)
Katharina Beller (*Abstract Co-Author*)
Thula C. Walter-Rittel, MD (*Abstract Co-Author*)
Moritz Wagner, MD (*Abstract Co-Author*)
Bernd K. Hamm III, MD (*Abstract Co-Author*)

PURPOSE

To determine the size and contrast required for liver lesion detection in oncologic and low-dose CT examinations.

METHODS AND MATERIALS

We collected 100 abdominal CT datasets retrospectively, with 50 from vendor A and 50 from vendor B. Each scanner had half the datasets using a regular dose oncologic protocol and half using a low-dose kidney stone protocol. Cylindrical liver lesions with 23 different combinations of size and contrast were synthetically inserted. A four-alternative forced choice reader experiment was conducted to determine lesion detectability, and image noise was measured within the liver.

RESULTS

Detection thresholds at regular dose were -30, -35, and -70 HU (vendor A) and -25, -35, and -65 HU (vendor B) for 15-, 10-, and 5-mm lesion diameters, respectively. At low dose, thresholds were -40 and -45 HU (vendor A) and -40 and -50 HU (vendor B) for 15- and 10-mm lesions, while 5 mm lesions were not reliably detectable. Noise levels were 21.5±2.3 HU (vendor A) and 25.9±4.9 HU (vendor B) at regular dose, and 22.2±2.0 HU (vendor A) and 30.9±3.1 HU (vendor B) at low dose.

CONCLUSION

In oncologic CT exams, liver lesions require contrasts of -30, -35, and -70 HU for reliable detection at 15-, 10-, and 5-mm diameters. In low-dose exams, the required contrasts increase to 40 and 50 HU for 15- and 10-mm lesions, while 5 mm lesions cannot be detected with confidence despite up to 70 HU lesion contrast.

CLINICAL RELEVANCE/APPLICATION

1. Higher contrast improves detection of smaller lesions, but is less important for larger lesions over 10 mm in diameter. 2. Dose reduction increases noise differently across CT vendors, yet lesion size and contrast detection remain consistent, making noise an unreliable predictor of detection accuracy. 3. Our results establish detection thresholds to support patient assessment and future liver lesion detection research.

R5A-SPPH-9 DEEPCT: A GENERAL DEEP LEARNING-BASED MODEL FOR CT IMAGE RESTORATION

Thomas C. Arnold, PhD (*Presenter*)
Zhihao Zhang (*Abstract Co-Author*)
Lei Xiang (*Abstract Co-Author*)
Qi Yang, MD (*Abstract Co-Author*)

PURPOSE

Reducing radiation dose while maintaining diagnostic-quality CT remains a key clinical goal. However, strategies such as lowering tube voltage/current, reducing views, or using static CT often introduce noise and artifacts, including sparse-view, nonuniform-view, and metal artifacts. To address this, we developed DeepCT, a general deep

learning model for restoring image quality across diverse CT degradations.

METHODS AND MATERIALS

A dataset of 860,000 training pairs was constructed, including low-dose CT images and corresponding normal-dose images with simulated artifacts. Nonuniform-view artifacts were generated by modeling the imaging mechanism of static CT.DeepCT was trained to jointly denoise and remove artifacts in both spiral and static CT images. To improve perceptual realism, a Noise Power Spectrum (NPS) loss guided the learning of natural noise textures by modeling spatial correlations. A Window-Range Focused (WRF) strategy improved training efficiency by focusing on clinically relevant intensity ranges.Evaluation was conducted on clinical low-dose (<40%) CT datasets from multiple hospitals, comprising 50 spiral and 50 static CT cases. Noise texture was assessed using 2D NPS, while PSNR, SSIM, and MAE were used to measure similarity to the corresponding normal-dose images.The effect of the NPS loss was evaluated using an abdominal enhanced CT case. The impact of the WRF strategy was assessed by tracking PSNR, SSIM, and MAE across epochs on the mediastinal window.

RESULTS

Compared to baseline methods, DeepCT achieved superior denoising and artifact removal, with more realistic textures, fewer HU deviations, and better anatomical detail preservation. It obtained the highest SSIM (0.873 ± 0.041), PSNR (28.91 ± 0.088), and the lowest MAE (2.2 ± 0.48), highlighting its advantage in both visual quality and quantitative metrics.Ablation studies on different loss functions showed that L1 and L1+SSIM produced over-smoothed textures, while perceptual loss failed to preserve fine vascular structures. In contrast, NPS loss maintained structural fidelity and generated noise patterns closer to normal-dose CT, as confirmed by 2D NPS analysis. The WRF strategy further enhanced DeepCT's performance by improving training stability and image quality within clinically relevant intensity ranges.

CONCLUSION

DeepCT is a general image restoration model trained on large-scale low-dose and simulated-artifact datasets using NPS loss and the WRF strategy, capable of achieving diagnostic-quality images comparable to normal-dose CT scans.

CLINICAL RELEVANCE/APPLICATION

DeepCT restores diagnostic-quality images from low-dose CT scans, enabling radiation dose reduction while also prolonging X-ray tube lifespan.

R5A-SPPH-10 CONFOUNDING EFFECT OF TEMPERATURE ON CHEMICAL SHIFT-ENCODED TRANSVERSE RELAXATION RATE (R2*) AND PROTON DENSITY FAT FRACTION (PDFF)

Felix Schoen (*Presenter*)
Florian Brandt (*Abstract Co-Author*)
Sophia Blum, MD (*Abstract Co-Author*)
Marie-Luise Kromrey, MD (*Abstract Co-Author*)
Ralf-Thorsten Hoffmann, MD (*Abstract Co-Author*)
Jens P. Kuehn (*Abstract Co-Author*)

PURPOSE

Chemical shift encoded magnetic resonance imaging (CSE-MRI) is widely used to determine the transverse relaxation rate (R2*) and proton density fat fraction (PDFF) as quantitative biomarkers for the assessment of liver iron and fat. Our aim was to investigate the impact of temperature changes on R2* and PDFF.

METHODS AND MATERIALS

Two agarose-based MRI phantoms were constructed, each containing vials filled with either 1) ferucarbotran-based MRI contrast agent or 2) peanut oil to modulate R2* and PDFF effects, respectively. The target concentrations for ferucarbotran and peanut oil were 16 µg/ml, 42 µg/ml, 70 µg/ml, 98 µg/ml, 126 µg/ml and 10%, 20%, 30%, 40%, respectively. The phantoms were evaluated at 3.0T CSE-MRI with five echo times across six different temperature levels (6 °C, 20 °C, 35 °C, 37 °C, 39 °C, and 41 °C). CSE-MRI datasets were post-processed to generate R2* and PDFF maps. Three measurements were performed in each vial. Results were evaluated using Intra-Class Correlation (ICC) to test for homogeneity within the vials and linear regression analysis to investigate temperature dependencies.

RESULTS

R2* and PDFF maps were obtained with homogenous values across all vials (ICCs = 1.00). Overall, R2* and PDFF values demonstrated a linear increase with rising concentrations of ferucarbotran and oil, respectively, across all temperature levels (coefficient of determination [R^2]: 0.990 - 0.999 for R2* and R^2: 0.964 - 0.999 for PDFF; both $p < 0.001$). For R2*, increasing temperatures were associated with decreasing values (slope: 7.90 at 6 °C and 5.92 at 41 °C). The average percentage decrease per °C in R2* ranged from -0.68% at 16 µg/ml to -0.50% at 126 µg/ml ferucarbotran concentration. For PDFF, increasing temperatures were associated with an increase in PDFF values (slope: 0.894 at 6 °C and 1.367 at 41 °C). The average percentage increase per °C in PDFF ranged from +0.87% at 10% to +1.42% at 40% oil concentration.

CONCLUSION

Temperature is a confounding factor for R2* and PDFF quantification, potentially causing significant deviations across different temperature levels. Therefore, studies for fat and iron quantification should incorporate algorithms to compensate for temperature effects.

CLINICAL RELEVANCE/APPLICATION

The results emphasize the need for temperature-compensating algorithms in fat and iron quantification to ensure accurate measurements, as temperature differences between a potentially cooler phantom compared to in-vivo conditions may lead to significant deviations.

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R5A-SPVA

Vascular Imaging Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-SPVA-1 COMPARISON OF CORONARY CTA IMAGE QUALITY DURING SYSTOLE UNDER DIFFERENT ALGORITHMS

Shikuan Li (*Presenter*)
Feng Chen, MD, PhD (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Xin Qin (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To evaluate the image quality of coronary CTA during systole using deep learning image reconstruction (DLIR-H) combined with the second-generation motion correction technique (SnapShot Freeze 2, SSF2) and compare it with traditional methods (ASIR-V50% + SSF2 and ASIR-V50% + SSF1), providing a basis for high-quality imaging in patients with atrial fibrillation.

METHODS AND MATERIALS

This retrospective study included 30 patients with atrial fibrillation who underwent coronary CTA during systole.Three reconstruction algorithm combinations were used:Group 1: DLIR-H + SSF2;Group 2: ASIR-V50% + SSF2;Group 3: ASIR-V 50% + SSF1.?Quantitative Metrics?: CT value, noise standard deviation (SD), signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and artifact index (AI).?Subjective Scoring?: A 5-point scale (1 = non-diagnostic, 5 = excellent) was used by two independent reviewers. Weighted Kappa coefficients (k = 0.8 indicating excellent agreement) were calculated to assess inter-observer consistency.

RESULTS

Right Coronary Artery : DLH + SSF2 showed the lowest SD values, highest SNR and CNR, and relatively lower AI across all segments (proximal, mid, and distal).AR50% + SSF1 performed the worst, with the highest SD values, lowest SNR and CNR, and higher AI. Left Coronary Artery : For the left main coronary artery, proximal left anterior descending artery, and proximal circumflex artery, DLH + SSF2 again demonstrated the lowest SD values, highest SNR and CNR, and relatively lower AI. Aortic Root : There were no significant differences in CT values among the three algorithm combinations. DLH + SSF2 showed the best performance in SNR and CNR, with relatively lower SD values and AI. Pairwise Comparisons ?DLH + SSF2 vs AR50% + SSF2?: Significant reductions in SD values ($P < 0.05$), increases in SNR and CNR by approximately 15%-20%, and decreases in AI by 30%-40% in the right coronary artery.

CONCLUSION

The combination of DLIR-H and SSF2 significantly reduces noise and motion artifacts, enhances image contrast and clarity, and outperforms traditional iterative reconstruction techniques (ASIR-V50%) in coronary CTA during systole. This technological advantage provides important support for precise diagnosis in patients with atrial fibrillation and high-quality imaging in the presence of arrhythmia, demonstrating significant clinical application potential.

CLINICAL RELEVANCE/APPLICATION

By significantly improving image quality, reducing noise, and artifacts, the combination of DLIR-H and SSF2 offers a more efficient and precise solution for coronary CTA examinations in patients with atrial fibrillation, holding clear clinical application prospects.

R5A-SPVA-2 AI-POWERED AUTOMATED DETECTION, SEGMENTATION, AND QUANTIFICATION OF PERIPHERAL ARTERIAL LESIONS ON CTA AXIAL IMAGES

Amin Katouzian, PhD (*Presenter*)
Kourosh Jafari-Khouzani, PhD (*Abstract Co-Author*)
Raj P. Shah, MD, MBA (*Abstract Co-Author*)
Justin Kline (*Abstract Co-Author*)
Sameer Suman (*Abstract Co-Author*)

PURPOSE

To develop and validate a novel AI pipeline for automated peripheral arterial disease assessment (PAD) on CTA, addressing three critical needs: 1) accelerating radiologist interpretation time, 2) replacing subjective qualitative assessments with accurate quantitative stenosis measurements, and 3) providing the first comprehensive end-to-end automated solution for peripheral arterial lesion analysis.

METHODS AND MATERIALS

We developed a two-stage AI pipeline processing CTA series from aorta to ATA bifurcation. From 500 patients, we excluded studies with stents, bypass grafts, or imaging artifacts, yielding 406 studies for training/validation and 58 for testing. Annotators provided labels for seven landmarks (aorta, common iliac, external iliac, common femoral, superficial femoral, popliteal, ATA bifurcation) and drew lumen/lesion contours. The landmark model used ResNet18 feature extraction, mean pooling, and fully connected regression layer, outputting values [1,7], each representing a landmark, using MSE loss. Results defined anatomical boundaries, limiting subsequent processing to slices between aorta and ATA bifurcation. A 2D bidirectional convolutional double-head U-Net was trained to segment lumen and lesion using Dice loss. Stenosis was automatically calculated, and studies flagged having lesions greater than 50% stenosis.

RESULTS

The landmark identification model achieved MSE of 0.0361 (SD: 0.0069, 95% CI: [0.03415, 0.03796]) on test set. For segmentation, we achieved 2D Dice scores of 91% and 66% for lumen and lesion respectively using 5-fold cross-validation on validation set (82 studies). On test set, we achieved 90% and 62% Dice for lumen and lesion. At patient-level for detecting lesions with greater than 50% stenosis, we achieved 92% sensitivity and 99% specificity on test set. When applied to 100 reportedly normal studies, our model identified 8 which had at least one lesion with greater than 50% stenosis that were missed in original radiology reports.

CONCLUSION

This first-of-its-kind AI pipeline successfully automated the entire workflow for PAD assessment on CTA axial series, providing accurate lesion detection and quantification comparable to expert interpretation while significantly reducing reading time.

CLINICAL RELEVANCE/APPLICATION

This novel AI solution represents a paradigm shift from subjective to objective PAD assessment, providing standardized quantitative measurements across institutions. It significantly improves radiologist efficiency, enables consistent disease monitoring, and facilitates data-driven clinical decision-making in PAD management.

R5A-SPVA-3 APPLICATION VALUE OF SPECTRAL CT MONOENEGY IMAGING COMBINED WITH DLIR IN CT ANGIOGRAPHY OF SUSPECTED PULMONARY EMBOLISM

Gaoyang Liu (*Presenter*)
Maofen Shi (*Abstract Co-Author*)
Suping Chen (*Abstract Co-Author*)
Lei Wu (*Abstract Co-Author*)

PURPOSE

To explore the impact of deep - learning - based image reconstruction algorithms on image quality and embolus display in pulmonary embolism patients' dual - energy CT pulmonary angiography (CTPA) virtual monochromatic imaging.

METHODS AND MATERIALS

In this retrospective study, 35 patients with pulmonary embolism who underwent dual-energy CTPA were enrolled. Virtual monochromatic images (VMIs) at 40 keV, 50 keV, and 60 keV were reconstructed using 50% ASIR-V and three different intensity deep learning reconstruction algorithms (DLIR-H, DLIR-M, and DLIR-L).Measure the CT values and SD values of the target regions, using the SD value of the erector spinae muscle as background noise to compute the SNR and CNR. Additionally, calculate the CNR for the embolus versus the normal-filled vessel.Two physicians subjectively scored overall image quality, thrombus visualization, and image noise on a scale of 0-5. Repeated - measures ANOVA and Friedman test were employed to compare inter - group differences.

RESULTS

With the same reconstruction algorithm, the SD, SNR, CNR of the pulmonary artery and clot - specific CNR decrease as keV increases. At the same keV, DLIR - H and DLIR - M algorithms show better objective image - quality parameters (all $P<0.05$), with DLIR - H the best - performing; but 50% ASIR-V and DLIR-L show no statistically significant differences (all $p>0.05$). The vascular noise of 50 keV DLIR-H images was lower than that of 60 keV ASIR-V images. At the same keV, DLIR-H had the highest thrombus-specific CNR of the three reconstruction methods, which was higher than that of ASIR-V and DLIR-L ($P<0.05$). The CNR of 40 keV DLIR-H was the highest among all. In subjective scores of overall image quality and noise, scores increased with increasing keV. At the same keV level, DLIR-H perform the best.Moreover, 50 keV DLIR-H images showed no statistically significant difference in scores compared to 60 keV ASIR-V images.In thrombus visibility score assessment, DLIR also led to an improvement, with DLIR-H delivering the most remarkable enhancement.

CONCLUSION

DLIR can remarkably reduce image noise of DE CTPA monochromatic images, improve the image quality of low - energy images from ASIR - V reconstruction, which were previously underused due to excessive noise, and sustain higher vessel enhancement and thrombus - depicting ability.

CLINICAL RELEVANCE/APPLICATION

Under ASIR-V reconstruction, low-energy images, despite high enhancement, are clinically unacceptable due to excessive noise. However, DLIR, particularly DLIR-H, can substantially reduce image noise. This makes low-energy images clinically applicable and is expected to enhance the detection of pulmonary embolism and even occult clots.

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R5B-SPBR

Breast Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPBR-1 OPTIMIZING AI POSITIVE FINDINGS ON PRIOR NEGATIVE MAMMOGRAMS FOR CONTRALATERAL BREAST CANCER DETECTION AFTER BREAST CANCER SURGERY: DISTINGUISHING TRUE FROM FALSE POSITIVES

Eun Kyung Park, MD, PhD (*Presenter*)
Nariya Cho, MD, PhD (*Abstract Co-Author*)
Ji-Jung Jung (*Abstract Co-Author*)
Hong-Kyu Kim (*Abstract Co-Author*)
Eunhye Kang (*Abstract Co-Author*)
Wonshik Han (*Abstract Co-Author*)

PURPOSE

Artificial intelligence (AI) systems can often accurately localize the missed cancers on prior mammograms before cancer diagnosis. However, for AI marks to lead to earlier cancer detection, radiologists must respond to them even without obvious suspicious findings. Therefore, this study aimed to identify the characteristics of true-positive (TP) AI marks on prior mammograms in which contralateral breast cancer (CBC) subsequently developed in women who had undergone breast cancer surgery, in comparison with false-positive (FP) AI marks observed in a control group.

METHODS AND MATERIALS

Between 2000 and 2018, 454 surveillance mammograms performed prior to CBC diagnosis and 460 matched controls without CBC were identified from a cohort of 15859 women (median age, 53 years [IQR, 46-60 years]) who had undergone breast cancer surgery. A commercial AI system (AI score, 0-100) was retrospectively applied to the mammograms. AI marks were considered TP if the score exceeded 10 and correctly localized subsequent cancer. FP marks were defined as those were benign or remained negative after = 2 years. Two radiologists classified AI findings by suspicion level (0, normal; 1, uncertain; 2, probably benign; 3, suspicious), lesion type (mass, asymmetry, architectural distortion, calcifications, and mass with calcifications), and presence of an adjacent vessel sign (a vessel converging toward the marked area) in consensus without clinical information. TP and FP groups were compared using the Wilcoxon rank-sum test and Fisher's exact tests.

RESULTS

Twenty-eight TP marks were identified a median of 7 months (range, 1-23 months) prior to CBC diagnosis and 66 FP marks were identified. The median AI score was significantly higher in TP than in FP marks (32.5 [IQR, 17.5-64.5] vs. 14.7 [IQR, 11.8-21.3]; P <.001). Compared to FP, TP mark findings more frequently showed high suspicion level (3: 68% [19/28] vs. 15% [10/66]; P <.001), was more associated with masses or architectural distortion (46% [13/28] vs. 8% [5/66]; P <.001), and showed a more adjacent vessel sign (50% [14/28] vs. 9% [6/66]; P <.001).

CONCLUSION

AI system correctly identified early signs of CBC in 6.2% of the CBC group, with a median of 7 months before diagnosis. TP marks were associated with significantly higher AI scores, more suspicious imaging features, and more frequent adjacent vessel sign compared to FP marks.

CLINICAL RELEVANCE/APPLICATION

Differentiating features between true and false positive AI marks enables radiologists to use AI systems for early detection of contralateral breast cancer while minimizing false recalls during postoperative surveillance, providing valuable guidance for refining radiologist-AI interaction.

R5B-SPBR-2 LEVERAGING THE DIAGNOSTIC COMPLEMENTARITY BETWEEN AI AND HUMAN READING TO REACH SUPERIORS OUTCOMES IN BREAST SCREENING

Annie Ng, PhD (*Presenter*)
Clarisse De Vries (*Abstract Co-Author*)
Gerald Lip, MBBCh, FRCR (*Abstract Co-Author*)
Roger T. Staff, PhD (*Abstract Co-Author*)
Peter D. Kecskemethy, PhD (*Abstract Co-Author*)
Ben Glocker, PhD (*Abstract Co-Author*)
Lesley A. Anderson, PhD,MPH (*Abstract Co-Author*)

PURPOSE

Double reading breast screening employs two human readers who ideally catch each other's errors to improve clinical outcomes, demonstrating diagnostic complementarity. As AI and human readers have different strengths and weaknesses, diagnostic complementarity can be enhanced when using AI in complementing workflows. Use of AI in dual roles, as an independent reader (IR) and additional reader (XR), has demonstrated significantly improved clinical and operational outcomes. This study assesses the diagnostic complementarity between first and second human readers versus standalone AI with single human reading, a key element in how AI-integrations can be so effective and beneficial.

METHODS AND MATERIALS

In a Scottish prospective service evaluation (N=10,899; Feb-Oct 2024), an AI system was deployed as an XR to flag cases for additional review, not recalled by standard double reading (DR). The AI was deployed live at a balanced sensitivity-specificity operating point (OP A2) and simulated at a higher-specificity OP (A1). The AI as an IR, acting as the second reader when it agreed with the first reader to not recall a case, was modelled at OP A2 and at a higher-sensitivity OP A3. This enabled four IR+XR combination AI workflows that use the AI at four OP combinations: 1) A2 and A1, 2) A2 and A2, 3) A3 and A1, and 4) A3 and A2, respectively, for the IR and XR roles. AI workflows 1-4 were compared to DR and assessed in terms of cancer detection rate (CDR), recall rate (RR), positive predictive value (PPV), and workload savings. Non-inferiority (a=0.05) was tested for CDR, RR, and PPV; superiority was tested when non-inferiority passed (a=0.1). The relative differences in sensitivity (SEN) and specificity (SPEC) between first (R1) and second readers (R2) and between standalone AI at OP A1-3 with R1 were compared.

RESULTS

All AI workflows 1-4 resulted in significant improvement across all metrics; superiority tests passed for CDR, RR, and PPV, and modelled workload savings were between 31-37%, except AI workflow 4 passing non-inferiority, but not superiority for RR. Relative differences between R1 and R2 were 2.0% for SEN and 1.3% for SPEC. Relative differences between AI and R1 were 3.0-9.9% for SEN and 4.1-17.2% for SPEC.

CONCLUSION

Greater SEN-SPEC diagnostic differences were demonstrated between AI and R1 compared to R1 and R2. Such differences have been leveraged to optimize diagnostic complementarity resulting in multiple AI-integrations that provide superior clinical outcomes and modelled operational outcomes.

CLINICAL RELEVANCE/APPLICATION

When the different performance of AI and human readers are leveraged to optimize diagnostic complementarity, superior clinical and operational outcomes can be achieved, demonstrating the power of complementing AI workflows.

R5B-SPBR-4 FACTORS DRIVING TIMELY COMPLETION OF SCREENING MAMMOGRAPHY EPISODES OF CARE

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Yingke Xu (*Abstract Co-Author*)
Suzanne Kolb (*Abstract Co-Author*)
Mary Grace Asirot (*Abstract Co-Author*)
Janie M. Lee, MD, MSc (*Abstract Co-Author*)
Christoph I. Lee, MD,MS (*Abstract Co-Author*)
Marissa B. Lawson, MD (*Abstract Co-Author*)

PURPOSE

To evaluate disparities in timely diagnostic follow-up after positive screening mammography based on woman- and neighborhood-level social determinants of health (SDOH) using two composite measures, Area Deprivation Index (ADI) and County Health Rankings Health Factors (CHR).

METHODS AND MATERIALS

Positive screening mammograms—with a Breast Imaging Reporting and Data System (BI-RADS) 0 assessment and recommendation for additional imaging—obtained January 2010-December 2022 in women 40-89 years old were included. Diagnostic exams, defined as first follow-up mammogram or ultrasound, were positive if the final BIRADS assessment was 4 or 5, recommending biopsy. Woman-level variables included age, self-reported race and ethnicity, breast density, first-degree family history or personal history of breast cancer, prior biopsy, and time from last mammogram. Neighborhood-level SDOH were ADI quartiles (1 st quartile as the lowest deprivation) and CHR quartiles (1 st quartile as the healthiest). Median time with interquartile range (IQR) in days for three distinct diagnostic intervals was assessed: screening mammography to diagnostic exam, diagnostic exam to biopsy, and screening to biopsy. Two bootstrapped quantile regression models evaluated associations between woman- and neighborhood-level factors and timeliness metrics, using ADI or CHR.

RESULTS

There were 11,854 positive screening mammograms and 2,957 diagnostic exams. Median (IQR) time in days was 15.0 (11.2-27.3) from screening to diagnostic imaging, 3.0 (0-6.0) from diagnostic to biopsy, and 19.8 (14.1-35.3) from screening to biopsy, adjusting for ADI. Asian, Black and Hispanic women often experienced longer diagnostic intervals. For example, Hispanic women waited 3.6 (95% CI: 2.2, 4.7) days longer than White women between screening and diagnostic exams when adjusting for woman-level factors and ADI ($p<0.001$). Women in the highest ADI areas had 3.7 (95% CI: 2.4, 4.9) more days between screening and diagnostic exams and 3.9 (95% CI: 1.1, 7.2) more days between screening and biopsy than women in lowest ADI areas ($p<0.001$). Compared to women in the healthiest CHR counties, patients in the least healthy CHR counties had 5.3 (95% CI: 2.1, 8.5) fewer days from screen to diagnostic, ($p = 0.002$).

CONCLUSION

Minority race and ethnicity was associated with longer diagnostic follow-up after positive screening mammogram, after adjusting for other woman- and neighborhood-level factors. However, association between neighborhood-level SDOH and timely diagnostic follow up differed depending on the composite measure.

CLINICAL RELEVANCE/APPLICATION

Multilevel analysis of disparities and their interactions is needed to identify actionable factors to guide interventions to improve timely care.

R5B-SPBR-5 OPPORTUNISTIC LUNG CANCER SCREENING DURING BREAST MRI: PRELIMINARY RESULTS

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Brianna A. Karim, BS (*Abstract Co-Author*)
Joao Fonseca, MD (*Abstract Co-Author*)
Henry Okonkwo (*Abstract Co-Author*)
Maysa R. de Oliveira, MD (*Abstract Co-Author*)
Jennifer Wen (*Abstract Co-Author*)
Pavan Iyengar (*Abstract Co-Author*)
Amanda Acevedo (*Abstract Co-Author*)
Kayla Davis (*Abstract Co-Author*)
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Joice C. Prodigios, MD (*Abstract Co-Author*)
Jean Bontemps (*Abstract Co-Author*)
Arman Mahmood (*Abstract Co-Author*)
Kayla Davis (*Abstract Co-Author*)
Udochukwu Amanamba (*Abstract Co-Author*)
Ronak Kundalia, MSc, BS (*Abstract Co-Author*)
Bruno Hochhegger, MD, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the feasibility of opportunistic lung cancer screening for patients undergoing breast MR imaging.

METHODS AND MATERIALS

This 48-month prospective study recruited outpatients undergoing contrast-enhanced breast MRI scans. All scans were performed on either 3.0 T or 1.5 T scanner, with prone positioning and a dedicated breast coil. To evaluate the thorax, we included an axial postdynamic 3D ultrafast gradient-echo acquisition to the standard breast MRI protocol.Breast coils were switched off, and a body array coil was placed onto the back of the patient in the same prone position. Data are reported as mean ± standard deviation (SD), range, or percentage as appropriate. Inter-observer agreement for image quality and nodule detection was analyzed using kappa statistics.

RESULTS

A total of 419 subjects met the inclusion criteria. Additional mean time was 27s and 20s for 1.5T and 3.0T scanners, respectively.Mean age was 50 years (SD ± 12). Most patients underwent breast MRI for evaluation of breast cancer (n = 236; 61.9%) or breast nodule (n = 96; 25.2%). The majority were never smokers (n = 220; 73.1%). Most cases were negative for lung cancer screening (Lung-RADS 1: n=340,89; 24%); and Lung-RADS 2: n = 31; 8.14%). Between the positive scans, the Lung-RADS scores found were 3 (n = 7;1; 84%), 4A (n = 2; 0.52%), and 4x (n = 1; 0.26%). None of these findings were visible in the standard breast MR sequences.

CONCLUSION

The opportunistic addition of a full-chest sequence during breast MRI is a quick and potentially reliable tool for lung cancer screening.

CLINICAL RELEVANCE/APPLICATION

Opportunistic lung cancer screening during breast MRI detects clinically significant nodules and extra-mammary findings, supporting its feasibility in high-risk patients.

R5B-SPBR-6 CRYOABLATION OF OLIGOMETASTATIC AXILLARY LYMPH NODES IN PATIENTS WITH BREAST CANCER INELIGIBLE FOR SURGERY: A THREE-YEAR SINGLE-CENTER EXPERIENCE

Jorge Rey, MD (*Presenter*)
Jose Maria Oliver-Goldaracena (*Abstract Co-Author*)
Vicenta Cordoba Chicote (*Abstract Co-Author*)
Maria Jose Roca Navarro, MD (*Abstract Co-Author*)
Diego Garrido Alonso (*Abstract Co-Author*)
Ylenia Navarro Monforte, MD (*Abstract Co-Author*)
Teresa Diaz de Bustamante, MD (*Abstract Co-Author*)
Fernando Garcia Martinez, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility, safety, and efficacy of ultrasound-guided cryoablation for the treatment of axillary lymph node oligometastases in breast cancer patients who are not candidates for surgery.

METHODS AND MATERIALS

In this single-institution retrospective study, 12 patients with breast cancer deemed ineligible for surgery underwent ultrasound-guided cryoablation of oligometastatic axillary lymph nodes between November 2021 and February 2025. Patient demographics, disease characteristics, and procedural details were recorded. Cryoablation was performed using the ICEfx Galil argon gas system (Boston Scientific, USA). A "triple-phase" protocol was applied: freeze, thaw, and freeze. Ultrasound follow-up was performed initially at 1-2 months post-procedure to assess for incomplete treatment, and subsequently every six months to monitor for recurrence. Procedural efficacy was evaluated based on morphological (sonographic) and/or functional (PET-CT) imaging criteria. Primary endpoints were technical success and major complications.The secondary endpoints were local control rate and time to progression. Events were classified according to the Common Terminology Criteria for Adverse Events (CTCAE), version 5.0, as grade 1 (mild), grade 2 (moderate), or grade 3 (severe).

RESULTS

The study cohort included 12 patients (mean age, 83 ± 7.64 years) who underwent 14 cryoablation procedures targeting 16 axillary lymph node oligometastases. The mean short-axis diameter of the targeted nodes was 1.3 ± 0.5 cm. Technical success was achieved in all 14 procedures (100%). Mild adverse events (grade 1) were reported in two patients.Local tumor control was achieved in all 16 treated nodal metastases over a median follow-up period of 15 months (range, 3-32 months). However, local progression with further spread to additional lymph nodes occurred in 2 out of 12 patients (16.6%). The median time for recurrence was 15 months.

CONCLUSION

Cryoablation of axillary lymph node oligometastases is a feasible, safe, and effective treatment option with favorable medium-term outcomes in breast cancer patients who are not candidates for surgery. Further studies are needed to evaluate the long-term efficacy of this technique and to better define its role in this patient population.

CLINICAL RELEVANCE/APPLICATION

This study highlights cryoablation as a minimally invasive and well-tolerated option for managing axillary lymph node metastases in breast cancer patients unfit for surgery.

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R5B-SPCA

Cardiac Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPCA-3 COMPARISON OF SINGLE- AND DUAL-PHASE METHODS ON PHOTON-COUNTING DETECTOR CT (PCD-CT) WITH DUAL-PHASE METHOD ON ENERGY-INTEGRATING DETECTOR CT (EID-CT) FOR MYOCARDIAL EXTRACELLULAR VOLUME (ECV): MRI AS THE REFERENCE

Mengzhen Wang, MD (*Presenter*)
Shouyu Bao (*Abstract Co-Author*)
Zhihan Xu, MD (*Abstract Co-Author*)
Wenjie Yang, MD (*Abstract Co-Author*)

PURPOSE

Aimed to evaluate the correlation and consistency of Extracellular volume (ECV) quantification between Photon-counting detector CT (PCD-CT) and Energy-integrating detector CT (EID-CT) using a dual-phase method, with cardiac magnetic resonance imaging as reference. Additionally, we validated an automatic and comprehensive three-dimensional single-phase ECV assessment method on PCD-CT that does not require first-pass coronary CT angiography images for segmentation.

METHODS AND MATERIALS

This retrospective study included 80 patients who underwent both CMR and cardiac CT (40 patients underwent PCD-CT and 40 underwent EID-CT). Pearson correlation coefficients and intraclass correlation coefficients (ICCs) were used to evaluate the correlation and reliability of CT ECV with CMR ECV. Subgroup analysis was performed based on heart rate (HR).

RESULTS

The single-phase and dual-phase ECV measurements on PCD-CT showed excellent correlation and consistency with CMR ECV (correlation coefficient: single-phase, 0.84; dual-phase, 0.91; ICC: single-phase, 0.90; dual-phase, 0.94). Both methods significantly outperformed EID-CT (correlation coefficient: 0.62; ICC: 0.76; all $p < 0.05$). No significant differences were observed between the two PCD-CT methods ($p > 0.05$). PCD-CT demonstrated high consistency across both HR subgroups (ICC: HR = 60 bpm: 0.89 for single-phase, 0.85 for dual-phase; HR > 60 bpm: 0.87 for single-phase, 0.88 for dual-phase), whereas EID-CT exhibited reduced consistency in patients with HR > 60 bpm (ICC: HR = 60 bpm: 0.78; HR > 60 bpm: 0.60).

CONCLUSION

PCD-CT demonstrated superior correlation and reliability in ECV analysis compared to EID-CT, especially in the high HR group. The single-phase ECV measurement method was as effective as the dual-phase method, showing excellent correlation and consistency with CMR.

CLINICAL RELEVANCE/APPLICATION

This study highlights that PCD-CT provides superior myocardial ECV quantification with better image quality, lower radiation exposure, and high consistency with CMR. Its automatic three-dimensional single-phase ECV assessment offers a safer, more efficient approach for evaluating myocardial fibrosis in clinical practice.

R5B-SPCA-4 DIAGNOSTIC ROLE OF NON-DEDICATED DUAL-ENERGY CT CALCIUM SCORING IN AORTIC STENOSIS DETECTION

Giuseppe Muscogiuri, MD (*Presenter*)
Gregorio Chierchia, MD (*Abstract Co-Author*)
Jessica Usai, MD (*Abstract Co-Author*)
Daniele Sferratore, MD (*Abstract Co-Author*)
Paolo Marra, MD (*Abstract Co-Author*)
Sandro Sironi, MD (*Abstract Co-Author*)

PURPOSE

This retrospective study evaluates the calcium score as a diagnostic indicator for aortic stenosis (AS) using dual-energy CT with virtual unenhanced images. Echocardiography, while considered the gold standard for AS evaluation, presents limitations in approximately one-third of patients due to discordant parameters. The calcium score offers an anatomical assessment independent of hemodynamic flow conditions that potentially complicate echocardiographic accuracy.

METHODS AND MATERIALS

The study analyzed 60 patients (36 males, 24 females; mean age 67.5 years; mean BMI 26.8) who underwent both dual-energy CT and echocardiography within a one-year timeframe. Calcium score was calculated using the Agatston method on virtual unenhanced images, while AS severity was classified according to European Society of Cardiology guidelines into four categories: no stenosis (n=42), mild (n=7), moderate (n=6), and severe stenosis (n=5). Statistical analysis included Mann-Whitney U test for group comparisons and ROC curve analysis with DeLong test for determining diagnostic accuracy.

RESULTS

Results demonstrated significantly higher calcium scores in patients with AS (median 134.5, IQR 5-455) compared to those without stenosis (median 0, IQR 0-8), with $p=0.0001$. ROC curve analysis revealed excellent diagnostic performance for detecting severe stenosis (AUC=0.93), moderate performance for moderate stenosis (AUC=0.73), and limited value for mild stenosis (AUC=0.60). DeLong test comparisons between stenosis categories confirmed statistically significant differences ($p<0.05$) in the discriminative ability of calcium score for severe stenosis compared to all other categories, while differences between "any stenosis" and mild or moderate stenosis were not significant.

CONCLUSION

This study confirms the feasibility of calcium scoring using non-dedicated dual-energy CT acquisitions for AS evaluation, with particular utility for identifying severe AS cases that might otherwise be misclassified by echocardiography alone.

CLINICAL RELEVANCE/APPLICATION

Identifying patients with severe aortic stenosis using non-dedicated CT scans can be pivotal in the management of oncology patients. Beyond the benefits of dual-energy acquisition for oncologic assessments, evaluating cardiac structures can be crucial for appropriate clinical management and prognostic stratification

R5B-SPCA-5 AI-DRIVEN MOTION COMPENSATION IN PROSPECTIVELY ECG-TRIGGERED CORONARY CTA: A STEP FORWARD IN DIAGNOSTIC PRECISION?

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Faruk Colak (*Abstract Co-Author*)
Magin Eduardo Sosa Contreras (*Abstract Co-Author*)
Thorsten Klink, MD (*Abstract Co-Author*)

PURPOSE

To investigate the diagnostic benefit of AI-driven motion-compensated reconstruction (MCR) in prospectively ECG-triggered coronary CTA (cCTA). This study is one of the first to systematically evaluate the impact of MCR on objective and subjective image quality, and to identify patient-specific predictors of its utility.

METHODS AND MATERIALS

This retrospective single-center study includes 31 consecutive patients (19 females, 12 males; mean age 56.7 range 30-71) who underwent prospectively ECG-triggered cCTA using 256-slice dual-layer spectral CT scanner. For each patient, standard model-based iterative (IMR) and motion-corrected IMR reconstructions (MCR, Precise Cardiac) with a slice thickness of 0.67 mm were analyzed using a comprehensive cardiac analysis tool. The nine proximal coronary segments based on the 18-segment SCCT model were evaluated. Objective image quality was assessed based on contrast-to-noise ratio (CNR), signal-to-noise ratio (SNR), full width at half maximum (FWHM), and line spread function (LSF). Subjective image quality was evaluated using a 5-point Likert scale. A subgroup analysis was conducted for segments affected by motion artifacts.

RESULTS

MCR significantly reduced FWHM in the left main coronary artery (?FWHM-0.0590, p =0.0157), while other segments showed non-significant differences (p >0.05). Heart rate (HR) was the strongest predictor of ?CNR and ?SNR (p <0.001), with younger age and female sex showing non-significant trends. Higher heart rate variability (HRV) correlated with improved edge sharpness (?LSF, p =0.027), suggesting greater benefit in patients with rhythm irregularities. MCR images achieved higher subjective image quality scores compared to standard reconstruction (p <0.05), particularly in motion-affected segments (p <0.01). MCR upgraded 4 of 12 non-diagnostic segments to interpretable (33.3%; McNemar's test, p=0.125).

CONCLUSION

Preliminary results indicate that MCR improves objective metrics, notably FWHM and LSF, as well as subjective image quality and may lead to more reliable coronary artery assessment in CTA patients with motion artifacts.

CLINICAL RELEVANCE/APPLICATION

MCR not only improves coronary CTA images at higher heart rates but may also turn previously unreadable segments into diagnostically assessable ones—offering a real step forward in clinical confidence.

R5B-SPCA-7 FRAGILITY OF DEEP LEARNING MODELS FOR CORONARY ARTERY DISEASE DETECTION IN CARDIAC MRI: A FIRST LOOK AT ADVERSARIAL VULNERABILITY

Basudha Pal (*Presenter*)
Muhammad Umair, MBBS (*Abstract Co-Author*)

PURPOSE

Deep learning systems have demonstrated high accuracy in detecting coronary artery disease (CAD) from cardiac MRI and are increasingly considered for noninvasive screening. However, their reliability under real-world image perturbations has not been systematically assessed. While prior work explored adversarial attacks in other modalities such as chest X-rays, to our knowledge, there has been limited evaluation on the robustness of CAD classifiers trained on cardiac MRI. This work presents a comprehensive vulnerability analysis in this setting, demonstrating how even high-performing models can be sensitive to visually imperceptible perturbations.

METHODS AND MATERIALS

A ResNet-18 backbone was trained on the CAD Cardiac MRI Dataset, consisting of 75,064 cardiac MRI images labeled for CAD presence or absence. Images of 512x512 dimensions were preprocessed to include grayscale conversion, median and Gaussian denoising, CLAHE-based contrast enhancement. The dataset was partitioned into training (70%), validation (15%), and test (15%) subsets. The model was trained using cross-entropy loss and optimized with Adam and the best check point was chosen on the basis of validation AURoC. We established a baseline performance on clean test data followed by a stress test using three white-box, gradient-based adversarial attacks: Fast Gradient Sign Method (FGSM, epsilon=0.03), Projected Gradient Descent (PGD, epsilon=0.03, 40 steps), and the Carlini-Wagner (CW) attack. These attacks introduced targeted perturbations designed to alter model predictions while preserving image appearance.

RESULTS

The model achieved an AURoC of 99.6% on clean test data. However, AURoC dropped markedly under adversarial conditions: to 54.27% with FGSM, 51.21% with PGD, and 63.63% with CW. Adversarial examples remained visually indistinguishable from the originals but induced misclassification of CAD labels. The sharp performance drop across all three attack types highlights a critical vulnerability.

CONCLUSION

CAD classifiers trained on cardiac MRI are highly susceptible to minimal input perturbations, despite near-perfect clean performance. This discrepancy underscores the need to go beyond conventional accuracy metrics and adopt robustness evaluation as part of model validation using methods such as adversarial training.

CLINICAL RELEVANCE/APPLICATION

We present a systematic evaluation of adversarial vulnerability in the context of CAD detection from cardiac MRI, an area that has not been previously explored in depth. Understanding model fragility through structured attacks can support the development of more reliable and clinically acceptable deep learning systems, especially as AI tools move toward deployment in cardiac imaging workflows.

R5B-SPCA-9 MACHINE LEARNING MODEL USING 3D CARDIAC MR SUBSTRATE FEATURES FOR POST-MYOCARDIAL INFARCTION RISK PREDICTION: A MULTICENTER STUDY

Lujing Wang (*Presenter*)
Xiaoying Zhao (*Abstract Co-Author*)
Xinxiang Zhao (*Abstract Co-Author*)

PURPOSE

To explore the predictive value of machine learning (ML) models based on 3D cardiac MR substrate features for assessing the risk of major adverse cardiovascular events (MACE) after myocardial infarction (MI).

METHODS AND MATERIALS

This retrospective study included MI patients who underwent cardiac MR imaging between May 2015 and August 2024. The primary outcome was a composite MACE endpoint, including all-cause mortality, recurrent MI, heart failure rehospitalization, ventricular arrhythmias, and stroke. External validation was performed using independent datasets from multiple centers. 3D substrate features, including core scar, border zone, and abnormal electrophysiological corridors, were extracted using ADAS 3D software. In addition to clinical and functional cardiac MR parameters, feature selection was conducted using univariate logistic regression and the Boruta algorithm. Eight ML models, including TabPFN, were trained and evaluated using ROC curve analysis. The optimal ML model was used to construct multimodal prediction models, and model interpretability was enhanced using SHAP analysis.

RESULTS

A total of 292 MI patients were included, with a median follow-up of 35 months. MACE occurred in 91 patients. Nine key variables were retained after feature selection, including three clinical variables: high-density lipoprotein, chronic kidney disease, tricuspid regurgitation degree, two CMR functional parameters: left ventricular ejection fraction, left ventricular global circumferential strain, and four 3D substrate features: border zone mass, corridor mass, corridor burden, corridor length. Six multimodal models were developed using the best-performing ML algorithm, TabPFN. Model 4 (clinical + 3D substrate features) demonstrated robust predictive performance across the training (AUC = 0.91), internal test (AUC = 0.82), and external validation (AUC = 0.89) cohorts. Model 3 (only 3D substrate features) achieved an external AUC of 0.90, significantly outperforming models using only clinical features (Model 1: AUC = 0.63) or functional parameters (Model 2: AUC = 0.49). Decision curve analysis confirmed the superior clinical net benefit of models incorporating 3D substrate features. SHAP analysis identified corridor mass and corridor burden as the most influential predictors.

CONCLUSION

ML models based on 3D CMR substrate features effectively predict the risk of MACE in MI patients and outperform models relying solely on traditional clinical or functional CMR parameters.

CLINICAL RELEVANCE/APPLICATION

These models offer a novel, interpretable tool to support precision risk stratification and individualized treatment planning in post-MI management.

R5B-SPCA-13 EFFECT OF DEEP LEARNING RECONSTRUCTIONS ON THE INTERPRETATION OF RADIOMICS FEATURES IN CARDIAC MR IMAGING

Durga Udayakumar, MD (*Presenter*)
Mohamed Gamal, MD (*Abstract Co-Author*)
Huan Lu, MD (*Abstract Co-Author*)
Vincenzo Scialo (*Abstract Co-Author*)
Spencer Waddle (*Abstract Co-Author*)
Ananth J. Madhuranthakam, PhD (*Abstract Co-Author*)
Tim Leiner, MD, PhD (*Abstract Co-Author*)

PURPOSE

Deep learning-based reconstruction (DLR) methods are increasingly used to improve cardiac magnetic resonance (CMR) image quality. Radiomics offers a complementary approach by extracting high-dimensional, quantitative features for insights into cardiac structure and function. This pilot study evaluated the effect of DLR methods on radiomic features and their influence on the interpretation of radiomic analysis in cardiac imaging.

METHODS AND MATERIALS

This IRB approved study included CMR images from 42 healthy subjects (M/F: 14/28; Age: 39±12 years), acquired using cine balanced steady-state free precession with compressed sensing acceleration factor 4 (CS4). The images were also reconstructed with DLR methods (Philips Healthcare) - product SmartSpeed (SS) for improving signal-to-noise ratio (SNR) and work-in-progress Precise Super Resolution (SR) for increasing spatial resolution. ROIs were drawn on 3D Slicer® covering the entire myocardium on a single center slice at mid-diastole (MD) and mid-systole (MS), followed by radiomics features extraction using PyRadiomics. Consistency of radiomics features were evaluated with Pearson correlation coefficients (?) between the following pairwise comparisons: CS4 vs. CS4-SS and CS4 vs. CS4-SR for both MD and MS images and visualized using histograms and heatmaps on R software.

RESULTS

A total of 105 radiomics features were included in the analysis. Excellent correlation (?=0.8; all P<0.05) was observed for a substantial number of radiomics features between CS4 and CS4-SS (MD: 97/105, MS: 93/105), whereas correlations between CS4 and CS4-SR were notably lower (MD: 72/105, MS: 68/105). All shape and first-order features showed consistently high correlations (?=0.8) between CS4 and CS4-SS across both MD and MS images, a consistency that was not observed between CS4 and CS4-SR. Features exhibiting lower correlations (?<0.8) predominantly included those related to "Low Gray Level Emphasis," indicating variations in gray-level intensity introduced by DLR methods.

CONCLUSION

DLR methods that improve SNR without altering spatial resolution (e.g., SmartSpeed) preserve the integrity of most radiomics features, especially shape and first-order metrics, enabling reliable comparisons across reconstruction methods. While this study found the works-in-progress Super Resolution model affected more features, further studies are needed to assess DLR methods that enhance spatial resolution for comparative analyses with other reconstruction methods.

CLINICAL RELEVANCE/APPLICATION

Understanding of DLR methods and their effects on spatial resolution is essential for accurate radiomics-based interpretation of cardiac MR images and their utility in precision diagnostics and personalized care.

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R5B-SPCH

Chest Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPCH-3 ENHANCING RADIOLOGIST PERFORMANCE IN LUNG NODULE DETECTION ON CHEST RADIOGRAPHS USING AN AI-ASSISTED TOOL

Sean D. Raj, MD, MBA (*Presenter*)
Barry J. Sadegi, MD (*Abstract Co-Author*)
Xiaowei Hong (*Abstract Co-Author*)
John Simon, MD (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the diagnostic performance of a commercially available, FDA-approved, artificial intelligence (AI) system for lung nodule detection on chest radiographs and to assess its impact on radiologists' accuracy and efficiency.

METHODS AND MATERIALS

This multi-center study was conducted across five imaging centers in four states across the US. In Phase 1, a retrospective dataset of 2,181 chest radiographs was used to assess the standalone performance of the AI tool. In Phase 2, a multi-reader, multi-case study was conducted using 400 cases sampled from Phase 1. Twenty radiologists (including thoracic and non-thoracic specialists) reviewed all 400 images twice - once with and once without AI assistance - separated by a one-month washout period to reduce recall bias.Performance metrics included area under the ROC curve (AUC), sensitivity, specificity, and interpretation time per image. Analysis was performed overall and across patient subgroups (age, gender, ethnicity). Lesion-based performance (AFROC and sensitivity) was assessed by size and density. Ground truth was established by consensus of three board-certified radiologists.

RESULTS

The AI-assisted tool detects nodules on chest X-rays with high sensitivity (88.5% (95% CI: 86.4-90.3%), specificity (83% (95% CI: 80.7-90.3%), and AUC (84.1% (95% CI: 82.7-85.5). Performance remains robust across subgroups. Readers' performance significantly improved with AI assistance (AUC=85.8% (95% CI: 85.2-86.5%)) compared to without (AUC=80.7% (95% CI: 80-81.5%)). Sensitivity and specificity increased from 79.8% to 89.4% (p <.001) and 82.4% to 85.1% for all readers. The interpretation time per image was reduced by 23.3%. Results per lesion size and density are presented in Table 1.

CONCLUSION

This study shows that Radiologists enhanced by an AI-assisted tool achieve higher diagnostic accuracy and efficiency than either Radiologists or the AI tool alone. These results support the complementary role of AI in clinical Radiology and its potential to enhance patient care.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the potential of AI-assisted systems to improve Radiologists' diagnostic accuracy and efficiency, contributing to better patient care and reduced workload.

R5B-SPCH-6 RADIOLOGICAL FEATURES AND CLINICOPATHOLOGICAL ASSOCIATIONS WITH RECURRENCE IN RESECTED PATHOLOGICAL STAGE 0-1A NON-SMALL CELL LUNG CANCER

Lijing Zhang, MD (*Presenter*)
Wenchao Ma (*Abstract Co-Author*)
Rowena Yip, PhD, MPH (*Abstract Co-Author*)
Louis Gros, MD (*Abstract Co-Author*)
David F. Yankelevitz, MD (*Abstract Co-Author*)
Claudia I. Henschke, PhD, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to identify radiologic features associated with recurrence in early stage lung cancer patients.

METHODS AND MATERIALS

This study was a secondary review of CT findings and clinicopathologic data from an integrated health care system with participants enrolled in the Initiative for Early Lung Cancer Research on Treatment(IELCART) from February 2016 to March2024. Follow up was calculated from the date of surgery of their first primary lung cancer to the date for recurrence or December 12th , 2024, whichever comes first. Recurrence was classified as metastatic or local recurrence (including suture-line recurrence). Preoperative radiologic features, volume doubling time (VDT) and PET maximum standardized uptake value were evaluated. Multivariable logistic regression with LASSO selection was used to identify factors associated with recurrence, adjusting for demographic, clinical, and pathological covariates. Model performance was assessed using the area under the receiver operating characteristic curve (AUC).

RESULTS

We reviewed a total of 820 cases with resected NSCLCs, of which 128 cases with pathological Stage 0-1A NSCLCs met the inclusion criteria. Among these, 34 had recurrence and 94 had non-recurrence. Median follow-up was 70 months (IQR: 61-81.5 months). They were predominantly White (62%; 13% Black, 12.5% Asian, 12.5% Other), 81% were non-Hispanic, and 71% were former smokers (23% never smokers, 6% current smokers). Compared to the non-recurrence group, the recurrence group had higher pack-years of smoking (35.5 vs 12.8, p=0.015) and were more likely to have self-reported COPD (52% vs 48%, p=0.002). Angiolymphatic invasion were more common in the recurrence group compared to non recurrence group(P<0.001)In a multivariable logistic regression combining clinicopathological and radiological features, COPD (OR = 3.76,p=0.04) and presence of the lollipop sign(Lollipop sign is defined as a single blood vessel entry in the middle of the lung cancer nodule on any multiplanar reconstructive CT image.) (OR = 5.69, p=0.005) were independent predictors of recurrence. This model demonstrated good discriminatory performance with an AUC of 0.87 (95% CI: 0.81,0.94).

CONCLUSION

A combination of radiological and clinicopathological features may help predict postoperative recurrence in patients with pathological Stage 0-IA NSCLC, potentially informing decisions about adjuvant treatment after surgery.

CLINICAL RELEVANCE/APPLICATION

Identifying radiologic and clinicopathologic predictors of recurrence in pathologic Stage 0-IA NSCLCs can help tailor postoperative management and guide decisions on adjuvant therapy.

R5B-SPCH-7 "TRY BEFORE YOU BUY": COMPARATIVE EVALUATION OF FDA-APPROVED AI ALGORITHMS FOR CORONARY CALCIUM SCORING ON LUNG CANCER SCREENING CTS

Syed Muhammad Awais Bukhari, MD (*Presenter*)
Sreyes Venkatesh (*Abstract Co-Author*)
Annie Singh (*Abstract Co-Author*)
Cody R. Johnson, MD (*Abstract Co-Author*)
Robert C. Gilkeson, MD (*Abstract Co-Author*)
Amit Gupta, MD, MBBS (*Abstract Co-Author*)

PURPOSE

While FDA-approved AI tools for coronary artery calcium (CAC) scoring have demonstrated utility on non-gated chest CTs, their performance on low-dose CTs (LDCTs) from lung cancer screening programs, where incidental CAC detection is critical, remains less clear. Given the cardiovascular risk overlap in this population and the lack of LDCT-specific training in these algorithms, our objective was to benchmark and compare the performance of three commercially available, FDA-cleared CAC scoring AI tools. This study underscores the need for local validation prior to clinical and commercial adoption.

METHODS AND MATERIALS

We retrospectively identified 44 patients (mean age: 61±5.6 years; 57.8% females, 42.2% males) who underwent both ECG-gated calcium scoring CT (CSCT) and LDCT within a 16-day interval. CAC scores were calculated on LDCTs using three FDA-approved AI tools (CAC-AI A , CAC-AI B , and CAC-AI C) via a vendor-neutral AI deployment platform (CARPL.AI). A semi-automated CAC score measured by a board-certified radiologist on CSCT (CAC G) served as the reference standard. All CAC scores were stratified into Agatston-based risk categories: Very Low (0), Low (1-99), Moderate (100-399), and High (=400). Performance metrics included ANOVA for mean comparisons, concordance correlation coefficient (CCC), Bland-Altman analysis, and weighted kappa (?) statistics for risk classification agreement.

RESULTS

Mean CAC scores were as follows: CAC G = 314.33 ± 651.84; CAC-AI A = 295.0 ± 533.2; CA C -AI B = 317.2 ± 595.9; CAC-AI C = 313.4 ± 623.0 (p = 0.998). CCC values with the ground truth (CAC G) were 0.96 (CAC-AI A), 0.97 (CAC-AI B), and 0.93 (CAC-AI C). Mean differences from CACG were: CAC-AI A : -18.6 ± 161.9 (95% CI: -67.9 to 30.6); CAC-AI B : +2.9 ± 128.2 (95% CI: -36.1 to 41.8); CAC-AI C : -1.0 ± 226.5 (95% CI: -69.8 to 67.9). Risk category agreement (?) compared to CAC G was highest for CAC-AI B (? = 0.76), followed by CAC-AI C (? = 0.69) and CAC-AI A (? = 0.47).

CONCLUSION

All three AI tools demonstrated reasonable agreement with gated CSCT for CAC scoring on LDCTs. However, in our institutional setting, vendor B's tool (CAC-AI B) showed the most reliable performance for both quantitative scoring and risk stratification, followed by vendor C. Vendor A underperformed relative to the others.

CLINICAL RELEVANCE/APPLICATION

As AI tools enter clinical practice, particularly in high-impact domains such as incidental CAC detection, local validation remains essential. Despite regulatory approval, differences in real-world performance across platforms can influence clinical utility. Vendor-neutral platforms now enable institutions to "try before you buy," facilitating informed, data-driven decisions that align with local imaging protocols and patient populations.

R5B-SPCH-9 DIFFUSION-WEIGHTED IMAGING (DWI) WITH REVERSE ENCODING DISTORTION CORRECTION (RDC) TECHNIQUE: IMPROVING IMAGE QUALITY AND DIFFERENTIATION CAPABILITY FOR LYMPH NODE METASTASIS AS CONVENTIONAL DWI IN NON-SMALL LUNG CANCER

Yoshiharu Ohno, MD, PhD (*Presenter*)
Maiko Shinohara (*Abstract Co-Author*)
Natsuka Yazawa (*Abstract Co-Author*)
Kaori Yamamoto (*Abstract Co-Author*)
Yuichiro Sano, RT (*Abstract Co-Author*)
Masato Ikedo (*Abstract Co-Author*)
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Masahiko Nomura, MD, PhD (*Abstract Co-Author*)
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Daisuke Takenaka, MD (*Abstract Co-Author*)
Yoshiyuki Ozawa, MD, PhD (*Abstract Co-Author*)

PURPOSE

To determine the capability of diffusion weighted imaging (DWI) with reverse encoding distortion correction (RDC) technique for improving image quality and diagnostic capability for lymph node metastasis in non-small cell lung cancer (NSCLC) patients, when compared with conventional DWI.

METHODS AND MATERIALS

40 pathologically NSCLC patients underwent STIR FASE imaging, DWIs with and without RDC at 1.5T system, FDG-PET/CT, transbronchial or mediastinal biopsies, surgical treatment, pathological examinations and more than 2 years follow-up examinations. Then, 69 metastatic nodes and 69 out of 354 non-metastatic nodes were computationally selected. To determine the utility of RDC for DWI, deformation ratios (DRs) between each DWI and STIR images and signal-to-noise ratio (SNRs) of each primary lesion and selected lymph node were determined by region-of-interest (ROI) measurements. Then, overall image quality, artifact and lesion conspicuity of each lesion and lymph node were assessed by 5-point scales. Then, apparent diffusion coefficients (ADCs) on DWIs with and without RDC (i.e. RDC DWI and DWI) and maximum values of standard uptake value (SUV max) of metastatic and non-metastatic lymph nodes were also evaluated by ROI measurements. To compare each index between metastatic and non-metastatic lymph nodes, Student’s t-test was performed. To compare diagnostic performance for lymph node metastasis, ROC analysis was performed among DWIs and PET/CT. Finally, sensitivity (SE), specificity (SP) and accuracy (AC) were compared among all methods by McNemar’s test.

RESULTS

DR of RDC DWI was significantly smaller than that of DWI (p=0.003). Overall image quality and artifact of RDC DWI were significantly improved as compared with DWI (p<0.05). There was significant difference of each index between two groups (p<0.05). Area under the curve (AUC), SP and AC of RDC DWI (AUC=0.95, p<0.0001; SP=84.1%, p<0.0001; AC=79.7%, p<0.0001) were significantly better than those of DWI (AUC=0.84, p<0.0001; SP=84.1%, p<0.0001; AC=79.7%, p<0.0001) and PET/CT (AUC=0.85, p=0.006; SP=81.2%, p<0.0001; AC=81.2%, p<0.0001).

CONCLUSION

RDC technique has better potential for improving distortion, image quality and diagnosis of lymph node metastasis as compared with conventional DWI and FDG-PET/CT in NSCLC patients.

CLINICAL RELEVANCE/APPLICATION

RDC DWI can improve distortion, image quality and diagnosis of lymph node metastasis as compared with conventional DWI and FDG-PET/CT in NSCLC patients.

R5B-SPCH-11 PILOT NATIONAL LUNG CANCER SCREENING – SUMMARY OF THE NORTHERN MACROREGION RESULTS

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Julia Rymarowicz (*Abstract Co-Author*)
Katarzyna Kobylecka (*Abstract Co-Author*)
Katarzyna Dziadziuszko, MD (*Abstract Co-Author*)
Witold Rzyman (*Abstract Co-Author*)

PURPOSE

The study aimed to evaluate the outcomes of Pilot National Lung Cancer Screening Program in the northern macroregion of the country.

METHODS AND MATERIALS

Following primary prevention, lung cancer screening is considered a key strategy to reduce lung cancer-related mortality.A total of 3,068 asymptomatic volunteers aged 50 - 74 years, with a smoking history of at least 20 pack-years, underwent low-dose computed tomography (LDCT) LCS with smoking cessation program.Nodule management protocol was designed for a two-year follow-up. It was intentionally developed for the national program and implemented uniformly across the country. LDCT scans in the northern macroregion of the country were performed in four radiology centers. All participating radiologists received dedicated training.

RESULTS

Invasive diagnostic procedures were carried out in 85 participants (2.77%). As of the time of abstract submission, lung cancer was diagnosed in 59 participants (1.92%) with 31 (52.54%) being female.Surgery was performed in 45 participants (76%), of whom 22 (52%) were female. Early lung cancer including stages I and II was diagnosed in 42 participants (71%). In the group of 58 operated patients, 12 participants (20%), underwent resection for benign lesions, and one participant underwent surgery for a thymoma. Primary oncological treatment was provided in 21 instances, including 3 who received stereotactic body radiotherapy (SBRT). The false-positive rates were 11.6% at baseline, 1.4% at the first annual round, and 0.49% at the second annual round. Adherence to the screening program remained high, with 89% retention after the first year and 78% after the second year. In addition, we assessed (or are currently analyzing) the number and types of pulmonary nodules, the presence of emphysema, coronary artery calcification (CAC), incidental findings, and the effectiveness of the smoking cessation intervention.

CONCLUSION

Lung cancer screening with LDCT has proven to be an effective tool in reducing lung cancer mortality.Moreover, LDCT is also effective in identifying other diseases. Therefore, it should be implemented as a National Screening Strategy as soon as possible. Limitations Quality control at one of the screening sites indicated that periodic retraining of radiologists is necessary.

CLINICAL RELEVANCE/APPLICATION

A governmental decision regarding full implementation is expected in May 2025.

R5B-SPCH-12 IMAGING FEATURES OF PATHOLOGICALLY CONFIRMED SMOKING-RELATED INTERSTITIAL FIBROSIS: IDENTIFYING CHARACTERISTIC FEATURES TO DIFFERENTIATE FROM COMBINED PULMONARY FIBROSIS AND EMPHYSEMA

Yong Deok Lee (*Presenter*)
Chohee Kim, MD (*Abstract Co-Author*)
Myung Jin Chung, MD (*Abstract Co-Author*)
Tae Jung Kim, MD, PhD (*Abstract Co-Author*)
Joungho Han (*Abstract Co-Author*)
Yoon Ki Cha, MD, PhD (*Abstract Co-Author*)

PURPOSE

To differentiate SRIF (CPFE-histologic SRIF) from CPFE (CPFE-IPF) using chest computed tomography (CT).

METHODS AND MATERIALS

This retrospective study included 72 patients who underwent surgical lung biopsy or resection between January 2015 and January 2025, all of whom had histopathological confirmation. Preoperative chest CT images were independently reviewed by three radiologists. Imaging features assessed included centrilobular and paraseptal emphysema, multiple thin-walled cysts (MTWC), honeycombing, traction bronchiectasis, subpleural ground-glass opacities (GGO)/reticulation, smoking-related disease (SRD), and pulmonary hypertension (PH). CT features were assessed using univariable and multivariable logistic regression analyses. Receiver operating characteristic (ROC) curve analysis was used to quantify the performance of imaging features. The log-rank test was used to compare overall survival (OS), and associations between OS and patient characteristics were evaluated using Cox proportional hazards regression analysis.

RESULTS

A total of 72 patients (mean age, 66.24 years ± 7.86; 63 male) with SRIF (n = 29) or CPFE (n = 43) were included. Among the evaluated CT features, MTWC was significantly more prevalent in SRIF (72.4%) than in CPFE (25.6%), whereas honeycombing (39.5% in CPFE, 6.9% in SRIF) and PH (62.8% in CPFE, 17.2% in SRIF) were more frequently observed in CPFE. Centrilobular and paraseptal emphysema were observed in both groups, with higher frequencies in SRIF. Traction bronchiectasis and subpleural GGO/reticulation were present in all patients in both groups. In both univariable and multivariable analyses comparing SRIF and CPFE, MTWC was a predictive feature of SRIF ($p < 0.05$), whereas honeycombing and PH were predictive features of CPFE (all $p < 0.05$). ROC curve analysis to evaluate the predictive value of the logistic model based on the imaging features of SRIF, and the area under the curve (AUC) value was 0.958. There was no difference in OS between the SRIF and CPFE groups (log-rank $p = 0.1098$). Notably, PH was identified as an independent predictor of poor OS (hazard ratio [HR] = 0.24 [95% CI: 0.07, 0.91], $p = 0.036$).

CONCLUSION

For differentiating SRIF from CPFE, MTWC and honeycombing are valuable CT features; the presence or absence of PH may serve as a supplemental role for identifying CPFE.

CLINICAL RELEVANCE/APPLICATION

SRIF and CPFE have overlapping imaging/clinical features. While SRIF is known to have a benign clinical course, CPFE is associated with high morbidity and mortality burden. Therefore, accurate differentiation based on imaging findings is essential for improving prognosis.

R5B-SPCH-13 FEEL THE STRAIN: RADIOLOGIST AGREEMENT ON RIGHT HEART STRAIN IN ACUTE PULMONARY EMBOLISM

Renee Friedman (*Presenter*)
Linda B. Haramati, MD, MS (*Abstract Co-Author*)

Stuart L. Cohen, MD (*Abstract Co-Author*)
Charles S. White, MD (*Abstract Co-Author*)
Jonathan Alis, MD (*Abstract Co-Author*)

PURPOSE

Evaluation of right heart strain (RHS) on CTPA is a risk stratification metric used to guide clinical management in acute pulmonary embolism (PE). The purpose of this study is to evaluate agreement and reproducibility of RHS assessment using subjective assessment and right ventricle (RV) to left ventricle (LV) diameter ratio.

METHODS AND MATERIALS

10 acute PE cases with variable degrees of RHS were selected by a single cardiothoracic radiologist. Axial series DICOM images were anonymized and uploaded to a secure online platform. Fellowship trained cardiothoracic radiologists were invited to participate voluntarily in the study. For each case, they were asked to provide subjective assessment for RHS (yes/no) and subsequently measure RV and LV diameters using their typical clinical practice method. No measurement technique instructions were given. A second survey was completed 3 months later with the same cases in a different order. Interobserver and intraobserver agreement analysis was performed.

RESULTS

32 cardiothoracic radiologists completed both surveys. 6 were excluded due to incomplete data. Cases were classified based on the European Society of Cardiology threshold of RV/LV ratio of 1. We defined cases positive if the interquartile range (IQR) was above 1 (5 cases), negative if the IQR was below 1 (2 cases) and borderline if the IQR crossed the threshold of 1 (3 cases). Overall interobserver agreement for subjective assessment was 85%. Agreement was lowest for borderline cases (63%) and 41% of readers changed their subjective assessment from time 1 to time 2 for these cases. For quantitative RV/LV ratio, overall intraclass correlation coefficient (ICC) was 0.79. ICC for individual cases ranged from 0.12-0.67, suggesting that while radiologists could reliably differentiate between cases, the measurement precision for any single case was poor. Using the RV/LV ratio cutoff of 1, 44% of readers had a different outcome from time 1 to time 2 for borderline cases. Bland Altman analysis showed minimal systemic bias but differences in reliability across cases.

CONCLUSION

Overall agreement for RHS assessment in acute PE was high for subjective assessment and RV/LV ratio. However, agreement and reproducibility were poor for borderline cases both in qualitative and quantitative assessment. This is of clinical relevance because inconsistencies in measurements for borderline cases could lead to different management decisions based on current guidelines.

CLINICAL RELEVANCE/APPLICATION

Inconsistent assessment of RHS on CTPA for borderline cases could lead to divergent clinical decisions based on current guidelines. The variability observed in this study may have impacted datasets used for outcomes studies and guidelines, meriting further evaluation.

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R5B-SPER

Emergency Radiology Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPER-1 PHOTON COUNTING CT CALCIUM OVERLAY AND VIRTUAL NON-CALCIUM TECHNIQUE TO DIFFERENTIATE ATYPICAL INTRACRANIAL CALCIFICATION FROM HEMORRHAGE

Khanin Khanungwanitkul, MD (*Presenter*)
Fides Schwartz, MD (*Abstract Co-Author*)
Aaron D. Sodickson, MD, PhD (*Abstract Co-Author*)

PURPOSE

Differentiating atypical intracranial calcifications (Ca) from hemorrhage (Hem) on non-contrast head CT can be challenging, and often prompts follow-up imaging. Dual energy CT three material decomposition methods that create Calcium overlay (Ca) and Virtual Non-Calcium (VNCa) images have been demonstrated to be effective at this task, but have not yet been investigated using Photon Counting CT (PCCT). The purpose of this study was to reproduce this algorithm on PCCT, and to investigate its diagnostic performance.

METHODS AND MATERIALS

Hyperattenuating foci on non-contrast head PCCT were included if they measured <100 HU, and had reference standard comparison imaging. Hem was confirmed for CT hyperdense foci that were not present on prior CT/MRI within 2 weeks, or dynamic change on follow up CT/MRI. Ca was confirmed by stability at least 1 month before or after the index CT. Typical basal ganglia and choroid plexus Ca were excluded. 54 lesions from 37 patients were included, confirmed by reference standard to be 27 Hem and 27 Ca. A blinded reader classified each lesion on a Likert scale (1 definite Ca, 2 probable Ca, 3 unsure, 4 probable Hem, 5 definite Hem), first on the conventional scan, and then with the addition of 3 mm and subsequently 0.8 mm paired Ca/VNCa image series.

RESULTS

Conventional CT gave the correct diagnosis of 59% Ca (Likert scores 1/2) and 70% Hem (Likert 4/5; Cohen's weighted Kappa 0.67 compared to reference standard). The addition of 3 mm Ca/VNCa images yielded 70% Ca and 93% Hem (k 0.87) and 0.8 mm Ca/ VNCa yielded 81% Ca and 89% Hem (k 0.92). Diagnostic certainty (Likert 1+5) increased from 15% with conventional CT to 74% with additional of either 3 mm or 0.8 mm Ca/VNCa images. (Chi square $p<0.001$ for overlays versus conventional, no significant difference between overlay thicknesses).

CONCLUSION

Dual-energy Ca/VNCa post-processing is a promising tool on clinical photon-counting non-contrast head CT, enabling improved differentiation and diagnostic confidence in differentiating calcium from hemorrhage.

CLINICAL RELEVANCE/APPLICATION

The ability to more definitively characterize hyperattenuating foci on non-contrast head CT may yield clinical benefits, including earlier definitive diagnosis of intracranial hemorrhage to prompt treatment, or a reduction in follow-up imaging and ED length of stay for calcifications.

R5B-SPER-2 VALUE ASSESSMENT OF AUGMENTATIVE ARTIFICIAL INTELLIGENCE FOR ASSESSMENT OF PULMONARY EMBOLI ON CT

Igor M. Kitanovski, BA (*Presenter*)
Steven C. Schoettler Woll, MD,MS (*Abstract Co-Author*)
Abdul M. Zafar, MD (*Abstract Co-Author*)

PURPOSE

Artificial Intelligence (AI) algorithms in radiology are currently deployed as tools to augment radiologists rather than autonomous readers. An augmentative tool should improve performance above and beyond the baseline performance achieved by the user alone. We conducted a meta-analysis to elucidate the added value of augmentative AI to radiologists for detecting Pulmonary Embolism (PE) on CT scan.

METHODS AND MATERIALS

Using PRISMA guidelines, studies in which both AI and Human Interpreter (HI) assessed CT scans for pulmonary emboli were selected. We only included studies in which independent adjudication by radiologist(s) was used to establish the ground truth. Studies using the original reader as ground truth for AI were excluded. Data extracted from these studies were used to compare diagnostic performance of AI vs a HI.

RESULTS

Both HI and AI performed similarly with no statistically significant difference in the pooled estimates of sensitivity (AI=0.997, HI=0.998, p=0.546), specificity (AI=0.876, HI=0.823, p=0.69), positive predictive value (AI=0.949, HI=0.960, p=0.727), negative predictive value (AI=0.99, HI=0.986, p=0.589), and accuracy (AI=0.988, HI=0.984, p=0.506). Subsequent analysis focusing on the differences between performance of AI and HI within each study, followed by pooled estimates, also did not demonstrate any significant difference ($p<0.05$).

CONCLUSION

In a meta-analysis of nearly sixteen thousand CTs, AI and HI had similar performance for detection of pulmonary emboli. On one hand, this buttresses AI's use for triaging and for second reads. On the other hand, the outcomes may or may not be different when AI is added-on. The findings of this meta-analysis can be used to re-examine the use-scenarios of AI and to re-calibrate its value proposition. It may be argued that the value proposition of AI may be better as an augmentative tool rather than a stand-alone entity.

CLINICAL RELEVANCE/APPLICATION

This meta-analysis provides evidence to guide the clinical implementation of augmentative AI in pulmonary embolism detection. The comparable performance between AI and radiologists suggests that AI could be effectively deployed for preliminary screening of studies, prioritizing radiologist worklists, and expediting reporting of actionable findings. The lack of statistically significant improvement in diagnostic metrics reframes the value proposition of AI, since AI only evaluates one of several potential findings on each scan and a human reader is required to evaluate each study regardless of AI deployment. Healthcare systems considering AI implementation should carefully evaluate the cost-benefit ratio, focusing on workflow optimization rather than diagnostic improvement.

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Gastrointestinal Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPGI-1 DIFFUSION-WEIGHTED IMAGING-BASED VIRTUAL ELASTOGRAPHY IN METABOLIC DYSFUNCTION-ASSOCIATED FATTY LIVER DISEASE

Jie Yuan, MD (*Presenter*)
Fuhua Yan, MS (*Abstract Co-Author*)
Huimin Lin (*Abstract Co-Author*)
Zhiwei Qin (*Abstract Co-Author*)

PURPOSE

Virtual magnetic resonance elastography (vMRE), based on diffusion-weighted imaging (DWI), presents a promising alternative to traditional magnetic resonance elastography (MRE) for assessing chronic liver disease, particularly without the specialized hardware and expertise typically required for MRE. However, research on metabolism-related fatty liver disease (MAFLD) remains limited. This study aimed to develop and evaluate a vMRE method using DWI to assess MAFLD and compare its performance with traditional MRE and liver biopsy.

METHODS AND MATERIALS

In this prospective study, based on international expert consensus on the definition of fatty liver associated with metabolic dysfunction, 69 patients were included, including 54 patients with MASH. DWI and MRE imaging were performed after the liver biopsy. Pathological steatosis and liver inflammation were assessed using the NAFLD activity score (NAS), with NAS=4 indicating metabolic dysfunction-related steatohepatitis (MASH). The correlation between shear modulus derived from MRE and apparent diffusion coefficient (ADC) was analyzed, and the diagnostic effect was evaluated by deducing vMRE formula.

RESULTS

ADC values, particularly ADC 0-800 ,ADC1 50-800 ,ADC 150-1000 ,ADC 200-800 ,ADC 200-1000 ,ADC 200-1200 showed significant correlations with MRE elasticity values in MASH patients(r=-0.619,r=-0.647,r=-0.620,r=-649,r=-0.675,r=-0.645;P<0.01)in MASH patients. The strongest correlation was observed with ADC values at b-values of 200 and 1000 s/mm². The vMRE formula was determined as:vMRE=11.686-0.006×ADC.

CONCLUSION

DWI-based vMRE can assess MASH without the need for mechanical vibration equipment, offering a non-invasive and practical alternative to traditional MRE for evaluating MAFLD.

CLINICAL RELEVANCE/APPLICATION

DWI-based vMRE eliminates the need for mechanical vibration hardware, enabling non-invasive, cost-effective evaluation of MASH severity, aiding early diagnosis and therapeutic monitoring without liver biopsy.

R5B-SPGI-2 PUSHING THE LIMITS OF LIVER MRI: ENHANCED DETECTION OF SUBPHRENIC LESIONS WITH COMPRESSED SENSING VIBE

Fabio Pivetta, MD (*Presenter*)
Johannes Kolck, MD (*Abstract Co-Author*)
Dominik Geisel, MD (*Abstract Co-Author*)

PURPOSE

Imaging of liver lesions is of significant importance for systemic and interventional therapy planning, as well as oncologic follow-up. However, their visualization can be particularly challenging when localized subphrenically. Magnetic resonance imaging (MRI), with its superior contrast resolution - especially when combined with gadoxetic acid (GdEOB-DTPA, commercially known as Eovist or Primovist) - is an invaluable tool for evaluating these lesions and often provides definitive characterization. Despite this, precise MRI imaging of subphrenic lesions is frequently impaired by respiratory and cardiac motion. This study aimed to evaluate, both qualitatively and quantitatively, the effectiveness of compressed sensing Volumetric Interpolated Breath-hold Examination (VIBE CS) in hepatobiliary phase imaging following GdEOB-DTPA administration.

METHODS AND MATERIALS

Patients who underwent liver MRI between September 1 st , 2022 and April 30 th , 2024 were prospectively enrolled. Quantitative analysis focused on the smallest lesion size (mm) and contrast between liver parenchyma and lesion. Qualitative assessment comprised lesion detectability, image quality, diagnostic confidence, sharpness, contrast, and artifacts (all evaluated on a 1-4 scale). Performance of a standard VIBE (VIBE S) and compressed sensing (VIBE CS) were compared using the paired Wilcoxon signed-rank test, with statistical significance defined as $p < 0.05$.

RESULTS

VIBE CS demonstrated superior performance compared to VIBE S in detecting small lesions ($p = 0.035$) and providing enhanced image sharpness ($p < 0.001$). Overall image quality, contrast, and lesion detectability were comparable to VIBE S (all $p > 0.05$).

CONCLUSION

VIBE CS outperforms VIBE S in detecting small subphrenic lesions and offering higher image sharpness.

CLINICAL RELEVANCE/APPLICATION

Compressed sensing VIBE enhances liver lesion detection, crucial for systemic therapy, interventional procedures, and oncologic follow-up - potentially leading to more accurate treatment planning and improved patient outcomes.

R5B-SPGI-3 ULTRASOUND SHEAR WAVE ELASTOGRAPHY THRESHOLDS FOR DIAGNOSTIC ENRICHMENT IN MASLD - A MULTIVENDOR META-ANALYSIS

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PURPOSE

To identify satisfactory ultrasound shear wave elastography (SWE) thresholds for clinical trial diagnostic enrichment of 'significant' liver fibrosis (F=2) and 'at-risk' metabolic dysfunction-associated steatohepatitis (MASH) in patients with metabolic dysfunction-associated steatotic liver disease (MASLD) based on prior non-alcoholic steatohepatitis (NASH) and non-alcoholic fatty liver disease (NAFLD) research.

METHODS AND MATERIALS

A systematic literature search of PubMed, Embase, and Web of Science identified studies with 2D SWE or point SWE (pSWE) in adults with NAFLD who underwent liver biopsy within six months. Sensitivity (Sn), specificity (Sp), and SWE thresholds for F=2 fibrosis and 'at-risk' NASH (NASH + F=2 fibrosis + NAFLD Activity Score =4) were extracted. Summary receiver operating characteristic (sROC) curves were generated using vendor-agnostic and technique-specific models to enable identification of SWE thresholds satisfactory for diagnostic enrichment. Satisfactory thresholds were defined as having Sn = 70% and positive predictive value (PPV) = 50% assuming a 30% pre-test probability (typically achievable through clinical/hematologic biomarker risk stratification). Point estimates and, for Sn and Sp, 95% confidence intervals (CIs) are presented.

RESULTS

Thirty-one studies (16 2D SWE, 13 pSWE, 2 both; 2,801 patients) with F=2 fibrosis outcome, and 5 studies (2 2D SWE, 3 pSWE; 265 patients) with 'at-risk' NASH outcome were included. For F=2 fibrosis, two SWE technique-agnostic thresholds that met satisfaction criterion were: 6.8 kPa (Sn 80% [95% CI: 75%, 84%], Sp 78% [95% CI: 72%, 83%], PPV 60%) and 10.1 kPa (Sn 70% [95% CI: 62%, 78%], Sp 83% [95% CI: 77%,88%], PPV 64%). When stratified by technique, two satisfactory pSWE thresholds were 5.8 kPa (Sn 80% [95% CI: 67%,89%], Sp 76% [95% CI: 63%, 86%], PPV 59%) and 7.0 kPa (Sn 70% [95% CI: 54%, 83%], Sp 84% [95% CI: 72%, 91%], PPV 65%). Two 2D SWE thresholds identified were 7.9 kPa (Sn 80% [95% CI: 72%, 89%], Sp 84% [95% CI: 78%, 89%], PPV 69%) and 8.7 kPa (Sn 70% [95% CI: 57%, 80%], Sp 90% [95% CI: 85%, 94%], PPV 75%). For 'at-risk' NASH, a single satisfactory threshold was 7.7 kPa (Sn 80% [95% CI: 16%, 98%], Sp 74% [95% CI: 14%,98%], and PPV 57%).

CONCLUSION

We identified satisfactory SWE thresholds for diagnostic enrichment in MASLD clinical trials. SWE thresholds varied by SWE technique. Prospective validation of these thresholds is needed.

CLINICAL RELEVANCE/APPLICATION

SWE has the potential to provide effective diagnostic enrichment in clinical trials, thereby reducing screen-fail rates, need for liver biopsy, and cost. This could improve participant safety and accelerate drug development. -The 1st and 2nd names in the author list contributed equally.

R5B-SPGI-4 SYSTEMIC INFLUENCE OF METABOLIC SYNDROME ON RECURRENCE IN EARLY-STAGE HEPATOCELLULAR CARCINOMA AFTER LOCAL THERAPY

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PURPOSE

To investigate the association between metabolic syndrome (MetS) and recurrence patterns, local and intrahepatic distant, as well as progression free survival (PFS) and overall survival (OS) in hepatocellular carcinoma (HCC) patients treated with curative-intent therapies.

METHODS AND MATERIALS

In this IRB-approved single-institution retrospective cohort study, 270 patients with HCC who met Milan criteria and were treated at UCLA between 2005 and 2022, were included. Patients were divided into two groups based on presence or absence of MetS (n = 144 versus n = 126, respectively). MetS was defined by the presence of at least three of the following criteria adapted from the NCEP ATP III guidelines: BMI >30 kg/m² (used as a surrogate for central obesity), elevated triglycerides (=150 mg/dL or on lipid-lowering therapy), reduced HDL cholesterol (<40 mg/dL in men, <50 mg/dL in women or on therapy), hypertension (=130/85 mmHg or on antihypertensives), and fasting glucose =100 mg/dL or diabetes diagnosis. Treatment modalities included surgical resection, microwave ablation (MWA), and Y90 radioembolization. Recurrence was categorized as overall, local, and intrahepatic distant, and OS was evaluated using Kaplan-Meier curves with log-rank test.

RESULTS

Over a cumulative follow-up duration of approximately 250 months, non-MetS patients, patients with MetS had a significantly higher rate of intrahepatic distant recurrence (40.3%, (58/144) vs 21.4% (27/126)), local recurrence (26.4%, (38/144) vs 20.6%, (26/126)). The overall PFS was significantly reduced in MetS patients (median time 27 versus 48 months; p=0.0027). Intrahepatic distant PFS was significantly lower the MetS subcohort compared to non-MetS subcohort (median time 46 months versus 116 months; p=0.0058). OS was similar between MetS and non-MetS subcohorts, (median time 179 vs 184 p=0.823).

CONCLUSION

Metabolic syndrome significantly correlates with increased recurrence risk, both local and intrahepatic distant among early-stage HCC patients eligible for curative therapies, even when they meet strict Milan criteria.

CLINICAL RELEVANCE/APPLICATION

Metabolic syndrome has been linked to pro-oncogenic metabolic pathways. Despite its prevalence, MetS is frequently overlooked but can potentially be a clinically relevant predictor of recurrence in early-stage HCC - indicating the need for enhanced follow-up and possible adjuvant therapeutic approaches beyond local treatment. This relationship reflects the oncogenic role of underlying metabolic dysfunction and emphasizes the need to consider MetS status in post treatment monitoring strategies.

R5B-SPGI-5 FULLY AUTOMATED PREDICTION OF LIVER FIBROSIS PATHOLOGICAL STAGING APPLYING T1-WEIGHTEDAND T2-WEIGHTED MRI BASED DEEP LEARNING

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Qizhi Wang (*Abstract Co-Author*)
Wenxin Ma (*Abstract Co-Author*)
Xutong Huang (*Abstract Co-Author*)
Xiong Wang (*Abstract Co-Author*)
Jie Yuan, MD (*Abstract Co-Author*)

PURPOSE

To develop and validate a fully automated deep learning approach based on T1-weighted imaging (T1WI) and T2-weighted imaging (T2WI) MRI for segmenting the liver and predicting liver fibrosis pathological stages as determined by biopsy.

METHODS AND MATERIALS

In this retrospective study, T1WI and T2WI data from 245 participants with suspected chronic liver disease who underwent liver biopsy was analyzed. Based on biopsy results, the participants were categorized into four fibrosis stages S1/S2/S3/S4, with distributions of 40/86/70/49, respectively. We employed the nnUNet for automated liver segmentation and proposed a novel classification architecture named Dual-sequence MRI Fusion ResNet (DMF-ResNet) for liver fibrosis stages prediction. We evaluate the performance of a multi-stage classification framework through systematic combinations of distinct stages (S1, S2, S3, S4) across six key metrics: accuracy, precision, sensitivity, specificity, F1 score, and area under the curve (AUC).

RESULTS

The liver segmentation model yielded a Dice coefficient of 0.952 on the T1WI validation set and 0.924 on the T2WI validation set. The area under the curve (AUC) values for the T1WI, T2WI, and combined T1WI + T2WI models were 0.895, 0.806, and 0.916, respectively, for classifying liver fibrosis from stages S1 to S4. Among the tested configurations, the S1-S2-S3/S4 model demonstrated superior performance, achieving the highest accuracy (0.962), sensitivity (0.976), and AUC (0.963), alongside balanced precision (0.917) and specificity (0.917). Other configurations exhibited notable trade-offs: for instance, S1/S2-S3-S4 yielded exceptional precision (0.958) but lower sensitivity (0.750), while S1-S2/S3-S4 achieved harmonized sensitivity and specificity (0.929 each) with strong AUC (0.956).

CONCLUSION

T1WI+T2WI-based architecture can accurately predict liver fibrosis stages as suggested by biopsy, offering a fully automated and noninvasive alternative for assessing liver fibrosis.

CLINICAL RELEVANCE/APPLICATION

It offers a non-invasive, fully automated alternative for liver fibrosis staging, reducing the need for biopsy. It promotes the use of routine MRI sequences for disease staging, which could inform public health strategies in regions with limited access to biopsy or advanced imaging techniques. The study propose seven staging combinations (e.g., S1/S2/S3/S4 or grouped stages like S1-S2/S3-S4) for tailored clinical applications.

R5B-SPGI-8 DESIGN AND VALIDATION OF A ROBOT-ASSISTED VIBRATION CONTROLLED TRANSIENT ELASTOGRAPHY (VCTE) SYSTEM FOR LIVER IMAGING

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PURPOSE

The aim of this work was to design and validate a robot-assisted Vibration Controlled Transient Elastography (VCTE) system that can reduce operator dependence and maximize the precision and consistency of liver stiffness measurements.

METHODS AND MATERIALS

We developed a robot-assisted VCTE system using a modular 7-DOF Kinova Gen3 robotic arm and an ATI Net Gamma force/torque (F/T) sensor to ensure consistent probe-phantom interaction. A custom 3D-printed end-effector was created to securely mount the FibroScan Expert 630 probe (Echosens, France), and a resolved-rate based force control framework was implemented to maintain stable contact. The system uses a two-layer control strategy: a high-level controller modulates the probe's pose based on real-time force feedback, and a low-level loop ensures smooth and accurate motion. To evaluate the system, simulations were conducted in the Gazebo environment (an open source 2D/3D robotic simulator) using a simplified elastic phantom created via a rigid block and custom force plugin to mimic soft tissue contact (Figure 1a). A target contact force of 7 ± 0.5 N was set as the desired regulation point. A prototype gripper was also designed to enable automatic switching between standard ultrasound and VCTE probes, facilitating a more standardized imaging workflow (Figure 1b).

RESULTS

Simulation results showed that the contact force increased steadily and stabilized at the target value, while the torque remained under 0.2 Nm, indicating proper alignment and stable contact (Figure 1c). These findings validate that the hierarchical control approach enables precise and compliant probe positioning without reliance on complex dynamic models.

CONCLUSION

This study successfully demonstrates that a robot-assisted VCTE system can maintain stable and precise contact force during liver stiffness assessments through a hierarchical force control approach. The system's modular design and reliable probe handling have the potential to streamline liver imaging by reducing operator variability and enabling automated probe transitions.

CLINICAL RELEVANCE/APPLICATION

Current liver stiffness assessments require manual switching between B-mode ultrasound and VCTE probes, contributing to measurement inconsistencies, procedural delays, and increased operator workload. This robotic solution offers a more consistent, automated alternative for clinical liver elastography.

R5B-SPGI-9 COMPARISON OF OPEN 1.16T MR AND CONVENTIONAL CLOSED 1.5/3.0T MR SCANNERS IN THE EVALUATION OF PANCREATIC LESIONS: ASSESSMENT OF IMAGE QUALITY AND DIAGNOSTIC PERFORMANCE

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PURPOSE

Pancreatic lesions are increasingly identified on cross-sectional imaging, with a prevalence of 2.4 - 13.5% in individuals who undergo abdominal imaging for non-pancreatic indications. MRI plays a crucial role in the characterization and follow-up of pancreatic lesions. In patients with claustrophobia or larger body habitus, open MRI may improve compliance and access. This study aims to evaluate image quality and diagnostic performance of the 1.16T open MRI system for pancreatic lesion assessment compared to conventional 1.5T/3.0T scanners.

METHODS AND MATERIALS

This retrospective study included adult patients who underwent contrast-enhanced abdominal MRIs on both the open 1.16T (Oasis, Hitachi) and closed-bore 1.5T/3.0T scanners (Artist and Premier, GE Healthcare) between January 2017 and December 2022. Qualitative assessment of image quality was based on technical adequacy or repeat scan recommendations on the reports. Quantitative analysis includes estimation of signal-to-noise ratio (SNR) for pancreas and contrast-to-noise ratio (CNR) for focal pancreatic lesions. SNR estimation included ratio of pancreas signal to background noise and CNR was estimated by dividing the difference between average signal intensities of the focal lesion and the pancreas by background noise. Statistical comparisons of SNR and CNR were performed using Wilcoxon signed rank test with significance set at $p<.05$ and inter-reader agreement.

RESULTS

The final cohort included 64 abdominal MRIs in 32 patients (n=32 for both open and closed MR), consisting of 14 males and 18 females with a median age of 63.5 years (IQR: 59, 68). Median body mass index (BMI) was 28.6 (IQR: 24.8, 33.9) with 31.3% (n=10/32) and 40.6% (n=13/32) in the overweight and obese categories respectively. Focal pancreatic lesions were seen in 93.8% (n=30/32). These included intraductal papillary mucinous neoplasms (IPMNs; 27/32), pancreatic ductal adenocarcinoma (PDAC; 2/32), and serous cystadenoma (1/32). The mean pancreatic SNR was significantly higher on the 1.16T scanner [37.5 (SD of 17.6) compared to 23.9 (SD of 12.4) on the closed systems ($p<.001$)]. CNR for pancreatic lesions was 49.2 (SD of 33.9) vs. 53.3 (SD of 38.0) ($p=.72$). Technical inadequacy was reported in 3.1% (n=1/32). Repeat imaging was recommended in 6.3% (n=2/32) - one with higher field MR and abdominopelvic CT each.

CONCLUSION

The 1.16T open MRI system demonstrates higher SNR and comparable CNR compared to higher-field closed scanners in evaluating pancreatic lesions.

CLINICAL RELEVANCE/APPLICATION

Open MRI systems may be a viable alternative in select patient populations for pancreatic lesion follow-up and characterization.

R5B-SPGI-12 PERFORMANCE OF NON-ENHANCED ABBREVIATED LIVER MRI COMBINED WITH CT FOR LIVER METASTASIS SCREENING IN RECTAL CANCER STAGING

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Hae Young Kim, MD, PhD (*Abstract Co-Author*)
Subin Heo, MD (*Abstract Co-Author*)
Jong Keon Jang, MD (*Abstract Co-Author*)
So Yeon Kim, MD, PhD (*Abstract Co-Author*)
Seong Ho Park, MD (*Abstract Co-Author*)

PURPOSE

Since non-enhanced pelvic MRI is routinely performed for staging rectal cancer, an additional scan of the liver during pelvic MRI could be easily acquired. This study aimed to evaluate the utility of routinely adding non-enhanced abbreviated MRI (NE-AMRI) for liver metastasis screening, in comparison to CT alone (the current guideline-recommended modality), and CT combined with AMRI using hepatobiliary phase imaging (HBP-AMRI) (another potential alternative).

METHODS AND MATERIALS

This retrospective study included patients diagnosed with rectal cancer between 2017 and 2022 at a tertiary institution. AMRI was simulated using full-protocol liver MRI. Two readers independently evaluated the presence of liver metastasis using 1) CT alone, 2) CT+NE-AMRI and 3) CT+HBP-AMRI. Per-patient sensitivity and specificity for liver metastasis were compared using generalized estimating equations. Technical imaging cost of incorporating NE-AMRI was assessed using reimbursement data and the literature.

RESULTS

A total of 476 patients (mean age 61.3±11.9 years; 302 males) were included, 144 (30.3%) of whom had liver metastasis. CT+NE-AMRI had sensitivity higher than CT alone (96.5% [92.6-98.4%] vs. 86.8% [81.0-91.1%]; $p<.001$), and similar to CT+HBP-AMRI (96.9% [93.8-98.5%]; $p=0.54$). No significant difference was noted in specificity between the three protocols (91.3% [88.3-93.5%] for CT; 92.3% [89.4-94.5%] for CT+NE-AMRI; and 91.7% [88.6-94.0%] for CT+HBP-AMRI; $p=0.24$-0.72).). The cost incurred by incorporating NE-AMRI was estimated as $113.26 per patient, in comparison to $131.90 using the current guideline (i.e., CT used primarily and MRI added if needed).

CONCLUSION

CT+NE-AMRI showed higher sensitivity for liver metastasis screening than CT alone, without a reduction in specificity. Integrating NE-AMRI of the liver into routine pelvic MRI protocol in rectal cancer patients may improve tumor staging accuracy without added cost.

CLINICAL RELEVANCE/APPLICATION

Since non-enhanced pelvic MRI is routinely performed for rectal cancer, additional scan of the liver can be easily acquired during pelvic MRI. Adding non-enhanced abbreviated liver MRI for rectal cancer staging may improve sensitivity in detecting metastasis without added cost.

R5B-SPGI-14 LEVERAGING LOCALLY-TRAINED LARGE LANGUAGE MODELS FOR AUTOMATED SYNOPTIC REPORTING AND RESECTABILITY CATEGORIZATION IN PANCREATIC DUCTAL ADENOCARCINOMA

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Umaseh Sivanesan, MD (*Abstract Co-Author*)
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PURPOSE

Pancreatic ductal adenocarcinoma (PDAC) treatment relies on imaging to guide decisions. However, inconsistent CT reporting makes extracting key imaging features for staging and resectability an ongoing challenge. Large language models (LLMs) show promise in extracting this data, but proprietary models (e.g. ChatGPT) may lack security. This study aims to develop a secure, locally trained LLM to generate synoptic reports from non-synoptic PDAC staging reports, and assess whether the extracted data accurately determines resectability.

METHODS AND MATERIALS

109 consecutive non-synoptic PDAC staging reports from 2018-2024 at a tertiary care centre were retrospectively reviewed to manually extract 20 key synoptic features based on the 2014 joint consensus statement published by the Society of Abdominal Radiologists and American Pancreatic Association. Using 5-fold cross-validation, the Gemma-2 27B open-source LLM was fine-tuned to extract these features from the reports, and the LLM-extracted values were compared to the manually extracted reference standard. To assess the utility of LLM-extracted data in resectability classification, a retrospective chart review was conducted for the 109 patients with non-synoptic reports and 40 patients with synoptic reports to identify the resectability category as decided by hepatobiliary surgeons. The 2024 National Comprehensive Cancer Network criteria for predicting resectability based on imaging features was applied to both LLM-extracted features from non-synoptic reports and manually extracted features from synoptic reports written by fellowship trained subspecialty radiologists. Both sets of predictions were compared to the surgical decision.

RESULTS

For feature extraction, our trained LLM achieved mean area under the ROC curve (AUC) of 0.95, with positive predictive value of 0.90 and negative predictive value of 0.81. AUC varied when broken down into features associated with the pancreatic tumour (0.96), involved vasculature (0.92), and metastatic disease (0.96). For resectability category, the LLM achieved accuracy of 0.90 with quadratic-weighted Cohen's kappa of 0.92, in comparison to accuracy of 0.95 from manual synoptic reports.

CONCLUSION

We successfully trained an open-source LLM to securely generate synoptic reports by accurately extracting key features, which can be used to predict resectability with performance comparable to synoptic staging reports written by fellowship-trained radiologists.

CLINICAL RELEVANCE/APPLICATION

This study supports the viability of locally trained open-source LLMs to securely generate synoptic reports which reduce variability in radiology reporting, improving treatment planning and patient outcomes in PDAC care.

R5B-SPGI-15 INTERPRETABLE MACHINE LEARNING MODEL BASED ON MRI INTRA- AND PERITUMORAL RADIOMICS FOR PREDICTING BIOCHEMICAL RECURRENCE AFTER RADICAL PROSTATECTOMY

XUELIAN ZHAO (*Presenter*)
Hao Li (*Abstract Co-Author*)
Ning Zhang (*Abstract Co-Author*)
Guangyao Liu (*Abstract Co-Author*)
Kai Ai (*Abstract Co-Author*)

PURPOSE

To investigate the impact of intratumoral and peritumoral MRI radiomics features combined with clinical risk factors on biochemical recurrence (BCR) in prostate cancer patients after radical prostatectomy (RP).

METHODS AND MATERIALS

A retrospective analysis was conducted on 277 RP patients with complete follow-up data (=1 year), all of whom underwent preoperative MRI before biopsy. Patients were divided into training and validation sets (7:3 ratio). Tumor regions of interest (ROIs) were manually segmented by three experienced radiologists on T2-weighted imaging (T2WI) and apparent diffusion coefficient (ADC) maps. Peritumoral features were obtained by expanding ROIs using the SimpleITK package in Python (v3.7.12), followed by manual removal of non-prostatic tissues. Radiomics features from both intratumoral and peritumoral regions were extracted. Machine learning models (radiomics, clinical, and combined radiomics-clinical models) were constructed. Predictive performance was evaluated using receiver operating characteristic (ROC) curve analysis in both training and validation sets. SHapley Additive exPlanations (SHAP) analysis was applied to interpret the combined model's decision-making process.

RESULTS

The C-indices for the IntraPeri_4mm ADC and IntraPeri_4mm T2 models were 0.902 and 0.842, respectively, while the RadR model achieved C-indices of 0.706 and 0.662 in the validation set. The clinical (Clinic) model yielded AUCs of 0.897 and 0.731, whereas the combined radiomics-clinical (Combined) model demonstrated superior performance with AUCs of 0.978 and 0.810. Decision curve analysis (DCA) confirmed greater clinical net benefit for the Combined model.

CONCLUSION

The integration of preoperative MRI-based intratumoral and peritumoral radiomics features with clinical data enables accurate prediction of early BCR after RP.

CLINICAL RELEVANCE/APPLICATION

The integration of preoperative MRI-based intratumoral and peritumoral radiomics features with clinical data enables accurate prediction of early BCR after RP, facilitating proactive surveillance for high-risk patients and improving outcomes. Additionally, SHAP-based interpretability transforms "black-box" predictions into quantifiable feature contributions, aiding clinicians in identifying risk factors and tailoring personalized treatment strategies.

Abstract Archives of the RSNA, 2025

R5B-SPGU

Genitourinary Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPGU-2 IMPACT OF ADDING PSMA PET ON THE DIAGNOSTIC PERFORMANCE OF MRI FOR PROSTATE CANCER AFTER CRYOABLATION THERAPY

Benjamin Fletcher, MD (*Presenter*)
David J. Bartlett, MD (*Abstract Co-Author*)
Patrick Navin, MBBCh, FFR(RCSI) (*Abstract Co-Author*)
Daniel A. Adamo, MD (*Abstract Co-Author*)
Scott M. Thompson, MD, PhD (*Abstract Co-Author*)
David A. Woodrum, MD, PhD (*Abstract Co-Author*)
Hiroaki Takahashi, MD, PhD (*Abstract Co-Author*)

PURPOSE

Post-cryoablation imaging of prostate cancer is challenging; we assessed whether adding PSMA PET improves diagnostic performance over MRI alone.

METHODS AND MATERIALS

Patients with biopsy-proven prostate cancer treated with focal cryoablation and subsequent imaging by PSMA PET/MRI alone or MRI and PSMA PET/CT within 6 months between January 1, 2010 and July 1, 2024 were retrieved. All patients were otherwise treatment naive. Biopsy (Gleason 3+4 or more was considered as positive) or follow-up imaging after subsequent treatment served as the reference standard and required for inclusion. Images were reviewed by three fellowship-trained radiologists using established scoring systems, first MRI alone, then PET with MRI. In cases with PET/CT, the PET images registered onto the accompanying MRI were provided. Evaluation was limited to the prostate gland. The readers evaluated the diagnostic confidence of malignancy (0-100, with more than 25 as positive) on a per-patient basis as well as a per-lesion basis within and outside the ablation cavity. The area under the curve (AUC) of PI-FAB and TARGET for MRI and PRIMARY score for PET were determined for each individual reader. Performance metrics were reported based on consensus among the three readers. Differences in performance between the available modalities were analyzed by using the McNemar test.

RESULTS

A total of 23 patients were evaluated (10 positive and 13 negative by reference standard). In the ablation cavity, the three readers by consensus identified 7 lesions on MRI alone versus 9 lesions on PET+MRI. Outside the ablation cavity, readers respectively identified 0, 0, and 1 lesions on MRI versus 7, 6, and 7 areas of focal PSMA uptake within the prostate on PET+MRI. In 7 cases, the inclusion of PET images upgraded the consensus diagnosis from negative to positive while the remaining 16 cases were unchanged ($p<0.023$). The per-patient diagnostic performance comparing MRI alone versus PET+MRI yielded sensitivities of 50% vs 80%, specificities of 92% vs 62%, positive predictive values of 83% vs 62% and negative predictive values of 71% vs 80% when considered by consensus. Diagnostic performance of the scoring systems for the three readers measured by AUC ranged from 0.56-0.81 for PI-FAB, 0.62-0.87 for TARGET, and 0.73-0.82 for PRIMARY score.

CONCLUSION

In prostate cancer patients treated with focal cryoablation, adding PSMA PET increased lesion detection and sensitivity compared to MRI alone. The PRIMARY score demonstrated similar diagnostic performance with reduced inter-reader variability relative to PI-FAB and TARGET.

CLINICAL RELEVANCE/APPLICATION

Adding PSMA PET to post-ablation evaluation reveals lesions missed by MRI alone, increasing sensitivity for detecting residual or recurrent disease.

R5B-SPGU-4 AUTOMATED ADRENAL INCIDENTALOMA IDENTIFICATION IN NON-CONTRAST CT: A DUAL-CENTER STUDY INTEGRATING DEEP LEARNING AND RADIOMICS

Fanxing Meng (*Presenter*)
Tuo Zhang (*Abstract Co-Author*)
Yuwei Xia (*Abstract Co-Author*)
Yinghui Ge (*Abstract Co-Author*)

PURPOSE

Adrenal incidentalomas are common findings in medical imaging, with most being benign but some requiring clinical attention[1] . Missed detection can delay treatment and worsen patient outcomes. This study develops an AI-driven framework combining 3D nnU-Net-based adrenal segmentation with radiomics to differentiate normal adrenal glands from adrenal incidentalomas on non-contrast CT scans, validated across dual-center datasets.

METHODS AND MATERIALS

We retrospectively analyzed non-contrast CT scans from 558 patients (279 normal, 279 tumor) across two centers (January 2020-January 2025). All tumors were surgically pathology-confirmed (248 adenomas, 22 pheochromocytomas, 9 myelolipomas). Preprocessing included resampling, normalization, and noise reduction. A 3D nnU-Net model was trained on 200 cases (100 normal, 100 tumor) with five-fold cross-validation, evaluated by Dice Similarity Coefficient (DSC), 95% Hausdorff Distance (HD95), and Average Symmetric Surface Distance (ASSD). The remaining 358 cases were processed by the segmentation model, and the cohort was split 8:2 into training (n=446) and testing (n=112) sets. From each adrenal gland's Volume of Interest (VOI), 1,904 radiomics features were extracted and key features selected using MRMR and LASSO. A support vector machine (SVM) was used for classification, evaluated by AUC, sensitivity, specificity, precision and F1 score.

RESULTS

The segmentation model achieved excellent performance, with a mean DSC of 0.907, HD95 of 8.153 mm, ASSD of 0.092 mm, and a processing time of 10.3 seconds per case—far surpassing manual labeling (10-15 min/case). For classification, 24 key features were selected, and the SVM achieved an AUC of 0.978 (95%CI : 0.947-0.995), sensitivity of 0.953, and specificity of 0.955, with over 95% accuracy on the test set. It has showcased a superior degree of adaptability and precision compared to enhanced CT-based models.

CONCLUSION

This study successfully developed a fully automated pipeline for adrenal incidentalomas identification using non-contrast CT.

CLINICAL RELEVANCE/APPLICATION

The deep learning segmentation model accurately segments adrenal glands, while the classification model precisely differentiates between normal adrenal glands and those containing incidentalomas. This method leverages the advantages of non-contrast CT—being non-invasive, cost-effective, and widely available—while achieving high diagnostic accuracy. Fully automated processing further enhances clinical utility, making it a practical alternative to contrast-enhanced CT for incidentaloma detection.

R5B-SPGU-5 QUANTITATIVE EVALUATION OF RENAL MICROSTRUCTURAL ALTERATION USING R2*-MRI IN DIABETIC KIDNEY DISEASE

Jongjin Yoon, MD, PhD (*Presenter*)
Jae Hyon Park, MD (*Abstract Co-Author*)
Dae Chul Jung, MD (*Abstract Co-Author*)
Byung Chul Kang (*Abstract Co-Author*)
Young Taik Oh, MD (*Abstract Co-Author*)

PURPOSE

To determine whether R2*-weighted MRI can serve as a noninvasive quantitative imaging biomarker for renal microstructural alteration in patients with type 2 diabetes mellitus (T2DM) and early-stage chronic kidney disease (CKD). We aimed to compare whole-kidney R2* values between T2DM patients with mild CKD (Stage 2, eGFR 60-90 mL/min/1.73 m²) and those with preserved renal function (eGFR > 90), and to evaluate the correlation between R2* metrics and glomerular filtration rate (eGFR).

METHODS AND MATERIALS

This retrospective study included 395 adults (median age 59.0 years, 69.1% male) who underwent 3.0 T MRI for liver elastography between January 2010 and November 2024. Inclusion required the presence of T2DM and/or hypertension without other metabolic disease. Forty-one patients had T2DM, and 354 were non-diabetic. R2*-weighted sequences were used to segment both kidneys in 3D and extract first-order pixel intensity features (minimum, maximum, mean, median, uniformity, and variance). CKD stage was defined by CKD-EPI eGFR. Group comparisons were performed using unpaired tests, and Pearson correlation was used to evaluate R2*-eGFR relationships. Statistical significance was set at $p < 0.05$. Statistical analyses were performed using Python (ver. 3.13.3), Scikit-learn (ver. 1.6.1), and R (ver. 4.3.3).

RESULTS

In T2DM patients, those with stage 2 CKD showed significantly higher mean and median R2* values than those with preserved renal function ($p = 0.012$ and $p = 0.008$, respectively). Diabetic patients with stage 2 CKD also had significantly higher R2* values than non-diabetic patients, regardless of CKD stage. An inverse correlation was found between eGFR and both mean and median R2* values in diabetic patients ($r = -0.48$, $p = 0.001$), but not in non-diabetic patients.

CONCLUSION

R2*-weighted MRI enables noninvasive quantification of renal microstructural alterations in diabetic kidney disease. Elevated R2* values and their inverse correlation with eGFR suggest early hypoxia and perfusion imbalance before measurable functional decline. In particular, increased renal oxygen consumption driven by hyperglycemia may lead to tissue hypoxia and accumulation of paramagnetic deoxyhemoglobin, thereby elevating R2* values. Limitations include the retrospective design, lack of histologic correlation, and a relatively small diabetic CKD subgroup, which may affect generalizability and statistical power.

CLINICAL RELEVANCE/APPLICATION

R2*-weighted MRI may serve as a promising imaging biomarker for early detection and monitoring of diabetic kidney disease. Physiologically, R2* increases may reflect hyperglycemia-induced oxygen demand and tissue hypoxia, enabling noninvasive assessment of subclinical renal damage in diabetic patients.

R5B-SPGU-6 DUAL-LAYER SPECTRAL DETECTOR CT FOR IMPROVED ASSESSMENT OF RIGHT ADRENAL VEIN IN PATIENTS WITH PRIMARY ALDOSTERONISM

Ryuya Yoshida (*Presenter*)
Yasunori Nagayama, MD (*Abstract Co-Author*)
Takumi Esaki (*Abstract Co-Author*)
Taiga Matsumoto, MD (*Abstract Co-Author*)
Yoshitaka Tamura (*Abstract Co-Author*)
SOICHIRO ISHIUCHI (*Abstract Co-Author*)
Taihei Inoue, MD, PhD (*Abstract Co-Author*)
Daisuke Sakabe, MS (*Abstract Co-Author*)
Masafumi Kidoh, MD, PhD (*Abstract Co-Author*)
Seitaro Oda, MD, PhD (*Abstract Co-Author*)
Takeshi Nakaura, MD (*Abstract Co-Author*)
Hiro Kiyosue (*Abstract Co-Author*)
Toshinori Hirai, MD, PhD (*Abstract Co-Author*)

PURPOSE

To investigate whether virtual-monoenergetic images (VMI) from dual-layer spectral-detector CT (DLCT) improve right adrenal vein (RAV) assessment before adrenal venous sampling (AVS), and portal-venous phase (PVP) images alone can replace conventional multiphase CT combining late-arterial phase (LAP) and PVP.

METHODS AND MATERIALS

Sixty-three patients with primary aldosteronism (28 males, 35 females; 53.0 ± 11.4 years) who underwent LAP and PVP DLCT before AVS were retrospectively analyzed. Conventional polyenergetic images (PEI) and VMI at 40-70 keV (VMI 40-70) were reconstructed. Image noise and contrast-to-noise ratio (CNR) of RAV were quantified. VMI with the highest CNR was predefined as the best-VMI. Two radiologists evaluated four image series (PEI and best-VMI at LAP and PVP) separately for RAV visibility, accessory hepatic vein (AHV) assessability, and image noise using five-point scales. RAV detectability and AHV assessability rates were compared among image series.

RESULTS

VMI 40-70 showed lower image noise and higher CNR than PEI (all $p<0.001$), with VMI 40 providing the highest CNR. VMI 40 demonstratedlower subjective noise and better RAV visibility than PEI in both phases (all $p<0.001$). Using the same reconstructions, RAV visibility was better in LAP, while AHV assessability was better in PVP (all $p<0.001$). VMI 40 improved RAV detectability rate (89.7% vs. 54.8%) and AHV assessabilityrate (96.8% vs. 80.2%) at PVP compared to PEI, achieving equivalent RAV detectability rate to PEI at LAP (89.7%, $p=1.0$).

CONCLUSION

DLCT-VMI improved RAV assessments before AVS. VMI 40 at PVP provided RAV depiction equivalent to PEI at LAP and better AHV assessability than PEI at PVP, potentially serving as a surrogate for dedicated multiphase CT.

CLINICAL RELEVANCE/APPLICATION

The use of VMI 40 at routine PVP CT has the potential to serve as a promising surrogate for dedicated multiphase CT before AVS, allowing for radiation dose reduction while maintaining or even improving the RAV assessments.

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Abstract Archives of the RSNA, 2025

R5B-SPHN

Head & Neck Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPHN-2 DEEP LEARNING METHOD FOR TOOTH DEVELOPMENT STAGING ON PEDIATRIC PANORAMIC RADIOGRAPHY

Meng You (*Presenter*)

PURPOSE

Panoramic radiography is a widely utilized imaging technique in pediatric dentistry for assessing tooth development and detecting anomalies. This study aimed to establish a deep learning method with improved performance to determine the development stages of all permanent teeth on pediatric panoramic radiography.

METHODS AND MATERIALS

Three independent cohorts comprising panoramic images of patients aged between 3 and 15 years were collected from the dental hospitals of three provinces (Sichuan, Zhejiang, Henan) in China. A two-step framework was developed to automatically estimate tooth development stages, utilizing the core cohort from Sichuan. First, CenterNet was employed to detect and number permanent teeth. Subsequently, the Dental Position-Based Attention Enhancement Network (DPBAE-Net) was introduced to accurately identify tooth development stages based on a modified Demirjian method. DPBAE-Net uses ResNeXt101 as its backbone network and incorporates two key modules: the Attention-Based Feature Pyramid Enhancement Module (ABFPEM) and the Dental Auxiliary Feature Module (DAFM). The model's performance was validated across the three cohorts.

RESULTS

Ablation studies demonstrated the effectiveness and interpretability of ABFPEM, DAFM, and the post-processing strategy, resulting in a 6.15% improvement in the F1 score. Both quantitative and qualitative results confirmed the efficacy of each DPBAE-Net component, with a weighted precision of 84.05%, weighted sensitivity of 84.78%, and a weighted F1 score of 84.34%. The accuracy of tooth development staging (weighted F1 score) across different centers was 84.43%, 84.19%, and 83.35% for the Sichuan, Zhejiang, and Henan cohorts, respectively.

CONCLUSION

The proposed automated framework enhances the tooth development staging process in a fast and standard manner. The multicenter study validated the method's applicability across a diverse population.

CLINICAL RELEVANCE/APPLICATION

The proposed automated framework not only standardizes and accelerates tooth development staging but also provides population-specific reference data for dental age assessment. Additionally, the deep learning-based staging network facilitate the precise identification of permanent teeth with abnormal growth, improving the effectiveness and comprehensiveness of dental diagnoses using pediatric panoramic radiography.

R5B-SPHN-6 DIAGNOSTIC ACCURACY OF TIRADS ULTRASONOGRAPHY CLASSIFICATION IN EVALUATION OF THYROID NODULES WITH HISTOPATHOLOGY RESULTS

Rita Maia (*Presenter*)
Ana Margarida Frederico (*Abstract Co-Author*)

PURPOSE

The extensive use of ultrasonography has contributed to increased detection of thyroid nodules. TIRADS (thyroid imaging reporting and data system) is a reporting data system for thyroid lesions, that can be understood by clinicians and also to stratify the risk of malignancy of a lesion based on ultrasound findings. This study aims to compare the agreement of TI-RADS's ultrasonography (US) and to assess the diagnostic performance of these scores against histological findings in suspicious thyroid nodules.

METHODS AND MATERIALS

We conducted a cross-section study diagnostic test evaluation, between January 2023 and December 2024. Thyroid nodules were characterized by using the five TI-RADS systems and US-guided fine needle aspiration (US-FNA) was done for nodule with the highest TI-RADS score. Correlation between TI-RADS and US-FNA results were analyzed. Nodules with either size less than 1 cm and non-diagnostic or inconclusive US-FNA results were excluded. Details of all patients was introduced in a proforma, the data documented in Microsoft Excel and processed using SPSS for Windows, Version 17. Variables were plotted and analyzed using Chi square and Fisher exact test. A p value less than 0.05 was considered statistically significant.

RESULTS

Out of 106 thyroid nodules studied, 91.51% were benign and 8.49% were malignant. High specificity, negative predictive value and accuracy for detecting malignancy were noted with the following parameters: taller than wide shape and irregular margin. Highest specificity (96,91%) was noted with irregular margin. However, nodules that presented calcifications had a sensitivity of 67.01% and a specificity of 88.89%, statistically significant association was noted between presence of macrocalcification and risk of malignancy with p value < 0.05. On retrospective comparison of final pathological diagnosis with the assigned TIRADS score, it was noticed that majority of benign nodules were assigned benign TIRADS- 3 and all malignancies were assigned malignant TIRADS score (4 and 5).

CONCLUSION

Although there were no TIRADS-3 malignant diagnoses, and the malignant cases corresponding to the TIRADS-4 and 5, we can conclude that current results reassert the notion that TIRADS shows at least some correlation between benign or malignant cytology diagnoses. Nevertheless, further studies may be needed to improve TI-RADS criteria for improved specificity and positive predictive value.

CLINICAL RELEVANCE/APPLICATION

TI-RADS can achieve meaningful reduction in the number of benign thyroid nodules recommended for biopsy, avoiding unnecessary procedures.

R5B-SPHN-8 ISOLATED UNILATERAL INTRACAVERNOUS OCULOMOTOR NERVE ENHANCEMENT ON 3D CONTRAST-ENHANCED T1 VIBE MRI: CLINICAL CHARACTERISTICS AND OUTCOMES IN PATIENTS WITH DIPLOPIA

YoonSeo Choi, MD (*Presenter*)
Eunhee Kim, MD, PhD (*Abstract Co-Author*)
Hyeji Lee (*Abstract Co-Author*)
Hongseok Ko, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the clinical characteristics and outcomes of patients with isolated unilateral intracavernous oculomotor nerve (CNIII) enhancement on 3D contrast-enhanced (CE) T1 volumetric interpolated breath-hold examination (VIBE) MRI, and to determine its diagnostic and prognostic value in patients presenting with diplopia.

METHODS AND MATERIALS

We retrospectively analyzed 274 consecutive patients with diplopia who underwent MRI including coronal 3D CE T1 VIBE sequences from April 2022 to April 2025. Among these, 40 patients (14.6%) demonstrated CNIII enhancement. After excluding 22 patients with identifiable pathologies (multiple neuritis, tumor, cavernous dural AVF, inflammatory pseudotumor, etc.), we focused on 18 patients (6.6%) with isolated unilateral intracavernous CNIII enhancement, analyzing clinical profiles, treatments, and outcomes.

RESULTS

The 18 patients (4 female; mean age 60 years, range 32-80) underwent MRI at mean 15 days post-symptom onset (range 1-90). Unilateral neural enhancement was observed on the right side (61%, 11/18) and left (39%, 7/18). All presented with ipsilateral third nerve palsy with diplopia. Ptosis occurred in 66.7% (12/18), while pupillary involvement was rare (5.6%, 1/18). Mild headache/ocular pain was reported in 33.3% (6/18). Comorbidities included diabetes mellitus (72.2%, 13/18) and hypertension (55.6%, 10/18). Treatment comprised antiplatelet therapy (61.1%, 11/18), steroid monotherapy (22.2%, 4/18), combined steroid/antiplatelet therapy (11.1%, 2/18), and observation (5.6%, 1/18). All patients achieved complete resolution within 1-6 months. Presumptive diagnoses included diabetic microvascular ischemic neuropathy (66.7%, 12/18), inflammatory neuropathy (11.1%, 2/18), and inconclusive ischemic versus inflammatory neuropathy (22.2%, 4/18).

CONCLUSION

Isolated unilateral intracavernous CNIII enhancement on CE T1 VIBE in patients with diplopia was frequently associated with microvascular ischemic etiology, with favorable clinical outcomes observed in all cases.

CLINICAL RELEVANCE/APPLICATION

High-resolution 3D CE T1 VIBE MRI facilitates precise visualization of the oculomotor nerve within the cavernous sinus, aiding in the diagnosis and management of related dysfunctions. When isolated unilateral intracavernous CNIII enhancement is identified in patients with diplopia, it often indicates a benign, self-resolving condition, emphasizing the vulnerability of this nerve segment to microvascular ischemia.

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R5B-SPIN

Imaging Informatics Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPIN-1 TIME SAVED OR TIME SPENT? EXAMINING RADIOLOGISTS' INTERPRETATION SPEEDS PRE- AND POST-AI TRIAGE IMPLEMENTATION

Aawez Mansuri, BS, MS (*Presenter*)
Seyed Mohammadreza Chavoshi, MD (*Abstract Co-Author*)
Dan I. Cohen-Addad, MD (*Abstract Co-Author*)
Theodorus Dapamede, MD, PhD (*Abstract Co-Author*)
Ninad V. Salastekar, MD, MPH (*Abstract Co-Author*)
Hanzhou Li, MD (*Abstract Co-Author*)
John T. Moon, MD (*Abstract Co-Author*)
Wasif Bala, MD (*Abstract Co-Author*)
Bardia Khosravi, MD, MPH (*Abstract Co-Author*)
Chad Robichaux (*Abstract Co-Author*)
Frank Li, PhD (*Abstract Co-Author*)
Rohan Satya Isaac (*Abstract Co-Author*)
Beatrice Brown-Mulry (*Abstract Co-Author*)
Janice M. Newsome, MD (*Abstract Co-Author*)
Hari Trivedi, MD (*Abstract Co-Author*)

PURPOSE

Artificial Intelligence (AI) models for triaging radiological cases have shown promise in improving report dictation efficiency. However, limited evidence exists on their impact on radiologist interpretation times, especially among residents. AI-generated alerts may also introduce diagnostic bias. This study investigates whether deploying an AI triage tool for intracranial hemorrhage (ICH) and pulmonary embolism (PE) detection affects interpretation times among resident and attending radiologists.

METHODS AND MATERIALS

A retrospective analysis compared exam interpretation time (EIT) before and after deployment of an FDA-cleared AI tool for ICH (non-contrast head CT) and PE (CT pulmonary angiography). EIT was defined as the time from report creation to preliminary submission (residents) or sign-off (attendings), stratified by resident training year and report outcome (positive/negative). Statistical significance was assessed using the Mann-Whitney test. We used bootstrapped means with 95% CI, as the mean reflects the impact of outliers (i.e., difficult cases), which are clinically relevant in this context. Ground truth was extracted from final reports and compared to AI outputs to analyze EIT by triage accuracy (TP, FP, TN, FN).

RESULTS

AI triage significantly reduced exam interpretation time (EIT) for first- and second-year residents in both ICH and PE cases. For example, R1 mean EIT for ICH-positive reports decreased from 1265s (95% CI: 1134-1400) to 1072s (963-1188), and for negative reports from 1545s to 1354s. R2s showed similar reductions (e.g., ICH-negative: 519s to 474s). These differences were statistically significant ($p < 0.05$), particularly for negative cases. No significant time change was observed for R3, R4, or attendings post-deployment. Stratification by AI triage accuracy revealed longer EITs for false positives across all groups. For PE, residents spent 736s (CI: 579-927) on false positives vs. 695s (678-712) on true negatives; attendings: 746s vs. 590s. For ICH, residents: 707s vs. 531s; attendings: 572s vs. 412s. These results suggest AI misclassifications increase review time, while accurate triage supports more efficient interpretation.

CONCLUSION

AI triage reduced interpretation times for junior residents in ICH and PE cases but had limited impact on senior residents and attendings. Both groups spent more time on false positives, suggesting increased scrutiny, while accurate AI predictions were associated with faster interpretation.

CLINICAL RELEVANCE/APPLICATION

AI triage may enhance efficiency for trainees but can increase workload when results are inaccurate. Ongoing evaluation is essential to balance utility with risks of over-reliance in clinical practice.

R5B-SPIN-2 TIMING OF AI AND HUMAN INTERACTION: A MULTI-MODALITY MULTI-CENTER STUDY ACROSS SWITZERLAND

Natalie Heracleous, PhD (*Presenter*)
Sergey Morozov, PhD, MPH (*Abstract Co-Author*)
Octave Novarina (*Abstract Co-Author*)
Benoit Rizk, MD (*Abstract Co-Author*)
Benoit Dufour (*Abstract Co-Author*)
Simon Pericou (*Abstract Co-Author*)
Cyril Thouly (*Abstract Co-Author*)

PURPOSE

Integrating AI into radiology workflows poses challenges in result timing. While AI promises efficiency, the timing of AI outputs relative to radiologist report creation critically affects AI clinical utility and potential liability. Understanding these temporal patterns is key for optimal use.

METHODS AND MATERIALS

We retrospectively analyzed 4 months of AI use provided via an AI platform, covering 12,398 studies processed by 7 AI solutions across multiple modalities (XR, CT, MR, MG) in the Swiss Imaging Network 3R. Metrics included AI latency (image extraction, transfer, processing, return), AI output availability before report creation/validation, and radiologist report TATs.

RESULTS

AI outputs were consistently available before report validation in the vast majority of cases (94.85%), but their availability before initial report creation varied widely by imaging modality, from as low as 11.12% for trauma and orthopedic X-ray to as high as 52.96% for mammography. Processing times also differed: X-ray AI solutions delivered results most rapidly (median 2.5-3.25 minutes), with chest X-ray AI achieving 92.20% pre-validation and 17.29% pre-creation availability (radiologist TAT 2-3 minutes). Mammography AI showed 95.77% pre-validation and 52.96% pre-creation availability (median latency 3.5 minutes; TAT 15 minutes). In contrast, MRI and chest CT required substantially longer processing (median 13.65-15.52 minutes), with chest CT AI achieving 92.42% pre-validation and 45.42% pre-creation availability (radiologist TAT 22 minutes), while neurological AI solutions (brain volumetry, multiple sclerosis lesion detection) had high pre-validation rates (88.89%-90.48%) but low pre-creation availability and the longest radiologist TATs (25-36 minutes). Thus, while bone and mammography applications provided the most timely AI support, complex modalities like MRI and chest CT were limited by longer processing times and lower early availability.

CONCLUSION

AI performance and timing vary significantly by application, with trauma XR and mammography solutions demonstrating superior technical performance. Although AI outputs are generally available before report validation, variability before report creation highlights the need for workflow optimization. Modality-specific processing times and availability patterns should inform implementation strategies. This study provides benchmarking data for future AI integration projects.

CLINICAL RELEVANCE/APPLICATION

AI timing findings offer actionable guidance for radiology departments adopting AI, supporting optimized workflow integration, and realistic expectations for clinical AI use.

R5B-SPIN-3 OPEN WEIGHT LANGUAGE MODELS TO IDENTIFY CRITICAL FINDINGS IN RADIOLOGY REPORTS

Patricia W. Wu, MD (*Presenter*)
Chun-Shan Yam, PhD (*Abstract Co-Author*)
Bettina Siewert, MD (*Abstract Co-Author*)
Seth J. Berkowitz, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of open weight language models (LMs) for identifying critical findings in free-text radiology reports to provide timely communication of potentially life-threatening conditions and facilitate audits for compliance with institutional critical result reporting policies.

METHODS AND MATERIALS

We retrospectively collected 6743 radiology reports that were previously audited by radiologists for the presence or absence of critical findings that required immediate notification as per departmental policy. The dataset included 171 reports that were flagged as containing critical results. Using zero-shot prompt engineering techniques, we prompted 3 locally hosted LMs to analyze the reports to identify and classify critical findings based on a predefined list of 19 findings outlined in our communication policy. We evaluated several models across a range of sizes, including Llama 3.2 (3B), Mistral (7B), and Gemma-3 (27B), to assess performance. Model inference was run on a single GPU within a locally hosted high-performance computing environment. Models were evaluated for sensitivity and specificity.

RESULTS

Llama 3.2 (3B), Mistral (7B), and Gemma-3 (27B) achieved a sensitivity/specificity of 0.84/0.43, 0.82/0.70, and 0.94/0.68, respectively, in identifying reports containing critical findings. Error analysis revealed that most false negatives involved ambiguous results or findings that were not explicitly included in the predefined list which included a catch-all category for miscellaneous critical findings. Inference times were less than 1 second for all models.

CONCLUSION

Open weight language models can accurately and efficiently identify critical findings in radiology reports according to departmental policy. The models were able to flag critical findings in near real-time, running locally within the hospital, showing potential for integration into the clinical workflow as a system for prospective alerting and compliance auditing.

CLINICAL RELEVANCE/APPLICATION

Automated identification of critical findings using open weight language models can reduce delays in communication, enhance patient safety, facilitate quality assurance, and improve workflow in radiology practice.

R5B-SPIN-4 IMAGING BIOMARKERS OF CARDIOVASCULAR RISK: FAT RADIOMICS IN PREOPERATIVE CT OF HIP FRACTURE PATIENTS

Sheen-Woo Lee, MD, PhD (*Presenter*)
Ieun Yoon, MD (*Abstract Co-Author*)

PURPOSE

To investigate if body composition features of lower extremity on preoperative CT images can predict major cardiovascular events (MACE) in patients with hip fracture.

METHODS AND MATERIALS

Patients with CT-confirmed hip fractures were included in this retrospective study. CT images of bilateral lower extremity were analyzed using body segmentation programs (DeepCatch Medical IP, and Aview Coreline, Korea). Quantitative and qualitative characteristics of muscle and fat were extracted, which included cross-sectional area, intermuscular adipose tissue [IMAT], low-attenuation muscle area [LAMA], normal-attenuation muscle area [NAMA], and radiomics features. The primary outcome was MACE within 30 days post-surgery, defined as a composite of all-cause mortality, myocardial infarction, stroke, or heart failure hospitalization. Pearson correlation and logistic regression analyses were performed to determine the association between MACE and the variables. SPSS and MedCalc programs were utilized, and statistical significance was determined at $p<0.001$.

RESULTS

Of 356 patients (female:male=239:117, median age 81), 72 (20.2%) experienced MACE during a median follow-up of 13.1 months. Muscle metrics showed no significant association with MACE, except for a shape feature termed roundness ($p=0.0005$). Fat cross-sectional area, shape compactness, first-order mean value, GLSZM, GLCM,and GLDM features showed significant correlation with MACE ($p < 0.0001$). Multivariate analysis revealed that selected fat GLSZM and shape characteristics were independently associated with MACE ($p < 0.001$).

CONCLUSION

The cross-sectional area and radiomics features of lower extremity fat from preoperative CT may serve as imaging biomarkers for predicting cardiovascular risk after hip fracture surgery in elderly patients.

CLINICAL RELEVANCE/APPLICATION

CT-based imaging informatics can aid the management of elderly patients at risk.

R5B-SPIN-6 RADIOLOGY REPORT ENHANCEMENT WITH LLAMA-4 AND AGENTIC WEB BROWSER: AUTOMATED TRANSCRIPTION, GRAMMAR CORRECTION, STRUCTURED FINDINGS, AND RADIOPAEDIA-POWERED EDUCATIONAL AUGMENTATION

Shahriar Faghani, MD (*Presenter*)
Mana Moassefi, MD, MD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate an agentic AI assistant—combining an open-source Whisper transcription engine, LLaMA-4 for grammar correction and structured key-item extraction, and a web-orchestrated Radiopaedia retrieval pipeline—that (1) converts spoken radiologist dictation into error-free text, (2) identifies and organizes key findings and impressions, and (3) retrieves peer-reviewed Radiopaedia articles and exemplar images to enhance diagnostic confidence and trainee education.

METHODS AND MATERIALS

We implemented a modular pipeline that: Speech Transcription : Processes radiologist narration with Whisper, yielding initial text. Grammar & Structure : Uses LLaMA-4 to correct grammar and typos, then extracts key findings, impressions, and relevant items. Agentic Web Orchestration : Leverages a goal-driven browser agent to construct and iteratively refine Radiopaedia search queries. Retrieval Augmented Generation (RAG) & Summarization : Retrieves top Radiopaedia articles and images via a retrieval-augmented generation (RAG) framework, then summarizes and integrates them through LLaMA-4. Performance was assessed on 80 de-identified radiology dictations (40 routine, 40 rare/atypical cases) spanning neuroradiology, musculoskeletal, and body imaging. Ground truth comprised expert-corrected transcripts, annotated key items, and relevance judgments for Radiopaedia outputs.

RESULTS

Transcription Accuracy : Mean word error rate (WER) improved from 5.3% to 0.4% post-LLM correction, corresponding to a final transcription accuracy of 99.6%. Key-Item Extraction : Achieved 94% precision and 91% recall for identifying findings and impressions. Radiopaedia Retrieval : Returned at least one highly relevant article in 95% of routine cases and 80% of rare cases (overall 87.5% success), covering 84% of atypical entities. Mean of 3.1 pertinent articles and 2.4 exemplar images per query.

CONCLUSION

This LLM-driven, agentic browser-enabled platform reliably transcribes and refines radiologist speech, structures critical report elements, and seamlessly augments reports with Radiopaedia-sourced educational materials.

CLINICAL RELEVANCE/APPLICATION

It offers robust decision support in challenging cases and serves as an interactive learning tool for trainees. Future work will integrate with PACS, validate prospectively in clinical workflows, and extend to subspecialty-specific knowledge bases.

R5B-SPIN-7 AI IMPROVEMENTS TO RADIOLOGY WORKFLOW: NOT THE EXPECTED BLESSING

Ali Ghasemi, MD (*Presenter*)
Avneesh Chhabra, MD, MBA (*Abstract Co-Author*)
Azin Etemadimanesh (*Abstract Co-Author*)

PURPOSE

To explore how artificial intelligence (AI) is shaping the practice of radiology through changes in workflow efficiency, economic performance, and workforce well-being, with attention to both observed benefits and emerging challenges.

METHODS AND MATERIALS

A narrative synthesis of studies published between 2018 and 2025 was conducted, focusing on AI implementations in diagnostic imaging and radiology workflow. Evidence was drawn from economic models, real-world interventions, and meta-analyses reporting outcomes related to cost, efficiency, burnout, and policy alignment.

RESULTS

AI adoption has led to measurable efficiency gains in specific settings. A study integrating structured EHR and PACS systems reported a 38% reduction in turnaround time (from 11.2 to 6.9 minutes, $p < 0.05$). A deployment of AI triage tools for pneumothorax reduced median reporting time from 186 to 100 minutes ($p < 0.001$). Simulation models estimate up to 30% cost savings when radiologists focus on complex cases while AI handles initial screening ($p < 0.01$). Additionally, natural language processing tools and remote workflows have contributed to administrative relief and reduced task redundancy. However, pooled data across 48 workflow studies showed no statistically significant reduction in task time due to wide variation in AI deployment and clinical context ($I^2 > 95\%$). Oversight responsibilities required by AI systems have also introduced new cognitive burdens, often referred to as "tech stress." Cross-sectionalsurvey data suggest a positive correlation between AI use and emotional exhaustion among radiologists. Financial incentives remain misaligned, with most reimbursement systems offering no differentiation for AI-assisted interpretations. Concerns around case complexity clustering, data governance, and lack of standard evaluation metrics persist, potentially limiting sustained adoption.

CONCLUSION

AI technologies are contributing to improvements in radiology operations and may reduce costs under certain conditions. Yet, without policy updates, reimbursement reform, and targeted support for AI oversight, these benefits may be unevenly realized. Further prospective research is needed to clarify long-term outcomes for workflow, well-being, and compensation.

CLINICAL RELEVANCE/APPLICATION

AI technologies are contributing to improvements in radiology operations and may reduce costs under certain conditions. Yet, without policy updates, reimbursement reform, and targeted support for AI oversight, these benefits may be unevenly realized. Further prospective research is needed to clarify long-term outcomes for workflow, well-being, and compensation.

R5B-SPIN-9 ZERO-SHOT CT EMBEDDINGS FOR OVARIAN TUMOR CLASSIFICATION AND FEATURE DETECTION

Yu-Fu Wu, MD (*Presenter*)
Gigin Lin, MD (*Abstract Co-Author*)

PURPOSE

To determine the potential of zero-shot CT embeddings produced by a publicly available vision-language model in the tasks of (1) discriminating between benign and malignant ovarian tumors and (2) detecting clinically relevant morphologic and disease-spread features without additional model training.

METHODS AND MATERIALS

We retrospectively collected 3,679 pathology-proven abdominopelvic CT studies (CGMH OVCTCL archive, 2010-2020). After removing sequential examinations and retaining a single contrast-enhanced axial series per patient, 3,449 studies remained. Cases were labeled as benign (benign, endometriosis, n = 2,420) or malignant (ovarian cancer, borderline tumor, metastasis, n = 1,029).Images were embedded using the MedImageInsight model without further fine-tuning. Anonymized radiology report findings sections were parsed with the GPT-4o JSON tool-calling method to generate binary labels for 11 CT descriptors, including tumor features (solid component, septation, calcification), size and location, uterus status (fibroids, endometrial thickening), lymphadenopathy, ascites, and carcinomatosis.Five-fold cross-validation logistic regression probes were fitted on the frozen embeddings. Performance metrics included AUC, sensitivity, specificity, and confusion-matrix analysis.

RESULTS

For malignancy classification: The AUC was 0.79; the optimal Youden threshold yielded a specificity of 0.78 (361/464) and a sensitivity of 0.68 (153/226), with a positive predictive value of 0.73. For feature recognition: The mean AUC across the 11 descriptors was 0.72 ± 0.07 (range 0.63-0.83). The highest performance was observed for peritoneal carcinomatosis (AUC 0.83), followed by ascites (AUC 0.77) and septation (AUC 0.75). Calcification proved to be the most challenging target (AUC 0.63).

CONCLUSION

CLIP-style model has the potential to capture enough CT image information and generate embedding vectors that are suitable for downstream tasks.

CLINICAL RELEVANCE/APPLICATION

These model can runs on resource limited settings, and could assist in prioritizing high-risk cases in clinical settings.

R5B-SPIN-10 AI PATENTS IN RADIOLOGY: HOW INVOLVED ARE ACADEMIC PHYSICIANS?

Ali Ghasemi, MD (*Presenter*)
Azin Etemadimanesh (*Abstract Co-Author*)
Laura M. Fayad, MD (*Abstract Co-Author*)
Shivani Ahlawat, MD (*Abstract Co-Author*)

PURPOSE

Artificial Intelligence (AI) has revolutionized medical imaging, particularly with advanced modalities like Magnetic Resonance Imaging (MRI) and Computed Tomography (CT). Our objective was to map the evolution of patent filings over the past decade, identify thematic innovation trends with an emphasis on understanding the roles of academia, industry, and cross-sector collaborations.

METHODS AND MATERIALS

We analyzed global patent filings from 2015 to 2025 related to AI-driven MRI and CT applications, using harmonized datasets from the U.S. Patent Office (USPTO) and European Espacenet databases. Patents were filtered using key AI terminology and three broad CPC classifications that anchor the field: A61B6/03 (MRI), A61B6/545 (CAD), and A61B34/20 (AI for diagnosis). Universities and other non-academic sectors were separately analyzed.

RESULTS

A total of 382 unique patent families were identified and classified by assignee type: University-only, Collaboration, and Non-academic. The results reveal growing innovation activity in all three domains of computer-aided diagnosis, synthetic imaging, and AI-enhanced reconstruction. There was a steady increase in annual filings starting in 2019, with peaks occurring around 2022-2024. This aligns with broader adoption trends of AI in clinical settings and the maturation of deep learning architectures suitable for medical applications. Academic institutions accounted for 23% of filings, and university-industry collaborations represented a significant proportion. Non-academic entities accounted for the largest share of filings (e.g., medical device companies, software firms, healthcare conglomerates).

CONCLUSION

This patent landscape offers valuable insights into technological priorities and institutional dynamics driving AI advancement in radiology with a dynamic interplay between academia and industry in advancing AI applications in medical imaging. Future research could expand this analysis to include patents from Asia, track regulatory approvals, and examine citation networks to assess the impact and influence of such innovations.

CLINICAL RELEVANCE/APPLICATION

Understanding the patent landscape of AI in radiology helps clinicians and stakeholders anticipate emerging technologies likely to impact diagnostic workflows. By revealing academic and industry contributions to innovations in AI-driven MRI and CT, this study informs strategic planning, fosters translational research, and supports evidence-based adoption of new imaging tools in clinical practice.

R5B-SPIN-11 DIAGNOSTIC ACCURACY OF MACHINE LEARNING MODELS FOR LIVER FIBROSIS STAGING IN CHRONIC HEPATITIS C: A SYSTEMATIC REVIEW AND META-ANALYSIS

Victor Arthur Ohannesian (*Presenter*)
Henrique Lecomte (*Abstract Co-Author*)
Wagner Rios-Garcia (*Abstract Co-Author*)
Filipe R. Barra, MD (*Abstract Co-Author*)
Luiz Felipe Simoes Antunes Nery Dos Santos (*Abstract Co-Author*)
Isabelle Menezes (*Abstract Co-Author*)
Matheus Da Silva Ferreira (*Abstract Co-Author*)
Miriana E. Mariussi, MD (*Abstract Co-Author*)
Luciano Falcao (*Abstract Co-Author*)
Miguel J. Francisco Neto, MD, PhD (*Abstract Co-Author*)
Marcelo R. Silva, MD (*Abstract Co-Author*)
Marcos R. Queiroz, MD, MBA (*Abstract Co-Author*)

PURPOSE

To systematically evaluate the diagnostic accuracy of various machine learning (ML) models for staging liver fibrosis in patients with chronic hepatitis C (CHC). The aim was to estimate pooled sensitivity, specificity, likelihood ratios (LR), diagnostic odds ratio (DOR), and area under the curve (AUC).

METHODS AND MATERIALS

This meta-analysis was conducted according to PRISMA-DTA guidelines. Studies that applied ML models to classify fibrosis stage using liver biopsy or 2D shear-wave ultrasound as the reference standard were included. Extracted outcomes were sensitivity, specificity, AUC, DOR, and LR+/LR-. A bivariate random-effects model was used via the midas package in Stata v15. Heterogeneity and threshold effects were assessed. Included models were Random Forest, Support Vector Machine, Gradient Boosting, Artificial Neural Networks, ANFIS, Bayesian Networks, XGBoost, and others.

RESULTS

Twenty-one studies were included. A total of 8473 patients were analyzed (1733 with fibrosis, 6740 without). Pooled sensitivity was 89% (95% CI: 85-92%). Pooled specificity was 92% (95% CI: 87-95%). AUC was 0.95 (95% CI: 0.93-0.97). DOR was 90 (95% CI: 39-208). LR+ was 10.7 (95% CI: 6.4-17.8) and LR- was 0.12 (95% CI: 0.08-0.17). Assuming a pre-test probability of 20%, the post-test probability was 74.1% for a positive result and 2.9% for a negative result. Significant heterogeneity was observed (I^2 = 80%), mainly explained by the diversity of ML models. A strong threshold effect was present (correlation = 1.00). No significant publication bias was detected (p = 0.098).

CONCLUSION

ML models demonstrated high diagnostic accuracy for staging liver fibrosis in CHC. They outperform traditional noninvasive methods. Neural networks, Random Forest, and boosting-based models showed the best combined performance to date.

CLINICAL RELEVANCE/APPLICATION

ML models may support noninvasive staging of liver fibrosis, particularly when biopsy or elastography is unavailable. Their high sensitivity and specificity allow for safe and reproducible assessment. However, external validation and technical implementation remain necessary, currently representing the main limitations to clinical application.

R5B-SPIN-12 THE IMPACT OF DIFFERENT ITERATIVE ALGORITHMS AND SPECTRAL PARAMETERS ON ABDOMINAL CT IMAGE QUALITY IN DUAL-ENERGY SPECTRAL SCANNING MODE

Xiao Ma (*Presenter*)
Wu Jinhua, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the effects of varying weighted iterative algorithms (Adaptive Statistical Iterative Reconstruction-V, ASiR-V) and spectral parameters on image quality in abdominal dual-energy spectral CT and determine the optimal ASiR-V level for abdominal imaging.

METHODS AND MATERIALS

A prospective study enrolled 47 patients requiring abdominal CT angiography (CTA). Scans were performed at 120 kV tube voltage with automatic tube current modulation (Smart mA, range: 140-740 mA) and a noise index (NI = 9). Images were reconstructed using ASiR-V at three weight levels (30%, 40%, and 50%) with a slice thickness of 1.25 mm. Portal venous phase images were analyzed. Regions of interest (ROIs, 50-150 mm^2) were delineated to measure CT values, noise (standard deviation, SD), and signal-to-noise ratio (SNR) of the portal vein. One-way ANOVA was used to compare differences in SD and SNR among ASiR-V weight groups for spectral parameters, including effective atomic number (Effective-Z) and material decomposition pairs (iodine-water, water-iodine) ($P < 0.05$ for statistical significance).

RESULTS

In 47 patients, increasing ASiR-V weights (30% to 50%) progressively reduced SD values and improved SNR. At ASiR-V 50%, the portal vein SD values were 0.38 ± 0.13 HU (Effective-Z), 10.73 ± 3.39 HU (iodine-water), and 8.66 ± 2.00 HU (water-iodine). Optimal image quality was achieved at ASiR-V 50% with the Effective-Z parameter, demonstrating the lowest SD and highest SNR ($P < 0.05$ for all comparisons). ASiR-V weights exhibited similar effects on Effective-Z and material decomposition pairs (iodine-water, water-iodine), with statistically significant intergroup differences ($P < 0.05$).

CONCLUSION

ASiR-V iterative algorithms significantly enhance abdominal dual-energy spectral CT image quality. The combination of ASiR-V 50% and Effective-Z parameter optimization yields the highest image clarity for abdominal visualization.

CLINICAL RELEVANCE/APPLICATION

Dual-energy spectral CT with ASiR-V iterative algorithms improves abdominal image quality by leveraging atomic number-based parameters, enabling enhanced diagnostic precision without increasing radiation exposure.

Nov. 30 – Dec. 4
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R5B-SPIR

Interventional Radiology Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPIR-1 OUTCOMES OF GENICULAR ARTERY EMBOLIZATION FOR OSTEOARTHRITIS-RELATED KNEE PAIN: A SINGLE-CENTER STUDY

Sina Golzarian (*Presenter*)
Seyed A. Astani, MD, MBA (*Abstract Co-Author*)
Jafar Golzarian, MD (*Abstract Co-Author*)

PURPOSE

Genicular artery embolization (GAE) is a minimally invasive procedure for treating knee pain associated with osteoarthritis (OA). This study evaluates its short-term effectiveness and clinical success rates in a single-center outpatient population.

METHODS AND MATERIALS

This retrospective study included 153 patients treated with GAE at a single outpatient center between March and December 2024. Embolization targeted hyperemic genicular branches identified on angiography and cone-beam CT using Embo ASSIST (GE HealthCare). Embolic agents included imipenem/cilastatin or 100-300 µm Embosphere particles. Pain and function were assessed using the Visual Analog Scale (VAS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), collected pre-procedure and at 1-, 3-, and 6-month follow-ups. Clinical success was defined as a =20% improvement in either score. Paired t-tests were used to compare pre- and post-treatment outcomes.

RESULTS

Clinical success, defined as a =20% improvement in either WOMAC or VAS score, was achieved in 85% of patients at 1 month, 80% at 3 months, and 79% at 6 months. Among responders, mean WOMAC scores improved from 63.0 to 26.2 at 1 month and to 23.3 at 6 months ($p < 0.001$). Mean VAS scores decreased from 6.4 to 2.3 by 1 month and remained stable through 3 and 6 months ($p < 0.001$). No major complications occurred. Clinical success rates were similar across BMI categories.

CONCLUSION

GAE is a safe and effective outpatient treatment for knee OA, providing sustained symptom improvement through 6 months. These findings support its use as a minimally invasive alternative to more invasive therapies.

CLINICAL RELEVANCE/APPLICATION

GAE may offer an effective, low-risk option for patients with knee OA seeking pain relief without undergoing surgery.

R5B-SPIR-3 IMAGE TRACKING OF ABLATION PROBES AND ULTRASOUND WITH 3D CAMERA AND DEEP LEARNING IN AN INTERVENTIONAL CT SUITE

Laetitia Saccenti, MD (*Presenter*)
Rayal Prasad (*Abstract Co-Author*)
John W. Karanian, PhD (*Abstract Co-Author*)
Ankur Kapoor, PhD (*Abstract Co-Author*)
Ming Li, PhD (*Abstract Co-Author*)
Bradford J. Wood, MD (*Abstract Co-Author*)

PURPOSE

To develop, deploy, and assess a 3D camera and custom software to track an ablation probe and an ultrasound transducer without a fiducial or sensor in an Interventional CT suite.

METHODS AND MATERIALS

Custom deep-learning software was developed and integrated with a 3D camera in a fixed location adjacent to an interventional CT gantry. The input in the software of 3D models (CAD files) of a microwave ablation probe (IntelliBlate, Varian) and an ultrasound transducer (Siemens Healthineers) allowed the detection and tracking of those objects in real-time. Calibrated camera feedback updated the position and direction of the needle or ultrasound transducer in real-time display. The needle and ultrasound transducer were manipulated and tracked in multiple angles and relationships to an anthropomorphic phantom. To evaluate the accuracy of the ablation probe tracking, the 3D coordinates of the ablation needle in the CT space were computed from camera 2D images. The projected position and angle of the needle were compared to the real CT position and angle with Euclidian geometry.

RESULTS

The ablation probe and the ultrasound transducer were successfully tracked via a 3D camera and deep learning. Multiple angles were imaged and transformed into planning software with superimposed graphics updating the location and angulation of the probe and ultrasound in real-time following manual manipulation. Preliminary results showed the cosine similarities between camera estimation and CT image of inserted ablation probes ranged between 0.892-0.944 (1 being perfectly parallel vectors).

CONCLUSION

A 3D camera and custom deep learning software were used to track an ablation probe and ultrasound transducer in real-time. Such a novel approach to interventional ablation planning has the potential for combining ultrasound, needle, and CT data during multimodality fusion ablation without ergonomically cumbersome conventional hardware-based tracking methods.

CLINICAL RELEVANCE/APPLICATION

Image tracking of medical devices with 3D camera and deep learning may design the future of multimodality fusion or registration workflows. Such technologies may theoretically be interfaced with ablation planning and guidance software towards obviating conventional registration with fiducials or electromagnetic sensors.

R5B-SPIR-4 COMPARISON OF CONVENTIONAL VERSUS PHARMACOMECHANICAL CATHETER-DIRECTED THROMBOLYSIS: A MULTI-CENTER ANALYSIS

Zain Hussain, MD (*Presenter*)
Hailey Carruthers, MD (*Abstract Co-Author*)
Arif Musa, MD, MS (*Abstract Co-Author*)
Hussein Chahrour, BS,MD (*Abstract Co-Author*)
Ali N. Harb, MD (*Abstract Co-Author*)

PURPOSE

Large-scale clinical trials, including ATTRACT, CAVA, and CaVenT, have shown strict patient selection is necessary for optimal outcomes when performing conventional catheter-directed thrombolysis (cCDT) and pharmacomechanical CDT (pmCDT). Our purpose is to directly compare post-procedure safety endpoints between cCDT and pmCDT.

METHODS AND MATERIALS

This retrospective analysis compared two cohorts based on thrombolytic treatment modalities: cCDT (n = 2,047 before matching; n = 2,041 after matching) and pmCDT (n = 3,007 before matching; n = 2,041 after matching). Given the 2013 change in CDT CPT definitions, patients in both cohorts must have underwent a documented procedure between January 1, 2013 and January 1, 2023 (10-year time interval). For the cCDT group, the procedure was identified with CPT 37212, while the pmCDT group was defined by 37187 and 37188. Patients were required to have a diagnostic ICD code for thromboembolic event (I80.1 or I80.2 for phlebitis/thrombophlebitis of the lower extremities or I82.4 for acute embolism/thrombosis of deep veins), appearing within 3 months before CDT, thereby confirming the indication for thrombolysis. Exclusionary criteria included a history of PE occurring before CDT. Baseline patient demographics were balanced across the cohorts. Outcome measures included risks of acute PE, chronic PE, and all-cause mortality. Kaplan-Meier (KM) analyses were conducted. Hazard ratios (HR) and absolute risk differences (ARD) were calculated. 95% confidence intervals were reported; statistical significance was achieved at $p<0.05$.

RESULTS

Acute PE occurred in 121/1,246 cCDT patients (9.71 %) versus 130/1,268 pmCDT patients (10.25 %) (RD -0.54 %, 95 % CI -2.89 to 1.80; HR 0.883, 95 % CI 0.689-1.131; p = 0.65). Chronic PE developed in 112/1,974 cCDT patients (5.67 %) versus 78/1,970 pmCDT patients (3.96 %) (RD 1.71 %, 95 % CI 0.38-3.05; HR 1.342, 95 % CI 1.005-1.792; p = 0.012). All-cause long-term mortality was 116/1,919 (6.05 %) for cCDT versus 127/1,922 (6.61 %) for pmCDT (RD -0.56 %, 95 % CI -2.10 to 0.98; HR 0.819, 95 % CI 0.636-1.054; p = 0.47).

CONCLUSION

In our large cohort analysis of lower extremity DVT cases, pmCDT was associated with a significantly reduced risk of chronic PE compared to cCDT. Larger prospective cohorts could further clarify our endpoints.

CLINICAL RELEVANCE/APPLICATION

The significant reduction of chronic PE risk associated with pmCDT compared to cCDT suggests that the mechanical adjunct provided in pmCDT may mitigate residual embolic risk by enhancing thrombus clearance.

R5B-SPIR-5 BODY COMPOSITION AND CLINICAL RISK SCORES AS PREDICTORS OF 6-MONTH MORTALITY AFTER TIPS: A COMPARATIVE ANALYSIS OF PATIENTS WITH REFRACTORY ASCITES VS. VARICEAL BLEEDING

Destina Gizem Aydemir, MD (*Presenter*)
Jennifer Erley, MD (*Abstract Co-Author*)
Isabel Molwitz, MD, MBA (*Abstract Co-Author*)
Felix Piecha (*Abstract Co-Author*)
Gerhard B. Adam, MD (*Abstract Co-Author*)
Peter Bannas, MD (*Abstract Co-Author*)
Lennart Well, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the prognostic value of body composition (myosteatosis, adipose tissue analysis) compared to established clinical risk scores (Freiburg index of post-TIPS survival [FIPS], Model for End-Stage Liver Disease [MELD], and Chronic Liver Failure Consortium Acute Decompensation [CLIF-C AD] for 6-month mortality in patients undergoing transjugular intrahepatic portosystemic shunt (TIPS) due to refractory ascites (RA-TIPS) or acute variceal bleeding (early TIPS).

METHODS AND MATERIALS

This retrospective monocentric study included patients who underwent early-TIPS at our hospital between January 2014 and July 2024 (n=51; 29 male, mean age 53.4 years) and patients who underwent TIPS due to RA between July 2020 und July 2024 (n=37; 29 male, mean age 60.3 years). Patient survival was monitored over six months after implantation of TIPS. Body composition analysis was performed on abdominal CT scans at the level of the third lumbar vertebra (L3). The cross-sectional areas of visceral adipose tissue (VAT), subcutaneous adipose tissue (SAT), and intramuscular adipose tissue (IAT) were quantified. Patients were classified as sarcopenic below a skeletal muscle index (SMI) of 52.4 cm 2 /m 2 in men and 38.5 cm 2 /m 2 in women and below a mean muscle radiation attenuation (mMRA) of 34.2 HU in men and 27.1 HU in women (myosteatosis). Both patient groups were categorized regarding FIPS, MELD, and CLIF-C AD scores. For statistical analysis, analysis of variance (ANOVA) was performed.

RESULTS

Six-month mortality was 21% (8/37) in the RA-TIPS group and 42% (22/51) in the early TIPS group (p=0.03). In both groups, increased mortality was associated with higher FIPS (RA-TIPS: p=0.021; early TIPS: p=0.004), higher MELD (RA-TIPS: p=0.033; early TIPS: p=0.021), higher CLIF-C AD (RA-TIPS: p=0.008; early TIPS: p=0.001) and presence of myosteatosis (RA-TIPS: p=0.045; early TIPS: p=0.012). IAT was significantly higher in non-survivors in the early TIPS group (54 vs. 39 cm^2, p=0.04), but not in the RA-TIPS group (51 vs. 42 cm^2, p=0.09). Mean VAT was higher in non-survivors than survivors in both groups, but the difference was only significant in the early TIPS group (RA-TIPS: 1012 ± 420 cm^2, vs. 812 ± 310 cm^2, p=0.09; early TIPS: 950 ± 340 cm^2 vs. 730 ± 260 cm^2, p=0.04).

CONCLUSION

FIPS, MELD, CLIF-C AD and myosteatosis were all significantly associated with 6-month mortality in both groups (all $p<0.05$). The association between mortality and IAT / VAT was only significant in the early TIPS group (p=0.04), but not in the RA-TIPS group (p=0.09).

CLINICAL RELEVANCE/APPLICATION

Integrating CT-based body composition analysis with established clinical risk scores enhances risk stratification for mortality especially after early TIPS and helps improve patient management.

R5B-SPIR-6 TREATMENT OF PRIMARY AND SECONDARY BRAIN TUMORS USING INTRAARTERIAL CHEMOPERFUSION (IAC): THERAPY RESPONSE AND SURVIVAL RATES

Thomas J. Vogl, MD, PhD (*Presenter*)
Hamzah Adwan, MD (*Abstract Co-Author*)
Tatjana Gruber-Rouh (*Abstract Co-Author*)

PURPOSE

To evaluate the efficacy of intraarterial chemoperfusion (IAC) in patients with malignant primary or secondary brain tumors regarding overall survival time and therapy response.

METHODS AND MATERIALS

In total, 64 patients (mean: 52 years; range: 21-80; 34 women, 30 men), who were treated using IAC in 290 sessions (mean: 4.5 sessions/patient; range: 1-16) were analyzed and included in this retrospective study. 39 patients had primary brain tumors and 25 patients secondary brain tumors. Overall survival time was calculated using the Kaplan-Meier method. Therapy response was determined according to the RECIST criteria.

RESULTS

The mean overall survival time was 1018 days with a six-month survival rate of 65.5% for all patients. The mean overall survival time for patients with primary brain tumors was 1412 days and 516 days for patients with secondary brain tumors, (p-value: 0.1). Two patients achieved complete response (3.4%), 7 patients of partial response (12.1%) and 29 cases of stable disease (50%). Progressive disease was observed in 20 cases (34.5%). RECIST could not be performed in six cases due to loss of follow-up.

CONCLUSION

This study shows that IAC is a potentially effective treatment option for primary and secondary brain malignancies. The patients had promising overall survival and therapy response. However, further prospective studies are required.

CLINICAL RELEVANCE/APPLICATION

IAC is a relevant targeted therapy option for brain malignancies

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R5B-SPMK

Musculoskeletal Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPMK-1 MEASURING LUMBAR INTERVERTEBRAL MOTION USING REAL-TIME MRI IN A STANDARD 3T HORIZONTAL BORE SCANNER

Fiona Mellor, PhD, BSc (*Presenter*)

PURPOSE

Develop an MRI technique to measure dynamic lumbar vertebral motion during passive and active movements. Evaluate automated tracking algorithms for detecting x- and y-position of vertebral bodies throughout dynamic sequences. Background: Understanding intervertebral motion is key to identifying biomechanical contributors to back pain. Quantitative fluoroscopy captures this reliably but involves ionizing radiation. Kinetic MRI offers a non-ionising alternative. This study explores the feasibility of a radiation-free method to visualize and quantify lumbar spine motion using a standard closed-bore 3T MRI system.

METHODS AND MATERIALS

Ten healthy participants (five male, five female; aged 18-51) underwent passive and active lumbar motion imaging in a horizontal 3T MRI scanner. Mid-sagittal images were acquired using adapted sequences from patellar and TMJ tracking: TRUFISP and HASTE. Image quality was subjectively rated on a 4-point Likert scale, and tracking algorithms were applied to vertebral bodies from the most promising sequences. Passive motion was facilitated using inflatable bolsters: for flexion, participants lay prone on a deflating bolster; for extension, they lay supine. Active motion involved voluntary flexion to extension to neutral. Participant acceptability was assessed via a post-scan questionnaire. All images were reviewed for incidental findings.

RESULTS

HASTE sequences produced superior image quality, supported by subjective ratings and tracking performance. Vertebral visualization and artefact reduction succeeded in 89% of HASTE images versus 49% with TRUFISP. Passive motion yielded minimal intervertebral rotation but greater variability in positioning, reducing reproducibility and participant comfort. Active motion was better tolerated, more reproducible, and resulted in shorter scan times with greater vertebral rotation. No incidental findings warranted further investigation. TRUFISP: 40 measurements over 30 seconds (TR 741.68 ms) HASTE: 30 measurements over 42 seconds (TR 1400 ms)

CONCLUSION

Dynamic lumbar spine imaging is feasible using a standard 3T MRI scanner but is limited by body habitus, with BMI >30 reducing motion range and affecting SAR limits. Further work will evaluate algorithm reliability and support the development of a validated kMRI protocol for clinical and biomechanical applications.

CLINICAL RELEVANCE/APPLICATION

This technique may aid in identifying sources of spinal dysfunction or pain by enabling detailed biomechanical analysis. It establishes a foundation for future studies in clinical populations and may enhance diagnostic and therapeutic strategies for spine-related conditions.

R5B-SPMK-2 NONSPECIFIC LOW BACK PAIN: HIGH RATES OF RADIOGRAPHS AND MRI EARLY IN THEIR MANAGEMENT NOT CONSISTENT WITH CLINICAL GUIDELINES

Katelyn E. Rudisill, MPH, BS (*Presenter*)
Gwyneth Maloy (*Abstract Co-Author*)
Jonathan Grauer (*Abstract Co-Author*)

PURPOSE

Nonspecific lower back pain (LBP) is one of the most common clinical diagnoses worldwide. Although diagnostic imaging may aid in the management of nonspecific LBP, guidelines do not recommend this prior to six weeks of conservative management. While radiographs are typically thought of as first line imaging, the use of magnetic resonance imaging (MRI) has increased. The current study evaluates trends in radiographs and/or MRI among patients diagnosed with nonspecific LBP.

METHODS AND MATERIALS

Data were abstracted from the 2010 to 2021 M151Ortho PearlDiver national, multi-insurance, administrative dataset. The use and timing of lumbar spine radiograph and/or MRI within one year of diagnosis were characterized. Patient characteristics were compared across imaging groups using multivariable analyses.

RESULTS

For a large cohort of 17,558,141 patients with nonspecific LBP, imaging was obtained within the first year for 952,072 (5.4%). Of these, lumbar radiographs only were obtained for 569,107 (59.8%), MRI only was obtained for 295,655 (31.0%), and both radiographs and MRI were obtained for 43,655 (4.6%). Within the first six weeks of diagnosis, 52.9% of the radiographs were obtained and 23.6% of MRIs were obtained. Independent predictors for receiving MRI relative to radiographs included male sex (OR 1.06) and non-clinical factors: region (relative to West, Midwest [OR 1.20], Northeast [OR 1.17], and South [OR 1.15]) and insurance type (relative to commercial, Medicare [OR 1.13] and Medicaid [OR 0.96]) ($p < 0.0001$ for each).

CONCLUSION

Despite guidelines discouraging imaging within six weeks of nonspecific LBP diagnosis, a substantial proportion of patients received radiographs and MRIs during this early period. MRI use remains common and is influenced by non-clinical factors. These findings highlight variation in practice and the need for improved adherence to evidence-based imaging guidelines.

CLINICAL RELEVANCE/APPLICATION

Imaging for nonspecific low back pain often occurs earlier than guidelines recommend, with use influenced by non-clinical factors. These findings highlight a need for more consistent adherence to evidence-based imaging practices.

R5B-SPMK-3 PROSPECTIVE, MULTICENTER, MULTIVENDOR CLINICAL ASSESSMENT OF PATIENT-CENTERED LUMBAR-SPINE MRI: FROM ULTRAHIGH-SPEED SCANNING TO SIMULTANEOUS AUTOMATED REPORT GENERATION IN JUST 5 MINUTES

Jiwoo Park, MD, PhD (*Presenter*)
Young Han Lee, MD (*Abstract Co-Author*)

PURPOSE

Magnetic resonance imaging (MRI) is a critical tool for diagnosing lumbar spine (L-spine) pathologies, but MRI scan is time-intensive, limiting patient throughput and increasing costs. Recent advancements in ultrahigh-speed MRI with deep learning (DL)-based enhancement and artificial intelligence (AI)-driven automated reporting offer potential solutions to these challenges. To demonstrate the clinical equivalence in quality and safety between ultrahigh-speed L-spine MRI with DL-based enhancement and conventional turbo spin echo (TSE) MRI, while simultaneously evaluating the clinical application of AI-generated automated radiologic reports.

METHODS AND MATERIALS

This prospective study included 70 patients enrolled from two institutions. All participants underwent both conventional L-spine MRI and ultrahigh-speed L-spine MRI with DL-based enhancement during the same session, resulting in a total of 140 MRI scans. Quantitative analyses included signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) measurements, while qualitative assessments were conducted by four radiologists blinded to scan type and patient information. Interchangeability between conventional and ultrahigh-speed MRI protocols was evaluated using predefined equivalence criteria for five key pathologic findings. Diagnostic agreement was assessed by comparing AI-generated reports with radiologist consensus reports. Statistical analyses were performed, with $p < 0.05$ considered statistically significant.

RESULTS

Ultrahigh-speed L-spine MRI with DL-based enhancement demonstrated significant reductions in acquisition time, achieving an approximate 80-86% decrease compared to conventional MRI, while maintaining interchangeability in diagnostic performance. Quantitative analysis revealed superior SNRs and CNRs for bone marrow and intervertebral discs in ultrahigh-speed MRI, with qualitative evaluations supporting comparable image quality. Automated report generation using AI software exhibited diagnostic agreement comparable to radiologists' reports, with substantial to almost perfect agreement.

CONCLUSION

Ultrahigh-speed L-spine MRI with DL-based enhancement, in conjunction with AI-driven reporting systems, demonstrated clinical feasibility and efficiency in practice, significantly reducing overall workflow time.

CLINICAL RELEVANCE/APPLICATION

The ultrahigh-speed reconstruction and automated reporting were executed with fully commercial, regulatory-cleared software rather than in-house research code. Using off-the-shelf solutions underscores the immediate, plug-and-play translatability of the 5-minute MRI-to-report workflow to routine clinical practice across vendor platforms.

R5B-SPMK-4 COMPARISON OF HIGH-RESOLUTION 3D VS. 2D LUMBAR SPINE MRI USING A NOVEL DEEP LEARNING RECONSTRUCTION ALGORITHM AND PROTOTYPE CONFORMAL SPINE COIL

Allison Lowe, BSc (*Presenter*)
Ek Tsoon Tan, PhD (*Abstract Co-Author*)
Darryl B. Sneag, MD (*Abstract Co-Author*)
Meghan Sahr, MD (*Abstract Co-Author*)
J. Levi Chazen, MD (*Abstract Co-Author*)
Richard Kijowski, MD (*Abstract Co-Author*)

PURPOSE

Conventional 2D MRI has limitations in image scoliotic spines, leading to longer scan times and reduced visualization of complex pathology. This study compared interobserver agreement and image quality between deep learning reconstructed (DLR) 3D and 2D MRI sequences. We hypothesized that a prototype conformal 72-channel posterior coil with DLR would yield high-resolution 3D lumbar-spine images comparable to 2D scans.

METHODS AND MATERIALS

30 scoliosis patients identified on previous imaging (68.5 years old ±14.5, 13 M/17 F) undergoing clinical lumbar spine MRI at 3T were prospectively recruited under an IRB-approved protocol. Isotropic 3D T1, T2 and STIR sequences were obtained with the standard three-plane 2D protocol using the prototype coil and DLR. Three radiologists averaging 14 years of experience assessed the randomized sequences for image quality, central and foraminal stenosis, disc herniation (presence, location, type), facet joint cyst, and fracture. Interrater agreement was evaluated by Gwet's agreement coefficient for categorical (AC1) and ordinal (AC2) variables, and intraclass correlation coefficient (ICC) for continuous variables. To compare 2D and 3D sequences, the sign test, Wilcoxon sign rank test, and McNemar test, were used for ordinal variables, continuous variables, and binary nominal data, respectively. Cobb's angle was measured in all subjects on MRI.

RESULTS

Interrater agreement was similar between 3D and 2D sequences of the same tissue weighting. Gwet's AC1 values for fracture were 0.84-0.85 (95% confidence interval: 0.682-1) for 3D and 0.86-0.88 (0.719-1) for 2D. Synovial cyst agreement was high: 0.87-0.88 (0.751-0.995) for 3D and 0.93-0.98 (0.837-1) for 2D. Disc herniation AC1 values were 0.48-0.53 (0.321-0.699) for 3D and 0.38-0.55 (0.23-0.711) for 2D. AC2 values for foraminal stenosis were 0.71-0.82 (0.535-0.936) for 3D and 0.72-0.80 for 2D (0.582-0.93). ICC values for canal stenosis were 0.95 (0.89-0.98) for 3D and 0.95 (0.89-0.98) for 2D. Significant differences were seen between CSF flow artifact in 2D and 3D T2 images ($p < 0.001$), with flow artifacts detect solely on 2D sequences. The image quality of 3D T1 sequences was lower than that of 2D images. Mean scoliosis across patients was mild (Cobb angle of 13o [3-39o]).

CONCLUSION

3D lumbar spine imaging with a conformal coil and DLR provides comparable image quality to 2D sequences and similar levels of interrater agreement for the assessment of common degenerative pathology.

CLINICAL RELEVANCE/APPLICATION

Robust 3D lumbar spine imaging enhances the visualization of complex pathology including scoliosis (>10 degrees of curvature) and reduces scan time by providing multiple reformatted scan planes at comparable image quality.

R5B-SPMK-6 PREDICTION OF INCIDENT VERTEBRAL FRACTURES USING AUTOMATED OPPORTUNISTIC OSTEOPOROSIS SCREENING IN LOW-DOSE COMPUTED TOMOGRAPHY: DATA FROM THE NATIONAL LUNG SCREENING TRIAL

Maximilian Loeffler, MD (*Presenter*)
Sebastian Ruhling (*Abstract Co-Author*)
Marco Reisert (*Abstract Co-Author*)
Susanne Rospleszcz (*Abstract Co-Author*)
Fabian Bamberg, MD, MPH (*Abstract Co-Author*)
Jan S. Kirschke, MD (*Abstract Co-Author*)
Jakob Weiss, MD, PhD (*Abstract Co-Author*)

PURPOSE

Guidelines in the US, China, and EU recommend low-dose computed tomography (LDCT) for lung cancer screening in adults with a history of heavy smoking. The US Preventive Services Task Force recommends screening for osteoporosis in women =65 years or older. We used a validated deep learning-based tool to investigate if opportunistic quantification of bone mineral density (BMD) predicts incident vertebral fractures in lung cancer screening eligible individuals.

METHODS AND MATERIALS

Participants of the National Lung Screening Trial (NLST) with available baseline and 1-year follow-up LDCT scans (n=16962, mean age 61.5±5.0 years, 41% women; n=9760 with incomplete data excluded) were evaluated for vertebral fractures and BMD using a fully-automated deep learning-based tool (SpineQ v. 1.1, Bonescreen GmbH). Baseline BMD was averaged over unfractured visualized vertebrae T11-L4 using asynchronous calibration and stratified into normal BMD (>120 mg/cm 3), low bone mass (80=BMD=120 mg/cm 3), and osteoporotic BMD (<80 mg/cm 3). Incident vertebral fractures were defined as a new fracture at follow-up or =1 grade increase in a previously fractured vertebra using the Genant classification. Odds ratios (ORs) and 95% confidence intervals (CIs) for incident vertebral fractures (=outcome) were calculated in multivariable logistic regression models adjusting for smoking status, pack years, prevalent type 2 diabetes, hypertension, past myocardial infarction and stroke and, also, in models using stepwise backward selection.

RESULTS

Vertebral fracture prevalence was 8.6% at baseline (n=1405; of those 638, 619, and 148 with =1 grade 1, 2, and 3 fractures, respectively). Vertebral fracture incidence after 1 year was 3.4% (n=580). Only BMD, baseline fractures, and hypertension were significantly associated with incident vertebral fractures and remained in multivariate models. Odds for incident vertebral fractures increased for low bone mass (OR=1.72, CI: 1.37-2.17), osteoporotic BMD (OR=3.09, CI: 2.35-4.07), and prevalent baseline fractures (eg OR=12.0, CI: 9.55-15.1, for grade 1) and decreased for prevalent hypertension (OR=0.80, CI: 0.66-0.97).

CONCLUSION

Deep learning allows for fully-automated opportunistic osteoporosis screening in a lung cancer screening scenario. We confirmed low BMD and prevalent vertebral fractures as important and independent risk factors for incident fractures beyond clinical risk factors.

CLINICAL RELEVANCE/APPLICATION

Clinical guidelines recommend screening for lung cancer in heavy smokers and for osteoporosis in older women. We showed that both screening aims can be met leveraging low-dose lung CT and artificial intelligence that allows for fully automated fracture detection and bone density evaluation.

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R5B-SPMS

Multisystem Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPMS-1 SYMPTOMATIC AND LIFE-THREATENING ADVERSE EVENTS FOR IVC FILTERS ARE MORE LIKELY TO BE RELATED TO OLDER SHELF LIFE PRODUCTS: A NATIONWIDE ANALYSIS OF IVC FILTER ADVERSE EVENTS

Ashima Kundu, BS (*Presenter*)
Sachin Govind (*Abstract Co-Author*)
Andrew C. Gordon, MD, PhD (*Abstract Co-Author*)

PURPOSE

Inferior vena cava (IVC) filters are widely used for pulmonary embolism prevention in patients who cannot receive or have failed anticoagulation, but they are associated with delayed complications. The impact of device age at implantation on adverse events remains poorly understood. This study evaluates whether IVC filters implanted late in their shelf life are more likely to result in symptomatic or life-threatening adverse events.

METHODS AND MATERIALS

A retrospective analysis was conducted using the FDA's Manufacturer and User Facility Device Experience (MAUDE) database, reviewing 34,372 adverse event reports for IVC filters from April 2019 to April 2025. Reports were included if both device manufacture and event dates were available, yielding 759 adverse event reports for analysis. The primary outcome was the occurrence of symptomatic or life-threatening adverse events.

RESULTS

Of the 759 reports, 15.5% of patients were female and the mean age at adverse event was 53.0 ± 17.1 years. Severe adverse outcomes (life-threatening or death) occurred in 26.7% of cases, and 35.3% required intervention. Among the six most common adverse event classes, thrombosis or occlusion (n=195) and cardiovascular injury (n=170) were most frequently associated with life-threatening outcomes (57.9% and 20.6%, respectively). Malposition (n=280) and deployment/removal complications (n=257) were the most common device problems, each associated with life-threatening outcomes (26.4% and 21.0%, respectively). Symptomatic adverse events (n=449) occurred at a median of 242 days post-manufacture, significantly later than asymptomatic events (median 190 days, $p<0.0001$). Events resulting in life-threatening outcomes or death (n=197) occurred at a later median latency than events related to less severe outcomes (328 vs. 195 days, $p<0.0001$).

CONCLUSION

IVC filter adverse events with symptomatic or life-threatening outcomes are more likely to be related to devices that are implanted later on in their shelf life. Future studies should evaluate these findings with prospective data, controlling for IVC filter dwell time.

CLINICAL RELEVANCE/APPLICATION

These findings suggest device age at implantation is an underrecognized risk factor for severe complications, emphasizing the importance of considering device shelf life in clinical decision-making.

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R5B-SPNMMI

Nuclear Medicine & Molecular Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPNMMI-1 DISENTANGLING ENVIRONMENTAL AND GENETIC CONTRIBUTIONS TO AMYLOID AND TAU BURDEN IN PATIENTS ACROSS ALZHEIMER'S DEMENTIA CONTINUUM USING MACHINE LEARNING AND CAUSAL MODELING

Mahsa Mayeli, MD, MPH (*Presenter*)
David Matuskey (*Abstract Co-Author*)

PURPOSE

Socioeconomic disadvantage has been linked to increased risk for cognitive decline and dementia; however, its neurobiological underpinnings remain unclear. We investigated the relationship between the Area Deprivation Index (ADI) and amyloid and tau accumulation using positron emission tomography (PET), while also exploring the contributions of genetic risk (APOE -e4) and demographic factors through both statistical and machine learning approaches.

METHODS AND MATERIALS

Participants (n = 164 for [18F] florbetaben [FBB]) were grouped into cognitively normal (CN, CDR = 0) and mild cognitive impairment/mild dementia (CDR = 0.5-1). Linear regression and mixed-effects models were used to assess the association between ADI and PET-derived amyloid and tau burden, controlling for age, sex, and group. Moderation and mediation models were used to evaluate the interactive and indirect effects of APOE -e4. Additionally, an XGBoost machine learning model with SHAP (SHapley Additive exPlanations) interpretation was used to identify the most influential predictors of Centiloid values.

RESULTS

ADI was significantly associated with higher amyloid deposition in CN individuals across multiple brain regions ($p < 0.001$-0.01), with no significant associations observed in MCI/mild dementia. ADI also predicted tau deposition in various cortical and subcortical regions (p-values=0.017 - 0.044). SHAP analysis revealed that ADI and age were the most important predictors of Centiloid values, surpassing APOE -e4 status in model influence. A significant moderation effect (p=0.016) showed that the relationship between ADI and amyloid burden was stronger in APOE -e4 non-carriers. Mediation analysis did not support a significant indirect pathway from ADI to amyloid burden through APOE -e4.

CONCLUSION

Neighborhood disadvantage contributes significantly to dementia-related brain pathology, particularly in preclinical stages and non-carriers of APOE -e4. Machine learning and SHAP interpretation confirmed the relative dominance of social and demographic predictors over genetic risk in amyloid accumulation.

CLINICAL RELEVANCE/APPLICATION

Neighborhood disadvantage is a significant predictor of amyloid and tau burden detectable on PET imaging. These findings suggest that social determinants of health influence early neuropathological changes. Integrating ADI and demographic factors into imaging-based risk models, supported by machine learning tools such as SHAP, may enhance the stratification of preclinical AD risk. Clinically, this approach could inform targeted screening protocols, guide earlier intervention in socially vulnerable populations, and ultimately support more equitable, personalized dementia care.

R5B-SPNMMI-2 RETROSPECTIVE EVALUATION OF THE CORRELATION BETWEEN SOMATOSTATIN RECEPTOR PET/CT AND HISTOPATHOLOGY IN PATIENTS WITH SUSPECTED INTRACRANIAL MENINGIOMAS

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Lukas Salvermoser, MD (*Abstract Co-Author*)
Johannes Ruebenthaler, MD (*Abstract Co-Author*)
Clemens C. Cyran, MD (*Abstract Co-Author*)
Anna Hinterberger (*Abstract Co-Author*)
Matthias P. Fabritius, MD (*Abstract Co-Author*)
Nicola Fink, MD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Rudolf A. Werner (*Abstract Co-Author*)
Freba Grawe, MD (*Abstract Co-Author*)

PURPOSE

The aim of this retrospective study was to evaluate the correlation between findings from somatostatin receptor (SSTR) positron emission tomography/computed tomography (PET/CT) and histopathological diagnosis in patients with suspected intracranial meningiomas, with PET/CT serving as a non-invasive imaging modality.

METHODS AND MATERIALS

A total of 223 SSTR-PET/CT scans were performed for suspected meningioma. 240 lesions were identified and matched with corresponding histopathological results within four months. Medical reports from both SSTR-PET/CT scans and histopathology were retrospectively reviewed to assess the presence of intracranial meningioma. The positive and negative predictive values (PPV/NPV), sensitivity, specificity, and overall diagnostic accuracy of SSTR-PET/CT were calculated. For each lesion, the maximum standardized uptake value (SUVmax) was determined.

RESULTS

In 222 of 240 lesions (92.5%), meningioma was accurately identified by SSTR-PET/CT and confirmed by histopathology. In 7 cases (2.9%), meningioma was suspected on SSTR-PET/CT but not confirmed by histopathology (false positive); these cases revealed, for example, anaplastic/malignant solitary fibrous tumor or metastasis from breast cancer. Furthermore, in 11 cases (5.0%), meningioma was neither suspected by SSTR-PET/CT nor confirmed by histopathology (true negative). There were no cases of false negatives in our cohort. SSTR-PET/CT demonstrated a sensitivity of 100% (95% CI: 98.4 - 100%) and a specificity of 61.1% (95% CI: 35.8 - 82.7%) in detecting meningiomas. PPV was 96.9% (95% CI: 93.8 - 98.8%), and NPV was 100% (95% CI: 71.5 - 100%). Overall diagnostic accuracy was 97.1%. The ROC analysis for SUVmax values in predicting histopathology results showed an AUC of 94.0%, indicating excellent discriminative performance of SUVmax.

CONCLUSION

SSTR-PET/CT is a precise imaging modality for detecting and assessing intracranial meningiomas, as demonstrated by its high sensitivity. However, in 2.9% of cases, despite a positive PET/CT result, histology did not confirm the presence of a meningioma. By integrating magnetic resonance imaging (MRI), histopathology, and SSTR-PET/CT, clinicians can achieve a comprehensive understanding of meningiomas and other intracranial lesions, enabling well-informed treatment strategies.

CLINICAL RELEVANCE/APPLICATION

SSTR-PET/CT reliably identifies intracranial meningiomas, guiding precise diagnosis and treatment planning, though false positives require confirmation through MRI and histopathology.

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R5B-SPNPM

Noninterpretive Skills (Beyond Imaging) Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPNPM-1 MISREADING THE READINGS: A QUALITATIVE STUDY OF PATIENT PERCEPTION AND UNDERSTANDING OF RADIOLOGY REPORTS

Benjamin Perrin Hee, MD, MPH (*Presenter*)
Alexander M. Beekman, MD (*Abstract Co-Author*)

PURPOSE

The advent of electronic medical records (EMR) has granted patients unprecedented access to their health information. This shift toward increased transparency, while beneficial, has highlighted a significant challenge: bridging the gap between complex medical language and patient understanding. This study aimed to examine the experience of participants tasked with interpreting radiology results without physician assistance. This experience mirrors the common scenario that occurs when patients receive results through an EMR. As digital health applications become increasingly common, it is crucial to understand how they impact the patient experience when accessing and interpreting health information.

METHODS AND MATERIALS

We conducted 20 qualitative interviews with participants aged 20 to 79 years. Prior to the interview, each participant was provided with an identical sample report of a coronary calcium CT scan to read as if it was their own report. The notable sample report findings included a coronary calcium score of zero and an incidental finding of pulmonary nodule. Participants were then asked to reflect on their experience, emotional response, and suggestions for improvement. Interview transcripts were independently coded by two MD/MPH students. Directed content analysis was used to identify themes in participant responses.

RESULTS

When presented with the sample report, 85% of the participants reported feeling concerned or overwhelmed by the information provided. Many participants were unable to derive useful information from the report, and about half expressed fear when interpreting it. One participant stated, “I’m more confused now than I was before I read it”. Major sources of confusion included scoring systems and medical jargon. Adding a lay summary, incorporating visual explanations, and removing citations were commonly suggested solutions. Notably, 95% of participants stated the inclusion of a lay summary would increase their understanding of the report.

CONCLUSION

The majority of participants felt confused or distressed after receiving the sample report. In a real-world scenario, receiving results in this manner could cause emotional distress. Many participants expressed uncertainty about next steps and desired guidance from their radiologist regarding the need for follow-up care.

CLINICAL RELEVANCE/APPLICATION

This study highlights the need for patient-centered communication in the field of radiology. These results provide a foundation for future investigations into the effectiveness of the interventions our participants suggested. By creating reports that are easier for patients to comprehend, the risk of miscommunication is minimized, and patients are empowered to become more involved in their own care

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R5B-SPNR

Neuroradiology Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPNR-2 C-DIR: DOUBLE INVERSION RECOVERY WITH CONTROLLED SIGNAL SUPPRESSION

Alexander Jaffray (*Presenter*)
Christina Graf, PhD (*Abstract Co-Author*)
Armin Rund (*Abstract Co-Author*)
Stefan Steinerberger (*Abstract Co-Author*)
Anthony Traboulsee, MD (*Abstract Co-Author*)
David K. Li, MD (*Abstract Co-Author*)
Alexander Rauscher, PhD, MSc (*Abstract Co-Author*)

PURPOSE

Double inversion recovery (DIR) is a magnetic resonance imaging (MRI) technique in which signal from two types of tissue are suppressed, usually cerebrospinal fluid and white matter. The suppression is achieved with two inversion pulses. In brain regions affected by strong inhomogeneity in the static magnetic field, inversion may be inadequate, resulting in bright signal from insufficient signal suppression. The purpose of our study was to develop a DIR scan with inversion pulses that are robust against such inhomogeneities.

METHODS AND MATERIALS

The DIR sequence was equipped with inversion pulses designed with optimal control theory. Robustness against field inhomogeneities was incorporated directly into the cost functional for pulse optimization. Experimental data with the conventional and the new inversion pulses were acquired and compared at 3 T in a phantom designed to exhibit strong inhomogeneities in the static field, and in human participants (3 healthy volunteers, 2 patients with multiple sclerosis, 1 patient with post-concussive symptoms, 2 participants with asymptomatic white matter hyperintensities). Images were acquired sagitally in three dimensions with 1 cubic mm isotropic resolution, 1st inversion time (TI1) = 2550 ms, 2nd inversion time TI2 = 470 ms, repetition time (TR) = 5500 ms, effective echo time (TE) = 293 ms. Images were assessed by a neuroradiologist with 42 years of MRI experience.

RESULTS

In the phantom, the new inversion pulse exhibited nearly perfect inversion across the phantom, whereas the conventional pulse resulted in bright artifactual signal in areas with inhomogeneous field. In human participants, such bright signal appear near the paranasal sinuses with the conventional pulse but were absent with the controlled double inversion recovery (C-DIR) scan. Image contrast of lesions in multiple sclerosis and in white matter hyperintensities were identical for DIR with the optimized pulses and C-DIR and DIR with the conventional pulses.

CONCLUSION

C-DIR shows elimination of artifacts caused by incomplete inversion, without altering image contrast of MS lesions and white matter hyperintensities.

CLINICAL RELEVANCE/APPLICATION

C-DIR requires no modifications to the scanner hardware and no new data sampling approaches. The method can be easily adopted into routine MRI, with direct beneficial clinical impact.

R5B-SPNR-6 OPTIMIZATION OF CORTICOSPINAL TRACTOGRAPHY WITH MULTI-BAND HIGH-RESOLUTION DTI COMPARED TO STANDARD DTI

Matthew L. White, MD (*Presenter*)
Devin A. DeLuna, MD, MBA (*Abstract Co-Author*)
Yan Zhang, MD, PhD (*Abstract Co-Author*)
Michele Aizenberg, MD (*Abstract Co-Author*)
Jie Chen (*Abstract Co-Author*)
Sean Kelly, MD (*Abstract Co-Author*)

PURPOSE

Multi-Band MRI allows for marked acceleration of MRI acquisitions. We utilized a 3x faster approach(MB3) to increase the spatial and angular resolution of our DTI brain mapping exams. Our hypothesis was: Higher resolution DTI techniques would improve tractography mapping by demonstrating more fibers and fibertracts will map closer to the point of interest.

METHODS AND MATERIALS

Patients were recruited from our brain lesion mapping cases (3 vascular lesions, 3 metastatic cases, 6 gliomas). A 3T Ingenia (Philips) system was utilized with a 32 channel head coil. Informed consent was obtained. There are 12 subjects (8Male, 4Female). Average age is 49 years old. Volumetric T1 images pre contrast, T2 FLAIR images and T1 images post-contrast were obtained. DTI parameters: Standard DTI 2x2x2mm zero filled to 1x1x2mm ;16 directions encodes scan time approximately 5 mins, TR=9500, TE=65-70, NSA=2, B-value=800. MB3 DTI 1.5x1.5x1.5mm zero filled to .7x.7x1.5mm, 32 (4 cases) or 64 (8cases) direction encodes, scan time 16 minutes, TR=3900, TE=95, NSA=3, B-value=1000. DTI analysis was performed utilizing Olea Sphere (Olea Medical, France) with FACT technique (Min FA-0.2, Max angle -60 degrees, Min fiber length -10mm). Corticospinal (CS) tractography was performed utilizing 2 main regions of interest (ROIs). Additional ROIs were utilized to remove spurious fibers. ROIs to create the tracts were placed in the same positions on each DTI study. The total fiber count from each CS tract was recorded. The distance between the CS tract and the point of interest was measured. T-tests were employed to evaluate differences between the data sets.

RESULTS

The average CS fiber counts was 433 for the standard DTI and 2021 for the MB3 DTI and were statistically different with a p-value of <0.003. The standard DTI failed in 2 cases and the MB3 failed once. The analysis of distance of CS tract to the point of interest demonstrated average distance of 8.7mm for the standard DTI and for MB3

DTI measured 6.8mm. The The MB3 CS tracts were significantly closer with a p-value <0.003. Two subjects were excluded from this analysis because tract distances could not be measured since the techniques failed.

CONCLUSION

High spatial and angular resolution MB3 DTI allowed for the creation of CS tracts that contained more fibers and demonstrated CS fiber tracts closer to the points of interest in pre-operative brain lesion mapping.

CLINICAL RELEVANCE/APPLICATION

The MB3 DTI technique takes significantly longer to perform but is promising for consistently having better performance in brain lesion mapping cases. This improvement in mapping could result in better pre-operative plans with improved estimation of lesion resection leading to maximal resection with minimization of post-operative deficits.

R5B-SPNR-8 AI ENHANCES DETECTION OF CHALLENGING ACUTE ISCHEMIC STROKE LESIONS ON DIFFUSION-WEIGHTED IMAGE: A READER STUDY

Younbeom Jeong, MD (*Presenter*)
Wi-Sun Ryu (*Abstract Co-Author*)
Byungse Choi, MD,PhD (*Abstract Co-Author*)
Jae Hyoung Kim (*Abstract Co-Author*)
Leonard Sunwoo, MD (*Abstract Co-Author*)

PURPOSE

To assess the impact of artificial intelligence (AI) assistance on the diagnostic performance of human readers in detecting challenging acute ischemic stroke (AIS) lesions on diffusion-weighted imaging (DWI), focusing on small and hyperacute lesions that are often missed in clinical practice.

METHODS AND MATERIALS

This retrospective, single-center, randomized crossover study included 3,986 patients (mean age, 68 ± 14 years; 2,383 men) who underwent DWI between February 2017 and November 2021. From this cohort, 250 cases (130 challenging AIS, 120 controls) were selected for a multi-reader study. Challenging cases were defined as infarcts < 0.5 mL in posterior circulation or < 1.0 mL in anterior circulation within 3 hours of symptom onset. Five readers, including radiology and neurology residents and a neuroradiologist, interpreted the cases with and without AI assistance (JLK-DWI). Diagnostic performance was assessed using AUC, sensitivity, specificity, and Dice similarity coefficient (DSC).

RESULTS

AI assistance significantly improved AUC from 0.85 (95% CI: 0.82-0.90) to 0.93 (95% CI: 0.90-0.95; $p < 0.01$). Pooled sensitivity increased from 74.6% (95% CI: 69.8-79.4) to 90.6% (95% CI: 87.4-93.7; $p < 0.01$), with a notable sensitivity gain of 20.9% in challenging cases. DSC improved from 0.523 to 0.742 ($p < 0.01$), indicating enhanced lesion segmentation accuracy. Specificity slightly decreased from 88.8% (95% CI: 85.1-92.3) to 84.0% (95% CI: 78.5-89.5; $p = 0.05$). AI identified 79.6% (43/54) of false-negative stroke cases missed in clinical reports, including 27 of 38 challenging cases.

CONCLUSION

AI-assisted interpretation significantly improved diagnostic accuracy and lesion segmentation in challenging AIS cases on DWI, reducing missed diagnoses while slightly decreasing specificity. Enhanced sensitivity and lesion detection may aid in earlier stroke identification and more accurate treatment planning.

CLINICAL RELEVANCE/APPLICATION

Integrating AI into stroke imaging workflows may assist radiologists in detecting subtle AIS lesions that are challenging to identify, potentially reducing diagnostic errors and facilitating timely intervention.

R5B-SPNR-9 RELATIONSHIP BETWEEN SPINAL STENOSIS AREA ON MRI AND IMMEDIATE CLINICAL OUTCOME FOR PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT (ED) WITH SUSPECTED CAUDA EQUINA COMPRESSION (CEC)

Mahsa Alborzi Avanaki, MD (*Presenter*)
Pritesh J. Mehta, MD (*Abstract Co-Author*)
Sepideh Abdi, MD (*Abstract Co-Author*)
Donnella S. Comeau, MD,PhD (*Abstract Co-Author*)
Yu-Ming Chang, MD, PhD (*Abstract Co-Author*)
Rafeeque A. Bhadelia, MD (*Abstract Co-Author*)

PURPOSE

Severe spinal stenosis on lumbar spine MRI in patients presenting to ED with symptoms of CEC may lead to immediate clinical outcome such as surgery. However, accurate diagnosis of severe stenosis depends on experience and training of a radiologist (or in-training radiologist). We hypothesized that measurement of stenosis area may improve the utility of MRI in clinical decision making. Our purpose was to measure the area of spinal stenosis on lumbar spine MRI in patients presenting to ED and correlate it with immediate clinical outcome (surgery or conservative management).

METHODS AND MATERIALS

We retrospectively reviewed approximately 1,000 MR Code Cord cases performed between January 1, 2019, and December 31, 2023. We identified 218 cases with emergency lumbar spine MRI performed for suspicion of CEC. Here we present the preliminary results of first 61 measurements of lumbar stenosis. We excluded thoracic cord compression, fractures, infection, and cancer to focus on degenerative lumbar stenosis. AP and transverse diameters were measured by an experienced neuroradiologist and spinal canal area was calculated using the ellipsoid formula. Patients were classified into two groups based on lumbar spinal canal cross-sectional area: mild/moderate stenosis (=70 mm^2) and severe stenosis (<70 mm^2). Clinical outcomes were surgery or conservative management determined at the time of presentation to ED. Only cases which underwent surgery within 72-hours were included.

RESULTS

The mean age of 61 patients was 54.76 years and 35 were female. Based on the area measurement, 28/61 patients had severe stenosis (<70 mm 2) and 33/61 patients had mild or moderate stenosis ((=70 mm^2). 16/28 patients with severe stenosis and 3/33 patients with mild to moderate stenosis had immediate surgical outcome. This outcomes were significantly different among the groups ($p<0.001$). Patients with mild/moderate stenosis more frequently underwent conservative management (90.9%), whereas patients with severe stenosis were more likely to undergo surgery (57.1%).

CONCLUSION

Our findings show that measurement of spinal stenosis area is an objective method of evaluation which highly correlates with immediate clinical outcomes in patients presenting with suspected cauda equina compression to the ED. Additional data are needed to further refine diagnostic thresholds and support clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

Spinal canal area on MRI can guide early triage in cauda equina compression, with severe cases more likely to require urgent surgery.

R5B-SPNR-11 ASSOCIATION OF PLASMA INTERLEUKIN-6 WITH CEREBRAL AMYLOID AND TAU DEPOSITION AND ADIPOSITY IN A MIDLIFE COHORT AT RISK FOR ALZHEIMER'S DISEASE

Amanollahi (*Presenter*)
Soheil Mohammadi, MD, MPH (*Abstract Co-Author*)
Mahsa Dolatshahi, MD, MPH (*Abstract Co-Author*)
Paul K. Commean, BA (*Abstract Co-Author*)
Farzaneh Rahmani, MD, MPH (*Abstract Co-Author*)
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Tammie S. Benzinger, MD, PhD (*Abstract Co-Author*)
Joseph E. Ippolito, MD, PhD (*Abstract Co-Author*)
John C. Morris, MD (*Abstract Co-Author*)
Cyrus A. Raji, MD, PhD (*Abstract Co-Author*)

PURPOSE

Recent studies have demonstrated the impact of elevated BMI and visceral adipose tissue (VAT) in the development of Alzheimer's disease (AD) related pathology. Herein, we aim to study the potential mediating route of this effect by studying the association between plasma interleukin-6 (IL-6), a pro-inflammatory cytokine, and cerebral amyloid and tau deposition measured by PET imaging in a middle-aged cohort of overweight and obese participants.

METHODS AND MATERIALS

Fifty-four participants (mean age 50.2 ± 6.3 years; mean BMI 32.50 ± 7.39; 59.3% male) underwent amyloid PET imaging and plasma IL-6 quantification and were included in the centiloid analysis. Additional analyses examining the relationship between IL-6 and adiposity measures (BMI, VAT, SAT) included 68 participants with available data. Tau PET was assessed in a subset of participants across four selected regions.

RESULTS

Higher IL-6 was significantly associated with greater amyloid burden (ß = 1.92, p = 0.009). Although associations between IL-6 and tau PET SUVRs did not remain significant after FDR correction (FDR-p = 0.067), nominal associations were observed in the lateral occipital and inferior temporal regions. IL-6 correlated with BMI (? = 0.538, p < 0.0001), SAT (? = 0.521, p < 0.0001), and VAT (? = 0.377, p = 0.0016).

CONCLUSION

Plasma IL-6 is positively associated with amyloid deposition and adiposity in midlife, supporting inflammation's role in AD pathology in early stages. However, the exact relationship warrants further investigation on larger sample sizes.

CLINICAL RELEVANCE/APPLICATION

IL-6 may serve as a peripheral biomarker associated with radiological indicators of cerebral amyloid pathology and potentially early tau changes in preclinical AD. It may also act as a mediator linking BMI and visceral adiposity to AD-related pathology.

R5B-SPNR-12 EXPLORING EVIDENCE FOR VERTICAL RECURRENCE OF GLIOBLASTOMA USING DYNAMIC CONTRAST-ENHANCED MRI

Minchul Kim, MD, PhD (*Presenter*)
Kyu Sung Choi, MD, PhD (*Abstract Co-Author*)

PURPOSE

The role of the subventricular zone (SVZ) in glioblastoma progression is acknowledged, yet the detection of its mutated cells through imaging remains elusive. This study utilizes dynamic contrast-enhanced (DCE) MRI to explore changes in the SVZ in patients with recurrent glioblastoma followed by gross total resection, aiming to uncover mechanisms behind tumor recurrence.

METHODS AND MATERIALS

Sixty-three recurred GBM patients after gross total resection (mean age=58±14 years) were evaluated using presurgical DCE. Regions of interest were obtained on the ipsilesional and contralesional SVZ. The volume transfer constant (K trans) and plasma volume fraction (V p) values were assessed using Bayesian one-way repeated measures ANOVA.

RESULTS

Using Bayesian hypothesis testing, we show that the present data substantially favor the null model of no differences between ipsilesional and contralesional SVZ for the DCE pharmacokinetic parameters. The inclusion Bayes factor (BF 10) of SVZ laterality (ipsilesional, contralesional) ranged from 0.186 to 0.328.

CONCLUSION

Together, these findings suggest DCE pharmacokinetic metrics lacking in the ability to prove evidence for "vertical recurrence" and provide the need for a more sensitive metric.

CLINICAL RELEVANCE/APPLICATION

We report that no DCE pharmacokinetic evidence of TERTp mutation in GBM recurrence, suggesting that DCE pharmacokinetic metrics lacking in the ability to prove evidence for "vertical recurrence". In addition, we provided a comprehensive analysis method to investigate SVZ using publicly available FreeSurfer and MATLAB code. As GBM arises from the SVZ, there is a definite unmet need to investigate SVZ in GBM patients. Future researchers may follow our method that analyzes SVZ in multiple shell types as well as layer by layer.

R5B-SPNR-13 THE VALUE OF BLACK-BLOOD MRI IN CEREBRAL VENOUS THROMBOSIS DIAGNOSIS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Ali Akhavi Milani (*Presenter*)

PURPOSE

To evaluate the diagnostic performance of black-blood MRI (BB-MRI) in detecting cerebral venous thrombosis (CVT).

METHODS AND MATERIALS

This study was registered in PROSPERO [ID: blinded]. The PubMed/MEDLINE, Web of Science, Scopus, and Embase databases were searched for studies evaluating the performance of BB-MRI in diagnosing CVT. Studies were selected based on predefined eligibility criteria. The risk of bias was assessed using the QUADAS-2 tool. Meta-analysis was performed using a bivariate random-effects model to calculate pooled sensitivity, specificity, and area under the curve (AUC).

RESULTS

Nine studies fulfilled the eligibility criteria and were included in the review; however, two studies insufficiently reported quantitative data. Thus, seven studies involving 176 CVT patients and 217 controls, encompassing 610 thrombosed and 3,279 normal cerebral venous segments were included in the meta-analysis. The studies

demonstrated a high risk of bias in the patient selection and reference standard domains. The pooled sensitivity and specificity of BB-MRI were 96% [95% CI: 92%-98%] and 96% [95% CI: 93%-98%] on a patient-based level, and 92% [95% CI: 87%-95%] and 98% [95% CI: 92%-99%] on a venous segment-based level, respectively. The AUC was 0.98 for patient-based data and 0.96 for venous segment-based data.

CONCLUSION

BB-MRI demonstrates a significant potential as a diagnostic method for CVT. However, further comparative studies are needed to define its role in the diagnostic workup of patients suspected of having CVT.

CLINICAL RELEVANCE/APPLICATION

BB-MRI provides better diagnostic accuracy for detecting CVT, particularly in small-diameter veins and anatomical locations near bony structures.

R5B-SPNR-14 TIME-SERIES MRI HISTOGRAM ANALYSISIN PREDICTING BRAIN INVASION IN MENINGIOMAS: A PRELIMINARY STUDY

Xianwang Liu, MD (*Presenter*)

PURPOSE

To investigate the utility of time-series histogram parameters (including absolute time-series histogram parameters (AtHP) and relative time-series histogram parameters (RtHP)) in predicting brain invasion in meningiomas.

METHODS AND MATERIALS

One hundred and twelve patients with meningiomas (non-invasion group:68, invasion group:44) who underwent MRI examination (including T1-weighted (T1) and contrast-enhanced T1-weighted images (T1C)) were enrolled in this retrospective study. Histogram parameters (HP) of T1 and T1C were extracted. MRI morphological features, AtHP (AtHP=T1CHP-T1HP), and RtHP (RtHP=(T1CHP-T1HP)/T1HP) were recorded and compared, respectively. Binary logistic regression analysis was used to obtain the combined performance of the significant parameters. Diagnostic performance was identified by the receiver operating characteristic (ROC) analysis.

RESULTS

In MRI morphological features, the invasion group was more likely to have peritumoural edema and irregular margins (all $p<0.05$). In time-series histogram parameters, the invasion group exhibits a higher mean, Perc.01, Perc.25, Perc.50, and variance of AtHP, maximum, mean, Perc.25, and Perc.50 of RtHP, compared with the non-invasion group (all $p<0.00357$). The optimal predictive performance was obtained by combining MRI morphological features and time-series histogram parameters with an AUC of 0.878.

CONCLUSION

Time-series MRI histogram analysis could predict brain invasion in meningiomas, when combined with MRI morphological features yielding superior predictive performance.

CLINICAL RELEVANCE/APPLICATION

Brain invasion in meningiomas correlates with higher recurrence rates and poorer prognosis. This study demonstrates that time-series MRI histogram analysis can predict brain invasion in meningiomas and, when combined with MRI morphological features, further improves predictive performance, which may help to select the appropriate surgical approach and predict prognosis.

R5B-SPNR-17 ORBITAL MRI AFTER CLINICALLY ISOLATED SYNDROME: DIAGNOSTIC PERFORMANCE AND PREDICTION OF VISUAL OUTCOMES

Hana Larassati, MD, MSc (*Presenter*)
Ferran Prados (*Abstract Co-Author*)
Sara Collorone (*Abstract Co-Author*)
Baris Kanber (*Abstract Co-Author*)
Marios Yiannakas (*Abstract Co-Author*)
Giuseppe Pontillo, MD (*Abstract Co-Author*)
Frederik Barkhof, MD, PhD (*Abstract Co-Author*)
Olga Ciccarelli, PhD,MD (*Abstract Co-Author*)
Indran Davagnanam, MBBCh (*Abstract Co-Author*)
Ahmed Toosy (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic performance of orbital 2D-STIR (short-tau inversion recovery) and brain 3D-FLAIR (fluid-attenuated inversion recovery) in optic nerve lesion detection in CIS and their predictive value for structural and functional visual outcomes at one year.

METHODS AND MATERIALS

A retrospective analysis of a prospective study included 100 CIS patients within four months of onset. All underwent orbital 2D-STIR, visual function assessments, and optical coherence tomography; a subset (N=51) had brain 3D-FLAIR. Optic nerve lesions were identified on both acquisitions by experienced radiologists (HL, ID). Lesion lengths, as absolute values (ALL) and relative values as proportions of optic nerve length (RLL), and swelling were recorded. Diagnostic performance was examined using clinical optic neuritis diagnosis as the reference standard. Visual function (Farnsworth-Munsell 100 hue, high contrast acuity (LogMAR) and low contrast letter acuity (LCLA)) and OCT parameters (pRNFL and GCIPL) at baseline and one year were correlated with the MRI findings.

RESULTS

Forty eyes had clinically confirmed ON. The 2D-STIR had a sensitivity of 100%, a specificity of 85.5% and an accuracy of 91.18%. The 3D-FLAIR had a sensitivity of 100%, a specificity of 88.7% and an accuracy of 93.14%. Agreement in lesion detection was near-perfect (Cohen's Kappa=0.961, $p<0.001$), and lesion length measurements were highly concordant (ICC=0.894). Swelling on 2D-STIR correlated with poorer colour vision, high-contrast and low-contrast acuity at baseline ($p<0.05$). ALL and RLL on 2D-STIR predicted LCLA at one year (B=-0.414, 95%CI [-0.716, -0.112], p=0.008 and B=-19.1, 95%CI [-32.3, -5.97], p=0.005), and the model fit improved when RLL was combined with the presence of nerve swelling (R2 change=6.7%, p=0.009). ALL and RLL on 3D-FLAIR predicted LogMAR (B=0.007, 95%CI [0.001, 0.013], p=0.034 and B=0.332, 95%CI [0.072, 0.592], p=0.015), and LCLA (B=-0.511, 95%CI [-0.965, -0.058], p=0.029 and B=-23.7, 95%CI [-41.8, -5.65], p=0.012) at one year.

CONCLUSION

Orbital MRI showed excellent diagnostic performance in detecting optic nerve lesions in CIS patients. The brain 3D-FLAIR may be a practical alternative for optic nerve assessment in routine brain imaging. Optic nerve lesions on MRI show clinical utility in predicting one-year visual outcomes.

CLINICAL RELEVANCE/APPLICATION

Orbital MRI showed excellent diagnostic performance in detecting optic nerve lesions in CIS. Orbital 2D-STIR and brain 3D-FLAIR showed high concordance for optic nerve lesions, suggesting that either acquisition can be reliably used in clinical practice, offering flexibility in MRI protocols. Optic nerve lesions on MRI show clinical utility in predicting one-year visual outcomes.

R5B-SPNR-18 EXPLORING THE VALUE OF MAGNETIC RESONANCE FINGERPRINTING (MRF) AND DIFFUSION-WEIGHTED IMAGING(DWI) FOR PREOPERATIVE PREDICTION OF GLIOMA GRADE AND METHYLATION OF THE MGMT PROMOTER

Liyun Sun
(*Presenter*)
Sike Fu (*Abstract Co-Author*)
Wei Wei (*Abstract Co-Author*)
Yaping Wu (*Abstract Co-Author*)
Yan Bai (*Abstract Co-Author*)
Meiyun Wang (*Abstract Co-Author*)

PURPOSE

Predicting glioma grade and whether the MGMT promoter is methylated using T1 and T2 values obtained by MRF with ADC values obtained from DWI to guide surgery and treatment

METHODS AND MATERIALS

The clinical data of 41 patients with glioma confirmed by histopathology who visited our hospital from December 2023 to January 2025 were analyzed (10 cases of WHO grade II, 5 cases of WHO grade III, and 26 cases of WHO grade IV). All patients underwent preoperative MRF and DWI scans. The optimal region of interest (ROI) was delineated on the tumor using 3D Slicer software, and the Mann-Whitney U test was used to compare the MRF T1, MRF T2 values and ADC values between the two groups. The receiver operating characteristic (ROC) curve was used to calculate the area under the curve (AUC) and logistic regression analysis was used to evaluate the diagnostic efficacy of the related parameters.

RESULTS

Among the 41 patients, 31 had high-grade glioma and 10 had low-grade glioma. Among them, 22 patients had MGMT promoter methylation status-related gene detection. There were 13 cases in the MGMT promoter methylation group and 9 cases in the non-methylation group. Compared with high-grade glioma, the MRF T1, MRF T2, and ADC values of low-grade glioma were higher ($p = 0.002, 0.003, 0.003$, respectively), and the single-discriminative ability was the highest for MRF T1 (AUC = 0.787), and the combined discriminative ability was the greatest for the three (AUC = 0.816). The MRF T2 value and ADC value of the MGMT promoter methylation group were significantly higher than those of the non-methylation group ($p = 0.022, 0.003$, respectively), and there was no significant difference in MRF T1 value between the MGMT methylation group and the non-methylation group ($p > 0.05$). The AUC of MRF T2 and ADC was 0.761 and 0.846, respectively, and the combined AUC of MRF T2 and ADC was 0.855. The combined diagnostic efficacy of MRF T1, MRF T2, and ADC was the highest (AUC = 0.974), with a sensitivity of 100% and a specificity of 84.6%.

CONCLUSION

This study utilized MRF and DWI to distinguish the grading of gliomas and predict whether the MGMT promoter was methylated. The MRF T1, T2 values and ADC values of low-grade gliomas were significantly higher than those of high-grade gliomas. The MRF T2 value and ADC value of the MGMT-methylated group were significantly higher than those of the MGMT-non-methylated group. The combined diagnostic efficacy of MRF T1, MRF T2 and ADC was the highest.

CLINICAL RELEVANCE/APPLICATION

This study is helpful for predicting the grading of gliomas and whether the MGMT promoter is methylated before surgery, and evaluating the sensitivity of patients to the first-line chemotherapeutic drug temozolomide. Thus, it can guide surgery and chemotherapy.

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R5B-SPPD

Pediatric Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPPD-1 MRI EVALUATION OF IRON DEPOSITION PATTERNS IN NEONATAL HEMOCHROMATOSIS USING MULTI-ECHO GRADIENT-RECALLED ECHO SEQUENCES

Diana Veiga Canuto, PhD, MD (*Presenter*)
Mar Miserachs (*Abstract Co-Author*)
Iram Siddiqui (*Abstract Co-Author*)
Chris Tomlinson (*Abstract Co-Author*)
Govind B. Chavhan, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the ability of multi-echo T2* MRI sequence to differentiate NH from other causes of neonatal liver failure. To compare the iron deposition in different organs, including salivary and thyroid glands, in neonates with and without NH .

METHODS AND MATERIALS

This retrospective single-center study evaluated 26 neonates (=20 weeks of age) who underwent MRI for suspected liver failure between November 2016 and December 2024. All examinations included multi-echo GRE T2* sequences (11 echoes, TE range: 2.52-30.6 ms) performed on either 1.5T (n=14) or 3T (n=12) scanners. Two blinded radiologists independently assessed iron deposition in the liver, spleen, pancreas, kidneys, thyroid, and salivary glands using a standardized semi-quantitative grading system. Interobserver agreement was assessed using Cohen's weighted kappa. Correlation between iron deposition grade and final diagnosis was analyzed using Kendall's tau. Diagnostic performance metrics were calculated using integrated clinical, biochemical, imaging and histopathologic data as the reference standard.

RESULTS

Of 26 patients, 7 had liver failure from NH and 19 from other causes. Interobserver agreement was highest for liver iron assessment (?=0.97), followed by kidney (?=0.87), spleen (?=0.84), thyroid (?=0.80), and pancreas (?=0.73). Significant positive correlations on Kendall Tau analysis between iron deposition grade and NH diagnosis were found in thyroid (p=0.0003), pancreas (p=0.0002), and liver (p=0.0271), while spleen showed a significant negative correlation (p=0.0051). No correlation was found for renal iron deposition (p=0.9472). Among the evaluable submandibular and parotid glands, no iron deposition was identified in either group. MRI demonstrated 100% sensitivity, 89.5% specificity, 77.8% positive predictive value, 100% negative predictive value, and 92.3% overall accuracy for NH diagnosis.

CONCLUSION

Multi-echo GRE T2* MRI provides excellent diagnostic performance for NH with distinct patterns of iron deposition across organs. Increased iron in the thyroid, pancreas, and liver, coupled with relative sparing of the spleen, represents a characteristic pattern highly associated with NH. The high interobserver agreement for iron deposition assessment indicates the reliability of this imaging approach.

CLINICAL RELEVANCE/APPLICATION

MRI with multi-echo GRE T2* sequences offers a non-invasive and accurate method for diagnosing NH in neonates with liver failure. The identification of characteristic iron deposition patterns may obviate the need for invasive diagnostic procedures while facilitating timely treatment decisions. This approach is robust across different MRI field strengths and is not influenced by patient sex or gestational age.

R5B-SPPD-3 ACCURACY COMPARISONS OF 2D AND 3D METHODS IN MEASURING FEMORAL VERSION: A PARAMETRIC POSITIONAL STUDY USING 3D-PRINTED HAPTIC FEMUR MODELS

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Jade Iwasaka-Neder, MD, MPH (*Abstract Co-Author*)
Pedro Henrique Caldeira Brant Faria, MD (*Abstract Co-Author*)
Andy Tsai, MD, PhD (*Abstract Co-Author*)
Michael B. Millis, MD (*Abstract Co-Author*)
Sarah D. Bixby, MD, MBA (*Abstract Co-Author*)

PURPOSE

Femoral version is typically assessed using 2D methods, based on landmarks such as the femoral head/neck junction (Lee), neck (Reikerås), and lesser trochanter (Murphy). Though recent studies have shown that 3D methods are more reliable than 2D approaches, their accuracy is unknown, precluding their wide clinical adoption. To overcome this barrier, we aimed to compare the accuracies of 2D and 3D methods in measuring femoral version, through the use of 3D-printed haptic femur models positioned in different orientations.

METHODS AND MATERIALS

CT DICOM data of three skeletally mature pediatric patients (2 females, 1 male; age 17.8 ± 0.1 years) with femurs representing normal, severe retroversion, and severe anteversion were used as digital templates to 3D-print three biofidelic haptic femur models. CTs were then acquired of each model in 17 different positions: neutral, flexion, internal rotation, external rotation, abduction and adduction (at 15°, 30°, 45°), in addition to a combination of 30° flexion and 30° external rotation. A blinded radiologist measured the femoral versions of these haptic models using four techniques: Lee, Reikerås, Murphy, and 3D. Ground truth femoral version was established by an orthopedic surgeon using the customary approach of a K-wire and an inclinometer. We used absolute error (AE) to assess the accuracy performance of each method in measuring the femoral version of each haptic model across different positions.

RESULTS

Ground truth femoral version was 28° in the normal femur, -14° in the retroverted femur, and 81° in the anteverted femur. Across the different positions of the normal femur, the AE ranges were 0°-127° with Murphy's, 9°-46° with Lee's, 4°-91° with Reikerås', and 1°-4° with 3D methods. Across the different positions of the retroverted

femur, the AE ranges were 0°-44° with Murphy's, 1°-22° with Lee's, 0°-21° with Reikerås', and 0°-3° with 3D methods. Across the different positions of the anteverted femur, the AE ranges were 6°-67° with Murphy's, 0°-26° with Lee's, 0°-32° with Reikerås', and 0°-4° with 3D methods.

CONCLUSION

Femoral version measurement based on the 3D method is more accurate than traditional 2D techniques, and robust to variable femur positioning.

CLINICAL RELEVANCE/APPLICATION

Accurate measurement of femoral version is important for understanding lower extremity deformities in the pediatric population.

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R5B-SPPH

Physics Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPPH-2 THE VALUE OF DEEP LEARNING IMAGE RECONSTRUCTION COMBINED WITH HIGH-RESOLUTION LOW-DOSE CT IN NECK IMAGING: A HUMAN CADAVER-BASED DOSE OPTIMIZATION STUDY

Wenjun Qiao (*Presenter*)
Fang Zhou, MD (*Abstract Co-Author*)
Ge Wen (*Abstract Co-Author*)
Yanbing Li (*Abstract Co-Author*)
Basheng Hu (*Abstract Co-Author*)
Tong Su, MD (*Abstract Co-Author*)

PURPOSE

This study aims to explore the potential of a high-resolution scanning mode integrated with deep learning image reconstruction algorithm (ClearInfinity, DLIR-CI) for neck CT image quality improvement under low-dose conditions using human cadaver specimens.

METHODS AND MATERIALS

A wide-detector CT system (NeuViz Epoch Elite CT) was employed to perform neck CT scans on a human cadaver specimen in both conventional scanning mode: standard-dose standard-resolution mode (SDCT: 120 kV, 112 mA, 0.625 mm collimation,CTDI vol 4.97mGy) and low-dose high- resolution mode (HR-LDCT: 120 kV, 56 mA, 0.3125 mm collimation,CTDI vol 2.49mGy). For SDCT, iterative reconstruction (ClearView, CV40%) was applied, while for HR-LDCT, images were reconstructed using CV40% and a deep learning-based algorithm with varying weight levels (CI), resulting in four datasets: HR-LDCT-CI20%, HR-LDCT-CI40%, HR-LDCT-CI60%, and HR-LDCT-CI80%. The CT values and noise (standard deviation, SD) of the left thyroid gland and semispinalis cervicis muscle were measured, with the muscle SD representing the image noise level. Measurements were taken at five layers centered on the isthmus of the thyroid gland, with each region of interest (ROI) measured three times. The signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) of the thyroid gland were calculated for six image groups.

RESULTS

Image noise (SD) decreased progressively with higher CI strength, whereas SNR and CNR gradually increased. The groups of HR-LDCT-CI60% and HR-LDCT-CI80% exhibited significantly lower SD values compared to SDCT-CV40% (15.74 ± 1.62 vs. 19.52±4.34,$P < 0.001$; 10.27 ± 2.07 vs. 19.52±4.34, $P < 0.001$). The group HR-LDCT-CI60% and HR-LDCT-CI80% demonstrated significantly higher SNR compared to Group SDCT-CV40%(9.14 ±0.82 vs. 7.98±0.78, $P < 0.001$; 13.82±1.39 vs. 7.98±0.78, $P < 0.001$)with 14.53% and 73.18% increase, and The group HR-DCT-CI80% demonstrated a 64.13% higher CNR(7.14±1.45 vs. 4.35±0.92, $P < 0.001$).

CONCLUSION

Integrating a high-resolution scanning mode with the ClearInfinity deep learning reconstruction algorithm (DLIR-CI) significantly enhances neck CT image quality while maintaining diagnostic efficacy at half the standard radiation dose.

CLINICAL RELEVANCE/APPLICATION

The radiation risk to the thyroid gland represents a critical concern in neck CT imaging. This study validates that deep learning-enhanced low-dose CT reduces radiation by 90% while improving thyroid imaging, offering a safer protocol for radiation-sensitive neck CT applications.

R5B-SPPH-6 FEASIBILITY OF ULTRA-LOW-DOSE CT FOR AI-BASED HEPATIC STEATOSIS DETECTION: PERFORMANCE ACROSS RADIATION DOSE

Boyuan Li, BS (*Presenter*)
Justin Tse, MD (*Abstract Co-Author*)
H. Henry Guo, MD, PhD (*Abstract Co-Author*)
Adam S. Wang, PhD (*Abstract Co-Author*)

PURPOSE

Hepatic steatosis affects 1/3 of the world’s population and can progress to cirrhosis and related complications, such as liver cancer. AI-based automated liver segmentation methods can robustly detect hepatic steatosis using standard radiation dose CT (hereafter referred to as full-dose CT). This study investigates the performance of these AI methods across varying radiation dose levels using low radiation dose CT (LDCT), exploring their potential utility for preventive screening.

METHODS AND MATERIALS

Fifty pairs of full and low-dose (10% full dose) 120 kVp non-contrast chest CT examinations from the Mayo LDCT dataset were used to synthesize images at varying dose, followed by AI-based liver segmentation. To simulate LDCT at varying dose levels, a noise-only image (difference between full and low-dose images) is scaled by a dose-dependent factor and added to the full-dose image to match the noise expected at the low-dose level. TotalSegmentator, a pretrained nnU-Net based AI segmentation tool, was used to segment livers in all images. Mean liver HU was calculated, and a threshold of <40 HU was used for moderate hepatic steatosis detection. Dose-dependent bias adjustment of detection thresholds was performed by aligning mean liver HU of all subjects for each dose level relative to full-dose CT images. Detection accuracy was evaluated against full-dose-derived ground truth.

RESULTS

The liver segmentations from moderate low-dose CT images (>10% full dose) were closely aligned to the full-dose CT images (Dice scores >0.95). The AI segmentation tool began to suffer from image noise at lower doses, reducing Dice scores from 0.94 at 5% dose to 0.74 at 1% dose. Using mean liver HU from full-dose segmentation as ground truth and <40 HU as threshold, detection accuracy fell slightly to 96% at 10% dose but dropped sharply to 74% at 1% dose. However, at lower doses, the error was dominated by the HU bias rather than segmentation errors. Adjusting the detection threshold for the HU bias, LDCT with 3% full dose achieved 92% detection accuracy.

CONCLUSION

We investigated the effect of radiation dose on the performance of LDCT-based liver fat quantification with AI-based liver segmentation. AI-based hepatic steatosis detection remains robust at significantly reduced radiation doses (~3%), suggesting the potential feasibility of ultra-low-dose CT protocols for preventive screening of hepatic steatosis.

CLINICAL RELEVANCE/APPLICATION

Early detection of hepatic steatosis can facilitate interventions, mitigating progression to irreversible end-stage liver disease and associated complications. The combination of LDCT and robust AI-segmentation may provide an accessible non-invasive approach for whole liver assessment.

R5B-SPPH-9 COMPARISON OF SPATIAL RESOLUTION AND IMAGE QUALITY AMONG FOUR DIFFERENT SCAN MODES IN PHOTON-COUNTING DETECTOR CT: A PHANTOM EXPERIMENTS

Tomoki Maebayashi (*Presenter*)
Koki Kataoka (*Abstract Co-Author*)
Kazuki Ishikawa (*Abstract Co-Author*)
Akiyo Fukutomi, MS, RT (*Abstract Co-Author*)
Kiyosumi Kagawa (*Abstract Co-Author*)
Takashi Okunaga (*Abstract Co-Author*)
Noriyuki Negi, RT (*Abstract Co-Author*)
Akiko Kusaka, RT (*Abstract Co-Author*)
Keitaro Sofue, MD (*Abstract Co-Author*)
Takamichi Murakami, MD, PhD (*Abstract Co-Author*)

PURPOSE

Photon-counting detector CT (PCD-CT) (NAEOTOM Alpha) now supports an Ultra-High-Resolution (UHR) mode with Flash Spiral scan(FS_UHR). In addition to the previously available scan modes- Normal Spiral (NS), Normal Spiral UHR (NS_UHR), and Flash Spiral (FS)- a total of four scan modes are currently available. This phantom study aimed to compare in-plane and z-axis spatial resolution and image noise characteristics across the four modes.

METHODS AND MATERIALS

All scans were acquired using unified parameters in four scan modes: tube voltage, 120kVp; rotation time, 0.25s/rot; pitch, 0.8 of NS and 3.2 of FS. In-plane (x-y) spatial resolution was evaluated using the Task Transfer Function (TTF) measured with an air-filled cylindrical object submerged in water within a TOS phantom (QC phantom). Images were reconstructed using 120kVp image with FBP, kernels: Bv36/40/44/48, slice thickness of 0.4mm, FOV of 320mm. Fifty images were averaged, and 64×64-pixel region of interest (ROI) was placed in the air module. Z-axis spatial resolution was evaluated using a Type 9 X-ray test chart (Moriyama X-ray Equipments), placed 15 cm from the gantry isocenter. Images were reconstructed with 120kVp image with FBP, kernel: Bv48, slice thickness of 0.2/0.4 mm, FOV of 50 mm. Full width at half maximum (FWHM) and CT value fluctuation (maximum - minimum) were calculated using a 1 LP/mm profile curve on the coronal image. Image noise was analyzed via the Noise Power Spectrum (NPS) measured in a uniform water region of a TOS phantom. Tube current was set at CTDI vol of 6.4mGy, simulating clinical AEC setting (IQ level: 65). Images were reconstructed at monochromatic image at 40-70keV(in 5-keV intervals) with FBP, kernels: Bv36/40/44/48, slice thickness: 0.4mm, FOV: 200mm. NPS was measured within 128×128-pixel ROI, and averaged from ten images.

RESULTS

UHR mode showed superior in-plane resolution across all kernels at 10% TTF. Among them, NS_UHR achieved the highest values, followed by then FS_UHR, particularly for Bv44 and 48. For z-axis resolution, FWHM in UHR mode exceeded 0.4mm, with CT value fluctuation being highest in NS_UHR, followed by FS_UHR NPS was the lowest in NS_UHR, followed by FS_UHR.

CONCLUSION

Among the four available scan modes, NS_UHR mode achieved the best performance in terms of in-plane and z-axis spatial resolution and image noise characteristics followed by FS_UHR mode.

CLINICAL RELEVANCE/APPLICATION

PCD-CT with UHR mode provides improved spatial resolution and reduced image noise. The use of 0.2 mm slice thickness enables high-quality imaging while allowing for potential dose reduction. FS_UHR achieves fast acquisition with higher image quality, potentially suitable for patients with poor breath-hold capacity, pediatric imaging, and organs near the cardiac.

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R5B-SPVA

Vascular Imaging Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-SPVA-3 DEEP LEARNING ENHANCED ULTRA-LOW DOSE DUAL VASCULAR CTA: PROSPECTIVE VALIDATION OF 55% RADIATION & 21% CONTRAST REDUCTION WITH DIAGNOSTIC NON INFERIORITY

Lin Yang (*Presenter*)
Chao Zheng (*Abstract Co-Author*)
Xin J. Sheng (*Abstract Co-Author*)
Meng Wang (*Abstract Co-Author*)
Min Xu, PhD (*Abstract Co-Author*)

PURPOSE

Current combined coronary-carotid-cerebral CT angiography (C&CC-CTA) protocols risk cumulative radiation/contrast toxicity in vulnerable populations, while isolated dose reductions compromise diagnostic quality. We developed a deep learning-enhanced "dual-low" protocol to simultaneously reduce both radiation and contrast burdens without sacrificing diagnostic accuracy.

METHODS AND MATERIALS

This IRB-approved prospective trial (July 2024-April 2025) randomly assigned 80 patients requiring C&CC-CTA into two groups, utilizing a 320-detector CT scanner (Aquilion ONE Genesis Edition). The dual-low group (n=40) received imaging at 80 kVp with 1.48 mgI/kg contrast, reconstructed using both DLR(L-DLR) and hybrid iterative reconstruction (L-HIR). The regular-dose group (n=40) underwent imaging at 100 kVp with 1.85 mgI/kg contrast, reconstructed solely using HIR(R-HIR). Objective metrics, including vessel-specific CT values, standard deviation (SD), signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR), were quantitatively analyzed. Subjective image quality assessments were performed independently by two fellowship-trained radiologists (with 15 and 8 years of experience), using a blinded, randomized review approach with and a 5-point Likert scale. Statistical analyses were conducted using SPSS 22. Normality of data distribution was assessed by the Shapiro-Wilk test, employing independent t-tests for normally distributed data and Mann-Whitney U tests for non-normally distributed data.

RESULTS

Compared to the regular-dose group, the dual-low protocol significantly reduced both contrast volume (45.2±2.4 mL vs. 57.4±3.2 mL, 21% reduction) and radiation dose (2.3±0.5 mSv vs. 5.1±1.5 mSv, 55.1% reduction). L-DLR markedly enhanced vascular visualization relative to R-HIR, reflected by significant improvements in CT values across coronary and cerebrovascular territories (all $p < 0.05$). Furthermore, L-DLR showed similar or lower SD values in most vascular areas compared to R-HIR, except for the internal carotid artery (13.9±6.4 vs. 17.4±5.4; $p = 0.007$). Additionally, SNR and CNR for L-DLR images were comparable or superior relative to R-HIR. L-DLR images yieled comparable subjective image scores to R-HIR ($p > 0.05$ for both reader 1 and reader 2)

CONCLUSION

In comparison to the regular-dose protocol, the “dual-low” C&CC-CTA using DLR reconstruction demonstrates relatively better image quality while effectively reducing both radiation dose and contrast agent usage.

CLINICAL RELEVANCE/APPLICATION

We propose a novel deep learning-enhanced "dual-low" coronary-carotid-cerebral CTA protocol, significantly reducing radiation by 55% and contrast by 21% while preserving diagnostic accuracy.

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S3A-SPBR

Breast Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPBR-1 PREDICTING FUTURE RISK OF DCIS AND INVASIVE BREAST CANCER USING AI: A MULTI-SITE STUDY IN U.S. AND EUROPEAN SCREENING PROGRAMS

Constance D. Lehman, MD, PhD (*Presenter*)
Mark Scully (*Abstract Co-Author*)
Emily Hipp (*Abstract Co-Author*)
David Miller (*Abstract Co-Author*)
Christiane K. Kuhl, MD, PhD (*Abstract Co-Author*)
Elizabeth A. Morris, MD (*Abstract Co-Author*)
Lora D. Barke, DO (*Abstract Co-Author*)
Louie Enriquez, MD, JD (*Abstract Co-Author*)
Toni W. Vomweg (*Abstract Co-Author*)
Philippe Raffy, PhD (*Abstract Co-Author*)

PURPOSE

Traditional breast cancer risk models, such as the Breast Cancer Risk Assessment Tool (Gail model) and Tyrer-Cuzick (IBIS) model, were developed to estimate the risk of invasive breast cancer. The Gail model does not provide risk estimates for ductal carcinoma in situ (DCIS), and the majority of studies evaluating both models exclude DCIS as an outcome. Given these limitations, we evaluated the performance of an image-based artificial intelligence (AI) risk model in predicting DCIS and invasive breast cancer in a large, multi-site study of screening programs in the U.S. and Europe.

METHODS AND MATERIALS

The AI model was trained on 421,499 mammograms from 27 facilities in Europe, South America, and the U.S., using a deep convolutional neural network and calibrated on an independent test set to output 5-year risk probabilities. We applied the model to a cohort of 163,262 bilateral 2D screening mammograms (154,316 from five U.S. sites; 8,946 from one European site) acquired from 2011-2016. Cancer outcomes and type (pure DCIS vs any invasive breast cancer) were obtained from local tumor registries. Five-year cancer incidence was defined as the number of cancers diagnosed within five years of the index exam divided by the total number of exams. Incidence was calculated separately for DCIS (excluding invasive cases) and for invasive cancers (excluding pure DCIS cases). Model performance was assessed with time-dependent areas under the receiver-operating characteristic curve [AUC(t)] and bootstrapped 95% confidence intervals.

RESULTS

A total of 3,234 cancer-positive exams were identified in the cohort of 163,262 exams (2.0%). Among these, 69.9% were invasive cancer (n = 2,260) and 30.1% were DCIS (n = 974). The overall AUC(t) was 0.71 (95% CI: 0.70-0.72), 0.72 for invasive cancer (95% CI: 0.71-0.73), and 0.68 for DCIS (95% CI: 0.66-0.70) ($p < 0.001$). In the European site, AUC(t) was 0.78 for both invasive cancer and DCIS. In contrast, U.S. sites showed higher performance by AUC(t) for invasive cancer than for DCIS (0.71 vs. 0.68).

CONCLUSION

The image-based AI model demonstrated strong performance in predicting both DCIS and invasive cancer, with significantly higher predictive accuracy for invasive disease. Notably, model performance for DCIS and invasive cancer was similar at the European site, whereas in the U.S., the model demonstrated stronger discrimination for invasive cancer than for DCIS.

CLINICAL RELEVANCE/APPLICATION

AI-based five-year breast cancer risk prediction using mammography alone can effectively identify risk for both invasive breast cancer and DCIS across diverse screening populations, and thus may support more comprehensive personalized screening strategies and risk-reduction interventions.

S3A-SPBR-2 MR T_1/T_2 DUAL-MODAL IMAGING OCCLUDER PERFUSED WITH DILUTED GADOPENTETATE DIMEGLUMINE SOLUTION

Xin Weng, MBBS (*Presenter*)
Pingping Wang (*Abstract Co-Author*)
Baoying Chen (*Abstract Co-Author*)

PURPOSE

Currently, needle artifacts limit MRI-guided interventions, affecting visual size estimation and targeting. Combining the excellence of magnetic resonance imaging (MRI), We attempted to fabricate a novel MR T 1 /T 2 dual-modal imaging occluder perfused with a diluted gadopentetate dimeglumine solution. In this research, the imaging occluder hardly produces susceptibility artifacts under different scanning sequences. Moreover, it is easier to manufacture and has a lower cost compared with the traditional VIsILoC TM occluder, offering new value for optimizing MR-guided vacuum-assisted breast biopsy (VABB).

METHODS AND MATERIALS

Using a 3.0 T MR scanner (MAGNETOM Prisma, A Tim + Dot System) and standard head coil, we scanned five diluted gadopentetate dimeglumine solutions (0.5 - 2.5 mmol/L) with T1 and T2 Mapping. After analyzing data, 1.5 mmol/L was chosen as the best concentration. We simulated punctures on porcine tissues with a tube containing the selected solution and scanned a 10G needle as control, using 6 sequences. The 6 sequences are T1 FLASH, T1 FLASH with water excitation fat suppression, T2-weighted turbo spin echo sequence, T2-weighted turbo spin echo sequence (fat sat), diffusion weighted sequence(b values:0, 1000 s/mm 2). Process the obtained images, analyze the length and width of the actual objects and the imaging artifacts, as well as the needle insertion depth, and then conduct a further comparison.

RESULTS

Among all the solutions, the one at a concentration of 1.5 mmol/L exhibited the best-quality imaging, with a T1 relaxation rate of 6.612 s?¹ and a T2 relaxation rate of 4.951 s?¹. For the tube, in coronal T1-fs scans, it was 111.16 mm long, 3.10 mm in diameter, and 67.22 mm deep. The artifact was 107.80 mm long, 3.39 mm wide, and 67.34 mm deep. The 10G needle was 11.30 mm long, 4.00 mm in diameter, and 38.76 mm deep, with an artifact 36.03 mm wide and 78.31 mm deep. Needle artifact reduction was 99.09% in width and 99.70% in length.

CONCLUSION

In this study, the 1.5 mmol/L solution showed the best imaging, with clear images and fewer artifacts. The novel T 1 /T 2 dual - modal magnetic resonance (MR) developing occluder based on a diluted gadopentetate dimeglumine solution was successfully developed. This innovation effectively overcomes a series of challenges in traditional MR rotary cutting biopsy techniques, such as the severe artifacts generated by titanium alloy needle cores, the high cost of fluorescent developing occluders, and their short shelf-lives.

CLINICAL RELEVANCE/APPLICATION

This innovation offers a new solution for MR biopsy and strengthens MR imaging in clinics. Future research will optimize the technology and conduct clinical validation.

S3A-SPBR-3 RESEARCH ON THE VALUE OF CONTRAST-ENHANCED MAMMOGRAPHY (CEM)-GALACTOGRAPHY IN THE DIAGNOSIS OF NIPPLE DISCHARGE

Juan Tao (*Presenter*)
Wenying Zhu (*Abstract Co-Author*)
Shuyi Peng (*Abstract Co-Author*)
Jie Liu (*Abstract Co-Author*)
Fan Pu (*Abstract Co-Author*)
Fan Yang, MD (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the diagnostic efficacy of contrast-enhanced mammography (CEM)- galactography for nipple discharge and compare it with ultrasound imaging.

METHODS AND MATERIALS

Patients with nipple discharge first underwent full-field digital mammography (FFDM), followed by injection of an appropriate amount of contrast agent into the discharging nipple and delayed acquisition of CEM- galactography images. Diagnosis was performed by integrating FFDM and CEM- galactography images. A total of 81 patients underwent CEM-galactography, among whom had both pathological and ultrasound data. Images from different imaging modalities were evaluated by three researchers with varying levels of experience in breast diagnostic assistance (10, 11, and 30 years). Using histopathological results as the gold standard, the specificity and sensitivity of CEM- galactography were analyzed, and the radiation dose of CEM examinations was recorded. Mann-Whitney U tests were used for analyzing differences in average glandular dose (AGD).

RESULTS

The mean age of the 81 patients was 47.3 years. Their evaluations were compared with the histopathological assessment of the surgical specimens resected from the 81 patients. Pathological findings included 13 cases of intraductal carcinoma, 21 cases of ductal carcinoma in situ, 39 cases of intraductal papilloma, and 8 cases of ductal dilation. CEM- galactography demonstrated a sensitivity of 98% and a specificity of 89% in diagnosing nipple discharge-related diseases, with a contrast agent dosage of approximately 1-2 ml. Ultrasound imaging showed a sensitivity of 90% and a specificity of 81%. The average radiation dose during CEM- galactography was 1.65 mSv, significantly lower than the safety limit of 3 mSv per single mammography examination set by the International Commission on Radiological Protection (ICRP).

CONCLUSION

CEM- galactography ensures that contrast agent dosage and radiation exposure remain within safe ranges during nipple discharge diagnosis. Compared with ultrasound imaging, it offers notable advantages. A single exposure can provide low-energy and subtraction images. It can not only replace galactography obtained under the traditional FFDM technology, but also provide diagnostic images of higher quality for visualizing the contrast medium-filled ducts through the subtraction images. Thus, it serves as a crucial, safe, and reliable reference for clinical diagnosis of nipple discharge.

CLINICAL RELEVANCE/APPLICATION

CEM- galactography offers clinicians a more reliable diagnostic option, enriches the diagnostic strategies for nipple discharge, promotes the optimization of diagnostic procedures, and ultimately improves patient outcomes and prognosis.

S3A-SPBR-4 TRANSFORMER-BASED MULTIMODAL AI RISK MODEL FOR LONG-TERM BREAST CANCER RISK ESTIMATION: PERFORMANCE AND EXTERNAL VALIDATION

Felicia Pasadyn, MA, BA (*Presenter*)
Yanqi Xu (*Abstract Co-Author*)
Jungkyu Park, MS (*Abstract Co-Author*)
Linda Moy, MD (*Abstract Co-Author*)
Laura Heacock, MD, MS (*Abstract Co-Author*)
Krzysztof J. Geras (*Abstract Co-Author*)
Yiqiu Shen, PhD, BSc (*Abstract Co-Author*)

PURPOSE

This study evaluates the performance and generalizability of the Multimodal Transformer (MMT), an AI model for long-term breast cancer risk prediction using FFDM, DBT, and ultrasound (US) across diverse populations and imaging protocols.

METHODS AND MATERIALS

The IRB-approved MMT was developed and validated on a longitudinal dataset comprising 1,442,572 screening and diagnostic FFDM, DBT, and US from 299,024 patients collected from 2010-2020. Internal testing was performed on a matched case-control cohort (n=936) consisting of 468 breast cancer cases (within 5 yrs) and 468 controls matched by age, race/ethnicity, and breast density. External validation included two cohorts: a Polish dataset with 454 patients (916 screening episodes, 40 cancers within 2 yrs; no DBT, 60.0% with prior FFDM, 3.17% with US) and a U.S. dataset with 9,681 patients (50% Black, 9,681 screening episodes, 1,011 cancers within 5 yrs; no DBT, 100% with prior MMG, 0.73% with US). MMT predicts 1- to 5-yr breast cancer risk using modality-specific neural networks, a temporal transformer, and a risk prediction layer. Model performance was assessed using 2- and 5-year AUCs and 2-5-yr concordance indices (C-index). Statistical significance was assessed via bootstrapping and permutation testing. We compared MMT's performance to Tyrer-Cuzick (T-C) and MIRAI on the internal test set and to MIRAI on the external datasets.

RESULTS

On the internal matched test set (mean age 60.5, 60.3% dense breasts, 71.6% white, 8.3% Black, 2.6% Hispanic, 4.5% Asian), MMT achieved higher C-index 0.758 (95% CI: 0.737-0.779) and demonstrated better performance in 2-yr AUC (0.869, 95% CI: 0.841-0.895) and 5-yr AUC (0.875, 95% CI: 0.850-0.897) compared to MIRAI, an FFDM-based AI risk predictor (C-index: 0.657, 95% CI: 0.634-0.679, p<0.001), and T-C (C-index: 0.605, 95% CI: 0.580-0.633, p<0.001). On external dataset 1, MMT had a higher C-index (0.857, 95% CI: 0.740-0.963) compared to MIRAI (0.777, 95% CI: 0.592-0.947, p<0.001). On external dataset 2, MMT achieved a C-index of 0.699 (95% CI: 0.668-0.730), outperforming MIRAI (0.680, 95% CI: 0.650-0.710, p<0.001). For 2-year risk, MMT had AUC of 0.803 (95% CI: 0.751-

0.851), compared to MIRAI (0.783, 95% CI: 0.733-0.831). For 5-yr risk, MMT had AUC of 0.700 (95% CI: 0.667-0.732) compared to 0.684 (95% CI: 0.652-0.714) for MIRAI.

CONCLUSION

MMT consistently outperformed both MIRAI and T-C models in long-term breast cancer risk prediction on internal and external datasets.

CLINICAL RELEVANCE/APPLICATION

More accurate breast cancer risk models like MMT allow for earlier, targeted preventive interventions. This potentially reduces overscreening in low-risk patients and allows resource re-allocation to high-risk patients.

S3A-SPBR-5 DOUBLE-READING MAMMOGRAPHY FOR BREAST CANCER SURVIVORS: A GATEWAY TO SCREENING-BASED FOLLOW-UP

Giulia Vatteroni, MD (*Presenter*)
Rubina Manuela Trimboli (*Abstract Co-Author*)
Federica Fici (*Abstract Co-Author*)
Paola Nardi (*Abstract Co-Author*)
Nicolo Turri (*Abstract Co-Author*)
Elisa Salpietro (*Abstract Co-Author*)
Giulia Pinna (*Abstract Co-Author*)
Isabella Bolengo, MD (*Abstract Co-Author*)
Daniela Bernardi, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the rate and timing of breast cancer (BC) recurrences and to assess the diagnostic performance of double-reading mammography, structured according to a population-based screening model, in the long-term surveillance of women with a personal history of breast cancer (BC).

METHODS AND MATERIALS

This retrospective study included women submitted to BC surgery in 2013 and followed up for 10 years at a tertiary cancer centre in Italy. Recurrence rates and time to relapse were evaluated across molecular subtypes using chi-square and Kruskal-Wallis tests. Available mammograms were independently reviewed by 3 blinded radiologists using a positive/negative binary scale. Pathology served as reference standard. Sensitivity, positive predictive value (PPV) and inter-reader agreement (Cohen's and Fleiss' ?) were calculated. Simulated double reading was analyzed using McNemar's test.

RESULTS

Overall, of the 505 women were included in the study, 46/505 (9.1%) women developed BC recurrences: 19/271 (7%) in Luminal A, 6/84 (7%) in Luminal B, 3/28 (10.7%) in Triple Negative (TN), 7/57 (12,3 %) in HER2+ and 11/65(16.9%) in Ductal Carcinoma In Situ (DCIS) cancers (p = 0.0024). Subtype analysis showed highest recurrence rates in DCIS (16.9%) and HER2+ tumors (12.3%). Median time to relapse ranged from 4.7 years (IQR: 3.1-7.0) for TN and 5.2 years for HER2+(IQR: 3.4-8.0) to 8.1 years (IQR 6.0-9.5) for Luminal A (p=0.190). For the radiological revision, 31 women had available mammograms and were included in the radiological revision. Individual reader sensitivity ranged from 67.7% (95% CI: 50.1%-81.4%) to 74.2% (95% CI: 56.7%- 86.2%) rising to 77.4% (95% CI: 60.2%-88.6%) - 83.9% (95% CI: 67.4%-92.9%) with double reading. PPVs ranged from 95.4% (95% CI: 78.2%-99.1%)-100% (95% CI: 85.6%-99.9%) (single) to 96.0% (95% CI: 80.4%-99.2%) -96.2% (95% CI: 81.7%-99.3%)(double). Differences in sensitivity and PPV were not statistically significant (p=1.0). Five recurrences (16.1%) were mammographically occult and detected by clinical examination. Inter-reader agreement was moderate to good (Cohen's ? = 0.38-0.69; Fleiss' ? = 0.57).

CONCLUSION

Double-reading mammography, modeled on population screening, demonstrates robust diagnostic performance even in the follow-up of women with a prior breast cancer diagnosis. These findings support its integration into structured surveillance protocols and suggest it may reduce reliance on additional imaging modalities

CLINICAL RELEVANCE/APPLICATION

Screening-based double reading mammography is a reliable tool for post-treatment BC surveillance. Incorporating this approach into follow-up strategies can enhance detection rates and ensure effective use of clinical and imaging resources.

S3A-SPBR-6 WHAT AI SEES - AND WHAT IT DOESN'T: EVALUATING THE DETECTION OF BREAST CANCER SUBTYPES ON SCREENING DIGITAL BREAST TOMOSYNTHESIS

Manisha Bahl, MD, MPH (*Presenter*)
Saul Langarica (*Abstract Co-Author*)
Synho Do, PhD, MS (*Abstract Co-Author*)

PURPOSE

Artificial intelligence (AI)-based computer-assisted detection and diagnosis (CADe/x) algorithms are increasingly being used in clinical practice, but there is relatively limited data about AI-based CADe/x for digital breast tomosynthesis (DBT) and the subtypes of breast cancer that are more likely to be detected versus missed by AI. The purpose of this study was to compare the characteristics of breast cancers detected versus not detected by a commercial AI-based CADe/x algorithm for DBT.

METHODS AND MATERIALS

The study institution's breast imaging reporting system was searched for consecutive true-positive (n=334), true-negative (n=333), and false-positive (n=333) screening digital breast tomosynthesis (DBT) examinations from January 2016 until the target sample size was reached (total n=1000). The 1000 DBT examinations were retrospectively analyzed by an AI-based CADe/x algorithm for DBT (INSIGHT DBT v1.1.0.0; Lunit, Inc.). True-positive examinations that were considered positive by AI (score of 10 or higher out of 100) were reviewed by a breast imaging radiologist to determine whether the AI marks corresponded to the site of the subsequently diagnosed breast cancer. Imaging and clinicopathological features were compared between true-positive cases detected versus not detected by AI with standard statistical tests.

RESULTS

The AI algorithm detected and correctly localized 84.4% (282/334) of true-positive (screening-detected) cases. It was more likely to detect cancers presenting as masses (42.9% [121/282] vs 25.0% [13/52], p =0.002) and less likely to detect cancers presenting as calcifications (31.9% [90/282] vs 59.6% [31/52], p =0.002). The AI algorithm was more likely to detect invasive ductal carcinoma (61.0% [172/282] vs 34.6% [18/52], p <0.001) and less likely to detect ductal carcinoma in situ (DCIS) (23.0% [65/282] vs 51.9% [27/52], p <0.001). There were no significant differences in tumor grade, size, hormone receptor status, or lymph node status between invasive cancers detected versus not detected by AI. Using the same threshold (with scores of 10 or higher considered positive), AI correctly categorized 85.9% (286/333) of true-negative and 73.3% (244/333) of false-positive cases as negative.

CONCLUSION

A commercial AI-based CADe/x algorithm for DBT detected and correctly localized 84.4% of true-positive cancers. It was more likely to detect cancers presenting as masses on DBT and less likely to detect cancers presenting as calcifications.

CLINICAL RELEVANCE/APPLICATION

Our study provides insights into the strengths and limitations of a commercial AI-based CADe/x algorithm for DBT. These findings underscore the need for continued refinement and validation of AI algorithms to maximize their clinical utility.

S3A-SPBR-7 LONG RANGE HISTORY OF PRIOR MAMMOGRAMS FOR BREAST CANCER RISK PREDICTION

Zhengbo Zhou (*Presenter*)
Dooman Arefan, PhD, MSc (*Abstract Co-Author*)
Jules H. Sumkin, DO (*Abstract Co-Author*)
Margarita L. Zuley, MD (*Abstract Co-Author*)
Shandong Wu, PhD (*Abstract Co-Author*)

PURPOSE

Predicting the risk of developing breast cancer using mammogram images has shown promising effects when using deep learning-based models. Existing models however are mostly limited to the use of a single mammogram exam, while in reality, many women have multiple longitudinal prior screening exams that may span for a long range of many years, with varying temporal intervals among exams. The goal of this study is to develop a risk model to account for long-range priors with irregular inter-exam intervals.

METHODS AND MATERIALS

Two retrospective datasets were used: Cohort A (n = 590, 293 biopsy-proven breast cancer and 297 normal controls, max 8 priors, inter-exam interval: 12 to 24 months) from a mammogram screening cohort of a single institution; the CSAW-CC (Karolinska Case-Control) dataset (n = 6459, 406 biopsy-proven breast cancer and 6,053 normal controls, max 4 priors, inter-exam interval: 12 to 36 months). We proposed a Spatio-Temporal Mamba(STM) risk model that (1) handles in theory an unlimited number of priors, (2) encodes inter-exam intervals directly in the Mamba structure, and (3) uses temporal contrastive learning to align representations across irregular temporal intervals of exams. CC and MLO views were combined. Patient-wise five-fold cross validation was conducted to report (format: average ±std) C-index and time-specific AUCs of from 1- to 5-year risk prediction. Model performance was assessed using up to 4 and 8 priors, with comparisons to the Mirai model (using a single exam).

RESULTS

STM model on Cohort A (4 priors): C-index 0.737±0.02; 1-/2-/3-/4-/5-yr AUC 0.734/0.729/0.709/0.687/0.665 ± 0.02-0.03. STM on Cohort A (8 priors): C-index 0.739±0.02; AUC 0.748/0.745/0.733/0.709/0.682 ± 0.02-0.04. STM on CSAW-CC (4 priors): C-index 0.737±0.02 and AUC 0.734/0.729/0.709/0.687/0.665 ± 0.02-0.03. Mirai on Cohort A: C-index 0.685±0.02 and AUC 0.685/0.660/0.670/0.655/0.653 ± 0.02-0.03. Mirai on CSAW-CC: C-index 0.687±0.02 and AUC 0.705/0.680/0.664/0.664/0.630 ± 0.02-0.03.

CONCLUSION

The STM model shows substantially improved performance when comparing to state-of-the-art risk model using a single exam. Using more priors appears to be more predictive.

CLINICAL RELEVANCE/APPLICATION

STM model can handle and benefit from multiple prior exams with irregular inter-exam intervals of a long-range screening history to more accurately predict breast cancer risk in real-world scenarios.

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Cardiac Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPCA-1 LEFT VENTRICULAR HEMODYNAMIC FORCE PARAMETERS IN OBESITY: A NEW APPROACH TO ASSESS EARLY MYOCARDIAL DYSFUNCTION

Wenjun Liu (*Presenter*)
Lele Cheng, DPhil, MD (*Abstract Co-Author*)
Jian Yang (*Abstract Co-Author*)
Zhijie Jian (*Abstract Co-Author*)

PURPOSE

Obesity is a well-established risk factor for cardiovascular diseases (CVDs), contributing to metabolic abnormalities, myocardial remodeling or heart failure. Hemodynamic force (HDF) analysis, utilizing cardiac magnetic resonance imaging (CMR), quantifies changes in the intraventricular pressure gradient within the left ventricle (LV) throughout the cardiac cycle, offering a promising tool for the early detection of myocardial abnormalities in patients with obesity. This study aims to evaluate the early effects of obesity on LV myocardial mechanics through HDF analysis and explore its role in detecting myocardial dysfunction.

METHODS AND MATERIALS

We retrospectively analyzed HDF parameters at various cardiac stages in individuals with obesity and comparing them to healthy controls. Relationships between HDF parameters and body mass index (BMI), myocardial morphology, function and strain indices were assessed. Hierarchical cluster analysis was performed to identify different HDF curve patterns in obesity group.

RESULTS

A total of 238 individuals [39.79±11.8 years, 134 male (56.30%)] including 125 obesity were enrolled. Significant alterations in HDF parameters were observed in obesity individuals, particularly in HDF longitudinal (A-B) and main transversal direction (L-S) values during the systolic/diastolic transition and diastolic deceleration phases. HDF parameters were positively correlation with myocardial dysfunction and strain abnormalities, with the correlation being more pronounced at the A-B level than L-S level. Five distinct HDF curve patterns were identified in the obesity group, reflecting potential types of myocardial dysfunction or maladaptation.

CONCLUSION

HDF analysis is an effective method for detecting early myocardial dysfunction in obesity, providing valuable insight for risk stratification and personalized management of obesity-related cardiovascular disease.

CLINICAL RELEVANCE/APPLICATION

This study highlights the potential of hemodynamic force (HDF) analysis, by measuring changes in the intraventricular pressure gradient within the left ventricle (LV), offers a sensitive method for detecting early alterations in myocardial mechanics in obese individuals. This approach not only provides a more accurate tool for evaluating myocardial function in obesity but also has the potential to serve as a novel diagnostic adjunct for assessing obesity-related heart disease in clinical practice, aiding in risk stratification, prevention, and personalized treatment.

S3A-SPCA-3 ASSESSMENT OF NON-ALCOHOLIC FATTY LIVER DISEASE IN SUSPECTED CORONARY HEART DISEASE PATIENTS: PROGNOSTIC VALUE AND INCREMENTAL PREDICTIVE UTILITY OVER CARDIOVASCULAR RISK FACTORS AND CCTA

Jiang Changqin (*Presenter*)

PURPOSE

This study evaluated the prognostic value of non-alcoholic fatty liver disease (NAFLD) in predicting major adverse cardiovascular events (MACE) among patients with suspected coronary artery disease (CAD), using coronary computed tomography angiography (CCTA) and CT-derived fractional flow reserve (CT-FFR). Time-dependent predictive performance and risk stratification were also examined.

METHODS AND MATERIALS

In this retrospective study, patients with suspected CAD who underwent both CCTA and non-contrast CT scans (liver and spleen) at XX University XX Hospital between January 2017 and December 2018 were included. NAFLD was diagnosed using CT imaging and clinical history. MACE was defined as a composite of cardiovascular/cerebrovascular death, all-cause mortality, myocardial infarction, unstable angina hospitalization, unplanned revascularization, and stroke. Patients were stratified into NAFLD and non-NAFLD groups. Cox regression analyses assessed the association between NAFLD and MACE, with adjustments for cardiovascular risk factors, CCTA metrics, and CT-FFR. Subgroup and time-dependent C-index analyses evaluated prognostic value across populations and over time.

RESULTS

Among 2,981 patients (737 with NAFLD), 408 experienced MACE over a median follow-up of 68 months. The NAFLD group had significantly higher CAD-RADS scores, high-risk plaque prevalence, segment involvement and stenosis scores, coronary calcification, and CT-FFR positivity (all $p < 0.05$). NAFLD remained an independent predictor of MACE in multivariate analysis (adjusted HR: 1.39; 95% CI: 1.15-1.73; $p < 0.001$). The association was particularly strong in males, smokers, hypertensive and non-diabetic patients, and those with non-obstructive CAD or normal CT-FFR. Models incorporating NAFLD showed superior predictive accuracy across all time points (C-index at 60 months: 0.753 vs. 0.727 and 0.695; $p < 0.001$).

CONCLUSION

NAFLD is an independent and robust predictor of MACE in patients with suspected CAD. Its inclusion in prognostic models enhances risk prediction beyond traditional clinical and imaging markers, especially in specific high-risk subgroups.

CLINICAL RELEVANCE/APPLICATION

NAFLD is an independent cardiovascular risk factor in patients with suspected CAD and is significantly associated with increased risk of MACE, independent of traditional risk factors and imaging findings.Incorporating NAFLD into existing CAD risk models improves predictive accuracy beyond conventional CCTA and CT-FFR parameters, supporting its use in integrated cardiovascular risk assessment.

S3A-SPCA-4 LATE GADOLINIUM ENHANCEMENT IN CARDIAC MRI AS A NOVEL BIOMARKER FOR PERSONALIZED RISK ASSESSMENT IN MULTI-VESSEL CORONARY ARTERY DISEASE

Zhaoxin Tian (*Presenter*)
Ting Liu (*Abstract Co-Author*)
Minjie Minjie, PhD (*Abstract Co-Author*)

PURPOSE

Multi-vessel coronary artery disease (MVD) is a major cause of morbidity and mortality, making accurate risk assessment essential for clinical decision-making. The SYNTAX score II (SSII) is widely used to guide treatment strategies such as percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG), but it has limitations in assessing myocardial injury. Cardiac magnetic resonance (CMR) imaging provides a more detailed and quantitative evaluation of myocardial damage, offering a potential improvement in risk stratification.

METHODS AND MATERIALS

In this multicenter cohort study, we retrospectively included 715 MVD patients who underwent contrast-enhanced CMR. The cohort was divided into a development group and an external validation group, with MI% being quantitatively measured using late gadolinium enhancement (LGE) techniques. We then developed a prognostic model to evaluate its predictive performance for cardiac death and major adverse cardiovascular and cerebrovascular events (MACCE). Cox proportional hazards models were used for stratified survival analysis across three clinical interventions: medical therapy, PCI, and CABG.

RESULTS

MI% was independently associated with both cardiac death and MACCE. Integrating MI% with SSII significantly improved the performance of the clinical prediction model, as indicated by enhancements in the area under the receiver operating characteristic curve (AUC), C-index, and net reclassification index (NRI). Survival analysis showed that revascularization strategies, compared to medical therapy alone, significantly improved patient survival outcomes. CMR-derived MI% not only optimized risk stratification in MVD patients but also provided valuable guidance for personalized treatment decisions.

CONCLUSION

Incorporating MI% into risk assessment models substantially enhances prognostic accuracy in MVD patients, offering additional value beyond traditional clinical scores like SSII. These findings support integrating MI% into routine clinical practice to guide treatment decisions, which is crucial for personalized management and improving outcomes in MVD patients.

CLINICAL RELEVANCE/APPLICATION

Incorporating MI% into revascularization decision-making better identify patients who would benefit from PCI over CABG, particularly when infarct burden is extensive (>20%). CMR-derived infarct quantification offers a noninvasive approach to refine heart team strategies and personalize therapy selection in complex coronary artery disease.

S3A-SPCA-6 STUDY ON THE APPLICATION OF FREE BREATHING, LOW TUBE VOLTAGE COMBINED WITH DEEP LEARNING AND FREEZING TECHNOLOGY IN CORONARY CTA IMAGING FOR OBESE PATIENTS

Yang Cheng (*Presenter*)

PURPOSE

To evaluate the efficacy of a 100-kVp free-breathing protocol combined with deep learning image reconstruction (DLIR) and motion-freeze technology in coronary CT angiography (CCTA) for obese patients (BMI=28 kg/m²), assessing its ability to maintain or improve image quality while reducing radiation dose.

METHODS AND MATERIALS

In this prospective study, 100 obese patients undergoing CCTA were randomly assigned to: Group A (n=50): Standard protocol (120-kVp, breath-hold, 120-HU trigger threshold, 4s delay) Group B (n=50): Experimental protocol (100-kVp, free-breathing, 250-HU threshold, 2s delay) Both groups utilized Smart-mA modulation and iopamidol contrast (350 mgI/mL; dose=BMI×1.5; 12s injection). Images were reconstructed using ASiR-V50%, DLIR-M, and DLIR-H algorithms. Objective measurements (CT values, noise) were obtained at aortic root (Ao) and proximal coronary segments (RCA, LMA, LAD, LCx), with calculation of contrast-to-noise ratio (CNR) and signal-to-noise ratio (SNR). Subjective image quality was assessed using a 5-point Likert scale.

RESULTS

The groups were well-matched in baseline characteristics (P>0.05). Key findings: No significant differences in CT values across vascular segments (P>0.05) DLIR-H demonstrated: 23-28% lower noise (SD) vs. ASiR-V/DLIR-M (P<0.005) 15-20% higher SNR/CNR (P<0.005) Group B showed: 12-15% higher vascular enhancement (P<0.005) 28% higher subjective scores (P<0.05) Radiation dose reduction: Group B: 3.1±1.0 mSv (vs 4.3±1.4 mSv in Group A, P<0.001) 27.9% effective dose reduction

CONCLUSION

The 100-kVp free-breathing protocol with DLIR and motion-freeze technology significantly improves distal vessel enhancement (15-20%) and branch delineation while reducing radiation exposure by 28% in obese patients. DLIR-H reconstruction provides optimal noise reduction and image quality, offering a safer and more effective CCTA solution for this challenging population.

CLINICAL RELEVANCE/APPLICATION

Free breathing, low tube voltage 100KV combined with deep learning reconstruction algorithm and freezing technique for obese patients with coronary artery CTA test, make the distal vascular enhancement, vascular branches clearer, and with the deep learning reconstruction algorithm noise reduction level increase, can further reduce the image noise, image quality to meet the demand of clinical diagnosis.

S3A-SPCA-7 MYOCARDIAL OXYGENATION IS COMPROMISED ONLY IN SEVERE FIBROTIC REGIONS IN PATIENTS WITH ISCHEMIC HEART FAILURE

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Keyan Wang (*Abstract Co-Author*)
Ran Li, MD, PhD (*Abstract Co-Author*)
Cihat Eldeniz, PhD (*Abstract Co-Author*)
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Jie Zheng, PhD (*Abstract Co-Author*)

PURPOSE

Many studies used positron emission tomography to assess the changes in myocardial oxygen metabolism in patients with myocardial ischemia. We are leveraging our new cardiovascular MR (CMR) technique in quantification of myocardial oxygen extraction fraction (mOEF) to evaluate oxygen metabolic changes in patients with ischemic heart failure.

METHODS AND MATERIALS

Twenty three patients (Age: 62 ± 12 years, 16 Male, left ventriclular ejection fraction or LVEF: 35 ± 14%) with ischemic heart failure were prospectively recruited after signing consent forms. Additional 10 subjects (Age: 40 ± 13 years, 9 Male, LVEF: 63 ± 10%) without any cardiovascular disease/history were recruited as a control group. The CMR were performed on a 3T MR scanner (Siemens, Skyra). Myocardial extracellular volume (ECV) and late gadolinium enhancement (LGE) were quantified. Rate pressure product (RPP) was obtained by multiplying systolic blood-pressure with heart rate. Myocardial mOEF maps were reconstructed by a supervised deep learning network model. Segmental measurements on maps based on 16-segment AHA model was performed for statistical analysis.

RESULTS

In patients, myocardial global mOEF correlates moderately with RPP ($r = 0.42$, $p = 0.04$), where ECV and native T1 are not related to RPP. This indicates mOEF may be the only index related to myocardial oxygen consumption. Compared to the controls, patients with heart failure had lower mOEF (0.52 ± 0.1 vs. 0.59 ± 0.05, $p < 0.001$) and higher ECV (34 ± 9% vs, 25 ± 2%, $p < 0.001$). Between mOEF and ECV in these patients, no correlation was observed when ECV < 40%, but a mild negative correlation exists when ECV = 40% ($r = -0.34$, $p = 0.002$). This is similar to the observation with the LGE presence (mOEF: 0.54 ± 0.08, LGE< 50% vs. 0.43 ± 0.12, LGE = 50% $p < 0.001$). Myocardial segmental mOEF is significantly lower subtended by obstructive coronary artery stenosis (= 50%) than those by non-obstructive stenosis (< 50%), regardless of 1-, 2-, or 3-vessel obstruction. Using a model combining mOEF, native T1, and myocardial strain values, the non-contrast imaging can predict LGE > 50% with AUC = 0.85 and sensitivity/specificity = 83% / 79%.

CONCLUSION

The novel non-contrast mOEF technique reveals that relatively severe myocardial fibrosis with ECV larger than 40% induces reduced oxygen metabolism in ischemic heart failure. This altered cardiac oxygenation appears to be related to severity of stenosis, but not to number of stenotic coronary arteries.

CLINICAL RELEVANCE/APPLICATION

The non-contrast mOEF technique can be complementary for evaluation of oxygen metabolic changes in patients with cardiac ischemia. Assessment of mOEF may allow series of assessment in treatment response of patients with heart failure in clinical practice.

S3A-SPCA-8 SYNERGISTIC IMPACT OF MULTIPLE DOSE REDUCTION STRATEGIES COMBINED WITH SUBTRACTION CORONARY CT ANGIOGRAPHY IN HIGH-CALCIFICATION PATIENTS

Mengqiang Xiao, MMEd (*Presenter*)
Jun Chen (*Abstract Co-Author*)
Rulin Xu (*Abstract Co-Author*)

PURPOSE

To evaluate the efficacy of combining multiple dose reduction strategies with subtraction coronary CT angiography (S-CCTA) in reducing radiation exposure while enhancing diagnostic accuracy for patients with high coronary artery calcium scores (CACS = 400).

METHODS AND MATERIALS

Fifty patients with severe coronary calcification (CACS = 400) underwent S-CCTA using a protocol integrating narrowed acquisition windows (70-80% R-R interval), reduced tube voltage (80 kV), isocentric scanning, and minimized tube current. Subjective and objective image quality (IQ) metrics, radiation dose, and diagnostic accuracy were compared between conventional CCTA (C-CCTA) and S-CCTA. Coronary segments were evaluated according to the 15-segment model, and stenosis severity was classified using the Coronary Artery Disease Reporting and Data System (CAD-RADS). Invasive coronary angiography (ICA) was used as the reference standard to compare the diagnostic performance of C-CCTA and S-CCTA.

RESULTS

The mean effective radiation dose was 1.08 ± 0.29 mSv. S-CCTA demonstrated comparable subjective IQ (3.71 ± 0.50 vs. 3.67 ± 0.53, $P = 0.10$) and objective metrics (noise, SNR, CNR; $P > 0.05$) to C-CCTA. Among 768 segments, S-CCTA significantly outperformed C-CCTA in sensitivity (87.50% vs. 78.52%) and specificity (92.58% vs. 82.42%, $P < 0.001$). Diagnostic accuracy improved markedly in severely calcified segments (74.56% vs. 49.12%, $P < 0.001$), moderately calcified segments (82.41% vs. 57.41%, $P < 0.001$), and mildly calcified segments (85.56% vs. 65.56%, $P = 0.002$). S-CCTA reduced overestimation of stenosis severity (CAD-RADS) compared to C-CCTA ($P = 0.001$).

CONCLUSION

The integration of multiple dose reduction techniques with subtraction coronary CT angiography substantially lowers radiation exposure while enhancing the diagnostic accuracy for assessing coronary stenosis in patients with high calcification scores.

CLINICAL RELEVANCE/APPLICATION

This advanced imaging protocol offers a promising noninvasive approach for patients with extensive coronary calcifications. By significantly reducing radiation dose without compromising image quality, the method enhances the reliability of coronary stenosis evaluation, thereby improving clinical decision-making and patient management in high-risk cardiovascular populations.

S3A-SPCA-9 CARDIOVASCULAR MAGNETIC RESONANCE T1ρ MAPPING FOR DIAGNOSIS OF ACUTE MYOCARDITIS

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Christoph Katemann (*Abstract Co-Author*)
Oliver M. Weber (*Abstract Co-Author*)
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Daniel Kuetting, MD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)

PURPOSE

Cardiovascular magnetic resonance (CMR) is an essential pillar in the non-invasive diagnosis of acute myocarditis and can obviate the need for endomyocardial biopsy in clinically stable patients. Although the implementation of T1 and T2 mapping to the Lake Louise criteria (LLC) was of incremental value, limitations and diagnostic uncertainties remain as field strength, sequence, heart rate, age or sex can confound relaxation times. T1? is a novel quantitative parameter that - unlike T1 and T2 mapping - can directly detect changes of the extracellular matrix. The aim of this study was to assess the diagnostic value of T1? mapping in acute myocarditis.

METHODS AND MATERIALS

In this prospective study, patients with acute myocarditis and controls underwent CMR at a 1.5 Tesla. The scan-protocol included 2018 LLC sequences (T2-weighted imaging, T1 and T2 mapping, late gadolinium enhancement) and T1? mapping. Receiver operating characteristic analysis compared the diagnostic performance of single and combined parameters of multiparametric CMR including T1?. The reference standard was defined as clinical evidence of acute myocarditis. Statistics included Mann-Whitney U-test, unpaired Student‘s t, DeLong test and intraclass correlation coefficient (ICC)).

RESULTS

25 patients with acute myocarditis (10 female; mean age: 45.1 ± 23.4 years) and 26 controls (15 female; mean age: 44.5 ± 19.0 years) were included. T1? relaxation time was significantly prolonged in acute myocarditis (98.0 ± 10.3 ms vs. 85.3 ± 5.0 ms, p < 0.01) and in segments with focal myocardial inflammation compared with remote myocardium (104.4 ± 11.3 ms vs. 93.2 ± 11.9 ms, p = 0.02). The area under the curve for T1? (0.89; 95% CI: 0.77-0.96) was comparable to that of T1 (0.93; 95% CI: 0.82-0.98, p=0.35) and T2 (0.86; 95% CI: 0.73-0.94, p=0.52). The diagnostic performance of the 2018 LLC was significantly enhanced by inclusion of T1? mapping (AUC 0.93; 95% CI 0.82-0.98 vs. 0.84 (95% CI: 0.71-0.93), p = 0.02;). The ICC for intra-reader reproducibility (ICC 0.99, 95 % CI 0.98 - 1.00) and inter-reader reproducibility (ICC 0.98, 95 % CI 0.97 - 0.99) were excellent.

CONCLUSION

T1? relaxation times are significantly prolonged in acute myocarditis can differentiate between patients with acute myocarditis and controls. T1? might further improve the diagnostic performance of multiparametric CMR in acute myocarditis.

CLINICAL RELEVANCE/APPLICATION

T1? could be a promising candidate to enhance the diagnostic performance of multiparametric CMR in acute myocarditis. A timely and accurate diagnosis is of special relevance because it can avoid clinical complications that might have an impact on patient outcome.

S3A-SPCA-14 SUPER-RESOLUTION DEEP LEARNING RECONSTRUCTION FOR CORONARY CT ANGIOGRAPHY:IMPROVED CORONARY STENOSIS ASSESSMENT AND CAD-RADS RECLASSIFICATION

Limiao Zou (*Presenter*)
Min Xu, PhD (*Abstract Co-Author*)

PURPOSE

Coronary CT angiography (CCTA) is well-established for non-invasive assessment of significant coronary stenosis, with overall high accuracy against invasive coronary angiography (ICA), and provides guidance for subsequent patient management. However, accurate stenosis assessment remains challenging, mainly due to its limited spatial resolution. By utilizing data from ultra-high-resolution CT as training target, a novel super-resolution deep learning reconstruction (SR-DLR) technique has been developed for CCTA and emerged as a promising tool. Therefore, the aim of this study was to compare SR-DLR against conventional hybrid iterative reconstruction (HIR) in coronary stenosis assessment, using ICA as a reference, and explore the possible impact on patient-level Coronary Artery Disease-Reporting And Data System (CAD-RADS) classification.

METHODS AND MATERIALS

From September 2023 to November 2024, patients who underwent clinically indicated CCTA and ICA within 2-month interval were prospectively enrolled. CCTA images were reconstructed with both HIR (Adaptive Iterative Dose Reduction [AIDR]3D, FC43 kernel) and SR-DLR (Precise IQ Engine [PIQE], Cardiac kernel) and percentage diameter stenosis (PDS) of calcified, noncalcified, and mixed plaques were quantified and compared. Using ICA as a reference, diagnostic performances of HIR and SR-DLR in detecting significant stenosis were compared with the area under the receiver operating characteristic curve (AUC). Patient-level CAD-RADS categories were determined based on the highest-grade stenosis and changes across HIR and SR-DLR were also recorded.

RESULTS

204 patients (mean age, 64.3 years ± 9.1 [SD]; 137 male patients) were included and 605 plaques (175 calcified, 140 noncalcified, and 290 mixed) were identified. Compared with HIR, the median PDS for calcified plaques decreased with SR-DLR (63% [IQR, 53%-85%] vs. 58% [IQR, 44%-71%], P < .001), increased for noncalcified plaques (41% [IQR, 27%-68%] vs. 50% [IQR, 28%-80%], P < .001), whereas no significant difference was found in mixed plaques (P = .12). Moreover, SR-DLR outperformed HIR in detecting significant stenosis, as determined by ICA, on both the per-lesion level (AUC: 0.97 vs. 0.88, P < .001) and per-patient level (AUC: 0.93 vs. 0.84, P < .001). While 163 patients remained constant between the two reconstruction methods, SR-DLR led to 41 patients being assigned a different CAD-RADS category relative to HIR, 25 downgraded and 16 upgraded.

CONCLUSION

SR-DLR outperformed HIR for coronary stenosis assessment and led to 20% patient-level CAD-RADS reclassification.

CLINICAL RELEVANCE/APPLICATION

SR-DLR holds great promise in enhancing the role of CCTA in the diagnosis and patient management of coronary artery disease.

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S3A-SPCH

Chest Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPCH-1 EVALUATION OF THE ACCURACY OF QUANTITATIVE PARAMETERS OF LUNG FUNCTION UNDER DIFFERENT CONVOLUTION KERNELS IN CHEST CT

Xu Wang (*Presenter*)
Caiyun Mou (*Abstract Co-Author*)
Hao Chen (*Abstract Co-Author*)

PURPOSE

To explore the effects of different convolution kernels on quantitative parameters of CT lung function.

METHODS AND MATERIALS

A total of 60 patients who completed chest CT and pulmonary function test (PFT) in one week were retrospectively collected from our hospital. Chest CT images with different convolution kernels (lung algorithm Lung20, standard algorithm F20, bone algorithm F60) were transferred to Neusoft NeuMiva Cloud platform, and the slow obstructive pulmonary screening software was utilized to obtain quantitative lung parameters, including the percentage of low-density in the lungs (LAA% -950, -910), and the ratio of the wall area of the airway analysis results (WA% Br0~4).The parameters of PFT examination included the volume of first-second expiratory volume with exertion, the volume of first-second expiratory volume with exertion, and the ratio of wall area with exertion. The PFT parameters included the ratio of first second force expiratory volume (FEV1) to forceful lung volume (FVC) (FEV1/FVC), and FEV1 as a percentage of predicted value (FEV1%). The Friedman test was used to compare the differences in the quantitative lung function parameters between the three reconstruction matrices. Spearman's rank correlation was used to analyze the correlation between CT quantitative parameters and PFT indexes.

RESULTS

The differences in lung quantitative parameters under different convolutional kernels were statistically significant (all P>0.05), except for WA% Br3 (P=0.190), of which LAA%-950 and -910 were the highest at Lung20 and the lowest at F20, and WA% Br0~4 were the highest at F20 and the lowest at F60. LAA%-950 and -910 were negatively correlated with both FEV1 and FEV1/FVC under different convolutional nuclei (both P < 0.001), with LAA%-950 correlating most highly with PFT parameters under F20 (P = -0.628, -0.508).

CONCLUSION

Different convolution kernels affect the accuracy of quantitative CT parameters of lung function, and it is recommended to use the standard algorithm F20 to assess lung function, which has the best correlation with the PFT index.

CLINICAL RELEVANCE/APPLICATION

Different convolution kernels affect the accuracy of quantitative CT parameters of lung function, and it is recommended to use the standard algorithm F20 to assess lung function, which has the best correlation with the PFT index.

S3A-SPCH-2 K-EDGE LUNG PERFUSION IMAGING ENABLED BY SPECTRAL PHOTON-COUNTING CT WITH A PHASE 2 THERANOSTIC AGENT

Salim Si-Mohamed, MD, PhD (*Presenter*)
Agnieszka Gutwinska (*Abstract Co-Author*)
Tristan Doussineau (*Abstract Co-Author*)
Jean-baptiste Langlois (*Abstract Co-Author*)
Vincent Cottin, MD, PhD (*Abstract Co-Author*)
Antoine Robert (*Abstract Co-Author*)

PURPOSE

Computed tomography (CT) technology can evaluate a surrogate marker of lung perfusion, so called pulmonary blood volume (PBV), using iodinated agents. But these agents are neither specific nor suitable for theranostic purposes. Only the concomitant development of color K-edge imaging, a method enabled by spectral photon-counting CT (SPCCT), and dedicated agents may overcome these limitations. In the present study, a gadolinium-based nanoparticle under clinical phase 2, has been tuned towards lung applications. Therefore, we assessed its feasibility for PBV imaging.

METHODS AND MATERIALS

Lung angiographies were performed on a clinical SPCCT prototype (Philips®) 4 s after injection in 2 rabbits (i.e., peak signal in the pulmonary trunk), and 6 s after injection in 1 rabbit (i.e., peak signal in the aorta). 7 mL of GBCA (300 mg/mL, 0.27M $Gd^{3?}$; NH TherAGuIX®) and 7 mL of Xenetix® (iobitridol, 350 mg/mL; Bracco®) were injected at separate times. Conventional (HU), spectral iodine (mg.I/mL), and gadolinium K-edge (mg.Gd/mL) images were reconstructed using voxel size of 0.35 mm^3. Lung segmentation using ISP 15 (Philips®) enabled measurement of global and regional PBV, defined as the ratio between lungs' signal over pulmonary trunk's signal. Spearman correlation analysis was performed.

RESULTS

Ratios of pulmonary trunk to left auricle's signals were inferior to 1 for the first 2 rabbits, i.e., a pulmonary phase, and superior to 1 for the last rabbit, i.e., an aortic phase. Last rabbit presented highest global PBV (18% vs 9%±0 on gadolinium image, 22% vs 9%±2 on iodine image), showing dependence in the acquisition time, as expected by the bolus biodistribution of agents from right to left cardiac cavities. Regional PBV increased from anterior to posterior regions, by 462% and 648% respectively on iodine and gadolinium images, for all rabbits. This highlights the expected gravitational dependence of blood perfusion in the lungs and underscores the substitutive relationship between PBV and perfusion. Excellent correlation of regional PBV was found between both agents (r=0.97, P<0.001), highlighting an excellent agreement.

CONCLUSION

Color K-edge lung perfusion imaging enabled by SPCCT with gadolinium-based nanoparticle is feasible in healthy animals.

CLINICAL RELEVANCE/APPLICATION

Lung perfusion imaging is feasible using dedicated color K-edge agents and spectral PCCT, translatable to disease animal models and potential clinical translation, opening to new theranostic approaches in lung vascular imaging.

S3A-SPCH-3 CT LUNG DENSITOMETRY : INTERGROUP COMPARISON OF QUANTITATIVE PARAMETERS TO ASSESS IMPACT OF AIR POLLUTION

Nitin P. Ghonge, MD, MBBS (*Presenter*)
Nidhi Goyal, MD, FRCR (*Abstract Co-Author*)

PURPOSE

The study examined the hypothesis that prolonged exposure to poor air quality may cause structural lung changes in asymptomatic Delhi-NCR population which may be detected using CT lung densitometry-based [CTLD].

METHODS AND MATERIALS

A prospective cross-sectional study was conducted at the Department of Radiology, Indraprastha Apollo Hospital, New Delhi in two groups [Delhi-NCR patients and elsewhere]. Patients with history of smoking or lung diseases along with pediatric and elderly patients were excluded. CTLD was performed using Osirix-MD to calculate Total lung volume [TLV]; Mean lung attenuation [MLA]; Low Attenuation Area [LAA]; High Attenuation Area [HAA]; Lung attenuation histograms [skewness and kurtosis]. CTLD parameters were compared in two groups. Level of statistical significance was $p<0.05$.

RESULTS

A total of 120 patients were studied with 60 patients in each group. MLA was -862 +/- 26.7 HU in Delhi-NCR and -857 +/- 26.4 HU in the elsewhere group (p-value 0.365). LAA were seen in 63.3 % patients in Delhi-NCR as compared to 38.3% patients in elsewhere group (p-value of 0.006); which is statistically significant. Delhi-NCR group showed mean LAA volume below -950 HU [RA950] of 266.1 cm 3 , as compared to 241.3 cm 3 in the elsewhere group (p value 0.621). HAA, mean HAA volume and CTLD histogram-based skewness and kurtosis does not revealed statistically significant difference.

CONCLUSION

Early 'silent' structural lung changes may be seen with exposure to bad air quality in Delhi-NCR. CTLD-based quantitative parameters are likely to play important role in early detection and surveillance of these lung changes.

CLINICAL RELEVANCE/APPLICATION

Early structural lung changes due to persistent bad air quality are a cause of significant concern and are detectable on CT lung densitometry. These 'silent' changes in the lung may gradually progress to significant structural damage with potential decline in the lung functions and may cause respiratory symptoms. These changes may cause wide range of adverse health effectsCT lung densitometry-based quantitative parameters, particularly low attenuation areas [LAA] are likely to play important role in early detection and surveillance of these lung changes.

S3A-SPCH-4 SARCOPENIA DIAGNOSED BY CHEST CT PREDICTS LONG-TERM MORTALITY IN CRITICALLY ILL PATIENTS WITH EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Xinyu Dai (*Presenter*)
Ning Lang, MD (*Abstract Co-Author*)

PURPOSE

Sarcopenia is a prevalent extrapulmonary comorbidity in patients with chronic obstructive pulmonary disease (COPD), associated with adverse outcomes. Chest CT is routinely conducted to assess the pulmonary condition of COPD patients. We aimed to investigate the impact of sarcopenia diagnosed by chest CT on the mortality in critically ill patients with exacerbation of COPD (ECOPD).

METHODS AND MATERIALS

This retrospective study enrolled a total of 148 patients hospitalized in intensive care unit (ICU) due to ECOPD from January 2018 to November 2023. Sarcopenia was defined by the skeletal muscle index (SMI) measured at 12 th thoracic vertebra (T12) level on chest CT. Patients were categorized into the sarcopenia and non-sarcopenia groups. Hospital and ICU length of stay, short-term (30-day and 90-day) and long-term (1-year and overall) COPD-related mortality and all-cause mortality were compared between the two groups. Cox regression analyses were further conducted to recognize the risk factors for mortality and a sarcopenia-based nomogram was developed to predict long-term survival.

RESULTS

Eighty-four patients (56.76%) with sarcopenia were found through chest CT measurement. No significant differences were observed in the hospital and ICU length of stay, or short-term mortality between sarcopenia and non-sarcopenia groups ($p > 0.05$). The 1-year COPD-related and all-cause mortality, as well as overall COPD-related and all-cause mortality were significantly higher in sarcopenia group than the non-sarcopenia group (19.05% vs. 4.69%, $p = 0.010$; 28.57 % vs. 6.25%, $p = 0.001$; 33.33% vs. 15.63%, $p = 0.015$; 47.62% vs. 29.69%, $p = 0.027$, respectively). Multivariate Cox regression revealed chest CT-defined sarcopenia as a risk factor for both 1-year (hazard ratio =3.981, 95% CI [1.137,13.938], $p = 0.031$) and overall all-cause mortality (hazard ratio =2.308, 95% CI [1.310, 4.065], $p =0.004$). The sarcopenia-based nomogram demonstrated favourable prognostic performance.

CONCLUSION

Sarcopenia evaluated at T12 level on chest CT may serve as a prognostic factor for predicting long-term mortality among critically ill ECOPD patients. And a sarcopenia-based nomogram may provide prognostic value in clinical practice.

CLINICAL RELEVANCE/APPLICATION

This study expands the value of chest CT, revealing that chest CT can provide more information beyond the pulmonary evaluation for ECOPD patients, which contributes to the comprehensive management for patients.

S3A-SPCH-5 DIRECT EVALUATION OF PERIPHERAL AIRWAYS USING AN ULTRA-HIGH-RESOLUTION 24 X-RAY SOURCES STATIONARY CT SYSTEM

Mu Lin, PhD (*Presenter*)

PURPOSE

Accurate visualization of small airways (<2 mm) is essential for diagnosing diseases such as COPD and bronchiolitis but is limited by the resolution of conventional helical CT (512×512 matrix, =0.5 mm slice thickness). This study evaluated whether a high-resolution stationary CT prototype with 3072×3072 matrix improves peripheral airway visualization and quantification compared to standard helical CT, using both phantom and in-vivo imaging.

METHODS AND MATERIALS

The stationary CT prototype utilizes a dual-ring architecture with 24 fixed X-ray sources and a full detector ring, offering bore size of 83 cm and field of view of 50 cm. Unlike conventional systems, it eliminates the need for slip-ring and mechanical gantry rotation by electronically activating the 24 X-ray sources in sequence. The system achieves ultra-high spatial resolution of 165 μm. A custom airway phantom composed of eleven tubes (internal diameters: 0.9-2.7 mm; wall thicknesses: 0.3-0.4 mm) was scanned using the stationary CT. Measurement accuracy was determined by comparing the measured lumen area to known dimensions. For in-vivo evaluation, 30 subjects underwent chest imaging with both standard helical CT (512×512, 0.6 mm-thickness, 120 kVp, 100 mAs, 50-cm FOV) and the prototype stationary CT (3072×3072, 0.33 mm-thickness, 120 kVp, 100 mAs, 50-cm FOV). A thoracic radiologist reviewed axial images to identify the most distal visible bronchial generation in the right upper lobe, using the right main bronchus as the first-order branch. Maximum generation counts of all subjects were recorded and compared between two CT systems using the Wilcoxon signed-rank test, with significance defined as $p < 0.01$.

RESULTS

In phantom scans, lumen area measurement errors were within -10% for all tubes =1.2 mm in diameter. For smaller tubes, errors increased to -15.2% for 1.1 mm, -22.6% for 1.0 mm, and -38.0% for 0.9 mm tubes. For in-vivo evaluation, stationary CT enabled improved visualization of small airways. The median visible bronchial generation was significantly higher on stationary CT than helical CT (9 vs. 7; $p < 0.001$), with maximum visibility reaching 12 vs. 9 generations, respectively. These results indicate enhanced peripheral airway tracking with stationary CT.

CONCLUSION

The stationary CT prototype demonstrated significantly enhanced visualization and quantification of peripheral small airways compared to conventional helical CT, supporting its potential utility for advanced airway assessment in both clinical and research settings.

CLINICAL RELEVANCE/APPLICATION

By enabling detection and measurement of subtle airway abnormalities, the stationary CT prototype may facilitate early diagnosis of COPD, bronchiolitis, asthma and other small airway diseases.

S3A-SPCH-6 SPAIDNET: A DEEP LEARNING-BASED IMAGING CLASSIFICATION FRAMEWORK FOR INTERSTITIAL LUNG DISEASE

Hongyi Wang (*Presenter*)
Min Liu (*Abstract Co-Author*)
Huaping Dai (*Abstract Co-Author*)

PURPOSE

Interstitial lung diseases (ILDs) are a group of significantly heterogeneous conditions, where diagnosis relies on high-resolution chest computed tomography (HRCT) imaging. This study aims to develop and validate a deep learning (DL) model for the automated classification diagnosis of ILD based on HRCT enabling improved diagnostic consistency.

METHODS AND MATERIALS

Our multicenter study prospectively included 2,901 ILD patients (1496 women, median age: 64) undergoing who underwent 5,213 high-resolution chest computed tomography (HRCT) scan from July 2016 to June 2023, The study was registered at ClinicalTrials.gov (NCT04370158). Patients were divided into 4 cohorts for model development and internal validation, and two independent cohorts for external validation. SPAIDNet, a DL framework using the pre-trained ResNet18 model, was developed, leveraging multi-instance learning techniques to detect spatial pattern enhancing ILD diagnosis. SPAIDNet-assisted radiologist was compared with radiologists and evaluated in both internal and external validation cohorts. Performance metrics included macro-average under the receiver operating characteristic curve (AUC) for multiclass classification. We employed a multivariate Cox proportional hazards regression model to assess the prognostic association between diagnostic probability and all-cause mortality risk.

RESULTS

SPAIDNet model achieved macro-average AUCs of 1.000 [1.000-1.000], 0.905 [0.856-0.944], and 0.870 [0.798-0.932] for multiclass classification in the internal validation cohort, external validation cohort I, and external validation cohort II, respectively. The model outperformed a junior radiologist with 3 years of experience (macro-average AUC: 0.737 [0.691-0.784]) and a senior radiologist with 10 years of experience (macro-average AUC: 0.763 [0.713-0.812]). With AI assisting, the junior radiologist achieved an improved macro-average AUC of 0.817 [0.779-0.855] ($p<0.001$) and the senior radiologist also obtained improvement (macro-average AUC: 0.787 [0.739-0.835], $p<0.001$). A higher probability of usual interstitial pneumonia was strongly associated with increased mortality risk across all models, with adjusted hazard ratios remaining significant at 2.19 (95% CI: 1.91-2.51, $p<0.001$).

CONCLUSION

The multi-instance SPAIDNet model demonstrated high accuracy and robustness in the imaging-based diagnosis of common ILD subtypes, with strong generalizability and potential clinical utility.

CLINICAL RELEVANCE/APPLICATION

This model has the potential to significantly enhance the diagnostic capabilities of clinicians, providing a valuable tool for more accurate diagnosis and prognosis of ILD in clinical practice.

S3A-SPCH-9 TIME SERIES MODEL BASED ON CLINICAL DATA, LABORATORY INDICATORS, AND CHEST X-RAY PNEUMONIA QUANTIFICATION SCORES TO PREDICT PSEUDOMONAS AERUGINOSA PULMONARY INFECTION AND COLONIZATION

Zhi Zhang (*Presenter*)
Yaya Guo (*Abstract Co-Author*)
Zilong He (*Abstract Co-Author*)
Jiefang Wu (*Abstract Co-Author*)
Zhaodong Zeng (*Abstract Co-Author*)
Zeng Fengxia (*Abstract Co-Author*)
Lixuan Jia (*Abstract Co-Author*)
ZHIJUN FAN (*Abstract Co-Author*)
Yue Tan (*Abstract Co-Author*)
Genggeng Qin, MD, PhD (*Abstract Co-Author*)
Weiguo Chen (*Abstract Co-Author*)

PURPOSE

To establish a time-series model based on clinical data, multi-timepoint laboratory indicators, and multi-timepoint chest X-ray pneumonia quantification scores to predict the infection and colonization status of Pseudomonas aeruginosa in the lungs.

METHODS AND MATERIALS

This study retrospectively analyzed 143 patients who met the inclusion criteria.Clinical information, laboratory markers at three time points, and chest X-ray pneumonia quantification scores at these three time points were collected from the patients.The time points are as follows: T1: within 1 day after admission; T2: 3 or 7 days prior to specimen submission; T3: the day of specimen submission.Four time series models were constructed: Model_1 (including clinical baseline information, T3 laboratory data, and chest X-ray pneumonia quantification scores), Model_2 (adding ?T3-T1 change values), Model_3 (adding ?T3-T2 change values), and Model_4 (adding both ?T3-T2 and ?T3-T1 change values).Each model was based on seven machine learning algorithms, and the optimal classifier was selected by evaluating the area under the

ROC curve (AUC).The final four time series models were evaluated using AUC, sensitivity, specificity, accuracy, and other metrics. The Shapley additive explanation method was used to analyze key factors and interpret the model's decision-making process.

RESULTS

The optimal classifiers corresponding to the four time series models were XGBoost, logistic regression, random forest, and logistic regression, respectively.The multivariate time series model (Model_4) performed the best, with an AUC of 0.936 (95% CI: 0.818-0.988), accuracy of 0.907, sensitivity of 0.895, and specificity of 0.917, significantly outperforming the basic model that only includes a single time point (Model_1, AUC = 0.717).The features with higher model contribution include the short-term change in pneumonia score (?T3-T2), pneumonia score at T3, short-term change in CRP (?T3-T2), long-term change in pneumonia score (?T3-T1), and long-term change in platelet count (?T3-T1).

CONCLUSION

The time series model constructed based on clinical data, laboratory indicators from three time points, and chest X-ray pneumonia quantification scores can accurately distinguish Pseudomonas aeruginosa lung infections from colonization. It provides guidance for clinical antibiotic use, improves patient prognosis, and further promotes precision treatment for pneumonia.

CLINICAL RELEVANCE/APPLICATION

This study develops the first machine learning model for distinguishing Pseudomonas aeruginosa pulmonary infection from colonization, offering reliable decision support for clinicians and providing new insights into the diagnosis and treatment of bacterial pneumonia.

S3A-SPCH-10 CORRELATION BETWEEN LYMPHATIC ABNORMALITIES AND GROUND-GLASS OPACITIES IN CHYLOPTYSIS-RELATED PLASTIC BRONCHITIS: FINDINGS FROM CT LYMPHANGIOGRAPHY

Chunyan Zhang (*Presenter*)
Ling Li (*Abstract Co-Author*)
Meng Huo (*Abstract Co-Author*)
Yunlong Yue, MD (*Abstract Co-Author*)

PURPOSE

To investigate the correlation between lymphatic abnormalities and ground-glass opacities (GGOs) using CT lymphangiography (CTL) in chyloptysis-related plastic bronchitis (PB).

METHODS AND MATERIALS

This retrospective study included 19 PB patients with branching bronchial casts. CTL was performed by injecting Lipiodol into foot lymphatic vessels after methylene blue dye localization. Dynamic imaging assessed lymphatic regurgitation (bronchial submucosal [BSLR], peripulmonary hilar [PHLR], subpleural) and pulmonary signs (GGOs, septal thickening, etc.). Two radiologists evaluated CTL findings, with inter-reader agreement analyzed via kappa statistics.

RESULTS

BSLR was present in 15 patients (78.9%), with strong agreement to bronchial wall thickening (kappa > 0.999, P < 0.001). GGOs occurred in 16 patients, 14 (93.3%) of whom had BSLR (84.2% concordance; kappa = 0.477, P = 0.035). PHLR was observed in 16 patients (84.2%), 15 (93.8%) of whom had BSLR and GGOs (89.5% concordance; kappa = 0.604, P = 0.01). Three patients without PHLR lacked GGOs in two cases.

CONCLUSION

CTL effectively detects lymphatic abnormalities in PB, demonstrating substantial concordance between BSLR, PHLR, and GGOs, supporting its role in comprehensive PB evaluation.

CLINICAL RELEVANCE/APPLICATION

CTL provides critical insights into lymphatic dysfunction underlying PB-associated GGOs, aiding diagnosis and guiding targeted therapies. A figure illustrating lymphatic-pulmonary correlations is recommended for review.

S3A-SPCH-11 DLCT-BASED MACHINE LEARNING MODEL FOR PREDICTING EGFR MUTATION STATUS IN NON-SMALL CELL LUNG CANCER

Haojie Zhang (*Presenter*)
Yuhan Zhou, MD (*Abstract Co-Author*)
Fan Feng (*Abstract Co-Author*)
Rui Chen (*Abstract Co-Author*)

PURPOSE

To develop a machine learning model using dual-layer detector spectral CT (DLCT) parameters, conventional imaging features, and clinical data for non-invasive prediction of EGFR mutation status in non-small cell lung cancer (NSCLC).

METHODS AND MATERIALS

This IRB-approved retrospective study included 342 patients with pathologically confirmed NSCLC (193 EGFR-mutant, 149 wildtype) who underwent preoperative DLCT between January 2021 and December 2023. Patients from our institution (n=204) formed the training cohort, while patients from two external centers (n=138) constituted the validation cohort. We extracted quantitative DLCT parameters (iodine concentration, water concentration, effective atomic number, and virtual monoenergetic values at 40-200 keV), conventional imaging features (size, margins, density, location), and clinical parameters (age, sex, smoking history). Feature selection was performed using LASSO regression, and a random forest model was developed. Performance was evaluated using AUC, accuracy, sensitivity, and specificity.

RESULTS

The final model incorporated 12 features: 8 spectral CT parameters (primarily iodine concentration, Z-effective values, low-keV measurements), 2 conventional imaging features (tumor margin, density), and 2 clinical parameters (age, smoking status). In the external validation cohort, the model achieved an AUC of 0.87 (95% CI: 0.81-0.92), accuracy of 82.6%, sensitivity of 84.3%, and specificity of 80.1%. This significantly outperformed models based solely on clinical parameters (AUC=0.66, p<0.001) or conventional CT features (AUC=0.72, p<0.001). Iodine concentration measurements and low-keV (40-70 keV) values contributed most significantly to prediction performance.

CONCLUSION

The DLCT parameter-based machine learning model demonstrates strong generalizability with high accuracy for non-invasive EGFR mutation prediction in NSCLC patients across different institutions. This approach leverages spectral CT's material decomposition capabilities without requiring complex radiomic feature extraction, potentially reducing reliance on invasive biopsies.

CLINICAL RELEVANCE/APPLICATION

This externally validated approach offers a promising non-invasive strategy for precision oncology by facilitating accurate prediction of EGFR mutation status. The model's reliance on standardized spectral CT parameters rather than complex radiomics enhances its clinical applicability and potential for wider implementation across institutions.

S3A-SPCH-12 LOBAR IMPAIRMENTS IN MULTI-VOLUME CT-DERIVED RESPIRATORY AIRWAY MECHANICS IN COPD

Syed Ahmed Nadeem, PhD (*Presenter*)
Xinyu ZHANG (*Abstract Co-Author*)
Xiaoliu Zhang (*Abstract Co-Author*)
Kung-Sik Chan (*Abstract Co-Author*)
Elizabeth A. Regan, MD,PhD (*Abstract Co-Author*)
R. Graham Barr (*Abstract Co-Author*)
Eric A. Hoffman, PhD (*Abstract Co-Author*)
Sean B. Fain, PhD (*Abstract Co-Author*)
Alejandro Comellas, MD (*Abstract Co-Author*)
Punam K. Saha, PhD (*Abstract Co-Author*)

PURPOSE

Impaired airflow is the hallmark of chronic obstructive pulmonary disease (COPD). Differential radiographic signals of lung health impairments in COPD have been observed at different lobes. We retrospectively study associations of multi-volume CT-based respiratory airway mechanical biomarkers with demographics, smoking, and COPD severity.

METHODS AND MATERIALS

Our automated algorithms were applied to inspiratory and expiratory CT images to compute breathing-related radial expansion (? air-R) and along-the-length stretching (? air-S) of airways (Figure 1(a)). ? air-R is computed as the change (%) in cross-sectional area (CSA) at a matching airway between two lung volumes. ? air-S is computed as the change (%) in airway geodesic path-length from the carina to a specific matching airway between two lung volumes. Mean values of ?-metrics at segmental airways were computed at upper and lower lobes. The method was applied on multi-volume CT scans of participants of the Genetic Epidemiology of COPD (COPDGene) study Iowa cohort at baseline and of those with 5-year follow-up visits to compute baseline and 5-year longitudinal changes in airway ?-metrics respectively; exclusion criteria: never-smokers, body mass index (BMI) < 20 kg/m 2 or > 35 kg/m 2 , and missing data. Pearson correlation of baseline values of airway ?-metrics with age, sex, BMI, smoking data, and COPD severity was computed.

RESULTS

The correlation (r-values) heat map of lobar airway ?-metrics with age, sex, BMI, smoking data, and COPD severity is presented in Figure 1(b) (n = 853; age (mean±SD): 64.2±8.3 years; 384 females; BMI: 27.9±3.6 kg/m 2). All airway ?-metrics showed significant negative association with COPD severity; the association was stronger for ? air-S compared ? air-R and for lower lobes compared to upper lobes. Aging had significant negative association with ? air-S at both lobes. Females had significantly lower ? air-S at both lobes as compared to males. BMI showed significant positive association for ? air-R at upper lobes and for ? air-S at lower lobes. Smoking status showed significant negative association for ? air-R at lower lobes, while pack-years were found to have significantly negative association for ? air-S at upper lobes.

CONCLUSION

Breathing-related airway mechanical biomarker of along-the-length stretching strongly associates with COPD severity, age, and sex at both upper and lower lobes; differential regional associations of BMI and smoking data with airway mechanical biomarkers were observed.

CLINICAL RELEVANCE/APPLICATION

Understanding regional interactions of breathing-related mechanical properties of airways with different demographic risk factors and smoking in COPD-a disease of compromised airflow and lung function.

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S3A-SPER

Emergency Radiology Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPER-1 GENERALIZABILITY OF PE DETECTION AI TOOL IN PEDIATRIC CT PULMONARY ANGIOGRAM AND CHEST CT WITH CONTRAST

Seyedehelaheh Hosseini, MD (*Presenter*)
Javier Contreras Yametti, MD (*Abstract Co-Author*)
Keith J. Dreyer, DO, PhD (*Abstract Co-Author*)
Bernardo C. Bizzo, MD, PhD (*Abstract Co-Author*)
Subba R. Digumarthy, MD (*Abstract Co-Author*)
Pallavi Sagar, MBBS (*Abstract Co-Author*)

PURPOSE

Differences between pediatric and adult chest stress the importance of testing generalizability of AI tools in children. We investigated the generalizability of an AI tool for triaging and detecting pulmonary emboli (PE) in pediatric CT pulmonary angiogram (CTPA) and contrast-enhanced routine chest CT (CECT).

METHODS AND MATERIALS

Our IRB-approved study included 395 CTPA and CECT in children (age range 3- 20 years; mean age 15.9 years, female: male 222:173) from 13 US sites in emergency (n=215), inpatient (n=102), and outpatient settings (n=78). We recorded the presence/absence and location of PE. De-identified thin-section CT images of each patient (1-1.25mm slice thickness) were deidentified, exported, and processed with a commercial AI tool (United Imaging Intelligence) for triaging, detecting, and localizing PE (at main, lobar, segmental, and subsegmental levels). A thoracic subspecialty radiologist performed the failure analysis of all discrepancies between AI outputs and radiology reports. We also recorded the AI output of the pulmonary arterial obstruction index (PAOI- based on Qandil scoring system for PE burden). Data were tabulated in EXCEL and analyzed with SPSS to estimate sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), F1-score, Area Under the Curve (AUC with 95% confidence interval [95%CI]). We performed DeLong test to assess differences in AI tool performance across different pediatric age groups.

RESULTS

Out of the 395 pediatric exams, 60 (15.2%) were positive for PE, and 335 (84.8%) were negative. The AI's performance for detecting PE in pediatric CT scans showed the following metrics: 90% NPV, 99% PPV, F1-score of 0.65, AUC (95% CI): 0.93 (0.9-0.96), 96% sensitivity, and 90% specificity. There was no significant difference in the AI performance in children =15 years compared with those >15 years (p-value>0.05). The localization of detected PE was correct in all CTPA and CECT exams (main PE: 15/60; lobar PE: 19/60; segmental PE 11/60; subsegmental PE 3/60). The PAOI scores for patients with central PE (main and lobar PE: 32.2) were significantly higher than for peripheral PE (segmental and subsegmental PE:13.66) ($p<0.01$).

CONCLUSION

We demonstrate the generalizability of the AI tool for detecting and localizing PE in children who underwent CTPA and contrast-enhanced routine chest CT.

CLINICAL RELEVANCE/APPLICATION

The assessed AI tool had higher performance in pediatric CTPA and CECT despite the variable dimensions, hyperdynamic circulation, and propensity for motion artifacts in pediatric CT exams.

S3A-SPER-3 DEVELOPMENT AND VALIDATION OF A DEEP-LEARNING MODEL FOR SEGMENTING ACTIVE BLEEDING LESIONS ON ABDOMINOPELVIC CT

Jihwan Kim, BSc, MSc (*Presenter*)
Taehyun Kim (*Abstract Co-Author*)
Sujeong Kwon, BA (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)
Gil-Sun Hong, MD, PhD (*Abstract Co-Author*)

PURPOSE

Active abdominopelvic bleeding requires rapid, accurate diagnosis, yet manual interpretation of abdominopelvic CT (APCT) is labor-intensive and error-prone. We developed and externally validated a two-stage, 3D patch-based deep-learning model to detect and segment active bleeding lesions on APCT.

METHODS AND MATERIALS

A total of 1,727 APCT scans obtained between January 2001 and February 2019 were retrospectively collected; active bleeding was present in 57.7% of cases. The scans were randomly divided into training, tuning, and internal-validation sets in an 8:1:1 ratio. External validation involved two cohorts: cohort A, 204 APCT scans from another institution’s emergency department (29.4% bleeding), and cohort B, 514 scans from the public RSNA 2023 challenge dataset (47.1% bleeding). All examinations were reviewed, and bleeding foci were manually annotated by board-certified emergency radiologists with more than 20 years of experience. A two-stage U-Net model with a ResNet encoder was trained on small patches to capture fine-grained features and large patches to reduce false positives. Performance metrics were the Dice similarity coefficient (DSC), lesion-wise sensitivity (LWS), and mean false-positives per scan (FPV), with all metrics reported with confidence intervals (CIs).

RESULTS

LWSs of our two-stage model in the internal set, cohort A, and cohort B, were 95.5% (93.9-97.4), 88.2% (79.4-94.2), and 84.2% (80.1-87.7), with corresponding FPVs of 2.2 (1.9-2.6), 1.3 (1.1-1.5), and 2.0 (1.8-2.2), respectively. Our model achieved DSCs of 66.5% (62.5-70.6), 50.7% (42.8-58.6), and 42.1% (39.8-47.1) for the same datasets.

CONCLUSION

Our proposed model detects and segments active abdominopelvic bleeding with LWSs of at least 84% while maintaining acceptable false positives per scan across both internal and external datasets, suggesting it could accelerate diagnosis and reduce human error in emergency care.

CLINICAL RELEVANCE/APPLICATION

This AI model can facilitate timely diagnosis and rapid clinical decision-making in patients with active abdominopelvic bleeding. By automatically detecting and segmenting bleeding foci, it can help prioritize critical cases, reduce interpretation delays, and assist in early intervention planning, such as embolization or surgery.

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S3A-SPGI

Gastrointestinal Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPGI-1 FROM LIVER TO BRAIN: A 2.5D DEEP LEARNING MODEL FOR PREDICTING HEPATIC ENCEPHALOPATHY USING OPPORTUNISTIC NON-CONTRAST CT IN ACUTE-ON-CHRONIC LIVER FAILURE PATIENTS

Kangyi Pan (*Presenter*)
Xueyun Zhang (*Abstract Co-Author*)
Yuxian Huang (*Abstract Co-Author*)
Shiman Wu, MD (*Abstract Co-Author*)

PURPOSE

To develop a 2.5D ?deep learning framework leveraging ?non-contrast CT scans for early prediction of ?hepatic encephalopathy (HE) in ?acute-on-chronic liver failure (ACLF) patients.

METHODS AND MATERIALS

This prospective study enrolled 228 ACLF patients from two centers, which were divided into training (n=102), internal validation (n=44), and external testing group (n=82). Non-contrast CT scans from six scanner models were preprocessed (1×1×1 mm³ voxels, HU 30-110), with liver ROIs segmented by two radiologists (arbitrated by an expert). The image center on the maximal cross-sectional slice of the ROI and its adjacent slices (central ±1/2/4) were cropped to generate a 2.5D data. Deep learning models, including DenseNet121, DenseNet201, ResNet50, and InceptionV3, were used for features extraction from 2.5D data and were evaluated for their prediction efficacy on slice level. Multi-instance learning (MIL) methods, including probability likelihood histograms and bag-of-words, were used for feature fusion. Machine learning algorithms including Logistic Regression, RandomForest, and LightGBM with 5-fold cross-validation were applied for fusion signature building and classifier model construction for ACLF-HE prediction. Performance was evaluated by the area under the receiver operating characteristic curve (AUC). Gradient-weighted Class Activation Mapping (Grad-CAM) technique was employed for visualizing the recognition region of deep learning model.

RESULTS

The DenseNet121 model exhibited the highest AUC of 0.698 in the validation cohort compared to other models based on slice-level prediction. The LightGBM model based on MILFusion signature demonstrated the best predictive performance with AUCs of 0.969 (training), 0.886 (validation) and 0.829 (external testing), and outperformed other fusion methods. Grad-CAM confirmed anatomically plausible attention to peri-portal fibrotic regions.

CONCLUSION

The MIL-based 2.5D deep learning model can effectively individualize the evaluation of the risk of HE in patients with ACLF using non-contrast CT.

CLINICAL RELEVANCE/APPLICATION

The MIL-based 2.5D deep learning model enables a scalable solution for early HE risk stratification using conventional CT scans, especially in resource-limited environments.

S3A-SPGI-2 STUDY ON THE TREATMENT OF LIVER CIRRHOSIS WITH BONE MARROW MESENCHYMAL STEM CELLS LABELED WITH NAGDF4@ZIF-8

Yuxin Huang (*Presenter*)
Yao Zhenwei (*Abstract Co-Author*)
Shiman Wu, MD (*Abstract Co-Author*)
Xueyun Zhang (*Abstract Co-Author*)
Yuxian Huang (*Abstract Co-Author*)

PURPOSE

This study developed a multifunctional NaGdF4@ZIF-8 nanozyme with tracking and antioxidative stress capabilities. MRI was used to track NaGdF4@ZIF-8-labeled stem cells, while its ROS scavenging ability optimized cell survival and colonization in the cirrhotic microenvironment.

METHODS AND MATERIALS

NaGdF4@ZIF-8 was characterized by using TEM, XRD, and FTIR. Its effects on cell viability, ROS scavenging, and its ability to label stem cells were evaluated through both in vitro and in vivo experiments. In the CoCl 2 -induced cell oxidative stress experiment, its ROS scavenging ability were observed. The colonization, differentiation and regeneration ability of NaGdF 4 @ZIF-8-labeled stem cells in the liver were further verified by magnetic resonance imaging, pathological staining, blood biochemical indicators and fluorescent staining. C57BL/6J mice with carbon tetrachloride-induced cirrhosis were injected with NaGdF4@ZIF-8-labeled stem cells via the superior mesenteric vein. Colonization was assessed by MRI and verified again by fluorescent staining. ROS distribution and liver pathology were analyzed using DHE staining, H&E staining, Masson, and Sirius red staining. Biocompatibility was evaluated through histology, hepatic/renal function, and blood parameters.

RESULTS

NaGdF 4 @ZIF-8 exhibited uniform morphology and high T1 relaxivity without affecting stem cell viability. It effectively scavenged ROS in vitro and in vivo. Laser confocal microscopy imaging showed that NaGdF 4 @ZIF-8 was endocytosed by stem cells and effectively scavenged intracellular ROS. T1WI and T1 mapping sequences revealed that, compared to the control group, the cirrhotic mice injected with NaGdF 4 @ZIF-8-labeled stem cells exhibited higher liver T1 signals on days 1 and 2 post-injection, which returned to baseline levels by day 7. Immunofluorescence co-localization staining confirmed the successful colonization and differentiation of NaGdF 4 @ZIF-8-labeled stem cells into hepatocyte-like cells, promoting liver regeneration. NaGdF4@ZIF-8-labeled stem cells significantly improved liver pathology and blood biochemistry compared to the control group.

CONCLUSION

NaGdF 4 @ZIF-8 exhibits high T1 relaxivity, excellent ROS scavenging ability, and good biocompatibility, making it a valuable tool for assisting stem cell therapy in liver cirrhosis and monitoring the short-term colonization of stem cells after injection.

CLINICAL RELEVANCE/APPLICATION

The antioxidant properties of NaGdF4@ZIF-8 can reduce oxidative stress under liver pathological condition, ensuring the colonization and proliferation of transplanted stem cells. Its T1 relaxation performance also enables MRI tracking of stem cell localization in the liver.

S3A-SPGI-3 DEEP LEARNING-BASED DETECTION OF SMALL BOWEL TUMORS ONNON-CONTRAST CT WITHOUT BOWEL PREPARATION

QIUXIAN WANG (*Presenter*)
Jianbin Zhu (*Abstract Co-Author*)
Dong Zeng (*Abstract Co-Author*)
Ni Zeng, MS (*Abstract Co-Author*)
Caihong Li (*Abstract Co-Author*)
Wen Zhibo, BA (*Abstract Co-Author*)

PURPOSE

Small bowel tumors (SBTs) pose significant clinical challenges due to their nonspecific symptoms. Most patients present with lymph node or distant metastases at diagnosis, leading to poor therapeutic outcomes and substantially worsened prognosis. Early detection is critical for improving survival rates. Although non-contrast CT is widely used, its diagnostic performance for SBTs remains limited, with sensitivity of 0.71 and specificity of 0.75. Moreover, the lack of bowel preparation during CT examination markedly increases the risk of missed SBTs lesions. This study aimed to develop and validate a deep learning (DL) model for small intestine segmentation and SBTs detection on non-contrast CT, thereby enhancing tumor detection rates and diagnostic accuracy.

METHODS AND MATERIALS

We first trained a segmentation DL model on a manually annotated dataset (298 patients vs. 480 normal controls) and tested it using an external validation set (33 patients vs. 54 normal controls). Subsequently, we developed a detection DL model with a multicenter dataset (298 patients vs. 239 normal controls; 5,474 positive slides and 4,320 negative slides). The detection model was further validated with an independent test set (33 patients vs. 54 normal controls).

RESULTS

For the external validation:The segmentation model achieved an AUC of 0.677 (95% CI: 0.642-0.712), with 97.5% sensitivity and 71.8% accuracy.The detection model showed an AUC of 0.745 (95% CI: 0.711-0.779), demonstrating 88.5% sensitivity and 65.5% accuracy.

CONCLUSION

The proposed DL model shows potential as a novel tool for SBTs detection and segementation in low-preparation settings.

CLINICAL RELEVANCE/APPLICATION

This DL model helps mitigate the influence of radiologists' subjective factors, reducing the risks of missed diagnoses. It shows promising potential to improve early diagnosis rates, thereby enhancing patient survival outcomes. Furthermore, the model facilitates optimization of clinical workflows, enabling radiologists to complete diagnostic procedures more efficiently while maintaining diagnostic accuracy.

S3A-SPGI-4 COMPUTED TOMOGRAPHY-BASED DEEP LEARNING MODEL FOR ASSESSING PREOPERATIVE TUMOR DEPOSIT IN COLORECTAL CANCER

Gengyun Miao (*Presenter*)

PURPOSE

Tumor deposits (TDs) are an established adverse prognostic factor in colorectal cancer (CRC). However, their identification currently depends on postoperative histopathologic evaluation, restricting their utility in preoperative risk stratification and treatment planning. This study aimed to develop and validate a deep learning (DL) model based on contrast-enhanced CT for the noninvasive, preoperative prediction of TD status in patients with CRC, with the goal of facilitating personalized therapeutic strategies.

METHODS AND MATERIALS

A deep learning model was trained using retrospective data collected from a single center between 2015 and 2024, with patients randomly assigned to training and internal test sets in a 7:3 ratio. External validation was conducted using data from a tertiary medical center between 2017 and 2024. CNN architectures (ResNet18, ResNet34, and attention-enhanced variants) were trained separately on colon cancer (CC), rectal cancer (RC), and combined CRC cohorts. Model performance was assessed using area under the receiver operating characteristic curve (AUC), sensitivity, specificity, and decision curve analysis.

RESULTS

A total of 441 patients were included (340 in the development cohort: 237 for training, 101 for internal testing; 103 in the external test cohort). The attention-enhanced ResNet18 model consistently demonstrated robust performance in identifying TDs. In the combined CRC cohort, the model achieved AUCs of 0.999 (training), 0.909 (internal validation), and 0.896 (external validation). In subgroup analyses, AUCs for the CC cohort were 0.999, 0.892, and 0.828, respectively, and for the RC cohort were 0.999, 0.931, and 0.889, respectively. DCA showed a favorable net benefit across all cohorts, suggesting potential clinical applicability.

CONCLUSION

This DL-based model leveraging contrast-enhanced CT enables accurate preoperative prediction of TD status in CRC. The proposed approach holds promise for enhancing individualized treatment planning and improving risk stratification before surgery.

CLINICAL RELEVANCE/APPLICATION

ResNet18_Attention-based CT model demonstrated excellent performance in identifying tumor deposit status preoperatively in colorectal cancer, offering a noninvasive tool for clinical decision-making.

S3A-SPGI-5 NON-INVASIVE PREDICTION OF TERTIARY LYMPHOID STRUCTURES AND PERITONEAL RECURRENCE IN GASTRIC CANCER USING A MULTITASK DEEP LEARNING MODEL: A MULTICENTER STUDY

Yuming Jiang, MD, PhD (*Presenter*)

PURPOSE

Tertiary lymphoid structures (TLSs) are markers of antitumor immunity and are associated with favorable prognosis and treatment response in gastric cancer. However, histologic evaluation is invasive and subject to sampling bias. This study aimed to develop and validate a novel deep learning model for non-invasive prediction of TLS subtypes and peritoneal recurrence using CT imaging, with implications for treatment stratification.

METHODS AND MATERIALS

We developed CTransNet , a multitask deep learning model combining a convolutional neural network with Transformer-based self-attention to extract features from pre-treatment CT images. The model was designed to predict TLS subtypes (TLS1-3) and peritoneal recurrence. This retrospective study included 2,569 gastric cancer patients from seven independent cohorts. Patients had annotated CT scans, histologic TLS classification, and clinical follow-up. Model performance was assessed in internal and external validation cohorts. Multitask learning was compared to single-task models using area under the curve (AUC), Kaplan-Meier survival analysis, and multivariate Cox regression.

RESULTS

CTransNet demonstrated high predictive accuracy for TLS classification in the training cohort (AUC: TLS1 = 0.910, TLS2 = 0.925, TLS3 = 0.953), with consistent performance in internal and external validation. High-risk scores predicted by the model were associated with significantly increased 5-year cumulative peritoneal recurrence across cohorts. The model independently predicted recurrence in multivariate analyses. Importantly, in patients with low model scores, adjuvant chemotherapy significantly improved DFS and OS, whereas patients with high-risk scores derived minimal benefit. Multitask learning outperformed single-task models in both TLS classification and peritoneal recurrence prediction.

CONCLUSION

This multitask deep learning model enables non-invasive prediction of TLS subtypes and peritoneal recurrence using CT imaging in gastric cancer. It offers a valuable tool for personalized treatment planning, particularly in identifying patients likely to benefit from adjuvant chemotherapy.

CLINICAL RELEVANCE/APPLICATION

This AI-based imaging model predicts tumor immune microenvironment and recurrence risk, offering a non-invasive method to guide individualized therapeutic decisions in gastric cancer.

S3A-SPGI-7 RADIOMIC FEATURE EXTRACTION IN RECTAL CANCER USING WHOLE-MOUNT HISTOPATHOLOGY AS THE GOLD STANDARD

Joao Manoel M. Santos, PhD (*Presenter*)
Jon S. Heiselman (*Abstract Co-Author*)
Nil Urganci (*Abstract Co-Author*)
Canan Firat (*Abstract Co-Author*)
Hadi Ghahremannezhad (*Abstract Co-Author*)
Rami Vanguri, PhD (*Abstract Co-Author*)
Jayasree Chakraborty (*Abstract Co-Author*)
Julio Garcia Aguilar (*Abstract Co-Author*)
Marc J. Gollub, MD (*Abstract Co-Author*)
Jinru Shia, MD (*Abstract Co-Author*)
Natally Horvat, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the ability of MRI-based radiomic features to predict treatment response in rectal cancer using co-registered whole- and half-mount histopathology as the gold standard.

METHODS AND MATERIALS

We included 38 patients with rectal adenocarcinoma who underwent neoadjuvant therapy followed by surgery. Whole-mount slides were divided into 3 slices and 4 quadrants each, yielding 456 ROIs. After excluding regions with only healthy tissue and regions with missing ground truth pathology information, 370 regions remained (171 with complete response, 199 with incomplete response). Data were split by patient into training (n = 259) and test (n = 111) sets. T2-weighted MRIs were used for radiomic feature extraction (n = 1,510) within the registered tumor bed using PyRadiomics, with isotropic resampling. After removal of highly correlated features, statistical filtering and mRMR selection were performed. Logistic regression was used for classification.

RESULTS

In the training set, the model achieved an AUC of 0.71 (95% CI: 0.65-0.76), sensitivity of 0.80 (0.75-0.85), specificity of 0.46 (0.40-0.52), PPV of 0.61 (0.55-0.67), and NPV of 0.68 (0.63-0.74).In the independent test set, performance was similar with an AUC of 0.72 (95% CI: 0.63-0.80), sensitivity of 0.84 (0.78-0.91), specificity of 0.45 (0.36-0.55), PPV of 0.63 (0.54-0.72), and NPV of 0.73 (0.64-0.81).

CONCLUSION

MRI radiomic features, validated against co-registered whole- and half-mount histopathology, demonstrate promising predictive performance for assessing treatment response in rectal cancer.

CLINICAL RELEVANCE/APPLICATION

This radiomics-pathology pipeline provides spatially validated, imaging-based biomarkers that may support clinical decision-making regarding nonoperative management in rectal cancer patients.

S3A-SPGI-8 UNMASKING EARLY RENAL DAMAGE: PERFORMANCE OF MECHANICAL MAGNETIC RESONANCE ELASTOGRAPHY IN DETECTING EARLY REMODELING IN KIDNEY DISEASE BEFORE DIALYSIS

Vitali Koch, MD (*Presenter*)
Thomas J. Vogl, MD, PhD (*Abstract Co-Author*)
Leon D. Gruenewald, MD (*Abstract Co-Author*)
Mohamed Alrahmoun (*Abstract Co-Author*)
Katrin Eichler, MD (*Abstract Co-Author*)
Christian Booz, MD (*Abstract Co-Author*)

PURPOSE

Chronic kidney disease (CKD) is a progressive condition characterized by renal fibrosis and loss of function. 3D magnetic resonance elastography (MRE) has emerged as an advanced imaging technique that facilitates more detailed tissue characterization, providing not only biomarkers of renal fibrosis but also inflammation. This study aims to assess the performance of 2D/3D MRE in detecting pre-dialysis CKD stages and renal inflammation.

METHODS AND MATERIALS

A prospective cohort of 60 patients with CKD stages 1-4 and healthy controls underwent both 2D and 3D MRE (low-frequency mechanical vibrations ~40 Hz) during the same imaging session. Inversion algorithms were applied to generate stiffness maps in kilopascals (kPa). Quantitative stiffness values, spatial heterogeneity, and diagnostic sensitivity were compared across modalities. Associations with eGFR, urinary biomarkers, and biopsy-confirmed fibrosis/inflammation (where available) were analyzed.

RESULTS

3D MRE demonstrated superior spatial resolution, better depiction of cortical-medullary contrast, and more consistent detection of focal stiffness elevations compared to 2D MRE. In patients with early-stage CKD and normal imaging morphology, 3D MRE detected stiffness increases in both cortical and perihilar regions, while 2D MRE

often failed to capture these regional changes due to slice positioning limitations. Stiffness values showed a significant inverse correlation with eGFR (P<0.01), and elevated stiffness was observed in patients with histologically confirmed early fibrosis, even in the absence of morphological abnormalities on conventional MRI. Patients with CKD stage 3-4 exhibited up to a 30% increase in cortical stiffness compared to healthy controls. Importantly, 3D MRE detected subclinical changes in patients with preserved renal morphology, offering imaging markers for early fibrotic remodeling. Phase angle (Y) and wave attenuation (a) correlated with progression to dialysis and mortality (both P<0.05).

CONCLUSION

3D MRE offers significant advantages over 2D MRE and provides a non-invasive, quantitative, and reproducible method for assessing renal stiffness, enabling early detection of CKD in pre-dialysis stages and outcome prediction. Its volumetric coverage, enhanced sensitivity, and superior spatial resolution allow for improved detection of early pathological changes.

CLINICAL RELEVANCE/APPLICATION

Our findings support the clinical potential of 3D MRE as a next-generation diagnostic tool in nephrology, warranting further validation in larger, multi-center studies.

S3A-SPGI-9 DEEP LEARNING-BASED VENOUS PHASE CT RADIOMICS COMBINED WITH CLINICAL MODELS PREDICT TUMOR BUDDING GRADING AND 2-YEAR METASTASIS/RECURRENCE IN COLORECTAL CANCER

Dong Bai (*Presenter*)
Zhiqun Wang (*Abstract Co-Author*)

PURPOSE

To develop a deep learning radiomics-clinical fusion model for preoperative prediction of tumor budding (TB) grading in colorectal cancer (CRC) using venous-phase CT and clinical data, and evaluate its prognostic value for 2-year metastasis/recurrence.

METHODS AND MATERIALS

Materials and Methods This multicenter retrospective study included 412 CRC patients (2018-2021) with pathologically confirmed TB grades (low-grade: 246; high-grade: 166). Venous-phase CT images were analyzed using hybrid 3D CNN-Transformer architecture for deep radiomics feature extraction, followed by LASSO regression to select signatures for Rad-score calculation. Clinical variables (age, sex, CEA, CA199, CA724, tumor location/size, vascular invasion, T-stage, neural invasion, liver/lymph node metastasis) were filtered via random forest. A multilayer perceptron integrated Rad-score and clinical features. Model performance was validated through 5-fold cross-validation and external testing (n=156). Prognostic analysis included 2-year metastasis/recurrence follow-up. Statistical methods encompassed AUC/Delong test, SHAP interpretability, and Cox regression.

RESULTS

The integrated model demonstrated superior TB grading performance (training AUC: 0.92 vs. 0.85/0.81 for radiomics/clinical models; validation AUC: 0.88 vs. 0.80/0.76; Delong p<0.05). Key predictors identified by SHAP included venous-phase tumor spiculation (weight=0.32), intratumoral heterogeneity (GLCM_contrast, weight=0.28), and CEA =5 ng/mL (weight=0.21). External validation showed sustained robustness (AUC=0.85). High-grade TB correlated with 2.85-fold increased metastasis/recurrence risk (HR=2.85, 95%CI:1.92-4.23), independent of vascular invasion (HR=1.78) and liver metastasis (HR=3.12), with a prognostic model C-index of 0.79.

CONCLUSION

A CT-based deep radiomics-clinical fusion model effectively predicts tumor budding grading and identifies CRC patients at high risk for early metastasis/recurrence. Tumor budding grading serves as an independent prognostic biomarker, supporting its integration into preoperative risk stratification.

CLINICAL RELEVANCE/APPLICATION

In summary, this model represents a significant step toward integrating advanced imaging analytics with clinical data to improve diagnostic accuracy and prognostic precision in CRC. Its clinical utility lies in enabling early risk stratification, guiding treatment decisions, and optimizing patient management to enhance outcomes.

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S3A-SPGU

Genitourinary Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPGU-1 DIAGNOSTIC VALUE OF CONTRAST-ENHANCED ULTRASOUND FOR PREOPERATIVE STAGING OF BLADDER CANCER: A PROSPECTIVE STUDY

Qiyun Ou (*Presenter*)
Weiwei Pan (*Abstract Co-Author*)
Xiaotong Li (*Abstract Co-Author*)
Zexin Fu (*Abstract Co-Author*)

PURPOSE

Bladder cancer is one of the most common malignancies worldwide, ranking ninth in incidence among all cancers. Based on the depth of invasion, it is classified into non-muscle-invasive bladder cancer (NMIBC) and muscle-invasive bladder cancer (MIBC). NMIBC accounts for 75% of cases, with 20%-25% progressing to MIBC. Over 95% of MIBC cases are highly aggressive, malignant, and prone to metastasis, with a poor prognosis and a 5-year survival rate often below 50%. Treatment strategies depend on staging, making preoperative diagnosis critical for guiding therapy. Contrast-enhanced ultrasound (CEUS) offers real-time dynamic imaging of lesions and blood flow, with advantages such as low allergic reactions, minimal nephrotoxicity, and high sensitivity. This study aims to evaluate the diagnostic value of CEUS for preoperative staging of bladder cancer.

METHODS AND MATERIALS

This prospective study included 491 bladder cancer patients diagnosed postoperatively at Sun Yat-sen Memorial Hospital, Sun Yat-sen University from April 2020 to December 2024. Two experienced radiologists independently analyzed 2D ultrasound and CEUS features to assess tumor invasion depth. Ultrasound findings were compared with postoperative pathological staging to calculate diagnostic accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

RESULTS

Among 491 patients (NMIBC: 413, MIBC: 78), CEUS demonstrated an AUC of 0.79 for differentiating MIBC and NMIBC, with an overall accuracy of 88.0% (95% CI: 85.0%-91.0%), sensitivity of 92.0%, and specificity of 65.0%. Significant CEUS features for muscle invasion ($P<0.05$) included tumor base width (AUC=0.78), pedunculation (AUC=0.80), tumor morphology (AUC=0.78), base continuity (AUC=0.74), and tumor size (AUC=0.73).

CONCLUSION

CEUS shows high diagnostic value in preoperative differentiation of NMIBC and MIBC. Statistically significant imaging features identified in this study may facilitate future risk stratification models for assessing muscle invasion.

CLINICAL RELEVANCE/APPLICATION

CEUS is a non-invasive, reliable tool for preoperative bladder cancer staging, aiding in treatment decision-making and improving patient outcomes.

S3A-SPGU-2 VALUE OF T1 MAPPING IN NON-INVASIVE ASSESSMENT OF THE OXFORD CLASSIFICATION OF IGA NEPHROPATHY

Chaobo Li (*Presenter*)
Shaopeng Zhou, MD (*Abstract Co-Author*)
Haiyi Wang, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic value of native T1 mapping in differentiating Oxford classification (MEST-C) scores in IgA nephropathy patients.

METHODS AND MATERIALS

In this prospective study, Patients who underwent both T1 mapping and renal biopsy at our Hospital between April 2023 to October 2024 were consecutively enrolled. Two radiologists performed blinded measurements of renal T1 mapping parameters,including cT1 (cortical T1 value), mT1 (medullary T1 value), ?T1(corticomedullary difference) and T1 ratio(corticomedullary ratio) values. Patients were grouped into five categories based on the Oxford classification (MEST-C). Spearman correlation analysis was applied to evaluate the associations between MEST-C scores and T1 parameters; the diagnostic performance of T1 parameters for discriminating different scores of Oxford classification was analyzed using the receiver operating characteristic (ROC) curve.

RESULTS

A total of 124 patients with IgA nephropathy were included in this study [66 males, 58 females; age 19~70 years (IQR: 30-51)]. Except for the E indicator, M, S, T, and C were significantly correlated with renal T1 values (? = 0.177-0.414, all $P < 0.05$). cT1 showed the best diagnostic efficacy for the S score, with an area under the curve (AUC) of 0.798, with a sensitivity of 0.687 and a specificity of 0.88. The best T1 parameters for differentiating the T score was T1 ratio, with an AUC of 0.687, sensitivity of 0.579 and a specificity of 0.791. The AUC values of T1 parameters for differentiating different scores of M, E, and C indices in patients range from 0.505 to 0.616.

CONCLUSION

Native T1 mapping can be used for non-invasive assessment of the S and T scores in the Oxford classification of patients with IgA nephropathy.

CLINICAL RELEVANCE/APPLICATION

Native T1 mapping demonstrates potential for non-invasive assessment of Oxford MEST-C scores in IgA nephropathy. Cortical T1 (cT1) effectively differentiates S scores (AUC=0.798), while T1% best identifies T scores (AUC=0.687). Correlations with M, S, T, and C scores (?=0.177-0.414) suggest utility in evaluating renal pathology, except for E lesions. This technique may reduce reliance on invasive biopsies for monitoring disease severity in select parameters.

S3A-SPGU-4 THE ROLE OF PALEORADIOLOGY IN THE STUDY OF ANATOMICAL SPECIMENS: A CASE OF FEMALE PSEUDOHERMAPHRODITISM IN A 19TH-CENTURY PRUSSIAN SOLDIER

Martina Afano, MD (*Presenter*)
Anna Russo, MD (*Abstract Co-Author*)
Alfonso Reginelli, MD (*Abstract Co-Author*)
Michele Papa, MD (*Abstract Co-Author*)

PURPOSE

This study aims to perform a morphological and diagnostic analysis of a rare pelvic anatomical specimen preserved at the Anatomical Museum of the University of Campania "Luigi Vanvitelli", using advanced radiological techniques. The goal is to identify signs of sexual development disorders and demonstrate the effectiveness of paleoradiology in the non-invasive investigation of historical specimens.

METHODS AND MATERIALS

The specimen examined is the pelvis of Stefan Rusz, a 28-year-old Prussian soldier from Rosu-Maskas, Transylvania, who died of “chest disease” on February 25, 1817, at the Military Hospital of Sacramento in Naples. His body was used for anatomical training and later examined by Professor Trinchera, who diagnosed female pseudohermaphroditism. In 1851, the specimen was donated to Professor Stefano delle Chiaje, then director of the Anatomical Museum of the Regia University of Naples. The pelvis underwent high-resolution multislice CT and MRI with T1- and T2-weighted sequences. Images were reconstructed in 3D and analyzed with focus on genitopelvic anatomy.

RESULTS

Imaging revealed a blind-ending vaginal-like canal and structures compatible with penile corpora cavernosa, but no identifiable uterus or ovaries. The anatomy supports a diagnosis of female pseudohermaphroditism—a condition in which genetically and gonadally female individuals present masculinized external genitalia, such as hypertrophied clitoris and labia majora resembling a scrotum. No signs of trauma, malformations, or surgical intervention were found. The bones showed normal preservation of trabecular and cortical structures. The gluteal muscles displayed normal MRI signal and preserved trophism.

CONCLUSION

This rare case of disordered sexual development in a historical individual highlights the value of paleoradiology in the diagnostic and preservational study of anatomical specimens. The combined use of CT and MRI enabled detailed reconstruction of pelvic structures, offering insights into poorly documented conditions of the past. The specimen also serves as a significant medico-historical and anthropological record.

CLINICAL RELEVANCE/APPLICATION

This study shows the utility of paleoradiology in diagnosing rare congenital conditions, such as disorders of sexual development (DSD), in historical specimens. CT and MRI allow detailed, non-invasive reconstruction of fragile structures, providing insight into intersex anatomy and supporting interdisciplinary collaboration between radiology, anthropology, and medical history.

S3A-SPGU-5 THE VALUE OF RADIOMICS MODELS BASED ON DTI AND DWI SEQUENCES IN IDENTIFYING CERVICAL ADENOCARCINOMA AND SQUAMOUS CELL CARCINOMA

Hanyue Zhang (*Presenter*)
Shifeng Tian (*Abstract Co-Author*)
Changjun Ma (*Abstract Co-Author*)
Ailian Liu, MD (*Abstract Co-Author*)

PURPOSE

To explore the value of radiomics models based on DTI and DWI sequences in differentiating pathological types of cervical adenocarcinoma and squamous cell carcinoma.

METHODS AND MATERIALS

This retrospective study included 147 cervical cancer patients with MRI in our hospital, including 41 adenocarcinoma and 106 squamous carcinoma. All enrolled patients underwent 1.5T MRI scanning two weeks before surgery, and the scanning sequences included T1WI, T2WI, DWI and DTI sequences.The original DWI and DTI images were transferred to the ADW 4.6 workstation, and the Functool function was applied to generate the ADC,FA and ADCT images. By using ITK-SNAP software , the primary lesions of cervical cancer were mapped manually on ADC images, FA images and ADCT images in full layer as Region of interest (ROI).On the uAI Research Portal platform, 464 radiomics features were extracted from ADC, FA and ADCT images respectively. The image data were randomly divided into the training set and the test set according to the ratio of 7:3. Through minimum Redundancy Maximum Relevance (mRMR), Recursive Feature Eliminationusing Cross Validation (RFECV) and Least absolute shrinkage and selection operator (LASSO) algorithms reduce the dimension of features. Based on the final selected features, partial least squares discriminant analysis(PLS-DA) was used to establish the radiomics models: including ADC, FA, ADCT and combined radiomics models.The area under the receiver operating characteristics curve (AUC), sensitivity, specificity and accuracy of each radiomics model were recorded.

RESULTS

The AUC of ADC radiomics model in the training set and test set were 0.877 (95%CI 0.810-0.946) and 0.825 (95%CI 0.684-0.961), respectively.The AUC of FA radiomics model in the training set and test set were 0.722 (95%CI 0.608-0.839) and 0.647 (95%CI 0.389-0.905),respectively.The AUC of ADCT radiomics model in the training set and test set were 0.725 (95%CI 0.610-0.841) and 0.71 (95%CI 0.481-0.934), respectively. The AUC of combined radiomics model in the training set and test set were 0.895 (95%CI 0.833-0.960) and 0.840 (95%CI 0.682-0.989), respectively.

CONCLUSION

The radiomics models based on DTI and DWI sequences are valuable in differentiating the pathological types of cervical adenocarcinoma and squamous cell carcinoma, and can provide a non-invasive and effective auxiliary method for judging tumor heterogeneity before clinical treatment of cervical cancer.

CLINICAL RELEVANCE/APPLICATION

Radiomics can transform images into data that can be mining, providing a non-invasive and effective auxiliary method for determining tumor heterogeneity before clinical treatment of cervical cancer.

S3A-SPGU-6 IMPROVED VISUALIZATION AND STAGING OF UPPER TRACT UROTHELIAL CARCINOMA USING CORONAL REDUCED FIELD-OF-VIEW DIFFUSION-WEIGHTED IMAGING

Wei Wang (*Presenter*)
Jian-Xing Qiu, MD (*Abstract Co-Author*)
Jingyun Wu (*Abstract Co-Author*)

PURPOSE

To compare image quality and staging performance between coronal reduced field-of-view (r-FOV) DWI and conventional axial full FOV (f-FOV) DWI in upper tract urothelial carcinoma (UTUC) evaluation.

METHODS AND MATERIALS

Sixty patients with confirmed UTUC underwent preoperative 3.0T MRI with both axial f-FOV and coronal r-FOV DWI (b value = 50, 1000 s/mm 2). Two experienced radiologists independently evaluated image quality for both DWI sequences, including image sharpness, distortion, artifacts, and lesion conspicuity using a 4-point scale. Tumor contrast was quantitatively calculated as the signal intensity difference between the tumor and adjacent fat. ADC values of tumors were obtained from ADC maps. Both readers evaluated tumor staging (T1-2 vs. T3-4) based on invasion of adjacent fat or renal parenchyma. Pathological results from radical nephroureterectomy served as the reference standard.

RESULTS

Tumors were in the renal pelvis (n =24), ureter (n =34), or both (n =2). Pathological staging classified 24 cases as T3-4. Coronal r-FOV DWI demonstrated superior image sharpness, reduced distortion, fewer artifacts, and better lesion conspicuity compared to axial f-FOV DWI (all $p < 0.05$). ADC values from f-FOV DWI were significantly lower than those from r-FOV DWI [$(1.02\pm0.25)\times10^{-3}$ mm²/s vs. $(1.17\pm0.33)\times10^{-3}$ mm²/s, $p < 0.001$]. Tumor contrast was higher on r-FOV DWI than on f-FOV DWI (240.95±107.97 vs. 183.95±89.87, $p < 0.001$). For staging UTUC (T3 or higher), coronal r-FOV DWI outperformed axial f-FOV DWI (AUC of Reader 1/2: 0.861/0.833 vs. 0.750/0.722, p =0.045/0.020).

CONCLUSION

Coronal r-FOV DWI provided superior image quality, tumor conspicuity, and staging performance for UTUC compared to axial f-FOV DWI, offering added diagnostic value. Integrating coronal r-FOV DWI into clinical protocols may enhance UTUC evaluation and guide clinical therapeutic strategies.

CLINICAL RELEVANCE/APPLICATION

UTUC often exhibits diverse morphological features with its elongated axis predominantly in the coronal plane, which may not be well visualized on axial DWI. Coronal r-FOV DWI improves visualization of UTUC along its long axis while providing superior resolution compared to f-FOV DWI. This study demonstrates that coronal r-FOV DWI provides better image quality and tumor conspicuity compared to axial f-FOV DWI in UTUC evaluation. Additionally, it improves staging accuracy in distinguishing invasive (T3-4) from non-invasive (T1-2) tumors, aiding therapeutic decision-making. The results support incorporating coronal r-FOV DWI into MRU protocols as an adjunct to conventional sequences, potentially improving diagnostic precision and clinical management for UTUC patients.

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S3A-SPHN

Head & Neck Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPHN-2 MRI EDEMA PATTERNS IN ACUTE NECK INFECTIONS: A MULTICENTER AND MULTIDISCIPLINARY INTEROBSERVER STUDY

Jussi Hirvonen, MD, PhD (*Presenter*)
Jari-Pekka Vierula, MD (*Abstract Co-Author*)
Heidi Huhtanen, MD (*Abstract Co-Author*)
Jaakko A. Heikkinen, MD (*Abstract Co-Author*)
Janne Nurminen (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic accuracy and interobserver agreement of radiologists and surgeons in detecting prognostic MRI edema patterns, retropharyngeal (RPE) and mediastinal (ME) edema, in acute neck infections, supporting their clinical integration into emergency imaging workflows. These patterns are known to predict disease severity, yet their reliable identification across specialties remains untested until now.

METHODS AND MATERIALS

In this multicenter observational study, 28 readers (comprising radiology residents, board-certified radiologists, and head and neck surgeons from five academic hospitals) evaluated axial T2-weighted Dixon MRI images from 60 patients with clinically confirmed acute neck infections. Readers, blinded to clinical data such as patient symptoms or laboratory results, assessed images for RPE and ME presence and rated their confidence. Sensitivity, specificity, accuracy, and interobserver agreement (Fleiss' kappa) were calculated against a consensus standard set by two fellowship-trained neuroradiologists. Intraobserver consistency was tested by repeating 10 randomly selected cases, unbeknownst to readers.

RESULTS

Overall sensitivity, specificity, and accuracy were 0.92, 0.80, and 0.87 for RPE and 0.88, 0.86, and 0.85 for ME, with substantial interobserver agreement (?=0.61 for RPE, 0.52 for ME). Radiologists outperformed surgeons in RPE sensitivity (p =0.007), RPE accuracy (p =0.04), ME sensitivity (p =0.01), and ME accuracy (p =0.02), with intraobserver consistency reaching 90%. Confidence was high, averaging 4.3 for RPE and 4.1 for ME, and strongly correlated with accuracy (p<0.001), reinforcing diagnostic reliability.

CONCLUSION

Physicians reliably detect MRI edema patterns across expertise levels, validating their use for risk stratification in acute neck infections and supporting broader adoption in clinical practice where MRI is available.

CLINICAL RELEVANCE/APPLICATION

These findings pave the way for the practical application of MRI-detected retropharyngeal and mediastinal edema patterns in emergency settings to stratify risk in acute neck infections. The high diagnostic reliability across specialties supports the broader use of these markers to guide timely clinical decisions and optimize patient care where MRI is available.

S3A-SPHN-3 IMPROVED VISUALIZATION OF MIDDLE EAR PROSTHESES USING PHOTON-COUNTING-DETECTOR CT COMPARED TO ENERGY-INTEGRATED-DETECTOR CT: A CADAVER STUDY

Maryam Sadeghian Sharafi, BSc, MSc (*Presenter*)
John I. Lane, MD (*Abstract Co-Author*)
John C. Benson, MD (*Abstract Co-Author*)
Paul J. Farnsworth, DO (*Abstract Co-Author*)
Kevin J. Treb, PhD (*Abstract Co-Author*)
Michael R. Bruesewitz, RT (*Abstract Co-Author*)
Joseph R. Swicklik, RT, BS (*Abstract Co-Author*)
Eric Babajanian (*Abstract Co-Author*)
Karl Khandalavala (*Abstract Co-Author*)
Matthew Carlson, MD (*Abstract Co-Author*)
Cynthia H. McCollough, PhD (*Abstract Co-Author*)
Shuai Leng, PhD (*Abstract Co-Author*)

PURPOSE

Middle ear prostheses require high-resolution CT for detailed visualization, which is essential for evaluating postoperative results following ossicular chain reconstruction. This study compared image quality, with a focus on spatial resolution, of photon-counting-detector (PCD) to energy-integrated-detector (EID) CT in a cadaver study.

METHODS AND MATERIALS

Nine types of middle ear prostheses, (six stapes and four ossicular replacement prostheses [two total and two partial]), were implemented in five fresh-frozen (non-fixed) whole head specimens. Each prosthesis was first implanted in the correct anatomic position, then intentionally displaced to mimick common types of prosthesis malposition. The specimens were scanned on both PCD-CT (NAEOTOM Alpha, Siemens) and EID-CT (SOMATOM Force, Siemens) scanners. Clinical temporal bone protocols were used with matched tube potential (120kV), CTDI vol, and field of view (80mm). Images were reconstructed at the thinnest slice thickness available on each scanner: 0.2mm for PCD-CT and 0.4mm for EID-CT, using clinical kernels (Hr84 for PCD-CT and Ur77 for EID-CT). A total of 18 image series were evaluated by two experienced neuroradiologists who were blinded to the scanner type and the prosthesis positioning. Each series was scored for prosthesis position (lateral and medial contact: 1=good contact, 2=tangential contact, 3=no contact), reader confidence, and overall image quality. Inter-reader agreement and agreement with ground truth were assessed and compared between PCD-CT and EID-CT.

RESULTS

PCD-CT consistently outperformed EID-CT in prosthesis visualization and diagnostic confidence. For lateral contact (n=18), PCD-CT correctly detected 14 cases versus 12 with EID-CT; for medial contact (n=18), 12 vs 9, respectively. PCD-CT was particularly superior in detecting loss of contact (score 3). Reader confidence was significantly higher with PCD-CT compared to EID-CT for both contacts. For lateral contact, reader 1 reported a mean confidence of 88.9% vs 79.4% (p=0.0188), and reader 2, 86.9% vs 63.3% (p=0.0001). For medial contact, reader 1 rated 92.5% vs. 76.1% (p<0.0001), and reader 2, 93.3% vs 75.6% (p=0.0033). Inter-reader agreement was also higher with PCD-CT (ICC: 0.88 vs 0.60 and 0.77 vs 0.57 for lateral and medial contact, respectively). For overall image quality, the readers preferred PCD-CT images in 16/18 (88.9%) and 17/18 (94.4%) cases.

CONCLUSION

PCD-CT provided superior image quality and higher diagnostic accuracy and confidence for evaluating the position and contact points of middle ear prostheses compared to EID-CT.

CLINICAL RELEVANCE/APPLICATION

Using PCD-CT for postoperative assessment of ossicular chain reconstruction can improve diagnostic confidence and accuracy.

S3A-SPHN-5 LOGIC-GATED MET-TARGETED NIR-II FLUORESCENCE IMAGING ENABLES SUBMILLIMETER QUANTITATIVE DELINEATION OF ORAL CANCER MARGINS

Jingbo Wang, MD (*Presenter*)
Qifan Ma (*Abstract Co-Author*)
Ying Yuan (*Abstract Co-Author*)
Xiaofeng Tao (*Abstract Co-Author*)

PURPOSE

To validate a novel pH-responsive, MET-targeted near-infrared II (NIR-II, 1000-1700 nm) fluorescent imaging system for precise, quantitative delineation of invasive tumor margins in oral squamous cell carcinoma (OSCC).

METHODS AND MATERIALS

A fluorescent probe (PCPA@oMBP-ICG) targeting MET receptors was synthesized by conjugating MET-binding peptides (oMBP) with indocyanine green (ICG), encapsulated within pH-sensitive polymeric vesicles (PCPA) for tumor-specific fluorescence activation. Orthotopic OSCC mouse models (n=30) underwent real-time NIR-II imaging. Dynamic fluorescence intensity-time curves were quantitatively analyzed. Tumor margins were delineated via threshold-based and morphological segmentation algorithms, generating pixel-level intensity maps. Imaging-derived margins were compared with pathology (HE staining, MET immunohistochemistry). Bland-Altman and Pearson correlation analyses quantified imaging-pathology concordance. Diagnostic accuracy was statistically compared to MRI.

RESULTS

The probe showed enhanced serum stability (82.3±4.5% at 24h vs. 51.2±3.6% control, p<0.001). Tumor-specific fluorescence activation yielded higher tumor-to-background ratios (14.6±2.1 vs. 4.8±0.9; p<0.001). Margin delineation achieved 0.63±0.18 mm accuracy, with strong fluorescence-MET expression correlation (r=0.92, p<0.0001). Bland-Altman analysis showed excellent imaging-pathology agreement (mean difference: 0.27 mm; limits: -0.39-0.93 mm). Imaging-based margins outperformed MRI (sensitivity: 93.2% vs. 74.5%; specificity: 89.7% vs. 70.8%; PPV: 91.3% vs. 69.2%; all p<0.05). No adverse probe effects were observed.

CONCLUSION

This logic-gated MET-targeted NIR-II system quantitatively delineates OSCC margins with submillimeter accuracy, superior to conventional MRI and closely matching pathology.

CLINICAL RELEVANCE/APPLICATION

This molecular imaging method has significant potential to enhance surgical accuracy and reduce positive margin rates in OSCC management.

S3A-SPHN-6 QUANTITATIVE STUDY OF VESTIBULAR ENDOLYMPHATIC HYDROPS IN MENIERE'S DISEASE BASED ON THREE-DIMENSIONAL REAL INVERSION RECOVERY SEQUENCE

Mengqiu Liu (*Presenter*)
Mengqiu Liu (*Abstract Co-Author*)
Jiang Fan (*Abstract Co-Author*)
Ying Liu (*Abstract Co-Author*)
Feier Ding, PhD (*Abstract Co-Author*)

PURPOSE

To quantitatively assess the degree of vestibular endolymphatic hydrops (EH) in patients with Meniere's disease (MD) using a three-dimensional real inversion recovery (3D-real IR)sequence and to analyze the correlation between the degree of EH and specific clinical features.

METHODS AND MATERIALS

A retrospective analysis was conducted on 155 clinically diagnosed MD patients (189 ears) treated at the First Affiliated Hospital of the University of Science and Technology of China between January 2022 and June 2024. For each case, we acquired a range of data, including a detailed medical history, pure tone audiometry, caloric tests, electrocochleography, and gadolinium-enhanced inner ear MRI. Vestibule volume (VV) and the volume of vestibular endolymph (EndV) were outlined on 3D-real IR sequence images, and the volume of vestibular endolymph was calculated by the vestibular endolymphatic ratio (ELR) to evaluate the degree of EH, analyze the correlation between the degree of EH and specific clinical features, hearing and vestibular function, and determine the optimal ELR value to differentiate each degree of effusion by using ROC curve analysis.

RESULTS

The degree of vestibular EH in the affected ear group (155 patients) was significantly correlated with disease stage and pure tone audiometry ($P < 0.001$), age and caloric test results ($P < 0.01$), but not with gender, disease duration, frequency of vertigo episodes, tinnitus, ear fullness or electrocochleography ($P > 0.05$). Both EndV and ELR differed significantly between the affected ear group and the control group ($P < 0.01$), although there was no significant difference in VV between the two groups ($P > 0.05$); the mean VV was 0.08 cm3. ROC curve analysis revealed that ELR cutoff values of 16%, 34% and 47% distinguished no hydrops from grade I, grade I from grade II, and grade II from grade III, with AUC values of 0.905, 0.871, and 0.899, respectively.

CONCLUSION

The degree of vestibular EH detected by 3D-real IR MRI correlated with age, disease stage, pure tone audiometry, and caloric test results in MD patients, but not with gender, disease duration, frequency of vertigo episodes, tinnitus, ear fullness, or electrocochleography results. The VV of the affected ear of patients with Meniere's disease was stabilized at 0.08 cm 3 with the healthy ear. Quantitative assessment of vestibular hydrops by 3D-real IR sequences is feasible, with ELR values of 16%, 34%, and 47% defining different levels of hydrops.

CLINICAL RELEVANCE/APPLICATION

The quantitative assessment of vestibular endolymphatic hydrops (EH) using Three-Dimensional Real Inversion Recovery (3D Real IR) sequence offers transformative potential in the diagnosis and management of Meniere's Disease (MD

S3A-SPHN-8 OPTIMIZING OPTIC NEURITIS DIAGNOSIS: THE ADDED VALUE OF CONTRAST-ENHANCED FAT-SUPPRESSED 3D FLAIR IN ORBITAL MRI

Etsushi Iida, MD (*Presenter*)
Atsuo Inoue (*Abstract Co-Author*)
Takaaki Ueda, MD (*Abstract Co-Author*)
Masahiro Tanabe, MD (*Abstract Co-Author*)
Katsuyoshi Ito, MD (*Abstract Co-Author*)

PURPOSE

This study evaluates whether the addition of contrast-enhanced fat-suppressed 3D FLAIR (CE FS 3D FLAIR) to the standard orbital MR protocol—comprising FS 2D T2WI and CE FS 3D T1WI—enhances lesion detection and diagnostic confidence in optic neuritis.

METHODS AND MATERIALS

A retrospective review of 422 orbital MR examinations identified 48 patients meeting specific clinical criteria for acute optic neuritis. These patients underwent imaging using FS 2D T2WI, CE FS 3D T1WI, and CE FS 3D FLAIR. The standard protocol included FS 2D T2WI and CE FS 3D T1WI, while the advanced protocol incorporated CE FS 3D FLAIR. Five datasets were created, analyzed independently by two blinded radiologists, and evaluated across seven optic nerve segments using a 5-point Likert scale. Scores =4.0 were classified as abnormal. ROC analysis and statistical comparisons assessed diagnostic efficacy.

RESULTS

Among symptomatic optic nerves, CE FS 3D FLAIR detected abnormalities in 31.5% of optic discs, outperforming CE FS 3D T1WI (20.4%) and FS 2D T2WI (0%). Intraorbital optic nerve abnormalities were identified in 24.1% (T2WI and FLAIR) versus 20.4% (T1WI). ROC analysis demonstrated a significantly higher AUC for the advanced protocol (0.926) compared to the standard protocol (0.879). Sensitivity, NPV, and accuracy were significantly improved with the advanced protocol (88.9%, 86.4%, 89.6%) versus the standard protocol (70.4%, 71.4%, 81.3%). Weighted kappa values indicated excellent inter- and intra-rater reliability (0.81-0.99).

CONCLUSION

Adding CE FS 3D FLAIR to the standard orbital MR protocol enhances lesion detection and diagnostic confidence in optic neuritis.

CLINICAL RELEVANCE/APPLICATION

CE FS 3D FLAIR is a valuable imaging sequence for the diagnosis of optic neuritis.

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S3A-SPIN

Imaging Informatics Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPIN-1 AI-POWERED MAP OF THE ABDOMEN COULD HELP FIND CANCER EARLY ON

Yucheng Tang (*Presenter*)
Wenxuan Li, BS (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)
Zongwei Zhou, PhD (*Abstract Co-Author*)

PURPOSE

This study explores whether AI trained to segment normal anatomy can better detect cancer by identifying deviations from the normal anatomy. The underlying intuition is that if AI has a deep understanding of what normal anatomy looks like—shaped by consistent structures across thousands of patients—it can more reliably identify abnormalities such as cancer that disrupts anatomical integrity.

METHODS AND MATERIALS

To enable AI to learn from normal anatomy, we voxel-wise annotated 16 anatomical structures in 45,312 CT scans, creating the largest datasets of healthy population. This dataset includes structures from all major abdominal organs and vessels, providing a comprehensive spatial map of human anatomy. The AI was pre-trained to mimic radiologists' segmentation behavior by learning to identify the precise boundaries of each structure. To validate that the AI had learned a generalizable representation of normal anatomy, we evaluated its segmentation performance on an external cohort (n = 5,242). Following successful pre-training, we fine-tuned this anatomy-aware AI on a smaller but richly annotated cancer dataset (n = 3,174), which included 3,577 voxel-wise annotations for pancreatic cancer. Notably, only 562 cases (17.7%) in this set were early-stage cancer (<2 cm), reflecting real-world data scarcity in early cancer CT scans. For evaluation, we assembled a test cohort (n = 1,008), with a focus on early-stage cancers confirmed by pathology (n = 274). We compared the anatomy-aware AI to a model trained from scratch for pancreatic cancer detection.

RESULTS

(1) The pre-trained AI achieved an average DSC of 89.8% across 16 anatomical structures on the external cohort. (2) For pancreatic cancer detection, the anatomy-aware AI achieved a sensitivity/specificity of 97.1/98.7%. In detecting early-stage cancer (<2 cm), this anatomy-aware AI obtained a sensitivity of 95.3%, yielding a 6.3%-point gain over the model trained from scratch. Compared to experienced radiologists, the anatomy-aware AI demonstrated a 27.6/4.4% higher sensitivity/specificity in cancer detection.

CONCLUSION

This work showed that pre-training on large-scale normal anatomy enables AI to generalize better to disease detection tasks through fine-tuning. The learned anatomical features were not only interpretable but also highly transferable, offering a principled approach to building clinically useful AI systems.

CLINICAL RELEVANCE/APPLICATION

Anatomy-aware AI has strong potential for broad clinical applications in early cancer detection and beyond. By using prior knowledge of normal anatomical structure, these models may offer enhanced accuracy, interpretability, and data efficiency for detecting subtle pathological changes in real-world patient populations.

S3A-SPIN-2 16 READILY AVAILABLE RADIOLOGY REPORTS ARE WORTH 1 TIME-CONSUMING VOXEL-WISE ANNOTATION FOR WHOLE-BODY CT TUMOR DETECTION

Zongwei Zhou, PhD (*Presenter*)
Pedro Ricardo Ariel Salvador Bassi (*Abstract Co-Author*)
Wenxuan Li, BS (*Abstract Co-Author*)
Sergio Decherchi (*Abstract Co-Author*)
Andrea Cavalli (*Abstract Co-Author*)
Kang Wang, MD,PhD (*Abstract Co-Author*)
Yang Yang, PhD (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

To leverage tumor characteristics extracted from radiology reports as large-scale, weak annotations to complement small-scale, but detailed voxel-wise annotations for accurate detection of seven understudied abdominal-pelvic tumors.

METHODS AND MATERIALS

We first applied large language models (LLMs) to extract the tumor characteristics—such as tumor size, location, attenuation, and more— from 40,000 radiology reports across a major U.S. hospital's clinical data repository. To ensure alignment between AI-predicted tumors and radiology report content, we introduced three novel loss functions to guide training: (1) Tumor Size Loss (TSL), (2) Tumor Location Loss (TLL), and (3) Tumor Attenuation Loss (TAL). These loss functions transformed both structured and narrative report content into supervisory signals, enabling the AI to learn tumor characteristics consistent with clinical documentation. This approach enhanced detection of tumor types rarely represented in public datasets, including those in the spleen, gallbladder, prostate, bladder, duodenum, esophagus, and uterus. The model was trained using a small number of voxel-wise annotated CT scans (n = 30 / tumor type) and a large set of weakly annotated scans (n = 6,625), derived from 109 to 1,223 reports per organ. Performance was evaluated on 1,000 CT scans for detecting the seven types of tumors.

RESULTS

Across the seven types of tumors, the model supervised by report and voxel-wise annotations achieved mean sensitivity 71.3% and specificity 77.7%, exceeding the model only supervised by voxel-wise annotations by 19.2% and 5.2%, respectively. The breakdown sensitivity/specificity for each type were 70.3/82.7% for bladder tumors, 71.2/64.7% for duodenum tumors, 75.0/72.9% for esophagus tumors, 65.5/80.5% for gallbladder tumors, 71.1/78.9% for prostate tumors, 72.3/79.7% for

spleen tumors, and 73.7/84.2% for uterus tumors. Efficiency analysis showed that replacing one voxel-wise annotation with 16 report-annotated scans kept sensitivity within 0.5 pp of the voxel-only model, establishing a 16:1 equivalence ratio.

CONCLUSION

Tumor information already present in radiology reports provide supervision equivalent to one voxel-wise annotations for every sixteen reports. Leveraging these weak annotations allows accurate multi-organ tumor detection with as few as 30 detailed masks per organ and creates the first public detectors for seven types of tumors.

CLINICAL RELEVANCE/APPLICATION

Report-enabled weak annotations turn hospital archives into a low-cost resource for developing and updating whole-body cancer AI, reducing annotation labor >90 % and accelerating deployment to different types of tumors where voxel-wise annotations are scarce and expensive.

S3A-SPIN-4 MCR-VQGAN FOR TAU PET IMAGE SYNTHESIS: A SCALABLE AND COST-EFFECTIVE ALTERNATIVE FOR ALZHEIMER'S DISEASE IMAGING

Jin Young Kim (*Presenter*)
Zhen Lin (*Abstract Co-Author*)
Jeremy Hudson (*Abstract Co-Author*)
Hongyu Yuan (*Abstract Co-Author*)
Richard A. Barcus (*Abstract Co-Author*)
Jeongchul Kim, PhD (*Abstract Co-Author*)
Qing Lyu (*Abstract Co-Author*)
Christopher T. Whitlow, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop a scalable and cost-effective method for synthesizing tau PET images from structural T1-weighted MRI scans to support more robust and accessible Alzheimer's disease (AD) imaging research.

METHODS AND MATERIALS

A modified Vector Quantized Generative Adversarial Network (VQGAN) architecture was developed by integrating ResNet blocks, multi-scale convolutional layers, and Convolutional Block Attention Modules (CBAM). The model includes three downsampling and three upsampling layers. The downsampling path uses multi-scale convolutions (kernel sizes 3, 5, and 7) to capture features at varying spatial resolutions, while the upsampling path employs standard convolutional layers (kernel size 3). The encoder and decoder are connected by six ResNet blocks. CBAM modules are applied throughout the network to enhance spatial and channel-wise attention. The model was trained and evaluated on 222 paired structural T1-weighted MRI and tau PET scans from the Alzheimer's Disease Neuroimaging Initiative 3 (ADNI-3), covering a range of AD clinical stages (CN = 134, MCI = 76, AD = 12). Dedicated preprocessing pipelines were applied separately to MRI and tau PET scans to ensure accurate spatial alignment and quantification. The dataset was randomly split into training (n = 178) and testing (n = 44) subsets. For each subject, 14 axial slices were extracted from the center of each MRI and tau PET volume to standardize model input. Model performance was assessed using RMSE, PSNR, and SSIM.

RESULTS

The proposed pipeline generated realistic tau PET images. The modified VQGAN outperformed other GAN-based models, achieving an SSIM of 0.9002, PSNR of 24.27 dB, and RMSE of 0.005724.

CONCLUSION

The proposed pipeline synthesizes realistic tau PET images from structural T1 MRI and provides a scalable, cost-effective alternative to direct PET imaging. This approach may expand access to tau biomarkers in AD research and improve performance in predictive modeling. A downstream AD clinical classification task will be conducted to further evaluate the utility of the synthesized tau PET images. Preliminary results indicate that synthetic tau PET scans achieve classification performance comparable to real PET scans in differentiating AD clinical stages.

CLINICAL RELEVANCE/APPLICATION

Tau PET is a critical imaging tool for early AD diagnosis due to its radiotracer's specificity for tau proteins, a key pathological hallmark. Longitudinal tau PET studies are often used to monitor disease progression but require repeated scans, which are costly and not always feasible. The proposed synthesis approach may reduce dependence on repeated PET imaging by generating tau PET-like images from more accessible MRI scans, enabling more frequent and scalable monitoring of AD progression.

S3A-SPIN-5 EFFECTIVENESS OF LIVER TUMOR SCREENING USING NON-CONTRAST CT: A LARGE-SCALE MULTI-CENTER STUDY

Wei Liu, MSc (*Presenter*)
ZHANG XIAOMING (*Abstract Co-Author*)
Xiaoli Yin (*Abstract Co-Author*)
Yuan Gao, MSc, PhD (*Abstract Co-Author*)
Chunli Li (*Abstract Co-Author*)
Ling Zhang (*Abstract Co-Author*)
Yu Shi, MD (*Abstract Co-Author*)
Ke Yan (*Abstract Co-Author*)
Xu Han (*Abstract Co-Author*)

PURPOSE

We developed a deep learning framework, LiSAR (Liver tumor Screening And Recognition), for early detection of liver tumors using non-contrast CT (NCCT) scans and validated its effectiveness on multi-center data.

METHODS AND MATERIALS

Our development cohort includes 7,709 patients with liver tumors and 7,376 non-tumor subjects from two hospitals. Of these, 1,600 cases were used for internal validation, and the rest for training. We further collected three external test sets: (a) 926 tumor cases, (b) 498 tumor cases, and (c) 363 tumor and 388 non-tumor cases. The study covers the full spectrum of liver tumors including hepatocellular carcinoma (HCC), intrahepatic cholangiocarcinoma, metastasis, hemangioma, focal nodular hyperplasia, cysts, other malignant/benign neoplasms and calcifications. Control cases include diffuse liver diseases like steatosis and cirrhosis. LiSAR comprises three key components: (1) a lesion branch dedicated to lesion segmentation and classifiation. (2) a patient branch focused on image-level diagnosis. (3) a fusion branch that integrates information from the lesion branch and the patient branch. This fusion mechanism enhances prediction accuracy by leveraging complementary information while mitigating potential misalignments between them.

RESULTS

LiSAR achieved a screening AUC of 0.994, sensitivity of 0.948 and specificity of 0.99. The average sensitivities for malignant and benign tumors were 0.967 and 0.867, respectively. For HCC stratified by Barcelona-Clinic Liver Cancer (BCLC) staging, LiSAR demonstrated sensitivities of 0.846 (BCLC=0), 0.975 (BCLC=A), and 1.0 (BCLC=B), surpassing the performance of routine screening methods (e.g., ultrasound+AFP) reported in previous literature. In the subset with severe diffuse liver diseases, LiSAR maintained robust performance, achieving a screening AUC of 0.972, with a sensitivity of 0.912 and specificity of 0.926. Moreover, LiSAR demonstrated strong generalizability across three external testing cohorts, achieving the following results: (a) sensitivity of 0.945, (b) sensitivity of 0.938, and (c) sensitivity of 0.891 and specificity of 0.995.

CONCLUSION

Extensive evaluation on internal and external cohorts highlights LiSAR's effectiveness in detecting liver tumors, outperforming existing routine methods, with consistent performance across diverse patient populations, including challenging cases.

CLINICAL RELEVANCE/APPLICATION

NCCT is a useful tool for early liver tumor screening, especially when contrast agents are contraindicated. LiSAR outperformed ultrasound + AFP in HCC screening, offering an accurate potential approach for routine surveillance or opportunistic discovery of hepatic lesions.

S3A-SPIN-6 CREATING TRIPLET DATASETS FOR MULTIOMIC AND MULTICENTER RADIOLOGY AI EXPLOITING CT IMAGES, ANATOMICAL SHAPES, AND RADIOLOGY REPORTS

Zongwei Zhou, PhD (*Presenter*)
Pedro Ricardo Ariel Salvador Bassi (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

To create a multicenter database of 9,262 pairs of CT images, anatomical shapes, and radiology reports.

METHODS AND MATERIALS

We developed a large public triplet dataset, with 9,262 triplets of 3D CT scans, shapes (organs & tumors), and radiology reports. First, we gathered 9,262 abdominal CTs from public sources (138 institutions, 19 countries). Most of them lacked shape annotations for many organs and tumors. Thus, our radiologists created shapes (contour) for tumors in the liver, kidney and pancreas in these public CTs. Organ shapes were created by AI and refined by radiologists. Then, a novel AI framework faithfully converted the shapes into reports, which the radiologists revised. The study involved 12 radiologists, and the dataset has reports and shapes for 929 liver, 344 pancreatic and 1,674 kidney tumor CTs. Reports can indicate organ enlargement, steatosis and tumor type, diameter, volume, location, vessel interaction and T stage.

RESULTS

Our AI-assisted framework allowed radiologists to annotate 9,262 CT scans in six months. With our dataset, we evaluated AI models for radiology report generation. We evaluated 5 state-of-the-art AI models (CT-Chat, CT2Rep, M3D, RadFM & Merlin)—trained with the CTs and reports—and our shape-based AI. The shape-based AI surpassed the 5 state-of-the-art models. On external validation, the shape-based AI reports had sensitivity and specificity of 76.9% and 76.6% for pancreatic tumors, 94.65% and 78.3% for kidney tumors, and 84.5% and 73.3% for liver tumors. The best not shape-based AI, CT-CHAT, had reports with sensitivity and specificity of 27.5% and 73.1% for pancreatic tumors, 27% and 74.6% for kidney tumors, and 4.7% and 94% for liver tumors.

CONCLUSION

Learning from shapes strongly improves AI performance in report generation. This highlights the importance of our triplet dataset, which has shapes and reports. Moreover, our dataset increases the number of annotated tumors in public datasets: in the public domain, these 9,262 CT scans had only 944 tumor shapes; now, we provide 2,947 tumor reports and shapes for them.

CLINICAL RELEVANCE/APPLICATION

The AI's ability to accurately detect and measure tumors enhances the precision and efficiency of radiological services, allowing healthcare professionals to focus on more complex cases. Our triplet dataset with CT, shapes and reports can help the community create AI models for diverse tasks, including tumor detection, contouring and staging.

S3A-SPIN-7 A UNIFIED MODEL FOR SYNTHETIC MULTIPLANAR REFORMATION OF MULTIPLE KNEE MRI SEQUENCES

Thomas C. Arnold, PhD (*Presenter*)
Long Wang (*Abstract Co-Author*)
Lawrence N. Tanenbaum, MD (*Abstract Co-Author*)
Ajit Shankaranarayanan (*Abstract Co-Author*)

PURPOSE

Knee MRI protocols typically consist of a limited number of 2D sequences acquired in multiple orientations (axial, sagittal, coronal) and sequence types (e.g., T1w, T2w, T2w fat-sat, PD, PD fat-sat), constrained by scan time. Previously, we demonstrated that deep learning can synthesize high-resolution multiplanar reformations (MPR), enabling more comprehensive exams or faster protocols. However, the diversity of sequence combinations across sites poses a challenge for generalizing such methods. To address this, we developed a unified deep learning model capable of synthesizing 2D sequences from various combinations of paired input images, leveraging complementary contrast and plane information.

METHODS AND MATERIALS

We retrospectively analyzed 245 knee MRI exams, yielding 708 possible synthesis sets (i.e., target image, sequence match, plane match) across 26 unique sequence/plane combinations. Forty-two sets from 26 subjects (spanning 9 combinations and 3 targets: Sag PD FS, Sag T2 FS, Cor PD FS) were held out for testing. The remaining data was used for training and validation with no subjects overlapping. A patch-based neural network was trained to synthesize target images using two input images (i.e. one sequence match, one plane match). Performance was assessed using peak signal-to-noise ratio (PSNR) and structural similarity index (SSIM) against ground truth images.

RESULTS

Synthesized images preserved tissue and pathology features and showed strong similarity to standard-of-care (SOC) images, outperforming basic 2D reformats. Across all combinations, the average PSNR was 24.8±3.0 dB and SSIM was 0.81±0.05. Among individual sequence targets, Sag T2 FS achieved the highest scores (PSNR: 27.2±3.1 dB, SSIM: 0.85±0.04), followed by Sag PD FS (PSNR: 24.4±2.8 dB, SSIM: 0.81±0.06) and Cor PD FS (PSNR: 23.3±1.9 dB, SSIM: 0.79±0.04).

CONCLUSION

We demonstrate that a single model can synthesize 2D knee MRI sequences across diverse protocol combinations, offering flexibility to match site-specific imaging protocols. The model showed strong quantitative performance across 9 input combinations for 3 different target sequences. Clinically, this enables a generalized image synthesis approach that supports existing protocol combinations, eliminating the need for sites to modify their protocols to fit algorithm input requirements.

CLINICAL RELEVANCE/APPLICATION

This study presents a deep learning model that can synthesize high-quality 2D knee MRI sequences from varied input combinations, enabling clinical sites to enhance or accelerate exams without altering their existing protocols. The approach supports flexible deployment across diverse imaging practices while maintaining diagnostic image quality.

S3A-SPIN-8 AI REGULATION IN HEALTHCARE AROUND THE WORLD: WHAT IS THE STATUS QUO?

Felix Busch, MD (*Presenter*)
Raym Geis, MD (*Abstract Co-Author*)
Cheng-Yuan Wang (*Abstract Co-Author*)
Jakob Nikolas Kather (*Abstract Co-Author*)

Marcus R. Makowski (*Abstract Co-Author*)
Daniel Truhn, MD (*Abstract Co-Author*)
Warren Clements (*Abstract Co-Author*)
Lisa C. Adams, MD, PhD (*Abstract Co-Author*)
Keno K. Bressem, MD (*Abstract Co-Author*)

PURPOSE

The rapid adoption of artificial intelligence (AI) in healthcare presents challenges related to ethics, safety, equity, and governance. In many jurisdictions, AI-driven medical devices are currently covered by existing medical device frameworks; however, novel AI-specific legislation may be required to address emerging complexities.

METHODS AND MATERIALS

We conducted an expert review focusing on frameworks and legislation explicitly tailored to AI as of December 2024. This review synthesized information from research literature, government and intergovernmental framework programs, and online media coverage to compile a global overview of AI-specific regulation or strategies in healthcare.

RESULTS

Among 197 countries or territories examined, 15.2% (n=30) had enacted legally binding AI-specific legislation, including the 27 member states of the European Union (EU) following the adoption of the EU AI Act. An additional 9.1% (n=18) had drafted legislation, and 28.4% (n=56) had issued non-binding guidelines. Notably, 47.2% (n=93) did not have any AI-specific framework or legislation in place. Disparities emerged between the Global North and South, with 60.3% (n=82/136) of Global South countries or territories lacking such frameworks or legislation, compared to 18% (n=11/61) in the Global North.

CONCLUSION

Despite some progress, nearly half of the countries or territories worldwide lack AI-specific regulation or strategies in healthcare. These findings highlight significant disparities in regulatory adoption and underscore the need for enhanced intergovernmental and regional cooperation to ensure equitable, effective governance of AI in healthcare.

CLINICAL RELEVANCE/APPLICATION

Addressing these regulatory gaps is critical for mitigating risks associated with AI in healthcare, particularly in regions with limited resources. Strengthened collaboration, harmonized standards, and forward-thinking policies will be essential to safeguard patient welfare and harness AI's transformative potential.

S3A-SPIN-9 MULTI-MODAL GUIDED CROSS-DOMAIN ADAPTATION FOR ESOPHAGEAL SQUAMOUS CELL CARCINOMA DETECTION ON NON-CONTRAST CT USING DEEP LEARNING

funing Chu (*Presenter*)
Jin Rong Qu, MD (*Abstract Co-Author*)
Binbin Han (*Abstract Co-Author*)
Zhaoqi Wang (*Abstract Co-Author*)
Bingmei Bai (*Abstract Co-Author*)

PURPOSE

To develop and validate a deep learning framework using multi-modal guidance (contrast-enhanced CT [CECT], MRI) and cross-domain adaptation to improve Esophageal Squamous Cell Carcinoma (ESCC) detection on non-contrast CT (NCCT), overcoming absent contrast and domain shift issues.

METHODS AND MATERIALS

This retrospective single-center (2018-2023) IRB-approved study included 480 ESCC patients with co-registered NCCT, CECT, and MRI acquired within 14 days. Data underwent normalization and expert segmentation. A multi-modal guided cross-domain adaptation framework was built: 1) A dual-encoder teacher network (using 3D ResNet-34/Inception-DenseNet) was pretrained on CECT/MRI. 2) CycleGAN adapted CECT features to the NCCT domain unsupervisedly. 3) A lightweight nnU-Net student network, enhanced with anatomical priors and consistency regularization, was trained specifically for NCCT detection via knowledge distillation using NCCT labels and teacher pseudo-labels. The dataset was split into training (n=336), validation (n=48), and independent test (n=96) sets. Performance metrics (Dice, 95th percentile Hausdorff distance [HD95], sensitivity, false positives/scan [FP/scan]) were compared against baseline models (NCCT-only U-Net, direct fusion, Mean Teacher semi-supervised) using paired Wilcoxon tests (Bonferroni corrected $p<0.05$). Radiologist agreement was assessed (Cohen's ?).

RESULTS

On the independent test set (n=96), the proposed framework significantly outperformed baselines. It achieved a mean Dice of 0.79 (±0.11 SD), compared to 0.66 (±0.14) for NCCT-only U-Net ($p<0.001$), 0.70 (±0.13) for direct fusion ($p<0.001$), and 0.72 (±0.12) for Mean Teacher ($p<0.001$). The framework showed superior boundary accuracy (mean HD95: 5.8 mm vs 10.3 mm for NCCT-only, $p<0.001$) and higher sensitivity (86% vs 74% for NCCT-only, $p=0.002$) at a comparable false positive rate (mean 1.7 vs 2.0 FP/scan for NCCT-only, $p=0.18$). Good agreement with radiologists was observed (mean ? = 0.76).

CONCLUSION

Leveraging CECT/MRI knowledge via dedicated cross-domain adaptation and anatomical priors significantly enhances deep learning performance for ESCC detection on NCCT, surpassing models trained solely on NCCT or using simpler fusion/semi-supervised techniques.

CLINICAL RELEVANCE/APPLICATION

This AI framework improves the diagnostic utility of accessible NCCT for ESCC detection, potentially facilitating earlier diagnosis, enabling better screening, and reducing the need for contrast or resource-intensive imaging in specific clinical situations.

S3A-SPIN-10 LOCAL RADIOMICS PROBABILITY MAPS AND AUTOMATED PATIENT CLASSIFICATION FOR EARLY DETECTION OF PANCREATIC DUCTAL ADENOCARCINOMA

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Felipe Lopez-Ramirez, MD (*Abstract Co-Author*)
Alejandra Blanco (*Abstract Co-Author*)
Mohammad Yasrab (*Abstract Co-Author*)
Hajra Arshad, MD (*Abstract Co-Author*)
Zahra Rahmatullah, MD (*Abstract Co-Author*)
Linda C. Chu, MD (*Abstract Co-Author*)
Satomi Kawamoto, MD (*Abstract Co-Author*)
Elliot K. Fishman, MD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a local radiomics approach that generates voxel-wise probability maps of pancreatic ductal adenocarcinoma (PDAC) and automatically classifies patients, with the goal of improving early detection and providing decision support for radiologists.

METHODS AND MATERIALS

We retrospectively enrolled 850 patients with histologically confirmed PDAC (IQR: 2.99-5.31 cm) and 711 control subjects who underwent contrast-enhanced abdominal CT in the venous phase. Manual segmentations of the pancreas were used to generate over 60,000 volumetric patches (1000 voxels or 1 cm^3 each), from which first-order and texture radiomics features were extracted. Patches were randomly divided into training (80%) and testing (20%) sets using stratified sampling to preserve the PDAC-to-normal class ratio. A random forest classifier was trained to distinguish PDAC from normal pancreas patches and then applied across the entire segmented volume to generate voxel-wise probability maps, computing each voxel's probability as the mean of the probabilities assigned to all patches containing that voxel. Patient-level classification was defined by the presence of at least one contiguous cluster of voxels exceeding a probability threshold and corresponding to a volume = 1 cm^3.

RESULTS

On the test set, the patch-level classifier achieved 96.6% accuracy. Patient-level predictions yielded a ROC-AUC of 0.97. Using the optimal probability threshold for detecting =1 cm^3 clusters, the model correctly classified 286 (91.4%) of the 313 patients in the testing set, with a sensitivity of 0.92, and a specificity of 0.90. Voxel-wise probability maps were generated, with high-probability regions aligning with the segmented pancreatic volume, facilitating visual reclassification of PDAC cases missed by the patient-level model.

CONCLUSION

This local radiomics approach improves predictive accuracy for early PDAC detection and generates voxel-wise probability maps highlighting tumor location.

CLINICAL RELEVANCE/APPLICATION

This model not only outperforms conventional radiomics approaches but also generates voxel-wise probability maps that can be overlaid on the original CT images to localize regions of high PDAC probability, adding spatial information typically absent from radiomics models. This approach enhances radiologists' confidence in the predictive model and accelerates accurate diagnosis in patients suspected of PDAC.

S3A-SPIN-11 ORIENTATION-CONSISTENT PATCH SAMPLING METHOD BASED ON CENTERLINE FOR COLON SEGMENTATION IN CT

Ze Jin, PhD (*Presenter*)
Yanhong He (*Abstract Co-Author*)
Yafei Ou (*Abstract Co-Author*)
Pengyu Dai (*Abstract Co-Author*)
Yuqiao Yang, MS (*Abstract Co-Author*)
Kenji Suzuki, PhD (*Abstract Co-Author*)

PURPOSE

Patch-based deep learning methods have become highly effective for segmentation tasks. However, the anisotropic shapes and varying orientations of the colon introduce patch inconsistencies among patches, which slow down model learning and limit segmentation accuracy. We developed an orientation-consistent patch sampling method that mitigates this issue by sampling patches from a straightened volume generated via curved planar reformation (CPR) along the centerline of the colon in the CT volume. By sampling from straightened volumes, anatomical variations among patches are reduced, thereby enhancing model learning ability and segmentation performance.

METHODS AND MATERIALS

We used the WORD dataset for colon segmentation, which includes 68 cases without severe adhesion. All scans were acquired without appearance enhancement, with each volume comprising 159-330 slices at an in-plane resolution of 0.976 mm and a slice thickness of 2.5-3.0 mm. For each volume, the colon centerline was extracted to guide the curved planar reformation (CPR), processing into a straightened volume. Orientation-consistent (OC) patches were then sampled from the straightened volume with less anatomical and orientation variability. These OC patches were used for model training, validation, and inference. After inference, segmentation results were mapped back to the original volume space for metric computation and visualization to ensure clinical usability.

RESULTS

We evaluated our proposed orientation-consistent patch sampling method on three widely adopted segmentation models: SegResNet, Swin-UNETR, and UNETR. Significant improvements ($P < 0.05$) were consistently observed across all models, with average Dice scores increase of 2.07%, 6.35%, and 9.31% on SegResNet, Swim-UNERT, UNETR, respectively.

CONCLUSION

We developed an orientation-consistent patch sampling method for colon segmentation to address patch inconsistency caused by variations in colon orientation. The proposed method improved segmentation accuracy across three major segmentation models, offering an effective and generalizable solution for colon related tasks.

CLINICAL RELEVANCE/APPLICATION

While CPR is widely used clinically for stent planning and plaque measurement, our study introduced CPR into the pre-processing pipeline, enabling anatomically consistent patch sampling and thereby improving colon segmentation accuracy.

S3A-SPIN-12 ANNOTATION-EFFICIENT SEMI-SUPERVISED DEEP LEARNING SEGMENTATION OF FETAL LUNGS AND LIVER IN MRI

Leo Joskowicz, PhD (*Presenter*)
Aaron Olender (*Abstract Co-Author*)
Aviad Rabinowich (*Abstract Co-Author*)
Jayan Khawaja, MD (*Abstract Co-Author*)
Dafna Ben Bashat, PhD (*Abstract Co-Author*)

PURPOSE

Volumetric evaluation of the fetal lungs and liver in MRI holds potential for diagnosing various fetal conditions, e.g. pulmonary hypoplasia, congenital diaphragmatic hernia, and liver-related anomalies. However, manual annotation is impractical and automatic deep learning methods required high-quality annotated data for training, which requires expertise and is resource and time intensive. Our aim was to evaluate the performance of a new annotation-efficient semi-supervised deep learning method for accurate segmentation of the fetal lungs and liver using MRI.

METHODS AND MATERIALS

We retrospectively collected 1,085 participants who underwent fetal whole-body TruFISP MRI scanning at 30-38 weeks' gestation. We used the semi-supervised Uncertainty-guided Collaborative Mean-Teacher framework to automatically segment the fetal lungs and liver with reduced radiologists' annotation burden. It uses a multi-class 3D V-Net architecture in which a teacher network generates pseudo-labels used to train two student networks. Cross pseudo supervision was used to regularize the student networks and uncertainty-guided region mix was used for augmentation.The network was initially trained on 80 scans with manual annotations combined with 920 unlabeled scans in a semi-supervised approach. For validation, an expert reviewed and corrected the network's segmentations on the remaining 85 scans. The final model was trained using expert-validated segmentations along with 1,000 unlabeled scans, with the dataset split into 45/5/30% scans for training/validation/testing respectively. Two experts independently annotated 10 additional scans to quantify interobserver variability. Segmentation accuracy was evaluated using both the Dice score and the Average Symmetric Surface Distance (ASSD).

RESULTS

The mean inter-observer variability for the fetal lungs and fetal liver yielded a Dice of 0.86±0.02 and 0.86±0.04, and ASSD of 1.0±0.3 mm and 1.5±0.4 mm, respectively. The automatic segmentation on the test set for the fetal lungs and fetal liver yielded a Dice of 0.96±0.02 and 0.91±0.07, and ASSD of 0.3±0.2 mm and 1.3±1.0 mm, respectively.

CONCLUSION

Training an automatic segmentation using a semi-supervised model surpasses the inter-observer variability while substantially reducing the annotator time and effort. Results are demonstrated on the fetal lungs and liver. The method may be applicable to other structures.

CLINICAL RELEVANCE/APPLICATION

The method may speed up the development and deployment of deep learning models for the automatic detection and segmentation of fetal structures in MRI.

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S3A-SPIR

Interventional Radiology Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPIR-1 QUANTITATIVE THREE-DIMENSIONAL (3D) ASSESSMENT OF THE DISTRIBUTION OF ABLATIVE MARGIN IN HEPATOCELLULAR CARCINOMA AS A PREDICTOR OF COMPLETE PATHOLOGIC NECROSIS

Mahmoud Odeh, MD (*Presenter*)
Adeel R. Seyal, MD,MBBS (*Abstract Co-Author*)
Muneeb Ahmed, MD (*Abstract Co-Author*)
Ammar Sarwar, MD (*Abstract Co-Author*)

PURPOSE

To compare quantitative 2D and 3D ablation margin assessment models in their predictive ability for complete pathologic necrosis (CPN) after percutaneous thermal ablation of hepatocellular carcinoma (HCC).

METHODS AND MATERIALS

This single-center retrospective HIPAA compliant study was approved by IRB. 128 tumors in 101 patients treated with percutaneous thermal ablation that subsequently underwent liver transplantation were evaluated. All target HCC lesions on the contrast-enhanced pretreatment imaging (CT or MRI) and ablation zones on the intraprocedural post-ablation contrast-enhanced CT were segmented and registered using 3D software (MIM - Columbus, OH). The 3D distribution of ablation margin was quantified by computing the exact tumor to ablation surface Euclidean distances. Conventional side-by-side 2D assessment of the ablation margin was also performed. Multivariable logistic regression analysis with generalized estimating equations was used to create 2D and 3D models to predict CPN. The discriminating power and optimal cutoff values for predicting CPN were calculated using receiver operatic characteristic (ROC) analysis.

RESULTS

CPN was reported in 85 out of 128 tumors (66%). A baseline multivariable logistic regression model that included patient and tumor characteristics yielded tumor diameter as the only significant variable associated with CPN [OR = 0.44 (95%CI: 0.25,0.79), p = 0.006]. Adding 2D ablation margin assessment to the baseline model resulted in a slight improvement in the discriminating power [AUC (95% CI), 2D model: 0.69 (0.59, 0.8) vs. baseline: 0.68 (0.57, 0.78)]. ROC analysis yielded optimal 3D quantitative ablation margin of = 1 mm with an optimal threshold of = 66% of the tumor surface (AUC = 0.64). Addition of optimal 3D quantitative ablation margin to the baseline model yielded 3D model as superior to 2D model [AUC: 0.72 (95%CI: 0.63, 0.82); p < 0.001] in predicting CPN.

CONCLUSION

3D ablation margin of = 1 mm with at least 66% tumor surface coverage is the strongest predictor for CPN after percutaneous thermal ablation of HCC.

CLINICAL RELEVANCE/APPLICATION

3D ablation margin quantification suggests that the entire 3D circumference of the tumor does not require 5 mm margins in order to predict complete pathologic response.

S3A-SPIR-2 MR GUIDED CATHETER-BASED INTERSTITIAL BRACHYTHERAPY OF LIVER TUMOURS - INTRAPROCEDURAL IMAGE QUALITY AND LOCAL RECURRENCE RATES

Matthias P. Fabritius, MD (*Presenter*)
Max Seidensticker (*Abstract Co-Author*)
Olaf Dietrich, PhD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Daniel Puhr-Westerheide, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the intraprocedural image quality and early local recurrence rates following MR-guided catheter-based high-dose-rate interstitial brachytherapy (HDR-BT) of primary and secondary liver tumours.

METHODS AND MATERIALS

In this subanalysis of a prospective single-center study (MR BRIGHT trial), 31 patients with a total of 48 liver lesions were analysed. All patients were treated between June 2023 and April 2024 using MR-guided catheter-based HDR-BT with IR192 due to primary or oligometastatic secondary liver cancer. All procedures were performed under conscious sedation using a 1.5T MRI system (Magnetom Solafit, Siemens Healthineers) with a 15 cm loop coil and real-time gradient-echo sequences (TE 3.4 ms, TR 7.3 ms, FA 30°) for needle navigation. Gadoxetic acid was administered intravenously for lesion visualization. After coaxial needle placement, brachytherapy catheters were inserted via a 6F sheath. 3D T1-weighted sequences were acquired and sent to the treatment planning system in the radiation department for BT with a IR192 HDR afterloading unit. and 3D T1-weighted datasets were transferred for treatment planning. Tumor coverage and catheter position were evaluated based on image quality during the procedure. Follow-up imaging was performed at 1, 3, 6, and 12 months to assess local control. Intraprocedural image quality was evaluated using a 5-point Likert scale (1 = no visibility of the lesion, 5 = excellent visibility during the procedure). MR-guided procedures were compared to a propensity score-matched cohort of patients who underwent CT-guided brachytherapy.

RESULTS

Local control rate was 97.9 % after 12 months. The analysis of the intraprocedural image quality revealed a significantly superior lesion visibility in the MR-guided group, with a median Likert score of 5 compared to 1 in the CT-guided group (p < 0.001).

CONCLUSION

MR-guided catheter-based interstitial HDR brachytherapy of liver tumours provides excellent intraprocedural lesion visibility and enables precise catheter placement, resulting in a high local control rate at 12 months.

CLINICAL RELEVANCE/APPLICATION

The superior image quality of MRI during HDR brachytherapy procedures supports its use as a highly effective guidance modality for local tumour control in primary and secondary liver cancer, particularly when accurate lesion targeting is critical

S3A-SPIR-3 ULTRASOUND-GUIDED THERMAL ABLATION VERSUS SURGICAL RESECTION OF T10N0M0 PAPILLARY THYROID CARCINOMA: A META-ANALYSIS

Karabo Marole, MD (*Presenter*)

PURPOSE

To compare and contrast the efficacy of ultrasound-guided thermal ablation with surgical resection in treatment of T1N0M0 papillary thyroid carinoma

METHODS AND MATERIALS

We performed a comprehensive literature search in PubMed, Embase, and Scopus for studies comparing thermal ablation (TA) and surgical resection (SR) in patients with T1N0M0 papillary thyroid carinoma (PTC). Data was extracted from published journal articles, and quality assessment was performed per Cochrane recommendations. Odds ratios (ODs) with 95% CI were pooled across studies with dichotomous outcomes, and mean differences were used for continuous outcomes. We assessed the heterogeneity using the I^2 statistics. The primary outcomes of interest were disease progression, recurrence, complication rates, and health-related quality of life. The study was registered on PROSPERO under the identifier CRD42024546144.

RESULTS

This study incorporates findings from twelve retrospective cohort studies and included 3767 patients. Patients who underwent thermal ablation (TA) showed a similar risk of disease progression (OR 1.10; 95% CI 0.70 -1.72; p = 0.69) and disease recurrence (OR 1.61; 95% CI 0.85 -3.04; p = 0.15) to surgical resection (SR). Additionally, the risk of lymph node metastasis was reduced in the TA group (OR 0.43; 95% CI 0.22 -0.88; p <0.05). The complication rates were significantly lower in the TA group than in the SR group (OR 0.33; 95% CI 0.25 -0.44; p <0.05). Health-related quality of life was assessed using THYCA-QoL scores, which showed an overall pooled standard mean difference of -0.09 (95% CI: -0.24 -0.06; p =0.25).

CONCLUSION

Thermal ablation represents a minimally invasive alternative to surgical resection. Here, we show that TA is comparable to SR in terms of disease progression, recurrence, lymph node metastasis, and quality of life assessed with THYCA-QoL in low-risk PTC. Furthermore, TA has a reduced risk of complications compared to SR.

CLINICAL RELEVANCE/APPLICATION

Surgical resection of low-risk T1N0M0 papillary thyroid carcinoma remains a common practice despite the American Thyroid Association guidelines recommending active surveillance. However, patient factors such as anxiety often encourage patients with T1N0M0 PTC to seek more invasive surgery such as lobectomy and thyroidectomy. Here, TA represents a robust and minimally invasive alternative to surgery in the management of T1N0M0 papillary thyroid cancer.

S3A-SPIR-4 A NATIONWIDE TARGET TRIAL EMULATION ON THE TREATMENT OF PATIENTS WITH HCC AND MAIN TRUNK PVTT USING ^{125}I IRRADIATION STENTS AND COMBINED THERAPEUTIC APPROACHES (PATENCY II)

Junhao Mei (*Presenter*)
Kaizhi Jia (*Abstract Co-Author*)
Jian Lu (*Abstract Co-Author*)
Gaojun Teng (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate the safety and efficacy of combining transcatheter arterial chemoembolization (TACE) following irradiation stent placement (ISP) combined with immune checkpoint inhibitors (ICIs) plus targeted therapy (TT), compared to ICIs plus TT alone in patients with hepatocellular carcinoma (HCC) and Vp4 portal vein tumor thrombosis (PVTT).

METHODS AND MATERIALS

Retrospective cohort study with target trial emulation (TTE) framework was conducted across thirty-one centers in China. All patients with HCC and Vp4 PVTT who underwent either ISP-TACE or ICIs-TT between January 2020 and May 2023 were screened. The clone-censor-weighting (CCW) approach was utilized as the primary analysis, while overlap propensity score weighting, multi-regional cluster propensity score matching, landmark analyses, traditional Cox proportional-hazards model and traditional propensity score matching were served as sensitivity analyses to enhance the robustness of our findings. E-values were calculated across all sensitivity analyses to evaluate the influence of unobserved confounders on the treatment-outcome association. The primary endpoint was overall survival (OS), with secondary endpoints including progression-free survival (PFS) and safety.

RESULTS

Among the 444 participants (The mean (SD) age was 57.0 (10.8) years, 396 (89.2%) were male), 131 patients were enrolled in the ISP-TACE group and 313 in the ICIs-TT group. Using CCW methodology for emulated target trial analyses revealed superior survival outcomes in the ISP-TACE cohort: median OS extended to 356 days (95% CI 309-420) versus 258 days (ICIs-TT group, 95% CI 235-287), demonstrating a 35% risk reduction (HR 0.65, 0.52-0.81; log-rank P<0.0001). PFS assessments showed consistent advantages through dual criteria - 150 vs. 96 days by RECIST 1.1 (HR 0.71, 0.59-0.87; log-rank P=0.0075) and 144 vs. 93 days by mRECIST (HR 0.74, 0.61-0.90; log-rank P=0.0030). Sensitivity analyses confirmed the robustness of these primary findings. Grade =3 treatment-related adverse events were reported in 42.0% (55/131) of the ISP-TACE group participants, compared to 33.5% (105/313) in the ICIs-TT cohort (P = 0.091).

CONCLUSION

The findings of this cohort study indicate that TACE following ISP, in combination with ICIs and TT, presents a promising and well-tolerated therapeutic strategy for patients with HCC and Vp4 PVTT.

CLINICAL RELEVANCE/APPLICATION

This study presents an innovative treatment protocol for HCC patients suffering from Vp4 PVTT. The irradiation stent placement significantly enhances liver functionality and markedly prolongs patient survival. Furthermore, the therapy maintains a manageable safety profile.

S3A-SPIR-5 TEN-YEAR OUTCOMES AFTER PARTIAL NEPHRECTOMY, HEAT-BASED ABLATION, AND CRYOABLATION OF RENAL CANCER: RETROSPECTIVE COHORT STUDY OF OVER 10,000 PATIENTS

Madison Stamper, BS (*Presenter*)
Jennifer Collins (*Abstract Co-Author*)
Ronald S. Arellano, MD (*Abstract Co-Author*)
Frank Annie (*Abstract Co-Author*)
Samuel Deem (*Abstract Co-Author*)

Matthew Desanto (*Abstract Co-Author*)
Amy R. Deipolyi, MD, PhD (*Abstract Co-Author*)

PURPOSE

To compare peri-procedural outcomes and 10-year survival, metastasis risk, and reintervention rates in patients undergoing partial nephrectomy versus image-guided ablation (cryoablation and heat-based ablation) for renal cell carcinoma (RCC).

METHODS AND MATERIALS

This IRB-approved, retrospective cohort study utilized TriNetX, a multi-institutional database of deidentified electronic health records. Adult patients with RCC who underwent partial nephrectomy, cryoablation, or heat-based thermal ablation between 2004 and 2025 were identified. Exclusion criteria included prior renal procedures, malignancies, and degenerative diseases. Propensity score matching (PSM) balanced cohorts for age, comorbidities, renal function, and BMI. Outcomes assessed peri-procedural complications, ICU admission, transfusion, hospital length of stay, reintervention, long-term survival and treatment for metastatic disease. Statistical analyses included Kaplan-Meier survival curves and chi-square tests for categorical variables.

RESULTS

The cohort included 9,374 partial nephrectomy, 2,169 cryoablation, and 1,003 heat-based ablation patients. After PSM, partial nephrectomy was associated with longer hospital stays (1.2 vs. 0.4 days for cryoablation and 0.3 days for heat-based ablation; $p<0.01$), increased intensive care unit admissions (4.0% vs. 1.4% and 1.0%; $p<0.01$), and higher blood transfusion rates (4.3% vs. 1.4% and 0.9%; $p<0.01$). Ablation was associated with increased reintervention rates at 10 years (cryoablation: 13.0%; heat-based ablation: 9.6%) compared to partial nephrectomy (1.3%; $p<0.01$). Ten-year survival rates were similar across groups (partial nephrectomy: 89.4%, cryoablation: 89.2%, heat-based ablation: 87.8%; $p>0.05$).

CONCLUSION

Partial nephrectomy and image-guided ablation demonstrated comparable 10-year survival and metastasis rates for RCC. Image-guided ablation confers lower procedural morbidity but higher reintervention rates. Findings support patient-specific treatment selection considering comorbidities and procedural risks.

CLINICAL RELEVANCE/APPLICATION

This analysis provides comparative data relevant to the evolving management of RCC by analyzing matched controls to assess procedural outcomes. Using this method allows for deeper understanding of therapy alternatives suitable in the clinic setting. While the current gold standard, partial nephrectomy, was found to have lower 10-year reintervention rates, ablation resulted in fewer peri-procedural complications. Despite higher reintervention rates, ablation achieved comparable 10-year survival. These findings reinforce the importance of individualized treatments to achieve optimal outcomes.

S3A-SPIR-6 RADIOFREQUENCY ABLATION FOR PATIENTS WITH PRIMARY HYPERPARATHYROIDISM: A MULTICENTER, NON-RANDOMIZED, OPEN-LABEL, SINGLE-ARM PROSPECTIVE CLINICAL TRIAL

Eun Ju Ha, MD (*Presenter*)

PURPOSE

To evaluate the efficacy, safety, and factors influencing the response to radiofrequency ablation (RFA) in patients with primary hyperparathyroidism (PHPT) in a prospective multicenter trial.

METHODS AND MATERIALS

Between September 2022 and June 2024, 34 patients with 35 parathyroid lesions who either refused surgery or were ineligible for it underwent RFA for treatment of PHPT across three hospitals. Nodule size, volume, and biochemical data were compared before and after treatment (at 2 hours, 1 week, and 1, 3, 6, and 12 months). Complications were assessed during and after treatment. Factors influencing the treatment response to RFA for PHPT were analyzed.

RESULTS

Significant reductions in nodule size and volume, as well as improvements in serum parathyroid hormone (PTH) and total calcium levels, were noted at the 3-, 6-, and 12-month follow-ups after RFA (all $p < 0.05$). Out of the 34 patients, 17 experienced a complete response with normalized serum PTH and calcium levels (50.0%), whereas 17 showed a partial response (50.0%) (median number of sessions 1). The initial serum PTH level was a key factor associated with the treatment response to RFA, with an area under the receiver operating characteristic curve of 0.853 using a PTH cutoff value of = 118 pg/mL. Transient voice change (n=1) and hypocalcemia (n=1) were reported after the procedure.

CONCLUSION

In selected cases, RFA is a safe and effective treatment option for patients with PHPT. The initial PTH level of < 118 pg/mL is associated with achieving a biochemical cure after a single treatment.

CLINICAL RELEVANCE/APPLICATION

1. RFA has been proposed as a treatment option for patients with PHPT who refuse or are ineligible for surgery, but limited evidence requires further investigation. 2. In this prospective multicenter study, the complete response rate was 50.0%, with 79.4% showing normocalcemic changes. Baseline serum PTH level influenced treatment response.

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S3A-SPMK

Musculoskeletal Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPMK-1 PROXIMAL HUMERUS FRACTURES IN CHILDREN: DISTRIBUTION AND PREDICTORS OF SURGERY

Julian Forero, MD (*Presenter*)
Vandan Patel, BS (*Abstract Co-Author*)
Jie C. Nguyen, MD, MS (*Abstract Co-Author*)
Samuel S. Hailu, MD (*Abstract Co-Author*)
Lewis Fanney (*Abstract Co-Author*)

PURPOSE

Proximal humerus fractures (PHFs) account for about 2% of all pediatric fractures, most commonly affecting children aged 10-14, typically due to falls onto an extended, externally rotated arm. While most PHFs in children are managed nonoperatively, indications for surgical management remain debated. Thus, the purpose of this study was to characterize clinical and radiographic findings of pediatric PHFs to identify findings that are associated with surgical management.

METHODS AND MATERIALS

This IRB-approved retrospective study included children (=18 years) with radiographically confirmed PHFs, who were treated at our tertiary care children's hospital (2014-2024). Age, sex, BMI percentile, mechanism of injury, and treatment were collected. Radiographs were reviewed to collect information on skeletal maturity, physeal involvement, fracture angulation, and displacement. Demographic and imaging findings were compared between surgical and non-surgical groups using t-tests, Mann-Whitney U, and Kruskal-Wallis tests. Logistic regression models were used to identify predictors of surgery.

RESULTS

418 patients (mean age 10.5 ±7.2 years; 47% male; 350, 83.7% skeletally immature) were included. Injuries from falls were more common among younger and sports injuries among older children (8.8 vs. 12.5 years, $p<0.01$). Physeal involvement occurred in 13.4% (47/350); Salter-Harris II was the most common (85.1%, 40/47). 10.1% (42/418) underwent surgery, more likely among fractures with greater angulation (<10°: 3.0%, >70°: 50%) and displacement (0% for nondisplaced, 61.8% for 100% translation). =40° angulation, >100% translation, physeal involvement, male sex, and increasing age significantly associated with surgery. In multivariate analysis, only =40° angulation (OR 6.51; $p<0.001$), >100% translation (OR 14.01; $p<0.001$), and age (OR 1.09; $p=0.027$) were independent predictors, while falls remained protective (OR 0.20; $p=0.004$).

CONCLUSION

Angulation (=40°), translation (>100%), and age (but not physeal involvement) were independent predictors of surgery. Key clinical and imaging findings identified in this study may assist in guiding treatment decisions and prioritizing early surgical consultation for high-risk pediatric patients.

CLINICAL RELEVANCE/APPLICATION

Most pediatric proximal humerus fractures are treated nonoperatively, but certain features warrant surgical consideration. This study identifies age, =40° angulation, and >100% translation as independent predictors of surgery. Recognizing these factors early can guide decisions and prioritize surgical consultation for high-risk patients.

S3A-SPMK-3 EVALUATION OF VERTEBRAL TRABECULAR STRUCTURE USING A 24-SOURCE STATIONARY CT SYSTEM: EX VIVO AND IN VIVO FINDINGS

Mu Lin, PhD (*Presenter*)

PURPOSE

Deterioration of vertebral trabecular microstructure is a critical factor contributing to spinal fracture. Accurate visualization and quantification of trabecular microstructure are essential for assessing bone strength and fracture risk. This study aimed to (1) evaluate the accuracy of a high-resolution stationary CT prototype for assessing vertebral trabecular microstructure on vertebral specimen using micro-CT as a reference and (2) assess its feasibility for in vivo application.

METHODS AND MATERIALS

The stationary CT prototype features a dual-ring architecture with 24 X-ray sources and 64 detector modules, providing a bore size of 83 cm, a 50-cm FOV, and an isotropic voxel size of 165 μm. For ex-vivo validation, 20 dried human vertebral specimens were scanned using both the stationary CT and micro-CT (18-μm resolution). For each specimen, images from the two systems were spatially registered, and ROIs defined on micro-CT was then mapped to stationary CT image. Trabecular bone within each ROI was segmented using adaptive thresholding. Microstructural parameters, including bone volume fraction (BV/TV), trabecular thickness (Tb.Th), trabecular separation (Tb.Sp), and trabecular number (Tb.N), were extracted using custom Python script. Spearman correlations were calculated to evaluate agreement with micro-CT. For in-vivo feasibility, lumbar spine scans were acquired from 20 patients using the stationary CT system (3072×3072 matrix, 0.165-mm slice thickness, 120 kVp, 100 mAs). Parameters were calculated and compared between two age groups (<50 vs. =50 years) using Mann-Whitney U tests. A significance level of $p < 0.01$ was applied.

RESULTS

For ex-vivo validation, the stationary CT demonstrated strong correlations with micro-CT across all trabecular parameters (Spearman's $r = 0.8$). BV/TV and Tb.Th were slightly overestimated, while Tb.N was underestimated. This could be explained by partial volume effects, where thin trabeculae may be missed and adjacent trabeculae appear merged. In vivo, age-stratified analysis revealed significant trabecular deterioration in the older group ($p<0.001$): participants =50 years had lower BV/TV (19.3% vs. 21.1%), reduced Tb.Th (0.32 mm vs. 0.35 mm), decreased Tb.N (1.05/mm vs. 1.16/mm), and increased Tb.Sp (0.78 mm vs. 0.71 mm), compared to those <50 years.

CONCLUSION

The stationary CT prototype provides accurate ex-vivo quantification of vertebral trabecular microarchitecture and demonstrates feasibility in detecting age-related trabecular microstructure changes in human spine.

CLINICAL RELEVANCE/APPLICATION

By enabling in-vivo assessment of vertebral trabecular microstructure, the stationary CT system may support early detection of osteoporosis and improved prediction of fracture risk.

S3A-SPMK-4 FLAT BONE FIBROUS DYSPLASIA: CORTICAL DISCONTINUITY—RED FLAG OR BENIGN FINDING?

Samia Sayyid (*Presenter*)
Leen Alkukhun, MD (*Abstract Co-Author*)
Hakan Ilaslan, MD (*Abstract Co-Author*)

PURPOSE

To assess the imaging characteristics of pathology-proven fibrous dysplasia (FD) in flat bones and compare them to long bones, with a specific focus on the prevalence of cortical discontinuity—a feature that may raise concern for malignant transformation or low-grade central osteosarcoma.

METHODS AND MATERIALS

Following IRB approval, a musculoskeletal radiologist and a musculoskeletal radiology fellow reviewed the imaging of pathology-confirmed fibrous dysplasia (FD) cases in flat bones over the past 20 years. Imaging modalities analyzed included radiographs, computed tomography (CT), magnetic resonance imaging (MRI), and bone scintigraphy. Lesions were assessed in the sternum, ribs, scapula, clavicle, pelvic girdle, and vertebral bodies, incorporating both monostotic and polyostotic cases. Craniofacial FD cases were excluded due to their distinct radiologic and clinical features. A total of 100 biopsy-proven FD cases were reviewed, evenly distributed between flat and long bones (50 cases each). For each case, anatomical location, lesion size, presence of cortical discontinuity, and presence of an associated soft tissue component were systematically documented.

RESULTS

Fibrous dysplasia (FD) in flat bones exhibited a higher incidence of cortical interruption compared to long bones, though without an associated soft tissue mass. Furthermore, lesions exceeding 5 cm demonstrated a greater likelihood of cortical disruption, with larger lesions more frequently presenting cortical irregularities.

CONCLUSION

Fibrous dysplasia (FD) in flat bones more commonly exhibits cortical discontinuities compared to long bones, especially in larger lesions. These findings may mimic aggressive pathology or suggest malignant transformation. Recognizing these imaging characteristics is crucial to prevent misdiagnosis and ensure appropriate clinical management.

CLINICAL RELEVANCE/APPLICATION

Fibrous dysplasia in flat bones can sometimes have features that may be confused as aggressive and may alter management accordingly.

S3A-SPMK-5 DEEP-LEARNING DERIVED OPPORTUNISTIC MEASURES OF PARASPINAL MUSCLE COMPOSITION PREDICTS THORACIC VERTEBRAL BONE LOSS USING NONCONTRAST CHEST CT: THE MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS

Quincy A. Hathaway, MD, PhD (*Presenter*)
Elena Ghotbi, MD (*Abstract Co-Author*)
Tommy Pan, MD, BA (*Abstract Co-Author*)
Sara Momtazmanesh, MD (*Abstract Co-Author*)
Eduardo J. Mortani Barbosa JR, MD, MBA (*Abstract Co-Author*)
Graham Barr, MD (*Abstract Co-Author*)
David A. Bluemke, MD, PhD (*Abstract Co-Author*)
Joao A. Lima, MD (*Abstract Co-Author*)
Wendy Post (*Abstract Co-Author*)
Matthew J. Budoff, MD (*Abstract Co-Author*)
Shadpour Demehri, MD (*Abstract Co-Author*)

PURPOSE

Paraspinal muscle quality and strength is the main contributor for biomechanical load on thoracic vertebrae. However, the potential impact of paraspinal muscle composition (e.g., myosteatosis and volume) on subsequent bone loss has not been investigated. We evaluated noncontrast chest CT as an opportunistic imaging technique to assess paraspinal muscle composition biomarkers as a potential modifiable risk factor for subsequent vertebral bone loss.

METHODS AND MATERIALS

A secondary analysis of the Multi-Ethnic Study of Atherosclerosis (MESA) included 1316 participants at Exam 5 and follow-up Exam 6 (median follow-up 6.2 years). Deep learning (DL) 3D segmentation of paraspinal musculature at the T1-T10 levels was performed with TotalSegmentator v2. Participants were excluded for incomplete or missing demographic information (n = 62), and/or missing DL segmentation (n = 53). Manual segmentation (n=50 participants) was performed with Dice scores calculated. Paraspinal-derived data (including size and composition metrics) was used to predict bone loss, assigning binary classifications to participants with values =1 st quartile (i.e., "1") and >1 st quartile (i.e., "0"). Additionally, paraspinal size and composition were used to predict incident vertebral fractures at Exam 6.

RESULTS

DL-derived 3D segmentations were correlated with manual segmentations (Dice score: 0.94 [0.91-0.97]). Participants with low paraspinal muscle attenuation (HU: 1.1 [0.0-2.1], =1 st quartile) were older (70.0 yrs. [69.1-71.0] vs. 66.3 yrs. [65.7-66.8]) and more likely to be Caucasian (47% vs. 31%) and female (61% vs. 50%). Bone loss was correlated with low paraspinal muscle attenuation (176 mg/cm 3 [173-180] vs. 204 mg/cm 3 [202-207], P=0.001) and decreased paraspinal muscle volume (181 mg/cm 3 [177-184] vs. 203 mg/cm 3 [200-205], P=0.001). Paraspinal muscle attenuation combined with clinical features (i.e., Fracture Risk Assessment Tool with no BMD (FRAXnb)) better predicted incident vertebral fractures compared with FRAXnb alone (AUC: 0.80 [0.67-0.93] vs. 0.66 [0.51-0.82], P=0.001).

CONCLUSION

DL-derived 3D paraspinal muscle attenuation, rather than volume, demonstrates independent and incremental predictive value for subsequent vertebral bone attenuation loss and incident vertebral fracture.

CLINICAL RELEVANCE/APPLICATION

Routine noncontrast chest CT scans can opportunistically evaluate paraspinal muscle quality. Changes in muscle composition, rather than muscle size, may be targeted as modifiable risk factors for vertebral bone loss with available secondary preventive measures.

S3A-SPMK-6 STRUCTURED PROMPTS, SHARPER DIAGNOSES: OPTIMIZING VISION-LANGUAGE MODELS FOR EXTREMITY FRACTURE DETECTION

Janardhana Ponnatapura, MD (*Presenter*)
Praveen Shastry (*Abstract Co-Author*)
Naveen Kumarasamy (*Abstract Co-Author*)
Eswaramoorthy Sellamuthu, DNB,DMRD,MBBS (*Abstract Co-Author*)
Vishwanath Reddappagari Suryanarayana, MD, MBBS (*Abstract Co-Author*)
Bargava Subramanian (*Abstract Co-Author*)

PURPOSE

To systematically evaluate and optimize prompt engineering strategies for extremity fracture detection using vision-capable large language models (LLMs), thereby enhancing their diagnostic performance and clinical utility in musculoskeletal (MSK) imaging.

METHODS AND MATERIALS

Fifty anonymized knee radiographs (including 42 tibia, 20 femur, 24 fibula, and 12 patella fractures) were analyzed using three leading vision-enabled LLMs: GPT-4V, Claude 3.7 Sonnet, and Grok 2. Various prompting strategies were tested, including tiered prompts (ranging from generic to fully guided clinical prompts), structured versus free-text prompts, iterative refinement techniques, reference image enhancement, and noise testing. AI-generated reports were independently scored by two radiologists on fracture detection accuracy, clarity, appropriate radiological terminology, hallucination frequency, and time efficiency. Inter-rater reliability was assessed using Cohen’s kappa.

RESULTS

Structured, context-rich prompts significantly improved performance across all models. GPT-4V achieved the highest overall mean score (2.0/3.0), outperforming Claude 3.7 Sonnet (1.8/3.0) and Grok (1.5/3.0). Fully guided prompts reduced hallucinations by 42% and improved fracture detection accuracy by 45% compared to generic prompting. Structured prompts outperformed free-text prompts by 45% in detection accuracy and shortened time to acceptable reports by 34%. Reference image enhancement notably increased fracture identification, especially for complex or subtle fractures. Despite optimization, all models demonstrated limitations, particularly in detecting tibial plateau fractures and pediatric growth plate injuries.

CONCLUSION

Optimized, structured prompting moderately enhances the diagnostic performance of vision-capable LLMs in extremity fracture detection but does not yet achieve expert radiologist-level accuracy. Inclusion of clinical context, structured outputs, reference images, and explicit measurement instructions significantly improves outcomes. Nonetheless, human oversight remains essential when integrating LLMs into clinical workflows.

CLINICAL RELEVANCE/APPLICATION

This study provides a practical, evidence-based prompting framework that can enhance the utility of vision-capable LLMs for preliminary extremity fracture detection. While offering potential as assistive tools, vision LLMs currently require optimized prompting and careful validation before clinical deployment in musculoskeletal imaging.

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Multisystem Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPMS-1 DIAGNOSTIC ACCURACY OF PMFI-CEUS IN DIFFERENTIATING MELANOMA FROM OTHER SKIN TUMORS : A RETROSPECTIVE STUDY WITH HISTOPATHOLOGICAL CORRELATION

Carla Cipri, MD (*Presenter*)
Letterio Militano (*Abstract Co-Author*)
Cristian Lebrino (*Abstract Co-Author*)
Pasquale Leone (*Abstract Co-Author*)
Marcello Ferrari (*Abstract Co-Author*)
Matilde Lico (*Abstract Co-Author*)
Debora Ierace (*Abstract Co-Author*)
Francesca Puccio (*Abstract Co-Author*)
Antonella Capomolla (*Abstract Co-Author*)
Francesco Zappia (*Abstract Co-Author*)
Giovanni Petracca (*Abstract Co-Author*)
Selenia Vallone (*Abstract Co-Author*)
Ilaria Vittoria Trecroci (*Abstract Co-Author*)
Rosario Maccarone (*Abstract Co-Author*)
Francesco Loria (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic performance of parametric micro-flow imaging contrast-enhanced ultrasound (PMFI-CEUS) in differentiating melanoma from other skin tumors.

METHODS AND MATERIALS

A total of 130 patients with skin tumors were retrospectively evaluated. All patients underwent high-frequency ultrasound (HFUS) (33 MHz) and PMFI-CEUS (18 MHz). Lesion size, depth, and margins were assessed. Time-intensity curves were generated to analyze vascular patterns and contrast dynamics. All patients underwent surgical excision, and imaging findings were correlated with histopathology.

RESULTS

Histopathology identified 40 basal cell carcinomas (BCCs), 15 squamous cell carcinomas (SCCs), 15 melanomas, and 60 benign lesions. HFUS accurately assessed lesion depth with a 90% correlation to histological measurements. PMFI-CEUS revealed three distinct enhancement patterns: Pattern 1: rapid wash-in (0-18 s) and wash-out (=32 s);Pattern 2 : slower wash-in (>30 s) and wash-out (>50 s);Pattern 3 : delayed wash-in (>30 s) and wash-out (>70 s). At pathological correlation, pattern 1 was correctly identified as melanoma, pattern 2 as BCCs or SCCs and patter 3 as benign lesions. PMFI-CEUS achieved 100% of sensitivity, specificity, positive predictive value and negative predictive value in distinguishing melanomas from other lesions.

CONCLUSION

PMFI-CEUS plays a crucial role in differentiating melanoma from other skin tumors based on their vascular behavior.

CLINICAL RELEVANCE/APPLICATION

Integrating HFUS and PMFI-CEUS into dermatologic workflows allows non-invasive lesion characterization and stadiation, optimizing therapeutic planning.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

S3A-SPNMMI

Nuclear Medicine & Molecular Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPNMMI-1 FDG PET IN THE ERA OF REVOLUTIONIZED OBESITY MEDICINE

Margit Szabari, MD, PhD (*Presenter*)
Farzana Z. Ali, MD,PhD,MPH (*Abstract Co-Author*)
Mojtaba Olyaie (*Abstract Co-Author*)
Jeremie Calais, MD (*Abstract Co-Author*)
Johannes Czernin, MD (*Abstract Co-Author*)
Ali Salavati, MD, MPH (*Abstract Co-Author*)

PURPOSE

Recent advancements have significantly improved the treatment of type 2 diabetes mellitus and obesity, particularly through the development of glucagon-like peptide-1 receptor agonists (GLP-1RAs), such as semaglutide (Ozempic®, Wegovy®), a long-acting GLP-1RA, and tirzepatide (Mounjaro®), the first approved dual agonist targeting glucose-dependent insulinotropic polypeptide (GIP) and GLP-1 receptors. These medications reduce glucagon release, increase insulin secretion, and slow gastric transit time. Considering the growing use of these medications—and their effects on insulin and blood sugar—understanding their impact on FDG PET imaging is essential. This study aimed to assess the effect of these therapies on FDG PET scan quality.

METHODS AND MATERIALS

We selected 86 patients who underwent FDG PET imaging while taking Ozempic (n = 29), Wegovy (n = 28), or Mounjaro (n = 29). An age-matched group of diabetic patients not on these medications (n = 50) was selected as control. Two nuclear medicine physicians and one radiology resident visually assessed all cases. Limitations in diagnostic evaluation were recorded, and any FDG uptake in muscle was assessed. Logistic regression and subgroup analysis were performed to evaluate treatment effects and compare each drug to the control group. Maximum standardized uptake value (SUVmax) of the liver and blood pool were compared between all the treatment and control groups using independent two-tailed t-tests and in two separate univariate ANOVA models comparing each drug and the control groups.

RESULTS

No significant differences were found between the groups in average blood or liver FDG uptake ($p > 0.05$). The Ozempic group showed no increased muscle uptake, while the Mounjaro group had the highest incidence of muscle uptake (n = 14). The Wegovy group (n = 8) and the control group (n = 6) showed the least muscle uptake. No limitations were noted in the study reports regarding diagnostic accuracy. Only one patient in the control group had gastric contents, compared to 18 in the treatment group. Subgroup analysis revealed that the log odds of having gastric contents increased for Ozempic by 3.44 ($p < 0.01$), for Mounjaro by 3.51 ($p < 0.01$), and for Wegovy by 1.05 ($p > 0.05$).

CONCLUSION

These results suggest that GLP-1RAs and dual GLP-1RA/GIP-RA therapies do not significantly affect FDG biodistribution or image quality.

CLINICAL RELEVANCE/APPLICATION

For patients on these therapies requiring an FDG PET scan, no changes to scan protocol or patient preparation are recommended. However, the relatively small sample size of this single-institution study supports the need for further evaluation in a multi-institutional cohort to confirm the effects of thesemedications on FDG PET image quality.

S3A-SPNMMI-2 VIRTUAL CUTANEOUS AREA SEVERITY INDEX (VCASI): A COMPREHENSIVE METHODOLOGY FOR QUANTITATIVE SKIN DISEASE ASSESSMENT ON POSITRON EMISSION TOMOGRAPHY IMAGES

Mahdie Hosseini, MD (*Presenter*)
Aliasghar Mortazi, MSc (*Abstract Co-Author*)
Jayaram K. Udupa, PhD (*Abstract Co-Author*)
Yubing Tong, PhD (*Abstract Co-Author*)
Drew A. Torigian, MD, MA (*Abstract Co-Author*)

PURPOSE

Quantification of skin diseases such as cutaneous lymphoma or psoriasis is important for pretreatment planning and response assessment. Currently, this quantification relies on clinical assessments, which are cumbersome, error-prone, and subject to inter-reader variability. Fluorodeoxyglucose-positron emission tomography/computed tomography (FDG-PET/CT) is widely used for non-invasive detection and quantification of metabolically active disorders, providing biomarkers of disease extent, severity, and therapeutic response. However, skin disease quantification from PET/CT remains challenging, error-prone, and labor-intensive.

METHODS AND MATERIALS

We proposed a novel comprehensive methodology called virtual Cutaneous Area Severity Index (vCASI) to quantitatively assess the extent and severity of metabolically active skin disease from FDG-PET/CT. Firstly, we used an automated body region localization method, followed by a PET standardization technique to reduce interscan measurement variability. Then, we generated skin shell PET images and developed a standardized Maximum Intensity Projection (MIP) rendering technique to enable reproducible 3D visualization of the skin with disease. Finally, we introduced and validated a new scoring system (vCASI score) to measure the extent and severity of skin disease via these renderings.

RESULTS

Correlations between vCASI scores and ground-truth assessments increased following standardization of PET images, further improved with use of adjusted mean of maximum percentile intensity values as the reference point for MIP rendering, and reached as high as 0.605. Correlations between repeated vCASI score assessments for torso, thorax, abdomen, and pelvis exceeded 0.85, demonstrating high repeatability.

CONCLUSION

The vCASI methodology allows for accurate and reproducible quantitative assessment of the extent and severity of metabolically active skin diseases, such as cutaneous lymphoma and psoriasis, from FDG-PET/CT. It addresses the challenges related to body region localization, non-standardness of PET images, robust visualization, and standardized display of PET images to detect and quantify skin disease. We demonstrated that the vCASI scoring system has high repeatability and good accuracy, and is optimized by the proposed methodology.

CLINICAL RELEVANCE/APPLICATION

The vCASI overcomes the lack of a practical and validated scoring system for quantifying metabolically active skin diseases on PET images.

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S3A-SPNPM

Noninterpretive Skills (Beyond Imaging) Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPNPM-2 SUSTAINED IMPROVEMENT IN MAMMOGRAPHY POSITIONING AT MULTIPLE SITES SIMULTANEOUSLY THROUGH SHARED LEARNING

Sarah M. Pittman, MD, FRCPC (*Presenter*)
Kay Zacharias-Andrews (*Abstract Co-Author*)
Kandice Tomkins, RN, MS (*Abstract Co-Author*)
Katherine Hall (*Abstract Co-Author*)
Mythreyi Bhargavan-Chatfield, PhD (*Abstract Co-Author*)
David B. Larson, MD, MBA (*Abstract Co-Author*)

PURPOSE

To establish and sustain excellent performance in mammography positioning at multiple sites simultaneously by utilizing a structured improvement program within a learning network framework that enables participating sites to develop and implement locally successful strategies while collaborating and sharing learnings across cohorts.

METHODS AND MATERIALS

Sites are selected to participate in the ACR Mammography Positioning Improvement Collaborative on the basis of strength of local leadership support, intraorganizational relationships, access to data and analytic support, and experience with quality improvement (QI) initiatives. Cohorts of sites enter the collaborative by first participating in a structured QI program, ImPower. During ImPower, sites organize their teams, develop SMART goals, gather data, evaluate their current state, identify root causes of inconsistent mammography positioning and corresponding key drivers, and develop, test, and refine interventions. Key learnings from each cohort are shared with subsequent cohorts. The impact of interventions implemented at each site is assessed by tracking the percentage of screening mammograms meeting overall passing criteria over time.

RESULTS

All six sites selected to participate in the first cohort of the collaborative completed the QI program in November 2022, and five sites continued to report data. Eight of nine sites in the second cohort completed the program in September 2023 and four sites continued to report data. Both sites in the third cohort completed the program in July 2024. Across cohorts, the most common key driver affecting mammography positioning was developing and maintaining technologist skill, followed by agreement on image quality. From the key drivers, interventions were developed and implemented at each site, and resulted in improvement in the average percentage of screening mammograms meeting overall passing criteria from a cohort mean of 51% at baseline to 86% by the end of the QI program for cohort 1, 36% to 75% for cohort 2, and 51% to 83% for cohort 3. The cohort 1 and 2 sites that continued to report data demonstrate ongoing performance at or near target.

CONCLUSION

Using a structured QI program within a learning network framework, the first three cohorts of the ACR Mammography Positioning Improvement Collaborative collectively demonstrated improvement in mammography positioning performance with sustained improvement beyond completion of the QI program.

CLINICAL RELEVANCE/APPLICATION

Suboptimal mammography positioning can lead to undetected breast cancer. A structured QI program within a learning network framework can facilitate sustained improvement in mammography positioning at multiple sites simultaneously, across multiple cohorts.

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S3A-SPNR

Neuroradiology Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPNR-1 REGIONAL CEREBROVASCULAR REACTIVITY BIDIRECTIONAL ALTERATIONS IN HEALTHY AGING: MEDIATION BY GRAY MATTER ATROPHY AND ASSOCIATION WITH COGNITIVE PERFORMANCE

Jiajia Zhang (*Presenter*)
Xiuqin Jia (*Abstract Co-Author*)
Qi Yang, MD (*Abstract Co-Author*)

PURPOSE

Cerebrovascular reactivity (CVR) correlates with cognitive performance in neurodegenerative conditions. This study aims to assess age-related alterations in regional CVR and their relationships with gray matter (GM) and cognitive function in healthy aging.

METHODS AND MATERIALS

This cross-sectional study included 301 cognitively unimpaired participants (181 younger: 18-34 years; 120 older: 60-89 years) from Ithaca, New York, and Toronto, Canada. MRI data were acquired at the two sites using high-field 3T scanners (the GE Discovery MR750 and the Siemens TimTrio MRI, respectively) with a 32-channel head coil. All subjects underwent multi-echo resting-state blood oxygen level-dependent (BOLD) fMRI for CVR measurement and T1-weighted MPRAGE for GM quanti&7;cation. Neuropsychological assessments were conducted on 283 participants. Voxel-wise t -tests compared regional CVR between age groups, with significant clusters defined as regions of interest (ROIs). Mediation analyses examined regional GM atrophy as a mediator of the aging-CVR relationships within ROIs. Multivariable linear regression models evaluated the associations between ROI-based CVRs and cognition.

RESULTS

Compared with younger adults, older adults exhibited lower CVR mainly in the temporal, basal ganglia, cingulate, brainstem, and cerebellum regions, whereas higher CVR in the frontal, parietal, occipitotemporal, thalamus, and caudate regions. Regional GM volume loss partially mediated age-related CVR increases in the right frontal pole ($p = 0.004$) and fusiform/lingual gyrus ($p = 0.001$), as well as age-related CVR attenuations in bilateral brainstem/cerebellum vermis 45 ($p < 0.001$). The mediating proportions were 55.9%, 56.6%, and 79.2%, respectively. ROI-based CVR was associated with cognition, with most regions linked to processing speed and episodic memory, followed by executive function and semantic memory.

CONCLUSION

Resting-state CVR performed by BOLD fMRI demonstrated spatially heterogeneous age-related deficits or increases. These CVR alterations were partly attributed to regional GM atrophy and were associated with cognitive performance.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the region-specific cerebrovascular compensation mechanisms and the macrostructural-microvascular interactions in the aging brain, and support CVR as a promising biomarker of preclinical cognitive changes.

S3A-SPNR-2 AI-BASED BEHAVIORAL SEVERITY PROFILING OF AUTISM SPECTRUM DISORDER USING WHITE MATTER CONNECTIVITY FROM DIFFUSION TENSOR IMAGING

Mohamed Khudri, BSc (*Presenter*)
Mostafa Abdelrahim, BSc (*Abstract Co-Author*)
Ahmed Shalaby, PhD (*Abstract Co-Author*)
Yaser Elnakieb (*Abstract Co-Author*)
Andrew E Switala (*Abstract Co-Author*)
Ali Mahmoud (*Abstract Co-Author*)
Asem C. Ali (*Abstract Co-Author*)
Sohail G. Contractor, MD (*Abstract Co-Author*)
Gregory Barnes (*Abstract Co-Author*)
Ayman S. El-Baz SR, PhD (*Abstract Co-Author*)

PURPOSE

To extend our previous work on AI-based ASD diagnosis by developing a novel framework that leverages white matter (WM) connectivity derived from Diffusion Tensor Imaging (DTI) for both diagnostic classification and multidimensional severity profiling. The system quantifies severity across five core behavioral traits: Communication, Cognition, Motivation, Awareness, and Mannerisms.

METHODS AND MATERIALS

DTI data from five ABIDE-II sites (n=226; 126 ASD, 100 TD) underwent standard preprocessing using the FSL tool including brain extraction (BET), eddy current correction (eddy), and susceptibility distortion correction (top-up). WM areas were parcellated using the Johns Hopkins atlas. For each region, DTI metrics (FA, MD, RD, and AD) were extracted and described using three statistical descriptors: mean, standard deviation, and skewness. A two-stage feature selection was applied: (1) Univariate Feature Selection using ANOVA, chi-square, and mutual information, and (2) Recursive Feature Elimination (RFE) with cross-validation. The machine learning pipeline consisted of two phases: Phase I comprised 750 classification experiments covering all combinations of behavioral traits and severity levels using multiple machine learning classifiers. Following these experiments, statistical validation was performed across 10 confidence intervals (90%-99%) to identify the most discriminative WM regions associated with ASD. In Phase II, behavioral probabilities obtained from Phase I were utilized to train the second-stage classifiers for the final classification of ASD versus TD.

RESULTS

Phase I achieved 98% accuracy, 96% sensitivity, and 99% specificity, with awareness as the top-performing trait (98.8% accuracy using LSVM). In Phase II, the SVC achieved the highest overall performance for ASD vs. TD classification (F1 = 0.96, B-Acc = 0.93). Significant WM regions associated with ASD were identified and reported across varying confidence intervals. Case studies showed strong agreement between model predictions and clinical scores.

CONCLUSION

This study presents a validated DTI-based framework for ASD assessment, enabling reliable severity profiling across five behavioral domains through machine learning and robust feature selection. Small sample size present current limitations. Future work will explore multimodal imaging, data augmentation, and genomic correlations.

CLINICAL RELEVANCE/APPLICATION

This non-invasive, AI-based system enables accurate ASD classification and severity profiling across multiple behavioral domains, offering clinically relevant insights for early intervention and personalized care.

S3A-SPNR-3 DELTA HISTOGRAM ANALYSIS OF SYNTHETIC MRI: A METHOD FOR ASSESSING MENINGIOMA GRADE AND CELLULAR PROLIFERATION

Ye Li (*Presenter*)
Xiaofang Zhou (*Abstract Co-Author*)
Yuncong Zhao (*Abstract Co-Author*)
Yizhu Chen (*Abstract Co-Author*)
Yunjing Xue, MD (*Abstract Co-Author*)
Lin Lin (*Abstract Co-Author*)

PURPOSE

Synthetic MRI (SyMRI) can generate quantitative maps simultaneously in a single scan within a shorter time. In addition, changes in radiological features within the image before and after contrast agent injection can be reflected by delta Radiomics or delta histogram. They have shown great potential in the diagnosis, grading, typing, and prognosis assessment of tumors. This study aimed to explore the feasibility of delta histogram analysis of SyMRI in predicting the grade and cellular proliferation of meningioma.

METHODS AND MATERIALS

Consecutive 95 patients with pathologically proven meningiomas were included and divided into low-grade and high-grade group. They underwent conventional MRI and SyMRI before surgery. SyMRI sequences were performed pre- and post-contrast injection to generate quantitative maps (T1, T2, PD, T1C, T2C, PDC) via synthetic reconstruction and post-processing. Histogram parameters (18 first-order radiomics features) and delta histogram parameters (absolute and relative) were calculated from whole tumor volume analysis. Mann-Whitney U test was used to compare histogram parameters. ROC analysis assessed diagnostic efficacy of histogram parameters for differentiating meningioma grades. Spearman’s correlation coefficients analyzed the correlations between histogram parameters and Ki-67 expression.

RESULTS

High-grade meningiomas showed significantly higher T1C (Energy, Total Energy), T2C [Interquartile Range(IR), Mean Absolute Deviation (MAD),Robust Mean Absolute Deviation (rMAD)], PDC Skewness, PD skewness, dPD (IR, MAD, rMAD, Variance) and dPD% (IR, MAD, rMAD, Variance) compared to LGMs (all $P < 0.05$; AUC = 0.645 - 0.785). The 90 Percentile and Median of PD of HGMs was significantly lower than that of LGMs ($P < 0.05$; AUC = 0.658-0.666) . The combination of dPD% (IR, MAD) and PD Skewness in tumors showed the highest AUC of 0.875. Significant correlations were found between the Ki-67 index and histogram parameters of the majority of synthetic MRI (r=-0.223-0.295, all $p<0.05$).

CONCLUSION

Synthetic MRI combined with delta histogram parameters could serve as potential imaging biomarkers for the classification of meningioma grades.

CLINICAL RELEVANCE/APPLICATION

The delta histogram analysis derived from SyMRI sequences has the potential to predict the grade and proliferative activity of meningiomas. This predictive capability may play a role in facilitating personalized treatment strategies and improving prognostic assessment for patients with meningiomas.

S3A-SPNR-4 TOWARDS A NEUROIMAGING CONSENSUS FOR THE WORKUP OF ADULT GENETIC LEUKOENCEPHALOPATHIES ON BEHALF OF THE WHITE MATTER ROUNDS NETWORK: STATE OF PRACTICE

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Carla Uggetti, MD (*Abstract Co-Author*)
Jennifer Orthmann-Murphy (*Abstract Co-Author*)
Erin Longbrake (*Abstract Co-Author*)
Sridar Narayanan (*Abstract Co-Author*)
Jenny Feng (*Abstract Co-Author*)
Gabrielle Macaron (*Abstract Co-Author*)
Elka Miller, MD, FRCPC (*Abstract Co-Author*)
Roberta La Piana (*Abstract Co-Author*)

PURPOSE

Adult-onset genetic leukoencephalopathies (AOL) are frequently misdiagnosed due to their overlap with more common acquired white matter diseases. MRI remains a central tool in narrowing the differential diagnosis of white matter diseases; however, a key barrier to optimizing diagnosis is the lack of MRI protocol standardization between institutions. The White Matter (WM) Rounds Network includes radiologists, clinicians, and scientists from more than 30 centers worldwide who meet monthly to discuss undiagnosed white matter diseases. We aimed to 1. assess the state of practice of current MR protocols for investigating suspected genetic leukoencephalopathies and 2. propose a core standard protocol.

METHODS AND MATERIALS

We used a modified Delphi method to facilitate group judgements. We developed a survey and submitted it for feedback to a panel of 40 neuroradiologists, neurologists, and neuroimaging research faculty specializing in white matter disorders from 30 institutions. The final survey was circulated to the entire WM Rounds Network. The

results were analyzed, and specific recommendations were put forward during Delphi rounds, for which the stop criterion was >75% agreement for each recommendation.

RESULTS

The MR protocols in participating institutions had an average magnet time of 40 minutes (range 25-60) and all included the following sequences: sagittal 3D T1 MPRAGE and 3D FLAIR, axial T2 and T2-FLAIR, axial DWI/ADC, axial SWI, and cervical spine imaging (T1 sagittal, T2 sagittal and axial). Thoracic spine imaging was also frequently performed (20/30, 67%). All four recommendations passed the Delphi process and were proposed as follows: 1. Contrast-enhanced T1 sequences should be performed for patients with demonstrable clinical or radiological evidence of adult genetic leukoencephalopathy. 2. Lumbar MR spine imaging has limited utility. 3. Head CT is of little added value and should not be included routinely. 4. MR spectroscopy, diffusion tensor imaging, and other advanced imaging techniques are currently of limited diagnostic utility, but may be helpful in supporting a working diagnosis.

CONCLUSION

Adult onset leukoencephalopathies remain a diagnostic challenge as advancements in imaging and genetics add complexity, requiring extensive collaboration across subspecialties for accurate diagnosis. MRI plays a central role in the initial workup, and timely diagnosis necessitates proper sequence acquisition.

CLINICAL RELEVANCE/APPLICATION

The recommendations of the WM Rounds Network aim to provide a practical guideline to help standardize and improve the diagnostic yield of the initial MRI exam, help improve the time to diagnosis, while also optimizing resource utilization.

S3A-SPNR-5 MRI BIOMARKERS IN DIFFERENTIATING RRMS FROM NMOSD: DIAGNOSTIC VALUE OF CENTRAL VEIN SIGN, PARAMAGNETIC RIM LESIONS, AND CORTICAL LESIONS AND THEIR CLINICAL CORRELATES

Long Ye (*Presenter*)

PURPOSE

The central vein sign (CVS), paramagnetic rim lesions (PRLs), and cortical lesions (CLs) are promising MRI biomarkers for differentiating multiple sclerosis (MS) from neuromyelitis optica spectrum disorder (NMOSD). We evaluated the diagnostic performance of these markers, individually and in combination, and their associations with clinical disability and cognitive function.

METHODS AND MATERIALS

Seventy-two adults with relapsing-remitting multiple sclerosis (RRMS) and 51 patients with NMOSD underwent 3.0 T brain MRI. The CVS and PRLs were assessed on phase images and quantitative susceptibility mapping (QSM), while CLs were assessed on 3D T2-FLAIR. Clinical disability in RRMS patients was evaluated using the Kurtzke Expanded Disability Status Scale (EDSS). Cognitive function was measured using the Mini-Mental State Examination (MMSE), the Symbol Digit Modalities Test (SDMT), and the Montreal Cognitive Assessment (MoCA). In RRMS patients, partial correlations controlling for age and years of education examined relationships between these MRI measures and EDSS and cognitive function.

RESULTS

RRMS patients had a higher burden of CVS-positive lesions (median 10 vs. 0 per patient), PRLs (2.5 vs. 0), and CLs (3 vs. 0) than NMOSD (all $p < 0.001$). Using optimal cutoffs (>20% CVS-positive lesions, >1 CL, >1 PRL), the diagnostic performance for distinguishing RRMS from NMOSD showed sensitivities of 81.6%, 58.3%, and 83.3%, specificities of 84.3%, 94.1%, and 90.2%, and AUCs of 0.887, 0.777, and 0.892, respectively. The combination of all three markers yielded a sensitivity of 79.2%, specificity of 100%, and an AUC of 0.936. In RRMS patients, higher PRL and CL counts were associated with lower cognitive scores (all $p < 0.01$), while a higher CVS proportion and PRL count correlated with higher EDSS scores ($p = 0.001$ and 0.015, respectively).

CONCLUSION

CVS, PRLs, and CLs are more frequently observed in RRMS than NMOSD, and their combined use enhances diagnostic accuracy. PRLs and CLs are strongly associated with cognitive impairment in RRMS, underscoring the clinical value of these imaging markers in diagnosis and disease evaluation.

CLINICAL RELEVANCE/APPLICATION

MRI biomarkers including the central vein sign, paramagnetic rim lesions, and cortical lesions can improve the differentiation between RRMS and NMOSD. Their combined assessment may support more accurate diagnosis, guide treatment decisions, and provide insight into disability and cognitive impairment in RRMS patients.

S3A-SPNR-6 ASSOCIATION OF MRI INDEXES OF THE GLYMPHATIC SYSTEM AND COGNITIVE IMPAIRMENT IN PATIENTS WITH ANTI-LGI1 ENCEPHALITIS

Ziyao Liu (*Presenter*)

PURPOSE

While glymphatic dysfunction is documented in neuroinflammatory disorders like MS and NMOSD, its role in anti-LGI1 encephalitis remains unclear. This study investigated: (1) glymphatic MRI indexes (DTI-ALPS, FW-WM, PVS-VF) across disease stages; (2) their associations with limbic volumes and cognition; and (3) treatment-related changes.

METHODS AND MATERIALS

This single-center prospective study included healthy controls (HCs) and patients with anti-LGI1 encephalitis who underwent MRI and cognitive evaluation between February 2017 to August 2024. We collected basic clinical information, including neuropsychological assessments. Patients were divided into three cognitive subgroups: LGI1-NCI, no cognitive impairment (normal MoCA); LGI1-MCI, mild cognitive impairment (MoCA 18-25); LGI1-SCI, moderate-to-severe cognitive impairment (MoCA <18). For each participant, we obtained the following measures: the diffusion tensor image analysis along the perivascular space (DTI-ALPS) index, hippocampal and amygdala volumes (based on 3D T1-weighted imaging), perivascular space volume fraction (PVS-VF) , and free water in white matter (FW-WM).

RESULTS

A total of 40 patients with anti-LGI1 encephalitis (mean age, 55.9 years ± 12.7[SD]; 25 males) and 42 HCs (mean age, 50.64 years ± 12.57; 24 males) were included. Key imaging biomarkers demonstrated significant alterations in anti-LGI1 encephalitis patients compared to healthy controls (HCs). The DTI-ALPS index was markedly reduced (1.483 vs 1.671, $p<0.001$), while WM free-water fraction (WM-FW) was elevated (0.202 vs 0.165, $p<0.001$). Subgroup analysis revealed progressive DTI-ALPS reduction (LGI1-SCI:1.428 vs HCs:1.671, $p<0.001$) and WM-FW elevation (LGI1-SCI:0.225 vs HCs:0.165, $p<0.001$) correlating with cognitive severity. Bilateral hippocampal atrophy was observed (right:3.27 vs 3.49cm³, $p=0.027$; left:2.94 vs 3.22cm³, $p=0.007$), with left hippocampal volume showing significant positive correlation with DTI-ALPS ($r=0.334$, $p=0.035$) and negative correlation with WM-FW ($r=-0.329$, $p=0.038$). WM-FW additionally correlated with MMSE scores ($r=-0.338$, $p=0.033$). No significant longitudinal changes were detected in the 37.5% (15/40) patients receiving immunotherapy at median 5-month follow-up.

CONCLUSION

This study revealed: (1) impaired glymphatic activity (decreased DTI-ALPS, increased FW-WM) versus HCs; (2) MRI-cognition correlations; (3) left hippocampal volume linked to both imaging markers and cognitive scores.

CLINICAL RELEVANCE/APPLICATION

Reduced DTI-ALPS index and elevated FW-WM may reflect glymphatic dysfunction in anti-LGI1 encephalitis, providing imaging targets for monitoring disease progression and treatment response.

S3A-SPNR-7 CEREBELLAR AND CEREBRAL WHITE MATTER MYELINATION PROCESSES DISTINCTLY DIFFERENT TRAJECTORIES DURING INFANCY

Haiying Lyu, MD, BMedSc (*Presenter*)
Zhengwang Wu (*Abstract Co-Author*)
Weiyan Yin (*Abstract Co-Author*)
Gang Li, PhD (*Abstract Co-Author*)
Yong Lu (*Abstract Co-Author*)
Weili Lin, PhD (*Abstract Co-Author*)

PURPOSE

Myelination of white matter (Wm) is a key process during early human brain development. However, the potential differences of developmental paces between the cerebellum and cerebrum remain largely unknown. The T1w/T2w ratio has been well established as a surrogate marker assessing the extent of WM myelination. To this end, this study aimed to evaluate the distinct myelination development trajectories in infant cerebellum and cerebrum major white matter (WM) tracts using T1w/T2w ratio.

METHODS AND MATERIALS

206 term infants (female: n=103, median chronological age 430 days (q1 200 ; q3 603)) with a total of 816 sessions of structural brain MRI scans were retrospectively included in this study. Data were obtained from the UNC/UMN Baby Connectome Project (BCP), where images were acquired at =3, 6, 9, 12, 18, and 24 months of age using a Siemens Prisma scanner. Data were preprocessed using an infant cerebrum-dedicated pipeline (iBEAT V2.0). After skull-striping, images were resampled to 0.8 × 0.8 × 0.8 mm3, and T2w images were linearly aligned with their corresponding T1w images, and the T1w/T2w ratio were calculated. For image registration, the brain and segmented cerebellum were registered first to an intermediate subject-level template and then to standard space of MNI and SUIT template, respectively. The JHU WM atlas was warped to the individual space using inversed deformation filed to extract the T1w/T2w ratio values at major WM tracts. The trajectories of T1w/T2w ratio were modeled using generalized additive model with REML method in R.

RESULTS

The overall patterns of cerebral and cerebellar WM development were similar, with significant age-related changes in the T1w/T2w ratio in both regions (R2 0.4~0.8, $p<0.001$). The cerebellar WM tracts show higher T1w/T2w values and earlier maturation. The cerebral tracts exhibit a slower growth curve during early infancy, consistent with a protracted developmental process. For cerebellum, the WM tracts in the ventral brain tend to develop faster than the dorsal. For cerebrum, the external capsule exhibits the slowest and lowest level of myelination in comparison to other major WM tracts.

CONCLUSION

The brain myelination development trajectory is tract-specific and the cerebellum myeline matures faster than cerebrum during infancy.

CLINICAL RELEVANCE/APPLICATION

Understanding the development process of brain major WM tracts is important for distinguishing the children with potential brain developmental abnormality. Multiple brain disorders and neurodegenerative diseases might suffer from the involvement of different brain regions due to the distinct trajectories of cerebellum and cerebrum.

S3A-SPNR-8 FROM PHANTOM TO PATIENT: TOTAL MAGNETIC MOMENT ENABLES RELIABLE CEREBRAL MICROBLEED QUANTIFICATION ACROSS MRI FIELD STRENGTHS

Chao Zhang, MD (*Presenter*)
Alexey Dimov, PhD (*Abstract Co-Author*)
Yi Wang, PhD (*Abstract Co-Author*)

PURPOSE

To assess the reproducibility and field strength dependence of total magnetic moment for cerebral microbleed (CMB) quantification using Quantitative Susceptibility Mapping (QSM) in both phantom and in vivo Alzheimer's disease (AD) studies.

METHODS AND MATERIALS

Sixteen AD patients with CMBs and a microbleed phantom underwent QSM imaging on GE and Siemens scanners at 1.5T and 3.0T. QSM was processed using the mSMV method and Morphology Enabled Dipole Inversion (MEDI). CMBs were manually segmented, and total magnetic moment was calculated as susceptibility times field strength. Total magnetic moment and volume ratios were analyzed across echo times. Bland-Altman and linear regression analyses were used to assess intra- and inter-scanner reproducibility.

RESULTS

Phantom experiments at both 1.5T and 3.0T demonstrated strong interscanner agreement in total magnetic moment, confirmed by linear regression ($R^2 = 0.861$; $p < 0.001$) and Bland-Altman analysis. In vivo analysis similarly revealed excellent reproducibility of total magnetic moment across field strengths ($R^2 = 0.832$; $p < 0.001$), with minimal bias on Bland-Altman plots. Moreover, in vivo total magnetic moment remained stable across echo times ($y = -0.001x + 0.962$; $R^2 = 0.035$; $p = 0.655$), in contrast to CMB volume, which showed pronounced TE dependence ($y = 0.085x - 0.199$; $R^2 = 0.994$; $p < 0.001$).

CONCLUSION

Total magnetic moment represents a reproducible, field-strength-independent quantitative biomarker for assessing CMB burden. Its consistency across different echo times, vendors, and field strengths supports its utility in standardized, multi-center imaging protocols and its reliability in microbleed quantification.

CLINICAL RELEVANCE/APPLICATION

This study establishes total magnetic moment as a robust, quantitative imaging biomarker for evaluating CMBs across different MRI platforms. Its stability makes it a valuable tool for longitudinal and multicenter evaluation of imaging abnormalities arising from anti-amyloid therapy in AD.

S3A-SPNR-10 AUTOMATED UNIQUE LESION TRACKING (AULTRA): A FRAMEWORK FOR LONGITUDINAL LESION-WISE MORPHOMETRY ANALYSIS IN MULTIPLE SCLEROSIS

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Aaron Carass (*Abstract Co-Author*)

PURPOSE

To develop an automated tool for tracking individual multiple sclerosis (MS) lesions over time using magnetic resonance imaging (MRI).

METHODS AND MATERIALS

AULTRA Pipeline: Given longitudinal multicontrast MRI data (e.g., T1-weighted, T2-weighted, and FLAIR) for each subject, the AULTRA pipeline performs automatic, unique lesion tracking through the following steps: Longitudinal rigid-body registration with image quality enhancement; MS lesion segmentation using SELF; Lesion filling with BiDDPM; Learning-based longitudinal deformable registration; Forward-backward confluent lesion separation; and Reverse deformable registration to map results back to the original space. For each lesion, AULTRA extracts a range of quantitative metrics that characterize both internal tissue properties and morphological features. These include: 1. Lesion volume , measuring size to monitor growth or shrinkage over time; 2. T1w/T2w ratio , a semi-quantitative measure for myelin integrity derived from co-registered T1w and T2w scans at each timepoint; 3. Sphericity , quantifying how closely a lesion approximates a perfect sphere; and 4. Eccentricity , measuring deviation from circular or spherical shape, with higher values indicating more elongated or irregular structures. These metrics provide a comprehensive lesion-level profile to support individualized and temporally resolved analysis. Dataset: AULTRA was applied to an MS dataset comprising 471 subjects, each with longitudinal MRI scans across at least two timepoints. This resulted in 79,221 lesion-level observations derived from 13,748 unique lesions.

RESULTS

For each lesion, AULTRA successfully extracted quantitative metrics, including volume, T1w/T2w ratio, sphericity, and eccentricity, at each timepoint. The results demonstrated consistent lesion correspondence across time, enabling robust lesionwise temporal profiling. Visual inspection confirmed accurate tracking of lesion trajectories, even in cases of subtle morphological change.

CONCLUSION

Our results demonstrate that AULTRA enables high-resolution, lesion-specific profiling by capturing quantitative metrics of lesion size and shape across timepoints. The method reliably extracts features such as volume, T1w/T2w ratio, sphericity, and elongation from longitudinal scans, supporting detailed characterization of individual lesions in multiple sclerosis.

CLINICAL RELEVANCE/APPLICATION

Automated unique lesion tracking based on morphology and tissue integrity can help monitor MS progression and assess treatment response, providing useful biomarkers for personalized disease management.

S3A-SPNR-11 CONSTRUCTING T1-WEIGHTED CONTRAST-ENHANCED MRI IMAGES FOR GLIOBLASTOMA FROM T1-WEIGHTED IMAGES USING A VISION MODEL: A NOVEL APPROACH FOR AUTOMATIC CE IMAGING IN NEW PATIENTS

Suhrud Panchawagh (*Presenter*)

PURPOSE

Glioblastoma requires precise imaging for diagnosis and treatment. This study develops a deep learning model to synthesize contrast-enhanced T1-weighted Magnetic Resonance Imaging (MRI) from routine non-contrast T1-weighted scans, reducing gadolinium-based contrast agent use.

METHODS AND MATERIALS

Data: Paired T1-weighted and T1-weighted contrast-enhanced scans from 153 glioblastoma patients (3-Tesla MRI) were aligned using Vision Transformer and split into training, validation, and test sets. Model: A hybrid Convolutional Neural Network-Vision Transformer architecture was trained with Mean Squared Error and Structural Similarity Index Measure loss to map T1-weighted inputs to synthetic T1-weighted contrast-enhanced outputs. Evaluation: Quantitative metrics (Structural Similarity Index Measure, Peak Signal-to-Noise Ratio, Root Mean Square Error) and qualitative assessments by three blinded radiologists compared synthetic and ground-truth images.

RESULTS

High-fidelity synthesis: Structural Similarity Index Measure 0.91, Peak Signal-to-Noise Ratio 32.5 decibels, Root Mean Square Error 0.015. 94% of synthetic images were rated diagnostically viable by radiologists. The model outperformed pix2pix and CycleGAN baselines.

CONCLUSION

The model reliably generates T1-weighted contrast-enhanced images, matching diagnostic quality without contrast agents.

CLINICAL RELEVANCE/APPLICATION

Eliminates contrast use, reducing risks of nephrogenic toxicity and gadolinium deposition. Streamlines clinical workflows, particularly beneficial in resource-limited settings.

S3A-SPNR-12 LEVERAGING MRI FEATURES IN MACHINE LEARNING TO PREDICT LIMBIC-PREDOMINANT AGE-RELATED TDP-43 ENCEPHALOPATHY (LATE)

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Arnold M. Evia JR, PhD (*Abstract Co-Author*)
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David A. Bennett, MD (*Abstract Co-Author*)
Konstantinos Arfanakis, PhD (*Abstract Co-Author*)

PURPOSE

Limbic-predominant age-related TDP-43 encephalopathy neuropathologic change (LATE-NC) is a common pathologic finding in aged brain, however, definitive diagnosis of this disease is only possible at autopsy. This work aimed to develop a marker of LATE-NC based on in-vivo MRI features from a large group of community-based older adults.

METHODS AND MATERIALS

This study included ex-vivo MRI, in-vivo MRI, and pathology data from four longitudinal clinicopathological cohort studies of aging conducted at the Rush Alzheimer's Disease Center (ROS, Rush MAP, MARS, LATC). LATE-NC was evaluated based on pathologic TDP-43 inclusions in 8 brain regions and categorized into 4 stages. MRI data was processed to obtain fractional anisotropy (FA), deformation-based morphometry (DBM) measurements, and lobar volumes. To develop a marker of LATE-NC, we first trained a classifier to distinguish between advanced (stages 2-3) and early LATE-NC stages (stages 0-1) based on ex-vivo MRI features (N=863). Our classifier used a two-level stacking model for training and cross-validation, where level-1 estimators generated risk scores based on single-modality features, and level-2 estimator (logistic regression) provided the final LATE-NC prediction score based on the combined risk scores. We then translated the classifier to in-vivo and validated it on a separate set of participants (N=60) with in-vivo MRI and pathology data. The entire pipeline was packaged into an automated software container named MARBLE (MARker of Brain LatE).

RESULTS

In the training group, the ex-vivo classifier demonstrated excellent performance, achieving an average AUC of 0.85±0.05 (sensitivity=78%, specificity=76%, balanced accuracy=77%) based on FA, DBM, and lobar volume features. In-vivo validation of MARBLE scores yielded an overall AUC of 0.78 in the test group. Additionally, ordinary least-squares regression revealed higher MARBLE scores with greater LATE-NC stages ($p < 0.001$), controlling for antemortem interval (AMI) and scanners.

CONCLUSION

This study developed MARBLE, a novel, automated, in-vivo marker of LATE-NC based on MRI features. MARBLE was trained on ex-vivo MRI and pathology data from a large number of community-based older adults and showed decent performance in-vivo (AUC=0.78). Future work will explore further validation in external independent cohorts.

CLINICAL RELEVANCE/APPLICATION

Given the prevalence of LATE-NC in older adult brains and the lack of a molecule-specific biomarker, MARBLE has the potential to fill this gap and significantly improve clinical diagnosis, prevention, and treatment of this devastating disease.

S3A-SPNR-13 UNIFIED DEEP LEARNING FOR ACCURATE SEGMENTATION OF 11 CNS TUMOR TYPES BASED ON WHO CLASSIFICATION: A MULTI-SEQUENCE MRI APPROACH WITH ATTENTION AND ADAPTIVE LOSS

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Liting Guo (*Abstract Co-Author*)
Yuchi Tian (*Abstract Co-Author*)
Guangliang Ju (*Abstract Co-Author*)
Yujun Zeng (*Abstract Co-Author*)
Anrong Zeng (*Abstract Co-Author*)
Yuting Luo (*Abstract Co-Author*)
Xibiao Yang (*Abstract Co-Author*)
Liping Wang (*Abstract Co-Author*)
Xiaoyun Liang, PhD (*Abstract Co-Author*)
Qiang Yue, MD (*Abstract Co-Author*)

PURPOSE

Develop a unified deep learning model for accurate segmentation of 11 CNS tumor types using standard MRI sequences, addressing the limitations of existing single-tumor models.

METHODS AND MATERIALS

The dataset used in this study consists of 2,881 cases, including 2,049 cases from the BraTS 2023 public dataset and 697 cases from West China Hospital for training, with an additional 115 cases from the hospital reserved for testing. Each case includes four MRI sequences—T1-weighted imaging (T1WI), T2-weighted imaging (T2WI), T2-FLAIR, and contrast-enhanced T1-weighted imaging (CE-T1WI)—along with corresponding brain tumor segmentation masks. The network adopts a U-shaped architecture, incorporating a deep supervision mechanism during training. An attention mechanism is integrated into the network to facilitate the capture of tumor-specific features. Given the wide variety of tumor types and the differing imaging characteristics associated with tumor severity, particularly the issue of distribution imbalance among the whole tumor, necrotic core, and enhancing tumor regions, the Dice loss and Focal loss functions are employed for network training. Furthermore, during training, the loss weights are adaptively adjusted based on the distribution of the whole tumor, necrotic core, and enhancing tumor regions within the dataset.

RESULTS

The proposed model achieved strong overall segmentation performance, with mean Dice scores of 0.8820 for enhancing tumor (ET), 0.8503 for tumor core (TC), and 0.8121 for whole tumor (WT) across all 11 CNS tumor types. Among individual tumor categories, the model demonstrated excellent performance in segmenting glioblastoma (Dice_ET: 0.9029, Dice_TC: 0.8993), brain metastases (Dice_ET: 0.9032, Dice_TC: 0.9073), and choroid plexus tumors (Dice_ET: 0.9729, Dice_TC: 0.9565), indicating high reliability in detecting both aggressive and well-enhanced lesions. Conversely, relatively lower Dice scores were observed in glioneuronal and neuronal tumors (Dice_ET: 0.6173, Dice_TC: 0.4588), which may be attributed to their diverse imaging patterns and limited training samples. Overall, the model maintained robust performance across both adult and pediatric tumor types, showcasing its potential for broad clinical applicability.

CONCLUSION

The unified model achieves accurate segmentation across 11 CNS tumor types by integrating deep supervision, attention mechanisms, and adaptive loss weighting, showing strong generalizability on both public and clinical datasets.

CLINICAL RELEVANCE/APPLICATION

This approach enables efficient, consistent, and scalable tumor segmentation using routine MRI, supporting clinical decision-making and reducing radiologist workload.

S3A-SPNR-14 MACHINE LEARNING-BASED CLASSIFICATION OF CEREBRAL AMYLOID ANGIOPATHY USING QUANTIFIED NON-HEMORRHAGIC MRI BIOMARKERS

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John Ringman (*Abstract Co-Author*)
Jeiran Choupan (*Abstract Co-Author*)

PURPOSE

To develop and validate a machine learning model using automatically quantified non-hemorrhagic imaging biomarkers from the Boston criteria, including perivascular space (PVS) enlargement and subcortical white matter hyperintensity (WMH) burden, to predict cerebral amyloid angiopathy (CAA).

METHODS AND MATERIALS

A total of 357 imaging sessions from the NACC cohort were included, with ground-truth CAA status determined by neuropathological postmortem confirmation (207 CAA-positive, 150 CAA-negative). Structural T1-weighted MRI scans were preprocessed using the Human Connectome Project (HCP) pipeline. PVS masks were generated using a Frangi filter-based segmentation algorithm, and PVS metrics (count and volume fraction) were extracted across Desikan-Killiany atlas regions, the centrum semiovale (CSO), and major lobar regions. WMH segmentation was performed on T2-FLAIR images using a consensus approach combining SAMSEG and LST-AI, categorizing lesions as subcortical, periventricular, juxtacortical, and infratentorial. Feature selection was performed using LASSO regression. Three classifiers—Random Forest, Support Vector Machine (SVM), and XGBoost—were trained on a balanced dataset generated through SMOTETomek oversampling and evaluated using an 80/20 train-test split. The best model parameters were selected via stratified five-fold cross-validation and subsequently validated on an independent test set.

RESULTS

PVS features, including counts within the basal ganglia, cingulate, temporal, and CSO, along with subcortical WMH count, were identified as the most predictive features through LASSO-based feature selection. Using these features, Random Forest (RF) achieved the highest classification performance on the independent test set, with an accuracy of 81.2%, sensitivity of 83.1%, specificity of 72.4%, and an area under the receiver operating characteristic (ROC) curve (AUC) of 0.80 (95% CI: 0.78 ± 0.04).

CONCLUSION

Non-hemorrhagic MRI features, particularly PVS enlargement and WMH burden, enabled accurate classification of CAA pathology. Adding hemorrhagic imaging markers in future studies may further enhance model performance and facilitate more comprehensive cerebrovascular risk assessment.

CLINICAL RELEVANCE/APPLICATION

Current CAA diagnostic frameworks, including the Boston criteria, rely primarily on hemorrhagic imaging markers assessed visually. This study demonstrates that using machine learning, non-hemorrhagic MRI features, specifically PVS enlargement and WMH burden quantified through automated methods, can supplement the prediction of pathologically confirmed CAA.

S3A-SPNR-15 ASSOCIATIONS BETWEEN ANTIHYPERTENSIVE TREATMENTS AND WHITE MATTER HYPERINTENSITY PROGRESSION IN AGING: INSIGHTS FROM THE ADOPIC CONSORTIUM

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Chia-Ling Phuah (*Abstract Co-Author*)
Donna Dierker (*Abstract Co-Author*)
Jingqin Luo (*Abstract Co-Author*)
Andrei Vlassenko, MD, PhD (*Abstract Co-Author*)
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Liang Jin (*Abstract Co-Author*)
Krista Moulder (*Abstract Co-Author*)
Tammie S. Benzinger, MD, PhD (*Abstract Co-Author*)
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Jin-Moo Lee, MD, PhD (*Abstract Co-Author*)
Michael W. Weiner, MD (*Abstract Co-Author*)
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PURPOSE

White matter hyperintensities (WMH) are common in aging brains and are presumed to be of vascular origin. Hypertension is associated with WMH and intensive hypertension treatment has been shown to reduce WMH progression. In this ongoing study we leverage a large dataset of harmonized WMH and clinical data from the ADOPIC consortium to study the longitudinal associations between antihypertensive treatments and WMH progression.

METHODS AND MATERIALS

The ADOPIC dataset merges harmonized amyloid PET, brain MRI, and clinical data from 3 large aging and Alzheimer disease neuroimaging cohorts (ADNI, AIBL, and OASIS-3), enhancing longitudinal statistical power. WMH volumes were quantified using the TrUE-Net algorithm. Antihypertensive medication use and different medication classes were identified through structured queries within each cohort. Linear mixed-effects models assessed associations between antihypertensive treatment and WMH growth, using log normalized global WMH volumes and adjusting for age, sex, AD biomarkers, and cardiovascular risk. Ongoing analyses examine class-specific medication effects upon WMH dynamics.

RESULTS

Drawing from 9,229 imaging and clinical datapoints across 3,589 ADOPIC participants, this analysis included 1,243 individuals (49% female; mean age 71.7) with at least three brain MRIs. At baseline, 52% reported using antihypertensive medications, including ACE inhibitors, calcium channel blockers, and beta-blockers each in over 10% of participants. Though antihypertensive treatment was associated with greater WMH volume at baseline, it was strongly and significantly associated with reduced WMH growth over time. Preliminary findings suggest possible medication class-specific effects, currently under ongoing analysis.

CONCLUSION

In this large, harmonized dataset of aging individuals, antihypertensive treatment was associated with slower progression of WMH over time. Ongoing analyses are evaluating for potential differences across medication classes.

CLINICAL RELEVANCE/APPLICATION

Anti-hypertensive treatment is significantly associated with reduced progression of white matter hyperintensities in aging individuals. Ongoing investigation of medication class-specific effects may inform more targeted approaches to reducing vascular contributions to cognitive decline.

S3A-SPNR-16 EGFR MUTATION SUBTYPES INFLUENCE LEPTOMENINGEAL METASTASIS MRI IMAGING FEATURESAND SURVIVALOUTCOMES IN LUNG ADENOCARCINOMA

Yizhen Jia (*Presenter*)
Mei Yuan (*Abstract Co-Author*)

PURPOSE

Leptomeningeal metastasis (LM) is a severe complication in lung adenocarcinoma (LUAD), particularly in patients with epidermal growth factor receptor (EGFR) mutations. However, the relationship between different EGFR mutation subtypes, their imaging characteristics on magnetic resonance imaging (MRI), and clinical prognosis remains unclear. This study aims to investigate the imaging features and survival outcomes among patients with EGFR L858R (Exon 21), EGFR del19 (Exon 19), and those with non-classic EGFR or other mutations (NCOM).

METHODS AND MATERIALS

A total of 110 LUAD patients with CSF-confirmed LM were retrospectively analyzed and categorized into three groups: EGFR 21 (n=43), EGFR 19 (n=29), and NCOM (n=38). Kaplan-Meier analysis and cox regression analysis was used to evaluate survival outcomes, while chi-square tests were applied to compare imaging characteristics across groups.

RESULTS

Patients with EGFR 21 mutations exhibited significantly longer intracranial progression-free survival (iPFS) and overall survival (OS) compared to the NCOM group, while EGFR 19 patients showed no survival advantage over NCOM. MRI findings revealed distinct imaging patterns among mutation subtypes, with significant differences in the presence of LM, meningeal involvement patterns, and the extent of brain lobe involvement. Notably, EGFR 21 patients had fewer affected brain lobes, while EGFR 19 patients were more likely to present as LM-negative on MRI.

CONCLUSION

Our findings suggest that EGFR mutation subtypes influence both prognosis and imaging characteristics in LUAD patients with LM. The differences in MRI patterns may provide valuable insights for early diagnosis and risk stratification, aiding in personalized treatment strategies.

CLINICAL RELEVANCE/APPLICATION

The high prevalence of MRI-negative LM in EGFR exon 19-mutant patients reveals the limitations of standard imaging. Distinct MRI patterns observed across EGFR mutation subtypes could serve as imaging biomarkers for risk stratification and guide individualized therapy. Prognostically, patients with EGFR exon 21 mutations tend to have more localized and detectable LM, potentially leading to earlier intervention and better treatment response, while EGFR exon 19-mutant LM—being diffuse and MRI-negative—may be associated with delayed diagnosis and poorer outcomes. Thus, mutation-specific differences in CNS involvement not only affect therapeutic

strategies but also have important prognostic implications. Integrating molecular and imaging markers into clinical decision-making could enhance early detection, treatment precision, and ultimately improve survival outcomes for EGFR-mutant LM patients.

S3A-SPNR-17 FREE WATER CORRECTED DIFFUSION MAGNETIC RESONANCE IMAGING REVEALS CORPUS CALLOSUM MICROSTRUCTURAL ALTERATIONS IN PRESCHOOLERS WITH AUTISM SPECTRUM DISORDER

Doudou Cao (*Presenter*)
Shijun Li (*Abstract Co-Author*)

PURPOSE

This study identified preschool children with autism spectrum disorder (ASD) related white matter microstructural changes in the corpus callosum (CC) using free water corrected diffusion magnetic resonance imaging(fwc-dMRI) method that mitigates partial volume effects from extracellular free water, and localized these changes to specific CC subregions.

METHODS AND MATERIALS

Sixty-one children with ASD (6.03±1.08 years) and sixty-two typically developing (TD) children (6.49±1.45 years) were enrolled in this study. Fwc-dMRI technique, a bi-tensor tractography method, was used to investigate the white matter microstructure, which models free water and brain tissues through isotropic and anisotropic tensors to eliminate the partial volume effects caused by extracellular free water. CC was segmented into seven parts automatically according to its alignment to the cortex by a robust machine learning approach based on an anatomically curated white matter atlas (Figure 1), ensuring reproducibility and anatomical accuracy. Fwc-dMRI-derived metrics—fractional anisotropy tissue (FA t), mean diffusivity (MD t), radial diffusivity (RD t), axial diffusivity (AD t), and free water (FW)—were extracted for each CC subregion. Group differences were assessed via independent samples t-test with false discovery rate (FDR) correction for multiple comparisons.

RESULTS

Significant group differences were localized to CC6 (connecting the temporal lobes) and CC1 (projecting to the orbital lobes): compared to TD, FA t value of CC6 in ASD decreased ($t = -3.251$, $P < 0.01$, FDR-corrected), RD t value of CC6 increased ($t = 3.632$, $P < 0.01$, FDR-corrected), and FW value of CC1 decreased ($t = -3.068$, $P < 0.05$, FDR-corrected). No significant differences were observed in MD t , AD t , or other CC subregions. (Table 1).

CONCLUSION

The microstructural disruption in CC6 (reduced FA t , elevated RD t) suggests compromised myelination in temporal lobe connectivity pathways, while reduced FW in CC1 may reflect diminished neuroinflammatory activity in orbital projections. These region-specific CC alterations highlight distinct pathological mechanisms in early ASD.

CLINICAL RELEVANCE/APPLICATION

Fwc-dMRI-derived metrics of CC6 and CC1offer novel imaging biomarkers for early ASD diagnosis and monitoring of targeted interventions.

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S3A-SPOB

OB/Gynecology Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPOB-1 ADVERSARIALLY-AUGMENTED DUAL-PERTURBATION FRAMEWORK FOR SEMI-SUPERVISED SEGMENTATION IN TRANSVAGINAL FETAL ULTRASOUND

Hien Nguyen, MD (*Presenter*)
Minh Le, MD (*Abstract Co-Author*)
Tran Quoc Khanh Le (*Abstract Co-Author*)
Huy Nguyen (*Abstract Co-Author*)
Le Huu Hanh Nhi, MD (*Abstract Co-Author*)
Hien Kha (*Abstract Co-Author*)
Nguyen Phat (*Abstract Co-Author*)
Han H. Huynh (*Abstract Co-Author*)
Hoai H. Le (*Abstract Co-Author*)
Uyen Do (*Abstract Co-Author*)
THANH MINH NGUYEN (*Abstract Co-Author*)
Thach Nguyen (*Abstract Co-Author*)
Nguyen Quoc Khanh Le (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a robust semi-supervised segmentation framework for transvaginal fetal ultrasound that reduces dependence on expert-labeled data while preserving high segmentation accuracy. This framework is designed to address specific challenges in transvaginal ultrasound imaging, including low tissue contrast, acoustic shadowing, speckle noise, and ambiguous anatomical boundaries caused by probe orientation and fetal movement. By leveraging a semi-supervised learning strategy, the proposed method aims to improve generalization to unseen data and enhance the efficiency of automated fetal and cervical structure delineation.

METHODS AND MATERIALS

To address these issues, we propose UltraMatch, a semi-supervised segmentation framework designed to reduce dependence on labeled data while enhancing model robustness under challenging ultrasound conditions. UltraMatch builds upon the GapMatch approach, which applies instance perturbation (input-level augmentation) and model perturbation (e.g., dropout) to enforce prediction consistency. These perturbations work in an iterative, mutually reinforcing way to improve generalization and drive the decision boundary into low-density regions. Furthermore, to better mimic ultrasound-specific noise, UltraMatch incorporates an adversarial augmentation module based on the Iterative Fast Gradient Sign Method (I-FGSM), generating strong perturbations that simulate real ultrasound distortions.

RESULTS

We evaluated UltraMatch on the Fetal Ultrasound Grand Challenge (FUGC) dataset, focusing on segmenting the pubic symphysis and fetal head—two key anatomical structures in labor progression monitoring. Our method achieved average Dice score of 0.9583 and average Hausdorff Distance (HD) of 5.2697 , outperforming both fully-supervised baselines and several state-of-the-art semi-supervised segmentation approaches . The best performance was consistently reached after only 35 training epochs.

CONCLUSION

UltraMatch demonstrates the value of combining dual-perturbation consistency with adversarial augmentation to improve segmentation robustness and accuracy, especially in data-limited, noise-prone ultrasound scenarios.

CLINICAL RELEVANCE/APPLICATION

UltraMatch offers a practical and efficient solution for real-world ultrasound segmentation, enabling accurate localization of fetal structures with reduced annotation cost, supporting better decision-making during pregnancy and labor monitoring.

S3A-SPOB-2 ANALYSIS OF MRI FINDINGS AND FOLLOW-UP OUTCOMES IN EARLY-ONSET VERSUS LATE-ONSET FETAL VENTRICULOMEGALY/TOP NORMAL VENTRICLES

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Behnaz Moradi, MD (*Abstract Co-Author*)
Maryam Movahedi (*Abstract Co-Author*)
Masoumeh Gity, MD (*Abstract Co-Author*)
Sedigheh Hantoushzadeh (*Abstract Co-Author*)
Mahboobeh Shirazi, MD (*Abstract Co-Author*)
Mohammad Ali Kazemi, MD (*Abstract Co-Author*)
Bijan Bijan, MD, MBA (*Abstract Co-Author*)

PURPOSE

To review the prenatal MRI findings and postnatal outcomes of Early-onset versus Late-onset cerebral ventriculomegaly.

METHODS AND MATERIALS

This is a retrospective cohort study of 266 fetuses who were diagnosed with early-onset (before 24 weeks), and late-onset ventriculomegaly/top normal ventricles (at 24 weeks or later)and underwent fetal MRI over the past 8 years. patients were divided into two main groups and six subgroups (top normal, mild and severe ventriculomegaly) based on the severity of it. MRI findings and patient outcomes, including developmental disorders and fetal death, will be analyzed and compared between the groups.

RESULTS

Among the 266 infants evaluated, 197 (74.1%) were classified within the late-onset group, while 69 (25.9%) were categorized as early-onset. The analysis demonstrated that asymmetric ventriculomegaly was more commonly observed in cases of late-onset, mild to moderate ventriculomegaly, whereas bilateral ventriculomegaly was more prevalent among fetuses with early-onset and severe ventriculomegaly ($p < 0.001$). Central nervous system (CNS) and non-CNS anomalies were detected at a higher rate in the early-onset severe group ($p < 0.0001$, $p = 0.338$). Infants with late-onset and top normal ventricles were associated with higher rates of live birth and favorable neurodevelopmental outcomes. Conversely, postnatal mortality and neurodevelopmental impairment were increased in the late-onset severe ventriculomegaly group ($p < 0.0001$).

CONCLUSION

Significant differences in CNS abnormalities, non-CNS abnormalities, live birth rates, and neurodevelopmental outcomes were observed between the early and late groups, with fetuses exhibiting early and severe ventriculomegaly demonstrating the poorest prognosis across the six subgroups.

CLINICAL RELEVANCE/APPLICATION

To improve understanding of the outcomes associated with ventriculomegaly in fetuses

S3A-SPOB-3 STUDY ON THE CORRELATION BETWEEN CEREBRAL OXYGEN METABOLISM IN GRAY MATTER NUCLEI AND COGNITIVE FUNCTION CHANGES IN PREGNANT WOMEN WITH PREECLAMPSIA

Na Wang (*Presenter*)
Linfeng Yang (*Abstract Co-Author*)
Tao Chen (*Abstract Co-Author*)
Xinyue Zhang (*Abstract Co-Author*)
Qingqing Wang (*Abstract Co-Author*)
Qihao Zhang, BS (*Abstract Co-Author*)
Lingfei Guo, MD (*Abstract Co-Author*)
Yi Wang, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the changes of cerebral oxygen metabolism in the deep nucleus during pregnancy in patients with preeclampsia based on region of interest (ROI), and to analyze the relationship between the changes of cerebral oxygen metabolism and cognitive function.

METHODS AND MATERIALS

This study included 112 non-pregnant healthy controls (NPHCs), 43 pregnant healthy controls (PHCs) and 103 patients with preeclampsia aged 20 to 40 years. Quantitative susceptibility mapping plus quantitative blood oxygen level dependent magnitude (QSM+qBOLD, or QQ) were used to obtain OEF maps. Then, the hippocampus, amygdala, striatum, thalamus and nucleus accumbens were automatically segmented using freesurfer and the corresponding OEF values were extracted. Analysis of covariance (ANCOVA) was used to compare the differences in OEF values of each nucleus among the three groups. Regression analysis was used to explore the influencing factors of OEF values in preeclampsia and its correlation with cognitive function in pregnant women.

RESULTS

After Bonferroni correction, the OEF values of amygdala ($F = 5.082$, $P = 0.035$), striatum ($F = 5.681$, $P = 0.020$) and nucleus accumbens ($F = 5.254$, $P = 0.030$) in preeclampsia group were significantly higher than those in NPHCs and PHCs groups. Regression analysis showed that OEF values of amygdala ($t = 2.579$, $P = 0.012$), striatum ($t = 2.033$, $P = 0.046$) and nucleus accumbens ($t = 2.347$, $P = 0.022$) were positively correlated with hemoglobin in preeclampsia patients. Furthermore, the OEF value of striatum was positively correlated with P-tau181 ($t = 3.101$, $P = 0.003$) and negatively correlated with t-tau ($t = -2.274$, $P = 0.026$). The OEF value of amygdala was negatively correlated with fasting blood glucose ($t = -2.117$, $P = 0.038$). Cognitive correlation analysis showed that the time to complete trail making tests (TMT) B was negatively correlated with preeclampsia ($t = -3.363$, $P = 0.001$), positively correlated with the OEF value of amygdala ($t = 2.811$, $P = 0.006$), and negatively correlated with the OEF value of nucleus accumbens ($t = -2.363$, $P = 0.019$).

CONCLUSION

The present study found that OEF values in the amygdala, striatum, and nucleus accumbens were significantly increased in preeclampsia pregnant women, indicating altered regional oxygen metabolism. Although TMT-B performance appeared better in preeclampsia, his may reflect a transient compensatory response to sympathetic activation rather than true cognitive enhancement.

CLINICAL RELEVANCE/APPLICATION

This study highlights altered cerebral oxygen metabolism patterns in preeclampsia and their potential cognitive implications, offering novel insights into the neurovascular pathophysiology of pregnancy-related brain dysfunction.

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S3A-SPPD

Pediatric Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPPD-1 EFFECT OF HEPATIC IRON DEPOSITION ON HEPATOCELLULAR PHASE IMAGES IN GD-EOB-DTPA CONTRAST-ENHANCED MRI ASSESSMENT OF PEDIATRIC ONCOLOGY PATIENTS

Jun Tsukamoto, MD (*Presenter*)
Ayako Imai, MD (*Abstract Co-Author*)
Reiko Okamoto (*Abstract Co-Author*)
Mikiko Miyasaka, MD (*Abstract Co-Author*)
Yoshiyuki Tsutsumi, MD (*Abstract Co-Author*)
Takatoshi Aoki, MD, PhD (*Abstract Co-Author*)
Osamu Miyazaki, MD (*Abstract Co-Author*)

PURPOSE

To assess whether transfusion-induced hepatic iron deposition in pediatric cancer patients results in poor enhancement in the hepatocellular phase of Gd-EOB-DTPA contrast-enhanced MRI.

METHODS AND MATERIALS

This retrospective study included 100 examinations from 46 pediatric cancer patients (with hepatoblastoma, neuroblastoma, etc.), aged 0.08 - 19.08 years (mean, 4.45years), who underwent Gd-EOB-DTPA-enhanced liver MRI between January 2020 and October 2024. The signal intensity of the liver parenchyma was measured at three locations on the in-phase and out-of-phase T1-weighted images, and the median signal intensity ratio (in-phase/out-of-phase: I/O ratio) was calculated. The liver-to-portal vein signal intensity ratio (L/PV ratio) during the hepatocellular phase was also obtained. The relationship between the I/O ratio and the L/PV ratio was statistically analyzed using a linear mixed-effects model, taking into account repeated measurements. The I/O ratio was classified as in being less than 0.88 or not, based on previous literature.

RESULTS

In the linear mixed-effects model, the fixed effect of I/O ratio (less than 0.88 or not) on L/P ratio showed a significant negative association (regression coefficient: -0.10 [95% confidence interval: -1.64- -0.34], p=0.004). The number of red blood cell transfusions was significantly higher in patients with an I/O ratio < 0.88 (mean 29.5) than in those with an I/O ratio = 0.88 (mean 7.5, P < 0.01) .

CONCLUSION

Transfusion-induced hepatic iron overload is associated with reduced enhancement in the hepatocellular phase on Gd-EOB-DTPA-enhanced MRI in pediatric oncology patients. This might affect the diagnostic utility of hepatocellular imaging in this population.

CLINICAL RELEVANCE/APPLICATION

In pediatric patients with suspected transfusion-related hepatic iron deposition, hepatocellular phase images on Gd-EOB-DTPA-enhanced MRI might be suboptimal. Radiologists should consider the possibility of hepatic iron overload when interpreting such images.

S3A-SPPD-2 PEDIATRIC INCLUSION MATTERS: IMPROVING DEEP LEARNING BASED LUNG LOBE SEGMENTATION ACCURACY FOR PEDIATRIC CT WITH MINIMAL PEDIATRIC TRAINING DATA ON PHOTON COUNTING CT

Nolan Dang, BS (*Presenter*)
Nicholas Ekstrom (*Abstract Co-Author*)
Lorna Browne, MD, FRCR (*Abstract Co-Author*)
Anne Taylor (*Abstract Co-Author*)
Donglai Huo, PhD (*Abstract Co-Author*)
Wei Zhou, PhD (*Abstract Co-Author*)

PURPOSE

Lung lobe measurements such as flow perfusion from pediatric CT can provide critical evidence for managing congenital heart disease (CHD) patients. The accuracy of lobe segmentation is fundamental to the quantification accuracy. The morphological variations and positional differences in pediatric patients make the segmentation task challenging for models trained on adult data. This study is to develop and evaluate a deep learning model for accurate lung lobe segmentation for pediatric chest CT scans.

METHODS AND MATERIALS

A nnU-Net-based 3D segmentation model was initially trained on LUNA16 adult chest CT dataset (44 cases, annotated for all 5 lobes). The dataset was randomly divided into training (34), validation (5), and test (5) subsets to develop a model for adult lung lobe segmentation (A-LobeSeg). Subsequently, 6 pediatric chest CTA cases (age: 20 days ~ 8 years) acquired on a photon counting CT (Alpha, Siemens), were manually annotated for lobe segmentation. 4 pediatric cases were randomly selected and added to the adult training set, and the model was fine-tuned using combined dataset to create a comprehensive model (C-LobeSeg). The remaining 2 pediatric cases were used for independent testing. Model performance was assessed using Dice similarity coefficient (DSC), symmetric surface distance (SSD) and Hausdorff distance (HD), comparing the predicted lobe against the ground truth annotations. All processing was performed with a GeForce RTX 4070.

RESULTS

With 4 added pediatric training cases, C-LobeSeg (DSC: 0.843 ± 0.130) performed significantly better than the original A-LobSeg model (DSC: 0.475 ± 0.330) on pediatric test cases, while achieving comparable performance on adult test cases: C-LobeSeg (DSC: 0.956 ± 0.038) vs A-LobeSeg (DSC: 0.954 ± 0.038). The SSD and HD values from both models showed similar trends as DSC. Combining both adult and pediatric data, the C-LobeSeg showed higher overall accuracy (DSC: 0.924 ± 0.091) than A-LobeSeg (DSC: 0.818 ± 0.280).

CONCLUSION

Our results showed improved performance of pediatric lung lobe segmentation when including very limited pediatric data during training phase. This study proves the importance of adding pediatric-specific data when training deep learning-based networks for pediatric imaging applications.

CLINICAL RELEVANCE/APPLICATION

To the best of our knowledge, all existing lobe segmentation tools, whether FDA-approved or used off-label, were developed without incorporating pediatric data and often perform poorly on small patients' data. This study examined the impact of including pediatric cases in deep learning training and proved that inclusion of pediatric data can significantly improve performance and be used to quantify lobe specific blood flow data for CHD patients.

S3A-SPPD-3 ENHANCED DETECTION OF PEDIATRIC SKULL FRACTURE IN EMERGENCY ROOM USING MULTI-LABEL SEGMENTATION

Sungchul On (*Presenter*)
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Gyounghyun Lim (*Abstract Co-Author*)
Junhyeok Ock, MSc (*Abstract Co-Author*)
Dongyeong Kim, MD (*Abstract Co-Author*)
Gil-Sun Hong, MD, PhD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

To improve the accuracy of pediatric skull fracture detection by developing a segmentation model that incorporates cranial suture lines and skull labels to differentiate fractures from normal anatomical structures.

METHODS AND MATERIALS

We collected 180 pediatric trauma head CT scans (89 fractures, 91 normal) from a tertiary medical center and 26 scans (13 fractures, 13 normal) from the CQ500 dataset for external validation. The internal dataset was split into training, validation, and test sets (8:1:1), ensuring balanced fracture and normal case distributions. Segmentation masks for suture, fracture, and skull structures were manually generated by a fourth-year radiology resident and verified by a board-certified radiologist. Four models with different label configurations were trained to evaluate the skull fracture segmentation: (1) a fracture-only model, (2) subtracting the output of a suture line model from that of a combined skull line model, (3) a multi-label model of fracture and suture labels, and (4) an extended multi-label model with the broader anatomical context of fractures, sutures, and the skull labels. Models were trained with the 3D nnU-Net framework for 500 epochs with batch size 1 and a combined Dice and focal loss. Metrics included Dice scores, bounding box IoU, and rule-based classification (fracture-positive if any fracture region was detected) with sensitivity, specificity, and accuracy.

RESULTS

The 3rd and 4th models achieved the highest performance, with bounding box IoUs of 63.43% and 70.01% and fracture segmentation Dice scores of 48.67% and 42.61%. Despite the lack of statistical significance between their segmentation performances, both models outperformed the 1st and 2nd models (Label Dice: 40.16%, 37.71%; BBox IoU: 56.01%, 47.29%). For classification, both 3rd and 4th models achieved a sensitivity of 100%. However, the 4th model showed better specificity (72.7% vs. 36.4%), fewer false positives (3 vs. 7), and a higher accuracy (85% vs. 65%) compared to the 3rd model. Although the difference in specificity was not statistically significant ($p = 0.199$), the 4th model identified twice as many true negatives (8 vs. 4), indicating better clinical reliability. External validation further confirmed the robustness of the 4th model with an accuracy of 84%.

CONCLUSION

This model enables automated skull fracture detection in pediatric emergency cases, improving the identification of subtle fractures from normal anatomical structures.

CLINICAL RELEVANCE/APPLICATION

AI-assisted detection of skull fractures in pediatric head CT enhances diagnostic accuracy by highlighting overlooked regions, reducing missed injuries in emergency pediatric head trauma cases.

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S3A-SPPH

Physics Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPPH-2 EARLY DETECTION OF CORONARY ARTERY DISEASE USING PHYSICS-INFORMED MULTI-MATERIAL DECOMPOSITION IN PATIENTS WITH ZERO CALCIUM SCORE

Dale Black, BS (*Presenter*)
Christine Nguyen (*Abstract Co-Author*)
Sabee Y. Molloi, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate if Physics-Informed Multi-Material Decomposition (PiMMD) identifies risk for future coronary artery calcium (CAC) progression and Major Adverse Cardiovascular Events (MACE) in patients with zero Agatston score, compared to conventional single energy multi-material decomposition (SE-MMD).

METHODS AND MATERIALS

A previously proposed physics-informed neural network (PiMMD) was used. This network decomposes single-energy CT images into 5 basis materials per voxel (calcium, collagen, water, lipid, air) using a physics-informed loss function. Its architecture, trained with high-fidelity ground truth data, overcomes the two-material per-voxel limitation of conventional SE-MMD. The PiMMD network was applied to baseline scans from the Multi-Ethnic Study of Atherosclerosis (MESA) cohort. Patients from this cohort were grouped into five categories: 1 (high Agatston, MACE+), 2 (moderate Agatston, MACE+), 3 (baseline Agatston=0, follow-up Agatston>0, MACE+), 4 (baseline Agatston=0, follow-up Agatston=0, MACE-), and 5 (high Agatston, MACE-). PiMMD and SE-MMD derived Calcium and Collagen mass were compared between all groups. Primary analysis focused on discriminating these mass measurements between Category 3 (N=10) and Category 4 (N=15), the key groups with identical baseline Agatston=0 but divergent outcomes, via ROC analysis (AUC).

RESULTS

Comparing these zero-baseline groups, PiMMD Calcium mass trended higher in the progression group vs stable controls (Mean±SD: 20.5±43.7 vs 5.5±10.8 mg). PiMMD Collagen mass also trended higher (7.9±24.7 vs 0.1±0.1 mg). SE-MMD showed a similar trend for Calcium mass (19.7±33.4 vs 10.5±11.2 mg) but minimal difference for Collagen mass (5044.3±2336.2 vs 4921.8±1666.9 mg), with high absolute values reflecting noise amplification inherent to the method. For these groups, indistinguishable by their identical zero Agatston scores, ROC analysis showed PiMMD Calcium (AUC=0.613) and Collagen (AUC=0.543) outperformed chance (AUC=0.50) and SE-MMD (Calcium AUC=0.467; Collagen AUC=0.507). Qualitative examples demonstrate PiMMD's superior noise suppression and material specificity, revealing subtle calcifications and associated collagen deposits that remain obscured by noise in SE-MMD.

CONCLUSION

Baseline PiMMD Calcium and Collagen measurements show potential to differentiate progressing from stable zero-Agatston score patients, outperforming SE-MMD. This AUC improvement suggests PiMMD may detect subclinical disease missed by conventional methods, warranting larger studies.

CLINICAL RELEVANCE/APPLICATION

PiMMD analysis of conventional CT scans may improve risk stratification beyond Agatston scoring by identifying subclinical plaque in zero Agatston score patients.

S3A-SPPH-3 LITA: LIVER TUMOR DIAGNOSIS ON MULTI-PHASE CONTRAST-ENHANCED CT WITH THREE CLINICALLY VALUABLE TASKS

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ZHANG XIAOMING (*Abstract Co-Author*)
Xiaoli Yin (*Abstract Co-Author*)
Wei Liu, MSc (*Abstract Co-Author*)
Xu Han (*Abstract Co-Author*)
Chunli Li (*Abstract Co-Author*)
Ling Zhang (*Abstract Co-Author*)
Ke Yan (*Abstract Co-Author*)
Yu Shi, MD (*Abstract Co-Author*)

PURPOSE

We present a novel deep learning framework called LITA (LIver Tumor diAgnosis network) for accurate differential diagnosis of liver tumors using multi-phase contrast-enhanced computed tomography (CECT). LITA is used in three diagnostic tasks: cirrhotic liver nodule evaluation, metastatic lesion detection, and early-stage HCC detection.

METHODS AND MATERIALS

LITA employs a dual-headed architecture featuring a segmentation head for lesion delineation and a classification head for patient-level diagnosis. It was trained using a dataset with 2,330 CECT from two centers, with 12,302 meticulously annotated lesions across eight categories (HCC, cholangiocarcinoma, metastasis, hemangioma, cyst, FNH, calcification, and others). We further enhanced the model by incorporating patient clinical history data to improve diagnostic accuracy.

RESULTS

In cirrhotic liver nodule characterization (n=100, 50 benign vs. 50 malignant), LITA achieved good performance (sensitivity: 0.943, specificity: 0.875) compared to both junior radiologists (=10 years' experience; sens: 0.577, spec: 0.921) and senior radiologists (>10 years; sens: 0.652, spec: 0.951). For liver metastasis detection (n=60, 30 positive), LITA's performance is (sens: 0.920, spec: 0.857), while radiologists' performance is junior (sens: 0.563, spec: 0.750) and senior radiologists (sens: 0.737, spec: 0.888). For early-stage HCC (<2cm) detection (n=150, 50 positive), LITA achieved a sens. of 0.930, spec. of 0.860, comparable to senior radiologists reading contrast-enhanced MR. Through score-level fusion of imaging and clinical features, the system achieved further improvements in diagnostic accuracy, with AUCs increasing from 0.945 to 0.964 for HCC and 0.929 to 0.964 for metastasis detection.

CONCLUSION

LITA demonstrates good performance in three clinically valuable diagnostic scenarios, namely cirrhotic liver nodule evaluation, metastatic lesion detection, and early-stage HCC detection, where traditional radiological interpretation is challenging. In all tasks, LITA's sensitivity significantly surpasses junior and senior radiologists. The system's ability to effectively integrate clinical information with imaging features through score-level fusion further enhances its diagnostic capability.

CLINICAL RELEVANCE/APPLICATION

LITA provides radiologists with a diagnostic aid for liver tumor detection and characterization, potentially expediting workflow and improving diagnostic confidence. The system's high sensitivity for malignant cirrhotic liver nodule identification, metastasis detection, and early HCC detection may be particularly valuable for screening high-risk populations, enabling earlier intervention and improved patient outcomes.

S3A-SPPH-4 INCORPORATING CLINICAL KNOWLEDGE INTO AI-DRIVEN PRECISE LIVER FIBROSIS STAGING USING NON-CONTRAST CT

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Yuan Gao, MSc, PhD (*Abstract Co-Author*)
ZHANG XIAOMING (*Abstract Co-Author*)
Wei Liu, MSc (*Abstract Co-Author*)
Ke Yan (*Abstract Co-Author*)
Yu Shi, MD (*Abstract Co-Author*)

PURPOSE

We developed and validated a large-scale multi-center non-contrast (NC) CT-based model for liver fibrosis staging, integrating liver segments into the network to capture shape and texture variations among different liver segments.

METHODS AND MATERIALS

Our study used 2,178 patients from center A for development, 572 patients with NC-CT and biopsy-confirmed fibrosis stages for internal validation, and an external cohort of 1,542 patients from 7 centers for generalizability test. We trained a liver segment segmentation model to integrate clinical knowledge into the model as the shape and size of liver segments is correlated with fibrosis. We concatenate the segment mask with NC-CT and then input them into a network combining a Convolutional Neural Network (CNN) and a Vision Transformer (ViT), enhanced with a Mixture of Experts system (MoE), for fibrosis classification. Model performance was gauged using the area under the receiver operating characteristic curve (AUC).

RESULTS

For the classification of F0-F1 vs. =F2 fibrosis grades, the AUCs were 0.843 and 0.865 for internal and external test cohorts, respectively; for F0-F2 vs. =F3, the AUCs were 0.916 and 0.914; and for F0-F3 vs. F4 (cirrhosis), the AUCs reached 0.939 and 0.916. Moreover, the model also showed good diagnostic performance in both chest and abdominal NC-CT subgroups. Notably, our approach demonstrated superior performance compared to Ultrasonic Transient Elastography (UTE) and five serological methods, with the observed differences reaching statistical significance.

CONCLUSION

Integrating clinical knowledge with CNN, ViT, and an MoE system, our proposed model accurately captures liver texture, shape, and size, outperforms UTE and serological methods in multi-cohort fibrosis staging (especially with chest NC-CT), providing a reliable non-invasive diagnostic alternative, and enables early screening across clinical settings.

CLINICAL RELEVANCE/APPLICATION

This study presents a novel, large-scale, multi-center validated model for liver fibrosis staging using NC-CT. By incorporating liver segment information and advanced neural network architectures, the model provides accurate and consistent results across diverse patient cohorts. This non-invasive approach may reduce the need for liver biopsies, avoiding patient discomfort and potential complications. Moreover, its superior performance compared to serological methods suggests that it could serve as a practical and efficient tool in clinical settings, facilitating early detection and management of liver fibrosis, and ultimately improving patient outcomes.

S3A-SPPH-5 WHOLE-LUNG DYNAMIC PERFUSION AREA-DETECTOR CT IN NON-SMALL CELL LUNG CANCER WITH PROGRESSIVE FIBROSING INTERSTITIAL LUNG DISEASE

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Daisuke Takenaka, MD (*Abstract Co-Author*)
Yasuko Fujisawa, MS (*Abstract Co-Author*)
Takeshi Yoshikawa, MD (*Abstract Co-Author*)
Kenji Fujii (*Abstract Co-Author*)
Yuya Ito (*Abstract Co-Author*)
Hirona Kimata (*Abstract Co-Author*)
Naruomi Akino (*Abstract Co-Author*)
Takahiro Ueda, MD, PhD (*Abstract Co-Author*)
Masahiko Nomura, MD, PhD (*Abstract Co-Author*)
Yoshiyuki Ozawa, MD, PhD (*Abstract Co-Author*)

PURPOSE

Since 2011, dynamic first-pass CE-perfusion area-detector CT (ADCT) has been in use for CT-based real perfusion matrix evaluation of not only nodules, but also lung cancer management. However, this technique has not been tested for evaluating the dynamic first-pass CE-perfusion matrix based on lung parenchymal changes and disease severity of lung parenchyma diseases. The purpose of this study was to determine the capability of whole-lung dynamic contrast-enhanced (CE-) perfusion area-detector CT (ADCT) for detecting pathological structural changes in stage I non-small cell lung cancer (NSCLC) patients.

METHODS AND MATERIALS

Sixty-three consecutive stage I NSCLC patients with progressive fibrosing interstitial lung disease (PF-ILD) underwent dynamic CE-perfusion ADCT examinations at two or three stations as a single examination, analyzed by dual-input maximum slope (DMS) methods, generated whole-lung total, pulmonary arterial and systemic arterial perfusion (TP DMS , PAP DMS and SAP DMS) maps, surgical treatment and pathological examination. Multicentric ROIs were then placed over sites assessed as normal lung, pulmonary emphysema, GGO or reticular pattern without traction bronchiectasis, reticular pattern with traction bronchiectasis and honeycombing in the resected lung. Next, an analysis of variance (ANOVA) followed by Tukey's honest significant difference (HSD) multiple comparison test was performed for a comparison of each of the perfusion parameters for five groups. Finally, discrimination accuracy for evaluation of lung parenchymal change was compared for all indexes and combined methods.

RESULTS

PAP DMS s of abnormal lungs were significantly lower than that of normal lungs ($p<0.0001$). SAP DMS s of normal or emphysematous lungs were significantly lower than those of others ($p<0.0001$). SAP DMS of GGO or reticular pattern without traction bronchiectasis was significantly lower than that for reticular pattern with traction bronchiectasis and honeycombing ($p<0.0001$). Discrimination accuracy of combined perfusion index was significantly higher than that of each index ($p<0.0001$).

CONCLUSION

Whole-lung dynamic CE-perfusion ADCT is useful for detecting pathological structural changes in stage I NSCLC patients with PF-ILD.

CLINICAL RELEVANCE/APPLICATION

Whole-lung dynamic CE-perfusion ADCT is useful for detecting pathological structural changes in stage I NSCLC patients with PF-ILD.

S3A-SPPH-6 COMPARISON OF CAPABILITY FOR POSTOPERATIVE RECURRENCE PREDICTION WITH MOLECULAR-BASED INFORMATION AMONG SINGLE AND MULTIPARAMETRIC MRIS AND FDG-PET/CT IN STAGE I NON-SMALL CELL LUNG CANCER PATIENTS

Yoshiharu Ohno, MD, PhD (*Presenter*)
Masao Yui (*Abstract Co-Author*)
Kaori Yamamoto (*Abstract Co-Author*)
Natsuka Yazawa (*Abstract Co-Author*)
Masato Ikedo (*Abstract Co-Author*)
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Yoshiyuki Ozawa, MD, PhD (*Abstract Co-Author*)

PURPOSE

To compare the quantitative prediction capability for postoperative recurrence with molecular-based imaging information among single and multiparametric MRIs with chemical exchange saturation transfer (CEST) imaging and diffusion-weighted imaging (DWI) and FDG-PET/CT in stage I non-small cell lung cancer (NSCLC) patients.

METHODS AND MATERIALS

79 pathologically diagnosed and surgically treated NSCLC patients underwent CEST imaging, DWI and FDG-PET/CT as preoperative examinations, follow-up and pathological examinations. According to the follow-up and pathological examination results, all patients were divided as recurrence (n=13) and non-recurrence (n=66) groups. In each lesion, magnetization transfer ratio asymmetry at 3.5ppm (MTR asym), apparent diffusion coefficient (ADC) and SUV max of each nodule were assessed by ROI measurements. To compare all indexes between two groups, Student's t-test was performed. To determine the significant predictors from each index as well as other clinical information, multiple logistic regression analysis was performed among all indexes. Then, ROC analysis was performed to compare distinguishing two groups among all indexes and combined significant predictors. Finally, sensitivity (SE), specificity (SP) and accuracy (AC) were compared among all methods by McNemar's test.

RESULTS

There was significant difference of each index between two groups ($p<0.05$). Multiple logistic regression analyses determined MTR asym (Odds ratio [OR]: 1.31, $p=0.03$) and ADC (OR: 0.002, $p=0.008$) as significant predictors in this setting. When applied each feasible threshold value, SPs and ACs of MTR asym (SP: 81.8%, AC: 82.2%), ADC (SP: 87.9%, AC: 86.1%) and combined predictors (SP: 89.4%, AC: 89.9%) were significantly higher than those of SUV max (SP: 69.7%, $p<0.05$; AC: 72. %, $p<0.05$). Moreover, AC of combined predictors was significantly higher than that of MTR asym ($p=0.03$).

CONCLUSION

Single and multiparametric MRIs with CEST and DWI had better potential for postoperative recurrence prediction than FDG-PET/CT in stage I NSCLC patients. Moreover, DWI can improve prediction capability of CEST imaging in this setting.

CLINICAL RELEVANCE/APPLICATION

Single and multiparametric MRIs with CEST and DWI had better potential for postoperative recurrence prediction than FDG-PET/CT in stage I NSCLC patients. Moreover, DWI can improve prediction capability of CEST imaging in this setting.

S3A-SPPH-7 IMPROVING IMAGE QUALITY OF 40-KEV MONOENERGETIC IMAGES IN LOWER EXTREMITY DUAL-ENERGY CT VENOGRAPHY USING DEEP LEARNING IMAGE RECONSTRUCTION

Yanan Li (*Presenter*)
Jianxin Guo (*Abstract Co-Author*)

PURPOSE

To evaluate the usefulness of deep learning image reconstruction (DLIR) to improve the image quality of 40-keV monoenergetic images in the lower extremity dual-energy CT venography (DECTV).

METHODS AND MATERIALS

32 patients ((14 women and 18 men; mean age, 57.56±14.50 years; range, 28-75 years; mean body mass index, 24.54±2.72 kg/m 2) with suspected lower extremity varix and DVT underwent DECTV were enrolled. Monochromatic images obtained at 40keV were reconstructed using ASIR-V50%, DLIR at medium-, and high-intensity levels (DLIR-M, and DLIR-H) at 1.25mm. CT attenuation and standard deviation (SD) were measured in regions of interest (ROI) in the following locations: inferior vena cava (IVC), right femoral vein (FV), right popliteal vein (PV), and homogeneous subcutaneous fat and adductor muscle at the mid-level of the medial thigh. The signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) were calculated. The overall image quality and diagnostic confidence were scored on a 5-point scale. The repeated measures ANOVA test and Friedman test with the Bonferroni post-hoc test were performed to compare objective and subjective results.

RESULTS

There were no significant differences in CT values of IVC, FV, PV and adductor muscle among all reconstruction algorithms as shown in Table1. DLIR significantly reduced image noise compared to ASIR-V 50%, resulted in significantly higher SNR and CNR values (all $p < 0.001$). For DLIR-H, the CNR values of IVC, FV and PV at 40 keV images were improved by 78.08±9.28%, 78.52±9.51%, and 78.40±9.28%, respectively compared to ASIR-V 50%. The overall image quality and diagnostic confidence of DLIR was rated higher than ASIR-V 50%, with DLIR-H having the highest image quality score.

CONCLUSION

Compared to ASiR-V50% images, DLIR images had higher CNR and diagnostic confidence with lower image noise in 40-keV lower extremity DECTV, and DLIR-H provides the best overall image quality and highest diagnostic confidence.

CLINICAL RELEVANCE/APPLICATION

Deep learning image reconstruction (DLIR) is useful for reducing image noise and improving the CNR of 40keV monochromatic images in lower extremity dual-energy CT venography.

S3A-SPPH-9 OPPORTUNISTIC OSTEOPOROSIS DIAGNOSIS USING TEXTURE-PRESERVING SELF-SUPERVISED PRE-TRAINING AND MULTI-TASK FINE-TUNING WITH MIXTURE OF EXPERTS

Minfeng Xu (*Presenter*)
Jiaxing Huang (*Abstract Co-Author*)
Heng Guo, MS (*Abstract Co-Author*)
Jinrong Yang (*Abstract Co-Author*)
Le Lu (*Abstract Co-Author*)

Fan Yang, MD (*Abstract Co-Author*)
Wei Luo (*Abstract Co-Author*)

PURPOSE

Osteoporosis is a highly prevalent yet underdiagnosed disease, especially where DXA access is limited, it calls for alternative diagnostic strategies. CT-based opportunistic diagnosis offers a promising alternative but faces three key limitations: underutilization of unlabeled CT data (e.g., thoracic vertebrae without DXA reference), heterogeneity of reference DXA devices affecting model compatibility, and inadequate integration of vertebral microstructural features and spatial bone density differences. This study proposes a unified deep learning model to address these challenges.

METHODS AND MATERIALS

We conducted a multi-center retrospective study using data from three tertiary hospitals (Sites A, B, and C) for model development and one independent hospital (Site D) for external testing. After pre-processing, the dataset included 2230 patients (5001 vertebrae) for training, 374 patients (839 vertebrae) for validation, 1100 patients (2498 vertebrae) for internal testing and 193 patients (271 vertebrae) for external testing. An additional 30256 unlabeled thoracic vertebrae were used for pre-training. The framework incorporates three innovations: (1) a texture-preserving self-supervised learning (TP-SSL) captures bone texture features; (2) a device-adaptive Mixture of Experts (MoE) architecture addresses variability across DXA devices by dynamically integrating device-specific features and preventing over-fitting on any single device; (3) a multi-task learning paradigm combines vertebral localization, bone density prediction, and vertebral-level osteoporosis classification, leveraging spatial bone density patterns.

RESULTS

The model demonstrated superior and robust diagnostic performance across diverse clinical settings. Vertebal-level sensitivity/specificity: Site A (82.76%/89.16%), Site B (66.04%/93.85%), Site C (70.15%/95.17%), and external Site D (77.44%/87.68%). Patient-level sensitivity/specificity: Site A (89.93%/86.09%), Site B (79.10%/96.90%), Site C (75.86%/93.51%), and external Site D (77.89%/91.84%).

CONCLUSION

This study proposes a unified deep learning framework that integrates TP-SSL, MoE, and multi-task learning to tackle critical challenges in CT-based osteoporosis diagnosis. Extensively validated across multiple clinical sites and an external hospital, the framework consistently achieves robust, high diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

By leveraging existing CT scans, the model offers a scalable, cost-effective solution for osteoporosis screening without additional radiation exposure or reliance on DXA. It can be deployed within routine CT workflows, facilitating early identification of individuals at risk and timely intervention.
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S3A-SPRO

Radiation Oncology Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPRO-1 CT-BASED QUANTIFICATION OF INTRATUMORAL HETEROGENEITY FOR PREDICTING DISTANT METASTASIS IN RETROPERITONEAL SARCOMA

Jun Xu (*Presenter*)
Ning Lang, MD (*Abstract Co-Author*)

PURPOSE

Retroperitoneal sarcoma (RPS) is highly heterogeneous, leading to different risks of distant metastasis (DM) among patients with the same clinical stage. This study aims to develop a quantitative measure of intratumoral heterogeneity (ITH) on preoperative contrast-enhanced CT (CECT) scans and test its performance for predicting the risk of DM after complete surgical resection in RPS patients.

METHODS AND MATERIALS

We conducted a retrospective analysis of 474 PRS patients who underwent complete surgical resection and were monitored for =36 months at two centers. Conventional radiomics (C-radiomics), ITH radiomics, and deep learning (DL) features were extracted from the preoperative CECT scans and develop single-modality models. Clinical indicators and high-throughput CECT features were integrated to develop a combined model for predicting DM. The performance of the models was evaluated by measuring the receiver operating characteristic curve and Harrell's concordance index (C-index). Distant metastasis-free survival (DMFS) was also predicted to further assess survival benefits.

RESULTS

The ITH model demonstrated satisfactory predictive capability for DM in internal and external validation cohorts (AUC: 0.735, 0.765; C-index: 0.691, 0.729). The combined model that combined clinicoradiological variables, ITH-score and DL-score achieved the best predictive performance in internal and external validation cohorts (AUC: 0.864, 0.801; C-index: 0.770, 0.752), successfully stratified patients into high- and low-risk groups for DM ($p < 0.05$).

CONCLUSION

The combined model demonstrated promising potential for accurately predict the DM risk and stratifying the DMFS risk in RPS patients undergoing complete surgical resection, offering a valuable tool for optimizing treatment selection and follow-up strategies.

CLINICAL RELEVANCE/APPLICATION

The ITH analysis facilitates the identification of high-risk RPS patients prone to DM and poor prognoses, enabling the selection of candidates for more aggressive surgical and post-surgical interventions.

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S3A-SPVA

Vascular Imaging Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-SPVA-1 EVALUATION OF IMAGE QUALITY, DIAGNOSTIC AGREEMENT, AND CLINICAL UTILITY OF MULTI-PHASE CTA DERIVED FROM DEEP LEARNING-BASED CEREBRAL PERFUSION IMAGING IN ACUTE ISCHEMIC STROKE

Shoushuai Wang (*Presenter*)
Xiaoyan Lei (*Abstract Co-Author*)
Ge Zhang (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Feng Chen, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study compares multi-phase CT angiography (mCTA) derived from deep learning image reconstruction (DLIR) of cerebral perfusion with conventional spectral mCTA using ASIR-50% for evaluating collateral circulation in acute ischemic stroke (AIS), aiming to explore a low-dose, efficient “one-stop” imaging approach and validate its diagnostic consistency with digital subtraction angiography (DSA).

METHODS AND MATERIALS

In this prospective study, 31 AIS patients (onset 6-12 hours) underwent cerebral perfusion CT (80 kV / 120 mA) and conventional spectral CTA (80-140 kV / 250 mA). Multi-phase CTA images were extracted from perfusion data. Group A images were reconstructed using high-level DLIR (DLIR-H); Group B (spectral CTA) images were reconstructed from 64 keV monochromatic images using ASIR-50%. Both image sets were processed using the FASTStroke workflow and COLORVIZ fusion technology on the GE AW platform to integrate arterial, venous, and late venous phases. Quantitative metrics included CT attenuation, image noise (SD), signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) at the ICA siphon, M1 segment, and temporal muscle during the arterial phase. Collateral grading was assessed via COLORVIZ by two radiologists using Cohen’s kappa, with DSA ASITN/SIR scores as reference.

RESULTS

No significant differences were observed in CT attenuation of the ICA siphon or M1 segment between DLIR-H and ASIR-50% CTA ($P > 0.05$). However, DLIR-H showed significantly lower noise and higher SNR in the M1 segment, and lower CT values and noise in the temporalis muscle ($P < 0.05$), indicating enhanced clarity. CNR did not differ significantly between groups. Collateral grading using COLORVIZ revealed similar median scores between DLIR-H and ASIR-50% CTA (Radiologist A: 2 vs. 3, $P = 0.058$; Radiologist B: both 3, $P = 0.655$), with strong interobserver agreement (kappa = 0.794, 0.837). Compared with DSA, DLIR-H mCTA showed higher diagnostic accuracy (79.3% and 89.7% vs. 55.2% and 68.9% for spectral mCTA), confirming superior reliability in collateral assessment.

CONCLUSION

DLIR-H mCTA enables low-dose cerebral imaging with improved noise reduction and preserved vascular detail, showing strong consistency with DSA for collateral evaluation.

CLINICAL RELEVANCE/APPLICATION

This technique offers a noninvasive, efficient alternative to conventional CTA and partial substitute for DSA, especially suitable for patients near treatment windows or unsuitable for invasive procedures.

S3A-SPVA-2 DEVELOPMENT OF A NOVEL SCAN TIMING PROTOCOL BASED ON VENOUS PEAK FOR IMPROVED ENHANCEMENT IN CEREBRAL CTA

Katsuyuki Matsui (*Presenter*)

PURPOSE

In cerebral three-dimensional computed tomography angiography (3D-CTA), achieving preserved contrast enhancement in both arteries and veins remains challenging, especially when using single-phase acquisition method. Conventional scan timing typically relies on estimating the time point of maximum arterial enhancement, however variations in individual arteriovenous transit times (AVTT) can result in inconsistent venous visualization. Such variability can limit the accuracy of post-processing and radiological image interpretation To address this limitation, we developed a novel scan timing strategy using the venous peak as a reference. In this method, by measuring the AVTT via a Test Injection (TI) method and calculating the scan end time as 50% of the AVTT from the arterial peak, stable enhancement in both arterial and venous compartments can be expected; the purpose of the present study was to assess the effectiveness of our method.

METHODS AND MATERIALS

This retrospective study analyzed 60 patients (31 females, 29 males; mean age 61.5) who underwent conventional head 3D-CTA between 2021 and 2023. AVTT was measured using a TI-based Time Enhancement Curve, defined as the interval between arterial (TA) and venous (TV) peaks. Patients were grouped by scan end timing as a percentage of AVTT: A (=39%), B (40-49%), C (50-59%), and D (60-73%). Arterial and venous CT values were compared across groups. Scan start timing was estimated by backward calculation: Scan Delay = Time to Peak - (Scan Duration - AVTT/2). The Tukey-Kramer test was used for statistical analysis.

RESULTS

All groups maintained arterial enhancement above 500 HU. Group C (50-59%) showed the highest mean arterial CT value (597.4 ± 67.2 HU) and sufficient venous enhancement (434.2 ± 97.6 HU). Venous CT values increased with longer scan end times, with Group A (=39%) showing significantly lower venous enhancement. No significant difference was found among Groups B-D. Compared to the conventional method, the proposed method showed similar mean arterial values (591.9 ± 52.2 HU vs. 583.8 ± 66.3 HU) but reduced variability, particularly in venous values (SD: 45.1 vs. 138.6).

CONCLUSION

The proposed scan timing method, using the venous peak to estimate scan end time at 50% of AVTT, provides a stable and individualized method for cerebral CTA. It achieves consistent arterial and venous contrast enhancement while minimizing variability and enhancing reproducibility.

CLINICAL RELEVANCE/APPLICATION

This scan timing method improves venous enhancement stability without compromising arterial visualization, allowing more reliable vascular evaluation. It may reduce post-processing workload and operator dependency, facilitating standardized cerebral CTA in clinical practice.

S3A-SPVA-3 AREA-DETECTOR CT FOR ABDOMINAL AORTIC ANEURYSM FOLLOW-UP: INFLUENCE OF GRAVITY ON IMAGE QUALITY AND DIAMETER MEASUREMENTS IN ROUTINE CLINICAL PRACTICE

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Yui Takagi (*Abstract Co-Author*)
Yunosuke Kumazawa (*Abstract Co-Author*)
Yuya Ito (*Abstract Co-Author*)
Hirona Kimata (*Abstract Co-Author*)
Kenji Fujii (*Abstract Co-Author*)
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Takeshi Yoshikawa, MD (*Abstract Co-Author*)
Daisuke Takenaka, MD (*Abstract Co-Author*)
Yoshiyuki Ozawa, MD, PhD (*Abstract Co-Author*)
Yoshiharu Ohno, MD, PhD (*Abstract Co-Author*)

PURPOSE

To determine the influence of gravity on image quality and abdominal aortic aneurysm (AAA) follow-up examination, when compared between upright and supine area-detector CTs (ADCTs) in routine clinical practice.

METHODS AND MATERIALS

This retrospective study included 50 AAA patients who underwent upright and supine ADCT examinations as follow-up CT and assessed as no requirement for surgery without any aneurysm expansion. For assessing quantitative image quality for abdominal structures between two CT systems, CT values and signal-to-noise ratios (SNRs) of abdominal aorta, inferior vena cave, liver, spleen, pancreas, kidney and fat were assessed with region of interest (ROI) measurements. To evaluate qualitative image quality of abdominal structures on each CT system, overall image quality and artifact were evaluated using a 5-point scale in all patients. On AAA evaluation in each patient, maximum long axis diameter (LAD max) and minimum short axis diameter (SAD min) were manually measured on the automatically selected slice which was perpendicular to the automatically drawn centerline of the abdominal aorta, and averaged to final values. To compare quantitative and qualitative image quality indexes, paired t-test and Wilcoxon signed-rank test were performed. To determine the relationship for each diameter measurement between two ADCTs, Spearman correlation was performed. To determine the influence of gravity on AAA diameter measurement, each index was compared between two ADCTs by paired t-test. Finally, each measurement difference between two ADCTs was determined by the Bland-Altman analysis.

RESULTS

Upright ADCT was determined as having significantly higher CT value for kidney and SNRs for liver and kidney than supine ADCT ($p<0.05$). Moreover, upright ADCT demonstrated significantly lower artifact than supine ADCT ($p=0.003$). In addition, upright ADCT demonstrated significantly excellent correlation with supine ADCTs (? =0.97, $p<0.0001$). Furthermore, upright ADCT showed significantly larger diameter than supine ADCT ($p<0.0001$). The limits of agreement between two ADCTs were determined as1.2±3.1 mm at LAD max , and 0.9±2.6mm at SAD min .

CONCLUSION

When AAA patients followed, upright ADCT demonstrates significantly larger diameter than supine ADCT due to gravity, although the difference had little influence on AAA management in routine clinical practice.

CLINICAL RELEVANCE/APPLICATION

When AAA patients followed, upright ADCT demonstrates significantly larger diameter than supine ADCT due to gravity, although the difference had little influence on AAA management in routine clinical practice.

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S3B-SPBR

Breast Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPBR-1 ASSOCIATION OF STATIN USE WITH BREAST ARTERIAL CALCIFICATION PROGRESSION

Alyssa T. Watanabe, MD (*Presenter*)

PURPOSE

Breast arterial calcification presence and extent are known risk markers for major adverse cardiovascular events. Statin use is associated with an increase in coronary calcium score. We studied the progression of breast arterial calcifications (BAC) scores in women who were statin users compared to those who were not.

METHODS AND MATERIALS

We retrospectively evaluated 27,780 full-field digital mammograms in 10,348 women (age 26-94 years, mean 56 years at index exam) performed 2006-2016 at a single Southwestern U.S. academic center. Imaging follow-up ranged 6 months-10 years (mean 4.1 years). We used an artificial intelligence model (AI) to generate a BAC score for each exam. BAC-positive scores were age-adjusted to derive percentiles, then binned by quartile (Q): 1st-25th (Q1), 26-50th (Q2), 51-75th (Q3) and 76-100th (Q4). Aalen-Johansen multi-state models estimated probabilities of transitioning to a higher quartile in 5 years. Risk of BAC progression in statin users and non-statin users compared to a reference group of BAC negative non-statin users was calculated as Hazard ratio (HR) which was adjusted for age.

RESULTS

Baseline statin use is associated ($p < 0.05$) with increased risk of five-year BAC progression: BAC-negative statin users had elevated risk of developing BAC with HR=1.44 [1.30-1.60]. Statin users with mild BAC (Q1) had HR= 4.53 [3.49-5.88] versus non-user HR= 3.52 [2.84-4.37]. Statin users with Q3 BAC had HR=2.55 [1.80-3.62] versus non-user HR= 1.59 [1.24-2.05].

CONCLUSION

BAC progression rate on mammography is significantly higher in women on statins. Statin users with mild (Q1) BAC at index had approximately a 29% higher BAC progression risk compared to non-users who also had mild (Q1) BAC. Statin users with higher BAC burden (Q3 BAC) at index had a 60% relative higher BAC progression risk compared to Q3 BAC non- statin users. This could be due to underlying metabolic disease and/or due to the medication itself.

CLINICAL RELEVANCE/APPLICATION

Statin use may be useful to consider as a contributing factor when evaluating progression of breast arterial calcification scores on mammography.

S3B-SPBR-2 COST-EFFECTIVENESS OF MR FINGERPRINTING IN EVALUATING RESPONSE TO NEOADJUVANT CHEMOTHERAPY IN PATIENTS WITH TRIPLE NEGATIVE BREAST CANCER

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PURPOSE

Imaging during neoadjuvant chemotherapy (NACT) for triple negative breast cancer (TNBC) can identify non-responders early, enabling timely treatment adjustments and improving survival outcomes. MR fingerprinting (MRF), a novel quantitative approach that can generate T1 and T2 maps in 5 minutes, can detect response within a week of NACT initiation with higher accuracy than standard imaging. To understand the economic value of MRF, our study evaluates the cost-effectiveness of MRF-guided NACT strategies compared to conventional imaging approaches and no imaging in TNBC patients.

METHODS AND MATERIALS

We developed a Markov model simulating lifetime outcomes for a cohort of TNBC patients undergoing NACT with KEYNOTE-522 regimen (pembrolizumab plus chemotherapy) from a health sector perspective. Five imaging modalities (MRF, MRI, ultrasound [US], PET/CT, mammography) were evaluated when performed during the first two cycles of NACT. Patients were classified as responders or non-responders based on modality-specific sensitivity/specificity (MRF: 81%/95%, MRI: 67%/85%, US: 43%/88%, PET/CT: 75%/97%, mammography: 81%/48%). Responders continued KEYNOTE-522 therapy. For non-responders, we modeled two strategy sets for each modality: (1) imaging-guided NACT adjustment: patients switched to chemotherapy alone prior to surgery; (2) imaging-guided direct-to-surgery: patients immediately underwent surgery. Standard care (SC) without imaging was the comparator. Strategies were compared using lifetime costs, quality-adjusted life years (QALYs), and incremental cost-effectiveness ratios (ICERs) at a willingness-to-pay (WTP) threshold of $100,000/QALY gained. Due to lack of cost data, MRF cost was set at $1,500 in the base-case analysis with a threshold analysis to determine cost-effectiveness cost range.

RESULTS

SC yielded 13.47 QALYs at the highest lifetime cost of $494,061 among all strategies (Table). MRF-guided and PET/CT-guided NACT adjustment strategies both outperformed SC by delivering more QALYs at lower lifetime costs. At the imaging cost of $1,500, MRF-guided NACT adjustment proved most effective (13.61 QALYs) with an ICER of $23,976/QALY gained, below the WTP threshold. Threshold analysis showed that MRF-guided NACT adjustment would remain cost-effectiveness at imaging costs below $8,500.

CONCLUSION

MRF-guided NACT adjustment can improve health outcomes and remain cost-effective across a wide cost range, supporting its use for NACT treatment decision-making in TNBC patients.

CLINICAL RELEVANCE/APPLICATION

Early detection of non-response to NACT through MRF can improve clinical outcomes, reduce unnecessary treatment burden for patients, and increase cost-effectiveness of treatment management in TNBC patients.

S3B-SPBR-3 IMPACT OF TUBE VOLTAGE ON IODINE DETECTABILITY IN CONTRAST-ENHANCED MAMMOGRAPHY

Raj Kumar Panta, PhD (*Presenter*)
Jeffrey Nelson (*Abstract Co-Author*)
Megan K. Russ, PHD (*Abstract Co-Author*)
Ehsan Samei, PHD (*Abstract Co-Author*)

PURPOSE

To assess the impact of tube voltage on iodine detectability in Contrast-Enhanced Mammography (CEM).

METHODS AND MATERIALS

A 1-cm-thick CEM breast phantom of 50/50 glandular-adipose mixture, containing glandular tissue inserts and iodine inserts of four different surface concentrations (0.2 - 2mg/cm²) was imaged using a Hologic 3Dimensions system. ?The phantom included tissue mimicking materials (4-8cm in thickness) across three types of tissue density representing extremely dense (BR-GLAND), heterogeneously dense (BR-MIX, combination of BR-GLAND and BR-50/50), and scattered fibroglandular (BR-50/50) breast tissue. The AEC-indicated tube voltage (kVp) for acquiring the low-energy image was used as the reference kVp for each tissue thickness. Low-energy images were acquired at kVp offsets ranging from -2kVp to +2kVp relative to reference kVp, while the kVp for the high-energy image was unchanged. The Limit of Detection (LOD) was calculated on the recombination images and compared to that at the reference kVp for each tissue density and thickness.

RESULTS

A strong linear relationship ($R^2 > 0.99$) was observed between the mean pixel values of iodine inserts and the exponential of their surface iodine concentrations across all kVp settings. Low-energy acquisitions at lower kVp (-2kVp) enhanced iodine detectability, with LOD decreasing by 53% for BR-Gland (6cm) and BR-MIX (8cm), and by 50% for BR-50/50 (8cm). Conversely, higher kVp settings (+2kVp) degraded iodine detectability, with LOD increasing by 33% for BR-Gland (4cm), and 30% for BR-MIX (4cm) and BR-50/50 (8cm).

CONCLUSION

Tube voltage strongly affects iodine detectability, and it should be optimized by breast thickness and composition.

CLINICAL RELEVANCE/APPLICATION

This study highlights the significance of optimizing tube voltage in CEM protocols to enhance diagnostic performance.

S3B-SPBR-4 LARGE-SCALE DEPLOYMENT OF A MULTISTAGE AI-DRIVEN WORKFLOW INCREASES DETECTION OF DANGEROUS BREAST CANCERS

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Annie Ng, PhD (*Abstract Co-Author*)
Edgar Wakelin (*Abstract Co-Author*)
Jiye G. Kim, PhD (*Abstract Co-Author*)
Christoph I. Lee, MD,MS (*Abstract Co-Author*)
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Bryan Haslam, PhD (*Abstract Co-Author*)

PURPOSE

AI can support increased breast cancer detection, however, there is no large-scale data on the types of additional cancers detected in a United States (US) screening setting. Prospective studies of AI outside the U.S. have shown AI can help detect more clinically relevant invasive cancers, but also ductal carcinoma in situ (DCIS) at a higher rate. The AI workflow employed can also impact the number and types of additional cancers detected. This study assesses the cancer subtypes detected in a large-scale deployment of a multistage AI-driven workflow, compared to the standard of care (SOC) prior to deployment.

METHODS AND MATERIALS

A multi-stage AI-driven workflow was deployed across 109 sites and 4 US states and involved concurrent reading with a CADe/x device, followed by an AI-facilitated safeguard review routing potentially missed findings to breast imaging experts for an additional review. The SOC cohort included screens between Sept 2021 to May 2022. The AI-driven workflow cohort included screens between Aug and Dec 2022. Cancer detection outcomes included cancer detection rate (CDR) and positive predictive value (PPV1). The distribution of cancer subtypes detected by SOC versus the AI-driven workflow was assessed in terms of cancer type, grade, invasivity, hormone receptor status (ER, PR, HER2), triple negative and luminal B proportions and those classified as particularly dangerous i.e. a combination of triple negative, Luminal B, and HER2+. The distributions were compared using an unadjusted chi-square test.

RESULTS

The deployment of the AI-driven workflow (N = 208 891; 1166 cancers) resulted in significantly increased CDR (5.58 vs 4.59, $p < 0.001$) and PPV1 (5.01 vs 4.35, $p < 0.001$) compared to SOC (N = 307 692; 1702 cancers). The majority of cancers detected by the AI-driven workflow were intermediate or high grade (80.6%) and invasive (67.5%) with 9.5% triple negative, 4.8% Luminal B and 7.1% HER2 positive. Dangerous cancers accounted for 16.9%. No differences were found in the distribution of cancer type, grade or invasiveness ($p>0.05$) between cohorts. In particular, the proportion of DCIS cancers (32.5%) did not increase. Accounting for the 21.6% CDR increase, an estimated 20 additional dangerous cancers were found.

CONCLUSION

Employing the multistage AI-driven workflow significantly improved clinical outcomes in terms of CDR and PPV1 in a cohort of over 2400 cancers, with the majority of cancers detected being clinically relevant and no corresponding increase in the proportion of DCIS.

CLINICAL RELEVANCE/APPLICATION

Detecting more clinically relevant cancers without increasing the proportion of DCIS diagnoses shows the AI-driven workflow investigated here increases the benefits of screening mammography without increasing potential harms.

S3B-SPBR-6 ROLE OF IMAGE-GUIDED STEROID INJECTIONS IN MANAGING IDIOPATHIC GRANULOMATOUS MASTITIS

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PURPOSE

To evaluate the role of image-guided steroid injection as a novel treatment for idiopathic granulomatous mastitis (IGM) compared to standard systemic therapy.

METHODS AND MATERIALS

Retrospective review of 50 consecutive patients with biopsy proven IGM from 01/2010-10/2024 was done. Demographics (age, race, ethnicity, BMI, parity), imaging findings and clinical variables including symptom duration prior to treatment were collected. Primary outcome was time from treatment to symptom resolution. Secondary outcome was reported degree of improvement within one month after injection (none, mild, moderate, substantial/near resolution). Outcomes were determined by clinic notes. Systemic therapy included oral prednisone or methotrexate; local therapy included image-guided steroid injection (40mg/mL triamcinolone). Nineteen (38%) had symptomatic resolution without therapy, resulting in 31 in the final cohort, of which 19 received only systemic therapy and 12 received steroid injection in addition to systemic therapy. Association of treatment with time to symptom resolution was analyzed with a negative binomial regression model. Incidence rate ratios (IRR) with 95% CI were computed adjusting for demographics, waiting period and co-treatment with injection and systemic therapy.

RESULTS

Median (range) age was 35 years (20-53), parity 2 (0-6) and BMI 29.8 (24.1-38.1). Those who received steroid injection had shorter median (IQR) time to symptom resolution of 4.3 (5.9) months compared to 6.7 (13.6) months for those who received only systemic therapy (P=0.09). A similar trend was observed in univariable analysis (IRR 0.46; 95% CI 0.25-0.87, P=0.02) and multivariable analysis after adjusting for potential covariates (IRR 0.63; 95% CI 0.36-1.09, P=0.10). In patients who received steroid injection, 100% reported clinical improvement within one month, of which 50% reported substantial improvement.

CONCLUSION

Patients with IGM who received image-guided steroid injection reported clinical improvement within one month and showed a trend towards shorter time to symptom resolution by about 2.4 months as compared to those who received only systemic therapy. We propose routine incorporation of steroid injection into the management of IGM based on this initial promising study. Multi-institutional studies with larger cohorts will help better understand the benefits of this approach.

CLINICAL RELEVANCE/APPLICATION

IGM is a benign, non-cancerous likely immune-mediated breast condition affecting predominantly postpartum women that can take up to two years to resolve even with systemic therapy. Image-guided steroid injection has the potential to provide immediate symptomatic relief and reduce overall symptom duration thereby mitigating morbidity.

S3B-SPBR-7 LONGITUDINAL CHANGE OF MAMMOGRAPHIC AI RISK SCORES OVER REPEATED SCREENING EXAMS

Alec Starzinski (*Presenter*)
Andrew L. Avins, MD,MPH (*Abstract Co-Author*)
Ninah Achacoso (*Abstract Co-Author*)
Laurel Habel (*Abstract Co-Author*)
Tejomay Gadgil (*Abstract Co-Author*)
Vignesh A. Arasu, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the dynamics of mammographic AI-derived breast cancer risk estimates over repeated screenings and describe how women may be reclassified between hypothetical risk strata across sequential screenings depending on their outcome of future breast cancer.

METHODS AND MATERIALS

We conducted a retrospective cohort study of 5,567 women who underwent two bilateral screening mammograms: the index in 2016 and follow-up between 2017 and 2020. The 2016 mammogram was negative at final imaging assessment based on BI-RADS and benign biopsy assessments. The AI mammography risk model Mirai was used to generate 5-year breast cancer risk scores at both time points. Hypothetical risk groups were defined: High risk (>95th % risk scores), Above Average risk (75th-95th %), Average Risk (25th-75th %), and Below Average risk (<25th %). The thresholds based on the 2016 score distribution were applied to follow-up scores to evaluate risk-group reclassification. Reclassification tables and descriptive summaries were generated and stratified by eventual breast cancer diagnosis status.

RESULTS

Among the 5% of women classified as High risk, 44% of women remained in that group, while 39% shifted to Above Average risk, 16% to Average risk, and <1% to Below Average Risk. Among women initially classified in the Above Average and Average risk groups, 52% and 56% remained in their respective categories, with most reclassifications occurring to adjacent groups. Among women initially in the Below Average group, 51% remained stable, 41% moved upward to Average, and 9% shifted to Above Average or High risk. Women who developed breast cancer (N=469) demonstrated more pronounced upward shifts. Among those initially classified as High risk, 79% remained in that category. In contrast, only 28% of women initially in the Average group and 17% of those Below Average remained stable. Notably, 44% of the Average group moved to High risk and 26% to Above Average, while 83% of the Below Average group moved upward, including 29% to High risk. Among the Above Average group, 60% transitioned to High risk.

CONCLUSION

AI-derived risk estimates exhibit moderate temporal stability, with most women remaining in their baseline or adjacent risk groups. However, women who developed breast cancer more frequently experienced upward risk transitions.

CLINICAL RELEVANCE/APPLICATION

Risk stratification using AI scores appears stable in most women but shows meaningful upward shifts among those who develop cancer. These findings support potential use of AI score trajectories to inform adaptive screening intervals and early intervention strategies. Implementing AI based risk stratification necessitates informing women also of the dynamic nature of this risk factor.

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S3B-SPCA

Cardiac Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPCA-4 PROGNOSTIC VALUE OF CCTA SCORES IN A LARGE REAL WORLD STUDY

Anna Palmisano, MD (*Presenter*)
Francesco Pisu, MS (*Abstract Co-Author*)
Elisa Bruno (*Abstract Co-Author*)
Davide Vignale (*Abstract Co-Author*)
Alberto Colombo (*Abstract Co-Author*)
Antonio Esposito, MD (*Abstract Co-Author*)

PURPOSE

Coronary artery disease (CAD) is a global leading cause of mortality and Coronary computed tomography angiography (CCTA) is able to rule out CAD with very high sensivity and good specificity. Several CCTA semi-quantitative risk scores were developed for staging severity if CAD, variably considering stenosis severity, plaque featurs and segmental distribution. However, their prognostic impact in the real-clinical world is not clearly understood. Aim was to define the prognostic value of semiquantitative CCTA scores in clinical practice.

METHODS AND MATERIALS

In this observational, single-center retrospective study were screened elective CCTA of 2850 patients with low-to-intermediate risk of CAD performed between 2016 and 2020 with at least 4 years of follow-up. Patient with good image quality (Likert score= 4) were considered eligible. Demographics, cardiovascular risk-factors (CVRF), and medical history were collected via phone call and medical records. Calcium score (CACS), CAD-RADS, Leiden risk score, Leaman risk score, SSS, and SIS scores were calculated on a dedicated platform. Composite endpoint was based on the occurrence of MACE (nonfatal myocardial infarction, all-cause mortality, cardiac-related hospitalization, late coronary revascularization).

RESULTS

Among 1878 patients enrolled, 187/1878 (10%) had MACE. Comparing patients with and without MACE, they were similar in terms of sex (men 69%vs65%;p=.035), but older 70 [IQR 61-78]y.o. vs63[IQR 54-71] y.o.;p<.001) and with higher rates of CVRF and higher CCTA scores (all p<.001). At univariate analysis all CCTA scores were predictors of outcome, with the highest HR for CAD-RADS (HR 16.35, 95%CI [7.5-35.61]; p<.001). Predictive models including clinical and a CCTA scores were compared: the model with CAD-RADS outperformed (C-index 0.75 for predicting MACE and 0.78 for predicting death and myocardial infarction). Moreover, adjusting the risk for CACS patients with CAD-RADS 3 that had an HR of 10.35 95%CI [4.67-22.92]) showed in case of CACs=0 an highest risk (HR 15.1 95%CI [3.90-58.26]; p<.001) that was comparable to patients with CAD-RADS 4-5 (HR 16.35 95%CI [7.5-35.61]; p<.001).

CONCLUSION

CAD-RADS emerged as the most effective CCTA-derived score for predicting MACE. It is easy to calculate and apply clinically. Adjustment of CAD-RADS according to CACs allows risk reclassification in patients with moderate stenosis.

CLINICAL RELEVANCE/APPLICATION

CAD-RADS is the simplest CCTA score to be calculated but also the one with huger prognostic impact. Implementation in clinical routine with the integration with calcium score is able to reclassify subcohort of patient with intermediate stenosis but high risk.

S3B-SPCA-7 CORONARY COMPUTED TOMOGRAPHIC ANGIOGRAPHY HIGH-RISK PLAQUE ATTRIBUTES IN NON-CULPRIT VESSELS AND FUTURE CORONARY EVENTS

Qian Chen, MD, PhD (*Presenter*)

PURPOSE

Non-culprit vessel-related major adverse cardiac events (MACE) after percutaneous coronary intervention (PCI) need better characterization.This study aimed to assess the prognostic value of high-risk plaque attributes derived from index coronary computed tomographic angiography (CCTA) in non-culprit vessels in patients with PCI.

METHODS AND MATERIALS

Between June 2013 and June 2023, patients who underwent CCTA and subsequently PCI within 3 months were included. Index CCTA-derived high-risk plaque attributes were evaluated, including significant stenosis, high-risk plaque (HRP), plaque volume (PV), fractional flow reserve (FFR), and coronary inflammation, determined by pericoronary adipose tissue attenuation. The primary endpoint was non-culprit vessel-related MACE, defined as cardiac death, myocardial infarction, or clinically driven revascularization.

RESULTS

A total of 1495 patients with 2014 non-culprit vessels were analyzed with a median follow-up of 3.3 years. The cumulative rate of non-culprit vessel-related MACE was 3.8%. In a multivariate Cox analysis adjusted for high-risk plaque attributes, vessel-specific FFR (adjusted hazard ratio [aHR]: 0.14; 95% CI: 0.03-0.76, P = 0.023) and necrotic core PV (aHR: 1.30; 95% CI: 1.06-1.59, P = 0.010) were independent predictors of the primary endpoint. Vessel-specific FFR and necrotic core PV showed an incremental prognostic value when added to clinical risk factors, including age, sex, clinical presentation, hypertension, diabetes, and previous myocardial infarction (area under the receiver-operating characteristic curve: 0.601 vs. 0.673, P < 0.001). In sub-group analysis, a significant interaction (P interaction = 0.028) was observed between necrotic core PV and the achievement of target blood lipid, defined as LDL-C <1.4 mmol/L at one-year follow-up, in relation to non-culprit vessel-related MACE.

CONCLUSION

High-risk plaque attributes on CCTA have independent and incremental prognostic values for non-culprit vessel-related MACE. Achieving target blood lipid attenuates the impact of necrotic core PV on the risk of MACE in non-culprit vessels.

CLINICAL RELEVANCE/APPLICATION

CT-derived vessel-specific FFR and necrotic core PV exhibited independent and incremental prognostic value beyond traditional cardiovascular risk factors for predicting non-culprit vessel-related MACE. In non-culprit vessels that achieve target blood lipid levels, necrotic core PV did not increase the risk of clinical events compared to vessels without achievement of target blood lipid. Our study confirms the benefits of achievement of target blood lipid in patients following PCI treatment.

S3B-SPCA-10 REFERENCE VALUES OF MYOCARDIAL STRAIN DERIVED FROM MRI FEATURE TRACKING: A STUDY BASED ON A NATIONWIDE CHINESE POPULATION AND DATA FROM THE NATIONAL CENTER FOR CARDIOVASCULAR DISEASES

Jing Xu (*Presenter*)
Wenjing Yang (*Abstract Co-Author*)
Yining Wang, MD (*Abstract Co-Author*)
Leyi Zhu (*Abstract Co-Author*)
Di Zhou (*Abstract Co-Author*)
Minjie Minjie, PhD (*Abstract Co-Author*)

PURPOSE

Population-specific reference values of myocardial strain tailored to the Chinese population remain limited. Our purpose is to establish reference values for myocardial strain across a large, nationally representative sample of the Chinese population and evaluate the impact of the demographic and technical factors on strain measurements.

METHODS AND MATERIALS

A total of 1,033 healthy participants(aged 14-69) from National Center for Cardiovascular Diseases(NCCD) underwent CMR feature tracking(CMR-FT) to measure myocardial strain and strain rate(SR) across all cardiac chambers. Reference ranges were stratified by gender and age, and multiple linear regression assessed the influence of the variables.

RESULTS

The reference ranges for CMR-FT strain and SR were provided. Significant differences in almost all strain and SR parameters were observed between genders and age groups. Female had higher myocardial strain, atrial SR, and early-diastolic ventricular SR (All $P<0.05$ except right ventricular global radial(RVGRS) and circumferential strain(RVGCS)), while male had higher systolic RVGRSR and RVGCSR(both $P<0.05$). Multiple linear regression revealed that gender, age, height, body mass index, field strength, and vendor all had some contribution to strain values.

CONCLUSION

This study provides a comprehensive set of age- and gender-specific reference values for myocardial strain and SR in a healthy Chinese cohort, utilizing a large dataset from the NCCD. The findings highlight the importance of adjusting for demographic and technical factors in clinical interpretations of myocardial strain. The established reference values serve as a foundational resource for future research and clinical applications of CMR-FT in assessing cardiovascular health and disease risk in China.

CLINICAL RELEVANCE/APPLICATION

Establishing population-specific reference values for myocardial strain in the Chinese population holds significant clinical importance. Utilizing a large dataset sourced from the NCCD, this study offers a comprehensive set of age- and gender-specific reference values for myocardial strain and SR in a healthy Chinese cohort. These reference values are anticipated to enhance diagnostic accuracy and prognostic capabilities within cardiovascular medicine, facilitating early detection, monitoring, and treatment of myocardial dysfunction. Furthermore, the study emphasizes that demographic and technical factors should be taken into consideration when conducting clinical diagnoses and research based on CMR-FT. Translating these findings into applicable values for other ethnic groups will necessitate further investigation, but it represents a crucial next step in future cross-ethnic research outcome exchanges.

S3B-SPCA-13 CARDIAC BLOOD POOL T2 SIGNAL IN RELATION TO CARDIOPULMONARY EXERCISE TESTING AND PROGNOSIS IN PATIENTS WITH DILATED CARDIOMYOPATHY

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Akiko Sakai, MD,PhD (*Abstract Co-Author*)
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Masami Yoneyama (*Abstract Co-Author*)
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PURPOSE

Blood T2 values can be modulated by hemoglobin oxygenation, as the paramagnetic properties of deoxyhemoglobin shorten T2 relaxation times. This suggests that blood pool signals on T2 map may serves as a surrogate for blood oxygen saturation, offering a potential approach to quantifying intra-chamber oxygen content. Patients with dilated cardiomyopathy (DCM) have a high-energy demand throughout the dilated ventricles due to progressive left ventricular (LV) dysfunction. The total oxygen demand is measured by cardiopulmonary exercise tests (CPX) to determine exercise tolerance and cardiac implantable device therapy (CIDT) or heart transplantation. We examined the correlation between intraventricular T2 values and CPX test in patients with DCM, and the association between these measurements and CIDT or death.

METHODS AND MATERIALS

Data of cardiac MRI and CPX test performed on 64 patients with DCM (mean age, 45 years; mean LVEF, 33%) at the same time was analyzed. Myocardial T2 map was scanned with a 3-tesla scanner and T2prep-based sequence, T2 value was measured throughout the left and right ventricular (LV, RV) cavities. The ratio of T2 values of RV and LV (RV/LV T2) was calculated as a representative value. Anaerobic threshold (AT), peak oxygen uptake (peak VO2), and peak oxygen pulse (peak O2pulse) were extracted from CPX test. The primary endpoint was defined as CIDT or death after cardiac MRI. CIDT consisted of implantable cardioverter defibrillators and cardiac resynchronization therapy.

RESULTS

During a mean follow-up of 22 months, three patients died and CIDT was performed in 12 patients. T2 for RV and LV, and RV/LV T2 were 87.0±112.6msec, 99.2±2.1msec, and 0.88±0.13, respectively. RV/LV T2 showed a moderate positive correlation with peak O2 pulse (Pearson r, 0.413; p=0.0007) and weak positive correlations with peak VO2 and AT (Pearson r, 0.315 and 0.249; p=0.0112 and 0.0475). Simple logistic regression showed a significant association between RV/LV T2 and CIDT or death (Log-likelihood, 6.926; odd ratio, 49.71; p=0.0085), but no association between CPX measurements and those events.

CONCLUSION

RV/LV T2 was significantly correlated with CPX measures, suggesting an association with exercise tolerance in DCM. In addition, a decrease in RV/LV T2 was found to be associated with adverse cardiac accidents.

CLINICAL RELEVANCE/APPLICATION

Cardiac blood pool T2 is a noninvasive analysis that can be calculated simultaneously with myocardial property with a T2 map, and has the potential to estimate patient-burdened CPX test.

S3B-SPCA-14 IMPROVEMENT OF CORONARY ARTERY STENT EVALUATION USING SUPER-RESOLUTION DEEP LEARNING RECONSTRUCTION TECHNIQUE: A MULTICENTER VALIDATION STUDY

Cheng Xu (*Presenter*)
Limiao Zou (*Abstract Co-Author*)
Min Xu, PhD (*Abstract Co-Author*)
Yining Wang, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of a novel super-resolution deep-learning reconstruction (SR-DLR) algorithm on the visible and diagnostic performance of coronary CT angiography (CCTA) in stents evaluation.

METHODS AND MATERIALS

From September 2023 to November 2024, consecutive patients who underwent clinically indicated CCTA and ICA within 2-month interval in 8 hospitals across China were prospectively enrolled. CCTA images were reconstructed with both hybrid iterative reconstruction (HIR) and SR-DLR. The image quality was evaluated using a 5-point scale (1=poor, 5=excellent). The signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR) and stent-lumen attenuation increase ratio (SAIR) were calculated. The maximum visible in-stent lumen diameter were measured. The patency of stent were evaluated and in-stent restenosis was defined as = 50% stenosis. Invasive coronary angiography served as reference standard. The diagnostic confidence was evaluated using a 5-point scale (1= low, 5= high).

RESULTS

A total of 112 stents from 75 patients were included for analysis.The qualitative image quality of coronary stents was superior in SR-DLR compared with HIR, and the average image scores were 4.24±0.71 and 3.30±0.53 ($P<0.001$), respectively. The SNRs of the two images were approximately equal (23.4±14.7 vs. 23.4±15.4, $P=0.53$), while SR-DLR yielded a better CNR (44.0±20.3 vs. 33.6±15.7, $P<0.001$). The SAIR of SR-DLR was lower than that of HIR (0.44±0.36 vs. 0.71±0.55, $P<0.001$). SR-DLR images showed the larger in-stent lumen diameters compared with HIR (2.12±0.60 vs. 1.78±0.48 mm, $P<0.001$). Compared with HIR, the lesion-based diagnostic accuracy of SR-DLR in detecting in-stent restenosis improved from 79.5% to 92.3% ($P<0.001$), with higher diagnostic confidence (4.38±0.56 vs. 3.68±0.63, $P<0.001$).

CONCLUSION

Compared with HIR, SR-DLR improves the visible and diagnostic performance of CCTA in stents evaluation.

CLINICAL RELEVANCE/APPLICATION

SR-DLR algorithm improves the diagnostic accuracy and confidence of coronary stent evaluation.

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S3B-SPCH

Chest Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPCH-1 ASSESSMENT OF DELAYS IN DIAGNOSIS OF LUNG CANCER IN INTERSTITIAL LUNG DISEASE

Ali Nowroozi, MD (*Presenter*)
Tician Schnitzler, MD, MSc (*Abstract Co-Author*)
Maya Vella, MD (*Abstract Co-Author*)
Jonathan A. Liu, MD (*Abstract Co-Author*)
Shravan Sridhar, MD, MS (*Abstract Co-Author*)
Jae Ho Sohn, MD, MS (*Abstract Co-Author*)

PURPOSE

To evaluate diagnostic delays in lung cancer among patients with interstitial lung disease (ILD), analyze associated tumor characteristics and patient outcomes, and identify key radiologic factors contributing to missed or delayed detection.

METHODS AND MATERIALS

In this retrospective study, imaging and clinical data of 54 patients diagnosed with ILD and concurrent lung cancer from two tertiary ILD referral centers were reviewed. Four thoracic radiologists independently determined the "earliest callable date," defined as the date when the majority would have first raised concern about a nodule, and compared it to the actual date of clinical suspicion. Tumor characteristics, including size, morphology, staging, volume doubling time (VDT), treatment, and survival outcomes were recorded. Radiologic causes of missed or delayed detection were categorized by consensus for delayed cases.

RESULTS

Diagnostic delays occurred in 50% of the cohort (27/54), with a mean delay of 3.18 years (IQR: 0.94-4.51). Tumors in delayed cases exhibited significantly slower growth (mean VDT: 1.42 years) compared to promptly diagnosed cases (mean VDT: 0.22 years, $p<0.0001$). Key radiologic factors contributing to delayed detection included obscuration by fibrosis, ground-glass opacities, or bronchovascular bundles (63%), misinterpretation as infection or exacerbation (15%), minimal interval growth (11%), and invisibility on prior CT scans (15%). No significant differences in tumor size, morphology, stage, or histologic subtype—predominantly adenocarcinoma (56%)—were noted between delayed and non-delayed cases. Additionally, survival outcomes did not significantly differ between the groups ($?^2=0.4$, $p=0.5$).

CONCLUSION

Diagnostic delays in lung cancer detection among ILD patients occurred frequently, primarily due to radiologic masking and subtle imaging features rather than aggressive tumor biology. Despite prolonged delays, tumor characteristics and patient survival outcomes were comparable to those diagnosed promptly, suggesting a generally less aggressive tumor phenotype.

CLINICAL RELEVANCE/APPLICATION

Recognizing specific radiologic pitfalls leading to diagnostic delays in lung cancer within ILD patients can guide radiologists in early identification, potentially improving timely management and patient counseling despite the generally indolent nature of tumors in delayed detection.

S3B-SPCH-2 INTEGRATING QUANTITATIVE CT MORPHOLOGY, PET METABOLIC PARAMETERS, AND CLINICAL FEATURES TO PREDICT PD-L1 EXPRESSION IN LUNG ADENOCARCINOMA: A MULTIVARIATE LOGISTIC REGRESSION STUDY

Jiaming You (*Presenter*)
Zheng Yuan (*Abstract Co-Author*)

PURPOSE

To establish a non-invasive model that predicts PD-L1 expression in lung adenocarcinoma by combining quantitative CT features, PET metabolic parameters (specifically, the tumor-to-lung SUVmax ratio), and clinical variables, without relying on complex radiomics workflows.

METHODS AND MATERIALS

18F-PET/CT images and clinical data from 431 pathologically confirmed lung-adenocarcinoma patients treated at tertiary hospitals in Shanghai were retrospectively reviewed. Patients were randomly assigned to training and validation cohorts(8:2). Collected variables included sex, smoking history, CT tumor density and morphological features, and PET metabolic parameters, primarily the maximum standardized uptake value of the tumor (SUVmax_tumor) and of reference lung tissue (SUVmax_lung). Continuous variables were compared with the Mann-Whitney U test; categorical variables with $?^2$ or Fisher's exact test. least absolute shrinkage and selection operator (LASSO) regression selected predictors, which were entered into a multivariate logistic model built on the training cohort and displayed as a nomogram. Performance was assessed with ROC and Area Under the Receiver Operating Characteristic Curve (AUC), compared by the DeLong test, and further evaluated with calibration curves, the Hosmer-Lemeshow test, and decision-curve analysis (DCA). Ten-fold cross-validation was used for internal validation. Analyses were performed in R.

RESULTS

LASSO identified four independent predictors—SUVmax_tumor/SUVmax_lung ratio, tumor density, sex, and smoking status—used to construct the model. Discrimination was good in both cohorts (training AUC = 0.762, 95 % CI 0.700-0.824; validation AUC = 0.758, 95 % CI 0.604-0.913), with no significant difference between them (DeLong p = 0.832). Calibration was acceptable (Hosmer-Lemeshow p &gt 0.09). DCA showed consistent net benefit across clinically relevant thresholds. The model achieved high negative predictive values (96.3%-97.6%) and positive predictive values (~28.7 %), mirroring the 21.3 % PD-L1-positive prevalence.

CONCLUSION

A practical logistic model using CT, tumor-to-lung SUVmax ratio, and clinical metrics accurately predicts PD-L1 in LUAD. Its high NPV aids identifying patients unlikely to benefit from immunotherapy, supporting decision-making.

CLINICAL RELEVANCE/APPLICATION

This implementable model, using available clinical and conventional 18F-PET/CT (including tumor-to-lung SUVmax ratio), offers non-invasive pre-operative PD-L1 estimation in LUAD. Its high NPV helps identify patients unlikely for immunotherapy, potentially sparing them ineffective/toxic treatments, optimizing selection and resource allocation without complex radiomics.

S3B-SPCH-3 DETERMINING THE RELATIONSHIP BETWEEN GROWTH RATE CALCULATED BY COMPUTED TOMOGRAPHY AND GRADE AND HISTOLOGICAL TYPE IN LUNG ADENOCARCINOMAS

Hakan Dogan, MD (*Presenter*)
Huseyin Ekin Ergin, MD (*Abstract Co-Author*)
Cetin Atasoy, MD (*Abstract Co-Author*)

PURPOSE

A new histological grading system for lung adenocarcinomas has been proposed by the International Association for the Study of Lung Cancer (IASLC), in addition to classification based on predominant histological subtype. Although studies have shown that the new grading system is successful in determining prognosis, the relationship between nodule growth rate and grade has not yet been investigated. This study aims to examine the relationship between growth rate, grade, and histological predominant subtype and compare their superiority to each other.

METHODS AND MATERIALS

This retrospective study was approved by the institutional review board. Patients diagnosed with invasive nonmucinous adenocarcinoma following surgical resection were included. Volume doubling time (VDT) was calculated by performing nodule segmentation in three planes. The grades and predominant subtypes of the nodules were determined by histopathological evaluation. Due to the limited number of micropapillary predominant subtypes (n=5), they were grouped with the solid predominant subtype for analysis.

RESULTS

Ninety nodules were included in the study. Among the nodules, 49% were solid, 40% were partially solid, and 11% had pure ground-glass opacity. Low, intermediate, and high-grade tumors accounted for 10%, 47%, and 43% of nodules, respectively. Predominant subtype was lepidic in 10%, acinar in 59%, papillary in 10%, and solid or micropapillary in 21% of lesions. VDT was shortest in high-grade tumors ($p < 0.001$), with median VDT values of 1542, 981, and 299 days in low-, intermediate-, and high-grade tumors, respectively. VDT also varied among predominant subtypes ($p < 0.001$), being longest in the lepidic-predominant subtype (1542 days) and shortest in the solid or micropapillary-predominant subtype (210 days), with acinar (774 days) and papillary (437 days) subtypes in between. In multivariate logistic regression analysis, grade was identified as an independent factor associated with VDT, while histological subtypes were not found to be significant.

CONCLUSION

The growth rate of high-grade tumors was found to be higher than that of low and intermediate-grade tumors. The IASLC grading system demonstrated a stronger correlation with growth rate than classification based on predominant histological subtype.

CLINICAL RELEVANCE/APPLICATION

This study provides insights into the correlation between growth rate and tumor grade, which could enhance clinical decision-making. Understanding the relationship between tumor growth rate and histological grade may enable earlier identification of aggressive tumors, facilitating risk-based surveillance strategies and personalized therapeutic approaches.

S3B-SPCH-4 AIR TRAPPING IN NSIP: IS IT A TRAP?

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Kayla Davis (*Abstract Co-Author*)
Ronak Kundalia, MSc, BS (*Abstract Co-Author*)
C. David Pfaehler (*Abstract Co-Author*)
Bruno Hochhegger, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to assess the prevalence and prognostic significance of air trapping in patients with interstitial lung diseases (ILDs) exhibiting a non-specific interstitial pneumonia (NSIP) pattern on high-resolution chest computed tomography (hrCT). As air trapping is traditionally considered a hallmark of hypersensitivity pneumonitis (HP), understanding its distribution and implications across diverse ILD subtypes is essential for accurate diagnosis and risk stratification.

METHODS AND MATERIALS

This retrospective, single-center study evaluated 414 hrCT scans acquired over a 10-year period. Patients were categorized into six groups: connective tissue disease-associated ILD (CTD-ILD), HP, idiopathic interstitial pneumonias (IIPs), drug-induced ILDs, smoking-related ILDs, and other etiologies. Air trapping was assessed in exams with adequate expiratory phases, and mortality associations were analyzed using multivariable logistic regression adjusted for age, sex, FVC%, and DLCO%, with results expressed as risk ratios (RR). Analyses were performed in RStudio (version 2024.04.2+764).

RESULTS

Among 313 patients with good-quality expiratory imaging, 59.7% were female with a mean age of 66.2 years. Air trapping was observed in 67.6%, most commonly in drug-induced and smoking-related ILDs (100%), followed by HP (84.8%). Extensive air trapping across all lobes was most frequent in HP (32%). Its prevalence was significantly higher in HP compared to IIP (84.8% vs. 61.3%; $p = 0.0162$). Upper lobe predominance was seen in 12.1%, particularly in smoking-related ILD (33%), though without statistically significant pairwise differences. Among patients with mortality data, 38 deaths (12.1%) were recorded. Air trapping was not significantly associated with mortality (RR = 0.55; 95% CI: 0.24-1.27; $p = 0.16$). DLCO%, however, was independently protective (RR = 0.95; 95% CI: 0.93-0.98; $p < 0.001$).

CONCLUSION

Air trapping is a common feature among ILD patients with NSIP patterns, particularly in HP and smoking-related ILDs. While it aids in differentiating HP from IIP, its presence was not associated with increased mortality in this cohort and appeared linked to relatively preserved pulmonary function.

CLINICAL RELEVANCE/APPLICATION

Air trapping is not exclusive to HP and occurs across various NSIP-pattern ILDs. Its diagnostic utility remains relevant, but its prognostic value may be limited. Further studies using time-to-event analysis are warranted to clarify its relationship with outcomes and pulmonary function trends.

S3B-SPCH-5 STACKING ENSEMBLE MODEL INTEGRATING 18F-PET/CT IMAGING, RADIOMIC, AND CLINICAL FEATURES FOR PRE-OPERATIVE PREDICTION OF HIGH-GRADE PATTERNS IN LUNG ADENOCARCINOMA

Jiaming You (*Presenter*)
Zheng Yuan (*Abstract Co-Author*)

PURPOSE

High-grade histologic patterns (&ge 20 % solid or micropapillary components) portend poorer prognosis in lung adenocarcinoma (LUAD) and can alter surgical and adjuvant-therapy decisions. We developed and validated a non-invasive stacking ensemble model that combines quantitative PET/CT metrics, CT-based radiomic features, and clinical variables to predict the presence of high-grade patterns pre-operatively.

METHODS AND MATERIALS

This retrospective study included 431 pathologically confirmed LUAD patients from tertiary hospitals in Shanghai. Patients were randomly split 8:2 into a training cohort (n = 345) and an independent validation cohort (n = 86). Collected data comprised sex, smoking status, tumor density, SUVmax, SUVmax_tumor/SUVmax_lung ratio, MTV, TLG, and 3380 CT radiomic features (3D Slicer, semi-automatic tumor segmentation). Mann-Whitney U and $?^2$/Fisher tests compared continuous and categorical variables, respectively. LASSO regression selected the most informative features. A two-layer stacking ensemble was built: (i) XGBoost and LASSO-logistic base learners; (ii) a ridge-regression meta-learner fusing their outputs. Ten-fold cross-validation assessed stability in the training set. Discrimination (AUC), calibration (calibration curve, Hosmer-Lemeshow test), and clinical utility (decision-curve analysis, DCA) were evaluated; training vs. validation AUCs were compared with the DeLong test. Analyses were performed in R.

RESULTS

The stacking model yielded a mean cross-validated AUC of 0.888 in the training set. Final performance was excellent in the training cohort (AUC = 0.978) and high in the validation cohort (AUC = 0.950) with significant differences (DeLong p &lt 0.05). Calibration was sub-optimal (Hosmer-Lemeshow p &lt 0.05). DCA showed net benefit versus treat-all/none strategies.

CONCLUSION

A multi-modal stacking ensemble integrating PET/CT quantitative parameters, CT radiomics, and clinical data achieved high discriminatory accuracy for predicting high-grade histologic patterns in LUAD. Significant DeLong and Hosmer-Lemeshow results indicate potential over-fitting and calibration issues that warrant further refinement before clinical deployment, but the model shows promise for guiding personalized surgical and therapeutic planning.

CLINICAL RELEVANCE/APPLICATION

Non-invasively identifying high-grade patterns in LUAD pre-operatively using this stacking ensemble model provides crucial prognostic data. This aids risk stratification and supports clinicians in tailoring personalized treatment strategies (e.g., lobectomy vs. sublobar resection) or deciding on the necessity and type of adjuvant therapy for aggressive tumor biology, aiming to improve patient outcomes.

S3B-SPCH-6 THE SPECTRAL CT QUANTITATIVE PARAMETERS AND PD L1 EXPRESSION PREDICT THE EFFICACY OF IMMUNOTHERAPY FOR ADVANCED NON-SMALL CELL LUNG CANCER PATIENTS

Jingxu Li (*Presenter*)

PURPOSE

This study aimed to investigate the value of spectral CT quantitative parameters combined with programmed cell death-ligand 1 (PD-L1) expression in predicting initial treatment response to immunotherapy in advanced non-small cell lung cancer (NSCLC).

METHODS AND MATERIALS

From July 2021 to July 2024, 106 stage III-IV NSCLC patients with complete clinicopathological data who underwent dual-phase contrast-enhanced chest spectral CT were retrospectively analyzed. Conventional CT morphological features and spectral CT quantitative parameters (arterial and venous phases) were evaluated. Patients received treatment via immune checkpoint inhibitors (ICIs) for 2-3 cycles or until clinical progression, followed by standard CT for initial response assessment. Patients were categorized into response and non-response groups based on RECIST 1.1. Logistic regression identified independent predictors of immunotherapy response. Three models were constructed: clinical-CT features, spectral CT parameters, and a combined model. Predictive performance was assessed using receiver operating characteristic (ROC) curve analysis with area under the curve (AUC).

RESULTS

Among 106 NSCLC patients treated with ICIs, 27 showed response and 79 showed non-response. Univariate analysis revealed PD-L1 expression status, lesion location, spiculation, M-stage, treatment regimen, arterial-phase iodine-water, normalized iodine concentration (NICA), venous-phase effective atomic number (Z-eff), and normalized arterial enhancement fraction (NAEF) were associated with treatment response (all $P<0.05$). Multivariate logistic regression identified arterial-phase iodine-water, NAEF, NICA and venous-phase Z-eff as independent predictors. The combined prediction model demonstrated superior diagnostic performance (AUC=0.947) compared to clinical-CT (AUC=0.880) and spectral CT parameter models (AUC=0.706).

CONCLUSION

Spectral CT quantitative parameters combined with PD-L1 expression provide a novel approach for predicting immunotherapy response in advanced NSCLC, offering valuable insights for clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

Spectral CT during routine scans could optimize immunotherapy selection while avoiding additional procedures.

S3B-SPCH-7 DEVELOPMENT AND VALIDATION OF A PULMONARY VESSEL SEGMENTATION MODEL BASED ON DEEP LEARNING FOR DETECTING CHRONIC THROMBOEMBOLIC PULMONARY HYPERTENSION AT CT PULMONARY ANGIOGRAPHY

Yue Lin (*Presenter*)
Longfei Zhao (*Abstract Co-Author*)
Sheng Xie (*Abstract Co-Author*)

PURPOSE

To construct a deep learning (DL) model using a multicenter data set for accurate intrapulmonary vascular segmentation and chronic thromboembolic pulmonary hypertension (CTEPH) detection on CT pulmonary angiography (CTPA) images and to compare its performance.

METHODS AND MATERIALS

A multicenter, retrospective analysis of 611 sequential patients with right heart catheterization (RHC)-confirmed CTEPH, CTED, and normal controls was conducted. There are 351 patients for model construction, 152 patients for the internal validation cohort and 108 patients constituted the external validation cohort. The available

CTPAs were identified to examine the differential arterial and venous volumes and tortuosity in all patients. The pulmonary vasculature was reconstructed, and a DL method was used to separate arteries and veins and to compute pulmonary vascular volumes and tortuosity. The significant CT imaging-derived quantification of vascular volumes and tortuosity were included in the stepwise binomial logistic regression to further explore CTEPH. The diagnostic performance was assessed using the receiver operating characteristic curve (AUC). DeLong testing was employed to compare the differences of AUCs. Spearman's correlation analysis was used to analyze the correlation between the hemodynamic parameters obtained by RHC and vascular quantitative variables.

RESULTS

The total vessel volume was greater in the CTEPH cohort compared with the CTED and control cohort (all $P < 0.001$). The CTEPH cohort reflected higher large vessel volume and total arterial volume, and greater median arterial and venous tortuosity compared with the CTED and control group (all $P < 0.05$). Taking RHC results as the gold standard, the vascular segmentation model had perfect diagnostic performance in identifying CTEPH (AUC from 0.95 to 0.97), and the AUC value of the mixed model combined with BNP also increased slightly, but DeLong testing revealed no significant differences among different cohorts (all $P > 0.05$). Decision curve analysis shows that the mixed model provides a slightly greater net benefit than the vessel DL model in the training, internal and external test cohorts.

CONCLUSION

The fully automated vessel segmentation model based on DL that could accurately segment pulmonary vessels and demonstrate promising diagnostic performance in detecting CTEPH at CTPA, with no evidence of a significant difference in diagnostic performance compared with internal and external validation data, while CT quantitative parameters correlating with mPAP and PVR obtained from RHC measurements.

CLINICAL RELEVANCE/APPLICATION

Automated quantification methods using CT imaging can provide a imaging marker for identification of CTEPH and CTED.

S3B-SPCH-8 MOLECULAR CHARACTERIZATION OF CELL DECAY IN INFLAMMATORY STATE AND TOPOLOGICAL ASSIGNMENT OF RELEASED CFDNA FOR INTEGRATIVE OUTCOME PREDICTION

Alexander Hertel, MD (*Presenter*)
Catharina Gerhards (*Abstract Co-Author*)
Michael Neumaier (*Abstract Co-Author*)
Stefan O. Schoenberg, MD, PhD (*Abstract Co-Author*)
Matthias F. Froelich, MD (*Abstract Co-Author*)

PURPOSE

Efficient triage of vulnerable patients in acute, particularly infectious respiratory diseases remains a major clinical challenge. Integrative biomarkers combining molecular and imaging information may significantly enhance early risk stratification. We therefore evaluated the predictive potential of circulating cell-free DNA (cfDNA) characteristics—namely integrity and epigenetics—alongside CT-based Radiomics, to identify high-risk patients and anticipate complications such as ARDS or organ failure.

METHODS AND MATERIALS

The cfDNA Integrity Index was established using automatic gel electrophoresis (TapeStation, Agilent Technologies) in cell culture models of apoptosis and necrosis (HEK293 and Jurkat cells, n = 57), then validated in patients with COVID-19 or other acute diseases (n = 62). cfDNA topological origin and tissue-specific injury were analyzed using the Infinium Methylation 850K assay. Radiomics features were extracted from thoracic CT scans and correlated with clinical endpoints.

RESULTS

Patients with ARDS showed significantly elevated cfDNA concentrations >246 bp ($p = 0.016$), particularly above 100 ng/ml ($p = 0.030$). Larger cfDNA fragments were associated with ICU admission ($p = 0.018$) and mortality ($p = 0.017$), and the cfDNA Integrity Index was higher in non-survivors ($p = 0.018$). cfDNA originated mainly from leukocytes. Hepatocyte-specific epigenetic cfDNA signals correlated strongly with serum GGT ($r = 0.79$), indicating liver involvement. Several radiomics parameters from chest CT correlated with clinical severity. The feature original_glcm_ClusterShade showed a strong negative correlation with ECMO need ($r = -0.84$), suggesting its potential as a non-invasive predictor of respiratory failure. Additionally, RSNA score, reflecting pulmonary infiltrates, moderately correlated with ICU admission ($r = 0.39$) and ARDS ($r = 0.41$), highlighting the prognostic value of imaging biomarkers.

CONCLUSION

This study demonstrates the potential of combining cfDNA-based molecular diagnostics with advanced CT Radiomics for comprehensive patient profiling in acute disease. The integration of laboratory and imaging biomarkers offers a powerful strategy to predict clinical trajectories, guide early intervention, and detect secondary organ complications. Radiomics, in particular, emerged as a valuable, non-invasive predictor of critical illness and therapy escalation such as ECMO.

CLINICAL RELEVANCE/APPLICATION

Integrating cfDNA-based molecular markers with CT radiomics enables early risk stratification, prediction of critical outcomes such as ARDS or ECMO need, and supports precision triage and resource allocation in acute respiratory diseases.

S3B-SPCH-9 REVISITING LLMS AND LUNG CANCER QUESTIONS: HOW AI RESPONDS TO COMMON LUNG CANCER QUESTIONS TWO YEARS LATER

Dan Nguyen (*Presenter*)
Amir A. Rahsepar, MD (*Abstract Co-Author*)
Hamid Chalian, MD (*Abstract Co-Author*)
Cameron Hassani, MD (*Abstract Co-Author*)
Grace Hyun Kim, PhD, MS (*Abstract Co-Author*)
Arash Bedayat, MD (*Abstract Co-Author*)

PURPOSE

Recent advances in artificial intelligence (AI), specifically large language models (LLMs) present themselves as novel tools to enhance healthcare, especially in the context of patient education. Prior research has shown varying levels of accuracy and consistency among these models within disseminating clinical advice for patients, highlighting the need for ongoing evaluation as models evolve. This study aimed to evaluate and compare the accuracy, consistency, and reliability of five state-of-the-art LLMs—ChatGPT-o3, Gemini, DeepSeek R1, Claude, and Perplexity—in answering standardized lung cancer-related questions, building upon prior assessments of earlier models in 2023.

METHODS AND MATERIALS

Forty lung cancer-related questions were developed by experienced radiologists, based on Lung-RADS and Fleischner Society guidelines. On February 16, 2025, each of the five models answered these standardized questions. Responses were independently graded by three radiology experts using a majority-voting system to classify answers as correct, partially correct, incorrect, or no answer (refusal). Statistical analyses included accuracy calculations, logistic regression models to compare response correctness across LLMs, and inter-rater agreement assessments (Cohen's Kappa).

RESULTS

ChatGPT-o3 achieved the highest accuracy (75.83% correct responses), closely followed by Gemini (74.17%). Claude demonstrated the highest rate of partially correct answers (17.5%). Statistical analysis showed ChatGPT-o3 had significantly higher odds of fully correct answers compared to Claude ($p=0.02$). DeepSeek R1 showed the highest agreement, while ChatGPT-o3 had substantial disagreement among raters on Cohen's Kappa. Notably, ChatGPT-o3 identified intentionally incorrect Lung-RADS questions more reliably than DeepSeek or Gemini.

CONCLUSION

ChatGPT-o3 showed the best overall accuracy among the models tested but had notable inter-rater variability. While recent models demonstrated improved accuracy over previous iterations, there continues to be ongoing issues. Nearly two years later, problems such as inconsistent performance, incorrect responses, and refusals emphasize the continued importance of expert oversight. Future research should expand evaluation beyond lung cancer-related content.

CLINICAL RELEVANCE/APPLICATION

LLMs like ChatGPT-o3 show promise in improving patient education by providing accurate lung cancer screening guidance, but clinical oversight remains crucial due to variability and occasional errors in responses.

S3B-SPCH-10 PREDICTING 25-YEAR RISK OF CARDIOVASCULAR DEATH ACCORDING TO BASELINE CORONARY ARTERY CALCIFICATION SCORE AND COMPETING CAUSES OF DEATH

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PURPOSE

Coronary artery calcifications (CAC) identified on basesline low-dose CT (LDCT) screening using a ordinal 12 point score has been shown to be a strong predictor of 10-year cardiovascular (CVD) death. We investigated whether this this baseline score could predictor CVD death, given competing causes of death, 25 years later.

METHODS AND MATERIALS

Baseline CAC score of 9047 participants in LDCT screening in New York State between 2000-2008 was determined for the main, left anterior descending, circumflex, and right coronary arteries, each scored separately as 0 (absent), 1, 2, or 3, yielding a possible score of 0-12 for each participant. Total CAC scores were categorized: 0, 1-3, and 4-12. Self-reported smoking history and comorbidities were documented at baseline. Date and cause of death (ICD-10) were obtained from the National Death Index. Adjusted Cox proportional hazards regression models and Fine-Gray subdistribution hazard model analyzed emphysema and mortality outcomes.

RESULTS

Follow-up to December 31 2024 of 9047 participants found that 3738 (42.2%) had died of all causes, 1153 (12.7%) due to CVD (median follow-up 14.5 years IQR: 6.2-22.3), and 295 (3.3%) due to COPD. CVD death increased with increasing Ordinal CAC categories of 0, 1-3, and 4-12 from 8.1%, 13.2%, and 22.0%, respectively (P <.0001). A similar trend was observed for all-cause mortality, 29.5%, 43.6%, 62.7%, respectively (P <.0001). CVD death was significantly higher for Ordinal CAC category of 4-12 compared to CAC 0 (Hazard Ratio=4.2, 95%CI: 3.6-4.9), P <.0001. After adjustment for sex, age, diabetes, and smoking pack-years, the association remained significant: HR=2.1(95%CI:1.8-2.5), P< .0001. Adjusted Fine-Gray subdistribution hazard model, which accounts for competing risks, the association between CAC scores and CVD mortality remained significant but was attenuated (HR3.00; 95%CI,2.57-3.49) (Figure).

CONCLUSION

A single Ordinal CAC score on baseline LDCT consistently predicted CVD and all-cause mortality up to 25 years and provide individualized probabilities based on age, smoking history, years quit. CAC score, and other causes of death which allow for a more meaningful discussion of preventive actions with each individual and further enhances the relevance of combined lung and heart screening.

CLINICAL RELEVANCE/APPLICATION

A single baseline CAC score predicts 25 year CVD death given competing causes of death and provides personalized information given the person's age and smoking history for individualizing smoking cessation counselling.

S3B-SPCH-11 CLINICAL AND RADIOLOGIC CHARACTERISTICS OF SOLITARY PULMONARY CAPILLARY HEMANGIOMA: A COMPARATIVE STUDY WITH LUNG ADENOCARCINOMA

Ye Qing Zhu, MD, PhD (*Presenter*)
Wan Qi, MD,PhD (*Abstract Co-Author*)
Xinchun Li (*Abstract Co-Author*)
Claudia I. Henschke, PhD, MD (*Abstract Co-Author*)
David F. Yankelevitz, MD (*Abstract Co-Author*)

PURPOSE

Solitary pulmonary capillary hemangioma (SPCH) is an underrecognized benign disease that can radiologically mimic lung adenocarcinoma. The purpose of this study was to investigate the clinical and radiologic characteristics of SPCH in a large cohort of histologically confirmed cases and compare these findings with those of lung adenocarcinoma.

METHODS AND MATERIALS

This retrospective study included all histologically confirmed SPCH cases from our institution between July 2015 and December 2024. For comparison, lung adenocarcinomas matched to SPCH by nodule consistency (nonsolid, part□solid, solid) and size within the same period were included. Each nodule's consistency, size, location, shape, presence of spiculation, pleural retraction, air bronchogram and perivascular lucency were evaluated by two chest radiologists independently, blinded to clinical and pathology information. The characteristics between SPCH and lung adenocarcinoma were compared with ?² tests or Fisher exact test for categorical and Mann-Whitney U tests for continuous variables.

RESULTS

The study comprised 44 SPCH patients (28 women, 63.6%; median age, 46 years [IQR, 37-55.2]) and 344 adenocarcinoma patients (194 women, 56.3%; median age, 58 years [IQR,49.8-65.0]). All SPCH were solitary, with the majority located in the lower lobes (33/44,75%). Approximately 79.5% (35/44) of SPCH were located in the peripheral lung zone. For nodule consistency, 54.5% (24/44) of SPCH were solid nodules, 27.3% (12/44) were nonsolid, and 18.2% (8/44) were part-solid nodules. More than half of the SPCH had an average diameter = 10.0 mm (26/44, 59.1%). Comparing with adenocarcinoma, SPCH were more likely to occur in lower lobes (33/44 [75%] vs 112/344 [33%]; P < .001), more often presented with air bronchogram (25/44 [57%] vs 68/344 [20%]; P < .001), and lacked of spiculation (2/44 [5%] vs 192/344 [56%]; P < .001) and pleural retraction (8/44 [18.2%] vs 183/344 [53.2%]; P < .001). Five SPCH cases demonstrated central branching/tubular lucency sign, while 3 cases showed perivascular lucency sign, which were not detected in lung adenocarcinoma.

CONCLUSION

SPCH shares some features with lung adenocarcinoma but typically occurs in the lower lobes, rarely shows spiculation or pleural retraction, and often contains air bronchograms. Central branching/tubular lucency and perivascular lucency may further help radiologists to detect SPCH.

CLINICAL RELEVANCE/APPLICATION

SPCH can manifest as nonsolid, part-solid and solid nodules which can mimic lung adenocarcinoma, but typically occurs in lower lobes, lacks spiculation and pleural retraction, and often shows air bronchograms. Central branching/tubular lucency and perivascular lucency were found in some SPCH.

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S3B-SPER

Emergency Radiology Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPER-1 IMAGING SPECTRUM OF BLUNT AND PENETRATING CARDIAC TRAUMA: ROLE OF DUAL-ENERGY AND PHOTON-COUNTING CT

Mohammed A. Al Turiqy, MBBS (*Presenter*)
Savvas Nicolaou, MD, FRCPC (*Abstract Co-Author*)

PURPOSE

To define the role of Dual-Energy CT (DECT) in detecting life-threatening cardiac injuries compared to conventional CT, emphasizing protocol optimization and clinical impact.

METHODS AND MATERIALS

This retrospective multicenter study (2018-2023) analyzed 80 cases of blunt/penetrating cardiac trauma imaged with DECT (n=40) and conventional CT (n=40), including: Blunt trauma : myocardial contusion (n=25), hemopericardium (n=20), cardiac rupture (n=10) Penetrating trauma : chamber perforation (n=15), tamponade (n=8), projectile tracking (n=2) Two blinded radiologists evaluated: Injury detection sensitivity Diagnostic confidence (5-point Likert scale) Artifact reduction (iodine maps vs. conventional reconstructions)

RESULTS

Myocardial contusions : DECT iodine maps improved detection (88% sensitivity vs. 65% conventional CT, p=0.01) by highlighting hypoenhancement. Tamponade : Virtual monoenergetic 40-keV images increased pericardial blood conspicuity (mean score: 4.5 vs. 3.1, p<0.001). Artifact reduction : Metal artifact reduction algorithms decreased beam-hardening by 35% (p=0.003). Clinical impact : DECT changed management in 28% of cases (e.g., occult active bleeding on iodine extravasation maps).

CONCLUSION

DECT significantly improves cardiac trauma evaluation through: Functional assessment via iodine mapping (contusions/ischemia) Enhanced lesion conspicuity with monoenergetic reconstructions Superior artifact reduction for penetrating injuries

CLINICAL RELEVANCE/APPLICATION

Use 40-keV monoenergetic series for tamponade assessment Employ iodine maps to distinguish contusion from chronic infarction Activate metal artifact reduction for projectile cases

S3B-SPER-2 AUTOMATED CT DETECTION OF PELVIC FRACTURES WITH YOLO V12 AND SLICE-LEVEL VOTING USING REAL-WORLD FRACTURE PREVALENCE

Taiyu Zhang, PhD (*Presenter*)
Mehrdad Salimitari, PhD, MSc (*Abstract Co-Author*)
David Dreizin, MD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a deep learning framework for automated detection of pelvic fractures on trauma CT using YOLOv12 and a slice-voting strategy tailored to class-imbalanced data.

METHODS AND MATERIALS

A dataset of 3,420 patients (513 positive, 2,907 negatives; 15% prevalence) was divided into training (2,394), validation (342), and testing (684) sets. Preprocessing included intensity clipping (-500 to 1500 HU), resampling to 0.8×0.8×2 mm, and conversion to 640×640-pixel PNG axial slices. Weakly labeled segmentation masks (25 fracture classes) were merged into a single label. Bounding boxes were generated using connected component analysis with noise suppression. The YOLOv12 large model was trained with focal loss and class-balanced slice sampling. Patient-level classification was performed using a slice-voting threshold (SVT) strategy: a patient was positive if at least n slices exceeded a confidence threshold. Performance metrics were reported for the best thresholds achieving sensitivity of at least 90%.

RESULTS

At respective optimal thresholds (recall > 90%), the model achieved progressively improved patient-level diagnostic performance with increasing SVTs:SVT 1 (Threshold 0.29): Accuracy: 79.6%, Precision: 41.7%, Recall: 90.3%, Specificity: 77.7%, NPV: 95.3%, F1-score: 0.57; SVT 2 (Threshold 0.28): Accuracy: 87.0%, Precision: 54.1%, Recall: 90.3%, Specificity: 86.4%, NPV: 93.2%, F1-score: 0.68; SVT 3 (Threshold 0.27): Accuracy: 92.4%, Precision: 68.6%, Recall: 91.3%, Specificity: 92.6%, NPV: 89.9%, F1-score: 0.78; SVT 4 (Threshold 0.26): Accuracy: 92.4%, Precision: 72.7%, Recall: 90.3%, Specificity: 94.0%, NPV: 86.8%, F1-score: 0.80; SVT 5 (Threshold 0.25): Accuracy: 95.0%, Precision: 78.5%, Recall: 92.2%, Specificity: 95.5%, NPV: 86.1%, F1-score: 0.85These results show that the 5-slice SVT strategy providing the strongest diagnostic performance — combining high sensitivity (90.3%), specificity (94.0%) with a high F1-score (0.80) reflecting a highly favorable trade-off between sensitivity and precision/PPV.

CONCLUSION

This YOLOv12-based framework with an SVT strategy achieved accurate and robust patient-level CT fracture detection in a class-imbalanced trauma dataset reflecting prevalence encountered at major trauma centers, and expected clinical operating conditions, supporting integration into real-time triage and second-reader workflows.

CLINICAL RELEVANCE/APPLICATION

Automated identification of pelvic fractures at the patient level can expedite trauma triage, reduce missed injuries, and improve clinical workflow efficiency in high-volume emergency environments.

S3B-SPER-3 PREDICTING FUTURE VERTEBRAL COMPRESSION FRACTURES: TESTING THE HYPOTHESIS THAT CHEST RADIOGRAPHS ARE BETTER THAN DEXA

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Seyedehelaheh Hosseini, MD (*Abstract Co-Author*)
Javier Contreras Yametti, MD (*Abstract Co-Author*)
Lina Karout, MD (*Abstract Co-Author*)
Minjee Kim (*Abstract Co-Author*)
Jeong Min Song, MD (*Abstract Co-Author*)
Subba R. Digumarthy, MD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)

PURPOSE

Extremely low rate of DEXA based bone mineral density (BMD) estimation leads to substantial under-diagnosis of osteoporosis/osteopenia, which are key risk factors for predicting vertebral compression fractures (VCFs). We tested the hypothesis that a three-class classification chest radiograph (CXR)-based AI tool can outperform DEXA-based prediction of future VCFs based on 15-site data.

METHODS AND MATERIALS

Our IRB-approved, multi-center, external dataset outcome prediction study included 934 chest radiographs from 934 patients (mean age: 71.9 ± 11.9 years; female: male 745:189) belonging to one of the 15 US sites (primary care, community care, and quaternary care sites). The study inclusion criteria were age> 21 years, posterior-anterior projection CXRs performed within 6 months of DEXA scan, DEXA reports with T and Z scores, and follow-up chest CT or CXRs 3 months to 10 years after the CXR/DEXA exams. We excluded pediatric patients, those with prior spinal surgeries, moderate to severe scoliosis and pacemaker/AICD, traumatic fractures. We used an NLP/CLU-based radiology report data warehouse and search engine to identify consecutive eligible patients. All CXRs were processed with the Promedius AI tool (South Korea), not trained with any US data, to obtain probability scores for normal BMD, osteopenia, and osteoporosis. Next, we classified patients into these three-classes based on T and Z-scores from DEXA reports. Data were analyzed to obtain ROC AUCs and odd ratios (OR) for predicting VCFs on follow-up chest CT and/or CXRs.

RESULTS

Among the 934 patients, 241/934 (25.8%) developed one or more VCFs on follow-up imaging. The OR for predicting VCFs with CXR-AI (OR 3.15; 95% CI: 1.95-5.08 was significantly higher than for DEXA (OR 1.68; 95% CI: 1.13-2.50) ($p<0.001$). Likewise, the ROC AUC for predicting VCFs with CXR-AI (AUC 0.643, 95% CI: 0.603 - 0.682) was also higher than for DEXA ($p<0.01$).

CONCLUSION

Opportunistic screening of BMD with the assessed CXR-based AI model has the potential for predicting future vertebral compression fractures.

CLINICAL RELEVANCE/APPLICATION

Given the underuse of DEXA relative to CXRs, CXR-AI opportunistic screening can represent a viable, initial screening and triaging tool for patients at higher risk of insufficiency fractures.

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S3B-SPGI

Gastrointestinal Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPGI-1 VIRTUAL NON-CONTRAST AND SPECTRAL IMAGING IN PHOTON-COUNTING DETECTOR CT HAVE MODERATE AGREEMENT WITH MRI IN QUANTIFYING LOW-GRADE LIVER FAT

David Klemm, MD (*Presenter*)
Maximilian Russe, MD (*Abstract Co-Author*)
Marco Reisert (*Abstract Co-Author*)
Sebastian Faby, DIPLPHYS (*Abstract Co-Author*)
Lukas Rohloff (*Abstract Co-Author*)
Michael Schultheiss (*Abstract Co-Author*)
Fabian Bamberg, MD, MPH (*Abstract Co-Author*)
Jakob Weiss, MD, PhD (*Abstract Co-Author*)
Stephan Rau, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the agreement of different liver fat quantification methods using photon-counting detector CT via virtual non-contrast (VNC) reconstructions and dedicated spectral post-processing algorithms, with MRI-derived fat fractions (MRI-FF) serving as the reference standard.

METHODS AND MATERIALS

This retrospective study included consecutive patients who underwent clinically indicated abdominal PCD-CT in arterial (art) and portal-venous (pv) phases, and abdominal multiparametric MRI with chemical shift imaging. In PCD-CT, liver fat fraction (FF) was quantified using two methods in all available phases: firstly, via Hounsfield units derived from VNC images using an established formula (HU-FF), and secondly directly by using a spectral post-processing algorithm (SPP-FF). These were compared among themselves and with MRI-FF using Pearson's correlation and mean absolute error (MAE).

RESULTS

A total of 42 patients (mean age 66.9 ± 11.4 years, 50% male) were included. Median MRI-FF was 1.49% (IQR, 0.72%-4.57%). HU-FF and spectral SPP-FF from PCD-CT showed a moderate correlation with MRI-FF in both arterial and portal-venous phases (Pearson’s $r = 0.40$-0.71, $p < 0.05$). A high correlation was observed between HU-FF and SPP-FF regardless of the contrast phase (Pearson’s $r = 0.72$-0.80, $p < 0.05$). Excellent agreement was found between arterial and portal-venous phases within the same FF quantification method (HU-FF: $r = 0.94$; SPP-FF: $r = 0.93$ respectively). The MAE between CT-based liver FF and MRI-FF was smallest for SPP-FF-art (3.30%, 95% CI: 2.20%-4.39%) and largest for HU-FF-pv (4.82%, 95% CI: 3.69%-5.94%), indicating small but systematic differences between methods.

CONCLUSION

PCD-CT offers several methods for liver fat quantification, yet, in a cohort with low liver fat, agreement with MRI serving as reference varied considerably. Due to systematic differences between available approaches, further research is necessary to establish reliable conversion factors and improve generalizability and comparability across approaches and studies.

CLINICAL RELEVANCE/APPLICATION

PCD-CT allows for non-invasive quantification of liver fat using VNC and dedicated spectral post-processing algorithms, although agreement with MRI is moderate. Consistent methodology is essential in research and further validation is needed to improve clinical reliability.

S3B-SPGI-3 FINE-TUNING A RADIOGRAPH FOUNDATION MODEL FOR CROSS-MODALITY PREDICTION OF OSTEOPOROSIS RISK FROM CT-DERIVED SURFACE MESHES

Akash R. Pattnaik (*Presenter*)
Dave Van Veen (*Abstract Co-Author*)
Himanshu Kale (*Abstract Co-Author*)
Muhammad Ahmed Chaudhry (*Abstract Co-Author*)
Sanmi Koyejo, PhD (*Abstract Co-Author*)
Lydia Lagari (*Abstract Co-Author*)
William W. Boonn, MD (*Abstract Co-Author*)
Khan M. Siddiqui, MD (*Abstract Co-Author*)
Ayis T. Pyrros, MD (*Abstract Co-Author*)

PURPOSE

We repurposed a chest radiograph foundation model to extract features from CT-derived 2D surface mesh renderings, enabling cross-modality inference of internal body composition. By doing so, we aim to accelerate opportunistic osteoporosis risk screening using inexpensive surface-based inputs.

METHODS AND MATERIALS

We used 24,588 abdominal CT studies from 19,571 patients and derived internal biomarkers using the OSCAR pipeline. To model skeletal and metabolic risk, we defined three binary classification tasks based on CT-derived body composition markers: (1) L1 bone mineral density (BMD) using a high-sensitivity threshold, (2) L1 BMD using the standard clinical threshold for osteoporosis, and (3) muscle mass at the L3 vertebral level, a surrogate marker for sarcopenia and frailty. CT volumes were converted into 2D mesh renderings simulating surface geometry, then encoded with a chest radiograph foundation model to produce fixed embeddings. A shallow multilayer perceptron (MLP) head was fine-tuned on these embeddings to predict osteoporosis risk, with the foundation model weights frozen. The MLP consisted of three fully connected layers with batch normalization, ReLU, and dropout. Training used a weighted binary cross-entropy loss, Adam optimizer, and early stopping. Performance was evaluated via ROC AUC with optimal threshold selection using Youden’s J statistic and 95% confidence intervals from 1000 bootstraps on a held-out test set.

RESULTS

We evaluated model performance on three binary osteoporosis classification tasks, each based on different CT-derived biomarker thresholds. Using a high-sensitivity BMD cutoff at the L1 vertebra, the model achieved a ROC AUC of 0.718 (95% CI: [0.681, 0.756]). When applying the standard BMD threshold for osteoporosis, performance decreased slightly (ROC AUC: 0.661, 95% CI: [0.591, 0.734]), consistent with the stricter definition. The model performed best when using a composite label based on muscle attenuation—an indirect surrogate of bone health and frailty—achieving a ROC AUC of 0.790 (95% CI: [0.773, 0.808]). These results highlight the model's ability to infer internal skeletal risk factors from surface mesh inputs, with the highest discrimination achieved when leveraging muscle-based biomarkers associated with osteoporosis risk.

CONCLUSION

Radiograph foundation models can be adapted to CT-derived surface meshes for predicting internal biomarkers, enabling low-cost, cross-modality screening using only surface geometry.

CLINICAL RELEVANCE/APPLICATION

Surface-based inference of body composition may unlock scalable, AI-driven screening for osteoporosis and metabolic risk in primary care, home, or global health settings without CT access.

S3B-SPGI-4 AUTOMATED SEGMENTATION AND RADIOMIC ANALYSIS OF ADIPOSE AND MUSCLE TISSUES USING MACHINE LEARNING TO PREDICT OUTCOMES FOLLOWING BARIATRIC SURGERY

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Ali Elzieny (*Abstract Co-Author*)
Kevin J. Chang, MD (*Abstract Co-Author*)
Donald Hess (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)
John W. Garrett, PhD (*Abstract Co-Author*)
Christina A. LeBedis, MD, MS (*Abstract Co-Author*)

PURPOSE

To identify patterns on CT images before gastric bypass that predict weight regain, using advanced imaging analysis and machine learning algorithms to guide personalized obesity management.

METHODS AND MATERIALS

In this retrospective study, 24 patients (18 female, mean age 40.48 ± 12.77 years) underwent CT imaging before and after a gastric bypass procedure. Patients were classified according to post-procedure BMI course into "Weight Re-Gain" (n=10, weight regain) and "Weight Loss" (n=14, weight loss) groups. Chest, abdomen, and pelvis CT images were segmented using a fully automated algorithm from the Opportunistic Screening Consortium in Abdominal Radiology (OSCAR toolbox version 9.3 / University of Wisconsin) for automated adipose and muscle tissue segmentation and volumetric and radiomic analysis. Adipose and muscle tissue ratios and volumes were calculated with Python algorithm by using Pydicom library and applying DICOM masks. Independent t-tests compared baseline metrics, with $p < 0.05$ indicating significance.

RESULTS

The Weight Re-Gain group had a significantly higher baseline visceral-to-total adipose tissue ratio than the Weight Loss group (0.30 ± 0.12 vs 0.23 ± 0.06, $p = 0.03$). Baseline visceral adipose tissue volume was higher in the Weight Re-Gain versus the Weight Loss (5,739.60 ± 3,737.5 vs 4,435.65 ± 1,474.4 mL, $p = 0.012$). The Weight Loss group achieved greater BMI reduction (-11.60 ± 6.09 vs. -9.46 ± 4.64, $p < 0.001$ and significant visceral fat volume reduction (1,955.84 ± 1,615.92 mL (44.09%), $p < 0.001$ vs 2,063.13 ± 4,928.43 (35.94%) mL, $p = 0.002$) compared to the Weight Re-Gain group.

CONCLUSION

Elevated baseline visceral adipose tissue volume and visceral-to-total adipose tissue ratio on CT predict weight regain post-gastric bypass, highlighting the role of advanced image post-processing and machine learning in identifying at-risk patients for targeted interventions.

CLINICAL RELEVANCE/APPLICATION

Pre-surgical CT imaging with deep learning segmentation can identify patients at risk of weight regain after gastric bypass by assessing fat distribution. Radiologists can incorporate this analysis into routine scans, enabling bariatric teams to target high-risk patients with personalized interventions, including enhanced counseling, specialized diets, or exercise programs, to promote fat loss and improve long-term weight maintenance.

S3B-SPGI-5 AI-ENHANCED MRE FEATURE MAPS IMPROVE CONFIDENCE OF RADIOLOGICAL INTERPRETATION IN STRICTURING CROHN'S DISEASE: A RADIOMICS-READER STUDY

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Prathyush Chirra (*Abstract Co-Author*)
Robert Toth (*Abstract Co-Author*)
Nicholas Fragakis (*Abstract Co-Author*)
Joseph Sleiman (*Abstract Co-Author*)
Ilyssa Gordon (*Abstract Co-Author*)
Florian Rieder (*Abstract Co-Author*)
Amit Gupta, MD, MBBS (*Abstract Co-Author*)
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Satish Viswanath (*Abstract Co-Author*)

PURPOSE

Radiological visual assessment scoring (VAS) of MR enterography (MRE) has gained traction for assessing degree of inflammation and fibrosis in patients with stricturing Crohn's disease, but requires further large-scale evaluation. We conducted an AI-enabled reader study to evaluate whether radiological assessment together with radiomics-based feature overlays improved the accuracy of characterizing inflammation and fibrosis in strictures vs radiological assessment alone.

METHODS AND MATERIALS

Retrospective, multicenter reader study of 25 patients with surgically confirmed stricturing ileal Crohn's disease who underwent MRE within 15 weeks prior to resection. A customized radiological interface with multi-pane display of original MRE sequences and radiomics feature map overlays was developed. Radiomics maps were pixel-wise visualizations of top-ranked features selected via a previously published machine learning model, which had been validated within a separate training cohort for characterizing severe pathologic inflammation and severe pathologic fibrosis on MRE. Three radiologists (R1, R2, R3) independently assessed each case to assign a VAS (0-100) for severe inflammation and severe fibrosis together with Likert confidence ratings (1-5). Two phase evaluation was conducted with a wash-out period in between: (1) VAS assessment via MRE alone, (2) VAS assessment via MRE and phenotype-specific radiomics feature maps. Diagnostic accuracy was evaluated using AUCs against reference standard pathologic severity scores. Weighted kappa was used to assess inter-reader agreement after binning VAS scores.

RESULTS

Utilizing radiomics overlays increased AUCs for identifying severe inflammation in 2 out of 3 readers (R2: 0.63 to 0.66; R3: 0.66 to 0.87); no significant change was observed for severe fibrosis. Radiomic overlays increased confidence scores for all 3 readers; average 21% increase for identifying severe inflammation, average 14% increase for identifying severe fibrosis. Minimal to no change observed in inter-reader agreement between both phases for both phenotypes (? range: -0.048-0.26 for inflammation, -0.044-0.28 for fibrosis).

CONCLUSION

Radiomics-derived overlays enhance radiologist confidence for assessing severe inflammation and severe fibrosis in ileal Crohn's disease via MRE. Specialized training and added interpretability will be critical to translating AI-enabled feature maps as an adjunct for radiological interpretation.

CLINICAL RELEVANCE/APPLICATION

Integrating radiomics visual overlays into MRE interpretation workflows may enable improved reader confidence in detecting inflammatory and fibrotic phenotypes, which could help inform treatment decisions in Crohn's disease management.

S3B-SPGI-6 VALIDATION OF A DEEP LEARNING-BASED AI SOFTWARE FOR THE DETECTION AND CLASSIFICATION OF PANCREATIC CYSTIC LESIONS ON ABDOMINAL CT: A RETROSPECTIVE, SINGLE-CENTER STUDY

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Antoni Malet, MD (*Abstract Co-Author*)
Beatriz Consola, MD (*Abstract Co-Author*)
Eva Ballesteros Gomiz, MD (*Abstract Co-Author*)
Marta Sola, MD (*Abstract Co-Author*)
Carlota C. Rodriguez, MD (*Abstract Co-Author*)
Anna Framis Utset, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of a deep learning-based artificial intelligence (AI) software in (1) detecting pancreatic cystic lesions (PCL) and (2) classifying them as mucinous (MUC, potentially malignant) versus non-mucinous (NM, potentially benign), using expert radiologist assessment as the reference standard.

METHODS AND MATERIALS

This retrospective, observational, single-center study included 522 contrast-enhanced abdominal CT scans performed between 2012 and 2021. The scans were obtained from 170 patients, some with a prior diagnosis of pancreatic cystic lesions (PCLs) and others serving as controls. All scans were analyzed using an artificial intelligence (AI) software, with subsequent blinded review by abdominal radiologists. Diagnostic performance metrics, including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and F1 score, were calculated for PCL detection and lesion classification as mucinous (MUC-positive) or non-mucinous (MUC-negative), with radiological and histopathological reports serving as the reference standard.

RESULTS

For PCL detection, the AI software demonstrated a sensitivity of 89%, specificity of 78%, positive predictive value (PPV) of 66%, negative predictive value (NPV) of 94%, and an F1 score of 76%. For lesion classification as MUC-positive or MUC-negative, the software exhibited a sensitivity of 76%, specificity of 42%, PPV of 83%, NPV of 33%, and an F1 score of 79%. The high NPV for lesion detection suggests a reliable ability to exclude false negatives, which is particularly important in screening contexts. However, the moderate PPV and relatively low specificity highlight the need for further refinement to reduce false positives and enhance classification accuracy.

CONCLUSION

The evaluated AI software demonstrates strong performance in detecting pancreatic cystic lesions, with particularly high sensitivity and NPV, supporting its potential utility as a screening aid. However, its ability to classify lesions as MUC- positive or MUC-negative remains limited, highlighting the importance of continued algorithm development.

CLINICAL RELEVANCE/APPLICATION

AI-based tools may assist radiologists in the early identification and risk stratification of pancreatic cystic lesions. Accurate detection with low false-negative rates can enhance patient management and follow-up protocols. However, clinical integration should consider current limitations in lesion characterization.

S3B-SPGI-7 THREE-DIMENSIONAL MAGNETIC RESONANCE ELASTOGRAPHY FOR PREDICTING HEPATIC DECOMPENSATION RISK IN PATIENTS WITH CACLD: A PILOT STUDY

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Xin Jin (*Abstract Co-Author*)
Jie Zhu (*Abstract Co-Author*)
Haimei Chen (*Abstract Co-Author*)
Ying Zeng (*Abstract Co-Author*)
Zhuoya Yi (*Abstract Co-Author*)

PURPOSE

Three-Dimensional magnetic resonance elastography (3D MRE)-derived mechanical properties are well established for staging liver fibrosis, and tissue mechanical heterogeneity assessed by 3D MRE has shown potential as a biomarker of liver disease severity. The value of 3D MRE for predicting hepatic decompensation in compensated advanced chronic liver disease (cACLD) remains unclear. This study aimed to evaluate the prognostic value of mechanical properties derived from 3D MRE.

METHODS AND MATERIALS

This retrospective study included cACLD patients who underwent paired 2D and 3D MRE between January 2015 and December 2018. Mean, standard deviation (SD) and coefficient of variation (CV) of stiffness, storage modulus, loss modulus and damping ratio (DR) of liver (L) and spleen (S) were calculated for each examination. Univariable Fine-Gray analysis and collinearity assessment ($p < 0.05$; VIF < 10) identified significant predictors. Multivariable Fine-Gray models were developed, and its performance was evaluated using Uno's C-index and time-dependent area under the curve (AUC).

RESULTS

Forty-eight cACLD patients (median age, 51 years; 81% male; 75% HBV etiology) were included. Six patients developed decompensation and six developed hepatocellular carcinoma during a median follow-up of 55.0 months (IQR, 20.8-93.2). Stiffness_2D_L_SD (SHR 5.09), and loss_3D_SD_L (SHR 3.77) showed robust associations with hepatic decompensation. Additionally, stiffness_2D_L_mean, stiffness_3D_mean_L, stiffness_3D_mean_S, storage_3D_mean_L, storage_3D_mean_S, storage_3D_SD_S, DR_3D_CV_L, total bilirubin, ALT and gender also showed significant associations in univariable Fine-Gray analysis ($p < 0.05$). Following univariable analysis, variables were further selected for multivariable modeling based on collinearity assessment (VIF <10). Based on this process, four models were developed: Model 1 (stiffness_2D_L_SD), Model 2 (DR_3D_CV1_L, stiffness_3D_mean_L), Model 3 (loss_3D_SD_L, storage_3D_SD_S), and Model4 (ALT and total bilirubin). It showed model 3 achieved the highest discrimination (C-index 0.81), followed by Model 1, 2, and the clinical Model 4. Model2 showed excellent predictive ability for early risk of hepatic decompensation (1- and 2-year AUCs of 0.91), while Model 3 had excellent discrimination for 5-year risk of hepatic decompensation (AUC (0.84).

CONCLUSION

Tissue mechanical heterogeneity assessed at MRE demonstrated potential value for predicting hepatic decompensation in cACLD patients.

CLINICAL RELEVANCE/APPLICATION

MRE-derived tissue mechanical heterogeneity may serve as a useful non-invasive tool for individualized risk stratification in cACLD patients. However, larger prospective studies are warranted.

S3B-SPGI-8 PREOPERATIVE AI-BASED CT ANALYSIS IDENTIFIES HIGH-RISK BODY COMPOSITION PHENOTYPES FOR POSTOPERATIVE COMPLICATIONS IN COLORECTAL CANCER PATIENTS

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Joanna Urbaniec-Stompor (*Abstract Co-Author*)
Tobias Nonnenmacher, MD (*Abstract Co-Author*)
Victoria Damerell (*Abstract Co-Author*)
Sheetal Hardikar (*Abstract Co-Author*)
Adetunji Toriola (*Abstract Co-Author*)
Hans-Ulrich Kauczor, MD (*Abstract Co-Author*)
Biljana Gigic (*Abstract Co-Author*)

PURPOSE

Surgery is an integral part of colorectal cancer (CRC) treatment. Body Composition Analysis (BCA) may provide additional value in predicting postoperative complications (POCs). This study aimed to evaluate the association between BCA and POCs in CRC patients.

METHODS AND MATERIALS

In this prospective cohort study, 463 CRC patients who previously underwent elective surgery were included. Preoperative CT scans were analyzed by automated CT-based body composition analysis (BCA) using the "Body and Organ Analysis" (BOA) tool. Five body composition indices including visceral adipose tissue (VAT), subcutaneous adipose tissue (SAT), intermuscular adipose tissue (IMAT), and muscle indeces as well as fat-free mass index (FFMI) were extracted. POCs were collected retrospectively and classified both binary and gradually depending on their severity. Unsupervised K-means clustering identified four phenotypes: cachectic, lean-muscular, fat-muscle-rich, and skinny-fat. Associations with POCs and severity were evaluated using multivariable logistic models.

RESULTS

Among the included patients 213 (46%) developed POCs. Patients who developed complications were older compared to those without complications (63.1 vs 60.4 yo, p=0.018). While individual CT metrics (IMAT, VAT, FFMI) were associated with complications in univariate analyses, these associations diminished in multivariable models. In contrast, phenotype-based classification retained predictive power. The fat-muscle-rich (OR = 2.47, p = 0.0088) and skinny-fat (OR = 2.15, p = 0.0239) phenotypes were independently associated with increased complication severity.

CONCLUSION

Preoperative body composition parameters are correlated with the development and severity of POCs in CRC patients. While traditional multivariable models showed limited predictive value, clustering-based phenotypes significantly stratified complication risk.

CLINICAL RELEVANCE/APPLICATION

A BCA clustering model may support personalized surgical planning and perioperative care, offering a potentially useful tool for clinical decision-making.

S3B-SPGI-9 VOXEL-SCALE IMAGE FUSION AND LABEL TRANSFER BETWEEN PARTIAL WHOLE MOUNT HISTOPATHOLOGY AND RECTAL MRI

Joao Manoel M. Santos, PhD (*Presenter*)
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Nil Urganci (*Abstract Co-Author*)
Canan Firat (*Abstract Co-Author*)
Hadi Ghahremannezhad (*Abstract Co-Author*)
Rami Vanguri, PhD (*Abstract Co-Author*)
Jayasree Chakraborty (*Abstract Co-Author*)
Julio Garcia Aguilar (*Abstract Co-Author*)
Marc J. Gollub, MD (*Abstract Co-Author*)
Jinru Shia, MD (*Abstract Co-Author*)
Natally Horvat, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate reproducibility of radiology-pathology image fusion methods for voxel scale mapping between preoperative rectal T2W MRI and whole-mount histology (WMH) in patients with hemisected whole-mount specimens and to evaluate the potential for voxel-based MRI radiomic features to predict pathologic disease state from co-registered WMH.

METHODS AND MATERIALS

This retrospective study compared thirty-eight consecutive patients with rectal adenocarcinoma who underwent total neoadjuvant therapy followed by total mesorectal excision. Complete WMH of the entire rectum was available for 18 patients, whereas hemisected whole-mount specimens were available for 20 patients. Annotations of the rectal wall, 8-15 corresponding landmarks, and 3 corresponding independent validation targets were made by a gastrointestinal pathologist and an abdominal radiologist on WMH and MRI. Ground truth labels of residual viable tumor, tumor bed, and background healthy tissue were also annotated on WMH. Target registration error (TRE) was computed to evaluate co-registration accuracy using rigid point-based registration (PBR) and a deformable linearized iterative boundary reconstruction (LIBR) alignment method. Additionally, 184 MRI radiomic features were extracted for each voxel inside the annotated rectum. The predictive potential for MRI radiomics to separate ground truth tissue pathology labels at voxel scale was assessed using supervised uniform manifold approximation and projection (UMAP).

RESULTS

TRE of the image fusion method for complete WMH specimens was 2.2±0.4 mm using PBR and 1.5±0.3 mm using LIBR ($p<0.001$). For hemisected WMH specimens, TRE was 1.4±0.6 mm using PBR and 1.0±0.3 mm using LIBR ($p<0.001$). TRE for hemisected WMH was lower than TRE for complete WMH using PBR ($p<0.001$) and LIBR ($p<0.001$). UMAP analysis showed clear separation of ground truth tissue pathology that was reproducible across complete and hemisected WMH datasets.

CONCLUSION

Accurate co-registration can be achieved in hemisected whole-mount specimens. Lower TRE was observed, likely due to smaller regions of interest at the expense of smaller territory of ground truth pathology. Hemisected whole-mount specimens are adequate for establishing voxel-to-voxel correspondence between MRI and ground truth histopathology.

CLINICAL RELEVANCE/APPLICATION

The MRI-WMH image fusion workflow establishes a high-quality reference standard that provides voxel-scale correspondences between imaging features and ground truth pathology, enabling greater precision for predictive models to identify residual disease on imaging.

S3B-SPGI-12 AI-BASED LIVER FAT QUANTIFICATION FROM ULTRA-LOW-DOSE CT

Lawrence Carl, MD (*Presenter*)
Arnaldo Mayer, PhD (*Abstract Co-Author*)
Edith M. Marom, MD (*Abstract Co-Author*)
George Biniashvili (*Abstract Co-Author*)
Lilach Arbel (*Abstract Co-Author*)

PURPOSE

To assess a novel AI-based algorithm for the quantification of liver fat fraction (FF) by ultra-low dose (ULD) CT

METHODS AND MATERIALS

We prospectively enrolled 31 consented patients for liver CT and MRI scans performed the same day. Liver MRI: acquired with an Ingenia 3T magnet (Philips, Best, The Netherlands), comprising mDIXON QUANT PDFF scan. Liver CT: non-contrast ULD-CT scan (kVp = 140, fixed current = 10 mA for 0.5 s, and average DLP = 11.49), 256 detectors Revolution CT (GE Healthcare, USA). Following automatic liver segmentation and masking in both CT and MRI, the mDIXON QUANT scan was co-registered to the ULD-CT to provide a ground truth (GT) PD-FF map for each subject's liver. A transformer-based SwinUNETR [1] neural architecture was trained and evaluated in a 7-folds cross-validation scheme to predict the 3D PD-FF maps, with the ULD-CT scans as input and the co-registered mDIXON QUANT PD-FF maps as GT. For comparison, a direct linear regression model (LRM) was also fitted on each training fold, relating ULD-CT HU values at 140 kVp to the MRI-derived PD-FF values, following the approach described in [2] for 120 kVp. Averaging over the folds, leads to: PD-FF [%] = -0.54 · CT [HU] + 33.46. The results for the novel method and the LRM method were presented as a volumetric liver average and on a slice by slice base.

RESULTS

Volumetric analysis using the novel neural method achieved an R 2 of 0.86 and an absolute FF error (L 1) of 1.52% (±1.03%), outperforming the LRM results of R 2 =0.79 and L 1 =1.84% (±1.23%) (P>0.05). Using the per slice method, the novel method performance decreased slightly, with R 2 =0.72, and L1=1.92% (±1.72%). However, for LRM, slice-level performances collapsed entirely at R 2 =-8.80 and L 1 =5.32% (±14.32%) (p<0.01), indicating a stronger spatial localization potential for the proposed neural method in comparison to the LRM. Furthermore, within the PD-FF range corresponding to normal to mild fat content (0-14%), the proposed method maintained a consistent L 1 error of 1.50% (±0.94%) while the LRM error increased to L 1 =1.95% (±1.28%) (P<0.05).

CONCLUSION

The proposed neural model successfully demonstrated the feasibility of predicting liver PD-FF from a ULD-CT scan, outperforming the LRM approach.

CLINICAL RELEVANCE/APPLICATION

These initial results support the potential of ULD-CT as a viable tool for non-invasive NAFLD screening.

S3B-SPGI-13 PROGNOSTIC VALUE OF CT-DERIVED BODY COMPOSITION IN STAGE II RECTAL CANCER MANAGEMENT

Fengli Jiang (*Presenter*)
Dening Ma, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study aims to investigate the ??associations between?? CT-derived body composition parameters ??and?? clinical outcomes, such as overall survival (OS), prolonged length of stay (LOS), and postoperative complications, ??in patients with stage II rectal cancer??, emphasizing their prognostic significance.

METHODS AND MATERIALS

This ??retrospective cohort study enrolled?? patients with stage II rectal cancer ??who underwent curative resection without neoadjuvant therapy from 2010 to 2022??. ??Both univariable and multivariable analyses were performed to assess the ??relationships?? between body composition parameters ??and?? clinical outcomes. ??A nomogram was developed?? using multivariable Cox proportional hazards models to predict overall survival?? in rectal cancer patients. The nomogram's validation involved?? time-dependent receiver operating characteristic (ROC) curve analysis, calibration plots, ?and?? decision curve analysis ??to evaluate its predictive accuracy and clinical utility.

RESULTS

Among 975 patients ??(median age 63 years, IQR 55-70 years; 331 [33.9%] female)??, 183 deaths were recorded during a median follow-up period of 53 months (IQR 33-83 months). ??Low skeletal muscle density (SMD)?? was associated with an ??increased odds?? of severe postoperative complications (Clavien-Dindo =III grade) ?? (OR=0.431; 95% CI 0.204-0.909)??. ??Additionally, a high visceral-to-subcutaneous adipose tissue ratio (VSR)?? ??predicted?? prolonged length of stay (LOS =10 days) ??with an odds ratio of 1.329 (95% CI 1.019-1.734)??. ??Multivariable analysis identified seven independent predictors?? for OS: age, gross tumor type, perineural invasion, lymphovascular invasion, inflammatory burden index, subcutaneous fat area (SFA), ??and?? SMD. ??The nomogram exhibited?? area under the curve (AUC) values of 0.767/0.616, 0.767/0.618, and 0.746/0.665 ??at 1-year, 3-year, and 5-year follow-ups in training/validation cohorts??, respectively. ??This prognostic tool showed?? significantly superior predictive performance compared to single-biomarker models?.

CONCLUSION

Visceral-to-subcutaneous adipose tissue ratio (VSR) emerged as an ??independent predictor of prolonged LOS, ??while low SMD was significantly associated with?? severe postoperative complications (Clavien-Dindo grade III or higher)??. Both low SMD and SFA were identified as high-risk factors for poor prognosis and served as independent predictors of stage II rectal cancer progression.

CLINICAL RELEVANCE/APPLICATION

Our study demonstrates?? that integrating body composition parameters ??significantly enhances?? prognostic stratification ??for stage II rectal cancer?? patients who have not received neoadjuvant therapy??.

S3B-SPGI-14 PORTAL VENOUS PHASE PERITUMORAL HYPOENHANCEMENT ON MRI CAN COMPLEMENT MICROVASCULAR INVASION ON PATHOLOGY FOR PREDICTING HCC RECURRENCE-FREE SURVIVAL

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Xinyuan Jia (*Abstract Co-Author*)
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Riccardo Sartoris, MD (*Abstract Co-Author*)
Jules Gregory (*Abstract Co-Author*)
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Ming Kuang, MD, PhD (*Abstract Co-Author*)
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Bin Song, MD (*Abstract Co-Author*)
Mustafa R. Bashir, MD (*Abstract Co-Author*)
Maxime Ronot, MD, PhD (*Abstract Co-Author*)

PURPOSE

Microvascular invasion (MVI) is associated with increased postoperative recurrence in hepatocellular carcinoma (HCC), but its assessment relies on histopathologic examination which is subject to sampling errors. Therefore, we aimed to propose an MRI-Pathology Criterion (MPC) integrating preoperative peritumoral MRI features with histopathologically-assessed MVI for improving prognostication.

METHODS AND MATERIALS

In this international multi-center cohort study, 1046 patients with single BCLC 0/A HCC who underwent curative-intent resection and preoperative contrast-enhanced MRI at six tertiary hospitals (China, France, USA) were retrospectively included in the training (n =656) or testing (Eastern, n =212; Western, n =178) datasets. Four MRI features were assessed: corona enhancement, portal venous phase (PVP) peritumoral hypoenhancement, T2 peritumoral mild-moderate hyperintensity, and hepatobiliary phase peritumoral hypointensity. Using early recurrence-free survival (RFS=2 years) as the endpoint, the MPC combined histopathologically-assessed MVI with independently prognostic MRI feature(s).

RESULTS

In the training dataset, PVP peritumoral hypoenhancement (HR, 1.83; p <.001) and histopathologically-assessed MVI (HR, 2.59; p <.001) independently predicted early RFS. Based on these two variables, the MPC stratified patients into the high-risk ("MVI and PVP +"; early RFS rate, 32.0%; median RFS, 11.6 months), intermediate-risk ("MVI + PVP -"; 56.1% and 31.0 months; p <.001 vs. high-risk), or low-risk ("MVI -", 78.0% and 60.2 months; p <.001 vs. intermediate-risk) groups. In both testing datasets, early RFS outcomes were consistently distinct among the three risk groups (p values, .023 to .035), and the MPC remained predictive of early RFS after adjusting for 18 other clinico-pathologic-surgical prognostic factors (e.g., a-fetoprotein, tumor size, Edmondson-Steiner grade, resection extent; p values, <.001 to .043).

CONCLUSION

The MPC synergizes MRI (PVP peritumoral hypoenhancement) and histopathologically-assessed MVI to enhance HCC recurrence prediction, which may inform postoperative monitoring and adjuvant therapy decisions.

CLINICAL RELEVANCE/APPLICATION

This study revealed the utility of integrating PVP peritumoral hypoenhancement on MRI with histopathologically-assessed MVI to improve HCC recurrence prediction, mitigating the limitations of sampling variability in histopathologic examination. The developed MPC may serve as a robust tool for stratifying postoperative recurrence risks as well as informing follow-up and adjuvant therapy decisions (e.g., intensified monitoring and prolonged admistrating duration of adjuvant therapy for the MPC-defined high-risk patients).

S3B-SPGI-15 VIRTUAL COLONOSCOPY: CURRENT INDICATIONS AND PATIENT TOLERANCE IN CLINICAL PRACTICE

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Carlos Capunay, MD (*Abstract Co-Author*)
Jimena B. Carpio, MD (*Abstract Co-Author*)

PURPOSE

Virtual colonoscopy (VC), or CT colonography, has emerged as a non-invasive alternative to conventional colonoscopy (CC), offering significant advantages in patient comfort and safety. It is increasingly used in colorectal cancer screening and for the evaluation of various colonic conditions, particularly in patients for whom CC is contraindicated due to medical comorbidities or prior incomplete procedures. One of the key benefits of VC is improved patient experience.The purpuse of this study is to evaluate the current clinical indications for VC at our institution and assess patient-reported experiences regarding the procedure.

METHODS AND MATERIALS

A retrospective review was conducted on 1,217 patients who underwent VC at our institution over the past four years. Examinations were performed using multislice CT scanners (68, 128, and 256 detectors). Technical parameters included 1 mm slice thickness, 0.5 mm reconstruction interval, 80-100 kV, and 200-500 mAs, adjusted for patient size. CO2 insufflation was used to enhance colonic distension and minimize discomfort, as CO2 is rapidly absorbed, allowing for quicker post-procedure recovery. After the procedure, all patients completed a questionnaire evaluating their expectations and level of discomfort, using a Likert scale (1 = no discomfort, 2 = mild, 3 = moderate, 4 = severe).

RESULTS

Among the 1,217 patients, 829 (68.1%) were female and 382 (31.4%) were male. No complications were reported in the patients studied. The most common clinical indication for VC was incomplete colonoscopy (n = 321), followed by abdominal pain (n = 250), constipation or altered bowel habits (n = 210), occult blood in stool (n = 82), diverticulosis (n = 79), rectal bleeding (proctorrhagia) (n = 60), anemia (n = 56), and unexplained weight loss (n = 56). Regarding patient experience, 98% of individuals stated that the procedure met their expectations. When assessing comfort levels, 82% of patients reported no discomfort, 12% experienced mild discomfort, and 6% reported moderate discomfort, while no patient experienced severe pain during the procedure.

CONCLUSION

While conventional colonoscopy remains the gold standard for colorectal cancer screening, virtual colonoscopy provides a valuable non-invasive alternative for patients with specific clinical indications. The high acceptance rate and minimal discomfort reported in our cohort reinforce VC as a patient-friendly diagnostic tool. With ongoing technological advancements, VC continues to play an essential role in colonic evaluation and colorectal cancer screening strategies.

CLINICAL RELEVANCE/APPLICATION

VC continues to play an essential role in colonic evaluation and colorectal cancer screening strategies.

S3B-SPGI-16 THE VALUE OF CT IMAGE FUSION IN PANCREATIC CANCER RESECTABILITY ASSESSMENT A READER STUDY

Mengru Li (*Presenter*)
Wei Wei (*Abstract Co-Author*)

PURPOSE

To evaluate the clinical value of CT arterial-venous phase fused images in assessing the resectability of pancreatic ductal adenocarcinoma through a reader study.

METHODS AND MATERIALS

A retrospective, multireader, multicase reader study was conducted using 30 contrast-enhanced upper abdominal CT images from our hospital between january 2023 and December 2024. Two preliminary reports were generated for pancreatic cancer resectability assessment: one using separate arterial and venous phase images, and the other utilizing arterial-venous phase fused images. Three experienced abdominal radiologists evaluated reading time, report consistency (RADPEER), and compared outcomes between the first session and the second session from February to March 2025. Reading time and report consistency were analyzed using IBM SPSS Statistics 27. Additionally, accuracy, sensitivity, and specificity between the two sessions were compared through Chi-square.

RESULTS

The introduction of arterial-venous phase fused imaging reports significantly reduced average reading times from 316.87 seconds ± 76.14 to 154.03 seconds ±32.05 ($P < .001$). In the analysis of pancreatic cancer resectability assessment, significant improvements in sensitivity were observed across all evaluation categories: resectable (84.3% to 90.8%; $P < .001$), borderline resectable (80.0% to 80.0%; $P < .001$), and locally advanced (30.0% to 100.0%; $P < .001$). Despite overall enhancement in diagnostic performance, inter-reader variability among individual radiologists was still noted.

CONCLUSION

The utilization of arterial-venous phase fused imaging in pancreatic ductal adenocarcinoma enhances both the efficiency and diagnostic quality of resectability assessment reporting.

CLINICAL RELEVANCE/APPLICATION

This study investigates the clinical value of domain-specific CT image fusion technology in pancreatic cancer resectability assessment reports and validates its potential to enhance radiology workflows through a reader study. The findings demonstrate that pancreatic cancer resectability assessment reports generated using fused images reduce radiologists' reading time while improving the consistency, quality, and sensitivity of the reports.
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S3B-SPGU

Genitourinary Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPGU-3 TEXTURE ANALYSIS ENHANCES DIAGNOSTIC ACCURACY OF PIRADS 5 LESIONS IN PROSTATE MRI

Chen-Jiang Wu, MD (*Presenter*)

PURPOSE

Prostatitis is frequently observed in false positive lesions scored as PI-RADS 5, necessitating improved diagnostic tools. This study investigated the potential of MRI texture analysis of ADC sequences to enhance the differentiation of prostatitis from prostate cancer (PCa) in PI-RADS 5 lesions.

METHODS AND MATERIALS

This retrospective study enrolled patients undergoing 3T MRI with lesions scored as PI-RADS 5. Lesions were manually delineated on ADC maps, and texture features were extracted using Firevoxel. Clinical data and ADC texture parameters were collected. The diagnostic performance (AUC, sensitivity, specificity, PPV, NPV) of clinical, ADC texture, and a combined model were calculated and compared using the DeLong test.

RESULTS

The final cohort included 185 patients with 185 PI-RADS 5 lesions (160 PCa, 25 prostatitis). The combined model, incorporating clinical indicators (Age, PSAD) and ADC texture parameters (signal coefficient of variation, ADC percentile), demonstrated the best diagnostic performance: sensitivity 98.7%, specificity 60.0%, PPV 97.9%, NPV 71.6%, and AUC 93.1%. Bootstrap resampling confirms the robustness of the model. Decision curve analysis indicated a better net benefit with the combined model for guiding biopsy decisions.

CONCLUSION

ADC imaging texture parameters are valuable for the differential diagnosis of prostatitis from lesions scored as PI-RADS 5. Their combination with clinical indicators significantly improves diagnostic performance, providing valuable information to facilitate surgical decision-making and potentially reduce unnecessary biopsies.

CLINICAL RELEVANCE/APPLICATION

The improved positive predictive value for PI-RADS 5 lesions achieved by the combined model has the potential to significantly reduce the number of unnecessary biopsies performed for highly suspected prostate cancer.

S3B-SPGU-6 A TRANSFORMER-BASED DEEP LEARNING MODEL FOR PREOPERATIVE PREDICTION OF BIOCHEMICAL RECURRENCE FOLLOWING RADICAL PROSTATECTOMY USING MULTIPARAMETRIC MRI

Ye Xiang (*Presenter*)
Fan Li (*Abstract Co-Author*)
Lihua Zhuo (*Abstract Co-Author*)
Ruishan Liu (*Abstract Co-Author*)
Lv Yue (*Abstract Co-Author*)

PURPOSE

To develop and validate a Transformer-based deep learning model using 2.5D multiparametric MRI for the preoperative prediction of biochemical recurrence (BCR) after radical prostatectomy (RP), and to assess whether integrating clinical features enhances prognostic performance.

METHODS AND MATERIALS

This multicenter retrospective study included 1164 patients who underwent RP between August 2013 and September 2021, with follow-up through March 2024. Patients were divided into training (n=498), internal test (n=214), and two external test cohorts (n=378 and n=74). A Transformer-based deep learning model was constructed using 2.5D tumor-centric MRI slices. A combined model was also developed by integrating key clinicopathological predictors. Model performance was evaluated via receiver operating characteristic (ROC) curves, DeLong's test, Hosmer-Lemeshow goodness-of-fit, and decision curve analysis (DCA). Grad-CAM heatmaps provided interpretability, and Kaplan-Meier analysis assessed associations between risk stratification and disease-free survival (DFS).

RESULTS

The Transformer-based model yielded strong predictive performance, with AUCs of 0.92 (95% CI: 0.879-0.974), 0.84 (95% CI: 0.784-0.894), and 0.82 (95% CI: 0.652-0.967) in the internal and two external test sets, respectively. The combined model further improved prediction, achieving AUCs of 0.94 (95% CI: 0.885-0.992), 0.94 (95% CI: 0.900-0.969), and 0.83 (95% CI: 0.693-0.965). Statistical analysis confirmed that the combined model significantly outperformed both the deep learning and clinical-only models ($P < 0.05$). High-risk patients, as identified by the model, demonstrated significantly shorter DFS than low-risk patients ($P < 0.05$).

CONCLUSION

The proposed integrative model combining Transformer-based imaging features with clinical data effectively predicts postoperative BCR and enables robust patient risk stratification.

CLINICAL RELEVANCE/APPLICATION

This model may facilitate personalized surveillance and treatment strategies by identifying patients at high risk of recurrence following prostatectomy.

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S3B-SPHN

Head & Neck Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPHN-2 MULTIMODAL DEEP LEARNING MODEL FOR PREDICTING ORIGINS OF METASTATIC CERVICAL LYMPH NODES

Xi Lin (*Presenter*)
Chunyan Li (*Abstract Co-Author*)
Jinjing Ou (*Abstract Co-Author*)
Cuiju Yan (*Abstract Co-Author*)

PURPOSE

To develop an artificial intelligence (AI) model for predicting the potential primary tumor of metastatic cervical lymph nodes, thereby providing clinical decision support for origin identification.

METHODS AND MATERIALS

The retrospective study analyzed 7880 metastatic cervical lymph nodes from 7810 patients across two centers. At center 1, a total of 7633 nodes from 7570 patients were divided into a training set (6106 nodes) and an internal test set (1527 nodes) at an 8:2 ratio. An independent external test set consisted of 247 metastatic cervical lymph nodes from 240 patients at center 2. An AI model based on the InceptionResNetV2 architecture was developed to combine ultrasound with clinicopathological metadata (sex, age, nodal level, pathological subtype). Predictive performance for metastases from head-neck, thyroid, respiratory, female reproductive, and digestive systems cancers was evaluated in the internal and external test sets. The performance for the five-class prediction was evaluated using macro-AUC and top-k accuracy, while for individual classes was assessed via AUC.

RESULTS

The AI model exhibited a macro-AUC of 0.851 (95% CI: 0.838-0.864) and 0.800 (0.768-0.828) in the internal and external test sets, respectively. The model's top-2 and top-3 accuracy were 0.887 (0.879-0.894) and 0.907 (0.901-0.914) in the internal test set, and 0.871 (0.851-0.891) and 0.893 (0.876-0.909) in the external test set. AUCs were 0.949 for the thyroid, 0.942 for the head and neck, 0.820 for the respiratory system, 0.793 for the female genital system, and 0.747 for the digestive system in the internal test set. Corresponding external evaluation results were 0.903 for thyroid, 0.876 for the head and neck, 0.759 for the respiratory system, 0.758 for the female genital system, and 0.690 for the digestive system.

CONCLUSION

Our model exhibited good predictive performance for identifying the primary tumor of metastatic cervical lymph nodes from routine ultrasound images and clinicopathological metadata.

CLINICAL RELEVANCE/APPLICATION

To search for the primary tumor of nodal metastasis, whole body radiological imaging and multitudinous immunohistochemical markers are required. Considering that ultrasound is the first examination method for superficial lymph nodes, AI based on ultrasound and clinicopathological metadata may reduce unnecessary following imaging examination sites, and guide the targeted selection of markers.

S3B-SPHN-5 EVALUATION OF BAYES'RULE BETWEEN NASOPHARYNGEAL LYMPHOID HYPERPLASIA AND NASOPHARYNGEAL CARCINOMA BASED ON MR SIGNAL INTENSITY RATIO

Jiuping Liang (*Presenter*)
Xueling Qin (*Abstract Co-Author*)
Yiyong Liu (*Abstract Co-Author*)

PURPOSE

To evaluate the efficiency of Bayes'rule, a method based on MR signal intensity ratio (SIR),to distinguish nasopharyngeal lymphoid hyperplasia (NPLH) from nasopharyngeal carcinoma (NPC).

METHODS AND MATERIALS

One hundred and twenty- six patients with pathologically proved nasopharyngeal lesions (27 cases of NPLH and 99 cases of NPC) from July 2017 to July 2023 were retrospectively analyzed. Max-signal intensity (Max-SI), Min-signal intensity (Min-SI) and Mean-signal intensity (Mean-SI) of nasopharyngeal lesions were obtained on axial T2WI and T1WI+C, and the ratios with Mean-SI of longuscapitis were calculated to construct the Bayes'rule of NPLH and NPC.

RESULTS

(1) The Max-SIR (6.70±0.99 vs 4.59±0.76), Min-SIR (4.40±0.65 vs 3.04±0.73), Mean-SIR (5.49±0.71 vs 3.83±0.69) on T2WI and Min-SIR (1.55±0.30 vs 1.73±0.29) on T1WI+C were significantly different between NPLH and NPC($P < 0.05$). (2) Using the stepwise method, Max-SIR on T2WI and Min-SIR on T1WI+C demonstrated statistical significance in distinguishing NPLH from NPC. Two sets of classification functions were derived as follows: Y1=-29.64+6.09×T2WI-Max-SIR+17.34×T1WI+C-Min-SIR and Y2=-43.36+9.47×T2WI-Max-SIR+14.06×T1WI+C-Min-SIR. The Original results indicate an overall discriminant coincidence rate of 95.2%, while the cross-validated results demonstrate a slightly lower overall discriminant coincidence rate of 93.7%.

CONCLUSION

The MR-SIR-based Bayes'rule is a non-invasive and ease of use method in identifying NPLH from NPC with a high accuracy.

CLINICAL RELEVANCE/APPLICATION

The MR-SIR-based Bayes'rule is a practical method without additional scanning techniques in differentiating NPLH from NPC with a high accuracy.

S3B-SPHN-6 DEVELOPMENT AND VALIDATION OF A MULTIMODAL DEEP LEARNING MODEL FOR PREOPERATIVE DIAGNOSIS OF GLAND TUMORS: A DUAL-CENTER STUDY BASED ON ULTRASOUND AND CLINICAL DATA

Yuchi Tian (*Presenter*)
Lin Lin (*Abstract Co-Author*)
Xiaoyun Liang, PhD (*Abstract Co-Author*)
Shaozheng He (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a deep learning-based multimodal fusion model integrating grayscale ultrasound (US), color Doppler ultrasound (Color US), and clinical data for the preoperative classification of Parotidular tumors, and to compare its diagnostic performance with single-modality models

METHODS AND MATERIALS

A total of 306 cases from two centers were divided into a training set (n=214) and validation set (n=92). The multimodal model achieved the best performance (AUC = 0.9118, accuracy = 0.8804). A multimodal framework was proposed to classify benign and malignant parotid Parotid tumors by fusing grayscale US, Color US, and clinical data. Grayscale and Color US images were processed via separate ResNet-18 CNNs, followed by Transformer Encoders to extract modality-specific contextual features. Clinical data were embedded using an MLP and refined with a Transformer Encoder to model feature dependencies. The imaging features and clinical embedded features were integrated via a Cross-Transformer Encoder, where clinical features served as Query, and the concatenated image features as Key and Value. The fused representation was passed through fully connected layers with sigmoid activation for classification.

RESULTS

The multimodal model achieved the best performance (AUC = 0.9118), surpassing single-modality models: Gray US (AUC = 0.8361), Color US (AUC = 0.8118), and Clinical (AUC = 0.8500). The multimodal model consistently demonstrated better discriminative ability in ROC and PR curves, a more favorable clinical net benefit in DCA, and better calibration with the lowest Brier score. Additionally, the radar plot highlights its balanced and superior performance across all key metrics. The kernel density estimate (KDE) plots of predicted probabilities further illustrate the clearer separation of positive and negative cases achieved by the multimodal fusion model compared to the single-modality models.

CONCLUSION

The multimodal fusion model combining Gray US, Color US, and clinical features outperformed single-modality approaches, offering a more accurate and reliable diagnostic solution for Parotidular tumors.

CLINICAL RELEVANCE/APPLICATION

By significantly improving the diagnostic accuracy of Parotidular tumors, the multimodal fusion model enhances clinical decision-making and helps reduce diagnostic uncertainty. Its implementation may lead to earlier and more precise treatment strategies, minimize unnecessary biopsies or surgeries, and ultimately improve patient outcomes.

S3B-SPHN-7 BEYOND THE T: QUANTITATIVE VOLUMETRIC 3D MRI ANALYSIS FOR LYMPHATIC SPREAD IN HNSCC IN COMPARISON WITH TNM

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Thomas J. Vogl, MD, PhD (*Abstract Co-Author*)
Maximilian Fleischmann (*Abstract Co-Author*)
Robert Sader, MD, PhD (*Abstract Co-Author*)
Ibrahim Yel, MD (*Abstract Co-Author*)
Philipp Thoenissen (*Abstract Co-Author*)

PURPOSE

To investigate the relationship between primary tumor volume, the spatial distribution of cervical lymph node metastases, and TNM staging in patients with oral and pharyngeal squamous cell carcinoma using high-resolution MRI-based volumetric and distance measurements.

METHODS AND MATERIALS

In this retrospective analysis, 116 predominantly male (62.9%) patients with a mean age of 67.7 ± 11.5 years with histologically confirmed oral and pharyngeal squamous cell carcinoma who underwent either primary surgical resection with neck dissection or definitive chemoradiation were evaluated. MRI-based volumetric analysis and center-to-center distance measurements between the primary tumor and cervical lymph node metastases were performed using dedicated 3D postprocessing software. Spearman correlation coefficients were calculated to assess relationships between tumor volume, lymph node distance, and TNM staging parameters.

RESULTS

Tumor-to-lymph node distances on MRI ranged from 11.7 to 117.3 mm (mean: 47.6 ± 19.4 mm). Tumor volume varied from 0.5 to 87.2 cm^3 (median: 13.3 ± 13.2 cm^3), and was higher in male patients. A significant correlation was observed between tumor volume and both lymph node distance and pT stage ($p < 0.0001$). No correlation was found between lymph node volume and metastasis distance ($p = 0.3436$). The correlation between tumor volume and the distance to metastatic lymph nodes was stronger (Spearman's $r = 0.4541$, $p < 0.0001$) than the correlation between the T-stage (TNM classification) and nodal distance (Spearman's $r = 0.2682$, $p = 0.0036$). Bilateral nodal metastases were associated with larger tumors (16.3 cm^3 vs 12.3 cm^3, $p < 0.0001$) and greater spread distances (52 mm vs 46 mm, $p < 0.0001$).

CONCLUSION

Tumor volume is a stronger predictor of the spatial extent of lymph node metastases than T-stage alone. Larger tumors were associated with greater distances to metastatic lymph nodes, particularly in cases with bilateral involvement. Lymph node volume did not correlate with spread distance, suggesting that even small nodes may be located at significant distances. Findings highlight the added value of quantitative 3D MRI-based volume and distance analyses in predicting metastatic spread patterns in head and neck cancer, ptotenially improving surgical and radiotherapeutic planning compared with traditional level-based anatomical classification systems.

CLINICAL RELEVANCE/APPLICATION

MRI-based 3D volumetric and spatial analysis may offer a more precise prediction of metastatic spread in oral and pharyngeal squamous cell carcinoma than conventional TNM staging, supporting improved surgical and radiotherapy planning.

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S3B-SPIN

Imaging Informatics Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPIN-1 ENHANCING HEMORRHAGE SEGMENTATION PERFORMANCE IN PEDIATRIC HEAD CT USING PRE-TRAINED ADULT HEMORRHAGE SEGMENTATION MODEL

Jihwan Kim, BSc, MSc (*Presenter*)
Joonseo Oh (*Abstract Co-Author*)
Jongjun Won, BS (*Abstract Co-Author*)
Hyungbin Park (*Abstract Co-Author*)
Joon Park, MD (*Abstract Co-Author*)
Gil-Sun Hong, MD, PhD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

Although numerous artificial-intelligence models have been developed to segment intracranial hemorrhage (ICH) in adults, their performance in pediatric patients remains uncertain. To bridge this gap, we investigated targeted strategies to enhance segmentation accuracy for pediatric ICH.

METHODS AND MATERIALS

The adult cohort comprised 965 training scans (643 hemorrhage, 322 normal; mean age ± SD 52.1 ± 17.6 years; 61 % male) and 889 test scans (169 hemorrhage, 720 normal; mean age 48.9 ± 16.4 years; 51 % male). The pediatric cohort, collected at a tertiary medical centre, contained 1,060 training scans (133 hemorrhage, 927 normal; median age 7.8 years, inter-quartile range 4.0-11.0; 58 % male) and 291 test scans (33 hemorrhage, 258 normal; median age 8.1 years, IQR 4.0-12.0; 58 % male). We employed STUNet—an nnUNet variant—for segmentation and compared four training strategies: (1) adult-only, (2) pediatric-only, (3) combined adult + pediatric, and (4) fine-tuning a model pre-trained on adults with pediatric data. Model performance on the pediatric hemorrhage test set was evaluated using the Dice similarity coefficient (DSC), sensitivity, and specificity.

RESULTS

The adult-only model performed well on adult data (DSC = 0.675; sensitivity = 0.982; specificity = 0.831) but its specificity collapsed when applied to pediatric cases (DSC = 0.555; sensitivity = 0.939; specificity = 0.109). The pediatric-only model also showed poor specificity on the pediatric test set (DSC = 0.508; sensitivity = 0.970; specificity = 0.202). Training on the combined adult + pediatric dataset improved the Dice score but still yielded low specificity (DSC = 0.596; sensitivity = 0.970; specificity = 0.248). By contrast, the fine-tuned model—pre-trained on adults and then fine-tuned with pediatric data—achieved a dramatic gain in specificity with only a modest drop in sensitivity (DSC = 0.541; sensitivity = 0.879; specificity = 0.818). Importantly, this fine-tuned model retained solid performance on the adult test set as well (DSC = 0.546; sensitivity = 0.923; specificity = 0.918).

CONCLUSION

The adult-only segmentation model—despite never encountering pediatric ICH—exhibited respectable generalization, particularly in sensitivity. Fine-tuning this model with pediatric data, however, dramatically increased specificity with only a minor reduction in sensitivity.

CLINICAL RELEVANCE/APPLICATION

These findings suggest that while adult-trained models can serve as strong initialization points, domain adaptation is essential for achieving clinically reliable performance in relatively limited pediatric populations.

S3B-SPIN-2 A DEEP LEARNING METHOD FOR THE AUTOMATIC CHARACTERIZATION OF LESIONS IN TAP CT SCANS FROM CANCER PATIENTS

Marc-Michel Rohe (*Presenter*)
Sophie Loizillon (*Abstract Co-Author*)
Arnaud Marcoux (*Abstract Co-Author*)
Alexandre Bone (*Abstract Co-Author*)

PURPOSE

TAP-CT imaging plays a pivotal role in the clinical management of cancer patients, but their analysis can be of burden for overstretched radiology services. Computer-assisted detection has the potential to streamline TAP-CT workflows but must avoid the pitfall of over-detection. This is why, in this study, we present a deep learning method for the automatic characterization of lesions in cancer patients, which could allow to filter out irrelevant detections such as cysts.

METHODS AND MATERIALS

In this retrospective study, we use a multicentric database containing 4176 cancer patients with 4765 CT scans from multiple international institutions. These images were acquired on a large variety of scanners with heterogeneous acquisition protocols, which reflect routine clinical setting. Expert radiologists manually contoured in 3D all visible lesions with access to the original radiology reports include medical background, and characterized, when possible, in one of the following classes: solid, cystic, lymphadenopathy, ground-glass opacity, lytic and sclerotic. The dataset was split between 3980 scans (35136 lesions) used for training and an independent test set of 724 randomly selected scans (5207 lesions). We train a deep learning model based on a ResNet architecture to automatically characterize lesions. The model input consisted of a 2D patch centered on the lesion, with the segmented lesion serving as an additional layer to the original patch. Evaluation was performed on the test set using ROC analysis. and comparison of model performance was assessed using DeLong's test.

RESULTS

Our deep learning model achieved an accuracy of 0.91 on our test set for the semiology classification of lesions in the 6 classes of interest. In particular, characterization of soft tissue lesions allowed cysts to be distinguished from solid lesions with an AUC of 0.94, significantly outperforming a baseline approach based on median HU

thresholding (AUC: 0.62; p-value: 2e-16). With regard to bone lesions, the AI model achieved an excellent AUC of 0.97 for the differentiation of lytic from sclerotic lesions. A very good sensitivity (0.90) was also found for the detection of lymphadenopathy.

CONCLUSION

The proposed AI solution for the automatic lesion characterization on TAP CT scans in oncology imaging showed promising performance on a large multi-center real-world dataset with different scanners, manufacturers and imaging protocols.

CLINICAL RELEVANCE/APPLICATION

This AI system may help radiologists to reduce the time needed to analyze TAP CT scans in oncology imaging.

S3B-SPIN-3 RADFORMER: A SELF-SUPERVISED FOUNDATION MODEL TO ADDRESS INCOMPLETENESS IN RADIOMICS FEATURES

Khashayar Namdar, PhD, MSc (*Presenter*)
Saeidehsadat Mirjalili (*Abstract Co-Author*)
Pascal N. Tyrrell, PhD (*Abstract Co-Author*)
Leo Anthony Celi (*Abstract Co-Author*)

PURPOSE

Radiomics-based AI has shown competitive performance compared with deep learning across various medical imaging tasks. However, radiomics pipelines suffer from poor reproducibility due to sensitivity to feature extraction settings and missing feature subsets. We propose RadFormer, a self-supervised transformer-based radiomics foundation model designed to improve robustness and reproducibility in downstream tasks, even when incomplete feature sets are available.

METHODS AND MATERIALS

Using the OpenRadiomics dataset, we collected 476,424 radiomics feature vectors via PyRadiomics across multiple imaging modalities and institutions. We trained a transformer-based autoencoder with 768-dimensional embeddings using self-supervised learning, combining reconstruction, contrastive, and feature decorrelation losses. Random masking of features and feature families simulated feature dropout during training. For evaluation, we used the 2021 PI-CAI prostate cancer dataset from RadMLBench, which includes 3,045 radiomics features extracted from T2-weighted, apparent diffusion coefficient (ADC) maps, and diffusion-weighted imaging (DWI) MRI for 969 patients. The clinical task was binary classification of csPCa (Gleason score >3+3, n=637) versus non-csPCa (n=332). We applied 20-fold cross-validation with LightGBM, using a 75/25 train/validation split to guide grid search based on validation area under the receiver operating characteristic curve (AUC). We compared three pipelines on the same splits: (1) Benchmark (all features), (2) Baseline (shape + first-order only), and (3) RadFormer-Augmented (RadFormer embeddings from incomplete features).

RESULTS

The benchmark model, trained on the full radiomic feature set, achieved a mean AUC of 0.733 [95% CI: 0.684-0.781]. In contrast, the model trained solely on shape and first-order features showed reduced discriminatory performance, with an AUC of 0.693 [95% CI: 0.648-0.738], indicating a substantial loss of predictive information. Using RadFormer-augmented features in place of the omitted higher-order radiomic features, achieved an AUC of 0.729 [95% CI: 0.680-0.779], outperforming the reduced feature model ($p = 0.0471$). Although this performance did not significantly exceed the benchmark, there was no significant difference.

CONCLUSION

RadFormer recovered much of the lost performance due to feature incompleteness, reinforcing its utility as a substitute for handcrafted higher-order features in radiomic modeling.

CLINICAL RELEVANCE/APPLICATION

RadFormer is, to our knowledge, the first radiomics foundation model. It addresses a major barrier in radiomics reproducibility by learning generalizable embeddings from large-scale feature distributions.

S3B-SPIN-4 FROM DICTATION TO DIAGNOSIS: ENHANCING RADIOLOGY REPORTING WITH INTEGRATED SPEECH RECOGNITION IN MULTIMODAL LARGE LANGUAGE MODELS

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Thomas M. Dratsch, MD, PhD (*Abstract Co-Author*)
Simon Lennartz, MD (*Abstract Co-Author*)
Johannes Bremm (*Abstract Co-Author*)
Andra-Iza Iuga (*Abstract Co-Author*)
Alexander C. Bunck (*Abstract Co-Author*)
Kai Roman Laukamp, MD (*Abstract Co-Author*)
Jonathan M. Kottlors, MD (*Abstract Co-Author*)

PURPOSE

This study evaluates the efficiency and quality of radiology reporting using multimodal large language models (LLMs) compared to conventional reporting with speech recognition software. We hypothesized that by providing patient history, clinical questions, and pathological findings as minimal audio input, LLMs could generate complete radiological reports, including impressions tailored to the clinical question.

METHODS AND MATERIALS

A total of 480 reports from 80 imaging studies (radiographs, ultrasound, CT, MRI) were generated by two board-certified radiologists using three workflows: one using speech recognition software (conventional workflow), and two reports using the audio input capabilities of GPT-4o and Claude Sonnet 3.5, respectively within an LLM-based workflow. Reporting time, number of corrections, and cost per report were recorded. Using a 5-point Likert scale two independent radiologists assessed formal structure and report quality.

RESULTS

LLM-WF significantly reduced reporting time (GPT-4o/Sonnet 3.5: 38.9 ± 22.7 s vs. (C-WF): 88.0 ± 60.9 s, $P < 0.01$), required fewer corrections (GPT-4o: 1.0 ± 1.1, Sonnet 3.5: 0.9 ± 1.0 vs. C-WF: 2.4 ± 2.5, $P < 0.01$), and lowered costs (GPT-4o: $2.3 ± 1.4, Sonnet 3.5: $2.4 ± 1.4 vs. C-WF: $3.0 ± 2.1, $P < 0.01$). Reports generated with Sonnet 3.5 were rated highest in quality, while GPT-4o and conventional reports showed no difference.

CONCLUSION

Multimodal LLMs can generate high-quality radiology reports based solely on minimal audio input, with greater speed, fewer corrections, and reduced costs compared to conventional speech-based workflows. Their integration into clinical systems could address key efficiency gaps and should be further evaluated in prospective real-world settings.

CLINICAL RELEVANCE/APPLICATION

LLM-based reporting from minimal audio input has the potential to improve efficiency and report quality, supporting more streamlined workflows in clinical radiology.

S3B-SPIN-5 HARNESSING SPECTRAL RADIOMICS FROM PHOTON-COUNTING CT FOR NEXT-GEN LIVER METASTASIS CLASSIFICATION

Simon Hellbruck, BSc, MSc (*Presenter*)
Thilo Brandmayr (*Abstract Co-Author*)
Humberto Abraham Cortes Magdaleno, MD (*Abstract Co-Author*)
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Thomas J. Kroencke, MD (*Abstract Co-Author*)
Josua A. Decker, MD (*Abstract Co-Author*)

PURPOSE

Photon-counting computed tomography (PCCT) introduces the capability to extract spectral radiomics features by leveraging multi-energy level data. This study explores the use of spectral radiomics to distinguish healthy from metastases-loaded livers using PCCT (NAETOM Alpha, Siemens Healthineers, Erlangen, DE).

METHODS AND MATERIALS

A retrospective analysis was conducted on 247 PCCT datasets: 148 healthy liver cases (mean age: 69 years; 95% CI: 67-71; 56 females, 92 males) and 99 with liver metastases (mean age: 71 years; 95% CI: 69-73; 50 females, 49 males). All datasets were reconstructed using a Qr40 kernel to generate monoenergetic images from 40 to 80 keV in 10 keV steps, as well as virtual non-contrast (VNC) images. Liver segmentation was performed on both healthy livers and livers with metastases using TotalSegmentator, applied to 70 keV and VNC images. All segmentations were reviewed and manually refined by a radiologist. Radiomic features were extracted from the segmented volumes using PyRadiomics. Feature selection was conducted using the Boruta algorithm, capped at 22 features. A random forest classifier with five-fold cross-validation was used for model training and evaluation.

RESULTS

Using radiomics features from only the 70 keV image yielded an average AUC of 0.81 for differentiating healthy and metastatic tissue. Including features from additional monoenergetic levels improved performance to an average AUC of 0.84. The inclusion of inter-energy-level features, such as intensity differentials and feature ratios, further enhanced performance, achieving an AUC of 0.89. The calculated contrast ratio of VNC vs. Mono 40 keV emerged as one of the most important features.

CONCLUSION

Overall, these findings provide initial evidence for the added value of spectral radiomics into PCCT-based imaging workflows. In this preliminary evaluation, the use of such information offers a more nuanced and stronger tool for the classification of liver CT texture, opening new avenues for opportunistic approaches and spectral radiomics research.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the clinical potential of integrating spectral radiomics into routine PCCT analysis pipelines. The improved discrimination between healthy and metastatic liver tissue may aid radiologists in earlier and more accurate diagnosis, treatment planning, and monitoring of oncologic patients. By surpassing traditional single-energy approaches, spectral radiomics can contribute to more personalized and precise patient care in liver oncology and beyond.

S3B-SPIN-6 PARROT, AN OPEN MULTILINGUAL RADIOLOGY REPORTS DATASET

Bastien Le Guellec, MD (*Presenter*)
Keno K. Bressem, MD (*Abstract Co-Author*)

PURPOSE

To develop and validate PARROT (Polyglottal Annotated Radiology Reports for Open Testing), a large, multicentric, open-access dataset of fictional radiology reports spanning multiple languages for testing natural language processing applications in radiology.

METHODS AND MATERIALS

From May to September 2024, radiologists were invited to contribute fictional radiology reports following their standard reporting practices. Contributors provided at least 20 reports with associated metadata including anatomical region, imaging modality, clinical context, and for non-English reports, English translations. All reports were assigned ICD-10 codes. A human vs. AI report differentiation study was conducted with 154 participants (radiologists, healthcare professionals, and non-healthcare professionals) assessing whether reports were human-authored or AI-generated.

RESULTS

The dataset comprises 2,658 radiology reports from 76 authors across 21 countries and 14 languages. Reports cover multiple imaging modalities (CT: 36.1%, MRI: 22.8%, radiography: 19.0%, ultrasound: 16.8%) and anatomical regions, with chest (19.9%), abdomen (18.6%), head (17.3%), and pelvis (14.1%) being most prevalent. In the differentiation study, participants achieved 53.9% accuracy (95% CI: 50.7%-57.1%) in distinguishing between human and AI-generated reports, with radiologists performing significantly better (56.9%, 95% CI: 53.3%-60.6%, $p<0.05$) than other groups.

CONCLUSION

PARROT represents the largest open multilingual radiology report dataset, enabling development and validation of natural language processing applications across linguistic, geographic, and clinical boundaries without privacy constraints.

CLINICAL RELEVANCE/APPLICATION

PARROT, a novel open-access dataset of 2,658 fictional radiology reports spanning 14 languages, enables cross-linguistic natural language processing research while circumventing privacy constraints.

S3B-SPIN-7 CREATION OF A LARGE LANGUAGE MODEL-BASED REVIEW TOOL FOR FOLLOW-UP OF CHEST X-RAYS

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Alvin Y. Soon, MBBS, FRCR (*Abstract Co-Author*)
Yao An Kendrick Chia (*Abstract Co-Author*)
Wilson Wen Bin Goh (*Abstract Co-Author*)
Cher Heng Tan, MBBS, FRCR (*Abstract Co-Author*)

PURPOSE

Traditionally, radiology reports are classified manually by radiologists into categories such as normal, abnormal, and critical, guiding clinical management. Errors can lead to delayed management of emergent conditions. We aim to investigate how Large Language Models (LLMs) can be used in the classification of chest X-ray (CXR) reports for quality assurance. A key strength of our approach is the preservation of human oversight at critical points, ensuring that automation does not compromise safety where failure may have serious consequences.

METHODS AND MATERIALS

This tool was developed based on 200 anonymized CXR reports, 100 from a tertiary care hospital and 100 from a primary care clinic. The ground truth was obtained by expert annotation. Reports were graded on a scale of 1 to 5: 1 is normal, 2 is a normal variant, 3 is abnormal but not requiring immediate follow-up, 4 is a potentially important finding and 5 is a critical result. OpenAI o4-mini and Llama3.1-8B were employed. 3 approaches were tested - in the LLM Approach, the LLM was prompted to grade the report directly, in the Semialgo Approach, findings were extracted and then graded according to predefined categories (Semialgo approach), and in the Judge Approach, a “reasoning” LLM was asked to judge which is a better result. The Cohen Kappa, a measurement of the agreement between the manual classification and the model’s results, was used as a primary performance metric.

RESULTS

All 3 approaches are promising, with a Cohen Kappa of 0.406, 0.221 and 0.466 for the LLM, Semialgo and Judge approaches respectively, and a within-1 agreement of 91.5, 90.0 and 98.0% for the three approaches respectively. Grouping the gradings into three categories,1/2 (within normal limits), 3 (abnormal) and 4/5 (urgent, actionable), yields an improved Cohen Kappa of 0.524. The critical undergrading rate, where a rating of less than 4 was assigned when it should be 4/5, was the lowest for the Semialgo approach at 5 out of 46 cases.

CONCLUSION

This study demonstrates that LLM-based tool accurately categorizes CXR reports with strong agreement to human raters, with some approaches also demonstrating low critical undergrading rates, essential for prompt clinical decision-making and ensuring patient safety.

CLINICAL RELEVANCE/APPLICATION

Through the automation of the final classification step in reporting, our proposed tool is a productive and meaningful application of LLMs in radiology. Seamless integration before reports are finalized can alleviate radiologists' cognitive load, allowing them to focus on image interpretation and complex cases.

S3B-SPIN-8 COMBINED RADIOMICS, DEEP LEARNING, AND CLINICAL DATA FROM CT PREDICTS SURVIVAL ACROSS TREATMENT MODALITIES IN ESOPHAGEAL SQUAMOUS CELL CARCINOMA: A MULTICENTER STUDY

Zhaoqi Wang (*Presenter*)
Jin Rong Qu, MD (*Abstract Co-Author*)
Binbin Han (*Abstract Co-Author*)
funing Chu (*Abstract Co-Author*)
Bingmei Bai (*Abstract Co-Author*)

PURPOSE

To develop and validate a predictive model integrating clinical data with contrast-enhanced CT-derived radiomics and deep learning features for overall survival (OS) prediction in a large cohort of esophageal squamous cell carcinoma (ESCC) patients undergoing diverse definitive treatment strategies.

METHODS AND MATERIALS

This retrospective study, approved by the IRB with waived consent, included 488 ESCC patients (training n=342, validation n=146) from our hospitals (Jan 2015 - Dec 2020). Patients had pretreatment contrast-enhanced CT and received one of four treatments: untreated (n=62), surgery alone (n=148), definitive chemoradiotherapy (dCRT, n=172), or neoadjuvant CRT plus surgery (n=130). Primary tumors were manually segmented on CT. A total of 1,216 radiomics features and 1,024 deep learning features were extracted from tumor ROIs after image preprocessing. Features were fused, normalized, and selected using univariate Cox regression ($p<0.10$) followed by LASSO-Cox regression. Three Cox proportional hazards models were developed to predict OS: 1) Clinical, 2) Imaging (radiomics+DL), and 3) Combined (Clinical+Imaging). Treatment group was included as a stratified covariate. Model performance was evaluated using time-dependent concordance index (C-index), 1-, 2-, and 3-year AUC, calibration curves, and decision curve analysis (DCA).

RESULTS

LASSO regression selected 8 radiomics features and 6 deep learning features for the Imaging model. In the independent validation cohort (n=146), the Combined model achieved significantly higher prognostic performance (C-index = 0.79; 95% CI: 0.74-0.84) compared to the Imaging model (C-index = 0.73; 95% CI: 0.67-0.79; $p=0.008$) and the Clinical model (C-index = 0.66; 95% CI: 0.60-0.72; $p<0.001$). The 3-year OS AUC for the Combined model was 0.82, superior to the Imaging (AUC=0.76) and Clinical (AUC=0.70) models. Calibration curves confirmed good agreement between predicted and observed survival probabilities for the Combined model. DCA demonstrated the highest net benefit for the Combined model.

CONCLUSION

A model integrating baseline clinical data with CT-derived radiomics and deep learning features significantly improves overall survival prediction accuracy in ESCC patients, irrespective of the specific treatment modality employed, outperforming models based on clinical or imaging information alone.

CLINICAL RELEVANCE/APPLICATION

This validated, integrated prognostic model utilizing readily available pretreatment CT scans provides enhanced risk stratification for ESCC patients across different therapeutic pathways, potentially informing personalized treatment discussions, follow-up intensity, and clinical trial eligibility.

S3B-SPIN-10 GAN-BASED SYNTHESIS OF VIRTUAL CONTRAST-ENHANCED ABDOMINOPELVIC CT FOR IMPROVED VISUALIZATION OF TUMORS AND LYMPH NODES

Yuma Fuzawa, MD (*Presenter*)
Motohiko Yamazaki, MD, PhD (*Abstract Co-Author*)

PURPOSE

The purpose of this study was to develop a Generative adversarial network (GAN)-based model capable of generating contrast-enhanced abdominopelvic CT images from non-contrast CT images, and to evaluate its efficacy in improving the visualization of lymph nodes and malignant tumors.

METHODS AND MATERIALS

A total of 255 abdominopelvic CT examinations were utilized as training data. The test dataset comprised 70 CT examinations, including 35 cases obtained from an external institution. Virtual non-contrast and contrast-enhanced CT images acquired via dual-energy CT were input into Pix2Pix, a GAN-based architecture. The input image size was 512 × 512 × 8, the batch size was set to 1, and training was conducted over 20 epochs. The similarity between the virtual and true contrast-enhanced CT images was assessed using the structural similarity index (SSIM). Quantitative evaluation of image quality for lymph nodes was performed by comparing signal-to-noise ratio (SNR_Ln) and contrast-to-noise ratios (CNR_LnFat and CNR_LnA) between non-contrast and virtual contrast-enhanced images. In addition, tumor SNR (SNR_Tumor) and tumor CNR (CNR_Tumor) relative to surrounding tissues were assessed. Furthermore, two radiologists, blinded to the image type, independently and subjectively evaluated lesion visibility across non-contrast, virtual contrast-enhanced, and true contrast-enhanced CT images.

RESULTS

In the test dataset, SSIM values were high at both our institution and the external institution (ours: 0.88 ± 0.02; external: 0.87 ± 0.03). SNR and CNR values were significantly higher in generated contrast-enhanced CT images compared with non-contrast CT images (SNR_Ln: 8.00 ± 2.48 vs. 3.26 ± 1.01; CNR_LnFat: 17.37 ± 7.65 vs. 8.85 ± 2.91; CNR_LnA: 4.51 ± 1.84 vs. 0.85 ± 0.62; SNR_Tumor: 6.18 ± 2.46 vs. 3.13 ± 0.91; CNR_Tumor: 10.37 ± 5.18 vs. 6.21 ± 2.95) (all $P < 0.001$). The virtual contrast-enhanced CT images were judged to exhibit superior lesion visibility compared with non-contrast CT images in 77.1% (37/48) of cases by Reader 1 and 95.8% (46/48) by Reader 2, and were considered equal to or superior to true contrast-enhanced CT images in 62.5% (30/48) and 60.4% (29/48) of cases, respectively.

CONCLUSION

The GAN-based model developed in this study significantly improved the CNR and SNR of lymph nodes and tumors while also enhancing their visualization in qualitative assessment.

CLINICAL RELEVANCE/APPLICATION

The generation of virtual contrast-enhanced CT images using the proposed GAN-based model holds promise for improving image quality and facilitating lesion detection, particularly in patients for whom the administration of contrast agents is contraindicated.

S3B-SPIN-11 CLASSIFICATION OF NINE ANATOMICAL VIEWS IN SHOULDER ULTRASOUND IMAGING USING RESIDUAL KOLMOGOROV-ARNOLD NETWORKS FOR ROTATOR CUFF TEAR ASSESSMENT

Chang Yong Choi, MS (*Presenter*)
Jinyoung Seo (*Abstract Co-Author*)
Sangah Park (*Abstract Co-Author*)
Seung Min Ryu, MD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

To develop an automated classification model using Residual Kolmogorov-Arnold Networks (ResKAN) for nine anatomical views in shoulder ultrasound to support standardized rotator cuff tear assessment.

METHODS AND MATERIALS

A total of 1,177 shoulder ultrasound images were labeled by a board-certified orthopedic specialist according to nine anatomical views commonly used in rotator cuff tear evaluation: short/long-axis views of the long head of the biceps tendon, subscapularis tendon, supraspinatus-infraspinatus tendons, infraspinatus-teres minor tendons, and the acromioclavicular joint. The dataset was split into training, validation, and internal test sets (7:1:2). An external test set of 449 images from another institution was used to assess generalizability. We compared three models: (1) ResKAN50, which integrates Kolmogorov-Arnold Networks into a ResNet50 backbone; (2) ResNet50; and (3) ImageNet-pretrained ResNet50. All models were trained for nine-class classification and evaluated using accuracy, precision, recall, specificity, and F1-score.

RESULTS

On the internal test set, ResKAN50 achieved the highest performance with an average accuracy, precision, recall, specificity, and F1-score of 0.963 (±0.016), 0.892 (±0.095), 0.873 (±0.157), 0.978 (±0.029), and 0.840 (±0.100), respectively. On the external test set, it maintained top performance with 0.901 (±0.049), 0.589 (±0.183), 0.543 (±0.219), 0.947 (±0.065), and 0.532 (±0.163), respectively. ResKAN50 also achieved the highest average AUROC (0.98 internal, 0.83 external), outperforming ResNet50 (0.97/0.77) and ImageNet-pretrained ResNet50 (0.95/0.78). To assess human-level performance, three observers (R1, R2, and R3) independently classified the internal test set. R1, a musculoskeletal specialist, achieved 79.15% accuracy, while R2 and R3 achieved 49.79% and 50.64%. Class-wise accuracy varied, with lower performance in difficult views such as IST-TM short (R1: 50.00%, R2: 31.25%, R3: 25.00%).

CONCLUSION

The proposed ResKAN model showed superior performance in classifying anatomical views in shoulder ultrasound, exceeding human observer accuracy and generalizing well to external data.

CLINICAL RELEVANCE/APPLICATION

Shoulder ultrasound interpretation is highly operator-dependent and often unclear to other clinicians reviewing stored images. The proposed model provides real-time guidance to non-expert users and standardizes image acquisition, enabling consistent interpretation across institutions and improving diagnostic confidence in rotator cuff tear assessment.

S3B-SPIN-12 VISION-LANGUAGE AGENTS FOR STRUCTURED REPORT GENERATION AND PROGNOSIS IN PULMONARY EMBOLISM CT ANGIOGRAPHY

Zhusi Zhong, PhD (*Presenter*)
Lulu Bi (*Abstract Co-Author*)
Yuli Wang (*Abstract Co-Author*)
Vineethsubbu Somasundaram, BS (*Abstract Co-Author*)
Shreyas Kulkarni, BS (*Abstract Co-Author*)
Sun Ho Ahn, MD (*Abstract Co-Author*)
Cheng Ting Lin, MD (*Abstract Co-Author*)
Grayson L. Baird, PhD, MS (*Abstract Co-Author*)
Ihab R. Kamel, MD, PhD (*Abstract Co-Author*)
Michael K. Atalay, MD, PhD (*Abstract Co-Author*)
Harrison X. Bai, MD (*Abstract Co-Author*)
Zhicheng Jiao, PhD, BS (*Abstract Co-Author*)

PURPOSE

Timely and accurate interpretation of CT Pulmonary Angiography (CTPA) is critical in diagnosing and managing pulmonary embolism (PE), a life-threatening condition. However, traditional AI tools often lack specificity and clinical interpretability. We propose a vision-language agent framework that integrates 3D imaging features, clinical variables, and structured diagnostic reasoning to improve PE abnormality detection, radiology report generation, and outcome prediction.

METHODS AND MATERIALS

Our framework comprises two core modules: a multi-label abnormality classifier based on an inflated 3D ResNet-152, and a report-generation pipeline guided by vision-language models (VLMs) and large language models (LLMs). The classifier detects 32 clinically relevant CTPA abnormalities across 7 anatomical regions. Identified findings are used to prompt medical VLMs, the CT-CHAT model for region-wise report generation. These structured outputs are then synthesized by a LLaMA3-based LLM into full radiology reports. A multimodal survival prediction module integrates imaging, abnormality labels, generated reports, and PESI clinical scores using a Cox regression model. Evaluation was conducted on over 69,000 image-report pairs from three datasets: INSTITUTION 1, INSTITUTION 2, and the public CTPA dataset.

RESULTS

The proposed classifier achieved AUROCs of 0.788 (INSTITUTION 1), 0.710 (INSTITUTION 2), and 0.754 (PUBLIC) across the 32 abnormalities. Abnormality-guided image-level report generation outperformed organ-based and holistic captioning methods across all evaluation metrics, while study-level report synthesis yielded superior BERT-F1 scores for both the Findings (up to 0.891) and Impression (up to 0.879) sections, demonstrating improved semantic precision and diagnostic relevance. Multimodal survival prediction achieved a C-index of 0.863 (INSTITUTION 1) and 0.731 (INSTITUTION 2), surpassing PESI scores and unimodal baselines. Decision curve and Kaplan-Meier analysis confirmed the model's clinical utility for risk stratification.

CONCLUSION

This framework offers a comprehensive and interpretable solution for CTPA analysis in pulmonary embolism. By integrating 3D imaging, structured abnormality detection, report generation, and multimodal outcome prediction, it mirrors core elements of the radiologist's workflow. The system produces accurate diagnostic reports and meaningful survival risk estimates, demonstrating scalability and clinical validity across diverse institutions.

CLINICAL RELEVANCE/APPLICATION

This system automates CTPA interpretation for PE, enhancing diagnostic consistency, enabling risk stratification, and supporting quality improvement across clinical settings.

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S3B-SPIR

Interventional Radiology Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPIR-1 AI-POWERED MODEL FOR CARDIAC RISK PREDICTION IN HEMODIALYSIS PATIENTS UNDERGOING INTERVENTIONAL RADIOLOGY PROCEDURES

Krishna Parvataneni (*Presenter*)
David Schramm (*Abstract Co-Author*)
Jie Cui (*Abstract Co-Author*)
Christopher Bridge, DPhil (*Abstract Co-Author*)
Dania Daye, MD,PhD (*Abstract Co-Author*)

PURPOSE

Interventional radiology procedures for dialysis access carry poorly defined peri-procedural cardiac risks in hemodialysis patients. This study developed and validated AI models to predict early post-procedure cardiac arrest, myocardial infarction (MI), and 30-day mortality in this population.

METHODS AND MATERIALS

This project uses the American College of Surgeons National Surgical Quality Improvement program (ACS-NSQIP) dataset, which contains preoperative, intraoperative, and 30-day postoperative data from 722 hospitals between 2011 and 2018. Using Current Procedural Terminology (CPT) codes, the data was filtered to include all hemodialysis access related interventional procedures. The data from 2011-2017 was divided into a training set (70%) and a 'contemporaneous' testing set (30%). The data from 2018 was used as a separate, 'non-contemporaneous' testing set. The 15 most relevant features to predicting each outcome were selected using Gini Importance. Two models, Random Forests and TabPFN, were trained and evaluated on our dataset, to compare performance. Random Forest Classifiers are ensemble models that fit multiple decision trees to the data and average over them to reduce overfitting and improve accuracy. TabPFN is a foundation model pre-trained on tabular datasets that outperforms ensemble methods on smaller datasets without further training. The primary outcomes were cardiac arrest, myocardial infarction, and 30-day mortality.

RESULTS

A total of 10839 cases were identified. Both models demonstrated strong performance in predicting cardiac arrest, myocardial infarction, and 30-day mortality. On the non-contemporaneous test set, Random Forest achieved accuracies of 76.69% (AUROC: 0.7695) for cardiac arrest, 73.27% (AUROC: 0.7013) for MI, and 78.47% (AUROC: 0.7763) for 30-day mortality. TabPFN performed slightly better for cardiac outcomes and comparably for mortality, with accuracies of 76.73% (AUROC: 0.8420) for cardiac arrest, 99.05% (AUROC: 0.7338) for MI, and 83.22% (AUROC: 0.7510) for 30-day mortality.

CONCLUSION

This AI-based approach using national surgical quality data achieved moderate discrimination in predicting early cardiac complications and 30-day mortality following dialysis-related IR procedures. TabPFN slightly outperformed conventional Random Forests across these outcomes.

CLINICAL RELEVANCE/APPLICATION

A validated dialysis-specific IR risk score has the potential to inform pre-operative counseling, anesthetic planning, and post-procedural monitoring. Subsequent work should target algorithm fine-tuning, conducting multicenter external validation, and piloting the tool within interventional radiology units.

S3B-SPIR-3 BILATERAL SUBCUTANEOUS RAT TUMOR MODEL SUPPLIED BY THE ILIOLUMBAR ARTERY: A SIMPLIFIED AND VERSATILE PLATFORM FOR TRANSARTERIAL THERAPY STUDIES

Takeshi Suzuki, MD, PhD (*Presenter*)
Kenkichi Michimoto (*Abstract Co-Author*)
Todd Graham (*Abstract Co-Author*)
Khashayar Farsad, MD, PhD (*Abstract Co-Author*)
Kentaro Yamada, MD, PhD (*Abstract Co-Author*)

PURPOSE

To determine the feasibility of a bilateral flank subcutaneous rat tumor model, perfused by the iliolumbar arteries (ILA), for pre-clinical trans-arterial therapy research.

METHODS AND MATERIALS

Eighteen male Lewis rats (body weight: 295 g [289-301], Median [IQR]) received bilateral flank implants of DSL-6A/C1 (pancreatic ductal cell adenocarcinoma cell line) tumor fragments (passaged 2-3 times) through a 14-G intravenous catheter at the iliac crest level. Tumors exceeding 8 mm in diameter were enrolled for angiography. Angiography procedures were performed via the tail artery approach using a 1.3 or 1.6-F microcatheter to select the ILA, followed by digital subtraction angiography (DSA) to assess tumor staining. Tumor engraftment rate, catheterization success and the procedural time from skin incision to DSA of the ILA were recorded. In one rat, Isosulfan Blue was injected from the ILA to confirm the tumor's vascular supply.

RESULTS

The time from tumor implantation to the angiography was 19 days in 17 rats and 20 days in 1 rat. At the time of the procedure, the body weight of the rats was 337 g [330-341], Median [IQR]. The tumor engraftment rate was 97.3% (35/36), with bilateral engraftment in 17 cases and unilateral engraftment in 1 case. No major complications, such as significant skin ulceration or hemorrhage were observed during tumor incubation period.ILA catheterization was technically successful in all 18 rats using the tail artery access technique with a procedural time from skin incision to angiography from the ILA of 20 min [15-25], Median [IQR]. All cases demonstrated tumor staining. In one case, Isosulfan Blue injection at the proximal portion of the iliolumbar artery resulted in macroscopically tumor staining, confirming the vascular supply to the tumor.

CONCLUSION

Bilateral flank tumors were consistently and exclusively supplied by the ILA. The model combined a high engraftment rate, straightforward monitoring, and technically simple catheterization of the ILA from the abdominal aorta, supporting its feasibility as a versatile platform for trans-arterial therapy studies and suggesting that it may be readily applied to various tumor models beyond pancreatic cancer. Bilateral implantation permitted one tumor to serve as an internal control or as a reserve when unilateral engraftment failed. These advantages suggested that this platform could further accelerate rat trans-arterial therapy research.

CLINICAL RELEVANCE/APPLICATION

This simplified, highly reproducible model enables uniform evaluation of intra-arterial therapeutics and standardized assessment of tumor microenvironments, potentially accelerating translation of novel trans-arterial treatments.

S3B-SPIR-4 MACROPHAGE PYROPTOSIS INHIBITION ALLEVIATES NEOINTIMAL FORMATION AND RESTENOSIS AFTER ENDOVASCULAR INTERVENTIONS

Zaixiong Ji, MD, PhD (*Presenter*)
Meijuan He (*Abstract Co-Author*)
Han Wang, MD, PhD (*Abstract Co-Author*)

PURPOSE

Clinically, the primary cause of long-term failure after endovascular interventions for cardiovascular diseases is restenosis. The commonly used therapeutic devices, including balloons or stents, are coated with non-specific antiproliferative agents, whose indiscriminate cytotoxicity exacerbates the underlying inflammation. Here, we explored the mechanisms of restenosis and devised a mechanism-based strategy against restenosis.

METHODS AND MATERIALS

Single-cell transcriptomic sequencing was employed to investigate cellular and gene changes in restenotic vessels. Macrophage-specific knockdown of GSDMD was performed, and disulfiram-coated balloon (DCB) is developed to deliver disulfiram (DSF) to the target vessel, blocking GSDMD-mediated pyroptosis. The effects of this strategy were validated through systematic in vivo and in vitro experiments.

RESULTS

Single-cell transcriptomic analysis demonstrates that macrophages are the key cell population undergoing pyroptosis in vessels with restenosis. Knockdown of specific macrophage GSDMD ameliorates inflammatory response and neointimal formation. DCB is specifically designed to precisely deliver DSF to the injured vessel wall, blocking GSDMD pore formation. Systematic in vivo and in vitro results con& 7;rm that DCB curbs macrophage pyroptosis and associated inflammation by inhibiting GSDMD, promoting functional re-endothelialization and suppressing neointimal hyperplasia, thereby superiorly preventing long-term vascular restenosis.

CONCLUSION

Collectively, our study shows that GSDMD-mediated macrophage pyroptosis plays a crucial role in the restenosis process following endovascular interventional injury. Based on this mechanism, the customed DCB targeting GSDMD to inhibit pyroptosis alleviates vascular restenosis, supporting the repurposing of FDA-approved disulfiram in proliferative cardiovascular diseases.

CLINICAL RELEVANCE/APPLICATION

In contrast to the status quo (drug-coated balloons and drug-eluting stents), DCB does not have cytotoxicity that exacerbates inflammation, providing a promising therapeutic strategy for restenosis prevention.

S3B-SPIR-5 PRE-PROCEDURE DESMOPRESSIN ADMINISTRATION REDUCES CLINICALLY SIGNIFICANT HEMORRHAGE AFTER NONFOCAL RENAL BIOPSY: RETROSPECTIVE COHORT ANALYSIS

Bradford Dugan, BS (*Presenter*)
Asif Rahman (*Abstract Co-Author*)
Michael V. Korona JR, MD (*Abstract Co-Author*)
Amy R. Deipolyi, MD, PhD (*Abstract Co-Author*)

PURPOSE

Ultrasound-guided nonfocal renal biopsy (NFRB) carries a bleeding risk of 1.5-14%. Desmopressin (DDAVP), a synthetic vasopressin analog, may reduce bleeding by promoting hemostasis. This study evaluated the safety and efficacy of pre-biopsy DDAVP administration to any patient undergoing NFRB regardless of pre-procedure renal function.

METHODS AND MATERIALS

A retrospective observational study was conducted at a single institution starting before and continuing after implementation of a DDAVP protocol for all NFRBs. The cohort included 150 patients undergoing 150 NFRBs from 3/2022-4/2025. Starting 7/2023, all patients received 0.3 mcg/kg IV DDAVP immediately prior to biopsy. All procedures used 17-gauge guiding needles to obtain 18-gauge cores. Patients who did and did not receive DDAVP were compared using Welch t-tests and Fisher's exact tests (a=0.05).

RESULTS

Of 150 patients, 71 (33 women, 38 men) received DDAVP and 79 (41 women, 38 men) did not (p=0.52). Patients who received DDAVP were younger (53±14 v. 59±18 y; p=0.02). Maximal systolic blood pressure was similar between groups (121±16 v. 124±13 y; p=0.21). There were no significant differences between the DDAVP and no DDAVP groups in the change in pre- and post- procedure hemoglobin (-3.5±14.4% v. -0.9±9.5%; p=24) or sodium levels (-0.3±2.0% v. 0.1±2.3%; p=30). The rates of blood transfusion were similar (8/79 v. 8/71; p=1). However, 6/79 (8%) patients without DDAVP required unplanned admission and/or angiography within 1 week, compared to 0/71 in the DDAVP group (p=0.03). No patients required surgery or died after NFRB. Thromboembolic events occurred in 2/79 (2.5%) without DDAVP and 3/71 (4.2%) with DDAVP (P=0.67). All 5 thromboembolic events occurred in patients on antiplatelet/anticoagulant agents held per Society of Interventional Radiology guidelines.

CONCLUSION

DDAVP administration prior to NFRB was associated with significantly fewer unplanned admissions or angiography/embolization procedures, without an increase in thromboembolic events. Pre-procedure DDAVP may reduce clinically significant hemorrhage following NFRB.

CLINICAL RELEVANCE/APPLICATION

Routine pre-procedure DDAVP administration to all patients undergoing NFRB may improve patient safety by reducing post-procedural bleeding and need for urgent interventions.

S3B-SPIR-6 LIVER RF ABLATION INDUCES DIFFUSE PRO-IMMUNOGENIC AND PRO-TUMORIGENIC PATHWAY ACTIVATION REVEALED BY MULTI-OMIC PROFILING

Lukas Salvermoser, MD (*Presenter*)
Lorenzo Sperlich (*Abstract Co-Author*)
Daniel David Khademi (*Abstract Co-Author*)

Matthias M. Stechele, MD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
S. Nahum Goldberg, MD (*Abstract Co-Author*)

PURPOSE

To investigate pro-immunogenic and pro-tumorigenic potential of hepatic RFA.

METHODS AND MATERIALS

Standardized Radiofrequency ablation (RFA) (70°Cx5min) of healthy normal liver tissue was performed on 15 male 8-10w C57/Bl6 mice. Evidence of increased transcription among 16,000 genes (FC>2 in any of 10 major cell populations) was obtained by Single cell RNA sequencing (scRNAseq) of normal distant liver from controls and at 1 and 7d post-RFA. Increased translational expression (>25% over shams) was assessed using Affymetrix proteinomics comparing 1,300 proteins between shams, 3 and 6d post-RFA pooled tissue homogenates. These genes were further evaluated by string-db pathway analysis (https://string-db.org/) including MCL clustering methodology to define common key active pathways. Thirty moderately sized (i.e. 49-545 proteins) pathways with high signal (>5) and a false discovery rate (FDR) of <10e-10 on the corresponding scRNA and proteinomic string clusters (i.e., combined cytokine/immune, growth factor, and collagen production) were further analyzed including: 17 GO Biology, 10 murine Reactome, and 3 Wikipathway databases. For each pathway, the signal and FDR were analyzed using the string website with odds ratios (OR) calculated using Enrichr (https://maayanlab.cloud/Enrichr).

RESULTS

443 genes and 427 proteins showed increased expression, with 73 of 228 identical proteins (32%) showing overlap. All 30 selected pathways had marked protein enrichment (signal=13; FDR=1.7e-41) on both the transcriptional (RNA) and translational (protein) level with 31±9% of possible pathway genes identified. Key immunogenic pathways with significant increase in both transcription and translation included “Regulation of IL-10 production”, “Chemokine-Mediated Signaling Pathway”, and “Regulation of T-Cell Proliferation” (OR=28.4, 27.8, 18.8, respectively). Multiple growth factor and tyrosine kinase pathways were similarly enriched, with markedly increased activation of angiogenesis and endothelial, epithelial, and fibroblast proliferation (OR>12).

CONCLUSION

RFA broadly activates both pro-immunogenic and pro-tumorigenic pathways. This suggests the potential beneficial use of adjuvant immunotherapy and that combination therapies will be essential, highlighting the need for deeper investigation into the interplay between these pathways.

CLINICAL RELEVANCE/APPLICATION

Focal hepatic ablation has both immunogenic and tumorigenic potential implying that combined adjuvant therapy may be required for optimal results in future clinical trials of tumor ablation and immunotherapy.

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S3B-SPMK

Musculoskeletal Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPMK-1 DIFFERENTIATING BENIGN FROM MALIGNANT BONE AND SOFT TISSUE TUMORS AND ASSESSING KI-67 EXPRESSION USING APT AND DWI TOOLS

Xinxin Liu (*Presenter*)
Pengxiang Li (*Abstract Co-Author*)
Pan Shang (*Abstract Co-Author*)
Jing Lu (*Abstract Co-Author*)
Kai Ai (*Abstract Co-Author*)
Xiaowen Ma (*Abstract Co-Author*)

PURPOSE

This study aimed to investigate the use of Amide proton transfer (APT) imaging and diffusion-weighted imaging (DWI) in distinguishing benign from malignant bone and soft tissue tumors. We also assessed the correlation among APT, DWI, and Ki-67 expression.

METHODS AND MATERIALS

The study enrolled 49 patients from June 2023 to January 2024, and 29 patients were malignant tumors. The site were upper and lower extremities. They underwent MR scanning, and the diagnosis was confirmed by pathology. The APT, apparent diffusion coefficient (ADC), and exponential apparent diffusion coefficient (EADC) values were measured. We used APT and DWI to distinguish benign from malignant tumors, and analyzed the correlation among APT, ADC, EADC, and Ki-67 expression. The diagnostic efficiencies were evaluated using the receiver operating characteristic (ROC) curve. We used intraclass correlation coefficient (ICC) to obtain the interobserver reprehensibility.

RESULTS

The ICC was 0.848. The APT value was 2.26% ± 1.07%, 4.62% ± 1.43%; ADC value was 1.33% ± 0.4 ×10 -3 mm 2 /s, 1.01% ± 0.55 ×10 -3 mm 2 /s; EADC value was 0.29 ± 0.13, 0.40 ± 0.17 in benign and malignant tumors, respectively. Statistical differences were observed between benign and malignant tumors in APT (P <.001), ADC (P =.0032), and EADC (P =.019). APT exhibited a positive correlation with Ki-67 [r = 0.546, 95% confidence interval (CI): 0.217-0.762, P =.002]. In the ROC curve analysis for differentiating benign from malignant tumors, the sensitivity and specificity were respectively 72.41% and 95%, with APT value of 3.6%;79.31% and 85%, with ADC value of 1.047×10 -3 mm 2 /s; and 72.41% and 85%, with EADC value of 0.34. Combining APT, ADC, and EADC, the sensitivity and specificity were 72.41% and 95%, respectively. The sensitivity and specificity were respectively 100% and 57.14% (P <.0001), with an AUC value of 0.794, for APT in assessing the Ki-67 expression.

CONCLUSION

APT image exhibited an improved qualitative diagnostic efficiency in differentiating between benign and malignant bone and soft tissue tumors. APT value was higher in malignant than benign tumors. When APT value more than 3.6%, the tumor was prone to be malignant, and the sensitivity and specificity were high. Combining APT, ADC, and EADC had a higher specificity, and was more beneficial in distinguishing benign from malignant tumors. In addition, APT value exhibited a notable correlation with Ki-67 expression.

CLINICAL RELEVANCE/APPLICATION

APT image could help the surgeon to define tumor boundaries and improve the long-term prognosis.It’s helpful for predicting proliferative activity and recurrence after surgery.

S3B-SPMK-3 THE VALUE OF SPECTRAL CT IN PREOPERATIVE EVALUATION OF SELECTIVE POSTERIOR RHIZOTOMY IN CHILDREN WITH SPASTIC CEREBRAL PALSY

Juan Liu (*Presenter*)
Xiaoyue Zhang (*Abstract Co-Author*)

PURPOSE

To explore the clinical application value of spectral CT multi-parameter imaging technology in preoperative nerve root imaging of selective posterior spinal nerve root resection (SPR) in children with spastic cerebral palsy (CP).

METHODS AND MATERIALS

The lumbar spectral CT examination data of 27 children with spastic cerebral palsy who underwent SPR were retrospectively included. A double-blind method was adopted. Two radiologists respectively conducted subjective quality scoring (on a 5-point scale) for images in three modes: conventional CT (SC), calcium suppression (VNCa), and electron density (ED). The Kruskal-Wallis test was applied to compare the differences between groups. The intraclass correlation coefficient (ICC) was used to assess the consistency among raters (ICC>0.75 was considered highly consistent). In terms of objective quantitative analysis, the CT values (HU), standard deviation (SD), signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) of the nerve roots and adjacent muscle tissues were measured at the opening level of the L5/S1 nerve roots, and the ED values (with water as the reference, %EDW) were calculated. Independent sample t-tests were used to compare the differences in SNR/CNR between SC and VNCa images, and paired t-tests were used to analyze the differences in ED values between nerve roots and muscle tissues.

RESULTS

The ED image quality score (4.6±0.5) was significantly higher than that of the SC (3.2±0.8) and VNCa (3.8±0.7) modes (P<0.01), and the ICC values of the scores of the two physicians reached 0.82. The SNR (1.7±2.5 vs 1.4±1.8, P=0.003) and CNR (5.4±12.5 vs 4.9±6.9, P=0.002) of the VNCa model were both superior to those of the traditional SC model. The ED value of nerve roots (99.8±2.3%EDW) was significantly lower than that of muscle tissues (105.2±0.2%EDW, P<0.001), and the difference was statistically significant.

CONCLUSION

Spectral CT significantly improves the imaging quality of nerve roots through multi-parameter imaging technology. Among them, the ED mode performs the best in soft tissue resolution, and the VNCa mode has an advantage in improving the signal-to-noise ratio.

CLINICAL RELEVANCE/APPLICATION

This technology can accurately quantify the density difference between nerve roots and surrounding tissues, providing a three-dimensional visualization basis for preoperative nerve root localization in SPR. It is expected to optimize the surgical path planning and shorten the intraoperative exploration time, and has important clinical application value.

S3B-SPMK-4 STATIN INITIATION AND LONGITUDINAL CHANGES IN CT-DERIVED VOLUMETRIC VERTEBRAL BONE MINERAL DENSITY: AN EMULATED TARGET TRIAL FROM THE MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS

Roham Hadidchi, BS (*Presenter*)
Elena Ghotbi, MD (*Abstract Co-Author*)
Quincy A. Hathaway, MD, PhD (*Abstract Co-Author*)
Michael Bancks (*Abstract Co-Author*)
David A. Bluemke, MD, PhD (*Abstract Co-Author*)
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Wendy Post (*Abstract Co-Author*)
Matthew J. Budoff, MD (*Abstract Co-Author*)
Joao A. Lima, MD (*Abstract Co-Author*)
Shadpour Demehri, MD (*Abstract Co-Author*)

PURPOSE

Opportunistic CT imaging enables extraction of clinically relevant data without added radiation or cost. Given the widespread use of thoracic and abdominal CT in the U.S., these scans represent an underutilized resource for secondary analyses such as bone assessment. Statins, prescribed to over 40 million U.S. adults (221 million prescriptions), are first-line therapy for hyperlipidemia and cardiovascular prevention. However, evidence regarding their effect on bone health is conflicting. We evaluated the association between statin initiation and longitudinal changes in multilevel vertebral bone mineral density (BMD) over six years.

METHODS AND MATERIALS

This emulated target trial is a secondary analysis of the Multi-Ethnic Study of Atherosclerosis (MESA). Participants underwent noncontrast chest CT with and without a phantom. TotalSegmentator v2, a nnU-Net algorithm, provided 3D vertebral body segmentation of T1-T10, followed by postprocessing to remove cortical bone. Vertebral BMD was computed using phantom HU values (0, 50, 100, 200 mg/cm³). Adults with 10-year ASCVD risk =7.5% at Exam 4 or 5 and no prior statin use were included. Statin initiators were propensity score-matched to non-initiators. Vertebral BMD was measured at baseline and six-year follow-up using chest CT. Linear mixed-effects models evaluated longitudinal BMD change, adjusting for scanner type. Prespecified subgroup analyses were conducted by age, sex, race/ethnicity, BMI, hs-CRP, physical activity, diabetes, smoking, and alcohol use. Sensitivity analysis using the array approach assessed the potential impact of unmeasured confounding.

RESULTS

DL-derived 3D segmentations correlated with manual axial (Dice score, 0.93; 95% CI: 0.92-0.95) and sagittal (0.91; 95% CI: 0.88-0.93) segmentations. A total of 384 participants (173 initiators; 211 non-initiators) were included in the per-protocol analysis. Statin initiation was associated with a slower decline in vertebral BMD compared with no initiation (ß = 1.00 g/cm³/year; 95% CI: 0.65-1.35; $p < 0.001$), corresponding to a 0.47% slower annual decline. An unmeasured confounder with a 1% annual effect would need to be =3× more prevalent among initiators vs. noninitiators to nullify the observed association, which is clinically unlikely. Subgroup analyses suggested stronger protective effects among those with impaired fasting glucose or diabetes, low hs-CRP, or higher physical activity.

CONCLUSION

Using multilevel DL-based quantification of vertebral BMD from routine chest CT, statin initiation was associated with reduced bone loss.

CLINICAL RELEVANCE/APPLICATION

Findings support the potential value of opportunistic BMD monitoring for medication effects on bone health using chest CT in high-risk populations.

S3B-SPMK-6 PREOPERATIVE DIFFERENTIATION OF SPINAL MULTIPLE MYELOMA AND OSTEOLYTIC METASTASIS USING DIFFUSION-WEIGHTED IMAGING-BASED HABITAT

Jun Xu (*Presenter*)
Ning Lang, MD (*Abstract Co-Author*)

PURPOSE

Multiple myeloma (MM) and osteolytic metastases (OM) are difficult to distinguish due to similar radiographic features and clinical symptoms, yet they require different treatments. Bone marrow biopsy is a key tool for differential diagnosis, but it is invasive and risky. This study aims to develop a non-invasive, preoperative method to differentiate MM from OM using diffusion-weighted imaging (DWI) habitat imaging.

METHODS AND MATERIALS

132 MM and 120 OM patients were prospectively included and underwent multi-b DWI examinations. Tumors were segmented into three habitats based on the true diffusion coefficient (Dt), perfusion fraction (f), and mean kurtosis coefficient (MK). The volume fraction of each habitat was calculated. Logistic regression was applied to identify risk factors from habitat fractions and clinical variables. Using these risk factors, clinical, habitat, and combined nomogram models were developed. Diagnostic accuracy was measured by the area under the receiver operating characteristic curves (AUCs).

RESULTS

MM exhibited a significantly higher fraction of habitat 3 ($p = 0.002$) and a significantly lower fraction of habitat 2 ($p < 0.001$), which were selected as risk factors. Additionally, sex, T2WI signal uniformity and homogeneous enhanced appearance were included as risk factors for differential diagnosis. The nomogram model demonstrated the highest diagnostic performance (AUC = 0.881), followed by the habitat model (AUC = 0.814) and the clinical model (AUC = 0.706). Decision curve analysis indicated that the nomogram model offered more net benefit in compared to the clinical model.

CONCLUSION

DWI-based habitat imaging shows clinical potential for noninvasively and preoperatively differentiating between spine MM and OM.

CLINICAL RELEVANCE/APPLICATION

DWI-based habitat imaging offers a non-invasive method to improve the challenging preoperative differentiation between spinal multiple myeloma and osteolytic metastases, potentially reducing invasive biopsies and guiding more timely and appropriate treatment selection.

S3B-SPMK-7 EVALUATION OF THE IMPACT OF DEEP LEARNING-BASED RECONSTRUCTION ON T2 AND T2* MAPPING DATA FOR KNEE CARTILAGE QUANTIFICATION

Nagore Castro (*Presenter*)
Alicia Palomar Garcia (*Abstract Co-Author*)
Jordi Catala March, MD (*Abstract Co-Author*)

PURPOSE

T2 and T2* mapping are quantitative MRI techniques to assess articular cartilage integrity by detecting changes in tissue composition and structure. However, measurement accuracy can be affected by noise and image quality. Advanced Intelligent Clear-IQ Engine (AiCE) technology, based on deep learning, would improve image quality while keeping the reliability of T2 and T2* quantification. The goal is to assess the impact of AiCE on T2 and T2* quantification by comparing and correlating knee articular cartilage measurements with and without AiCE reconstruction.

METHODS AND MATERIALS

A cohort of 10 patients with suspected knee articular cartilage pathology was evaluated on a 3T Vantage Galan (Canon Medical Systems, Tochigi, Japan) using a 16-channel, multipurpose, flexible SPEEDER coil. The protocol included conventional sequences, plus T2 mapping (4-echo fast spin echo) with TE min/ TE step =20/20ms, TR=3850ms, pixel size=0.36x0.36mm 2 and duration=2:54min; and T2* mapping (6-echo field echo) with TE min /TE step =2.3/2.3ms, TR=35ms, pixel size=0.7x0.7mm 2 and duration=3:33min. T2 and T2* maps were generated with Olea Sphere® Relaxometry plug-in to quantitatively assess the integrity of knee cartilage. A total of 5 slices per patient were selected to facilitate the full delineation of the femorotibial cartilage. T2 and T2* relaxation times, with and without AiCE reconstruction, were compared using a paired t-test and their correlation was assessed with Pearson correlation coefficient.

RESULTS

Non-significant differences were found between measurements based on data with and without AiCE reconstruction in either of the two relaxation times, T2 and T2*. A moderate and significant positive correlation between T2 and T2* values was observed both with AiCE reconstruction ($r=0.68$; $p<0.0001$) and without AiCE ($r=0.66$; $p<0.0001$), but correlation strength was slightly improved when AiCE reconstruction was used.

CONCLUSION

The results show that using AiCE does not affect knee articular cartilage quantification, as both T2 and T2* relaxation times based on data reconstructed with and without AiCE are equivalent. Besides, a more robust and significant correlation between variables was found when data was reconstructed with AiCE, probably due to the image denoising and improved quality. Therefore, using AiCE could improve the diagnostic performance of T2 and T2* mapping on the assessment of knee cartilage.

CLINICAL RELEVANCE/APPLICATION

Evaluation of T2 and T2* relaxation times allows the early detection of abnormalities as osteoarthritis, by revealing early cartilage changes due to degeneration that are not visible on MRI. Besides, they are sensitive to disruption in collagen fibres, increased water content, and useful for postoperative follow-up.

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Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

S3B-SPMS

Multisystem Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPMS-1 VOLUMETRIC ANALYSIS TO INCREASE SENSITIVITY OF RESPONSE ASSESSMENT FOR SOLID TUMOR EVALUATION LEVERAGING A PROMPTABLE SEGMENTATION MODEL, A PILOT STUDY

Leo Machado (*Presenter*)
Amaury Prat (*Abstract Co-Author*)
Korentin Le Floch (*Abstract Co-Author*)
Theo Danielou (*Abstract Co-Author*)
Maxime Ronot, MD, PhD (*Abstract Co-Author*)
Pierre Manceron (*Abstract Co-Author*)
Paul Herent, MD, MSc (*Abstract Co-Author*)
Daniel Tordjman (*Abstract Co-Author*)

PURPOSE

RECIST 1.1 is the standard methodology for the longitudinal follow-up of solid tumors. Linear measurements may not be as sensitive as volumetric ones to detect modifications of the lesion burden. This study investigates the benefits of using a promptable AI foundation segmentation model for volume-based longitudinal tumor response evaluation in a real-world cohort.

METHODS AND MATERIALS

We gathered a multicentric cohort of 28 patients monitored for oncological disease with 1 baseline and 2 follow-up CT scans. We compared the performance of volume vs RECIST diameters for disease status classification. We used the RECIST sum of diameters at the second follow-up as the ground truth, according to standard thresholds: -30% for Partial Response (PR), +20% for Progressive Disease (PD). For the volume, we used empirically derived thresholds of -50% for PR and +40% for PD, within the literature range (Goldmacher et al., 2012, Br J Clin Pharmacol; Hayes et al., 2016, Eur J Radiol). In total 79 target lesions (mostly lymph node, lung and liver lesions) were segmented in 3D and measured for RECIST diameters by 2 radiologists. For the semi-automated analysis, we used a segmentation model inspired by previous studies (Machado et al., 2025, NPJ Precis Oncol). We prompted the model with a bounding box around the tumor and up to 5 edit points to generate predicted segmentation masks, with a Dice score of 81% against the ground truth, indicating good segmentation performance.

RESULTS

At the first follow-up, the volume-based analysis identified 100% of the responders, compared to 40% with RECIST diameters, and 33% of the progressors vs 11%. At the second follow-up, 100% agreement was observed between volume-based response evaluation and RECIST diameters for PR (n=5) and PD (n=9). Among the 14 stable patients according to RECIST diameters at the second follow-up, volume-based analysis classified 4 as PD, 6 as stable, and 4 as PR. The absence of long-term clinical data limits the interpretation of these differences, possibly due to misclassification or early detection.

CONCLUSION

This study demonstrates the potential of a semi-automatic volumetry-based system for oncology based on a promptable AI segmentation model. This method enables early detection of progressors and responders, which could lead to essential modifications for patient care. This feasibility experiment calls for complementary studies with a prospective design and a priori selection of target lesions to demonstrate a clinically relevant impact for cancer patients.

CLINICAL RELEVANCE/APPLICATION

AI-driven volumetric analysis allows for earlier detection of tumor response and progression compared to RECIST 1.1, potentially enabling timely adjustments in patient care.

Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

S3B-SPNMMI

Nuclear Medicine & Molecular Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPNMMI-1 A DIGITAL AI EXPERIMENT IN COLLIMATOR-LESS SPECT AND COINCIDENCE-FREE PET IMAGING

Nathan S. Lay, PhD (*Presenter*)
Michael V. Green, MS (*Abstract Co-Author*)
Jurgen Seidel (*Abstract Co-Author*)
Steve Adler, PhD (*Abstract Co-Author*)
Om Khanal (*Abstract Co-Author*)
Peter L. Choyke, MD (*Abstract Co-Author*)
Baris Turkbey, MD (*Abstract Co-Author*)

PURPOSE

Image formation in SPECT and PET requires collimation, mechanical and electronic, respectively. We tested the hypothesis that under ideal circumstances, 3D images of transparent gamma radiation emitting objects could be formed without collimation by allowing radiation from the entire object to illuminate the interior of a surrounding cylinder imagined to be tiled with perfect, thin radiation detectors. This 2D "projection image" contains all the information necessary to reconstruct the original source distribution if a suitable inverse algorithm can be identified. Here, we trained an AI algorithm to carry out this inversion for a cylindrical detector "imaging" a MOBY digital mouse labeled with a bone-seeking radiotracer that approximates 18 F-fluoride (a positron emitter) and 99m Tc-MDP.

METHODS AND MATERIALS

The MOBY mouse model (Duke University) is a high-resolution digital rendering of the major body organs and subsystems of the adult male animal that allows the amount of radioactivity in each to be varied by the user. Activity (1.85 MBq) was distributed such that, on average, 50% of the "dose" went to the mouse skeleton and 50% was distributed throughout the rest of the body. The model mouse was placed inside the cylinder (8 cm dia. x 10 cm length) and allowed to irradiate its inner surface for 10 s creating the projection image. A ResNet50/U-net AI algorithm was trained by pairing 32,000 MOBY ground truth (GT) tracer distributions with their corresponding projection images while randomly perturbing the amount of tracer in the skeleton and body by + 10% around their means, and with other perturbations, e.g., statistical fluctuations. The AI was designed such that when shown a projection image from a never-before seen MOBY source distribution, the AI would produce the best match to its GT counterpart, the equivalent of a 3D SPECT or PET image stack.

RESULTS

AI reconstructions of the bone/body tracer distribution closely mimicked the anatomy and concentrations present in the GT distributions. Spatial resolution (FWHM) in the reconstructions was < 0.6 mm (GT images, 0.2 mm) and concentrations differed < 20% in the skeleton.

CONCLUSION

It appears possible to reconstruct a 3D gamma ray source distribution from its projection onto an uncollimated 2D surface using a suitably trained AI for reconstruction. Disadvantages of this method are whole-body imaging and the very large number of a priori training sets needed to span the large spatial and concentration parameter space.

CLINICAL RELEVANCE/APPLICATION

If practicable, clinical tracer doses could be reduced for SPECT (>100) and PET (>3) with the potential for improved spatial resolution and simplification of imaging system design.

S3B-SPNMMI-2 IMPACT OF PENALISED LIKELIHOOD RECONSTRUCTION ON RESPONSE ASSESSMENT FDG PET-CT CATEGORISATION IN SOLID TUMOURS AND HODGKIN LYMPHOMA

James Cairns, MSc, BMBS (*Presenter*)
Rachel J. Gravell I, MBChB, MSc (*Abstract Co-Author*)
Uzair Ali, MD, MBBCh (*Abstract Co-Author*)
Russell Frood, MBChB, FRCR (*Abstract Co-Author*)
Chirag Patel, FRCR (*Abstract Co-Author*)
Andrew F. Scarsbrook, BMBS, FRCR (*Abstract Co-Author*)

PURPOSE

FDG PET-CT response assessment is widely used, frequently influencing patient management and is based on studies using standard PET reconstructions. Newer penalised likelihood (PL) PET reconstruction algorithms increase the degree of tracer uptake particularly in smaller lesions on visual and semi-quantitative assessments by suppressing image noise and improving signal-to-noise ratio. The study aim was to evaluate clinical impact of standard versus PL reconstruction response assessment categorisation, in patients with Hodgkin Lymphoma (HL), head and neck, anal and cervical cancers.

METHODS AND MATERIALS

Consecutive patients undergoing post treatment FDG PET-CT with standard time of flight (TOF) and PL reconstruction between November 2023 and May 2024 were retrospectively analysed at a high-volume cancer centre. Cases were evaluated qualitatively and semi-quantitatively for residual tumour uptake/nodal disease on TOF and PL reconstructions. In the solid tumour group, cases were categorised as positive or negative based on activity above or below background liver uptake. Deauville Score (DS) was assigned for HL patients, where DS1-3 was considered negative, and DS4-5 considered positive for residual disease. Disease status at 12-month clinical follow-up was confirmed by case note review.

RESULTS

98 patients were included, 48 were solid tumour (27 head and neck (H&N); 15 anal and 6 cervical) and 50 HL. In the H&N group, two patients (7.4%) were upgraded to positive when using PL recons. One patient was upgraded within the anal group (6.7%), and none within the cervical group. In the HL group, DS, changed in ten scans

(20%) using PL recons. Three scans remained categorised as negative (DS1-3) and four positive (D4-5). However, three scans (6%) changed the outcome from negative (DS3) to positive (DS4). Most cases with negative to positive change on PL recon (5/6 patients, 83%) had no evidence of disease at the relevant site 12 months post therapy, one patient (17%) had subsequently confirmed disease relapse.

CONCLUSION

PL reconstruction enhances small lesion conspicuity. However, this increased sensitivity might lead to overestimation and potential response assessment misclassification in a minority of cases, warranting cautious interpretation in clinical practice.

CLINICAL RELEVANCE/APPLICATION

New PET reconstruction algorithms enhance lesion detection. Use in response assessment requires interpretative vigilance and consideration of follow-up imaging in select cases to avoid over treatment.

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S3B-SPNPM

Noninterpretive Skills (Beyond Imaging) Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPNPM-1 WORK-RELATED INJURIES IN RADIOLOGY

Amy L. Schranz, PhD, MBBCh (*Presenter*)
Ammar Alam (*Abstract Co-Author*)
Paula N. Patino, MD (*Abstract Co-Author*)
Susan Peddle (*Abstract Co-Author*)
Nathalie Fleming (*Abstract Co-Author*)
Mukesh G. Harisinghani, MD (*Abstract Co-Author*)
Marlise P. dos Santos, MD,MPH (*Abstract Co-Author*)

PURPOSE

Ergonomic optimisation of radiology reading rooms remains unaddressed in many departments. Poor workstation ergonomics including suboptimal monitors, chairs, desks, lighting, and input devices can increase the risk of repetitive stress injuries (RSIs) and contribute to adverse outcomes such as musculoskeletal pain, eye strain, and headaches. This study aimed to (1) determine the prevalence and types of RSIs among PACS workstation users in our department, (2) identify specific ergonomic deficiencies, and (3) explore the association between workstation ergonomics and physician burnout. We hypothesise that a higher burden of RSIs would correlate with increased burnout symptoms.

METHODS AND MATERIALS

Data was collected through an REB-approved electronic survey distributed to faculty, residents, and fellows in our radiology department (Collection period March 01-May 30, 2025). The anonymous survey collected data on RSI prevalence, ergonomic shortcomings, and perceived effects on work performance and burnout. Validated instruments used included the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) and the abbreviated Maslach Burnout Inventory (aMBI).

RESULTS

To date, RSIs have been reported by 82% of participants (n=42/49; M:F=31:18), with neck (70%) and upper back (60%) pain being most common. Of those affected, 68% stated that their injury impaired work performance, and 53% believed their workstation worsened their condition. Additionally, 82% noted a component of their hospital workstation had been broken in the past year, while 88% had never received formal ergonomic training. Notably, 33% felt that their RSI contributed to burnout. Preliminary analysis demonstrated a trend ($p < 0.1$) linking higher RSI frequency and severity with increased emotional exhaustion.

CONCLUSION

Preliminary data indicate a high prevalence of RSIs among radiology PACS users, driven in part by inadequate ergonomics, broken equipment, and lack of training. These factors may play a significant role in contributing to physician burnout.

CLINICAL RELEVANCE/APPLICATION

Repetitive stress injuries can diminish concentration, reduce efficiency, and impair job performance, ultimately affecting the quality and safety of patient care. Evidence suggests that improving workstation ergonomics can reduce injury rates, enhance productivity, and mitigate burnout. Proactive ergonomic interventions may therefore promote clinician well-being and improve patient outcomes.

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S3B-SPNR

Neuroradiology Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPNR-1 REPEATED NEUROMODULATION WITH LOW-INTENSITY FOCUSED ULTRASOUND IN PATIENTS WITH ALZHEIMER'S DISEASE

Yong-An Chung, MD, PhD (*Presenter*)
In Uk Song (*Abstract Co-Author*)

PURPOSE

This pilot study evaluated the safety and potential to improve cognition and functional connectivity following repeated LIFU treatment in AD patients.

METHODS AND MATERIALS

Ten early-stage AD patients underwent six sessions of neuronavigation-guided LIFU targeting the left dorsolateral prefrontal cortex (DLPFC) within 2-3 weeks, alongside ongoing standard pharmacotherapy. Neuropsychological assessments and resting-state functional magnetic resonance imaging were performed at baseline and eight weeks post-treatment.

RESULTS

Memory performance ($p = 0.02$) and functional connectivity between the left DLPFC and both the left perirhinal cortex and left dorsomedial prefrontal cortex (corrected $p < 0.05$) significantly improved from baseline. Additionally, enhancements in memory performance were positively correlated with increases in functional connectivity of the left DLPFC with the left perirhinal cortex (Kendall's tau = 0.56, $p = 0.03$). No adverse events were reported during the LIFU treatments or at the subsequent follow-up.

CONCLUSION

LIFU may have the therapeutic potential to enhance both brain network connectivity and memory functions in AD patients. Our results provide a basis for further research, including randomized sham-controlled trials and optimization of stimulation protocols, on LIFU as a supplementary or alternative treatment option for AD.

CLINICAL RELEVANCE/APPLICATION

The results showed significant improvements in memory performance and functional connectivity between the left DLPFC and both the left perirhinal cortex and the left dorsomedial prefrontal cortex, with no adverse events reported. Additionally, we found a positive correlation between changes in memory function and changes in functional connectivity. These findings suggest that LIFU may have therapeutic potential for AD patients.

S3B-SPNR-2 FAST SCREENING OF SPINAL DURAL ARTERIOVENOUS FISTULA AND AUTOMATIC IDENTIFICATION OF FISTULAS USING DEEP LEARNING: AN INNOVATIVE AI-DRIVEN 3D-CNN SYSTEM FOR ENHANCING CLINICAL WORKFLOW

Fei Zheng (*Presenter*)
Nan Hong, MD (*Abstract Co-Author*)

PURPOSE

Manual post-processing of computed tomography angiography (CTA) images, performed by technicians, is labor-intensive and prone to errors. We propose an AI-based reconstruction system using a three-dimensional convolutional neural network (3D-CNN) integrated with physiological anatomical knowledge to automatically detect spinal dural arteriovenous fistula (SDAVF) and localize its fistula position.

METHODS AND MATERIALS

This study involved 309 patients (371,737 images) diagnosed with SDAVF through digital subtraction angiography (DSA) and surgery, conducted from July 2018 to January 2025. The process was divided into a training set, validation set, and two independent test sets (one prospective). Four segmentation and recognition models were developed using ResU-net, and a fistula identification model was built with DenseNet. Initially, ResUnet1 segmented the spinal cord, followed by dilation to obtain the spinal canal region. ResUnet2 automatically segmented malformed vascular clusters within this region. ResUnet3 identified the centroids of vertebral bodies from T1 to L5, using a connected domain algorithm to label vertebrae. The highest and lowest points of malformed vessels were identified, and the region was cropped accordingly. The intervertebral foramina were then detected, and DenseNet assessed the presence of a fistula in each intervertebral foramen. Performance evaluation of each model was carried out using two independent test sets, with accuracy analysis used to validate the model's reliability.

RESULTS

The ResUnet2 model, using a 33.5 threshold for segmenting malformed vascular clusters, accurately distinguished patients with and without arteriovenous fistulas. In the first test set, the accuracy, precision, recall, and F1-score were 0.930, 0.871, 1.000, and 0.931, respectively, and in the second test set, 0.964, 1.000, 0.923, and 0.960, respectively. The DenseNet-based fistula identification model achieved accuracies of 0.903, 0.926, and 0.846 in the validation and test sets. Compared to technicians, this system reduced time consumption from 40.75 ± 11.57 minutes to 1.05 ± 0.29 minutes, and the number of clicks from 761.80 ± 202.05 to 9.68 ± 2.12. These improvements streamline the clinical workflow.

CONCLUSION

We developed an AI-based imaging recognition system, utilizing anatomical knowledge and 3D-CNNs, to diagnose SDAVF and localize fistula orifices. This system aids technicians and establishes a time-saving workflow in clinical settings.

CLINICAL RELEVANCE/APPLICATION

Our system has the potential to become a standard tool in radiological workflows, supporting faster diagnoses and enhancing communication with patients, ultimately improving patient care and efficiency.

S3B-SPNR-3 Zhiming Zhou (*Presenter*)

PREDICTION OF RUPTURE RISK IN INTRACRANIAL ANEURYSM: A HIGH-RESOLUTION VESSEL WALL IMAGING BASED RADIOMICS ANALYSIS

PURPOSE

This study aimed to develop and validate a novel prediction model to assess the risk of IA rupture by integrating high-resolution vessel wall imaging (HR-VWI) with radiomics.

METHODS AND MATERIALS

A total of 446 patients with IAs from two centers were included in this retrospective study. HR-VWI images were preprocessed to extract regions of interest from IA and parent artery (PA) walls. Using Pyradiomics, 851 radiomic features were extracted. Key features were selected through variance analysis, t-tests, and ElasticNet regularization. Based on these features, three radiomics score (Radscore) models were developed: Radscore_IA (for the IA), Radscore_PA (for the PA), and Radscore_IA_PA (a combined model). Moreover, aneurysm location (LOC), as a morphological predictor, was incorporated into new models: Radscore_LOC_IA, Radscore_LOC_PA, and Radscore_LOC_IA_PA. The performance of these models was evaluated using receiver operating characteristic (ROC) curves, with the ELAPSS score serving as a benchmark.

RESULTS

In the derivation cohort, AUC values for IA rupture prediction were as follows: ELAPSS (0.676), Radscore_IA (0.846), Radscore_PA (0.822), Radscore_IA_PA (0.878), Radscore_LOC_IA (0.864), Radscore_LOC_PA (0.836), and Radscore_LOC_IA_PA (0.888). In the validation cohort, AUC values were as follows: ELAPSS (0.617), Radscore_IA (0.837), Radscore_PA (0.820), Radscore_IA_PA (0.878), Radscore_LOC_IA (0.852), Radscore_LOC_PA (0.842), and Radscore_LOC_IA_PA (0.888). The Radscore_LOC_IA_PA model exhibited the highest predictive performance, significantly outperforming other models ($P < 0.05$). Calibration and decision curve analyses confirmed the robustness and clinical application of all models.

CONCLUSION

This study presents an innovative HR-VWI radiomics-based prediction model, Radscore_LOC_IA_PA, which combines radiomics features from the IA wall and PA wall along with the aneurysm location. This model significantly enhances the prediction of IA rupture risk compared to traditional methods, providing accurate risk stratification and clinical management of patients with IAs.

CLINICAL RELEVANCE/APPLICATION

Our study presents a groundbreaking HR-VWI radiomics-based prediction model, Radscore_LOC_IA_PA, which integrates 3D radiomics features from the IA wall and PA wall, along with aneurysm location.

S3B-SPNR-4 INTEGRATION OF RADIOMICS AND CLINICAL BIOMARKERS IMPROVES IDENTIFICATION OF INTRAPLAQUE HEMORRHAGE IN INTRACRANIAL ATHEROSCLEROSIS: A 3D HRMR-VWI STUDY

Xuan Chen (*Presenter*)

PURPOSE

To investigate the diagnostic value of radiomics analysis based on HRMR-VWI in detecting intraplaque hemorrhage (IPH) among symptomatic intracranial atherosclerotic disease (ICAD) patients.

METHODS AND MATERIALS

This retrospective study analyzed 144 intracranial atherosclerotic plaques from 169 patients with ICAD admitted between April 2020 and April 2022. Plaques were classified into IPH-positive (n=56) and IPH-negative (n=88) groups using HRMR-VWI. Clinical parameters, serum biomarkers, and conventional imaging features were collected. Univariate analyses (independent t-test, Mann-Whitney U test, chi-square test) identified significant predictors of IPH, followed by multivariate logistic regression to establish a traditional model. Plaques were stratified into training (n=115) and testing (n=29) cohorts using 8:2 stratified randomization. Radiomic features extracted from 3D-T1WI underwent least absolute shrinkage and selection operator algorithm for model construction in the training cohort, with subsequent validation in the testing cohort. A combined model integrating traditional and radiomic predictors was developed. Diagnostic performance was evaluated using the ROC curves, AUC, and DeLong's test.

RESULTS

Significant intergroup differences were observed in hypertension prevalence, Hcy, C-CRP, TC, LDL-C, stenosis rate, EI, and NWI, all $P <0.05$. Multivariate analysis identified CRP (OR=1.060, 95%CI 1.009-1.112, P = 0.019), LDL-C (OR=1.956, 95%CI 1.036-3.692, P = 0.039), and EI (OR=1.468, 95%CI 1.015-2.123, P = 0.041) as independent IPH predictors. The traditional model incorporating CRP, LDL-C, and eccentric index demonstrated AUC values of 0.710 and 0.707 in identifying IPH within the training and testing cohorts, respectively. By integrating radiomic features from 3D T1WI, improved diagnostic performance was achieved in both training and testing cohorts (AUC: 0.901 and 0.828). In the training cohort, the combined model showed significantly superior AUC in predicting IPH compared to the traditional model ($Z=3.946$, $P <0.001$). No statistically significant difference in AUC was observed between the radiomics model and the combined model ($Z=1.230$, $P >0.05$). The combined model achieved optimal performance (AUC=0.901; sensitivity=86.7%, specificity=85.7%, accuracy=81.7%).

CONCLUSION

The radiomics method based on 3D HRMR-VWI has demonstrates clinical utility in identifying IPH in symptomatic ICAD patients.

CLINICAL RELEVANCE/APPLICATION

Radiomics analysis combined with HRMR-VWI enhances non-invasive detection of intraplaque hemorrhage in symptomatic ICAD patients, improving risk stratification and guiding targeted therapies to reduce stroke recurrence through high diagnostic accuracy.

S3B-SPNR-6 PERFORMANCE OF GADOPICLENOL IN DYNAMIC SUSCEPTIBILITY CONTRAST MAGNETIC RESONANCE IMAGING (DSC-MRI) PERFUSION OF BRAIN GLIOMAS

Simona Gaudino (*Presenter*)
Anna Pichiecchio, MD (*Abstract Co-Author*)
Katarzyna Dziadziuszko, MD (*Abstract Co-Author*)
Simonetta Gerevini, MD (*Abstract Co-Author*)

PURPOSE

To demonstrate the non-inferiority of DSC-MRI perfusion using gadopiclenol (EluciremTM) at 0.05 mmol/kg compared to gadoterate meglumine (Dotarem®) at 0.1 mmol/kg in terms of diagnostic quality of Cerebral Blood Volume (CBV) perfusion map

METHODS AND MATERIALS

In this multicenter randomized controlled trial, 138 adult patients with naive or recurrent primary glial tumor scheduled for a follow-up DSC-MRI were randomized to receive either gadopiclenol at 0.05 mmol/kg or gadoterate meglumine at 0.1 mmol/kg, with stratification on glioma grade (low, high). CBV maps were generated through a post-processing software. The primary outcome was the CBV map diagnostic quality assessed by two independent blinded readers, using a 4-point scale (poor, fair, good, excellent). Secondary outcomes included differentiation of glioma grade by relative CBV (rCBV) quantification, and safety. Non-inferiority was defined as proportion of patients with excellent or good diagnostic quality images for gadopiclenol of no more than 12% below that for gadoterate meglumine

RESULTS

A total of 136 patients underwent an MRI with gadopiclenol or gadoterate meglumine, of whom 129 patients had diagnostic images. Finally, 124 patients without protocol major deviation were included in the per-protocol analysis: 60 with gadopiclenol and 64 with gadoterate meglumine. Gadopiclenol was non-inferior to gadoterate meglumine on CBV perfusion map diagnostic quality. The proportion of patients with CBV map images assessed as "excellent or good" was 96.7% and 98.4%, respectively, with a difference of -1.8% [two-sided 95% CI: -8.9% to 5.3%]. Overall, rCBV values were significantly different between high-grade and low-grade gliomas with both contrast agents, with a median of 3.11 vs 1.51 ($p = 0.003$) for gadopiclenol and 2.47 vs 1.41 ($p < 0.001$) for gadoterate meglumine. There was no difference between the two agents for grade differentiation ($p = 0.35$). Five patients (3.7%) experienced non-serious adverse events: 3 in the gadopiclenol group (incorrect dose administered for 2 patients, gastrointestinal disorders for one) and 2 in the gadoterate meglumine group (incorrect dose administered for one and headache for the other). All adverse events were of mild intensity and resolved spontaneously. None was considered related to the contrast agent

CONCLUSION

DSC-MRI perfusion using gadopiclenol at 0.05 mmol/kg was non-inferior to gadoterate meglumine at 0.1 mmol/kg on diagnostic quality of CBV perfusion map and both enabled tumor grade differentiation in patients with brain glioma. This study additionally confirmed the safety profile of gadopiclenol

CLINICAL RELEVANCE/APPLICATION

Half-dose of gadopiclenol (0.05 mmol/kg) can be used in DSC-MRI perfusion for brain gliomas

S3B-SPNR-7 PLASMA NEUROFILAMENT LIGHT REFLECTS BRAIN TISSUE LOSS, VENTRICULAR ENLARGEMENT, AND VASCULAR-MEDIATED NEURODEGENERATION

Khalid Saifullah, BSc (*Presenter*)
Gulam Mahfuz Chowdhury, BEng (*Abstract Co-Author*)
Arnold M. Evia JR, PhD (*Abstract Co-Author*)
David A. Bennett, MD (*Abstract Co-Author*)
Julie A. Schneider, MD (*Abstract Co-Author*)
Konstantinos Arfanakis, PhD (*Abstract Co-Author*)

PURPOSE

Neurofilament light chain (NfL), has gained attention as a blood-based indicator of neurodegeneration and brain structural changes. Despite its growing use, the association between NfL and white matter hyperintensities (WMH) - a hallmark of small vessel disease - along with measures of neurodegeneration using deformation-based morphometry (DBM), remains poorly understood in older adults without dementia. This study investigates the interconnections among NfL, WMH, and neurodegeneration, with particular emphasis on the mediating role of vascular pathology.

METHODS AND MATERIALS

Participants and Data We analyzed data from 202 non-demented, community-based older adults enrolled in four longitudinal studies: MAP, ROS, MARS, and AA. Fasting blood samples were collected and quantified by the NCRAD. Structural MRI scans (3D T1-weighted MPRAGE) were registered to the MIITRA atlas to generate log Jacobian (LogJ) maps reflecting local brain volume differences. WMH volume, segmented from T2w FLAIR and T1w images, was expressed as a percentage of intracranial volume and log-transformed. Statistical analysis Voxel-wise linear regression was used to assess the association between plasma NfL levels and LogJ-based neurodegeneration. Similar analyses were conducted to assess the relationship between WMH burden and LogJ maps. The link between NfL levels and WMH burden was also evaluated. To explore potential mediation, we assessed whether WMH burden accounted for the effect of NfL on neurodegeneration. All statistical models included covariate adjustments for age, sex, education, MRI-to-blood draw interval, and scanner type. Voxel-wise analyses were performed using FSL PALM, incorporating 5000 permutations, family-wise error rate correction ($p < 0.05$).

RESULTS

Higher plasma NfL levels were linked to greater neurodegeneration, as indicated by reduced brain volume and expanded ventricular spaces. NfL also showed a significant positive relationship with WMH volume ($\beta = 0.0798$, $SE = 0.0436$, $p = 0.0344$). Additionally, WMH burden demonstrated a strong association with brain tissue loss. Importantly, when WMH was accounted for in the model, the previously observed association between NfL and neurodegeneration was attenuated, suggesting that WMH may play a mediating role in this relationship.

CONCLUSION

Our results underscore the potential of NfL as an indicator of both neurodegeneration and vascular contributions to brain aging, with vascular pathology possibly driving neurodegeneration.

CLINICAL RELEVANCE/APPLICATION

These findings highlight plasma NfL as a non-invasive marker of neurodegeneration and vascular injury, aiding early risk detection for cognitive decline.

S3B-SPNR-8 HIGHER ARTS SCORE IS ASSOCIATED WITH HIGHER LEVELS OF NFL BUT NOT WITH P-TAU217

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Khalid Saifullah, BSc (*Abstract Co-Author*)
Arnold M. Evia JR, PhD (*Abstract Co-Author*)
David A. Bennett, MD (*Abstract Co-Author*)
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Konstantinos Arfanakis, PhD (*Abstract Co-Author*)

PURPOSE

Intracranial arteriolosclerosis affects cerebrovascular health and cognition, with ARTS serving as its MRI-based marker. Its relationship to Alzheimer's pathology and neuronal damage remains unclear. We investigated the association between ARTS and blood biomarkers p-tau217 (Alzheimer's) and NfL (axonal damage).

METHODS AND MATERIALS

This study included 202 participants from four longitudinal, clinical-pathologic cohort studies of aging: MAP, ROS, MARS, and AACC of the Rush Alzheimer's Disease Research Center. This sample included only participants with no or mild cognitive impairment (NCI, MCI). None of the participants had dementia. All participants underwent in-vivo MRI on 3 Tesla MRI scanners using MPRAGE, FLAIR, and DTI sequences. The MRI data were used to calculate ARTS scores for all participants using the fully-automated, publicly available ARTS software. Blood was collected on all participants. plasma p-tau217 and NfL levels were measured at the National Centralized Repository for Alzheimer's Disease and Related Dementias (NCRAD) using established procedures. Both p-tau217 and NfL values were log transformed to normalize the distribution. Linear regression was used to test the association of ARTS score with levels of p-tau217 and NfL, separately, controlling for demographics (age at visit, sex, years of education), interval between blood draw and MRI scanning, and scanner. The FSL PALM tool with 10000 permutations and tail acceleration was used for the statistical analysis. Associations were considered significant at $p<0.05$ after family-wise error (FWE) correction.

RESULTS

No significant association of ARTS scores with levels of p-tau217 was detected ($\beta=0.0046$, $p=0.38$), underscoring that ARTS is independent of Alzheimer's pathology (Fig.2A). In contrast, a strong positive association of ARTS with NfL was observed ($\beta=0.0485$, $p=0.0011$), highlighting that ARTS is linked to CSVD-related axonal injury.

CONCLUSION

The present study in community-based older adults without dementia suggests that ARTS scores are not influenced by Alzheimer's pathology, which often co-occurs with arteriolosclerosis. Yet, higher ARTS scores are associated with more severe axonal injury assessed by means of higher NfL scores.

CLINICAL RELEVANCE/APPLICATION

The study showed that the ARTS marker of arteriolosclerosis is unrelated to p-tau217 but positively associated with NfL. This suggests ARTS is independent of Alzheimer's pathology, making it a valuable tool for identifying arteriolosclerosis even when both conditions co-exist. The link between ARTS and NfL supports its role in detecting vascular-related axonal injury, aligning with evidence that small vessel disease contributes to brain damage and cognitive decline.

S3B-SPNR-9 MRI CHARACTERISTICS AND IMPROVEMENT DETERMINATION OF THE TYPE OF PITUITARY SOMATOTROPH TUMOURS

Alexey Petryaikin, MD, PhD (*Presenter*)
Safi Tamaeva (*Abstract Co-Author*)
Anna Khoruzhaya (*Abstract Co-Author*)
Evgeny Pronin (*Abstract Co-Author*)
Vyacheslav Pronin (*Abstract Co-Author*)
Egor Syrkashev (*Abstract Co-Author*)
Mikhail Antsiferov (*Abstract Co-Author*)
Iurii Vasilev (*Abstract Co-Author*)

PURPOSE

The study aimed to enhance noninvasive differentiation between densely (DGST) and sparsely granulated somatotroph tumors (SGST) using MRI-derived relative signal intensity metrics by developing a composite index combining T2- and T1-weighted imaging (T2-T1) signals, the research sought to improve prognostication for responsiveness to first-generation somatostatin receptor ligands therapy.

METHODS AND MATERIALS

A retrospective analysis included 71 acromegaly patients (34 DGST, 37 SGST) diagnosed postoperatively via histopathology. Preoperative MRI (1.5 Tesla) was performed, acquiring T1- and T2-weighted images (WI). Relative signal intensity (S rel) was calculated as: S rel =(S tumor -S gm)/S gm ×100%, where S tumor = tumor signal, S gm = gray matter signal. Metrics included S rel (T2), S rel (T1), and a synthetic index S rel (T2-T1) = S rel (T2) - S rel (T1). Secondary parameters: tumor volume, invasion index (Knosp + Hardy grading). Statistical analysis used Mann-Whitney U tests and ROC AUC test.

RESULTS

DGST exhibited significantly lower T2-WI signal intensity (S rel = -14.9% [-25.7; -0.6]) compared to SGST (+10.6% [1.7; 25.4], p<0.001), while T1-WI signals were higher in DGST (8.2% [3.7; 11.4]) versus SGST (-0.4% [-6.9; -3.9], p<0.001). The synthetic S rel (T2-T1) index demonstrated the largest intergroup difference (-21.5% [-44.7; -7.2] for DGST vs. +7.2% [-3.2; 31.5] for SGST, p<0.001) with superior diagnostic accuracy (AUC=0.864). ROC analysis identified optimal cutoffs at -6.0% for T2-WI (AUC=0.847, sensitivity=91.9%, specificity=70.6%) and -3.5% for S rel (T2-T1) (AUC=0.864, sensitivity=81.1%, specificity=82.4%). SGST tumors were larger in volume (3.1 vs. 2.1 mL, p=0.041), while invasion indices (7 vs. 7, p=0.337) and contrast enhancement (40.6% vs. 41.1%, p=0.290) showed no significant differences.

CONCLUSION

The composite S rel (T2-T1) index can improve preoperative differentiation of pituitary DGST and SGST in addition to the standard T2-based criterion, achieving high diagnostic accuracy (AUC=0.864). While tumor volume helps differentiation; invasion indices and contrast enhancement have no discriminatory power. Limitations include the retrospective design and unreported borderline cases near the cutoff values.

CLINICAL RELEVANCE/APPLICATION

Noninvasive MRI differentiation of pituitary DGST and SGST using the S rel (T2-T1) index in addition to the standard T2-based index allows timely planning of personalized treatment. Favorable DGST response to first-generation somatostatin receptor ligands highlights the clinical value of preoperative identification. This approach improves prognosis, optimizes treatment costs, therapeutic strategies and supports precision medicine in the treatment of acromegaly.

S3B-SPNR-10 SPATIAL HETEROGENEITY MODELING IN ACUTE ISCHEMIC STROKE: A MULTI-MODAL MRI-DERIVED CLUSTERING APPROACH FOR PROGNOSTIC STRATIFICATION

Mentian Ma (*Presenter*)
Weiyin V. Liu (*Abstract Co-Author*)
Suping Chen (*Abstract Co-Author*)
Kun Zhang, MD (*Abstract Co-Author*)

PURPOSE

Stroke remains a major cause of adult disability and death. While infarct volume and location are conventionally imaging biomarkers, recent radiomics and neuroimaging have revealed complex spatial heterogeneity in ischemic tissue beyond visible infarct zones. Inspired by spatial genomics and network neuroscience, this study aimed to delineate MRI-based spatial subgroups in ischemic stroke and assess their value in predicting disease-free survival (DFS) and 90-day outcomes.

METHODS AND MATERIALS

We retrospectively enrolled 287 patients with DWI-confirmed acute ischemic infarction who underwent T1-weighted, T2-weighted, and DWI scans. After preprocessing and co-registration, a two-step clustering approach was applied. First, first-order spatial features were extracted from infarct regions of interest (ROIs), followed by superpixel segmentation. Subsequently, the Leiden algorithm was used to cluster six representative spatial subregions. To enhance robustness, consensus clustering based on multi-region spatial interaction (MSI) matrices was performed, identifying two clusters: Cluster1 (n=190) and Cluster2 (n=97). DFS, 90-day modified Rankin Scale (mRS), and time-dependent AUCs at 1, 2, and 4 years were compared using Patti's model as a reference. Kaplan-Meier survival curves were

RESULTS

DFS was significantly longer in Cluster1 than Cluster2 (Log-rank P = 0.019). When dichotomizing 90-day mRS scores into favorable (0-2) and unfavorable (3-6) outcomes, Cluster1 showed a higher proportion of favorable prognosis (P = 0.030). Time-dependent AUCs for the Habbita Cluster model were 0.593 (0.528-0.658) at 1 year, 0.536 (0.460-0.611) at 2 years, and 0.665 (0.314-1.000) at 4 years-exceeding Patti's model values of 0.517 (0.489-0.545), 0.513 (0.495-0.530), and 0.506 (0.497-0.515), respectively. Kaplan-Meier analysis based on Patti's model showed no significant DFS stratification (P = 0.080).

CONCLUSION

The Habbita Cluster model, derived from multi-modal MRI fusion, effectively captures brain tissue spatial heterogeneity in ischemic stroke and improves prognostic stratification. Its superior predictive performance over conventional models indicates its value as an imaging biomarker to inform individualized management

CLINICAL RELEVANCE/APPLICATION

By enabling early and precise risk stratification, the Habbita Cluster model supported tailored clinical decisions-such as adjusting rehabilitation intensity and guiding secondary prevention—thereby optimizing therapeutic outcomes in stroke care.

S3B-SPNR-11 DETECTION OF TERT PROMOTER MUTATIONS IN GLIOMAS USING TIME-DEPENDENT DIFFUSION MRI-BASED MICROSTRUCTURE MAPPING

Jue Lu (*Presenter*)
Jing Wang (*Abstract Co-Author*)

PURPOSE

This study aimed to explore the utility of time-dependent diffusion MRI (t d -MRI) in quantitatively characterizing tumor microstructural features in vivo and evaluate the discriminatory efficacy of its derived parameters for the telomerase reverse transcriptase (TERT) promoter mutation status.

METHODS AND MATERIALS

This prospective study included 91 patients diagnosed with adult-type diffuse gliomas through pathology (mean age: 45.4 ± 12.3 years). They underwent t d -MRI with pulse and oscillating gradient diffusion sequences on a 3T scanner. Diffusion MRI data collected at different effective diffusion times were fitted into the limited spectrally edited diffusion model (IMPULSED) to obtain parameters such as intracellular fraction (V in), cell diameter, cellularity, and extracellular diffusivity(D ex).

RESULTS

In the IDH-mutant glioma subgroup (n = 33), the TERT-mutant group (n = 13) demonstrated significantly higher V in (0.14 ± 0.10 vs. 0.08 ± 0.05, p = 0.005) and cellularity (1.13 ± 1.06 vs. 0.53 ± 0.38, p = 0.002) compared to the TERT-wildtype group (n = 20), alongside smaller cell diameters (14.48 ± 1.47 μm vs. 15.84 ± 0.47 μm, p = 0.004) and lower D ex (1.50 ± 0.19 vs. 1.69 ± 0.24 $\mu m^2/ms$,p = 0.027). For molecular classification of TERT changes in gliomas, the area under the curve (AUC) for cellularity was the highest at 0.827, followed by V in at 0.792. In the T1 non-enhancement subgroup (n = 32), the AUC of cellularity further improved to 0.903, with V in reaching an AUC of 0.879. Notably, T1 contrast enhancement showed a strong positive correlation with tumor grade (r = 0.63, p<0.001).

CONCLUSION

The microstructural features based on t d -MRI provide supplementary information in the molecular classification of TERT mutations in adult-type diffuse gliomas. Cellularity and V in have good discriminative ability for identifying TERT changes.

CLINICAL RELEVANCE/APPLICATION

Gliomas are common malignant primary brain tumors, with adult-type diffuse glioma having the highest incidence. The telomerase reverse transcriptase (TERT) promoter mutation status is crucial for diagnosing adult-type diffuse gliomas for grading and determining patient prognosis.This study confirms the application value of microstructural mapping based on t d -MRI in molecular stratification of adult diffuse gliomas.

S3B-SPNR-16 ABNORMAL WHITE MATTER MICROSTRUCTURE IN THE AMYGDALA-RELATED FIBER TRACT PATHWAYS IN PATIENTS WITH TRIGEMINAL NEURALGIA: A MULTIVARIATE ANALYSIS

Zhang Chuan I, MD (*Presenter*)

PURPOSE

Trigeminal neuralgia (TN), a debilitating neuropathic disorder, is characterized by severe facial pain and heightened emotional comorbidities such as catastrophizing and anxiety. This study investigated whether microstructural abnormalities in amygdala-related white matter pathways mediate the relationship between psychological distress and pain severity in TN.

METHODS AND MATERIALS

A cross-sectional cohort of 46 TN patients (mean age: 57.6±10.2 years; ICHD-3 diagnosed) and 35 age-/sex-matched healthy controls underwent clinical assessments and 3T MRI. Pain intensity was quantified via the Penn Facial Pain Rating (PFPR) and McGill Pain Questionnaire (MPQ), while emotional distress was measured using the Pain Catastrophizing Scale (PCS) and Pain Anxiety Symptom Scale-20 (PASS-20). Diffusion tensor imaging (DTI) data were preprocessed using FSL v6.0 for eddy current/motion correction, followed by tensor estimation to derive fractional anisotropy (FA), mean diffusivity (MD), radial diffusivity (RD), and axial diffusivity (AD). Amygdala-related fiber pathways were reconstructed via seed-based fiber streamline (sFS) analysis in ExploreDTI, leveraging the Human Brainnetome Atlas for tract identification. Multivariate partial least squares correlation (PLSC) was employed to associate white matter metrics with clinical variables, validated through permutation/bootstrapping (5,000 iterations). Mediation analyses (SPSS Amos) tested whether amygdala-pathway microstructure explains the PCS-PFPR relationship, controlling for age/disease duration.

RESULTS

Our findings revealed a significant association between PCS and PFPR. Compared to HCs, TN patients exhibited abnormal white matter integrity in amygdala-related fiber pathways, mainly located at the splenium of the corpus callosum, bilateral anterior corona radiata, and bilateral external capsule. These white matter alterations were significantly associated with both pain severity (PFPR, MPQ) and emotional distress (PCS, PASS). Mediation analysis further showed that the fractional anisotropy values in amygdala-related white matter partially explained the link between catastrophizing and pain intensity.

CONCLUSION

These findings identify amygdala-prefrontal pathways as critical mediators of pain-emotion interactions in TN, suggesting that targeted neuromodulation of these circuits may disrupt the maladaptive pain-emotion cycle.

CLINICAL RELEVANCE/APPLICATION

This study suggests that pain catastrophizing may alter brain structure and contribute to chronic facial pain in trigeminal neuralgia patients. Early interventions targeting negative emotions could prevent further structural changes and improve clinical outcomes.

S3B-SPNR-17 QUANTITATIVE SUSCEPTIBILITY MAPPING REVEALS WHITE MATTER HYPERINTENSITY AND PERILESIONAL CHANGES RELATED TO COGNITIVE DECLINE IN CEREBRAL SMALL VESSEL DISEASE

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Yilin Guo (*Abstract Co-Author*)
Changhu Liang, MD, PhD (*Abstract Co-Author*)
Lingfei Guo, MD (*Abstract Co-Author*)
Na Wang (*Abstract Co-Author*)
Yuanyuan Wang (*Abstract Co-Author*)

PURPOSE

White matter hyperintensities (WMHs) are a hallmark of cerebral small vessel disease (CSVD) and have been implicated in cognitive decline. However, the role of magnetic susceptibility changes within and around WMHs remains unclear. This study aimed to investigate the relationship between WMH and perilesional susceptibility values and cognitive performance in CSVD.

METHODS AND MATERIALS

We included 299 participants who underwent 3T MRI with QSM and DTI. WMHs were automatically segmented and manually corrected. Susceptibility values were extracted from WMHs and concentric perilesional white matter regions (0-2 mm, 2-4 mm, 4-6 mm). Diffusion parameters (FA, RD, AD, ADC) were computed. Cognitive

assessments included MoCA, AVLT, SDMT, SCWT, and TSUM. We analyzed group differences across CSVD severity (score 0, 1, =2), and conducted partial correlations adjusted for confounders.

RESULTS

WMH susceptibility values were significantly lower than NAWM (P < .001) and increased with CSVD severity (P < .001). A spatial gradient was observed in perilesional regions, with susceptibility values progressively approaching NAWM levels. MoCA scores were negatively associated with WMH susceptibility (r = -0.16, P = .045). DTI metrics confirmed white matter degeneration with increasing CSVD severity. WMH volume significantly increased across 42 white matter tracts, especially in severe CSVD.

CONCLUSION

Both WMH and perilesional susceptibility alterations are linked to CSVD severity and cognitive impairment. The spatial gradient suggests early microstructural changes beyond visible lesions.

CLINICAL RELEVANCE/APPLICATION

QSM-derived susceptibility values in and around WMHs provide novel imaging biomarkers for CSVD-related white matter injury and may aid in early detection of cognitive decline.

S3B-SPNR-18 MULTIMODAL ASSESSMENT OF ACUTE SLEEP DEPRIVATION EFFECTS IN HEALTHY ADULTS USING 7T MRI

Eric Einspaenner, MSc (*Presenter*)
Erelle Fuchs (*Abstract Co-Author*)
Hendrik Mattern (*Abstract Co-Author*)
Heiko Grossmann (*Abstract Co-Author*)
Eya Khadhraoui (*Abstract Co-Author*)
Sebastian Johannes Muller (*Abstract Co-Author*)
Daniel Behme (*Abstract Co-Author*)

PURPOSE

Sleep deprivation has been known to impair cognitive performance and alter brain physiology. This study investigates structural, physiological and cognitive changes before, directly after and three days post sleep deprivation using 7T MRI, blood biomarkers and reaction time testing.

METHODS AND MATERIALS

We enrolled 30 healthy subjects (age 20-38) who underwent an 7T MRI at baseline (day 0), after sleep deprivation of 24h (day 1) and post-recovery (day 4). Participants were supervised by medical staff to confirm that the participants were awake for all 24h. Blood samples were collected before each scan in 27 participants. Cognitive performance was assessed via NASA PVT (Psychomotor Vigilance Test) at 0h, 12h, 24h, and 96h. QSM maps were reconstructed from ASPIRE-based GRE sequences using QSMbox. MP2RAGE scans enabled whole-brain segmentation via FastSurferCNN, aligned to QSM using FSL FLIRT. ROI-based mean +/- SD values were extracted from QSM and T1 maps. Additionally, an automated pipeline using Frangi filtering and thresholding on MP2RAGE and T2-weighted images was developed for enhanced perivascular space (PVS) detection and calculation of volume.

RESULTS

Sleep deprivation induced a transient increase in mean reaction time, in the slowest and fastest 10% after 24h, with recovery to baseline by 96h (not significant). Reaction time variability also decreased over time, indicating a training effect, as shown by the reduced variability in reaction times. Blood biomarkers showed delayed myoglobin and cystatin C elevations at 96h, consistent with muscle and renal stress, while osteopontin decreased at 24h, suggesting early metabolic response. MMP-9 peaked at 24h and normalized by 96h, reflecting transient inflammatory activation. Quantitative MRI revealed a negative correlation between ventricular T1 and reaction time slowing, suggesting altered glymphatic clearance. Similarly, QSM changes in the ventral diencephalon correlated with cognitive performance. White matter PVS volume peaked at 24h and normalized by 96h, supporting a reversible sleep-loss-associated alteration in fluid dynamics or neuroinflammation.

CONCLUSION

Sleep deprivation induces reversible alterations in cognitive performance, brain fluid dynamics, and systemic biomarkers, suggesting transient disruption of glymphatic and inflammatory homeostasis. Multimodal imaging and biomarker integration offer novel insights into sleep-dependent brain clearance mechanisms.

CLINICAL RELEVANCE/APPLICATION

To identify morphologic (PVS volume) and functional (qT1) changes in individuals before and after sleep deprivation as a potential new biomarker for glymphatic system impairment.

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S3B-SPOB

OB/Gynecology Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPOB-1 THE VALUE OF AMIDE PROTON TRANSFER-WEIGHTED IMAGING AND INTRAVOXEL INCOHERENT MOTION IMAGING IN OPTIMIZING RISK STRATIFICATION OF O-RADS MRI 4 LESIONS

Jinhui Huang (*Presenter*)
Mei-yu Sun (*Abstract Co-Author*)
Ying Han (*Abstract Co-Author*)
Yuqi Chen (*Abstract Co-Author*)

PURPOSE

Exploring the value of quantitative parameters of amide proton transfer-weighted imaging (APT) and intravoxel incoherent motion imaging (IVIM) in the differentiation of benign and malignant ovarian lesions classified as O-RADS MRI 4.

METHODS AND MATERIALS

This study retrospectively collected MRI image data from patients with ovarian mass confirmed by pathology at a certain hospital from November 2019 to October 2024. All masses are rated as O-RADS MRI score 4 , and the score is jointly decided by two observers. Among the 33 cases of O-RADS MRI category 4, there were 14 benign cases and 19 malignant cases. All patients underwent pelvic MRI scans on a 3.0T MRI scanner, including T1-weighted contrast-enhancement, IVIM and APTw imaging. Two physicians measured the APT values and standard apparent diffusion coefficient (ADC stand), slow diffusion coefficient (D slow), fast diffusion coefficient (D fast), and fast diffusion coefficient fraction (f) of the solid tissue of lesions. The intraclass correlation coefficient (ICC) was used to assess the consistency of measurements between two physicians. Compare the differences of various parameters between the benign and malignant groups,and build different diagnostic models.

RESULTS

The APT values, ADC stand , D slow , and f measured by the two physicians showed good consistency, with an ICC range of 0.874-0.915 (P <0.001).The consistency of D fast was moderate, with an ICC of 0.576 (P <0.001). In the differential analysis, the ADC stand of the benign group is higher than that of the malignant group[(0.853±0.19)×10 -3 mm 2 /s vs. (0.648±0.254)×10 -3 mm 2 /s, P =0.016], the f of the benign group is higher than that of the malignant group [0.854(0.172)vs. 0.553(0.362), P =0.007], the APT value of the benign group is lower than that of the malignant group[1.495(1.3)vs. 3.24(2.04), P =0.001], with statistically significant differences.Multivariate analysis indicated that f (OR =0.992, P =0.012) and APT value (OR =2.859, P =0.012) are independent predictors of ovarian malignancy. The AUC for predicting malignant lesions in O-RADS MRI category 4 using APT value and f were 0.831 and 0.776, respectively. By combining the APT value and f to construct a diagnostic model, the AUC for predicting malignant lesions in O-RADS MRI category 4 increased to 0.921. The AUC of the combined APT value and f was significantly higher than that of the f value alone, with a statistically significant difference (P =0.03).

CONCLUSION

The APT value of APTw and the f of IVIM are helpful in distinguishing the benign and malignant lesions of O-RADS MRI score 4.

CLINICAL RELEVANCE/APPLICATION

The APT value of APTw and the f of IVIM can optimize the risk stratification of O-RADS MRI category 4 lesions,which can provide some assistance for clinical decision-making.

S3B-SPOB-2 CORRELATION OF PLACENTAL ULTRASOUND ELASTOGRAPHY WITH PERINATAL OUTCOMES IN GESTATIONAL DIABETES MELLITUS

Neha Bagri, MD, MBBS (*Presenter*)
Sooraj Sukumaran, MBBS (*Abstract Co-Author*)
Ritu N. Misra, MD, MBBS (*Abstract Co-Author*)
Aanchal Bhayana, MBBS (*Abstract Co-Author*)

PURPOSE

To correlate placental ultrasound shear wave Elastography (SWE) values with perinatal outcomes in Gestational Diabetes Mellitus (GDM).

METHODS AND MATERIALS

The study included 160 pregnant women, comprising 80 GDM and 80 healthy controls. Ultrasound SWE was performed on the placenta, and mean SWE and velocity values were derived from six measurements. Both the cases and controls were followed to record Apgar scores and NICU admission. Statistical analysis was done, and the SWE values were compared to correlate these values with perinatal outcomes.

RESULTS

A moderate positive correlation was observed between SWE values and maternal fasting blood glucose (FBS) levels (rho = 0.32, p = 0.001), indicating that higher glucose levels are associated with increased placental stiffness. In the control group, the mean SWE was 5.5 kPa, while in the GDM group, it increased to 10.1 kPa, reflecting the impact of a diabetic environment on placental stiffness. The mean velocity was also higher in the GDM group (1.6 m/s) as compared to the control group (mean = 1.3 m/s). A moderate negative correlation between APGAR (1-min) and mean SWE was found at <32 weeks of gestation (rho = -0.48, p = 0.017). No significant correlation was found with NICU admissions.

CONCLUSION

Placental stiffness differs significantly between GDM and controls, with higher values in GDM. Ultrasound SWE can substantially contribute to the management of GDM and improve the outcomes. A negative correlation between SWE and 1-min APGAR score at <32 weeks of gestation highlights the adverse impact of increased placental stiffness on perinatal outcomes.

CLINICAL RELEVANCE/APPLICATION

Any degree of glucose tolerance in pregnancy is associated with adverse maternal and fetal outcomes. Metabolic insult in GDM may lead to short-term changes in various molecules, including the placental cells, resulting in the increased production of inflammatory cytokines, eventually increasing placental stiffness. The placenta may be considered a metabolic mirror reflecting the fetus's and the mother's health status. Ultrasound Elastography is a modality used to measure tissue shear wave velocity, a quantitative measure of the elastic properties of the soft tissue. Placental Elastography studies in the existing literature have shown evidence of higher tissue stiffness in women with preeclampsia and fetal growth restriction. However, there is a paucity of information regarding placental Elastography in women with gestational diabetes mellitus and its significance in the prediction of maternal and neonatal risks in terms of APGAR score and the requirement of NICU admission.

S3B-SPOB-3 ASSOCIATION OF FETAL PULMONARY ARTERY DOPPLER INDICES AND FETAL LUNG MATURITY IN SINGLETON PREGNANCIES

Priyanka Panda, MBBS, MD (*Presenter*)

PURPOSE

Respiratory distress syndrome (RDS) in newborns is one of the leading causes of neonatal mortality so accurately assessing fetal lung maturity is crucial in determining the best time for pregnancy termination to help reduce the incidence of respiratory distress syndrome. Non-invasive antenatal assessment of fetal lung maturity is important so that invasive procedures like amniocentesis can be avoided.

METHODS AND MATERIALS

This study was done on 84 pregnant women attending the hospital in active labor and fetuses delivered within 48 hours of ultrasound scan. Color Doppler examination was performed for obtaining fetal main pulmonary artery resistance index (RI), pulsatility index (PI) and the acceleration/ejection time (AT/ET) ratio. After delivery neonate was observed for the clinical signs of respiratory distress, need for exogenous surfactant administration and NICU admission. Cutoffs were determined for fetal main pulmonary artery doppler indices like PI, RI and AT/ET ratio for predicting fetal lung maturity.

RESULTS

If the AT/ET ratio is below the cutoff value (0.30), neonatal requirement of surfactant could be predicted with Sensitivity=91.7% and Specificity=96.7%. Similarly, If RI is higher than the cutoff value (0.82) neonatal surfactant requirement could be predicted with Sensitivity=75% and Specificity=95% while if PI is more that cutoff value (2.14), it could be predicted with Sensitivity=95.83% and Specificity=61.67% that there is fetal lung immaturity.

CONCLUSION

Fetuses having AT/ET ratio = 0.30, PI < 2.14 and RI < 0.82 were unlikely to develop respiratory distress and did not require exogenous surfactant administration postnatally while the fetuses who had AT/ET ratio = 0.30, PI > 2.14 and RI > 0.82 were more predisposed to develop respiratory distress post-delivery and required exogenous surfactant administration, admission to NICU. Thus, these values can help distinguish between mature and immature lung of fetus antenatally.

CLINICAL RELEVANCE/APPLICATION

Based on findings of current study, it may be concluded that Doppler ultrasound may be a useful tool in the diagnosis of fetal lung maturity. It was found that elevated PI and RI values and low acceleration- time/ejection-time ratio(AT/ET ratio) can accurately predict the development of neonatal respiratory distress syndrome in females with singleton pregnancies who had no other associated comorbidities. Ultrasound doppler is a fast, low-cost technique that can be carried out in smaller centres to evaluate the lung maturity in fetuses antenatally. This could lead to better preparedness of obstetricians and neonatologists prior to delivery and could aid in triaging patients for referral to higher centres which are better equipped with neonatal care facilities.

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S3B-SPPD

Pediatric Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPPD-1 ASSESSMENT OF TECHNICAL PRECISION OF PEDIATRIC LIVER FAT QUANTIFICATION WITH MRI AND ULTRASOUND

Jiayi Tang, MSc (*Presenter*)
Lizbeth Ayala-Dominguez, PhD (*Abstract Co-Author*)
Amber Possell, RDMS, RVT, BS, RT (*Abstract Co-Author*)
Gabrielle Hoffmann (*Abstract Co-Author*)
Jitka Starekova, MD (*Abstract Co-Author*)
Alexandra Anagnostopoulos (*Abstract Co-Author*)
Daiki Tamada, PhD (*Abstract Co-Author*)
Garrett Fullerton, MS (*Abstract Co-Author*)
Andrew L. Wentland, MD,PhD (*Abstract Co-Author*)
Aaron Carrel (*Abstract Co-Author*)
Ivan Rosado-Mendez, PHD (*Abstract Co-Author*)
Diego Hernando, PhD (*Abstract Co-Author*)

PURPOSE

Metabolic dysfunction-associated steatotic liver disease (MASLD) is prevalent in children, especially those with obesity, highlighting the need for accessible, noninvasive fat quantification. While 3D chemical-shift-encoded (3D-CSE) MRI is the standard for proton-density fat fraction (PDFF) quantification, its ~20s breath-hold (BH) limits accessibility to children. Alternative MRI methods may improve accessibility by avoiding BH, while ultrasound (US) offers lower cost and wider equipment availability. This work evaluates the bias and repeatability of two methods that improve accessibility to noninvasive fat quantification: 2D free-breathing (FB) CSE-MRI with short per-slice temporal aperture and flip angle modulation (2D-FAM), and US-derived fat fraction (UDFF).

METHODS AND MATERIALS

In this IRB-approved prospective study, children were imaged with BH 3D-CSE, FB 2D-FAM, and BH (~10s) US in a single visit, using a 3.0T GE Signa Premier MR system and a Siemens ACUSON Seqouia US system. US was acquired by one sonographer, in the intercostal view, with a 9C2 transducer. For CSE-MRI, whole-liver PDFF maps were reconstructed, and ROIs were placed on the 5th Couinaud liver segment for approximate colocalization with US. UDFF was computed with the vendor's algorithm after image quality was verified by the sonographer. 2D-FAM and UDFF were compared to 3D-CSE to assess bias. Test-retest acquisitions were obtained and assessed via Bland-Altman analysis.

RESULTS

22 children (ages 10-14; 11 male/11 female; 12 with >95th percentile BMI and 10 with normal BMI) were imaged in test-retest (44 exams). 32/44 US exams had =3 frames of sufficient quality and were included, while all CSE-MRI PDFF maps were of diagnostic quality. 3D-CSE and 2D-FAM showed good agreement (mean bias=-0.3±0.5% PDFF, 95% limits of agreement, LoA=3.3±0.9%). 2D-FAM somewhat underestimated PDFF at high fat vs 3D-CSE (slope=0.83±0.07, intercept=0.5±0.6%), which may be partly due to T1-bias in 3D-CSE. UDFF showed moderate agreement with 3D-CSE (mean bias=0.7±1.4%, 95% LoA=7.5±2.4%) and overestimated at low fat and underestimated at high fat (slope=0.68±0.18, intercept=2.4±1.5%). The repeatability coefficients for 3D-CSE, 2D-FAM, and UDFF were 4.5±1.8, 2.1±0.8, and 7.0±3.8% respectively.

CONCLUSION

FB 2D-FAM may improve repeatability (ie. precision) of PDFF measurements in children, while maintaining low bias compared to BH 3D-CSE. UDFF shows promise in accessible fat quantification, and bias and precision may be improved via new postprocessing methods.

CLINICAL RELEVANCE/APPLICATION

MR/US-based fat quantification methods with improved accessibility, bias, and precision may enable widespread screening and staging of MASLD in children.

S3B-SPPD-2 HIP MORPHOLOGY OF EHLERS-DANLOS/HYPERMOBILITY SYNDROME PATIENTS UNDERGOING PERIACETABULAR OSTEOTOMY

Pedro Henrique Caldeira Brant Faria, MD (*Presenter*)
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PURPOSE

Patients with Ehlers-Danlos Syndrome or Joint Hypermobility Syndrome (EDS/JHS) often experience hip instability. Some are treated with periacetabular osteotomy (PAO), a surgery traditionally reserved for acetabular deficiency in developmental dysplasia of the hip (DDH) in the setting of reduced lateral center-edge angle (LCEA) and other osseous abnormalities. It remains unclear whether instability in EDS/JHS is a clue to underlying osseous dysplasia or solely due to ligamentous laxity. This study (1) compared acetabular coverage in EDS/JHS patients undergoing PAO to non-EDS/JHS controls to assess the prevalence of radiographic dysplasia, and (2) reviewed surgical indications to evaluate potential mismatch between clinical and radiographic findings.

METHODS AND MATERIALS

Cases comprised pediatric patients (<21 years) with EDS/JHS and pre-operative hip radiographs who underwent PAO at our large tertiary children's hospital (1/2000-5/2024). EDS/JHS was defined as Beighton score =6 and reported history of ligamentous laxity. Matched controls included patients with DDH who underwent PAO with no history of EDS/JHS. Surgical indications were extracted from operative notes. Two readers measured LCEA, anterior center-edge angle (ACEA), Tönnis angle (TA), and Sharp angle (SA) independently. Statistical analysis included Wilcoxon rank-sum test and intraclass correlation (ICC).

RESULTS

The study included 36 EDS/JHS patients (all females; age = 17.6, range = 13-20 years) and 36 controls. Despite 97.2% (35/36) of EDS/JHS patients carrying a surgical diagnosis of dysplasia, 58.3% had normal LCEA (=25°) and 51% had normal ACEA (=20°), indicating normal acetabular coverage in over half the cases. Compared to controls, EDS/JHS patients had higher LCEA (26° vs. 16°, P=.001) and ACEA (25° vs. 14.5°, P=.001), and lower Tönnis (8.5° vs. 17.2°, P=.001) and Sharp angles (42.4° vs. 48°, P=.001). Inter-reader ICCs were good to excellent in both groups (0.88-0.93).

CONCLUSION

Many EDS/JHS patients undergoing PAO lack radiographic features of DDH. Hip instability in EDS/JHS patients may stem from soft tissue laxity rather than acetabular deficiency. We suggest that the term "acetabular dysplasia" may be inappropriate to describe EDS/JHS patients unless there is true acetabular deficiency. Further research is needed to assess their surgical outcomes and identify reliable imaging parameters to optimize treatment selection.

CLINICAL RELEVANCE/APPLICATION

This study highlights a misalignment between radiographic and pre-operative diagnoses in EDS/JHS patients undergoing PAO. Refining terminology in patients with instability without osseous deficiency may improve understanding of the underlying pathology and support surgical decision-making.

S3B-SPPD-3 DEEP LEARNING-ACCELERATED AUTOMATED SEGMENTATION OF PLEXIFORM NEUROFIBROMA IN PATIENTS WITH NEUROFIBROMATOSIS TYPE 1

Jeong Min Song, MD (*Presenter*)
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PURPOSE

While 3D volumetric analysis of plexiform neurofibromas (PNs) is crucial to evaluate treatment response in patients with neurofibromatosis type 1 (NF1), particularly to selumetinib, manual segmentation is labor-intensive and time-consuming. This study aims to develop a deep learning model to assist with the automated segmentation of PNs in patients with NF1.

METHODS AND MATERIALS

We retrospectively collected MRI examinations of pediatric and adult NF1 patients enrolled in a selumetinib clinical trial between May 2019 and December 2023. For model development, axial T2-weighted fat-suppressed images with a slice thickness of 3-7 mm and no interslice gap were used. To overcome the small dataset size, we employed 5-fold cross-validation to train a Cascade Mask R-CNN, using an ensemble of the resulting models for inference. As the reference standard, we used PN segmentation labels created by image analysts under radiologist supervision. Given the clinical importance of target PN volume measurement in treatment response evaluation, the model's performance was assessed separately for whole PN and target PN volume segmentation. For model testing, MRI examinations of NF1 patients with measurable PNs, not enrolled in the clinical trial, were retrospectively collected from a single institution between January and July 2024. Segmentation performance of the model was evaluated using Intersection over Union (IoU), F1 score, precision, and recall.

RESULTS

A total of 80 MRI examinations from 62 patients (median age, 12.5 years; 38 males) were used for model development, with 73 examinations used for training and 7 for tuning. For model testing, 10 MRI examinations from 10 NF1 patients were used. In the model development dataset, target PNs were most common in the pelvis (19 of 80 PNs), followed by the neck, chest, and other regions. In the test dataset, target PNs were most common in the neck (5 of 10 PNs). For whole PN volume segmentation, the model achieved an IoU of 0.45, F1 score of 0.59, precision of 0.55, and recall of 0.70. For target PN volume segmentation, the IoU, F1 score, precision, and recall were 0.07, 0.13, 0.08, and 0.93, respectively. The model's inference time was under one minute for all cases.

CONCLUSION

We developed and internally validated an automated segmentation assistance deep learning model for PNs in NF1 patients. The proposed model demonstrated a high recall of 0.93 for segmentation of target PNs, suggesting that simple post-processing of the predicted segments may be sufficient for accurate evaluation of 3D volumetric analysis of target PNs.

CLINICAL RELEVANCE/APPLICATION

Following model inference, clinicians can efficiently correct minor segmentation errors, enabling a streamlined PN segmentation workflow and reducing expert workload.

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S3B-SPPH

Physics Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPPH-1 3D FLUID ATTENUATED INVERSION RECOVERY WITH A GENERALIZED PREPARATION PULSE

Christina Graf, PhD (*Presenter*)
Alexander Jaffray (*Abstract Co-Author*)
Armin Rund (*Abstract Co-Author*)
Stefan Steinerberger (*Abstract Co-Author*)
Alexander Rauscher, PhD, MSc (*Abstract Co-Author*)

PURPOSE

Preparation pulses are widely used in magnetic resonance imaging (MRI), with fluid attenuated inversion recovery (FLAIR) being a prominent example. In FLAIR, the signal is prepared with an 180 degree inversion pulse, with the aim to suppress signal from cerebrospinal fluid (CSF) in the subsequent imaging sequence. The inversion is almost always realized with an adiabatic full passage pulse (i.e. 180 degrees), which has good robustness to inhomogeneities in the radiofrequency field. Smaller flip angles for the preparation pulse may have advantages in certain applications. The purpose of our study was to develop a generalized preparation pulse with a flip angle of 140 degrees, and to test the pulse in a FLAIR sequence.

METHODS AND MATERIALS

The preparation pulse was designed using optimal control, incorporating robustness against field inhomogeneities directly into the cost function for pulse optimization, with a target flip angle of 140 degrees. In addition, maximum dephasing of the transverse magnetization was imposed so that purely a z-magnetization remains after preparation. The pulse replaced the inversion pulse of a 3D FLAIR sequence. Experimental data were acquired at 3 T in a human volunteer. The 140-degree preparation resulted in an inverson time of 1600 ms. Other scan parameters were 1 cubic mm isotropic resolution, repetition time (TR) = 6000 ms, effective echo time (TE) = 300 ms, scan duration = 3 min 48 s. For comparison, data were acquired with 180 degree inversion, the same spatial resolution, echo time and duration, resulting in a TI of 2000 ms at a TR of 6000 ms, and the same scan duration of 3 min 48 s.

RESULTS

The FLAIR scan with 140 degree preparation shows improved CSF suppression compared to the conventional FLAIR scan. Image contrast is similar for the two scans.

CONCLUSION

Non-180 degree preparation pulses are feasible. FLAIR with a 140 degree preparation pulse shows favourable CSF suppression compared to a conventional FLAIR with the same scan duration.

CLINICAL RELEVANCE/APPLICATION

The preparation pulse can be easily adopted into routine MRI, without any hardware modifications, facilitating direct clinical impact.

S3B-SPPH-2 DEVELOPING AN ATTENTION-BASED BREAST DENSE TISSUE SEGMENTATION ALGORITHM FOR MULTI-CENTER, MULTI-VENDOR DATA

Razieh Ganjee (*Presenter*)
Tamerlan Mustafaev, MD (*Abstract Co-Author*)
Belayat Hossain, PhD (*Abstract Co-Author*)
Margarita L. Zuley, MD (*Abstract Co-Author*)
Juhun Lee, PhD (*Abstract Co-Author*)

PURPOSE

Breast density, defined as the proportion of glandular (dense) to fatty tissue, is one of key risk factors for breast cancer. Reliable density assessment can be possible through accurate dense tissue segmentation from mammograms. However, variations in tissue appearance and texture, particularly across images from different vendors, pose challenges to robust segmentation of dense tissue. This study presents a deep network model incorporating global contextual information to improve dense tissue segmentation in multi-vendor and multi-center mammogram data.

METHODS AND MATERIALS

We developed a hierarchical encoder-decoder architecture with adaptive spatial and channel-wise attention mechanisms integrated into the skip connections. This dual-attention framework enables the model to capture long-range feature dependencies and account for intra-class variation in tissue appearance. We used 1,500 "for-presentation" mammograms of 606 women from three independent sources, each comprising 500 mammograms. These mammograms were acquired at various centers using different imaging vendors, including one from Asia with Siemens (Set1), and two from United States with Hologic (Set2,3). Using radiologist-validated dense tissue masks as ground truth, we trained and evaluated our algorithm's segmentation performance using 5-fold cross-validation. We then computed percent density (PD) using the segmentation outcomes and used it to evaluate the algorithm's ability to classify each mammogram into dense (BI-RADS density C-D) and fatty (BI-RADS density A-B) groups.

RESULTS

The proposed model achieved strong agreement with the ground truth, with an overall average Dice score of 0.72 ± 0.17 for 5 fold CV. It performed best on dense breast cases, with Dice scores of 0.84 ± 0.10 (Set1), 0.83 ± 0.11 (Set2), and 0.80 ± 0.10 (Set3). In the classification task of fatty vs. dense using PD, our model achieved an AUC of 0.96. While this was statistically lower than the ground truth-based PD (AUC = 0.98; DeLong's p = 0.004), the performance was comparable.

CONCLUSION

Our deep learning model demonstrated effectiveness in segmenting dense breast tissue across clinical centers and imaging vendors by leveraging spatial and channel-wise attention to capture appearance variations in features of the same tissue type, regardless of their location in the image.

CLINICAL RELEVANCE/APPLICATION

Breast dense tissue is a critical risk factor for breast cancer. The proposed algorithm may enable reliable segmentation of dense tissue over different clinical centers and imaging vendors, which can facilitate the evaluation process of breast density.

S3B-SPPH-3 COMPARATIVE ASSESSMENT OF RECONSTRUCTION METHODS FOR PULMONARY NODULE DETECTION IN ULTRA-LOW-DOSE CT

Siqi Qu (*Presenter*)
Zhiming Xiang (*Abstract Co-Author*)
Qiuxing Chen (*Abstract Co-Author*)
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PURPOSE

To compare deep learning image reconstruction (DLIR) with adaptive statistical iterative reconstruction-Veo (ASIR-V) in ultra-low-dose chest CT (ULDCT) and evaluate their effects on image quality and quantitative assessment of pulmonary nodules.

METHODS AND MATERIALS

This prospective study included 98 patients with pulmonary nodules who underwent both standard-dose CT (SDCT) and ULDCT. ULDCT scanning parameters were adjusted based on body mass index (BMI) and categorized into four subgroups: L (<18.5 kg/m²), M (18.5-23.9 kg/m²), H (24-27.9 kg/m²), and F (=28 kg/m²). SDCT images were reconstructed using ASIR-V at 50% blending (ASIR-V 50%) and served as the reference standard. ULDCT images were reconstructed using ASIR-V 50%, DLIR at medium strength (DLIR-M), and DLIR at high strength (DLIR-H). Pulmonary nodule detection rates were calculated using SDCT as the reference. Nodule size (diameter and volume) was measured across all reconstructions. Standard deviation (SD) of CT attenuation values in lung parenchyma and subcutaneous fat at the same axial level as the nodules was used to assess image noise. Signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) were computed to evaluate image quality.

RESULTS

A total of 668 pulmonary nodules were identified on SDCT. Detection rates on ULDCT were 97.46% (651/668) with ASIR-V 50%, 97.90% (654/668) with DLIR-M, and 98.35% (657/668) with DLIR-H. The effective dose (ED) for SDCT was 3.74 ± 1.55 mSv, compared to 0.48 ± 0.11 mSv for ULDCT. Among ULDCT reconstructions, image noise—as measured by SD—was lowest in DLIR-H, followed by DLIR-M and ASIR-V 50%, while SNR and CNR followed the reverse trend ($P < 0.001$). No significant differences in nodule diameter or volume were found between ULDCT and SDCT reconstructions ($P > 0.001$). Nodule size and volume measurements from ASIR-V 50%, DLIR-M, and DLIR-H reconstructions were all highly consistent with those from SDCT, with ? values for diameter of 0.992, 0.995, and 0.991, and for volume of 0.992, 0.991, and 0.992, respectively. No statistically significant differences were observed among the three reconstruction techniques ($P > 0.001$).

CONCLUSION

DLIR enhanced image quality and improved nodule detection on ULDCT compared with ASIR-V50%. Nodule size measurements on ULDCT reconstructed with ASIR-V50%, DLIR-M, and DLIR-H showed high agreement with those on SDCT in both diameter and volume.

CLINICAL RELEVANCE/APPLICATION

DLIR improves image quality in ULDCT while preserving diagnostic accuracy for pulmonary nodule detection and quantification. By enabling substantial radiation dose reduction without compromising diagnostic performance, DLIR offers meaningful clinical value for routine lung cancer screening.

S3B-SPPH-5 IMPROVING CT IMAGE QUALITY OF THE LEFT ATRIAL APPENDAGE AFTER PERCUTANEOUS CLOSURE USING A SECOND-GENERATION WHOLE-HEART MOTION CORRECTION ALGORITHM

Yanan Li (*Presenter*)

PURPOSE

To demonstrate the ability of a whole-heart motion correction algorithm (snapshot freeze, SSF2) to improve the cardiac computed tomography (CT) image quality of the left atrial appendage (LAA) after percutaneous closure.

METHODS AND MATERIALS

A total of 38 patients after percutaneous closure of LAA underwent single-heartbeat cardiac CT on a 16cm detector CT scanner. Images were reconstructed with no motion correction (STD), first-generation snapshot freeze (SSF1) and SSF2. The motion artifact, LAA visualization and overall image quality for the LAA closure (proximal, central, and distal) were assessed by two experienced radiologists using a five-point scale as shown in Table 1. The regions of interest were placed in three areas with heavy artifacts at the middle level of the LAA closure to measure the standard deviation (SD). The Friedman test with a post-hoc test was performed to compare objective and subjective results.

RESULTS

The subjective scores (motion artifact, LAA visualization and overall image quality) and objective assessment of artifacts (SD) were significant different among the three groups as shown in Table 3 (all $P < 0.001$). The motion artifact scores of SSF2 group for the proximal, central, and distal regions (0.71±0.77, 0.82±0.80 and 0.55±1.06, respectively) were significantly lower than the STD (1.76±1.70, 2.18±1.27 and 1.61±1.59, respectively) and SSF1 groups (1.63±1.22, 1.76±1.24 and 1.37±1.53, respectively). The overall image quality score and LAA visualization with SSF2 were improved to 4.21±0.66 and 4.34±0.57, as compared to 3.11±0.98 and 3.24±1.00 with STD and 3.45±0.92 and 3.55±0.78 with SSF1. For the three areas with heavy artifacts among the three groups, the SSF2 group had the smallest and the STD group had the largest SD values. There was no significant difference between STD and SSF1 subjective scores, but the SD of artifacts with SSF1 were lower than STD group ($P < 0.001$, $P = 0.002$, $P = 0.005$).

CONCLUSION

SSF2 provides satisfactorily reduced artifacts, significantly improved LAA visualization, and image quality of LAA in cardiac CT patients after percutaneous closure compared to STD and SSF1.

CLINICAL RELEVANCE/APPLICATION

A whole-heart motion correction algorithm (SSF2) can further improve the image quality of LAA in patients after percutaneous closure.

S3B-SPPH-6 GENERATIVE ADVERSARIAL NETWORK-BASED KIDNEY CT ENHANCEMENT: IMAGE GENERATION FROM NON-CONTRAST TO CONTRAST CT

Lin Jiaze (*Presenter*)
Genggeng Qin, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study proposes a Generative Adversarial Network (GAN) model, KRES-GAN, focused on Kidney Routine Enhanced Scan (KRES). The model aims to generate diagnostic-grade KRES images from Kidney Routine Scan (KRS) images, providing an innovative alternative for patients who cannot receive contrast agents.

METHODS AND MATERIALS

This retrospective study collected three-phase KRS and KRES data from 734 patients with pathologically confirmed kidney tumors at Southern Medical University Southern Hospital, between January 2014 and June 2023. Automated methods were used to adjust the spatial resolution of KRS and KRES images, enabling layer-by-layer matching and image registration. A total of 502 high-quality registered samples were selected, with a 7:2:1 split for the training, validation, and testing sets. Additionally, 216 multi-center samples were collected for external validation. The proposed model integrates channel and spatial attention mechanisms with a cyclic model structure and progressively optimizes image generation quality through a three-stage training strategy. In the first stage, a global GAN structure was employed to model and generate the overall anatomical structure. In the second stage, the backbone network was frozen, and channel and spatial attention modules were introduced to enhance vascular detail and inter-layer consistency. In the third stage, multi-scale matching loss functions were integrated to improve the precision of HU values in the renal sinus and to optimize tumor boundary details.

RESULTS

Internal testing showed that KRES-GAN achieved an SSIM of 0.908 ± 0.021 and a PSNR of 31.11 ± 1.35, significantly outperforming mainstream models such as Pix2Pix and cGAN. External testing performance was stable (SSIM = 0.901 ± 0.029, PSNR = 30.32 ± 1.77).

CONCLUSION

KRES-GAN innovatively achieves intelligent generation of renal cortical phase KRES based on KRS, accurately identifying the renal cortex and tumor boundaries with precise spatial localization. Additionally, the generation of renal sinus structures demonstrates good continuity and inter-layer consistency.

CLINICAL RELEVANCE/APPLICATION

The KRES-GAN model proposed in this study provides an innovative, non-invasive alternative for renal tumor patients unable to use contrast agents, particularly in the precise classification of clear and non-clear cell carcinomas. KRES-GAN accurately identifies the renal cortex, tumor boundaries, and renal sinus, improving diagnostic efficiency and reducing contrast agent use and scanning costs. It is especially suitable for patients with impaired renal function or contrast agent allergies. Multicenter validation has shown its broad applicability, with expected significant clinical impact.

S3B-SPPH-9 ENHANCING CORONARY CT ANGIOGRAPHY IMAGE QUALITY IN ATRIAL FIBRILLATION PATIENTS THROUGH DEEP LEARNING-BASED RECONSTRUCTION AND ADVANCED MOTION CORRECTION TECHNOLOGY

Shikuan Li (*Presenter*)
Feng Chen, MD, PhD (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Xin Qin (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To evaluate the clinical utility of deep learning image reconstruction (DLIR) combined with second-generation whole-heart motion correction technology (SnapShot Freeze 2, SSF2) in patients with atrial fibrillation (AF) undergoing coronary CT angiography (CCTA), and to perform comparative assessments of image quality against first-generation motion correction (SSF) and iterative reconstruction (ASIR-V50%).

METHODS AND MATERIALS

This retrospective study enrolled 30 patients with atrial fibrillation (AF) who underwent coronary CT angiography (CCTA). Three reconstruction protocols were applied to each patient: Group A: DLIR-H + SnapShot Freeze 2 (SSF2) during diastole (75% R-R interval);Group B: ASIR-V50% + SSF2 during systole (45% R-R interval);Group C: ASIR-V50% + SnapShot Freeze 1 (SSF1)during systole (45% R-R interval).Quantitative measurements included: CT attenuation values (HU),Image noise (standard deviation, SD),Signal-to-noise ratio(SNR),Contrast-to-noise ratio (CNR),Motion artifact index (AI).Subjective image quality was independently evaluated by two radiologists (=5 years of experience in coronary CTA) using a blinded 5-point scale.

RESULTS

Group A (DLIR-H + SSF2) consistently demonstrated superior image quality metrics across both diastolic and systolic phases: Noise Suppression: The proximal right coronary artery (RCA) exhibited significantly lower image noise in Group A (18.2 ± 2.1 HU) compared to Group C (25.6 ± 3.5 HU), with a 29% reduction ($P < 0.001$). Similar reductions were observed in the left main coronary artery (LM), proximal left anterior descending artery (LAD), proximal left circumflex artery (LCX), and aortic root (AR) (all $P < 0.001$). Subjective evaluation using a blinded 5-point scale (1 = non-diagnostic, 5 = excellent) confirmed these findings :Group A achieved the highest scores in proximal RCA ($P < 0.001$), proximal LCx ($P < 0.001$), and overall image quality ($P < 0.001$), with a median score of 4.8 ± 0.4.Interobserver agreement was excellent (weighted Kappa = 0.915), underscoring the reliability of the qualitative assessment.

CONCLUSION

DLIR-H+SSF2 significantly improves image noise control, enhances contrast resolution, and effectively suppresses motion artifacts in coronary CT angiography (CCTA) for patients with atrial fibrillation (AF).

CLINICAL RELEVANCE/APPLICATION

As an advanced reconstruction algorithm, DLIR-H+SSF2 provides clearer and more accurate coronary artery imaging in the context of arrhythmia, offering critical support for pre-ablation anatomical assessment and intraoperative strategy formulation in patients with atrial fibrillation (AF). This approach demonstrates strong clinical potential for widespread adoption in clinical practice.

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S3B-SPRO

Radiation Oncology Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPRO-1 THE BLOODDASHSUPPLYING STATE OF SKULL BASE CHORDOMA: EVALUATED BY DIFFERENT IMAGING MODALITIES

Xinyao Shi (*Presenter*)
Xijia Zhang (*Abstract Co-Author*)
Xuzhu Chen SR (*Abstract Co-Author*)
Jiwei Bai (*Abstract Co-Author*)

PURPOSE

The blood-supplying state of skull base chordomas has been scarcely investigated. We aimed to elucidate the role and superiority of CT perfusion (CTP) in predicting tumor blood-supplying state to guide surgical strategy.

METHODS AND MATERIALS

79 patients with skull base chordoma were identified retrospectively, and their preoperative CTP, routine MRI, and apparent diffusion coefficient (ADC) values were analyzed. The tumor blood-supplying state was classified into three groups based on surgical records and videos. Pretreatment normalized mean CTP parameters, routine MRI parameters, and ADC values were calculated. The Kruskal-Wallis H test, ? 2 tests, and Fisher’s exact tests were used for multiple group comparison and Dunn's tests were used for pairwise comparison. Spearman correlation analysis was employed to assess the relationships between the variables.

RESULTS

CTP and routine MRI can distinguish different blood-supplying states of skull base chordoma (rCBF: P=0.006; rCBV: P<0.001; T2WI: P=0.011; contrast-enhanced T1WI: P<0.001; ADC: P=0.341). CTP (rCBF: r=0.361, P=0.001; rCBV: r=0.425, P<0.001) has an advantage over MRI (T2WI: r=-0.353, P=0.001; contrast-enhanced T1WI: r=0.383, P<0.001; ADC: r=0.084, P=0.462) in reflecting the skull base chordoma blood-supplying state. Pairwise comparisons revealing that both rCBF and rCBV were significantly higher in the rich blood-supplying group than in the poor blood-supplying group (rCBF: 1.90 vs.0.98, P<0.01; rCBV: 3.09 vs.1.55, P<0.001). rCBV (P<0.05) was also particularly effective in differentiating between poor and moderate blood-supplying groups (1.55 vs.2.30, P<0.05).

CONCLUSION

CTP and routine MRI can help differentiate different blood-supplying states of skull base chordoma. The efficacy of CTP is superior to MRI in predicting the blood-supplying states of skull base chordoma.

CLINICAL RELEVANCE/APPLICATION

Preoperative CTP examination allows the surgeon to assess the tumor blood-supplying state initially. Then the surgeon can adjust intraoperative strategy to avoid the most severe outcomes. The surgeon may choose intratumoral decompression or marginal resection, depending on the blood supply of the skull base chordoma. Intratumoral decompression is recommended when the blood supply is poor, as this procedure causes less damage to brain tissue. It’s more likely to complete operations safely, despite the trauma exposed by aspiration, leading to more blood exudation. When the blood supply is rich, marginal resection is often considered a preferable approach. This is because it minimizes blood exudation when separating the brain tissue from the tumor margin. However, it should be noted that this strategy may cause more damage to the surrounding normal brain tissue.

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S3B-SPVA

Vascular Imaging Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-SPVA-1 DUAL-MONITORING BOLUS TRACKING PEAK TRIGGER TECHNIQUE IN CORONARY CT ANGIOGRAPHY: A PROSPECTIVE STUDY COMPARING WITH SINGLE BOLUS TRACKING

Zijing Zhang (*Presenter*)
Yong Fan (*Abstract Co-Author*)
Zhidong Yuan, RT (*Abstract Co-Author*)
Fei Feng (*Abstract Co-Author*)

PURPOSE

To investigate the use of dual-monitoring bolus tracking of the pulmonary artery and ascending aorta for optimal peak scanning in coronary CT angiography (CTA) and to compare its image quality with single-monitoring bolus tracking.

METHODS AND MATERIALS

Prospectively collected 150 patients who underwent coronary CTA scanning from April 2024 to April 2025, randomly divided into two groups, using dual-monitoring bolus tracking (Group A = 70) or single-monitoring bolus tracking (Group B = 80), both groups set the ascending aorta as a triggered region of interest (ROI1). Group A additionally set the pulmonary artery trunk as a non-triggered region of interest (ROI2), the time-density curves of ascending aorta and pulmonary artery were obtained. The trigger threshold of ascending aorta was set at 250 HU in group A, and the scan was delayed for 4 s. The trigger threshold of group B was set at 160 HU, and the scan was delayed for 6 s. The subgroups of group A were divided into manual trigger group A1 (n=33) and automatic trigger group A2 (n=37). The scanning parameters and contrast injection protocol were kept the same in each group. Coronary CT values were measured, and CT ascending aorta /CT peak of the ROI2 was calculated in group A. Image quality was subjectively scored using a 4-point scale. Statistical analysis was performed using SPSS26.

RESULTS

All images satisfied the diagnosis, and the difference in subjective scores of images in each group was not statistically significant (P>0.05). Groups A1, A2, and B compared patients' age, gender, height, weight, heart rate, iodine flow rate, iodine intake, and total radiation dose with each other. The difference in coronary CT values in groups A, B was not statistically significant (P>0.05).Scan-triggered CT values were smaller in group A1 than in group A2 (P<0.05).Scan-triggered time and pulmonary artery peaking time were later in group A1 than in group A2 (P<0.05). The peak CT value of pulmonary artery and CT value of aorta in group A1 were smaller than that in group A2 (P<0.05), but the difference in the CT ascending aorta /CT peak of ROI2 between the two groups was not statistically significant (P=0.145).

CONCLUSION

Using dual-monitoring bolus tracking technique can provide an important reference for obtaining peak aortic time based on aortic and pulmonary artery time-density curves, without additional increase in radiation dose to the patient, and obtaining a good image in coronary CTA.

CLINICAL RELEVANCE/APPLICATION

The additional pulmonary artery time-density profile without increasing the radiation dose provides a reference value for obtaining peak aortic time and facilitates the acquisition of high-quality coronary artery images, which is of great value for clinical application.

S3B-SPVA-2 RADIOMICS-BASED CAROTID ULTRASOUND ANALYSIS TO IDENTIFY SUBCLINICAL CORONARY CALCIFICATION

YoungJun Lee, PhD (*Presenter*)
MIRAN LEE (*Abstract Co-Author*)
Rachel Surowiec (*Abstract Co-Author*)
Jeonggyu Kang (*Abstract Co-Author*)

PURPOSE

Atherosclerotic burden assessed by carotid ultrasound (CUS) does not always align with coronary artery calcium scores (CACS), and substantial coronary calcification may be present even in the absence of visible carotid plaque. While CACS measurements using computed tomography (CT) is guideline-endorsed, its use is limited by radiation, cost, and accessibility. This study aims to evaluate whether radiomics-based CUS can identify individuals with subclinical coronary calcification, defined by elevated CACS despite normal-appearing CUS, by capturing texture patterns beyond standard interpretation.

METHODS AND MATERIALS

A total of 210 participants who underwent both CUS and CACS CT were included, all of whom showed no overt atherosclerotic plaque on CUS. The two groups (CACS = 0 and CACS > 100, 105 participants each) were matched for age and sex. Longitudinal carotid ultrasound videos (30-50 frames per participant) were acquired from the distal CCA (1 cm proximal to the bulb) on both the right and left common arteries. The region of interest, defined according to intima-media thickness (IMT) measurement guidelines, was isolated using a pre-trained neural network. Radiomic features were then extracted from each frame, filtered by variance and correlation thresholds, and ranked using bootstrap-based reproducibility analysis with XGBoost-derived feature importance scores (FI). Group differences were assessed using the top-ranked features with statistical analysis (t-test or Mann-Whitney U test).

RESULTS

Among 700 extracted features, 7-10 features per group were retained based on reproducibility and statistical significance. Several higher-order features derived from GLDM and GLRLM matrices were consistently significant in both CACS 0 and CACS > 100 groups, while group-specific features such as 90Percentile (CACS 0: Rt. CCA = $p < .007$, FI = .030; Lt. CCA: $p < .021$, FI = .025) and RunEntropy (CACS > 100: Rt. CCA = $p < .001$, FI = 0.046; Lt. CCA = $p < .002$, FI = .038) emerged. LongRunEmphasis, DependenceNonUniformity, and Entropy were consistently observed in both CACS groups and across both CCA (all $p < .05$, FI range = .023 - .029).

CONCLUSION

Radiomic analysis revealed side-specific and bilaterally consistent textural features in carotid ultrasound that were associated with coronary calcium burden. These findings support the potential of radiomics-enhanced CUS to identify individuals with subclinical coronary calcification.

CLINICAL RELEVANCE/APPLICATION

By capturing subtle calcification patterns not visible through standard CUS interpretation, radiomic analysis may enhance cardiovascular risk assessment—especially when CT-based CACS is not available or practical in primary care or preventive cardiology settings.

S3B-SPVA-3 ELUCIDATION OF EMBOLIC EFFECTS OF EMBOSPHERE MICROSPHERES IN VIVO DEPICTED BY MONOCHROMATIC SYNCHROTRON X-RAY MICROANGIOGRAPHY

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Tsutomu Tamada, MD, PhD (*Abstract Co-Author*)

PURPOSE

To elucidate the properties of Embosphere (100-300, 40-120μm) as embolic agents in vivo.

METHODS AND MATERIALS

Four healthy Japanese white rabbits (approximately 3 kg each) were used. Two of the rabbits were subcutaneously injected with Picibanil (1.0 KE) into both ears to create an inflammatory model. High spatial resolution microangiography was performed using monochromatic X-rays extracted from synchrotron radiation facility (Super Photon ring-8; SPring-8). Under anesthesia, an elastomer needle (26 G) was placed in the intermediate branch of the auricular artery, and pre-embolization angiography was performed. Then, embolization was performed from the intermediate branch of the auricular artery using 2 ml of a mixture of Embosphere (9 ml) and nonionic contrast agent (9 ml) from a total of 18 ml. Angiography was performed 3, 10, 20, 30, 40, 50, 60, 70, 80, and 90 minutes after embolization. The diameter of the embolized vessel was evaluated using images before embolization. The presence or absence of recanalization was evaluated using angiographic images over time up to 90 minutes after embolization. ROIs were set in both normal and inflammation-induced sites, and the two were compared.

RESULTS

The mean diameter of the blood vessels embolized immediately after embolization was 233±44.84 μm with Embosphere (100-300 μm), with a range of 174-292 μm. In the Embosphere (40-120 μm), the mean diameter was 84±17.88 μm, range: 61-119 μm. Observation 90 minutes after embolization showed no clear recanalization in either normal or inflammation-induced sites. In cases of over-embolization, polymerization of the embolic material occurred in large blood vessels, but blood flow was observed through the gaps. Thrombus formation was observed to progress over time.

CONCLUSION

The characteristics of Embosphere as an embolic material in vivo were elucidated. There was no difference in the course of embolization between normal and inflammation-induced sites. The gradual formation of a thrombus was visualized.

CLINICAL RELEVANCE/APPLICATION

Embosphere is widely used clinically as an embolization material for various diseases (uterine fibroids, hypervascular tumors, etc.). We believe that by better understanding the intravascular dynamics during embolization, embolization can be performed more accurately.

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T2-SPBR

Breast Imaging Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPBR-1 AUTOMATIC CLASSIFICATION OF BREAST LESIONS IN CONTRAST ENHANCED MAMMOGRAPHY USING DEEP LEARNING IN CONJUNCTION WITH MULTIMODAL INFORMATION: BIRADS LEXICON FEATURES AND RAW IMAGE FEATURES

Danielle Fein (*Presenter*)
Miriam Sklair-Levy, MD (*Abstract Co-Author*)
Renata Faermann, MD (*Abstract Co-Author*)
Noam Nissan, MD, PhD (*Abstract Co-Author*)
Debbie Anaby (*Abstract Co-Author*)

PURPOSE

To assess the combined usage of BIRADS lexicon and pixel data for multi-modal automatic classification of breast lesions in contrast enhanced mammography (CEM) and evaluate its potential for biopsy sparing in benign breast lesions while maintaining high sensitivity.

METHODS AND MATERIALS

We validated a deep learning model by applying it to 537 CEM tests not included in the training data. Then we compared the model classification with the corresponding histopathological results of 483 breast lesions, were manually delineated by a research assistant, based on experienced radiologist's annotations and confirmed by an expert radiologist and described according to the BIRADS lexicon. The (BIRADS) lexicon data was encoded as a binary feature vector for each lesion, that together with the lesion pixels, formed its multi-modal representation. A deep neural network was implemented to process the multi-modal data. The network was designed to process low-level image data (pixels) from its entry layer and merge it with high-level lexical data in the deep layers, close to the final classification output. This allows for a better balance between the information content of the pixels' analysis and lexicon descriptors when they are jointly analyzed by the network. The network was trained and validated, using a 5-folds cross-validations approach, for the classification of benign and malignant lesions. The classification score assigned for each case a malignancy likelihood score between 0.00 and 1.00. A score above 0.29 was defined as "suspicious for malignancy," while a score of 0.29 or lower was classified as "likely benign"

RESULTS

We evaluated the deep learning application performance using cross-validation on 483 breast lesions found on 537 CESM studies. Each marked lesion was entered into the application, with the relevant BIRADS score, including background parenchymal enhancement,mass shape,mass margins and mass internal enhancement. Out of 483 lesions marked, 263 were benign (54.5%), and 220 were malignant (45.5%). At a predefined sensitivity of 100%, the model achieved a specificity of 80.5%, indicating strong diagnostic performance in differentiating malignant from benign findings

CONCLUSION

This research showed that the combined usage of BIRADS lexicon descriptors, with pixel data extracted from deep learning analysis of CEM strongly improves the specificity obtained for automatic lesion classification. The presented deep learning model may significantly reduce benign biopsies, without compromising sensitivity.

CLINICAL RELEVANCE/APPLICATION

Multi-modal lesion classification in dual energy CEM has the potential to reduce the number of benign breast biopsies, thereby reducing cost and improving patient experience

T2-SPBR-2 COMPARISON OF SINGLE-SHOT ECHO-PLANAR IMAGING WITH DEEP LEARNING RECONSTRUCTION (SS-EPI WITH DLR) AND MULTI-SHOT ECHO-PLANAR IMAGING WITH SIMULTANEOUS MULTISLICE (MS-EPI WITH SMS) FOR BREAST DWI: ENHANCED IMAGE QUALITY AND READER PREFERENCE

Hye Shin Ahn, MD (*Presenter*)
Sung-Hun Kim, MD (*Abstract Co-Author*)
Min Ji Hong (*Abstract Co-Author*)
Hyun-Soo Lee (*Abstract Co-Author*)
Thomas Benkert (*Abstract Co-Author*)

PURPOSE

Deep learning reconstruction (DLR) in single-shot EPI (ss-EPI) enhances image quality in diffusion-weighted imaging (DWI) of breast MRI. We compared the image quality and diagnostic performance of ss-EPI with DLR versus multi-shot EPI with simultaneous multi-slice (ms-EPI with SMS).

METHODS AND MATERIALS

This retrospective study included 77 breast cancer cases from 74 consecutive women (mean age: 53.1 years) who underwent breast DWI. Two radiologists assessed image quality and reader preference, and the cancer detection rate (CDR) was calculated. Quantitative analysis included apparent diffusion coefficient (ADC), signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and lesion contrast, along with phantom measurements.

RESULTS

Qualitative analysis showed ss-EPI with DLR had significantly higher scores for fat suppression and overall image quality, while artifact presence and lesion conspicuity were comparable to ms-EPI with SMS. The CDR showed no significant difference. Both radiologists preferred ss-EPI with DLR (Reader 1: 78.4%; Reader 2: 89.2%). Quantitatively, ss-EPI with DLR had significantly higher lesion contrast for both readers ($p = 0.001$), while ADC and SNR values were comparable. Phantom measurements showed no significant ADC differences except for mean ADC (DLR: 1.15 ± 0.61 vs. SMS: 1.19 ± 0.62, $p = 0.007$). SNR was higher with ss-EPI and DLR without significant difference (DLR: 630.03 ± 759.26 vs. SMS: 607.45 ± 565.21, $p = 0.912$). The acquisition time was shorter for ss-EPI with DLR (2.06 min) than for ms-EPI with SMS (3.29 min).

CONCLUSION

ss-EPI with DLR yielded superior image quality and greater reader preference than ms-EPI with SMS.

CLINICAL RELEVANCE/APPLICATION

The DLR sequence may have clinical potential for breast DWI to diagnose cancer, particularly due to its superior lesion contrast.

T2-SPBR-3 END-TO-END AI SYSTEM FOR REGION-LEVEL ANOMALY CLASSIFICATION IN BREAST MRI

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Alptug Seref Ayyildiz (*Abstract Co-Author*)
Seyma Nur Tufan (*Abstract Co-Author*)
Ibrahim Akduman (*Abstract Co-Author*)
Erkin Aribal (*Abstract Co-Author*)
Onur Bugdayci, MD (*Abstract Co-Author*)

PURPOSE

To develop an AI-based pipeline that assists radiologists in breast MRI interpretation by automatically detecting, segmenting, and classifying breast anomalies. This tool is designed to streamline the diagnostic workflow, reduce inter-reader variability, and enhance clinical decision-making. Given the complexity of MRI interpretation and the growing demand for efficient and consistent reporting, such tools can help reduce missed findings and assist radiologists in confidently evaluating both cancerous and non-cancerous anomalies.

METHODS AND MATERIALS

This study utilized 1,173 breast MRI images from 95 patients, sourced from a publicly available dataset of Latin American patients (Mendeley Data, CC BY 4.0). The dataset includes multi-sequence dynamic contrast-enhanced (DCE) MRI with annotations for lesion type, location, BI-RADS category, and fibroglandular composition. A total of 354 distinct regions of interest (ROIs) were analyzed, each corresponding to a separate anomaly to be detected and classified. The pipeline comprises three stages: detection using Faster R-CNN, segmentation using a hybrid approach with U-Net, Segment Anything Model (SAM), and inter-slice tracking, and classification using a ResNet50 architecture. The model outputs a malignancy probability score per ROI, with a classification threshold of 0.64; scores above this indicate high probability of malignancy. Modules were evaluated independently: detection via accuracy, segmentation via Dice coefficient, and classification via AUC, accuracy, sensitivity, specificity, and F1-score. Evaluation was done per ROI, reflecting the need to assess multiple lesions per image.

RESULTS

The pipeline achieved 87% detection accuracy. Segmentation of ROIs yielded a Dice score of 85%. Classification reached 83% accuracy, 84% sensitivity, 82% specificity, an F1-score of 83%, and AUC of 0.83.

CONCLUSION

The proposed AI-based pipeline demonstrates strong potential in automating the detection, segmentation, and classification of breast anomalies on MRI. Its balanced accuracy across malignant and benign lesions supports its potential role as a reliable decision-support tool. While results are promising on retrospective data, prospective validation is needed to confirm clinical applicability.

CLINICAL RELEVANCE/APPLICATION

This AI-based tool offers radiologists a structured and efficient way to identify, segment, and assess anomalies on breast MRI, potentially reducing interpretation time and diagnostic variability. By providing risk scores for each detected region, the system supports earlier detection and consistent stratification of lesions, enhancing clinical decision-making in breast cancer evaluation.

T2-SPBR-4 RETROSPECTIVE CLINICAL VALIDATION OF AI-BASED TUMOR SEGMENTATION IN BREAST MRI

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Akane Ohashi, MD,PhD (*Abstract Co-Author*)
Fernando Cossio Ramirez, BSc (*Abstract Co-Author*)
Taeyang Choi (*Abstract Co-Author*)
Yanlu Wang (*Abstract Co-Author*)
Apostolia Tsirikoglou, PhD, MSc (*Abstract Co-Author*)
Fredrik Strand, MD, PhD (*Abstract Co-Author*)

PURPOSE

AI has the potential to support radiologists by improving consistency, reducing workload, and enabling scalable access to automated expert-level interpretation for breast magnetic resonance imaging (MRI) exams. This study evaluates the performance of an AI-based segmentation model for breast cancer by analyzing localization concordance with expert radiologist annotations, and tumor size error compared to actual tumor size in the surgical specimen.

METHODS AND MATERIALS

We collected all breast MRI exams performed for women diagnosed with breast cancer from 2008 to 2021 at Hospital in City, using 1.5T and 3.0T scanners (GE, Philips, Siemens). Two expert radiologists annotated tumors, breast volume, nipple, and lymph nodes on Maximum Intensity Projection of Dynamic Contrast-Enhanced MRI. One radiologist served as the reference standard for model development, the other—the annotator—was used for this performance evaluation. A patient-level split was used for training, validation and testing. We trained the state-of-the-art nnUNet on 800 exams. We report results on the held-out test set, using Dice Similarity Coefficient (DSC), 95th percentile Hausdorff Distance (HD95), and tumor size error relative to post-surgical pathology reports.

RESULTS

From the held-out test set of 74 breast MRI exams from 72 patients with biopsy-confirmed cancer, 6 studies with a DSC of zero were excluded, leaving 68 exams. For tumor size estimation, 9 additional studies were excluded due to missing radiology and pathology reports, leaving 59 exams. Our trained model achieved a mean DSC of 0.76 and HD95 of 14.95 mm— for mass lesions: DSC 0.79, HD95 17.6 mm and for non-mass lesions: DSC 0.74, HD95 11.5 mm. Comparing three image interpreters: (i) our AI model, (ii) the original radiology report, (iii) and the study annotator: the Spearman's correlation coefficient with pathology-reported tumor size was 0.83 (95% CI: 0.65-1.00), 0.63 (95% CI: 0.34-0.92), and 0.53 (95% CI: 0.17-0.89); the median tumor size error was 20.1%, 17.2%, and 20.3%; overestimation by more than 5 mm occurred in 21, 21, and 23 cases; and underestimation by more than 5 mm was observed in 3, 2, and 3 cases, respectively.

CONCLUSION

We demonstrated our AI model achieving performance in both tumor size estimation and localization comparable to clinical experts with high consistency across mass and non-mass lesion types, exhibiting notably lower variability for non-mass lesions.

CLINICAL RELEVANCE/APPLICATION

This study highlights the potential of AI-based segmentation to support radiologists by providing consistent and accurate tumor size estimates in breast MRI, reducing uncertainty in treatment planning. This might be especially valuable in settings where there is a deficit in expert breast MRI radiologists.

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T2-SPCA

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Sub-Events

T2-SPCA-1 THE ADDITIVE EFFECTS OF HYPERTENSION ON LEFT VENTRICULAR MYOCARDIAL STRAIN IN CORONARY ARTERY DISEASES: A CT FEATURE TRACKING STUDY

Jian Jun Tang (*Presenter*)
Mengxi Yang, MS (*Abstract Co-Author*)
Chaoli Zeng (*Abstract Co-Author*)
Peng Zhou SR (*Abstract Co-Author*)

PURPOSE

Hypertension (HT) increases the risk of cardiovascular morbidity and mortality in coronary artery diseases (CAD). CT feature tracking (CT-FT) is a well-established method for myocardial strain analysis; Therefore, this study aims to investigate the impact of hypertension on left ventricle (LV) motion function in CAD patients using CT-FT.

METHODS AND MATERIALS

83 CAD patients were retrospectively enrolled from May 2023 to February 2025, and divided into two groups with [CAD (HT +), n = 43]and without hypertension [CAD (HT -), n = 40]. CT-FT was subsequently performed to measure LV strain parameters.

RESULTS

For baseline characteristics, CAD (HT +) group patients are elder and had a greater proportion of diabetes when compared with CAD (HT -) group. No difference in LV function parameters were observed between two groups. CAD (HT +) group patients demonstrated lower values in myocardial global longitudinal strain (Myo GLS) [-19.9 (-21.3, -18.1)% vs -21.0±2.7%] and endocardial global longitudinal strain (Endo GLS) [-23.1±3.2% vs -25.0±4.0%] than CAD (HT -) group. In the multivariate linear regression analysis adjusting for clinical characteristics, Sex, Hypertension and CAD-RADS=3 were both independently associated with the decreased of Myo GLS (Sex: ß=-0.224,P=0.049; Hypertension: ß=-0.271, P=0.007; CAD-RADS=3: ß= -0.284, P= 0.004) and Endo GLS (Sex: ß=-0.266, P=0.011; Hypertension: ß=-0.229,P=0.031; CAD-RADS=3: ß=-0.256,P=0.016).

CONCLUSION

HT could aggravate the LV subclinical dysfunction in CAD patients and CT-FT allows the sensitive assessment

CLINICAL RELEVANCE/APPLICATION

CT-FT is an emerging technology, it can provide a one-stop assessment of coronary anatomy, general cardiac function and strain in CAD patients to detect subclinical cardiac dysfunction. Compared with echocardiography speckle tracking imaging (STI) and cardiac magnetic resonance feature tracking technology (CMR-FT), it is more practical and has fewer contraindications.

T2-SPCA-2 INTRACORONARY OPTICAL COHERENCE TOMOGRAPHY VERSUS PHOTON-COUNTING DETECTOR CORONARY CT ANGIOGRAPHY IN CORONARY LUMEN ASSESSMENT

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Moritz Halfmann, MD (*Abstract Co-Author*)
Larissa Kavermann (*Abstract Co-Author*)
Lukas Mueller, MD, PhD (*Abstract Co-Author*)
Philipp Locherer (*Abstract Co-Author*)
Tobias Baeuerle, MD (*Abstract Co-Author*)
Anton Kilburg, MD (*Abstract Co-Author*)
Michaela Hell (*Abstract Co-Author*)

PURPOSE

Photon-counting detector coronary CT angiography (PCD-CCTA) offers ultra-high-resolution imaging that could enhance individualized assessment of coronary artery disease. While prior studies suggest reduced bias compared to conventional methods, validation against a high-resolution intravascular reference standard has been limited. This study aimed to compare coronary lumen area measurements from PCD-CCTA to those obtained by intracoronary optical coherence tomography (OCT).

METHODS AND MATERIALS

Patients with stable chest pain who underwent both PCD-CCTA (120×0.2 mm collimation; reconstructions at 0.6 mm and 0.2 mm slice thickness, using Bv64 kernel and quantum iterative reconstruction level 4) and invasive coronary angiography with steady-pullback OCT were retrospectively included. Lesions were matched across modalities based on anatomical landmarks. A trained cardiologist and radiologist, both blinded to each other's assessments, performed independent measurements. Per-lesion comparisons were conducted using Pearson's correlation, paired t-tests, and Bland-Altman analyses.

RESULTS

A total of 31 lesions from 7 patients were analyzed. PCD-CCTA lumen area measurements strongly correlated with OCT (r=0.82 for 0.6 mm; r=0.92 for 0.2 mm slice thickness). Minimal bias was observed for both reconstruction thicknesses (mean bias -0.20 mm² and -0.45 mm², respectively). Limits of agreement narrowed with thinner reconstructions (-3.3 to 2.9 mm² at 0.6 mm; -2.8 to 1.7 mm² at 0.2 mm), reflecting improved accuracy with higher resolution.

CONCLUSION

PCD-CCTA closely approximates OCT-derived coronary lumen measurements, confirming its capability to deliver, high-fidelity vascular assessment. The improved agreement with 0.2 mm reconstructions highlights the potential of ultra-high-resolution imaging in advancing precision cardiovascular diagnostics.

CLINICAL RELEVANCE/APPLICATION

By minimizing measurement bias between non-invasive imaging and intravascular reference, PCD-CCTA holds potential to minimize unnecessary downstream testing and advance equitable, precision-based care for patients with stable chest pain.

T2-SPCA-5 MYOCARDIAL EXTRACELLULAR VOLUME QUANTIFICATION IN CARDIAC AMYLOIDOSIS: A COMPARATIVE STUDY BETWEEN DUAL-LAYER SPECTRAL DETECTOR CT AND CARDIAC MAGNETIC RESONANCE IMAGING

Jingheng Zhang (*Presenter*)
Jiayu Chen (*Abstract Co-Author*)
Xiaomin Liu (*Abstract Co-Author*)
Zhijie Huang (*Abstract Co-Author*)
Hui Liu, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility and consistency of myocardial extracellular volume (ECV) quantification using dual-layer spectral detector CT (DLCT-ECV) in cardiac amyloidosis (CA), with cardiac magnetic resonance imaging-derived ECV (CMR-ECV) as the reference standard.

METHODS AND MATERIALS

This prospective study included thirteen patients with a clinical suspicion of CA, all of whom underwent both DLCT and CMR examinations. Final diagnoses of CA were confirmed by histopathology. DLCT-ECV was calculated in the delay phase as (1-hematocrit) × (iodine concentration in myocardium / iodine concentration in blood pool). Paired t-test was used to compare ECV value between CMR and DLCT across the 17 segments defined by the American Heart Association (AHA). Peason correlation and Bland-Altman analysis were performed to assess agreement between DLCT-ECV and CMR-ECV at the segmental and global levels. Further, correlations between ECV and clinical parameters were assessed.

RESULTS

The mean global DLCT-ECV and CMR-ECV were 51.93%±10.81, 51.30%±11.69, respectively, with no significant difference ($P > 0.05$). No significant differences were found across any of the 17 AHA segments. Bland-Altman analysis showed a mean difference of 0.6% with limits of agreement from -8.8% to +10.1%. Strong correlations were observed between DLCT-ECV and CMR-ECV at the basal ($r = 0.90$), mid-cavity ($r = 0.95$), apical ($r = 0.88$), and global levels ($r = 0.92$).

CONCLUSION

Cardiac DLCT enables accurate myocardial ECV quantification in patients with CA, with excellent agreement with CMR-ECV.

CLINICAL RELEVANCE/APPLICATION

DLCT-ECV offers a viable alternative to CMR-ECV, particularly for patients with contraindications to MRI or requiring shorter examination times.

T2-SPCA-6 BI-MODAL IMAGING OF MYOCARDIAL INFARCTION USING A GADOLINIUM-BASED CONTRAST AGENT IN COMBINATION WITH SPECTRAL PCCT AND MRI IN PIGS

Salim Si-Mohamed, MD, PhD (*Presenter*)
Tristan Doussineau (*Abstract Co-Author*)
Geraldine Le Duc (*Abstract Co-Author*)
Francois Lux (*Abstract Co-Author*)
Philippe Douek, MD,PhD (*Abstract Co-Author*)
Olivier Tillement (*Abstract Co-Author*)

PURPOSE

CMR and spectral photon counting computed tomography (SPCCT) modalities enable acute myocardial infarction imaging. But dedicated contrast agents are lacking from theranostic properties. In this context, a phase 2 gadolinium-based contrast agents (GBCA), may enable bi-modal imaging of myocardial infarction. Therefore, we evaluated the feasibility of bi-modal myocardial infarction imaging in ischemia-reperfusion pig models.

METHODS AND MATERIALS

An endovascular model of myocardial ischemia-reperfusion was performed in 7 pigs consisting in a ballon-occlusion of the distal LAD artery during 30 minutes followed by 3-hours reperfusion. All animals received intracoronary injection of AGuIX® (10 mL, 13.3 mg.Gd/mL; NH TherAguix ® , France) 10 minutes before sacrifice. Ex-vivo hearts were scanned using HR parameters on a clinical SPCCT prototype (Philips) and a clinical MRI scanner (1.5T, Avanto, Siemens). Infarct size was measured in short-axis images using a clinical workstation (ISP, Philips), similarly to histology. Semi-automatic measurement of infarction area using a thresholding method (Fiji software) was performed and compared using intra-class correlation (ICC) and Bland-Altman analysis.

RESULTS

4 pigs underwent the whole protocol. 6 slices per pigs were analyzed. 10 slices were excluded due to low image quality. 14 slices were analyzed. Mean infarct size relative to total slice area was 20±13.9%, 24.6±15.7%, 16.9±12.4%, on SPCCT, MRI and histology images, respectively. This corresponds to a mean difference of -4.7, 3.0, 7.7 between SPCCT vs MRI, SPCCT vs histology, MRI vs histology, respectively. Excellent agreement was found between SPCCT vs MRI (ICC=0.895), SPCCT vs histology (ICC=0.882), MRI vs histology (ICC=0.774). Bland-Altman analysis showed a bias of -4.67 between SPCCT vs MRI, within limits of agreement ranging from -15.14 to 5.81.

CONCLUSION

A phase 2 gadolinium-based contrast agent is a contrast agent suitable for infarction quantification with SPCCT and MRI. Its use allows for more accurate staining with SPCCT, as its spatial resolution is superior to that of MRI.

CLINICAL RELEVANCE/APPLICATION

A gadolinium-based contrast agent has proven to be specific of myocardial infarction in comparison to histology, and to be suitable for spectral photon-counting CT and MRI.

T2-SPCA-7 PROGNOSTIC VALUE AND RISK CONTINUUM OF CT-DERIVED FRACTIONAL FLOW RESERVE IN PATIENTS WITH TYPE A AORTIC DISSECTION

Feifei Zhou, MD (*Presenter*)
Yong Ju Yang (*Abstract Co-Author*)
Lei Yang (*Abstract Co-Author*)

PURPOSE

To evaluate the prognostic value of CT-derived fractional flow reserve (CT-FFR) for adverse clinical outcomes in patients with type A aortic dissection (TAAD) and to assess its risk continuum relationship with outcomes.

METHODS AND MATERIALS

This study retrospectively enrolled patients diagnosed with TAAD who underwent coronary CT angiography (CCTA) between March 2018 and June 2024. Clinical endpoints included major adverse cardiovascular events (MACE; defined as nonfatal myocardial infarction, unstable angina, and cardiac death), any revascularization (both planned and unplanned), and all-cause mortality. Cumulative incidence was estimated using the Nelson-Aalen method. Hazard ratios (HRs) were calculated using Cox proportional hazards models, and model discrimination was evaluated with Harrell's C-index.

RESULTS

A total of 768 patients (mean age 64 ± 9.5 years; 73.4% male) were included, with a median follow-up of 3.8 years. The incidence of MACE was 32.3%, any revascularization 12.6%, and all-cause mortality 15.1%. CT-FFR =0.80 was associated with higher risk of MACE (HR=4.0, 95% CI: 1.5-10.5; P=0.01) and revascularization (HR=3.2, 95% CI: 1.3-7.9; P=0.008), predominantly driven by planned revascularizations. Each 0.05-unit decrease in CT-FFR increased MACE risk by 50% (HR=1.5, 95% CI: 1.3-1.8; P<0.001) and revascularization risk by 38% (HR=1.38, 95% CI: 1.1-1.8; P=0.001). Incorporating CT-FFR into models with clinical and anatomical variables significantly improved prediction of MACE (C-index 0.78, P=0.002) and revascularization (C-index 0.74, P=0.004), but not all-cause mortality (P=0.67).

CONCLUSION

CT-FFR is significantly associated with MACE and revascularization in TAAD patients and exhibits a continuous risk relationship.

CLINICAL RELEVANCE/APPLICATION

As a noninvasive preoperative functional marker, CT-FFR demonstrates strong predictive utility in TAAD. A threshold of =0.80 is significantly associated with postoperative MACE and planned revascularizations, while its continuous value reflects a graded increase in risk. Integrating CT-FFR with anatomical and clinical assessments enhances preoperative risk stratification and supports optimized patient management.

T2-SPCA-9 ECG-LESS CORONARY CT ANGIOGRAPHY WITH SECOND-GENERATION MOTION CORRECTION (SSF2): ENHANCED IMAGE QUALITY AND DIAGNOSTIC CONFIDENCE IN CORONARY ASSESSMENT

Zhongying Wang, MD (*Presenter*)
Cheng Zhao (*Abstract Co-Author*)
Jinfu Bu (*Abstract Co-Author*)
Xiaomeng Shi (*Abstract Co-Author*)
Jie Lu, PhD (*Abstract Co-Author*)

PURPOSE

To assess the impact of the second-generation motion correction algorithm (SSF2) on coronary artery visualization and diagnostic accuracy in ECG-less CCTA.

METHODS AND MATERIALS

Seventy patients underwent ECG-less CCTA using wide detector CT (Revolution Apex Expert, GE Healthcare) with standard (STD), first-generation (SSF1), and second-generation (SSF2) motion correction. Objective parameters and diagnostic indicators (noise, SNR, CNR, plaque volume, stenosis grading) and subjective image quality (5-point Likert scale by two blinded cardiologists) were analyzed. Segment-, vessel-, and patient-level interpretability were evaluated.

RESULTS

The kappa value between two radiologists on STD, SSF1 and SSF2 images was 0.78, 0.83 and 0.87. There was no significant difference in CT value between 3 reconstruction methods. SSF2 significantly improved image quality, with higher SNR/CNR (all p<0.05) and superior subjective scores (median 5.0 vs. 4.0 [SSF1] and 3.0 [STD], p<0.001; inter-reader ?=0.87). Interpretability was excellent for proximal/mid segments (99.6%) and significantly better for distal vessels/small branches (97.2% vs. 89.4% [SSF1], p<0.05). Patient-level interpretability reached 100% (vs. 92.9% [SSF1] and 51.4% [STD]). SSF2 provided the highest stenosis detection accuracy (84.3%) without significant differences in plaque volumetry (p>0.05).

CONCLUSION

SSF2 optimizes coronary artery assessment in ECG-less CCTA, ensuring high diagnostic confidence even in distal segments, making it a robust tool for coronary artery disease evaluation.

CLINICAL RELEVANCE/APPLICATION

SSF2 enables reliable ECG-less coronary CT angiography, particularly valuable for emergency evaluations and arrhythmia patients, while maintaining diagnostic confidence comparable to ECG-gated studies. This innovation may reduce unnecessary invasive procedures and expand cardiac imaging accessibility in diverse clinical settings.

T2-SPCA-10 SIMPLIFYING LGE IMAGING: SYNTHETIC-LGE ASSESSMENT OF %LGE STABILITY AROUND THE NULL POINT AND VALIDATION OF A FIXED 400 MS INVERSION TIME

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Yoshiaki Morita (*Abstract Co-Author*)
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Akiyuki Kotoku, MD, PhD (*Abstract Co-Author*)
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Midori Fukuyama, MD (*Abstract Co-Author*)
Emi Tateishi (*Abstract Co-Author*)
Tetsuya Fukuda, MD, PhD (*Abstract Co-Author*)

PURPOSE

In LGE imaging, inversion time (TI) is typically determined with a safety margin. While shorter TIs lead to inaccurate lesion depiction, the effects of longer TIs remain unclear due to challenges in standardizing imaging time and acquiring multiple images. This study aimed to evaluate LGE extent across various TIs using pharmacokinetically generated synthetic LGE (sLGE) and to assess whether a fixed TI of 400 msec provides comparable measurements to conventional TI settings.

METHODS AND MATERIALS

A total of 109 subjects (median age 61 years, IQR: 49-74) referred for cardiac MRI were included. A two-compartment pharmacokinetic model calculated time-dependent contrast medium concentration curves from dynamic T1 maps acquired at 2, 5, 9, and 15 minutes after contrast administration. A predicted T1 map at 10 minutes was generated.The sLGE images were simulated using an inversion recovery sequence with SSFP readout, predicted T1 values, heart rate, and a TR of two heartbeats. sLGE images were generated by varying TI from 200 to 400 msec in 10 msec increments.The ROI for normal myocardium was defined on sLGE images by referencing conventional IR-LGE acquired 10 minutes after contrast. The null point was defined as the TI yielding minimal signal in normal myocardium. The proportion of LGE area to myocardium (LGEprop) was calculated at each TI using a threshold of mean signal intensity plus 5SD.LGEprop was assessed across TIs from 60 msec below to 100 msec above the null point. Correlation coefficients and Bland-Altman analyses compared LGEprop at TI 400msec with TInull, TInull -10msec, TInull +10msec, TInull +20msec, and TInull +30msec.

RESULTS

In every case, TInull was less than 400msec (median 290msec, IQR: 270-310msec).The LGE proportion (LGEprop) was 0.26±0.24 at TInull and increased to 0.36±0.27 at TInull +10msec, reaching a plateau up to TInull +100msec. Conversely, LGEprop was 0.13±0.21 at TInull -10msec, showing a plateau down to TInull -60msec. No significant differences in LGEprop were observed for TIs beyond TInull +20msec.Correlation coefficients (r) between TI 400msec and TInull -10msec, TInull, TInull +10msec, TInull +20msec, and TInull +30msec were 0.29, 0.50, 0.67, 0.82, and 0.89, respectively. The corresponding biases were -0.27, -0.14, -0.04, -0.03, and -0.01. There were no significant differences in LGEprop between TI 400msec and TIs beyond TInull +10msec.

CONCLUSION

sLGE demonstrated that a TI 400 msec provides comparable LGE quantification to TInull +20msec or longer.

CLINICAL RELEVANCE/APPLICATION

As %LGE plateaued above the null point, a fixed TI of 400 msec may offer a reliable and simplified method for LGE evaluation without the need for Look-Locker-based TI determination.

T2-SPCA-11 CARDIOVASCULAR MAGNETIC RESONANCE ASSESSMENT OF THE PROTECTIVE MECHANISM OF CANG-AI VOLATILE OIL L ON HEART FAILURE IN RATS

Qi Zhu (*Presenter*)
Fabao Gao, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study aims to assess the potential protective effect of Cang-ai volatile oil (CAVO) on ventricular remodeling in a heart failure rat model using 7.0T cardiovascular magnetic resonance (CMR) strain analysis and to preliminary explore its possible mechanisms of action.

METHODS AND MATERIALS

Forty rats were randomly divided into: control group, model group, and low- and high-dose Cang-ai volatile oil treatment groups. Except for the control group, the other groups received a continuous intraperitoneal injection of isoproterenol (ISO) at a dose of 5 mg·mL -1 ·d -1 for 14 days to establish a heart failure rat model. After successful modeling, the CAVO groups were gavaged with doses of 0.12 mL·kg -1 ·d -1 and 0.24 mL·kg -1 ·d -1 , while the control and model groups were given an equal volume of physiological saline via gavage for 28 days. Cardiac function and left ventricular (LV) structural changes were assessed using CMR before and after gavage, along with strain analysis to determine the protective effect of CAVO on ventricular remodeling in heart failure rat models.

RESULTS

CAVO treatment groups (low-dose and high-dose) demonstrated a dose-dependent enhancement in LV function compared to the Model control group. Regional strains, encompassing circumferential, longitudinal, and radial strains, showed significant differences between the CAVO treatment groups and the Model control group. Additionally, histological analysis indicated that the CAVO treatment groups exhibited reduced myocardial injury and fibrosis compared to the model group, with improved mitochondrial homeostasis. The CAVO treatment groups reversed the expression of HIF-1a, SIRT3, and ROS compared to the changes observed in the model and contorl groups.

CONCLUSION

CAVO exerts a protective effect against ISO-induced heart failure rat ventricular remodeling, and the specific mechanism may be related to improve mitochondrial homeostasis and oxidative stress. These findings contribute to understanding the potential therapeutic advantages of CAVO for patients at risk of chronic heart failure (CHF) and promote further research into its underlying mechanisms and possible clinical applications.

CLINICAL RELEVANCE/APPLICATION

The results of this study have significant implications for the management of patients at risk of CHF, particularly those in the precocious stage. Recognizing the cardioprotective effects of CAVO could lead to innovative therapeutic approaches, such as preconditioning interventions or drugs targeting hypoxia-related pathways. Utilizing advanced CMR technologies, including strain analysis, could provide valuable insights into myocardial function and damage, potentially enhancing accuracy in diagnosis and prognosis in clinical settings.

T2-SPCA-13 PERIVASCULAR-TO-EPICARDIAL FAT ATTENUATION RATIO AS A ROBUST MARKER OF MYOCARDIAL ISCHEMIA UNDER REAL-WORLD CORONARY CT ANGIOGRAPHY SETTINGS

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PURPOSE

Perivascular adipose tissue attenuation (PVAT) on coronary CTA (CCTA) is a promising marker of vascular inflammation, yet its clinical utility is hampered by variability in acquisition settings. We hypothesized that normalizing PVAT by epicardial adipose tissue attenuation (PVAT/EAT ratio) enables robust ischemia assessment. This study evaluated its diagnostic value across heterogeneous CCTA protocols.

METHODS AND MATERIALS

We retrospectively analyzed 81 patients who underwent CCTA and 13 N-ammonia positron emission tomography (PET) within three months between September 2019 and December 2024. Patients with suboptimal image quality were excluded. PVAT attenuation surrounding the proximal right coronary artery was measured semi-automatically, while EAT attenuation was automatically quantified across the entire heart. Assessment of myocardial blood flow (MBF) at both rest and stress utilized ammonia PET, with myocardial flow reserve (MFR) calculated accordingly. Ischemia was defined as MFR < 2.0 in any coronary territory. We conducted multivariable regression analysis to identify factors associated with PVAT and the PVAT/EAT ratio. This includes imaging parameters like CT scanner type, tube voltage, and ECG-gating type, along with clinical variables, Agatston scores, CAD-RADS classification, and MFR. Univariate and multivariate analyses compared ischemic and non-ischemic groups. Receiver operating characteristic analysis evaluated the diagnostic performance of PVAT and the PVAT/EAT ratio, comparing AUCs with the DeLong test.

RESULTS

Seventy-four patients were included (median age: 72 years [IQR: 60-79]; 41 males [55%]). Two CT scanner models each accounted for 34 cases (46%). Low tube voltage (70-90 kV) was applied to 37 patients (50%). MFR<2 was noted in 33 patients (45%). In the multivariate analysis, PVAT attenuation was significantly associated with tube voltage, ECG-gating type, and heart rate. Conversely, the PVAT/EAT ratio was linked to CAD-RADS score > 0 and MFR = 2.0. The ischemic group's PVAT/EAT ratio was significantly lower ($p < .01$). Age (log OR = 0.06 [95%CI: 0.01-0.11]) and PVAT/EAT ratio (log OR = -10.2 [95% CI: -19.2 to -2.3]) were independent predictors of ischemia. The AUC for PVAT alone was 0.57 (95% CI: 0.43-0.70), significantly improving to 0.70 (95% CI: 0.58-0.82; $p = .02$) with the PVAT/EAT ratio.

CONCLUSION

Acquisition parameters influenced PVAT attenuation, whereas the PVAT/EAT ratio was less affected and lower in ischemic patients, demonstrating better diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

Due to variability in CCTA acquisition, PVAT attenuation should be used cautiously in clinical practice. Our proposed PVAT/EAT ratio offers a more robust alternative for real-world applications.

T2-SPCA-14 EVALUATION OF RIGHT-SIDED VALVULAR REGURGITATION USING MONITORING IMAGES FROM TEST BOLUS TRACKING: A PRELIMINARY STUDY ON CONTRAST DYNAMICS IN CARDIAC CT

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PURPOSE

Test bolus tracking (TBT) is commonly used in cardiac CT to determine optimal scan timing, while the dynamic monitoring images obtained during TBT are typically disregarded for diagnostic purposes. However, these images may contain valuable information reflecting the contrast circulation dynamics, potentially revealing hemodynamic alterations associated with valvular disease. This study aimed to evaluate whether contrast dilution and delayed arrival in the left atrium (LA) and ascending aorta (AAo) can serve as surrogate indicators for assessing the severity of right-sided valvular regurgitation (RSVR), thereby expanding the clinical utility of TBT from scan timing to diagnostic support.

METHODS AND MATERIALS

We retrospectively analyzed 36 patients who underwent cardiac CT using the TBT technique. To minimize confounding, only patients in sinus rhythm with left ventricular ejection fraction =50% were included. RSVR severity was classified into four categories (none, trivial, mild, moderate) based on the presence and extent of tricuspid and/or pulmonary regurgitation. Time-attenuation curves were generated from TBT monitoring images at the LA level. Peak arrival time and attenuation in both LA and AAo were measured. ?HU_LA-AAo was calculated using peak attenuation values, and its diagnostic performance was analyzed in combination with LA peak arrival time.

RESULTS

Both ?HU_LA-AAo and LA peak arrival time significantly correlated with RSVR severity ($p < 0.05$). Ordinal logistic regression showed good model fit (Pseudo $R^2 = 0.369$, $p < 0.001$). For binary classification, the two-parameter model yielded excellent performance (AUC = 0.980, sensitivity = 93.1%, specificity = 100%). Although the sample size was limited, the results consistently demonstrated high discriminatory performance.

CONCLUSION

TBT monitoring images, though underused, can offer insights into contrast dilution and circulation delay in RSVR. ?HU_LA-AAo and LA peak arrival time may serve as surrogate indicators reflecting contrast dilution and circulation delay associated with RSVR, providing noninvasive support for its assessment.

CLINICAL RELEVANCE/APPLICATION

•Uses underutilized TBT data to assist RSVR evaluation.•Provides alternative when echocardiography is inconclusive.•Reflects early signs of right-sided volume overload.•Helps optimize scan timing in cardiac CT.•Enables retrospective and AI-driven analysis without extra radiation.•Contributes to early triage or pre-procedural risk assessment.

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T2-SPCH

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Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPCH-2 DEEP LEARNING-RECONSTRUCTED ULTRA-HIGH-RESOLUTION CT FOR PREDICTING INVASIVENESS OF SUBSOLID PULMONARY NODULES: A MULTIVARIATE ANALYSIS OF MORPHOLOGIC FEATURES

Yanyan Xu, MD, PhD (*Presenter*)
He Chen (*Abstract Co-Author*)
Sheng Xie (*Abstract Co-Author*)
Bing Li (*Abstract Co-Author*)

PURPOSE

To evaluate the predictive value of ultra-high-resolution CT (U-HRCT) with deep learning-based reconstruction (DLR-AiCE) for assessing the invasiveness of subsolid pulmonary nodules (SSNs).

METHODS AND MATERIALS

This retrospective study analyzed 126 SSNs (71 part-solid, 55 pure ground-glass) in patients (mean age 55.5±11.8 years; 37 male) who underwent U-HRCT (0.25-mm detector) with DLR-AiCE reconstruction. Nodule characteristics (long diameter, lobulation, spiculation, pleural indentation, vascular convergence, bronchial distortion, and solid component metrics) were correlated with pathological outcomes (34 preinvasive, 46 minimally invasive, and 46 invasive adenocarcinomas). Statistical analyses included univariate tests (?² , Mann-Whitney U) and multivariate logistic regression adjusted for age/sex/smoking.

RESULTS

Univariate analysis revealed significant differences ($p < 0.05$) across pathological groups for long diameter (invasive: 1.60±0.60 cm vs. preinvasive: 1.01±0.29 cm), solid component size (invasive: 0.81±0.61 cm vs. preinvasive: 0.29±0.41 cm), bronchial distortion (invasive: 78.3% vs. preinvasive: 17.6%), Pleural indentation (invasive: 43.5% vs. preinvasive: 11.8%). Multivariate analysis identified bronchial distortion (OR=0.184, $p = 0.007$), pleural indentation (OR=0.108, $p = 0.006$), and solid component size =0.8 cm (OR=0.093, $p = 0.001$) as independent predictors of invasiveness.

CONCLUSION

U-HRCT with DLR-AiCE enhances visualization of critical morphologic features. Bronchial distortion, pleural indentation, and solid component size are robust imaging biomarkers for stratifying SSN invasiveness, aiding clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

U-HRCT with DLR-AiCE enhances visualization of critical morphologic features, and then aiding clinical decision-making.

T2-SPCH-3 IMPACT OF PRIOR LUNG CANCER HISTORY ON SUBSOLID NODULE GROWTH: IDENTIFYING EFFECTIVE FOLLOW-UP STRATEGIES

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Chengyi Jiang (*Abstract Co-Author*)
Xue Zhang (*Abstract Co-Author*)
Xin Wen (*Abstract Co-Author*)
Meng Li (*Abstract Co-Author*)
Li Zhang (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate the influence of prior lung cancer history on subsolid nodule (SSN) growth and identify effective follow-up strategies.

METHODS AND MATERIALS

We retrospectively reviewed HRCT data of SSNs from May 2005 to August 2019 at our hospital. Persistent SSNs, showing either growth or stability during the first annual follow-up, were enrolled. The Kaplan-Meier method and log-rank test were used to compare SSN growth between patients with no history of cancer and those with a history of lung cancer. Multivariable Cox regression analyses were utilized to identify factors associated with SSN growth. Missed nodules were defined as nodules ineligible for follow-up or exhibiting growth beyond guideline-recommended intervals. The missed detection rate was calculated as the number of missed nodules divided by the total number of nodules, excluding ineligible ones and those meeting intervention criteria. Delay time was measured as the interval between clinical confirmation of growth and the earliest detectable growth timepoint per guideline recommendations. The missed detection rate and delay time were compared across various follow-up strategies, including the postoperative follow-up strategy for lung cancer (PFL) from the National Comprehensive Cancer Network Guidelines for Non-Small Cell Lung Cancer, the Fleischner Society's Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images, and other relevant protocols.

RESULTS

A total of 2749 SSNs in 1598 patients (median age, 54 years [interquartile range (IQR), 46-60 years]; 1034 [64.7%] female) were evaluated. The SSN growth rates were 9.5% (181/1,898) in the no cancer group and 37.8% (322/851) in the lung cancer group. The growth curve showed that SSNs in the lung cancer group were more likely to grow than those in the no cancer group ($P < .001$). Lung cancer history was associated with SSN growth (adjusted hazard ratio, 1.852 [95% confidence interval: 1.492, 2.297]; $P < .001$). The PFL strategy had a missed detection rate of 0 and a shorter delay time (4 months [IQR, 2-7]) compared to other strategies.

CONCLUSION

SSNs are more likely to grow in patients with a history of lung cancer, and the PFL strategy allows for effective detection of SSN growth in these patients.

CLINICAL RELEVANCE/APPLICATION

This study highlights the importance of monitoring SSNs in patients with a history of lung cancer. It demonstrates that the PFL strategy effectively supports the surveillance of SSNs in these patients, ensuring timely detection of growth.

T2-SPCH-4 BEHIND RACIAL CLASSIFICATION: DISPARITIES IN FEATURE USAGE ACROSS RACIAL GROUPS IN CHEST RADIOGRAPHY AI MODELS

Han-Jay Shu, BS (*Presenter*)

PURPOSE

This study investigates how deep learning models internally represent different racial subgroups when performing classification tasks on chest X-ray images. While outcome disparities in AI fairness have been widely discussed, little attention has been paid to whether models rely on distinct internal features across racial groups. If feature usage varies across subgroups, fairness interventions tested on only a few pairs may not generalize—highlighting the need for broader, representation-level evaluation in bias research.

METHODS AND MATERIALS

We used the MIMIC-CXR dataset, which includes fine-grained race and ethnicity labels spanning over 20 subgroups. Using RAD-DINO, a Vision Transformer-based self-supervised encoder, we trained two sets of binary classifiers: one contrasting ASIAN - INDIAN with each other subgroup, and the other using SOUTH AMERICAN as the reference class. For each binary task, we identified the top 100 most important features through linear probing on the learned embeddings. We then computed pairwise mean feature overlap across subgroup comparisons, stratified by broader demographic categories—White, Black, Latino, and Asian—to analyze patterns of feature consistency and divergence.

RESULTS

Our analysis revealed that feature usage by the models varied substantially depending on the racial subgroups being classified. Models distinguishing Black subgroups showed the highest internal feature consistency (intra-group overlap: 0.203 for INDIAN (IND), 0.173 for SOUTH AMERICAN (SA)), suggesting reliance on a stable feature set. However, External overlap, the average feature overlap with other subgroups, was 0.142 for IND and 0.164 for SA. This further underscores that models rely on more distinct features when classifying across group boundaries. Interestingly, Black-Asian pairings showed notably high feature overlap, indicating shared feature usage.

CONCLUSION

The observed disparities in feature usage across racial subgroups suggest that current models may rely on different, group-specific representations when performing classification. This challenges the assumption that bias correction methods validated on one or two subgroups will generalize across all populations.

CLINICAL RELEVANCE/APPLICATION

To ensure equitable application of AI tools in clinical imaging, it is not enough to assess model performance outcomes alone. This study highlights the need to examine internal representation strategies across racial groups. By examining how internal representations vary across racial subgroups, we highlight the need for bias mitigation strategies that target feature-level consistency, ensuring more equitable and clinically robust AI systems that generalize across diverse patient populations.

T2-SPCH-5 INVISIBLE RESPONDERS: RETHINKING RECIST IN THE ERA OF NEOADJUVANT TREATMENT FOR LUNG CANCER

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Damiano Caruso, MD, PhD (*Abstract Co-Author*)
Marco Francone, MD, PhD (*Abstract Co-Author*)
Andrea Laghi, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the accuracy of RECIST 1.1 criteria in assessing treatment response after neoadjuvant chemotherapy—with or without immunotherapy—in patients with stage IIIA-IIIB non-small cell lung cancer (NSCLC) undergoing surgical resection.

METHODS AND MATERIALS

A prospective pilot study was conducted on 33 patients with stage IIIA-IIIB NSCLC treated with neoadjuvant chemotherapy prior to surgery. Eleven of these patients also received pembrolizumab as part of combination immunotherapy. All patients underwent baseline and post-treatment contrast-enhanced CT scans, which were reviewed and assessed using RECIST 1.1 criteria or iRECIST by two expert radiologists in consensus. Histopathological analysis of the resected specimens was performed to identify complete or partial pathological response. Radiological response per RECIST was then compared with histological outcomes.

RESULTS

Among the 33 patients, 12 demonstrated a complete pathological response. However, none of these 12 patients met RECIST 1.1 criteria for complete response on post-treatment imaging. The remaining 21 patients showed a partial pathological response ranging from 80% to 10% residual viable tumor. Of these, only 9 (43%) met RECIST 1.1 criteria for partial response. The remaining patients were classified radiologically as stable disease despite substantial histological regression. These findings indicate a significant discrepancy between RECIST-based radiological assessment and actual pathological response, particularly in patients receiving combined chemotherapy and immunotherapy.

CONCLUSION

RECIST 1.1 criteria appear insufficiently sensitive to detect complete or substantial tumor response following neoadjuvant therapy in stage IIIA-IIIB NSCLC. This may be especially true in the context of immunotherapy, which can induce tumor changes not necessarily reflected in lesion size. These findings indicate a significant discrepancy between RECIST-based radiological assessment and actual pathological response, particularly in patients receiving combined chemotherapy and immunotherapy.

CLINICAL RELEVANCE/APPLICATION

In patients with locally advanced NSCLC treated with neoadjuvant therapy, RECIST 1.1 criteria may underestimate treatment response. Alternative or complementary imaging biomarkers should be explored to better predict pathological outcomes and guide clinical decisions.

T2-SPCH-6 BOOSTING PULMONARY EMBOLISM DETECTION WITH FDA-CLEARED AI: UNCOVERING HIDDEN CASES IN A RETROSPECTIVE STUDY

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Amit Gupta, MD, MBBS (*Abstract Co-Author*)

PURPOSE

To assess the power of an FDA-approved AI imaging solution in detecting symptomatic and incidental pulmonary embolism (PE) in a retrospective cohort, catching cases missed by radiologists.

METHODS AND MATERIALS

We analyzed 2,349 CT pulmonary angiograms (CTPAs) and 4,609 CT chest, abdomen, and pelvis (CTCAP)/abdominopelvic CT (CTAP) exams, performed for non-PE indications, from September 24, 2023, to November 30, 2023. An FDA-cleared AI platform (AIDOC) processed images, while natural language processing (NLP) analyzed radiology reports. Cases flagged as PE-positive by AI but negative by NLP were labeled "discordant" and independently reviewed by a board-certified radiologist to classify AI findings as true positives (TPs), false positives (FPs), or questionably positive (QPs). We calculated the enhanced detection rate as the proportion of AI-flagged TPs missed by radiologists relative to radiologist-detected positives.

RESULTS

Radiologists identified 142 PEs and 32 incidental PEs (iPEs), with AI confirming these at matching anatomical locations. AI flagged 32 (1.4%) CTPAs and 15 (0.3%) CTCAPs/CTAPs as discordant. Radiologist review confirmed 17/32 (53%) AI-flagged PEs as TPs, 9 (28%) as FPs, and 6 (19%) as QPs, and 12/15 (80%) AI-flagged iPEs as TPs, 1 (7%) as FP, and 2 (13%) as QPs. AI boosted detection by 12% (17/142) for PEs and 38% (12/32) for iPEs compared to radiologists. Additionally, expanded chart review of discordant cases showed that several patients were already on anticoagulation (e.g., Xarelto), suggesting low downstream harm. The majority of these additional detections were clinically silent but underscore the AI's role as a safety net for missed diagnoses, especially in high-throughput environments.

CONCLUSION

The AI tool significantly improved PE and iPE detection by uncovering overlooked cases, the majority of which were later confirmed as true positives upon expert review. Despite minimal downstream clinical consequences, these additional detections demonstrate AI's potential as a second-reader safety layer that enhances diagnostic sensitivity without harming specificity.

CLINICAL RELEVANCE/APPLICATION

Integrating AI into radiology workflows meaningfully improves pulmonary embolism detection, supporting earlier diagnosis and intervention. This study reinforces AI's value as a complementary tool that boosts radiologist accuracy and patient safety in routine clinical practice.

T2-SPCH-7 AUTOMATED INTERSTITIAL LUNG ABNORMALITY PREDICTION AT CT: EXTERNAL VALIDATION AND POTENTIAL RECOGNITION OF TRACTION BRONCHIECTASIS/BRONCHIOLECTASIS

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PURPOSE

A diagnostic system using artificial intelligence (AI) for interstitial lung abnormality (ILA) was developed, however, its effectiveness has not yet been sufficiently validated. This study aimed to examine the usability across different populations and the efficacy as an indicator of traction bronchiectasis/bronchiolectasis (TB) severity and its progression.

METHODS AND MATERIALS

The Rotterdam Study (2017-2019) and the Age Gene/Environment Susceptibility Reykjavik (AGES-Reykjavik) Study (baseline: 2002-2006, follow-up: 2007-2011) were used in this secondary analysis of the two prospective cohorts. The AI system calculated ILA probability score (AI score) in the range from 0 to 1. Three experienced readers independently evaluated for ILA, and two chest radiologists assessed the severity of TB using 4-scale TB index (TBI) and 5-scale TB progression score by consensus. Receiver operating characteristic (ROC) analysis, Kruskal-Wallis test, and Student's t-test were used for statistical analysis.

RESULTS

The system analyzed 932 cases of the Rotterdam Study and 5242 cases of the AGES-Reykjavik Study, and achieved areas under the ROC curve of 0.841 (95% CI: 0.804, 0.879) and 0.823 (95% CI: 0.798, 0.847), respectively. The AI score correlated with readers' certainty, decreasing from unanimous ILA cases to No-ILA cases. Higher baseline AI scores were associated with greater severity of TB (TBI-3: 0.931 [IQR, 0.911-0.932], TBI-2: 0.738 [IQR, 0.406-0.880], TBI-1: 0.537 [IQR, 0.317-0.761], TBI-0: 0.250 [IQR, 0.136-0.455], $P < 0.001$). Furthermore, the change in AI score showed a significant increase in the TB Progression group compared to the No-progression group (0.129 ± 0.216 vs. -0.032 ± 0.198, $P < 0.001$).

CONCLUSION

The system demonstrated applicability among different populations and potential utility for diagnosis, severity assessment, and progression monitoring of TB.

CLINICAL RELEVANCE/APPLICATION

This study demonstrated the potential of this AI system as an auxiliary tool for radiologists in diagnosing ILA, stratifying ILA severity through recognition of TB, and monitoring its progression.

T2-SPCH-9 ENSEMBLE MULTI-TASK NEURAL NETWORK FOR DIFFERENTIAL DETECTION OF PNEUMONIA AND PULMONARY EDEMA ON CHEST RADIOGRAPHS WITH CLINICALLY VERIFIED GROUND TRUTH

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PURPOSE

Pneumonia and congestive heart failure (CHF) often present with overlapping clinical features and radiographic findings. Chest radiographs play an important role in the initial diagnostic evaluation, but radiographic appearances may overlap. We developed a multi-task deep learning algorithm to improve detection and differentiation of pneumonia and CHF on chest radiographs. We evaluated its performance alongside radiologists of varying experience levels, using serum lab results and clinical diagnoses as reference standards.

METHODS AND MATERIALS

In this IRB-approved, HIPAA-compliant study, we developed an algorithm using 51,782 chest radiographs, designed to concurrently localize areas of pneumonia and infer serum NT-proBNP. We developed an ensemble multi-task CNN, combining two previously developed single-task CNNs - (1) a 2D U-Net for pneumonia heatmap localization and (2) a modified ResNet-152 for NT-proBNP regression. Radiographs from 251 inpatients who had serum NT-proBNP within 24 hours were identified as a test population, for which ground truth diagnoses were tabulated from medical records. Additionally, four radiologists each independently graded X-rays for likelihood of pneumonia and severity of pulmonary edema for comparison. Performance of readers and the CNN algorithms was evaluated against ground truth diagnosis using area under the receiver operating characteristic curve (AUC) and Spearman rank correlation for agreement with ground truth diagnosis.

RESULTS

For pneumonia detection, the multi-task CNN (AUC: 0.86) outperformed the single-task CNN (AUC: 0.74) and radiologists (AUC: 0.73). For CHF/volume overload, the multi-task (AUC: 0.79) and single-task CNNs (AUC: 0.80) both exceeded radiologist performance (AUC: 0.70). The multi-task CNN's pneumonia likelihood estimates showed strong linearity with actual pneumonia prevalence. NT-proBNP estimates from both CNNs more closely matched serum values than radiologists' categorical grading of pulmonary edema.

CONCLUSION

The proposed ensemble multi-task CNN is capable of reliably detecting and distinguishing between pneumonia and pulmonary edema, outperforming radiologists in this challenging interpretive task.

CLINICAL RELEVANCE/APPLICATION

The proposed multi-task CNN may enhance radiographic interpretation, reduce diagnostic errors, and support clinical decision-making. By assisting radiologists in making more confident and timely diagnoses, this deep learning algorithm may streamline clinical workflows and reduce diagnostic errors. Further prospective investigation may be necessary to assess its routine use to enhance radiologists' interpretation of chest radiographs and ultimately improve patient care.

T2-SPCH-10 INCIDENTAL LUNG CANCER ON NECK CT: PREVALENCE, MISSED DETECTION, AND PROGNOSTIC CONSEQUENCES

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PURPOSE

To determine the frequency of incidental lung cancer on neck CT, identify factors associated with missed detection, and evaluate the impact of missed detection on patient outcomes.

METHODS AND MATERIALS

This retrospective cohort study included consecutive adult patients who underwent neck CT at a tertiary-care hospital between January 2008 and December 2024. Patients with prior lung cancer, prior chest CT, no visible lesion, inadequate coverage, or without histologic confirmation of lung cancer were excluded. Two readers reviewed the CT images and original reports for lesion characteristics, lesion mention in the report, malignancy suspicion, and follow-up recommendations. Logistic and linear regression analyses were performed to identify predictors of missed lesions and diagnostic delay. Stage shift was defined by discrepancies between presumed stage at neck CT and final diagnostic stage. Causal mediation analysis was performed to evaluate the role of diagnostic delay on stage shift. Survival was analyzed using Kaplan-Meier and Cox models.

RESULTS

Of 74,508 patients who underwent neck CT, 147 (0.20%) patients had incidental lung cancers and were included in the final cohort (mean age, 65.3 years ± 11.1 [SD]; 75 [51.0%] men). Lung cancer lesions were not mentioned in 63.3% (93/147) of the patients. Missed detection occurred more frequently with CT for non-lung cancer staging (OR, 4.54 [95% CI: 1.38, 14.92]; P = .01) and CT angiography protocol (OR, 5.94 [95% CI: 1.99, 17.70]; P = .001), and was less likely with double reading by a resident and an attending radiologist (OR, 0.22 [95% CI: 0.06, 0.87]; P = .03), presence of lymphadenopathy (OR, 0.20 [95% CI: 0.08, 0.49]; P < .001) and lobulated margins of lung lesions (OR, 0.29 [95% CI: 0.12, 0.70]; P = .01). Missed detection led to longer diagnostic delay (ß = 32.2 months; P < .001) and increased risk of stage shift (OR, 5.53 [95% CI: 2.13, 14.38]; P < .001), adjusted for age and sex. Diagnostic delay independently predicted stage shift (OR, 1.03 [95% CI: 1.02, 1.05]; P < .001). Mediation analysis showed that 46% of the total effect of missed detection on stage shift was mediated through diagnostic delay (average causal mediation effect = 0.13; P < .001). Stage shift was associated with worse survival in patients with presumed early stage disease at neck CT (P =. 001) and remained an independent predictor of all-cause mortality (HR, 1.33 [95% CI: 1.03, 1.71]; P = .03).

CONCLUSION

Incidental lung cancer is not uncommon on neck CT. Missed detection results in diagnostic delay, stage shift, and decreased survival.

CLINICAL RELEVANCE/APPLICATION

Recognizing the common causes of missed lung cancer on neck CT may help reduce diagnostic delay and stage progression, thereby improving clinical outcomes.

T2-SPCH-11 IMPACT OF USER'S ATTITUDES TOWARDS A NEW AI-COMPUTER AIDED DETECTION/DIAGNOSIS (CAD_E/CAD_X) SYSTEM FOR LUNG CANCER RISK STRATIFICATION IN THE RADIOLOGY WORKFLOW

Andrew F. Scarsbrook, BMBS, FRCR (*Presenter*)
Catarina Santos, MD (*Abstract Co-Author*)
Nick Woznitza, PhD (*Abstract Co-Author*)
Mauro Santos, DPhil (*Abstract Co-Author*)

PURPOSE

Integration of AI-based CT computer aided detection (CADe) and diagnosis (CADx) tools in the lung cancer risk stratification radiology workflow could help improve and standardise CT reporting and follow-up recommendations, reduce the number of errors and increase efficiency. However, clinical benefit is in part dependent on user's

attitudes towards AI technologies. The effect of a new AI-CADe/x technology for assisting CT-scan based lung nodule risk stratification in relation to the user's levels of trust and aversion towards AI was evaluated.

METHODS AND MATERIALS

A Multiple Reader Multiple Case (MRMC) pilot study assessed the effect of a CADe/x tool on readers estimates of lung cancer likelihood from CT scans. The CADe/x tool included automatic nodule detection, segmentation, and lung cancer risk prediction. Five radiologists and three thoracic-reporting radiographers read 120 cases (85 with nodules; 41 cancers), with and without AI-CADe/x assistance. A mixed methods study followed: perceived ease of use and usefulness of the CADe/x component were evaluated via a 5-point Likert Scale Survey and thematic analysis of semi-structured interviews, grounded in the Technology Acceptance Model. Attitudes towards AI and trust in the tool were then coded and correlated with the MRMC average effect size, determined via the Dorfman-Berbaum-Metz method (F-test used for the effect size, z-test their difference; 95% bootstrapped confidence intervals reported).

RESULTS

The AI-CADe/x tool increased user reporting confidence, median survey score (interquartile range) was 4 (0.25), and was highly rated for perceived ease of use 4 (1.25) and usefulness 4 (0.25). Participants expressed greater trust towards CADe 4 (0.25) than CADx lung cancer risk prediction 3 (1) components. Those who trusted all CADe/x components (n=2), showed a significantly higher (p=0.009) average effect size of 9.95% [4.2, 15.7] (p=0.001) versus 0.97% [-3.36, 5.31] (p=0.619), for the nodule set, respectively. Thematic analysis suggested lower trust in CADx was due to unfamiliarity with the prediction model and its validation. Finally, those without aversion bias towards AI (n=5) showed a significantly higher benefit (p=0.041) from AI assistance, with effect sizes of 5.72% [-0.83, 12.26] (p=0.08) versus -0.94% [-726, 5.37] (p=0.586), for the nodule set, respectively.

CONCLUSION

Radiologists with positive attitudes and greater trust in AI tools show improved confidence and performance in lung nodule risk stratification and reporting.

CLINICAL RELEVANCE/APPLICATION

Positive user attitudes towards AI-CADe/x could increase benefit in lung cancer risk stratification. Developing strategies to augment trust are crucial for successful and effective adoption in the radiology workflow.

T2-SPCH-12 IMPACT OF PHOTON-COUNTING DETECTOR CT ON VISUALIZATION OF THE ADAMKIEWICZ ARTERY USING SUPER-HIGH-RESOLUTION MODE WITH DEEP LEARNING RECONSTRUCTION: A FIRST EXPERIENCE

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Toru Higaki, PhD (*Abstract Co-Author*)
Megumi Nishigaki (*Abstract Co-Author*)
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Yuko Nakamura, MD, PhD (*Abstract Co-Author*)
Kazuo Awai, MD (*Abstract Co-Author*)
Chikako Fujioka, RT (*Abstract Co-Author*)

PURPOSE

Detection of the artery of Adamkiewicz (AKA) and the anterior spinal artery (ASA) on CT is challenging due to their small vascular diameters and their location within the spinal canal. Photon-counting detector CT (PCD-CT) enables imaging in a super-high-resolution (SHR) mode, which uses smaller detector elements to improve spatial resolution. Additionally, a recently introduced deep learning reconstruction (DLR) algorithm significantly reduces image noise without degrading image texture compared to hybrid iterative reconstruction (HIR) algorithms. The purpose of this study was to evaluate whether the SHR mode reconstructed with DLR on PCD-CT improves the image quality of the AKA, using normal resolution (NR) mode reconstructed with HIR as the reference standard.

METHODS AND MATERIALS

We enrolled 15 patients who underwent CT aortography on a CZT-based PCD-CT scanner developed by Canon Medical Systems. Images were acquired at 120 kV with a tube current of 250 mA. Nonionic contrast media was injected at a rate of 5.0 mL/sec. The following image sets were prepared: NR mode reconstructed with HIR (NR-HIR), SHR mode reconstructed with HIR (SHR-HIR), and SHR mode reconstructed with DLR (SHR-DLR). On axial images, the CT number and standard deviation (SD) of the spinal cord were measured. CT attenuation profiles crossing through the center of the ASA lumen were generated, and the maximum values were recorded. The contrast-to-noise ratio (CNR) of the ASA was calculated using the following formula: CNR of ASA = (maximum CT number of the ASA - CT number of the spinal cord) / image noise of the spinal cord. The overall image quality of the AKA was visually assessed by two radiologists using a four-point scale (1 = poor, 4 = excellent), based on vessel margin sharpness and noise-related blurring.

RESULTS

The mean image noise in the spinal cord was significantly higher on SHR-HIR and SHR-DLR images than on NR-HIR images (19.6, 20.6, and 12.9 HU, respectively; $p < 0.05$). The mean maximum HU value of the ASA on SHR-DLR images was significantly higher than on SHR-HIR and NR-HIR images (149.6, 138.9, and 99.5 HU, respectively; $p < 0.05$); consequently, the CNR of the ASA on SHR-DLR images was the highest among the three reconstructions (5.7, 4.9, and 3.9, respectively; $p < 0.05$). The mean image quality score was also highest for SHR-DLR (3.5, 3.2, and 2.3, respectively).

CONCLUSION

The SHR mode reconstructed with DLR on a PCD-CT scanner significantly improves the image quality of the AKA compared to other reconstruction methods.

CLINICAL RELEVANCE/APPLICATION

The SHR mode reconstructed with DLR on a PCD-CT scanner enhances the image quality of the AKA, which may improve diagnostic performance in detecting the AKA and contribute to avoiding disruption of the AKA during aortic surgery.

T2-SPCH-13 IT IS THOUGHTFULLY BLENDED: OPTIMIZED MIXED BOLUS PROTOCOL REDUCES RADIATION EXPOSURE AND CONTRAST VOLUME FOR THORACIC PHOTON-COUNTING CT ANGIOGRAPHY

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Pauline Pannenbecker, MD, BA (*Abstract Co-Author*)
Theresa Sophie Patzer, MD (*Abstract Co-Author*)
Viktor Hartung (*Abstract Co-Author*)
Henner Huflage, MD (*Abstract Co-Author*)
Thorsten A. Bley, MD (*Abstract Co-Author*)
Jan P. Grunz, MD (*Abstract Co-Author*)

PURPOSE

Aim was to compare the image-quality comparison of photon-counting-detector CT angiographies (PCD-CTA) using an optimized mixed bolus protocol (MBP) to standard manufacturer-recommended PCD-CTA (SP) and energy-integrating-detector CT (EP) protocols.

METHODS AND MATERIALS

High-pitch PCD-CTA performed between 10/2024 and 04/2025 with MBP were retrospectively included in this single-center study. An intra-individual comparison was made with previous SP and EP examinations. PCD-CTA were performed with fixed tube voltage (120 kVp), IQ level of 42 (MBP) or rather 64 (SP) and reconstructed as

45/55 keV images after application of 26 ml Imeron 350 mg/ml as mixed bolus 53:47% (MBP; 9.1 g iodine) or 60ml Imeron350 (SP; 21 g iodine). EP was performed using ATVS (90/100 kVp) with a reference tube current of 434/350 mAs after administration of 60 ml Imeron350. Contrast-to-Noise Ratio (CNR) was calculated. Subjective image quality (overall quality, luminal contrast, vessel sharpness) was assessed by three radiologists using a 5-point scale.

RESULTS

101 PCD-CT MBP scans were performed, of which 18 patients (6 female; 61±10 years) received both preliminary examinations and were included in the study. The MBP was generated with the lowest radiation dose (3.0±0.5 mGy;p<0.01 each); 35% lower than SP (4.6±0.9 mGy) and 42% than EP (5.1±0.8 mGy). The highest intraluminal attenuation was achieved with SP, which was significantly higher than the contrast dose equivalent EP (539.8±70.8 HU vs. 368.3±45.6 HU; p<0.01). MBP (45keV) achieves comparable intraluminal contrast (377.5±42.3 HU vs. 368.3±45.6 HU; p>0.99) and CNR (29.9±3.9 vs. 28.5±4.3; p>0.99) to those of the EP while requiring 43% of the contrast agent and 58% of the radiation dose. Subjectively, SP was rated best in all categories (5 [5-5]). Overall image quality was rated slightly better for MBP than for EP (4 [4-5] vs. 4 [4-4]), with similar results for luminal attenuation (4 [IQR 4-4], each). The interrater agreement was good (ICC=0.78).

CONCLUSION

Thoracic PCD-CTA using MBP achieves adequate image quality while requiring significantly lower radiation and contrast agent dose compared to EID-CT and standard PCD-CTA.

CLINICAL RELEVANCE/APPLICATION

The ability to reduce radiation and contrast doses reduces the risk of secondary disease in vulnerable patient populations, such as young patients or those with impaired renal function.

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Abstract Archives of the RSNA, 2025

T2-SPER

Emergency Radiology Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPER-1 ENHANCING TRAUMA WORKFLOW WITH AI-POWERED GRAPHICAL SUMMARIES: A MULTIDISCIPLINARY STUDY INVOLVING RADIOLOGISTS AND SURGEONS

Nitai Bar, MD (*Presenter*)

PURPOSE

Efficient data flow in trauma settings is crucial for timely decision-making. Graphical summaries of traumatic findings may facilitate prioritization and support life-saving decisions in high-pressure environments. We aim to evaluate the efficacy of a language model-powered graphical summary in enhancing decision-making efficiency in chest trauma cases.

METHODS AND MATERIALS

This multidisciplinary study was conducted in two phases: 1. Evaluation of a language model's accuracy in extracting and classifying traumatic findings from chest CT reports. 2. Randomized crossover experiment to assess the impact of graphical summaries on decision-making time, clinical performance, and surgeon satisfaction.The dataset included 2,500 manually annotated chest CT reports, serving as a gold standard. GPT-based models extracted trauma-related findings, which were then rendered into graphical summaries using a rule-based system. Model performance was evaluated through mean AUC, F1, and exact match scores. In the second phase, 20 cases were selected, and 15 surgeons independently processed all cases, with graphical summaries randomly provided for each surgeon for a subset of the reports. Decision-making times were measured and analyzed using a mixed-effects model on log-transformed data. Clinical accuracy was evaluated by answering two questions and assessed with McNemar's test. Surgeon satisfaction was graded on a 1-5 Likert scale.

RESULTS

Results from phase one demonstrate an F1 of 0.922, indicating high model accuracy in identifying and classifying traumatic injuries. In phase two, graphical summaries reduced decision-making time by an average of 22%, adjusted for case complexity and surgeon variability. No significant difference was observed in clinical error rates. Mean surgeon satisfaction with graphical summaries was 4.2.

CONCLUSION

We present a novel pipeline that leverages natural language processing to generate real-time graphical summaries of chest CT findings in trauma scenarios. Our findings, based on a randomized within-subject crossover study in a simulated environment, suggest that this tool significantly optimizes trauma workflow efficiency.

CLINICAL RELEVANCE/APPLICATION

Multidisciplinary studies are a crucial step in successful integration and implementation of AI-powered support tools into clinical practice. Our preliminary evidence suggests that graphical summaries of traumatic findings can streamline communication between radiologists and surgeons, enhancing decision-making efficiency in trauma settings.

T2-SPER-2 COMPARATIVE ANALYSIS OF CONTRAST DOSE REDUCTION AND BEAM-HARDENING ARTIFACT MITIGATION BETWEEN ADAPTIVE LOW-CONTRAST-DOSE AND STANDARD CTPA SCANNING ACROSS DIVERSE CLINICAL SCENARIOS

Xiaoying Chen (*Presenter*)
Xubin Cui (*Abstract Co-Author*)
Wanting Wu (*Abstract Co-Author*)

PURPOSE

To evaluate whether the adaptive low-contrast-dose protocol can reduce contrast media dosage and mitigate beam-hardening artifacts (BHA) in CTPA across diverse clinical scenarios, while preserving diagnostic image quality compared to standard protocol.

METHODS AND MATERIALS

This retrospective cohort study enrolled 188 patients with suspected pulmonary embolism who underwent spectral CTPA between February 2022 and January 2025. They were categorized into two groups: Group A (adaptive low-contrast-dose protocol, n=84), randomly enrolled after routine implementation of the low-contrast-dose protocol, including 30 patients with body weight =80 kg. Group B (standard protocol, n=104), randomly selected patients pre-implementation, of whom 10 weighted =80 kg. The adaptive low-contrast-dose protocol employs a three-ROI test bolus for scan timing optimization and individualized contrast injection flow rates according to weight. Attenuation values in pulmonary arteries, branches, and muscles affected by BHA were measured, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), arteriovenous separation, and BHA levels were calculated and compared. Image quality was scored independently by two radiologists via a 5-point Likert scale, evaluating artery/vein contrast, BHA reduction.

RESULTS

The adaptive low-contrast-dose protocol (Group A) successfully reduced contrast agent usage by 35% (26 mL vs. 40 mL, $P < 0.001$) relative to the standard protocol (Group B), even in heavier patients ($P < 0.001$). Radiation exposure remained equivalent between groups ($P > 0.05$). Although Group A showed marginally lower CT numbers and SNR, all pulmonary artery segments achieved sufficient enhancement (= 350 HU) and clear vascular separation (CT difference = 300 HU). CNR equivalence confirmed no loss of diagnostic confidence. Notably, Group A outperformed Group B in minimizing BHA (13.10 (0.00,23.19) VS 33.30 (25.10,54.65), $P < 0.001$) and improving image quality as assessed subjectively ($P < 0.05$).

CONCLUSION

The adaptive low-contrast-dose protocol achieves significant reductions in both contrast media volume and BHA while preserving diagnostic image quality.

CLINICAL RELEVANCE/APPLICATION

The adaptive low-contrast-dose protocol achieves significant reductions in both contrast media volume and beam-hardening artifacts while preserving diagnostic image quality.

T2-SPER-3 EVALUATION OF A 5G-CONNECTED MOBILE CT SCANNER: TECHNICAL FEASIBILITY, IMAGE QUALITY AND RADIATION DOSE COMPARED TO CONVENTIONAL EMERGENCY DEPARTMENT IMAGING

Schanas Jawhar (*Presenter*)
Johann S. Rink, MD (*Abstract Co-Author*)
Greta Thater (*Abstract Co-Author*)
Stefan O. Schoenberg, MD, PhD (*Abstract Co-Author*)

PURPOSE

Stroke is a major global health burden requiring fast diagnosis and treatment. Mobile Stroke Units (MSUs), specialized ambulances equipped with head CT, improve acute stroke care. In Mannheim, Germany, a government-funded project enabled the development of an MSU with a novel 5G-connected CT scanner and telemedical equipment. This study evaluates the technical feasibility, image quality, and radiation dose of this mobile CT compared to a standard emergency department (ED) CT.

METHODS AND MATERIALS

Head phantom CT scans were performed using both the MSU and the ED CT scanner. Identical scanning protocols were applied to ensure comparability. For each scan, transmission times to the hospital Picture Archiving and Communication System (PACS) were measured. Image quality was assessed by calculating the signal-to-noise ratio (SNR). Radiation dose metrics, measured as dose-length product (DLP), were compared between the two scanners. Descriptive statistics were used to compare the parameters.

RESULTS

The median SNR in head CT scans performed in the MSU was higher compared to those obtained using the ED CT scanner (1.65 vs. 1.4). The radiation dose was < 800 mGy·cm in both settings. Image transmission was technically successful, with MSU images available in < 4 minutes.

CONCLUSION

The findings indicate that the newly implemented 5G-connected CT system in the MSU delivers state- of-the art imaging quality, transmission speed, and radiation dose comparable to that of a conventional ED CT scanner. These results support the technical reliability and diagnostic equivalence of the mobile system, underscoring the potential of such MSUs to streamline acute stroke care workflows.

CLINICAL RELEVANCE/APPLICATION

These findings support the clinical use of MSUs as a reliable tool for early stroke diagnosis, potentially reducing time to treatment and improving patient outcomes in pre-hospital settings.

Abstract Archives of the RSNA, 2025

T2-SPGI

Gastrointestinal Imaging Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPGI-1 AI-BASED APPROACH FOR PHEOCHROMOCYTOMA SEGMENTATION IN MULTIPLE ENDOCRINE NEOPLASIA TYPE 2 PATIENTS USING CT

Fahmida Haque, PhD (*Presenter*)
Shadin Ghabra (*Abstract Co-Author*)
Shruthi Perati (*Abstract Co-Author*)
Nathan S. Lay, PhD (*Abstract Co-Author*)
Stephanie A. Harmon, PhD (*Abstract Co-Author*)
Joanna Klubo-Gwiezdzinska (*Abstract Co-Author*)
John Glod (*Abstract Co-Author*)
Karel Pacak, MD (*Abstract Co-Author*)
Naris Nilubol (*Abstract Co-Author*)
Baris Turkbey, MD (*Abstract Co-Author*)

PURPOSE

Multiple Endocrine Neoplasia type 2 (MEN2) is a rare autosomal dominant tumor syndrome, with two distinct clinical subtypes: MEN2A and, more aggressive, MEN2B, commonly presenting with primary and recurrent pheochromocytoma (PHEO). This study aims to develop an artificial intelligence (AI)-based automatic lesion segmentation model to study PHEO progression in MEN2 patients

METHODS AND MATERIALS

Expert radiologist with over 20 years of experience, manually contoured contrast-enhanced abdomen CT images of the PHEO lesions on 58 Baseline scans and 30-second follow-up scans of 58 in-house patients (34 MEN2A and 14 MEN2B) and 18 scans of 13 patients from another institution (11 MEN2A, 2 MEN2B) (NCT01005654, NCT00004847, NCT01660984). Two additional open-access datasets: 53 confirmed Adrenocortical carcinoma (ACC) patients and 50 scans with no lesion as negative scans from the KiTS19 dataset were used to increase the sample size. The final dataset consists of 209 scans, which were split into train, validation, and test sets using a 70:10:20 ratio. 3D full-resolution (3D-FullRes) configuration from the nnU-Net framework was trained using 5-fold cross-validation. The model's performance was evaluated on the test set using the Dice similarity coefficient (DSC) and scan-level total tumor volume (TTV). We ran the AI model on 107 follow-up scans for the in-house patients and generated AI-predicted lesion masks. We compared the tumor growth rate (TGR) (%) between MEN2A and MEN2B with the AI-generated total tumor burden (TTB) on follow-up scans (AI Follow-up) in comparison with the expert-annotated ground truth (GT) and AI-generated TTB on baseline scans (AI Baseline).

RESULTS

The model achieved a DSC of 0.62, lesion detection sensitivity of 90%, with 0 median FP per scan (range=0, 2), for the test cohort. The mean absolute TTV difference is -22.19 (-226.94, 182.55), indicating lower tumor burden by AI prediction masks compared to the GT masks for most of the test scans. The median TGR values with 0.25 and 0.75 quartile values between MEN2A and MEN2B are -50.74 (-98.32, 151.16) and -96.80 (-99.33, -58.63) for AI Follow-up vs. AI Baseline and -44.40(-95.24,165.92) and -96.06(-99.26,-45.21) for AI Follow-up vs. GT, respectively ($p<0.05$, Wilcox-rank test). This indicates TGR for MEN2A is slightly faster than MEN2B

CONCLUSION

The developed AI model showed promising and reliable performance in segmenting adrenal lesions, which can be useful for physicians to make the annotation process more efficient in patients with adrenal lesions.

CLINICAL RELEVANCE/APPLICATION

The developed model can enable clinicians to automatically compute the total tumor burden on patients with adrenal lesions (PHEO and ACC) and also study the PHEO progression or recurrence for MEN2 patients.

T2-SPGI-2 HEPATOCELLULAR CARCINOMA AUTOMATIC DETECTION IN DYNAMIC CONTRAST-ENHANCED MRI USING DEEP LEARNING ALGORITHMS

Killian Monnin (*Presenter*)
Patrick Jeltsch (*Abstract Co-Author*)
Lucia Fernandes Mendes (*Abstract Co-Author*)
Mario Jreige, MD (*Abstract Co-Author*)
Montserrat Fraga (*Abstract Co-Author*)
Raphael Girardet, MD (*Abstract Co-Author*)
Clarisse Dromain, MD, PhD (*Abstract Co-Author*)
Jonas Richiardi (*Abstract Co-Author*)
Naik Vietti Violi, MD (*Abstract Co-Author*)

PURPOSE

To develop a deep learning-based model for automatic early-stage hepatocellular carcinoma (HCC) detection using Dynamic Contrast-Enhanced (DCE) MRI, and to analyze its diagnostic performance at both patient and lesion levels.

METHODS AND MATERIALS

This retrospective study included DCE T1wi liver MRI from two monocentric cohorts. The first cohort included patients (N=296) undergoing HCC surveillance with diagnosed HCC as well as negative cases. The patients were randomly split into training, validation and test sets. The second cohort included pre-ablation patients (N=67), all positive for HCC. The latter were used as test set for generalization evaluation. The two largest public liver lesion datasets (CT, N=1037 and MRI, N=485)

were used for pre-training algorithms. An attention U-Net model was trained to segment and detect HCC using a curriculum pretraining method and was compared to the state-of-art nnU-Netv2. The detection metrics were calculated with respect to radiologist detection. Diagnostic accuracy was evaluated using sensitivity, specificity, mean false positive rate per patient, the Area Under the Curve (AUC) of the Free-Response Operating Characteristic (FROC) curves and the Receiver Operating Characteristic (ROC) curves. Additionally, the results were stratified by Liver Imaging Reporting and Data System (LI-RADS) score to explain performance results.

RESULTS

The final population included 363 patients (58 ± 11 years; 284 men; 251 lesions), 51 patients (115 lesions) used in training set, 245 (12 HCC positive with 21 lesions, 233 HCC negative) in the HCC surveillance used as a first test set and 67 (115 lesions) in the HCC pre-ablation used as a second test set. At patient level, 80% sensitivity and specificity (AUC of 0.80 (95% CI, 0.66 - 0.91)) was measured on the HCC surveillance test set. At lesion level, 80% of sensitivity for a mean false positive rate per patient of 1 was measured on the HCC Pre-Ablation test set with our pre-trained model with a FROC AUC of 0.82 (95% CI, 0.77 - 0.88, $p < 0.01$), significantly outperforming the nnU-Netv2 at 0.61 (0.52 - 0.69).

CONCLUSION

Both patient-level and lesion-level achieved 80% HCC detection sensitivity by using deep learning segmentation neural network pre-trained from large open datasets and fine-tuned using heterogeneous proprietary data. This performance highlights the translational potential of such tools in the clinical workup of patients at risk of HCC.

CLINICAL RELEVANCE/APPLICATION

Visual interpretation for HCC detection in MRI is time-consuming, requiring high levels of expertise in radiology. Deep learning models pre-trained from large datasets are close to reach clinical utility for HCC lesions detection, and the combination with abbreviated MRI is promising for HCC screening.

T2-SPGI-3 SINGLE VENOUS PHASE DUAL ENERGY CT CAN DIFFERENTIATE BENIGN AND MALIGNANT LIVER LESIONS DEEMED "TOO SMALL TO CHARACTERIZE" IN ONCOLOGIC PATIENTS

Om B. Panta, MD (*Presenter*)
Francesca Rigiroli, MD (*Abstract Co-Author*)
Olga R. Brook, MD, MBA (*Abstract Co-Author*)

PURPOSE

To assess utility of dual energy (DECT) in characterization of "too small to characterize" liver lesions in oncologic patients and identify its diagnostic value in differentiating benign and malignant lesions.

METHODS AND MATERIALS

In this IRB-approved retrospective study, patients with small liver lesions who underwent single-phase dual-energy CT between March and August 2024 were analyzed. Patients with lesions between 5 to 15 mm with confirmed diagnosis (histopathology, ultrasound evidence of cyst, PET/MRI diagnosis, or stability on follow up imaging for at least 6months) were included in the study. Patients with lesions with inconclusive diagnosis were excluded. A fellow with 9 years of clinical experience analyzed lesions by drawing an ROI on a single slice, obtaining virtual enhancement (HU Contrast - HU Virtual un-enhanced), iodine concentration, and iodine concentration normalized to the aorta derived from material decomposition images. Statistical analysis included the Mann-Whitney U test and ROC curve analysis.

RESULTS

The study cohort comprised 65 patients (36/65 females [55.4%]) with a median age of 69 years (interquartile range [IQR]: 59-75 years). Of the 99 lesions evaluated (median size 9.7 mm, IQR: 8.2-12 mm), 56/99 (56.6%) were benign and 43/99 (43.4%) were malignant. Significant differences were observed between benign and malignant lesions in virtual enhancement (1.7 HU vs. 14.3 HU), iodine concentration (2.4 100µg I/ml vs. 9.3 100µg I/ml), and normalized iodine concentration (6.1% vs. 23.5%) ($P<0.01$). Using a normalized iodine concentration threshold of 13.2%, the diagnostic algorithm achieved 86% sensitivity and 92.8% specificity. The diagnostic performance was maintained or improved for lesions smaller than 10 mm.

CONCLUSION

Single venous phase dual-energy CT with quantitative iodine analysis demonstrates high diagnostic accuracy in "too small to characterize" liver lesions in differentiating benign and malignant lesions.

CLINICAL RELEVANCE/APPLICATION

Normalized iodine concentration has high diagnostic accuracy in differentiating benign and malignant lesion and could potentially impact surveillance protocols for patients with known malignancy resulting in lower use of PET and MRI for these lesions.

T2-SPGI-4 DUAL-LAYER SPECTRAL CT FOR HISTOLOGICAL GRADE PREDICTION IN PANCREATIC NEUROENDOCRINE TUMORS

Jing Sun (*Presenter*)
Zhengrong Zhou, MD,PhD (*Abstract Co-Author*)
Yu Wang (*Abstract Co-Author*)

PURPOSE

To predict the histological grade of pancreatic neuroendocrine tumors (pNETs) preoperatively using quantitative and qualitative variables obtained from dual-layer spectral detector CT (DLCT).

METHODS AND MATERIALS

This retrospective study assessed 177 patients with pathologically confirmed pNETs who underwent DLCT between November 2017 and December 2024. For quantitative analysis, both conventional and spectral parameters, such as effective atomic number (Zeff) and iodine concentration (IC), were measured in each phase. The iodine enhancement fraction (IEF_PP/VP) was calculated as the ratio of IC in pancreatic parenchymal phase to venous phase. Normalized IC (nIC) was derived from the lesion-to-aortic IC ratio at the same slice level. Qualitative variables of necrosis and enhancement uniformity were evaluated on virtual mono-energetic images (VMIs) at 40 keV. Univariate analysis identified significant predictors, followed by forward stepwise binary logistic regression for further screening and prediction model construction. A multiparametric logistic regression model integrating spectral parameters was constructed. Diagnostic performance was evaluated using receiver operating characteristic (ROC) analysis.

RESULTS

Among 177 pNETs pancreatic neuroendocrine neoplasms (PanNETs), 62 (35%), were grade G1 and 115 (65%) were grade G2 and G3. Independent predictors included necrosis (OR = 3.546, $p < 0.001$), enhancement uniformity (OR = 0.103, $p < 0.001$), Zeff_VP (OR = 0.141, $p = 0.001$), and IEF_PP/VP (OR = 0.208, $p < 0.001$). IEF_PP/VP (AUC = 0.708, $p = 0.016$) exhibited better predictive performance than Zeff_VP (AUC = 0.663), enhanced uniformity (AUC = 0.680), and necrosis (AUC = 0.523). The combination model integrating necrosis, enhancement uniformity, Zeff_VP, and IEF_PP/VP achieved superior diagnostic efficacy, with an AUC of 0.822 ($p < 0.001$), sensitivity of 88.7%, and specificity of 66.1%.

CONCLUSION

DLCT-derived spectral parameters are valuable for noninvasive preoperative prediction of pNET histological grade. The combined model demonstrates superior diagnostic accuracy, which may aid in surgical planning and treatment stratification.

CLINICAL RELEVANCE/APPLICATION

Dual-layer spectral CT enables noninvasive and accurate preoperative prediction of pancreatic neuroendocrine tumor grade, which may improve surgical decision-making and individualized treatment planning.

T2-SPGI-5 MACHINE LEARNING RADIOMICS OF PRE-OLT MULTIPHASE MRI AS A PREDICTOR OF HEPATOCELLULAR CARCINOMA RECURRENCE AFTER LIVER TRANSPLANTATION

Zahra Mohammadigoldar, MD (*Presenter*)
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PURPOSE

This study explores the prediction of hepatocellular carcinoma (HCC) recurrence following orthotopic liver transplantation (OLT) using a machine learning (ML)-based radiomics model. Specifically, it correlates pre-OLT locoregional therapy (LRT) multiphase MRI T1-weighted features with post-transplant recurrence rates and survival outcomes.

METHODS AND MATERIALS

This HIPAA-compliant, IRB-approved study cohort included 32 patients with confirmed LI-RADS 5 HCC (mean age 68 years; 19 males) who underwent OLT at the US transplant center between January 2005 and 2022. A post-OLT HCC recurrent subcohort and included 16 patients, and post-OLT HCC nonrecurrent HCC subcohort included 16 propensity matched patients. Initial T1-weighted Gadoxetic Acid multiphasic MRI at the time of diagnosis (pre-contrast, arterial, venous, and hepatobiliary Phase) were used to analyze imaging features. A machine learning-based radiomics analysis extracted 428 features per patient. The PyCaret library was employed to test eight clustering algorithms, with KMeans selected as the optimal algorithm for patient grouping. The model's ability to differentiate recurrence from non-recurrence was evaluated.

RESULTS

The mean overall and post-OLT rHCC follow-ups were 101.3 ± 28.3 months [IQR: 38, 83 months] and 35.6 ± 43.1 months [IQR: 10, 46 months], respectively. The KMeans clustering algorithm demonstrated optimal patient separation, initially grouping them into five clusters. Notably, four clusters (Clusters 0, 2, 3, and 4) predominantly comprised patients with HCC recurrence (11 out of 14), while Cluster 1 was largely made up of patients with both recurrence and non-recurrence (13 out of 19). Therefore, our ML-based radiomics analysis showed four features derived from gray-level co-occurrence matrix (GLCM) analysis showing significant differences between the groups, achieving a sensitivity and specificity of 81.2% and 64%, respectively. (Figure 1)

CONCLUSION

This study demonstrates the potential of a machine learning-based radiomics model analyzing T1-weighted pre-OLT LRT MRI features to predict post-OLT HCC recurrence. The findings suggest that pre-OLT MRI based radiomics features may help detect aggressive HCC.

CLINICAL RELEVANCE/APPLICATION

This ML-radiomics model using pre-OLT MRI features may help predicting HCC recurrence after OLT. Imaging radiomics features integrating imaging features with clinical data may b to improve clinical decision-making and patient management in liver transplantation.

T2-SPGI-7 HISTOGRAM ANALYSIS OF TRIPHASIC SPECTRAL CT FOR PREDICTING LYMPH NODE METASTASIS IN GASTRIC CANCER

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PURPOSE

To evaluate and compare of the predictive performance of histogram features derived from conventional 120-kVp images, virtual monoenergetic images, and iodine concentration maps in triphasic spectral CT for lymph node metastasis (LNM) in gastric cancer.

METHODS AND MATERIALS

This retrospective study enrolled 65 gastric cancer patients who underwent triphasic contrast-enhanced spectral CT before surgery, with a total of 290 lymph nodes evaluated (118 metastatic and 172 non-metastatic). Volumes of interest (VOIs) were delineated on conventional 120-kVp images from triphasic spectral CT scans, then automatically co-registered and propagated to both 40-keV and 100-keV virtual monoenergetic images (VMIs) and iodine concentration (IC) maps across all phases. Histogram features were extracted from each phase, including:
10Percentile,90Percentile,Energy,Entropy,InterquartileRange,Kurtosis,Maximum,MeanAbsoluteDeviation(MAD),Mean,Median,Minimum,Range,RobustMeanAbsoluteDeviatior
Univariate and multivariate logistic regression analyses were used to identify independent predictors, and receiver operating characteristic (ROC) curves were constructed to evaluate the predictive performance.

RESULTS

Univariate analysis identified 168 histogram features associated with lymph node metastasis (LNM). Subsequent multivariate analysis confirmed 20 features as independent risk factors for LNM. Among them, the AUC values of the three parameters—ICAP_TotalEnergy, 120-kVpVP_TotalEnergy, and ICVP_TotalEnergy—were significantly higher than those of other features, reaching 0.886 (95% CI: 0.849,0.923),0.888 (95% CI: 0.849,0.927),0.870 (95% CI: 0.827,0.913).

CONCLUSION

The histogram parameters derived from spectral CT conventional 120-kVp images, virtual monochromatic images, and iodine concentration maps—particularly TotalEnergy—can serve as imaging biomarkers for LNM in gastric cancer.

CLINICAL RELEVANCE/APPLICATION

Surgical resection combined with lymphadenectomy remains the primary treatment for resectable gastric cancer. As a crucial independent prognostic factor, lymph node metastasis (LNM) status not only guides the selection of surgical approaches and adjuvant therapies but also significantly correlates with patient survival outcomes. Histogram-based analysis of spectral CT triphasic virtual monoenergetic images (VMIs) and iodine concentration maps can effectively characterize lymph node heterogeneity, providing a more precise clinical assessment tool for LNM prediction.

T2-SPGI-8 REAL-LIFE EXPERIENCE IN THE TREATMENT OF GALLBLADDER CARCINOMA BY RADIOEMBOLIZATION: A MULTICENTER RETROSPECTIVE STUDY

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PURPOSE

Patients with hepatic metastases from gallbladder carcinoma have limited treatment options, highlighting the need for alternative therapies. Trans-arterial radioembolization (TARE) has the potential to enhance therapeutic strategies beyond conventional chemotherapy. This retrospective study, conducted across five major tertiary care centers, aimed to identify factors associated with improved median overall survival (OS) in patients treated with TARE.

METHODS AND MATERIALS

This retrospective study included patients with hepatic metastases from gallbladder carcinoma who underwent TARE treatment. Clinical data, imaging characteristics and TARE reports as well as data from RECIST 1.1 analysis performed 3, 6 and 12 months after TARE was collected. OS was analyzed using Kaplan-Meier survival curves.

RESULTS

Among 16 patients (56.25% female, 43.75% male; mean age: 65.7 ± 5.5 years), prior therapies included chemotherapy in 93.8% (15/16), surgery in 68.8% (11/16), and radiation therapy, local ablation, and monoclonal antibody treatment each in 6.3% (1/16) of patients. Twelve patients had extrahepatic metastases at the time of intervention (12/16, 75%). The follow-up showed a hepatic disease control rate of 81.8% (9/11) with a stable disease in 72.7% (8/11) and a partial response in 9.1% (1/11). The median OS of patients with hepatic metastases treated with TARE was 7 months (CI: 1.7 - 12.3 months) with a median time to hepatic progression of 115 days (CI: 108.5 - 121.5 days) and a median time to global progression of 112 days (CI: 80.2 - 142.8). Peri- and postinterventional complications were limited, including coil dislocation, reaction to contrast agent, and abscess formation, each occurring in 6.3% (1/16) of patients.

CONCLUSION

Radioembolization appears to be a safe and effective palliative treatment for hepatic metastases of gallbladder carcinoma.

CLINICAL RELEVANCE/APPLICATION

Radioembolization offers a promising palliative treatment option for patients with hepatic metastases from gallbladder carcinoma, demonstrating a favorable safety profile. These findings support its potential role in extending survival and improving disease management in a population with otherwise limited therapeutic alternatives.

T2-SPGI-9 VIRTUAL EXAM UNDER ANESTHESIA (VEUA): POTENTIAL BENEFIT OF PERIANAL MR 3D RENDERINGS FOR SURGEONS, RADIOLOGISTS AND PATIENTS

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PURPOSE

Virtual Exam Under Anesthesia (vEUA) is an interactive 3D display method that uses perianal MR images to display the relationship of perianal fistulas to the anal sphincter complex and levator ani. We sought to estimate the potential impact of vEUA images on surgical management as well as surgeon, radiologist, and patient understanding of perianal disease.

METHODS AND MATERIALS

40 patients with known perianal Crohn's disease underwent perianal MR followed by exam under anesthesia. Perianal fistulas, anal sphincters, and levator ani were segmented using semi-automated vEUA software (Motilent Ltd; London). Physicians were shown conventional MRI images and clinical reports in 10 patients, followed by unblinding of vEUA images. Two colorectal surgeons were asked if anticipated surgical therapy (e.g., LIFT, endorectal advancement flap), approach, or confidence were changed after viewing vEUA images. Five radiologists were asked if Park's classification or confidence were changed. Both groups were asked if vEUA images provided new anatomic insights, and if patient's understanding of their perianal disease would likely benefit from vEUA (5-point Likert scale; 0 = no benefit to 4 = definitely helpful).

RESULTS

Mean segmentation time was 11 minutes. Colorectal surgeons reported that surgical plan or approach changed after viewing vEUA images in 55% (11/20), with new anatomic insights appreciated in 70% (14/20) with vEUA images, and confidence increasing in 85% (17/20) of cases. Radiologists reported that Park's classification and understanding of levator involvement/other anatomic insights changed in 10% (5/50) and 42% (21/50), respectively; however, confidence increased in 74% (37/50) cases. Surgeons and radiologists reported that display and explanation of vEUA images with patients was felt to be definitely helpful in 100% (20/20) and 72% (36/50), respectively. Surgical plan/approach changed in 9/13 patients with complex fistulas and 2/7 with simple fistulas (chi-square statistic: 3.04, p =0.8). For radiologists, there was no relationship between complex fistulas and new anatomic insights (p=0.81).

CONCLUSION

vEUA images changed surgical plan or approach in over half of perianal disease patients and provided new anatomic insights for colorectal surgeons and radiologists. vEUA images were anticipated to be definitely helpful nearly 75% patients with perianal fistulas.

CLINICAL RELEVANCE/APPLICATION

3D renderings of the anal sphincters, levator ani, and complex perianal fistulas from perianal MR images change surgical plan and approach, improve surgeon and radiologist understanding, and are likely helpful to patients.

T2-SPGI-10 RADIOMICS-ASSISTED MRI INTERPRETATION IMPROVES RELIABILITY IN RECTAL CANCER RESTAGING

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PURPOSE

To assess inter- and intra-rater agreement of conventional MRI-based response evaluation in rectal cancer after chemoradiotherapy (CRT), and to determine whether integration of a previously validated radiomics score (RadScore) can improve reader consistency and reduce clinically significant diagnostic variability.

METHODS AND MATERIALS

This retrospective study included 60 patients with rectal adenocarcinoma randomly selected from a previously published cohort of 180. Two radiologists (5 and 10 years of experience) independently evaluated restaging MRIs using two standard classifications: MRI tumor regression grade (mrTRG) and T2-weighted imaging (T2WI)-based qualitative assessment. Each radiologist reviewed all cases twice. In the second round, half of the cases were assessed with access to RadScore and prior assessments (unblinded), while the other half were assessed blindly. Inter- and intra-rater agreement was evaluated using Cohen's kappa. Clinically significant threshold discrepancies—defined as changes between adjacent response categories with potential therapeutic implications—were also recorded.

RESULTS

Baseline inter-rater agreement was fair: ? = 0.32 for mrTRG and ? = 0.36 for T2WI-based assessment. Intra-rater agreement improved significantly when RadScore was available, with ? increasing from 0.36 to 0.74 (senior rater) and from 0.26 to 0.74 (junior rater) for mrTRG. T2WI-based assessment showed less consistent improvement (senior: ? = 0.54; junior: ? = 0.65). Among senior raters, clinically significant threshold discrepancies decreased from 69% to 42% (mrTRG) and from 61% to 60% (T2WI). Junior raters still showed substantial discordance, particularly for T2WI.

CONCLUSION

Radiologist agreement for rectal cancer response evaluation using conventional MRI remains limited, especially among less experienced readers. Integration of a quantitative RadScore significantly improves intra-rater consistency, particularly for mrTRG grading, and may help reduce clinically meaningful diagnostic variability.

CLINICAL RELEVANCE/APPLICATION

Incorporating a validated radiomics score into clinical workflows has the potential to enhance diagnostic reliability and standardize restaging evaluations in rectal cancer after CRT.

T2-SPGI-11 INTEGRATED RADIOGENOMICS AND PATHOMICS BASED IMAGING SIGNATURE FOR ACCURATE VASCULOGENIC MIMICRY EVALUATION AND PROGNOSIS PREDICTION IN LIVER HEPATOCELLULAR CARCINOMA

Jiahao Gao (*Presenter*)

PURPOSE

Vasculogenic Mimicry (VM) is closely associated with drug resistance and poor prognosis in liver hepatocellular carcinoma (LIHC). However, VM can currently only be identified by immunohistochemistry and Periodic Acid-Schiff stain. Macroscopic imaging tools are lacking to enable the identification of VM-associated gene expression and prognostic prediction in LIHC.

METHODS AND MATERIALS

We propose constructing a noninvasive imaging biomarker integrating radiogenomics and pathomics for accurate VM gene prediction and prognostic evaluation from 208 LIHC patients. A VM-based genomics model was constructed according to the Lasso method. Abdominal contrast-enhanced CT images of the corresponding patients were acquired, and three-dimensional regions of interest were manually outlined with radiomics features extracted. A radiogenomics biomarker was constructed using LASSO and mRMR algorithms. In addition, H&E sections were also obtained using CellProflier software to screen the pathomics features for a pathomics VM prediction model. Finally, an integrated nomogram combining radiogenomics and pathomics was constructed. The predictive accuracy of the models was evaluated.

RESULTS

A VM-based genomics model consisting of five risk genes successfully stratified the prognosis of LIHC patients. A radiogenomics marker consisting of nine radiomics features was constructed. The AUC values of the radiogenomics marker for the VM prediction in the training and test groups were 0.861 and 0.764, respectively. The pathomics model also possessed a certain predictive value. Finally, the integrated nomogram can further improve the VM prediction (AUC=0.898,0845, respectively). The integrated nomogram successfully achieved survival prediction in LIHC patients with 1-year, 3-year, and 5-year survival AUC values of 0.81,0.89,0.93, respectively.

CONCLUSION

The novel noninvasive imaging biomarker has a promising value for assessing VM-related gene expression in LIHC patients. In addition, it could enable survival prediction and prognostic stratification of LIHC. It is expected to contribute to accurate clinical therapeutic decisions and facilitate precise imaging for LIHC patients.

CLINICAL RELEVANCE/APPLICATION

Angiogenesis is significantly associated with poor prognosis and drug resistance in LIHC. VM is an essential angiogenic modality in LIHC; however, there is a lack of imaging characteristics and noninvasive assessment modalities for VM. Our study established a novel noninvasive radiogenomics biomarker,combined with pathomics, for noninvasive imaging of VM-related gene expression in LIHC. By deeply combining multi-omics imaging with genomics, such strategy has a reference value for precise tumor imaging.

T2-SPGI-12 INTEROBSERVER AGREEMENT AND ACCURACY OF ULTRASOUND (US) LIVER STIFFNESS AND FAT QUANTIFICATION BETWEEN A RADIOLOGIST VS. NON-RADIOLOGIST

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PURPOSE

Point-of-care ultrasound (US) increases access to a critical diagnostic tool, but US remains operator-dependent. We aim to assess interobserver agreement and accuracy of US liver stiffness and fat quantification by a radiologist vs. non-radiologist using magnetic resonance imaging (MRI) as the reference standard with all exams performed sequentially on the same day.

METHODS AND MATERIALS

Veterans (n=101) with obesity (body mass index (BMI) > 30) and/or type 2 diabetes were enrolled in an IRB-approved study in 2022-2024. Liver stiffness was obtained by US auto point shear wave elastography (auto-pSWE, Siemens ACUSON Sequoia with DAX transducer) and MRI elastography (MRE, Siemens MAGNETOM Vida Fit). Liver fat quantification was obtained by ultrasound derived fat fraction (UDFF) and MRI proton density fat fraction (PDFF). Veterans underwent US performed by a

radiologist and a non-radiologist (hepatology nurse practitioner or clinical research coordinator) with 5 measurements using auto-pSWE and UDFF (software revision VA30B). Interobserver agreement between radiologist and non-radiologist was analyzed with concordance correlation coefficients. McNemar test was used to compare proportions of diagnostic auto-pSWE measurements and Wilcoxon signed-rank test was used to compare US exam durations. Spearman rank correlation was used to compare US to MRI for each operator.

RESULTS

Of 101 veterans enrolled (median age 68 years, range 37-75 years), most were men (n=90) with type 2 diabetes (n=84) and a median BMI of 31.6 (range 19.3-49.1). Concordance correlation showed moderate interobserver agreement between the radiologist and non-radiologist for US liver stiffness at 0.70 (range 0.59-0.79) and was slightly higher for US UDFF at 0.80 (range 0.71-0.85). The radiologist had a significantly higher proportion of diagnostic US measurements (91.7% vs. 77.1%, p=0.006) and spent significantly less time obtaining US measurements (median 3 min vs. 4.5 min, p<0.001). Although both radiologist and non-radiologist US auto-pSWE values correlated with MRE, US auto-pSWE by the radiologist showed stronger correlation: 0.29 (p =0.005) vs. 0.21 (p =0.04). US UDFF by the radiologist also showed slightly stronger correlation with MRI PDFF (0.73 (p <0.001) vs. 0.67 (p <0.001)).

CONCLUSION

Although we observed moderate interobserver agreement in US liver stiffness and fat quantification, US by a radiologist has a higher proportion of diagnostic US measurements, requires less exam time, and more strongly correlates with MRI compared to US performed by a non-radiologist.

CLINICAL RELEVANCE/APPLICATION

US quantification for liver stiffness and fat remains operator-dependent and specialized training and/or certification may be required.

T2-SPGI-14 CHARACTERIZATION AND 5-YEAR PROGNOSTICATION OF CHRONIC LIVER DISEASE USING AI-BASED MRI RADIOMICS

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PURPOSE

To analyze the diagnostic value of AI segmentation (liver volume LV, splenic volume SV, hepatic veins volume HV) and liver T1 mapping for chronic liver disease (CLD) and their association with 5-year decompensation- and transplant-free survival.

METHODS AND MATERIALS

This retrospective study included 174 patients who underwent liver biopsy and liver MRI with Gd-EOB-DTPA including T1 maps before and 20 minutes after contrast administration as well as native T1 Dixon Sequences for volumetry between 09/2018 and 07/2019. Patients with CLD were grouped into early CLD (F0-F2; eCLD, n=34), advanced CLD (F3-F4; aCLD, n=27) and aCLD with clinically significant portal hypertension according to the BAVENO VII consensus (aCLDPH; n=68). 45 healthy patients served as a control group. LV, SV, HV and T1 times before (T1 long) and 20 minutes after Gd-EOB-DTPA administration (T1 short) were automatically measured using an in-house trained and validated liver-segmentation algorithm. T1 reduction rate (?T1) was calculated as (T1 long - T1 short)/T1 long. LV, SV, HV, T1 long, T1 short and ?T1 were compared between the groups using a Kruskal-Wallis test. ROC curve analysis was used to determine optimal cutoff values to distinguish between groups. Patients were followed-up for 5-years regarding first hepatic decompensation, liver transplantation and death in order to analyze the 5-year decompensation- and transplant-free survival by Kaplan-Meier curve analysis.

RESULTS

All parameters differed significantly between the groups (p<0.05). SV, T1 long, and T1 short increased with disease severity, while ?T1 decreased. LV and HV initially rose but declined in aCLDPH. ?T1 <0.68 was most effective for detecting CLD (sensitivity 73%, specificity 82%, AUC 0.82, p<0.001). aCLD was best identified by SV >259 ml (sensitivity 73%, specificity 91%, AUC 0.88, p<0.001). Kaplan-Meier analysis revealed significantly lower 5-year transplant-free and decompensation-free survival for patients with HV <13 ml (49% vs. 72%, p=0.002; 53% vs. 75%, p=0.014). Similarly, reduced survival was observed for T1 long >611 ms at 1.5T or >912 ms at 3T (49% vs. 76%, p<0.001; 56% vs. 77%, p=0.011) and T1 short >207 ms at 1.5T or >322 ms at 3T (47% vs. 76%, p<0.001; 54% vs. 77%, p=0.005). Additionally, ?T1 <0.67 was linked to lower transplant-free survival (49% vs. 76%, p<0.001).

CONCLUSION

AI segmentation of liver volume, splenic volume, hepatic veins volume, and liver T1 mapping provides valuable biomarkers for staging CLD severity and predicting long-term outcomes.

CLINICAL RELEVANCE/APPLICATION

AI segmentation of liver volume, splenic volume, hepatic veins volume, and liver T1 mapping effectively stages CLD severity and predicts 5-year survival, enhancing risk stratification and personalized patient care.

T2-SPGI-15 INTRACHOLECYSTIC PAPILLARY NEOPLASM ASSOCIATED WITH INVASIVE CARCINOMA VERSUS CONVENTIONAL GALLBLADDER ADENOCARCINOMA: DISTINCT IMAGING AND CLINICOPATHOLOGIC FEATURES

Seok Jin Hong, MD (*Presenter*)
Jung Hoon Kim, MD (*Abstract Co-Author*)
Jae Hyun Kim, MD (*Abstract Co-Author*)

PURPOSE

To investigate the different clinicopathologic and imaging features between intracholecystic papillary neoplasm associated with invasive carcinoma (ICPN-IC) and conventional gallbladder adenocarcinoma (c-GBA).

METHODS AND MATERIALS

We retrospectively reviewed medical records and computed tomography (CT) findings of patients who underwent surgery for GB lesions and pathologically confirmed ICPN-IC or c-GBA between January 2006 and December 2022. Clinicopathologic variables included age, sex, symptoms, surgery type, T-stage, resection margin status, and tumor markers (CA 19-9, CEA). Two radiologists independently assessed CT features, including wall thickness, enhancement pattern, irregular wall thickening, pericholecystic infiltration, gallstones, lymphadenopathy, and polyps. For polyps, multiplicity, size, shape, base wall thickening, and dimpling were analyzed. Chi-square and t-tests were used for group comparisons. Logistic regression was applied to identify significant CT predictors. Inter-reader agreement was evaluated with Cohen's kappa and intraclass correlation coefficients.

RESULTS

Sixty-nine patients with ICPN-IC and 323 patients with c-GBA were included. Common clinicopathologic features of ICPN-IC included the absence of symptoms, treatment with simple cholecystectomy, and a predominant T1 stage. Univariable logistic regression of CT features identified maximal GB wall thickening, enhancement pattern, irregular wall thickening, pericholecystic infiltration, lymphadenopathy, and presence of polyps as significant predictors of ICPN-IC. On multivariable analysis, irregular wall thickening (odds ratio (OR) 3.02; 95% CI, 1.57-5.81; p<0.01), lymphadenopathy (OR, 0.23; 95% confidence interval (CI), 0.07-0.8; p=0.02), and presence of polyp (OR, 5.54; 95% CI, 2.39-12.85; p<0.01) were independent predictors of ICPN-IC. For polyp patterns, only multiplicity (OR, 3.95; 95% CI, 2.07-7.68;

p<0.01) was identified as an independent predictor of ICPN-IC in both univariable and multivariable analyses. Inter-reader agreement ranged from fair to very good (? = 0.32-0.92), except for enhancement pattern (? = 0.17).

CONCLUSION

CT may be helpful in differentiating ICPN-IC from c-GBA using image features including irregular wall thickening, lymphadenopathy, and presence of polyp with multiplicity.

CLINICAL RELEVANCE/APPLICATION

CT features provide valuable clues for distinguishing ICPN-IC from c-GBA, potentially influencing surgical planning and prediction of prognosis.

T2-SPGI-16 AN END-TO-END DEEP LEARNING FRAMEWORK FOR LYMPH NODE DETECTION AND STAGING IN RECTAL CANCER MRI WITH NODE-BY-NODE HISTOPATHOLOGIC CORRELATION

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Ying-shi Sun, PhD (*Abstract Co-Author*)

PURPOSE

To develop a fully automated deep learning framework for nodal segmentation and staging on T2-weighted MRI using the node-by-node radiological-pathological matched nodal status as the reference, to enhance the diagnostic ability in rectal cancer N stage while streamlining workflow efficiency.

METHODS AND MATERIALS

This study prospectively enrolled consecutive rectal cancer patients undergoing total mesorectal excision and preoperative MRI between December 2021 and August 2023 as the training set, with a retrospective validation set comprising patients meeting identical inclusion criteria from February 2014 to August 2015. In the training set, the radiologist performed layer-by-layer manual delineation of all visible mesorectal nodes on axial T2-weighted images as the ROI using ITK-SNAP, which were classified into three categories: benign, metastatic, and indeterminate based on whether the node achieved matched between MRI and pathology and its pathological status (Fig. 1). A cascaded deep learning model integrating the nnU-Net segmentation framework with the Med3D-ResNet152 classification framework (Fig. 2) was constructed. The segmentation and classification performance of the model was evaluated on the nodal level in the training set, and the overall staging ability was validated on the patient level in the validation set on unannotated MRI scans.

RESULTS

In the training set, a total of 1003, 269, and 2064 nodes were classified as benign, metastatic, and indeterminate in the direct surgery group, while 678, 220, and 1248 nodes in the nCRT group, respectively. Using the manual delineation as the gold standard, the model reached a mean DSC of 0.70 and 0.63 after 5-fold cross-validation in segmenting all the visible mesorectal nodes in the direct surgery and nCRT group, respectively (Fig. 3). Compared to pathological result, the AUC, sensitivity, specificity of the model were 0.71 (95% CI: 0.67-0.74), 45.3%, and 84.7%, respectively in the direct surgery group; and 0.71 (95% CI: 0.67-0.76), 71.0%, and 62.3%, respectively, in the nCRT group. The validation set included 153 patients in the direct surgery and 319 patients in the nCRT groups, respectively. With the unannotated images as input, the model achieved AUCs of 0.74 (95% CI: 0.65-0.82) and 0.72 (95% CI: 0.64-0.78) in determining the nodal stage in the two groups (Fig. 4).

CONCLUSION

Using the node-by-node correlation between MRI and histopathology as the training label, an end-to-end framework from identifying mesorectal nodes to determine N staging in rectal cancer based on the nnU-Net and Med3D-ResNet152 networks was constructed.

CLINICAL RELEVANCE/APPLICATION

This framework improved the working efficiency and diagnostic performance of N staging in rectal cancer.

T2-SPGI-17 UNDIFFERENTIATED PANCREATIC CANCER WITH OSTEOCLAST-LIKE GIANT CELLS: IMAGING FEATURES

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PURPOSE

The 2019 WHO classification of pancreas ductal adenocarcinoma (PDAC) recognizes undifferentiated carcinoma with osteoclastic-like giant cells (UC-OGC) as a rare subset. There is sparse literature on this type of cancer. Pathologists also increasingly recognize that poorly-differentiated PDAC may also show occasional osteoclasts (PDC-O). We wanted to assess the difference in imaging features and natural history of these two groups.

METHODS AND MATERIALS

For this retrospective case-controlled study, we searched the Institutional Pathology and Imaging databases for “pancreas cancer” and “osteoclasts”. Of the 59 subjects identified, preoperative imaging (CT or MRI) and acceptable pathology data were available in 25 patients who formed the study cohort. Two specialist abdominal radiologists independently reviewed the imaging findings. There were 10 patients with PDC-O and 15 with UC-OGC.

RESULTS

There were no differences in age or gender between these groups. On univariate analysis, UC-OGC, compared to PDC-O, were larger (median size 6.3 cm vs. 3.9 cm, p=0.02), encapsulated (p=0.02) and tended to less likely have metastases at presentation (p=0.08). There were no differences between the two groups for other imaging parameters including pancreatic site of tumor, necrosis, enhancement pattern or calcification, presence of duct cut off or vascular invasion. On logistic regression analysis, only presence of capsule and size were significantly different between the groups. UC-OGC had fewer metastases at presentation and follow-up, though the differences were not significant. There was significantly higher overall survival (median 35.4 months vs. 10.7 months, p=0.02) and progression-free survival (median 31.6 months vs. 9.1 months, p=0.05) for UC-OGC compared to PDC-O.

CONCLUSION

The presence of a large (> 7 cm pancreatic mass) that is encapsulated may raise possibility of UC-OGC, rather than PDAC. Despite larger size at presentation, these tumors have a better prognosis than PDAC.

CLINICAL RELEVANCE/APPLICATION

UG-OGC is a rare subtype of pancreatic ductal adenocarcinoma. It is possible to raise the diagnosis of this tumor on imaging if there is a large, capsulated pancreatic mass, with few or no metastases at presentation.

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Sub-Events

T2-SPGU-1 ASSESSMENT OF CHRONIC KIDNEY DISEASE USING TWO-DIMENSIONAL SHEAR WAVE ELASTOGRAPHY: CORRELATION WITH CLINICAL, LABORATORY, AND HISTOPATHOLOGICAL PARAMETERS

Ricardo Lange Filho, MD (*Presenter*)
Ricardo M. Freitas, MD, PhD (*Abstract Co-Author*)
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Ilka S. Oliveira, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic utility of two-dimensional shear wave elastography (2D-SWE) in staging chronic kidney disease (CKD), define the most appropriated cut-off value, assess interindividual variability, and correlate 2D-SWE findings with structured histopathology.

METHODS AND MATERIALS

One hundred ten patients with suspected CKD undergoing renal biopsy and 30 healthy kidney donors (controls) were cross-sectionally evaluated by b-mode ultrasound and 2D-SWE. Five 2D-SWE measurements were acquired from the renal parenchyma of the mid-portion of the left kidney using a dedicated software, maintaining =1 cm distance from the capsule to reduce reverberation. 2D-SWE results were compared to serum creatinine levels and to histopathological variables such as glomerular sclerosis, tubular atrophy, interstitial fibrosis, vascular lesions, and inflammation. Statistical analyses included Student's t-test, ANOVA, and ROC curve analysis.

RESULTS

Mean 2D-SWE values were significantly lower in CKD patients (1.33 ± 0.47 m/s) than in controls (1.64 ± 0.31 m/s, $p<0.001$). 2D-SWE values negatively correlated with histological markers of chronicity and inflammation ($p<0.05$). Multivariate analysis identified collinearity among histopathological variables. Chronic Kidney Disease (CKD) stages were determined according to serum creatinine levels using the CKD-EPI formula. 2D-SWE was effective in distinguishing early CKD stages (1-3A) from advanced stages (3B-5D) ($p=0.001$).and ROC analysis identified an optimal cut-off of 1.4 m/s (AUC=0.78), yielding sensitivity of 74.1%, specificity of 83%, PPV of 88%, and NPV of 65.7%.

CONCLUSION

2D-SWE is a promising non-invasive technique for staging CKD and correlates with histopathological chronicity markers. It has demonstrated diagnostic value in patients with normal B-mode ultrasound findings and even in some with normal serum creatinine levels. 2D-SWE may improve clinical decision-making regarding renal biopsy and CKD management.

CLINICAL RELEVANCE/APPLICATION

2D-SWE enables quantitative renal stiffness assessment and shows potential for non-invasive evaluation of CKD severity, enhancing early diagnosis and risk stratification without the need for invasive biopsy.

T2-SPGU-3 A MULTIPARAMETRIC MRI-BASED MODEL FOR DECODING EXTRAPROSTATIC EXTENSION IN PROSTATE CANCER VIA HABITAT-GUIDED RADIOMICS AND CLINICAL INTEGRATION

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Fan Li (*Abstract Co-Author*)

PURPOSE

To develop and validate a multiparametric MRI-based integrative model that combines intratumoral microenvironmental heterogeneity (ITH), peritumoral radiomic features, and clinicopathological variables for noninvasive preoperative prediction of extraprostatic extension (EPE) in prostate cancer (PCa), with the goal of improving surgical planning and reducing postoperative biochemical recurrence.

METHODS AND MATERIALS

This multicenter retrospective study included 1180 PCa patients from four institutions (August 2013-September 2023), divided into training (n=498), internal validation (n=212), and two external test cohorts (n=398, n=72). Radiomic features and ITH metrics were extracted from T2-weighted imaging, diffusion-weighted imaging, ADC maps, and dynamic contrast-enhanced MRI. Six models were developed: Clinical, Radiomics, Peri-2 mm, Peri-4 mm, Peri-6 mm, and ITH. A fusion model (ITH + Peri-6 mm + Clinical) was constructed to integrate complementary predictors. Model performance was assessed using receiver operating characteristic (ROC) analysis, calibration curves, decision curve analysis (DCA), Hosmer-Lemeshow goodness-of-fit, DeLong's test, and a clinical nomogram.

RESULTS

The ITH model outperformed all single-modality models, achieving AUCs of 0.978 (training), 0.893 (internal validation), and 0.832/0.836 (external testing). Among the peritumoral models, Peri-6 mm achieved the highest accuracy (AUCs: 0.949-0.752). The fusion model demonstrated superior predictive performance with AUCs of 0.982 (training), 0.921 (validation), and 0.853/0.839 (external). Calibration and DCA confirmed the model's clinical utility across datasets.

CONCLUSION

Intratumoral heterogeneity and peritumoral radiomics provide independent predictive value for EPE. Their integration with clinical features into a multiparametric model significantly improves noninvasive preoperative prediction of EPE in PCa.

CLINICAL RELEVANCE/APPLICATION

The proposed model enables more accurate preoperative identification of EPE, supporting personalized surgical decision-making and potentially reducing the risk of biochemical recurrence.

T2-SPGU-4 THE VALUE OF THE CONTRAST ENHANCEMENT BOOST TECHNIQUE FOR RENAL ARTERY VISUALIZATION IN DYNAMIC CONTRAST-ENHANCED RENAL CT

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PURPOSE

Contrast Enhancement Boost (CE-boost) is an emerging post-processing technique that increases contrast enhancement in CT imaging by adding a denoised subtraction image to the original image. This study aimed to evaluate its utility for renal artery delineation and to determine the optimal CE-boost method for dynamic contrast-enhanced renal CT.

METHODS AND MATERIALS

This retrospective study was approved by our Institutional Review Board. Thirty patients were enrolled who underwent dynamic contrast-enhanced renal CT. Two types of CE-boost images were generated. For the 1-step method, subtraction images were obtained by subtracting non-contrast (NC) images from corticomedullary phase (CMP) images (i.e., CMP-NC). For the 2-step method, CMP images were first subtracted from nephrographic phase (NP) images, and the resulting CE-boost images were again subtracted from CMP images (i.e., CMP-[NP-CMP]). Original CMP images, 1-step CE-boost images, and 2-step CE-boost images were compared for renal parenchyma-to-artery contrast-to-noise ratio (CNR), the renal artery length, and the number of visible renal artery branches on 3D CT angiography. Statistical analyses included the Friedman test and repeated-measures ANOVA.

RESULTS

The mean cortex-to-artery CNR was 18.1, 51.7, and 76.5; medulla-to-artery CNR was 27.2, 77.9, and 114.5; and renal artery length was 93.8 mm, 97.4 mm, and 102.7 mm for the original CMP, 1-step, and 2-step CE boost images, respectively. The 2-step method yielded significantly the highest CNRs and longest artery lengths, while the original CMP showed the lowest CNR and shortest renal arterial length among the three methods ($P < 0.01$). The mean number of detectable renal artery branches was 19.0 for CMP, 25.6 for 1-step, and 29.4 for 2-step CE-boost images, with significant differences among all groups ($P < 0.01$).

CONCLUSION

The 2-step CE-boost method (CMP-[NP-CMP]) can improve the delineation of the renal artery by selectively increasing the contrast enhancement of the renal artery without increasing the renal parenchymal enhancement.

CLINICAL RELEVANCE/APPLICATION

The 2-step CE-boost technique may aid preoperative vascular assessment by enabling clearer delineation of the renal arteries.

T2-SPGU-5 POLYCYSTIC LIVER DISEASE IN ADPKD : NOVEL TECHNIQUE FOR LIVER VOLUME MEASUREMENT

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Hayley Briody, MBBCh (*Abstract Co-Author*)
Paul McHugh (*Abstract Co-Author*)
Martina M. Morrin, MD (*Abstract Co-Author*)

PURPOSE

Autosomal dominant polycystic kidney disease (ADPKD) is the most common genetic kidney disease, with half of those diagnosed reaching end stage kidney disease (ESKD) by age 60. Although frequently asymptomatic, enlarged liver secondary to PLD associated with APCKD can cause discomfort and compression on adjacent structures requiring cyst fenestration or partial liver resection. Manual calculation of liver cyst volume is cumbersome and can be performed using automated segmentation using deep learning models. This study aims to analyse the liver volumes in a subset of gene confirmed APCKD patients over time.

METHODS AND MATERIALS

A retrospective cohort review of PLD in ADPKD patients recruited to the Irish Kidney Gene Project (IKGP). We aimed to characterise the clinical presentation and radiological features with a focus on progression to ESKD, liver-related complications, and genotype-phenotype correlations. TRACE is a novel radiological tool that aids in diagnosis and monitoring patients with polycystic kidney disease utilizing CT and/or MRI scans. This was employed to calculate organ volume summaries, renal and hepatic cyst fractions and height adjusted total kidney volume (htTKV). Individuals were classified as per the Mayo Imaging Classification system.

RESULTS

We evaluated a cohort of 192 individuals, PKD1 was the most common genotype identified (84%). 87.6% of individuals had liver cysts. There was a 7.3% rate of hospitalisation for hepatobiliary related causes, such as cholelithiasis, haemorrhagic cysts, and infected hepatic cysts. We performed TRACE scans on 28 individuals, of which 25 have developed ESKD (89.3%). The most common genotypes were PKD1 with 23 individuals and PKD2 with 3 individuals. Overall, the mean htTKV was 1351mls with a Mayo Classification of =1C in 11 individuals. The mean liver volume was 2478mls with a mean liver cyst fraction of 17.5%. In PKD1, the htTKV was 1984mls, mean liver volume was 2549mls, and mean liver cyst fraction was 11.5%. In those with PKD2, the htTKV was 1498mls, the mean liver volume was 2352mls, and mean liver cyst fraction was 18.5%.

CONCLUSION

Liver cysts are a common occurrence in ADPKD with a low rate of complications. TRACE is a novel tool that can help to demonstrate cyst burden in the liver and kidney.

CLINICAL RELEVANCE/APPLICATION

With deep learning methods, evaluation for progression of PLD in PCKD patients can be streamlined. This enables future analysis in to factors that affect liver cyst growth over time including gene, gender and prediction for future risk of hospitalisation in this cohort.

T2-SPGU-6 AI DECISION SUPPORT IN THE PROSTATE CANCER PATHWAY COULD ENABLE SIGNIFICANT BIOPSY REDUCTION

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PURPOSE

False positives lead to unproductive biopsies and overdiagnosis of grade group 1 (GG1) prostate cancers. Review the potential of a prostate MRI AI-based decision support system (AI-DSS) to reduce false positives while maintaining detection of significant (GG=2) cancer in a multicentre study.

METHODS AND MATERIALS

AI-DSS was developed to calculate prostate volume, PSA density (PSAd) and cancer risk scores at lesion and patient levels, using MRI data and optional PSA and PI-RADS scores. In an independent cohort, clinical data of patients investigated for suspected prostate cancer at six sites were retrospectively obtained. A multidisciplinary team including radiologists determined the need for biopsy using local standard-of-care (SOC) evaluations. Targeted and systematic biopsies were performed on positive cases. Patients with PI-RADS=3 who did not undergo biopsy were excluded. MRI-negative patients who avoided biopsy were assumed negative. Biopsy avoidance (GGx), yields (GG=2; GG1; benign (GG0)), and selectivity (GG=2/GG1) and efficiency ratios (GG=2/(GG1+GG0) of SOC and AI-DSS were compared. Selective biopsy avoidance was also calculated (GGx/GG0).

RESULTS

252 patients were included; 137 (54%) underwent biopsy, 79 (31%) had GG=2 and 17 (7%) GG1 cancers. 139 (55%) patients were scored PI-RADS=3 or had PSAd=0.15. Under this criterion, GG=2 cancer detection rate (CDR) was 78/252 (31%), 15 patients (6%) would have GG1 diagnosed while missing 1 GG2 cancer case (PI-RADS 2, PSAd 0.10), giving GG=2/GG1=5.2, GG=2/(GG1+GG0)=1.3, GGx/GG0=2.5. A narrower criterion of PI-RADS=4 or PSAd=0.15 would lead to 121 (48%; $p<0.01$) biopsies, 12 (5%) GG1, missing the same GG2 case: GG=2/GG1=6.5, GG=2/(GG1+GG0)=1.8, GGx/GG0=4.2. AI-DSS at the same CDR as the standard-of-care would result in fewer (n=109; 43%; $p<0.01$) biopsies, detecting fewer (n=10; 4%) GG1 cancers, while missing the same GG2 case: GG=2/GG1=7.8, GG=2/(GG1+GG0)=2.5, GGx/GG0=6.8. AI-DSS at slightly lower CDR (75/252, 30%) would reduce biopsies even further (n=91; 36%; $p<0.01$), detecting less (6, 2%) GG1 while missing 4 cancers (2% of patients), 1 GG3, 3 GG2. Compared to the SOC biopsy reference, this equates to 95% sensitivity, 91% specificity, 82% PPV and 98% NPV: GG=2/GG1=12.5, GG=2/(GG1+GG0)=4.7, GGx/GG0=16.1.

CONCLUSION

Implementing AI-DSS in the prostate cancer diagnosis pathway could reduce GG1 detection, enhance biopsy selectivity and efficiency, and significantly reduce unnecessary biopsies, with comparable detection rates for GG=2 cancers.

CLINICAL RELEVANCE/APPLICATION

AI decision support software integrating MRI and clinical data could significantly reduce biopsy and overdiagnosis rates in men with suspected prostate cancer. Prospective validation studies are needed.

T2-SPGU-7 CONTRAST ENHANCED ULTRASOUND FOR EVALUATION OF NEPHRON SPARING TREATMENT FOR RENAL CELL CARCINOMA

Richard G. Barr, MD, PhD (*Presenter*)
Louis Mazzarelli, MS (*Abstract Co-Author*)
Davide Roccarina, MD,PhD (*Abstract Co-Author*)
Parker Bauman (*Abstract Co-Author*)

PURPOSE

To determine the accuracy of CEUS in evaluating post nephron-sparing procedures

METHODS AND MATERIALS

This retrospective 2 center study had informed consent waived. CEUS studies performed post nephron sparing procedure (radiofrequency ablation, cryoablation, microwave ablation, partial nephrectomy) from January 2018 to January 2025 were reviewed. Patient charts were reviewed for follow-up procedures and patient status. CEUS studies were performed on a Philips Epic ultrasound system with a C5-1 transducer. Lumason (Bracco Diagnostics) contrast was used with a dose of 1.0 to 2.0cc. The CEUS exam was saved as a 3-minute cine clip. A true positive examination was considered if there was contrast in the procedure site and either biopsy proven tumor or persistent enhancement for over 1 year. A true negative exam was considered if there was no contrast in the procedure site on follow up studies for at least 1 year.

RESULTS

There were 177 lesions in 171 patients. There were 103 (60.2%) male and 68 (39.8%) female participants. The average age was 65.5+/-7.8 years (range 33-90). The average lesion size was 3.1cm (SD 0.57cm)(range 1.0-5.3). There were 30 cystic and 115 solid lesions. There were 16 radiofrequency ablation (7 positive, 43.8%), 35 cryoablations (9 positive, 25.7%), 3 microwave ablations (0 positive, 0.0%), and 123 partial nephrectomies (2 positive, 1.6%)). There were 18/177 (10.2%) true positive cases and 159/177 (89.8%) true negative cases. Time of follow-up ranged from 1-336 months. There were no false positive or false negative cases based on biopsy and long-term follow-up.

CONCLUSION

CEUS has a positive predictive value of 100%, sensitivity of 100% and specificity of 100% in determining residual or recurrent tumor.

CLINICAL RELEVANCE/APPLICATION

Nephron sparing surgeries are now widely used for renal cell carcinomas. CEUS is a less expensive examination and avoids the radiation of CT and possible renal impairment of CT and MRI contrast agents.

Abstract Archives of the RSNA, 2025

T2-SPHN

Head & Neck Imaging Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPHN-2 PREDICTIVE CLINICAL AND ULTRASOUND FEATURES OF THYROID MALIGNANCY IN ONCOLOGY PATIENTS WITH INCIDENTAL DIFFUSE THYROID UPTAKE ON FDG PET/CT

JAEYONG MIN (*Presenter*)
Dong Gyu Na, MD (*Abstract Co-Author*)
Chae Young Shin (*Abstract Co-Author*)
Hyo Sang Lee (*Abstract Co-Author*)

PURPOSE

Although the malignancy risk is very low in patients with diffuse thyroid uptake on FDG PET/CT, rare cases of diffuse thyroid metastasis may mimic thyroiditis. However, a standardized approach to managing incidental diffuse thyroid FDG uptake remains unestablished. This study aimed to identify clinical and ultrasound (US) features predictive of thyroid malignancy in oncology patients with incidental diffuse thyroid uptake on FDG PET/CT.

METHODS AND MATERIALS

This retrospective cohort study included 481 consecutive oncology patients with incidental diffuse thyroid FDG uptake from January 2012 to September 2024. The primary outcome was the identification of clinical and US features predictive of malignancy. The secondary outcome was the malignancy risk of incidental diffuse thyroid uptake, determined by pathology or clinical follow-up for at least six months. US features were compared between benign and malignant thyroid disease in 36 patients who underwent thyroid US within three months of FDG PET/CT.

RESULTS

Excluding occult papillary thyroid carcinomas, thyroid malignancy was found in seven patients (1.5%), all of which were diffuse thyroid metastases originating from lung cancer (n=5), gastric cancer (n=1), and parotid carcinoma (n=1). FDG-avid cervical metastatic lymph nodes were present on FDG PET/CT in all patients with thyroid metastasis (100%) but only in 8.0% (38/474) of benign cases ($P < 0.001$). Punctate echogenic foci on US were significantly associated with thyroid metastasis (71.4% [5/7] vs. 10.3% [3/29], $P = 0.003$). US features of branching hypoechoic strands in the thyroid parenchyma and echogenic changes in the strap muscles were observed exclusively in patients with thyroid metastasis (85.7% [6/7] and 100% [7/7], respectively; $P < 0.001$). At least one of these two US features was present in all cases of thyroid metastasis.

CONCLUSION

The absence of FDG-avid cervical lymphadenopathy was highly specific for benign thyroid diseases, while the presence of branching hypoechoic strands or echogenic changes in the strap muscles on US was highly specific for diffuse thyroid metastasis in oncology patients with incidental diffuse thyroid uptake on FDG PET/CT.

CLINICAL RELEVANCE/APPLICATION

The absence of FDG-avid cervical lymphadenopathy can effectively rule out malignancy, while the presence of US features of branching hypoechoic strands or echogenic changes in the strap muscles can enable accurate diagnosis of thyroid metastasis.

T2-SPHN-3 PREOPERATIVE MULTIMODAL PREDICTION OF LYMPH NODE METASTASIS IN PAPILLARY THYROID CARCINOMA: INTEGRATING CLINICAL, SPECTRAL CT, AND RADIOMICS FEATURES

Yaoyuan Wu, MD (*Presenter*)

PURPOSE

To develop and validate multimodal models for preoperative prediction of cervical lymph node metastasis (LNM) in papillary thyroid carcinoma (PTC) by integrating clinical characteristics, spectral CT parameters, and radiomic features.

METHODS AND MATERIALS

This retrospective study included 149 pathologically confirmed PTC patients (2018-2023) who underwent preoperative spectral CT scans. Patients were stratified into metastasis and non-metastasis groups. Univariate and multivariate analyses identified LNM risk factors. Radiomic features were extracted from iodine maps. After partitioning the cohort into training and validation sets (7:3 ratio), radiomic features were selected via LASSO regression. Three logistic regression models were constructed: (1) clinical-spectral CT model, (2) radiomics model, and (3) combined model. Performance was assessed using receiver operating characteristic (ROC) curves, calibration curves, and decision curve analysis.

RESULTS

Independent predictors of LNM included tumor diameter, microcalcifications, multifocality, thyroid peroxidase antibody (TPOAb) levels, and spectral curve slope. Five radiomic features (wavelet- and gray-level textures) were selected from 1,186 parameters. The combined model outperformed individual models, achieving training/validation AUCs of 0.85/0.733, compared to the clinical-spectral CT model (0.807/0.718) and radiomics model (0.754/0.605) (all *p* < 0.05).

CONCLUSION

Integration of clinical, spectral CT, and radiomic features enhances preoperative LNM prediction in PTC, potentially improving risk stratification.

CLINICAL RELEVANCE/APPLICATION

This multimodal approach may refine surgical planning and reduce overtreatment. External validation is required to address overfitting risks in the radiomics model (validation AUC decline: 0.754 to 0.605), and future integration with molecular biomarkers (e.g., BRAF mutations) could strengthen clinical utility.

T2-SPHN-5 Pankaj Sharma JR, MBBS, FRCR (*Presenter*)

ROLE OF INTRAORAL ULTRASOUND IN ASSESSMENT OF DEPTH OF INVASION OF ORAL CAVITY SQUAMOUS CELL CARCINOMA AND ITS CORRELATION WITH HISTOPATHOLOGY : A PROSPECTIVE DIAGNOSTIC VALIDATION STUDY

PURPOSE

Oral cavity carcinoma (OCC) accounts for 1/3 rd proportion of head and neck carcinomas. Eight edition of American Joint Committee on Cancer (AJCC) introduced Depth of Invasion (DOI) as one of the main criteria in staging the OCC. The independent risk factor DOI is widely documented for nodal metastases. Given the increased probability of undetected and early nodal metastases in tongue cancer, head and neck oncologists advocate surgical neck dissection if DOI > 4 mm. Till date, most of published studies on this subject have been retrospective in nature, along with inclusion of few patients only. Our study is first prospective study from Himalayan belt of North India with inclusion of 86 patients, wherein we have tried to correlate DOI of oral cavity Squamous Cell Carcinoma (SCC) on IOUS with histopathology.

METHODS AND MATERIALS

IOUS was performed on 86 oral cavity SCC patients using high frequency hockey stick probe. DOI and cervical lymph node metastasis was assessed and correlated with postoperative histopathological DOI.

RESULTS

The Ultrasound DOI (usDOI) and pathological DOI (pDOI) had a high degree of agreement, according to a Bland-Altman plot. IOUS and histopathological staging assessment showed nearly complete agreement for the T stage (k=0.894, p value 0.001) and for N stage (k = 0.81, p value 0.001). Mean depth of invasion by histopathology and IOUS was 9 mm and 9.7 mm respectively. Strong correlation (interclass correlation coefficient = 0.95) was noted between radiological and pathological tumour depth.

CONCLUSION

The IOUS can be recommended as an alternative to MRI in the preoperative staging of oral cavity SCC, since it was reliable in preoperative assessment of pDOI and T stage. Ultrasound (USG) is a widely available, quick, affordable and efficient diagnostic tool, which can be used in Outpatient department (OPD) setting, without the danger of radiation exposure, along with advantage of good soft tissue resolution, specially with availability of dedicated hockey stick probes with high end USG machines. Additionally, we can perform core needle biopsy (CNB) or USG guided fine needle aspiration (FNA) with use of these machines.

CLINICAL RELEVANCE/APPLICATION

IOUS is a precise preoperative method for determining the real invasion of oral cavity malignancies, especially for early stage (T1 and T2) oral malignancies. It provides significant information regarding invasion depth for tumour excision, with cancer-free margins. When employing the new 8th edition TNM classification, IOUS can precisely assess DOI, a critical criterion for tumour staging, that is essential for maximising therapy options. The decision to undertake an elective neck dissection is therefore influenced by DOI.

T2-SPHN-6 DOPPLER ULTRASOUND MAPPING OF THE MAIN ARTERIES OF THE FACE: REFERENCE VALUES FOR VASCULAR COMPLICATION ASSESSMENT

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Leonardo Piber (*Abstract Co-Author*)
Sara Khoshnaw (*Abstract Co-Author*)
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PURPOSE

The popularity of minimally invasive facial aesthetic procedures, such as hyaluronic acid injections, has increased dramatically. Although generally considered safe, these interventions carry a risk of vascular complications such as occlusion or stenosis, potentially leading to necrosis, blindness, or cerebral ischemia. Doppler ultrasound is an established imaging method for evaluating hemodynamic parameters in large vessels like the carotids, but no reference values currently exist for the smaller arteries of the face. This study aims to establish reference Doppler ultrasound values for the main arteries of the face and to assess potential side-to-side asymmetries.

METHODS AND MATERIALS

A prospective, multicenter, cross-sectional study was conducted on 118 healthy volunteers (81% female; median age 40.55 years) with no history of facial injectable procedures, between December 2023 and May 2025. High-frequency color and spectral Doppler ultrasound was used to measure peak systolic velocity (PSV), end diastolic velocity (EDV), mean velocity flow (MVF), and resistive index (RI) in 13 arteries of the face as well as the carotid arteries, bilaterally. Side-to-side comparisons were analyzed using the paired Wilcoxon signed-rank test with continuity correction. Effect sizes were calculated using the rank-biserial correlation coefficient. All analyses were performed using R statistical software.

RESULTS

Most arteries showed similar hemodynamic profiles between the right and left sides, with non-significant p-values and minimal effect sizes, indicating the absence of systematic asymmetries. However, significant differences in PSV were found for three arteries: the facial ($p < 0.001$, effect size = 0.173) and infraorbital ($p = 0.027$, effect size = 0.128) arteries showed higher values on the left, while the supraorbital artery ($p = 0.019$, effect size = -0.204) had higher values on the right. All other arteries demonstrated negligible side-to-side variation.

CONCLUSION

This study provides the first set of normative Doppler ultrasound reference values for the main arteries of the face and highlights that most vessels exhibit symmetrical hemodynamic parameters, with few notable exceptions.

CLINICAL RELEVANCE/APPLICATION

Establishing reference Doppler values for the arteries of the face supports the identification of abnormal hemodynamic patterns, aiding in the diagnosis and management of vascular complications associated with aesthetic injectables. These data offer a valuable tool for safer, more precise diagnostic and therapeutic strategies.

T2-SPHN-8 TEMPORAL BONE DUAL-LAYER DETECTOR DUAL ENERGY COMPUTED TOMOGRAPHY FOR IDENTIFYING CHOLESTEATOMA

Xiaoxue Fan, PhD (*Presenter*)
Xiao Mei Lu, MMed (*Abstract Co-Author*)
Yang Hou, MD (*Abstract Co-Author*)

PURPOSE

Cholesteatomas are characterized by local aggressiveness and can infiltrate adjacent structures as they expand. This study aimed to establish a straightforward scoring system using dual-layer detector dual energy CT (DL-DECT) to improve the identification of cholesteatomas in patients.

METHODS AND MATERIALS

Between August 2023 and July 2024, 871 patients with soft tissue density shadows in the ear region who underwent DL-DECT examination were retrospectively enrolled at our institute. Surgical treatments followed by pathological examinations were performed. Based on pathological findings, the lesions were classified into cholesteatoma (CS) and non-cholesteatoma (non-CS) groups. The diagnostic performance of anatomical and quantitative parameters derived from DL-DECT was evaluated using receiver operating characteristic (ROC) curve analysis. Logistic regression was applied to develop a diagnostic scoring system.

RESULTS

A total of 87 patients (median age, 51 years; 45 men and 42 women) with suspected temporal bone cholesteatoma were included, comprising 44 CS cases and 43 non-CS cases. The effective atomic number (Zeff) demonstrated the highest diagnostic accuracy (area under the curve [AUC] = 0.786), followed by the slope of the energy spectral curve (AUC = 0.784), scutum destruction (AUC = 0.759), and CT40 keV (AUC = 0.724). Logistic regression identified two significant predictors, Zeff = 7.12 and scutum destruction, which were incorporated into the scoring system achieving an AUC of 0.868 (95% confidence interval: 0.778-0.931) in the ROC analysis, outperforming the individual parameters (all $p < 0.05$).

CONCLUSION

The scoring system derived from DL-DECT serves as an innovative imaging marker for the detection of cholesteatoma.

CLINICAL RELEVANCE/APPLICATION

This scoring system may facilitate the early identification of cholesteatoma, potentially improving patient outcomes through timely intervention.

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Nov. 30 – Dec. 4
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T2-SPIN

Imaging Informatics Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPIN-1 APPLICATION OF DIFFERENT WEIGHTED DEEP LEARNING RECONSTRUCTION ALGORITHMS TO DUAL-FLOW INJECTION TECHNIQUE COMBINED WITH LOW-DOSE SCANNING IN CT ANGIOGRAPHY OF PULMONARY ARTERIES

Rui Ma (*Presenter*)
Xiaohong Gong (*Abstract Co-Author*)
Guan Wang (*Abstract Co-Author*)

PURPOSE

To observe the value of a novel deep learning reconstruction technique using different weighted reconstructions for dual-flow injection technique combined with 70kV low-dose scanning in CT angiography (CTA) of pulmonary arteries.

METHODS AND MATERIALS

Thirty patients who underwent CTA of the pulmonary arteries were prospectively collected. The subjective and objective image quality of different reconstruction weights was compared using a dual-flow injection (tube a: iodohexol mixture at 65% concentration, tube b: saline) and a 70 kV tube voltage scanning protocol, followed by sequential reconstruction using 30% DLIR-CI, 50% DLIR-CI, and 70% DLIR-CI.

RESULTS

All images are clinically diagnostic. The subjective scores were higher as the weights increased. Among the groups, the 70% DLIR-CI group had the highest subjective score ($P < 0.05$). None of the differences in pulmonary artery CT values between the groups were statistically significant ($p > 0.05$). Pulmonary artery SNR and CNR values were higher in the 70% DLIR-CI group than in the 30% DLIR-CI group ($P < 0.05$). The difference in pulmonary artery SNR and CNR values between the 70% DLIR-CI group and the 50% DLIR-CI group was not statistically significant ($P > 0.05$).

CONCLUSION

In pulmonary artery CTA using dual stream injection technique combined with 70kV low dose scanning, deep learning reconstruction algorithm was able to improve the image quality better, where the best image quality was obtained by deep learning image reconstruction with 70% weights.

CLINICAL RELEVANCE/APPLICATION

A novel deep learning reconstruction algorithm with 70% weighting improved image quality best in pulmonary artery CTA using a dual-flow injection technique combined with 70kV low-dose scanning.

T2-SPIN-2 MULTICENTER, MULTIORGAN PRETRAINING HELPS PDAC, CYST, AND PNET RECOGNITION IN CONTRAST ENHANCED COMPUTED TOMOGRAPHY

Zongwei Zhou, PhD (*Presenter*)
Xinze Zhou (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

To investigate whether pre-training AI on a large healthy population helps diagnostic performance for pancreatic neoplasms including Pancreatic Ductal Adenocarcinoma (PDAC), Cysts, and Pancreatic Neuroendocrine Tumors (PNET).

METHODS AND MATERIALS

An AI model (nnU-Net) was pre-trained on AbdomenAtlas (n = 9,262), a large-scale dataset annotated for 25 structures, including 16 abdominal organs, 2 thoracic organs, 5 vascular structures, and 2 skeletal structures. This dataset was collected from 139 centers across the world, ensuring diverse populations, scanner manufacturers, and imaging protocols. Ten radiologists, including four senior radiologists with 8-15 years of experience and six junior radiologists with 3-5 years of experience, provided per-voxel annotations for these 25 structures. The pre-trained model was then fine-tuned on a large, labeled dataset (N = 3,159) from Johns Hopkins Hospital, comprising 1,072 normal CTs, 1,115 with PDAC, 418 with Cysts, and 588 with PNETs. This dataset reflected broad demographic and clinical variability, with patient ages ranging from 17 to 84 years, tumor sizes ranging from small to large, and representation across sexes, tumor grades, stages, and survival outcomes. This transfer learning approach allowed the model to adapt its learned anatomical knowledge to the variable imaging features of pancreatic neoplasms. Evaluation was performed on a separate test cohort (n = 1,927), including 604 normal, 543 PDAC, 498 cyst, and 321 PNET cases. Diagnostic performance was compared with the same AI model trained from scratch, using Sensitivity and Specificity. Segmentation accuracy was measured with Dice Similarity Coefficient (DSC) and Normalized Surface Dice (NSD, 1.5mm tolerance) respectively.

RESULTS

The AI model pre-trained on normal anatomical structures achieved a DSC of 63.4% (95% CI 61.9%-64.9%) and a NSD of 58.9% (57.6%-60.3%) for segmenting pancreatic neoplasms (PDAC, Cyst, and PNET). These results represent improvements of 7.9% in DSC and 1.6% in NSD compared with the same AI model trained from scratch. The pre-trained model also achieved Sensitivity of 95.8%, and Specificity of 98.7% which were 2.3% and 20.5% higher respectively than training from scratch.

CONCLUSION

Pre-training on large-scale anatomical datasets enhances AI model generalizability and improves performance in pancreatic neoplasmssegmentation and detection, even in challenging, heterogeneous clinical scenarios.

CLINICAL RELEVANCE/APPLICATION

Integrating AI models trained on multicenter dataset (139 centers in our study) into clinical practice can enhance diagnostic precision for pancreatic neoplasms, potentially aiding in more informed clinical decision-making.

T2-SPIN-3 OPPORTUNISTIC BREAST CANCER SCREENING USING NON-CONTRAST CT WITH CONTRALATERAL BREAST COMPARISON

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PURPOSE

The early detection of breast cancer can significantly improve the survival rates of patients. Chest CT scans can also be used for opportunistic breast cancer screening with the assistance of artificial intelligence. We propose an AI model called Dr. Brandon (Br east can cer d etection o n n on-contrast CT), which can localize the breast tumor and provide an estimation of its malignancy score.

METHODS AND MATERIALS

The model Dr. Brandon is an end-to-end framework for opportunistic breast cancer screening on non-contrast CT. In specific, we firstly crop out the two breasts using a coarse breast segmentation model. After that, we use a Mamba-based model to process the two breast crops and output the segmentation mask of breast and tumor. In particular, drawing inspiration from how physicians compare the left and right breasts during image review to find abnormalities, Dr. Brandon allows concurrently examining and comparing the left and right breasts for tumor localization. The malignancy score is calculated from the global tokens followed by two fully connected layers. The whole pipeline is illustrated in Figure 1. The training dataset consists of 772 breast samples with tumors (721 malignant and 51 benign) and 1298 healthy breasts as normal control. The malignancy of the breasts is confirmed through pathology report and the tumor masks were delineated by the radiologists. The testing dataset includes 229 breast samples with tumor (218 malignant and 11 benign) and 391 healthy breasts.

RESULTS

For the tumor localization part, Dice coefficient, Hit rate and FROC score were calculated. Hit rate measures the percentage of the breast samples with tumors whose ground truth tumor masks intersects with the predicted ones. The FROC score is the mean value of four sensitivities when the false positive detections per breast (fppb) are 0.1, 0.2, 0.3 and 0.4. The proposed model Dr. Brandon achieves 0.6588 on Dice coefficient, 0.9345 on Hit rate and 0.8974 on FROC score. The Free-Response Receiver Operating Characteristic (FROC) curve (shown in Figure 2) also shows the advancement of our method over baseline convolutional neural networks. For the malignancy classification part, Dr. Brandon can achieve 0.7248 on sensitivity, 0.9701 on specificity and an overall AUC of 0.9691, demonstrating strong competitiveness among current breast cancer screening tools.

CONCLUSION

Dr. Brandon can achieve a performance comparable to the recently reported mammography-based AI screening system and has the potential to become a practical opportunistic breast cancer screening tool on non-contrast CT.

CLINICAL RELEVANCE/APPLICATION

The potential exists for Dr. Brandon to be incorporated into radiologists' routine workflow as an opportunistic breast cancer screening tool on non-contrast CT.

T2-SPIN-4 INTERNATIONAL, MULTI-LINGUAL, EXTERNAL VALIDATION OF LLM-AND RULES-BASED PROTOTYPE FOR AUTOMATING CT ACQUISITION, CONTRAST ADMINISTRATION, RECONSTRUCTION, AND POST-PROCESSING FACTORS

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PURPOSE

We developed language-agnostic rules,an LLM-based prototype (Siemens Healthineers),and tested it on international,multicenter,and multilingual data for predicting the best scan and image processing factors from provided clinical indication and prior radiology reports of the same body part.

METHODS AND MATERIALS

Through our IRB approved study, we received information on clinical indications and prior radiology reports of chest CTs from 48 institutions in 18 countries across South America,Europe,Africa,and Asia. Each document was in one of 10 different languages or language combinations(English,Persian,French,Arabic,Portuguese,Turkish,Spanish, Swahili,Arabic-English and French-English). Each site contributed de-identified info on10-20chest CTs for a total of929adult patients: clinical indication for the current CT chest and CT report of the last prior chest CT (both copied as verbatim and in the original language).Following translation (LLM and/or native speakers)to English,an experienced thoracic radiologist assigned the best CT protocols, which incorporate both scan acquisition and post-processing factors. Separately, we defined the rules governing the choice of these CT factors based on clinical information from the indications and/or prior reports. Using an independent dataset which is not part of the validation data, we then developed a prototype that automatically derives ideal protocols according to these rules based on an automated derivation of relevant clinical indications/findings in the input data using an LLM with multilingual support (gpt-4o-mini). All documents have been processed in their original language without any modification to the LLM prompt.

RESULTS

Across all languages/regions (non-English/English only), we achieved an average protocol choice accuracy of 90.3% (86.3%/92.1%), with accuracies ranging from 65.0%(Turkish)to95.5%(Persian).Variable accuracy(85-100%)across English language contributors was likely related to variations in stated clinical indications.Protocol accuracies ranged from 44.4% for rarer protocols(lung nodule follow-up)to95.4%for well-represented ones(routine chest CT,CT PE,lung cancer screening)

CONCLUSION

The assessed prototype can accurately and reproducibly assign the best CT protocols and associated scan and reconstruction factors, regardless of the input languages and geographic regions of origin. The low performance in some languages (e.g. Turkish) can primarily be attributed to the difficulty of the LLM to understand fine terminological nuances.

CLINICAL RELEVANCE/APPLICATION

The prototype framework can automate and personalize CT acquisition and processing pathways to improve consistency, quality, and safety of protocoling process.

T2-SPIN-5 TWO-STAGE DEEP LEARNING FRAMEWORK FOR LESION DETECTION AND CLASSIFICATION IN DBT WITH LIMITED DATASET

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PURPOSE

Accurate lesion detection and classification in digital breast tomosynthesis (DBT) is critical, particularly with limited data, where false positives (FPs) and false negatives (FNs) pose clinical challenges. We present a knowledge distillation (KD) framework in which a lesion detection model (teacher) supervises a classification model (student). The student model achieves superior classification accuracy and lesion recognition reliability by learning lesion-specific features and being guided on FP suppression and FN reduction.

METHODS AND MATERIALS

DBT reduces tissue overlaps compared to conventional 2D mammography, but limited annotated data in datasets restrict automated lesion detection. We developed a KD-enhanced deep learning framework transferring knowledge from a robust detection model to a lighter classification network. An anonymized DBT dataset of 399 slices (153 cancer, 201 benign, 45 normal) was augmented to 951 samples using random flips, rotations (±25 degrees), affine scaling, translation, and elastic deformation. Images were preprocessed with contrast-limited adaptive histogram equalization (CLAHE), resized to 1536×2048 pixels, and standardized in orientation. The KD-YOLO architecture employs a YOLOv5 teacher model to detect candidate lesions, with two ResNet-34 student classifiers refining detection: student 1 distinguishes true positives (TP) from FPs, and student 2 classifies TPs as benign or malignant. A two-stage softmax decision process further refines lesion classifications, re-evaluating initial FP cases and minimizing FN rates.

RESULTS

Evaluation of 73 DBT images shows our KD-YOLO achieved a precision of 0.77, a recall of 0.92, and an F1-score of 0.84 for lesion detection, reflecting high sensitivity with balanced precision. In lesion classification, our KD-YOLO reached a precision of 0.69, a recall of 0.71, and an F1-score of 0.70. Compared with YOLOv5, YOLOv8, and YOLOv11, KD-YOLO reduces FPs and maintains a low FN ratio, improving accuracy and reliability. Its inference time is 1153.5 ms per image, demonstrating efficient computational performance.

CONCLUSION

The KD-based two-student approach progressively refines detection and classification, effectively addressing DBT’s limited data challenges by reducing FPs and minimizing FNs, ensuring high sensitivity and specificity. This architecture lowers training costs and offers faster inference, supporting integration into computer-aided diagnostic systems for efficient breast cancer screening.

CLINICAL RELEVANCE/APPLICATION

Reducing FPs minimizes unnecessary patient recalls, and fewer FNs avoid missed cancers, supporting timely, reliable, and accurate breast cancer detection, ultimately improving patient outcomes.

T2-SPIN-6 FROM REPORTS TO INTERPRETATIONS: A SCOPING REVIEW OF LARGE LANGUAGE MODELS IN RADIOLOGY

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PURPOSE

Recent trends show a growing interest in leveraging large language models (LLMs) for various tasks in radiology workflow. However, as these applications emerge, it is imperative to assess the current state of LLM research in radiology and identify gaps for future research. This scoping review explores the applications of LLMs in radiology, identifying the most frequently used models, and providing insights to guide future research in this field. Research on LLMs in radiology can recognize trends, gaps, and opportunities for improving clinical practice and efficiency.

METHODS AND MATERIALS

We conducted a systematic search across five databases: PubMed, EMBASE, SCOPUS, Web of Science, and IEEE Xplore. The search strategy utilized Boolean operators and included keywords such as "Large Language Models" and "Radiology", along with names of commonly used LLMs. We included only original research articles published from 2022 onwards, excluding reviews, commentaries, editorials and preprints. Two independent reviewers screened the articles by title and abstract, then subsequently by full text. Data were extracted on the domains of LLM applications in radiology, type of model (i.e., open-source or proprietary), and the most frequently used models

RESULTS

After screening, 275 papers met the inclusion criteria. The most common applications of large language models in radiology identified were clinical decision support (n=131), patient-facing applications (n=49), medical education (n=45), workflow optimization (n=34), radiology research aid (n=10), and miscellaneous (n=6). Most papers utilized proprietary models only (n=207), predominantly GPT (n=200). In contrast, 43 studies used only open-source models, with the most common being LLaMA (n=19). Twelve studies compared both types.

CONCLUSION

LLMs are increasingly applied in radiology for clinical decision support, patient-facing applications, and medical education. While proprietary models dominate, open-source models offer safer integration opportunities. However, proprietary models' features are often less transparent, posing challenges for validation and interpretability compared to open-source models.

CLINICAL RELEVANCE/APPLICATION

This scoping review provides a comprehensive assessment of how LLMs are being used in radiology to support clinical decision-making, streamline workflow, and enhance communication, offering insights into their potential to improve efficiency and patient care.

T2-SPIN-8 BEYOND TESLA: EVALUATING DEEP LEARNING GENERALIZATION ACROSS 1.5 T AND 3.0 T MRI SCANNERS

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PURPOSE

To quantitatively evaluate the impact of MRI scanner magnetic field strength (1.5 T vs. 3.0 T) on the performance and generalizability of deep learning-based segmentation algorithms.

METHODS AND MATERIALS

In this retrospective study, segmentation models were developed and validated using two datasets: MAMA-MIA for breast tumor segmentation (n = 1271; 851 from 1.5 T scanners and 420 from 3.0 T scanners across two centers) and PanSegNet for pancreas segmentation (n = 218; 90 from 1.5 T and 128 from 3.0 T scanners across four centers). Data were stratified by magnetic field strength. For each task, two nnU-Net segmentation models were trained—one using 1.5 T data and the other using 3.0 T data. Each model was externally validated on both 1.5 T and 3.0 T test sets. Segmentation performance was evaluated using the Dice Similarity Coefficient (DSC).

RESULTS

For breast tumor segmentation, the model trained on 1.5 T data achieved a mean DSC of 0.4105 (95% CI: 0.3690-0.4521) on the 1.5 T test set and 0.2889 (0.2559-0.3220) on the 3.0 T test set. The model trained on 3.0 T data yielded a DSC of 0.4326 (0.3948-0.4704) on the 3.0T test set and 0.4939 (0.4495-0.5383) on the 1.5 T test set. For pancreas segmentation, the 1.5 T-trained model achieved a DSC of 0.7169 (0.6666-0.7671) on the 1.5 T test set and 0.7797 (0.7296-0.8298) on the 3.0 T test set. The 3.0 T-trained model achieved a DSC of 0.8403 (0.8114-0.8691) on the 3.0 T test set and 0.7737 (0.7278-0.8195) on the 1.5 T test set. Models trained on 3.0 T MRI data performed significantly better than those trained on 1.5 T data when evaluated on the same validation sets (one 1.5 T and one 3.0 T) (breast tumor segmentation: $p < 0.0001$; pancreas segmentation: $p < 0.0001$, Wilcoxon signed-rank test).

CONCLUSION

MRI magnetic field strength of training data affects the performance of deep learning-based pancreas and breast tumor segmentation models. Models trained on 3.0 T data significantly outperformed those trained on 1.5 T across both same-field and cross-field evaluations, likely due to higher signal-to-noise ratio and resolution.

CLINICAL RELEVANCE/APPLICATION

Our findings highlight the importance of considering MRI field strength when developing AI models for clinical use across different scanner types. For clinical translation, models should be validated across field strengths to ensure generalizability in multi-center studies or longitudinal workflows where mixed-field systems are common.

T2-SPIN-10 BOOSTING CONCEPT EXTRACTION PERFORMANCE OF LARGE LANGUAGE MODELS USING SELF-CORRECT PROMPTING DERIVED FROM DISCORDANT DATA

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PURPOSE

Large language models (LLMs) in conjunction with radiology reports are often relied upon for "truthing" computer vision clinical models to obviate secondary human review. Concept extraction errors occur due to variations in reporting style, structure and context. We demonstrate a method to augment LLM accuracy via "self-correcting" prompt engineering.

METHODS AND MATERIALS

The AI outputs from a commercial AI intracranial hemorrhage (ICH) detector and corresponding radiology reports were collected prospectively from 18 hospitals in 2 states over a 10 month period. Impressions were fed to an ensemble of eight open-source LLMs using the Ollama API. An initial prompt to detect ICH was devised for the ensemble. A subset of reports whose findings were discordant from the AI outputs underwent manual review. Comparison (Cohen's kappa /Jaccard similarity) was used to evaluate agreement between the eight LLMs. Precision, recall, and AUC analysis were used to assess concordance with the human reviews. The impression text from the discordant exams was analyzed by K-means clustering to extract the most common concepts that produced a discordant result. Centroid concepts were

generated from the discordant impressions and used by an LLM (GPT4o) to modify the original prompt instructions to tune the ensemble to more accurately extract the report concepts. Concept extraction was repeated using the "enhanced" prompt with the same LLM ensemble to determine if the concordance rate with human expert review changed.

RESULTS

30,734 head CTs and reports were selected for analysis over a 10 month period. 654 impressions were manually reviewed. LLM concordance for detecting the concept of hemorrhage in the impression varied widely initially. The LLM-generated prompt added 3 centroids and 15 concepts. Following prompt correction, Kappa and Jaccard were augmented at >0.7 & 0.75 respectively for 4 LLMs with tighter clustering. AUC improved by 0.06 across all models, while the AP improved by 0.05. Findings reflect enhanced discrimination and precision with the refined prompt.

CONCLUSION

The use of k-means clustering of common detection error concepts can be used to automatically fine-tune an LLM prompt which can significantly decrease discordant feature extractions from reports.

CLINICAL RELEVANCE/APPLICATION

The combination of an ensemble of different LLMs in conjunction with a self-modifying prompt can be used to more accurately extract concepts from radiology reports with fewer false positives/negatives. This may have a practical application in automating performance review of AI tools.

T2-SPIN-11 A BENCHMARK FOR IDENTIFYING AND RECTIFYING ERRORS IN CT REPORTING THROUGH VISUAL QUESTION ANSWERING

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PURPOSE

Multimodal large language models (MLLMs) have gained significant attention in medical imaging analysis due to their capability to generate reports, detect overlooked errors, enhance reporting accuracy, and reduce report generation time. Despite these promising advancements, MLLMs frequently exhibit hallucination, generating clinically incorrect information. Existing benchmarks inadequately assess complex, clinically relevant reasoning skills. To address these gaps, this study proposes a novel benchmark designed to comprehensively evaluate the clinical utility and medical competence of MLLMs by assessing their ability to accurately identify and correct vision-centric errors (omission, insertion, direction, size) and lexical errors (unit, typo) within radiology reports based on CT images.

METHODS AND MATERIALS

We utilized 3,000 patient cases from RadGenome-Chest CT, including clinically significant lesions (nodules and pleural effusions). Six error categories—four vision-centric and two lexical—were established across three different tasks (classification, detection, and correction). Error generation leveraged DSPy and LLaMA-3.3, yielding ~40,000 visual question answer (VQA) samples, validated by radiologists. Six open-source 3D MLLMs (RadFM, M3D variants, and CT-CHAT variants) underwent zero-shot evaluation using accuracy, Rouge-based Sentence Index Matching (RSIM), and Generative Radiology Report Evaluation and Error Notation (GREEN) metrics.

RESULTS

For classification, CT-CHAT-LLaMA and CT-CHAT-Vicuna demonstrated the highest overall accuracy of approximately 0.40, though their performance was predominantly strong for non-error cases, indicating a conservative classification tendency. For error detection and correction tasks, the CT-CHAT-Mistral model exhibited superior performance, achieving an average RSIM score of 0.276 and a GREEN score of 0.146, effectively detecting and correcting various types of errors. Sensitive models like CT-CHAT-Mistral suit preliminary screening; conservative models (CT-CHAT-LLaMA) benefit final verification.

CONCLUSION

Our benchmark assesses medical MLLMs' capabilities in identifying and correcting CT report errors. CT-CHAT-Mistral showed best overall performance, highlighting the importance of CT-CLIP-based pretraining and comprehensive VQA datasets.

CLINICAL RELEVANCE/APPLICATION

This benchmark could be used to evaluate the clinical utility and medical competence of various kinds of MLLMs by assessing their ability to accurately identify and correct vision-centric errors and lexical errors, which could be common errors within radiology reports. All data and code will be publicly released to foster reproducibility and further research.

T2-SPIN-12 IMPROVED LESION-LEVEL IMMUNOTHERAPY RESPONSE PREDICTION IN METASTATIC MELANOMA USING DEEP LEARNING

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PURPOSE

Immune checkpoint inhibitors (ICI) have significantly improved survival in patients with metastatic malignant melanoma. However, therapy monitoring still relies on CT-based response assessment using RECIST 1.1, which functions primarily as a retrospective tool rather than a predictive marker. Therefore, better prognostic models are needed. Radiomics, by extracting quantitative imaging features, has shown potential, but existing studies are often limited by small cohorts or inconsistent annotations. We therefore tested whether a transformer-based deep learning model that encodes longitudinal CT information outperforms a radiomics machine learning (ML) classifier in predicting lesion-level response to ICI in metastatic melanoma.

METHODS AND MATERIALS

We retrospectively included 125 adult patients with stage IV melanoma treated with ICIs between 01/2010 and 05/2024. Staging exams (baseline and two follow-ups) were systematically annotated resulting in 699 abdominal lesions. Response was defined per lesion using volumetrically-adapted RECIST criteria. For ML, a Random Forest classifier was trained on radiomic features. For DL, a Siamese SwinUNetR model with shared encoders for baseline and follow-up inputs and a customized classifier was developed to capture temporal lesion dynamics. Performances for both models were averaged over 20 runs and evaluated using AUC, F1 score, accuracy, precision and recall.

RESULTS

The optimized DL model achieved an accuracy of 0.74, precision 0.91, recall 0.69 and F1 Score 0.79 with an AUC of 0.83. The conventional ML model demonstrated an accuracy of 0.61 (accuracy), 0.94 (precision), 0.49 (recall) and 0.64 (F1-score) with an AUC of 0.75.

CONCLUSION

Forecasting accuracy for lesion size dynamics during immunotherapy of melanoma can be significantly improved using imaging-based DL models compared to traditional ML methods. Aggregated predictions may be used for improved patient-level therapy response monitoring. Limitations include single-center data and restriction to abdominal lesions.

CLINICAL RELEVANCE/APPLICATION

Transformer-based deep learning models can enable early, image-based prediction of lesion-level treatment response in metastatic melanoma, potentially guiding timely adjustments to therapy and improving patient outcomes.

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T2-SPIR

Interventional Radiology Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPIR-3 MRI-GUIDED SIMULTANEOUS DUAL-ANTENNA MICROWAVE ABLATION FOR LIVER TUMORS: INITIAL TECHNICAL FEASIBILITY, SAFETY, AND EARLY OUTCOMES

Setayesh Sotoudehnia Korani, MD (*Presenter*)
David A. Woodrum, MD, PhD (*Abstract Co-Author*)
Scott M. Thompson, MD, PhD (*Abstract Co-Author*)
Daniel A. Adamo, MD (*Abstract Co-Author*)
Aiming Lu, PhD (*Abstract Co-Author*)

PURPOSE

To report the initial feasibility, safety, and outcomes for patients undergoing MRI-guided percutaneous microwave ablation (MWA) procedures utilizing two microwave antennas for the treatment of liver lesions

METHODS AND MATERIALS

This retrospective review included 12 patients (9 male, 3 female; mean age 58.2 years) who underwent 14 MRI-MWA procedures utilizing two microwave antennas between November 2020 and February 2025. Indications included metastatic disease (prostate n=6, rectal n=1, neuroendocrine n=2, germ cell n=1, RCC n=1) and symptomatic hepatic adenomatosis (n=1). Treatment intent varied, including palliative indications. Procedures were performed under general anesthesia with combined MRI and ultrasound guidance. Data collected included patient demographics, lesion characteristics, procedural details focusing on dual antenna usage (simultaneous or sequential), technical success, complications (SIR criteria), and follow-up outcomes including need for further treatment.

RESULTS

Fourteen procedures were performed successfully in 12 patients, demonstrating technical feasibility. Techniques involved simultaneous activation of two antennas in some cases, while others involved sequential placement or targeting of multiple lesions using two antennas within the same session. No procedure-related complications occurred (0%). Follow-up durations ranged from 2 to 53 months (median 22.5 months). Follow-up revealed 10 of 14 procedures (71%) resulted in local control without requiring further local treatment at the ablation site(s). Four procedures (29%) required further local treatment due to residual tumor (n=1), or were associated with subsequent local recurrence or development of new metastases (n=3).

CONCLUSION

MRI-guided MWA procedures utilizing two microwave antennas, whether simultaneous or sequential within a session, are technically feasible and appear safe in this diverse cohort. While local control was achieved in the majority of cases, further investigation is needed to determine the optimal technique (simultaneous vs. sequential) and patient selection for dual-antenna strategies.

CLINICAL RELEVANCE/APPLICATION

Employing two microwave antennas during an MRI-guided ablation session, either simultaneously or sequentially, may allow treatment of larger, multiple, or complexly located lesions. This initial experience highlights the safety and feasibility, supporting further exploration of dual-antenna techniques to potentially optimize ablation outcomes.

T2-SPIR-4 TACE EMPOWERS IMMUNE CHECKPOINT INHIBITORS AND TYROSINE KINASE INHIBITORS IN UNRESECTABLE HCC: A MULTICENTER RETROSPECTIVE STUDY

Yu Lei (*Presenter*)

PURPOSE

The aim of this multicenter retrospective study was to evaluate the efficacy and safety of transarterial chemoembolization (TACE) combined with tyrosine kinase inhibitors (TKI) and immune checkpoint inhibitors (ICI) in treating advanced hepatocellular carcinoma (HCC) compared to treatment with TKI and ICI alone.

METHODS AND MATERIALS

The study included 286 patients with advanced HCC, of which 210 were treated with TACE, TKI, and ICI (TACE+T+I group) and 76 with TKI and ICI alone (T+I group). Progression-free survival (PFS), overall survival (OS), overall response rate (ORR), and disease control rate (DCR) were assessed. A nomogram was developed to stratify patients into high-risk and low-risk groups based on their one-year and two-year survival probabilities.

RESULTS

Patients in the TACE+T+I group demonstrated significantly longer PFS (8.4 months vs. 4 months, $P = 0.0016$) and median OS (14.5 months vs. 10 months, $P < 0.0001$) compared to the T+I group. Additionally, the TACE+T+I group had a higher ORR (56.7% vs. 21.1%, $P = 0.002$) and DCR (84.3% vs. 72.4%, $P = 0.023$). Both groups exhibited good tolerance to adverse events. A nomogram incorporating factors such as therapy type, prothrombin time (PT), age, and tumor size effectively categorized patients into low- and high-risk groups with notably different survival outcomes.

CONCLUSION

These findings suggest that TACE combined with TKI and ICI significantly improved survival outcomes and showed good safety compared to TKI and ICI alone in the treatment of advanced HCC.

CLINICAL RELEVANCE/APPLICATION

The combination therapy significantly improved progression-free and overall survival compared to TKI and ICI alone. The nomogram developed can help stratify patients into high- and low-risk groups, guiding personalized treatment decisions. These findings support the use of TACE plus TKI and ICI as a promising treatment strategy for

advanced HCC, potentially offering better outcomes and safety.

T2-SPIR-5 PREDICATION OF LONG-TERM OUTCOME OF RADIOFREQUENCY ABLATION FOR INDETERMINATE THYROID NODULES AFTER RADIOISOTOPE IMAGING SCREENING

Ling Chieh Shih, MD (*Presenter*)

PURPOSE

Current guidelines recommend either active surveillance or diagnostic lobectomy for indeterminate thyroid nodules. However, a significant proportion of patients experience under- or over-treatment. Radiofrequency ablation (RFA) has emerged as an alternative treatment, though its role remains debated. Radioisotope imaging has shown promise in discriminating benign and malignancy in indeterminate thyroid nodules. Therefore, combining RFA with radioisotope imaging screening may facilitate appropriate patient selection and improve clinical outcomes. This study aims to predict long term outcome of RFA for indeterminate thyroid nodules after radioisotope imaging screening.

METHODS AND MATERIALS

This retrospective study included patients with Bethesda III or IV thyroid nodules who underwent RFA after radioisotope imaging screening between January 2018 and November 2024. The primary outcome was disease progression, defined as nodule regrowth, increase in viable volume, or persistent indeterminate cytology on follow-up fine-needle aspiration. The secondary outcome was complete tumor disappearance, defined as complete radiological resolution of the treated nodule. Other secondary outcomes included volume reduction rate (VRR), symptom and cosmetic scores, and biochemical markers.

RESULTS

A total of 96 patients (mean age: 45.2 ± 13 years; 83 females) were included, with a mean follow-up of 3 years. Disease progression and complete tumor disappearance were observed in 15% (14/96) and 8% (8/96) of patients respectively. Total nodule volume, symptom scores, cosmetic scores, free thyroxine (T4) and thyroglobulin (TG) levels significantly decreased during follow-up. VRRs were 55% at 3 months and 93% at 3 years. Baseline maximum nodule diameter was an independent predictor for both disease progression (odds ratio [OR]: 2.88; 95% confidence interval [CI]: 1.18-7.10) and complete disappearance (OR: 0.16; 95% CI: 0.03-0.74), with cutoff values of 3.5 and 2 cm showing high negative predictive values (NPV: 93% and 97%) for disease progression and complete tumor disappearance respectively.

CONCLUSION

RFA after appropriate radioisotope imaging screening, is a safe and effective treatment for indeterminate thyroid nodules. Furthermore, initial nodule maximum diameter of 3.5 and 2 cm is predictive for long term outcomes.

CLINICAL RELEVANCE/APPLICATION

These findings provide a practical framework for clinical decision-making in the clinical scenario of a patient with an indeterminate thyroid nodule who is considering RFA treatment. Nodules measuring between 2.0 and 3.5 cm demonstrate high NPV for both disease progression and complete tumor disappearance, indicating favorable long-term stability with low risk of adverse outcomes.

T2-SPIR-7 CREATION OF HEPATIC ARTERY EMBOLIZATION MODEL IN MICE: TOWARD TRANSLATIONAL RESEARCH

Reona Wada, MD, PhD (*Presenter*)
Haruyuki Takaki, MD, PhD (*Abstract Co-Author*)
Hiroshi Kodama, MD (*Abstract Co-Author*)
Yutaka Hirata (*Abstract Co-Author*)
Naoki Yokota (*Abstract Co-Author*)
Eisuke Ueshima (*Abstract Co-Author*)
Koichiro Yamakado, MD, PhD (*Abstract Co-Author*)

PURPOSE

Although hepatic artery embolization (HAE) is an effective treatment for hypervascular liver tumors, its biological mechanisms of action and recurrence in tumors are not fully understood. However, there is no animal model suitable to HAE in conducting basic research. Mice have access to extensive biological databases and tools. Furthermore, they have the advantage of low cost and require only a small amount of drugs to be used. This study aims to create HAE animal model in mice.

METHODS AND MATERIALS

Colon cancer cells expressing luciferase were injected into the spleens of 11 BALB/c mice to create liver metastases. After confirmation of tumor engraftment in the liver by bioluminescence imaging, mini-laparotomy was performed in all mice. HAE was performed in 6 mice (HAE group). The lienogastric artery was retrogradely punctured with a 34G needle under microscopy and the periphery of the lienogastric artery was ligated. 15-μm fluorescence-labeled microbeads were injected via a 34G needle into the hepatic artery until hepatic arterial blood flow stagnated. HAE was not performed in the other 5 mice (control group). The technical success rate of HAE, and changes in relative bioluminescence activity of liver tumors the day after mini-laparotomy were evaluated. Histopathological analysis of the liver metastases was also performed 2 days later.

RESULTS

HAE was technically successful in all 6 mice in the HAE group (technical success rate: 100%, 6/6). Although relative bioluminescence activity of liver tumors significantly decreased in the HAE group (1.00 +/- 0 to 0.23 +/- 0.13, $p < 0.001$), it didn't change in the control group (1.00 +/- 0 to 1.44 +/- 0.97, $p = 0.37$). Percentage of tumor necrosis was significantly higher in the HAE group than the control group (19.7% +/- 15.1% vs. 0.19% +/- 0.42%, $p < 0.05$).

CONCLUSION

The mouse HAE model was successfully created, which can serve as a useful platform to conduct basic research toward translational research.

CLINICAL RELEVANCE/APPLICATION

This novel mouse HAE model has a potential to become a valuable platform in investigating mechanisms of tumor response and recurrence after embolization and in evaluating new interventional oncology strategies in a preclinical setting.

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T2-SPMK

Musculoskeletal Imaging Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPMK-1 DIAGNOSTIC DECISION IN HYBRID HUMAN-AI MULTIRATER DISAGREEMENT SITUATIONS

Wolfram Bosbach, MD, PhD (*Presenter*)
Jan Felix Senge (*Abstract Co-Author*)
Nasir Gozlugol (*Abstract Co-Author*)
Robert Seifert (*Abstract Co-Author*)
Marc-Andre Weber, MD (*Abstract Co-Author*)
Keivan Daneshvar Ghorbani, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of incorporating AI-generated diagnoses on decision accuracy and certainty in human-AI hybrid settings, particularly in scenarios with multirater disagreement within clinical routine and tumor board contexts.

METHODS AND MATERIALS

We analyzed combined human and AI vote data from two MSK studies: an imaging-based study where human raters outperformed AI (human accuracy 0.868 vs. AI accuracy 0.444), and a text-based study where AI outperformed human raters (human accuracy 0.865 vs. AI accuracy 0.957). Two clinical scenarios were analyzed: clinical routine (1 human rater with 10 AI votes) and tumor board (10 human raters with 10 AI votes). Democratic majority voting and certainty-weighted decisions were evaluated.

RESULTS

In the tumor board setting, well-performing AI improved certainty of combined human-AI decisions, while underperforming AI moderately lowered combined decision accuracy (from 0.868 human-only to 0.656 human+AI). In the clinical routine setting with text data, accuracy of combined human-AI decisions reached 1.0 for several human raters, exceeding both individual human (ranging 0.652-0.957) and AI accuracy (0.957). However, with image data where AI underperformed, the combined human-AI decisions showed substantially lower accuracy (0.4) compared to human-only decisions (0.52-1.0). Notably, certainty levels of underperforming AI were not reliable indicators of AI accuracy.

CONCLUSION

Well-performing AI can effectively support human diagnosticians in both clinical routine and tumor board settings, potentially increasing decision certainty and accuracy. However, incorporating underperforming AI, even under AI-rater majority conditions, can significantly diminish diagnostic performance, highlighting the importance of careful AI validation before clinical integration.

CLINICAL RELEVANCE/APPLICATION

Understanding when and how to incorporate AI into diagnostic decision-making processes is crucial as healthcare systems face increasing imaging service demands. This study provides evidence-based guidance on human-AI collaborative diagnostic frameworks that can potentially enhance diagnostic capacity without compromising accuracy.

T2-SPMK-2 DIAGNOSTIC ACCURACY OF CT-BASED RADIOMIC MODELS FOR OPPORTUNISTIC OSTEOPOROSIS SCREENING: A SYSTEMATIC REVIEW AND META-ANALYSIS

Guilherme Augusto Silva (*Presenter*)
Jessica Carvalho (*Abstract Co-Author*)

PURPOSE

Assess the overall diagnostic performance of CT-based radiomic models for opportunistic identification of low bone mineral density.

METHODS AND MATERIALS

In accordance with PRISMA-DTA, we searched PubMed, Embase and Cochrane CENTRAL through April 2025 for CT + radiomics + osteoporosis/osteopenia. After dual screening of 82 records and full-text review of 20 articles, 17 studies (n = 2 720; 63 % female; mean age 62 ± 9 years) met inclusion, reporting sensitivity, specificity and/or AUC against DXA/QCT. We performed random-effects bivariate meta-analysis of sensitivity/specificity (GLMM) and random-effects meta-analysis of logit-AUC (REML+Hartung-Knapp; meta v8.0-2), back-transforming AUC via logistic. Heterogeneity was quantified by I^2 (significant if $p < 0.10$ or $I^2>25$ %).

RESULTS

Seventeen studies comprising 14 645 participants (mean age 64 ± 8 years; 59 % female) were included in the quantitative synthesis. In random-effects meta-analysis, the pooled sensitivity of CT-based radiomic models for opportunistic osteoporosis detection was 0.87 (95 % CI 0.85-0.90; I^2 = 94.1 %), and the pooled specificity was also 0.87 (95 % CI 0.82-0.90; I^2 = 97.2 %). The summary area under the ROC curve (AUC), back-transformed from the logit scale, was 0.89 (95 % CI 0.85-0.90; I^2 = 79.5 %). Despite high between-study heterogeneity, no evidence of small-study effects was found (Deeks' test p = 0.18). These results demonstrate that CT radiomics provides robust diagnostic accuracy for opportunistic osteoporosis screening.

CONCLUSION

CT-radiomic models demonstrate high accuracy (AUC ˜ 0.9; sensitivity/specificity ˜ 0.87) for opportunistic screening of low BMD. Although heterogeneity was substantial, the consistency of results supports their robustness. Future prospective multicenter validation is warranted.

CLINICAL RELEVANCE/APPLICATION

Incorporation of validated radiomic algorithms into routine CT workflows enables noninvasive, cost-effective opportunistic screening for osteoporosis without additional radiation or cost.

T2-SPMK-3 SIMPLIFIED RISK SCORE FOR PREDICTION OF POST-SURGICAL MARGIN INVOLVEMENT IN SOFT-TISSUE SARCOMA

Atefe Pooyan, MD, MPH (*Presenter*)
Ehsan Alipour, MD, PhD (*Abstract Co-Author*)
Chankue Park, MD, PhD (*Abstract Co-Author*)
Sara Haseli, MD (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)

PURPOSE

Soft tissue sarcomas (STS) typically require precise surgical resection to achieve local disease control. The status of the post-surgical tissue margin is a critical determinant of surgical success and a key predictor of local recurrence. In this study, we propose a risk stratification system with high sensitivity based on six clinical variables and imaging features derived from pre- and post-neoadjuvant MRI scans.

METHODS AND MATERIALS

We identified a cohort of patients with soft tissue sarcoma (STS) who underwent neoadjuvant radiotherapy. Inclusion criteria required the availability of both baseline and post-neoadjuvant therapy MRI scans, surgical resection following neoadjuvant treatment, and pathology reports detailing post-surgical margin status. Two musculoskeletal radiologists independently reviewed the MRI scans and extracted 18 key imaging features, including markers of marginal infiltration. Clinical variables—including tumor histopathology, grade, patient age, and sex—were incorporated. LASSO logistic regression with 3-fold cross-validation was applied to identify the most predictive features. The final model coefficients were scaled and rounded to integer values to generate a practical risk scoring system.

RESULTS

Our cohort included 119 patients, with a mean age at diagnosis of 55 years (±16). The female-to-male ratio was approximately 2:3. The most common histological subtype was undifferentiated pleomorphic sarcoma, and 67% of tumors were located in the lower extremities. Six variables were retained for inclusion in the risk model. These included post-treatment imaging features such as intratumoral enhancement (odds ratio [OR]: 0.17) and tail sign (OR: 1.4), as well as pre-treatment features such as necrosis (OR: 0.76) and tumoral extension (OR: 1.8). This risk score AUROC of 0.79 (95% CI: 0.68-0.90). Using the Youden index to determine the optimal threshold, the model demonstrated a sensitivity of 80% and a specificity of 63%. The complete risk score is presented in Table 1.

CONCLUSION

We present a risk scoring system designed to identify patients at increased risk of post-surgical margin involvement in STS. Our findings indicate that low-risk patients are characterized by the presence of intratumoral enhancement on post-treatment imaging and the absence of adverse radiologic features such as tumor extension and the tail sign. Future directions include external validation in independent cohorts and prospective studies to assess the utility of this scoring system in guiding surgical planning.

CLINICAL RELEVANCE/APPLICATION

This risk score can aid in preoperative planning by identifying high-risk patients for positive post-surgical tissue margin, who may benefit from tailored surgical strategies.

T2-SPMK-6 PERSONALIZED RISK PREDICTION OF VERTEBRAL FRAGILITY FRACTURES USING GENDER- AND AGE-SPECIFIC BONE MINERAL DENSITY ANALYSIS BASED ON QCT

Wei Duan (*Presenter*)

PURPOSE

To develop and validate a predictive model for vertebral fragility fractures by analyzing the interaction between gender, age group, and bone mineral density (BMD) measured by quantitative CT (QCT), and to visualize its performance using ROC, calibration, and decision curve analysis (DCA).

METHODS AND MATERIALS

A total of 1,825 patients who underwent QCT between 2020 and 2024 were retrospectively enrolled and divided into a training set (n = 1,672) and a test set (n = 153). Vertebral fractures were diagnosed based on imaging criteria. Logistic regression incorporating interaction terms (gender × BMD, age group × BMD) was used to construct the model. Discriminative ability was assessed via ROC curves , calibration via calibration plots, and risk scores were stratified into low-, intermediate-, and high-risk groups. Baseline characteristics were summarized.

RESULTS

Significant interactions were found between BMD and gender (OR = 1.009, P = 0.047) and between BMD and age group (OR = 0.989, P < 0.001). The model achieved an AUC of 0.921. Calibration curves showed good agreement between predicted and observed probabilities. Risk stratification showed fracture rates increased significantly across risk categories (P < 0.001).

CONCLUSION

Gender and age significantly modulate the effect of BMD on fracture risk. Incorporating interaction terms significantly improves model accuracy for vertebral fracture prediction.

CLINICAL RELEVANCE/APPLICATION

This interaction-based QCT model enables accurate risk stratification and supports personalized preventive strategies in high-risk populations.

T2-SPMK-7 A VISUAL GRADING SYSTEM FOR DIFFUSION TENSOR IMAGING OF THE PEDIATRIC KNEE: CORRELATION WITH QUANTITATIVE TRACTOGRAPHY

Jenny Vo-Phamhi, MS (*Presenter*)
Camilo Perdomo, MD (*Abstract Co-Author*)
Ola F. Kvist, MD, PhD (*Abstract Co-Author*)
Ingrid Galvis, MD, MS (*Abstract Co-Author*)
Sogol Mostoufi-Moab (*Abstract Co-Author*)
Diego Jaramillo, MD, MPH (*Abstract Co-Author*)

PURPOSE

To evaluate a structured grading system for tractographic images of the femur and tibia scoring tract direction and density. We have correlated the grading with quantitative DTI parameters in pediatric patients.

METHODS AND MATERIALS

3 independent observers reviewed images from a prospective multicentric study of 49 healthy patients aged 12-16 undergoing knee DTI at 0 and 12 months. For 40 patients, the reviewers—a pediatric musculoskeletal radiologist, a postdoctoral MD researcher, and a medical student—assigned scores (1, 2) to the distal femur and proximal tibia for tract direction and density, using a guide created by another pediatric musculoskeletal radiologist who graded 9 patients. Composite density-direction scores were correlated with tract volume and fractional anisotropy (FA) using Pearson correlation. Interrater agreement was calculated for tract density, direction, length, and distribution.

RESULTS

The correlation of mean composite density-direction scores with tract volume was strong in the femur (Pearson ? = 0.99, $p < 0.01$) and statistically insignificant but notable in the tibia (? = 0.99, $p = 0.14$). Correlation with FA did not achieve significance (femur: Pearson ? = -0.99, $p = 0.11$; tibia: ? = 0.6187, $p = 0.58$). In both femur and tibia, interrater agreement and reliability were substantial or moderate for direction (? = 0.63, 0.55; ICC2 = 0.63, 0.56) and density (? = 0.63, 0.54; ICC2 = 0.63, 0.55). We also evaluated correlation of DTI parameters with length (? = 0.36-0.45; ICC2 = 0.39-0.48) and distribution (? = 0.28, 0.14; ICC2 = 0.32, 0.21) of tracts, and found lower correlations.

CONCLUSION

A simple, visual grading system for pediatric knee DTI correlated well with tract volume and demonstrated strong interrater agreement for tract direction and density. These findings suggest that the direction-density grading system could serve as a simple, reproducible framework for longitudinal assessment of musculoskeletal tract development.

CLINICAL RELEVANCE/APPLICATION

This novel, two-point grading system offers a practical, interpretable approach for radiologists to assess tract maturation in growing children and may complement quantitative measures in both clinical and research settings.

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T2-SPMS

Multisystem Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPMS-1 SCREENING OF CHILDREN WITH FAMILY HISTORY OF HHT (HEREDITARY HEMORRHAGIC TELANGIECTASIA) FOR DISEASE EXPRESSION IN BRAIN, LIVER AND LUNG BY MAGNETIC RESONANCE IMAGING

Guenther K. Schneider, MD, PhD (*Presenter*)
Diane Wagner-Jochem (*Abstract Co-Author*)
Arno Buecker, MD (*Abstract Co-Author*)

PURPOSE

To evaluate magnetic resonance imaging for screening of pediatric patients who are children of clinically and/or genetically proven HHT patients for AVMs (arterio-venous malformations) in the brain, liver or lungs.

METHODS AND MATERIALS

59 Pts. (age range 3-17 years; mean 12 years; male/female 38/21) underwent unenhanced and contrast-enhanced MRI examinations of the brain, liver and pulmonary vasculature for the detection of AV malformations in a single examination. The imaging protocol included unenhanced MRI of the brain (T2w, FLAIR, SWI, DWI and T1w imaging) followed by unenhanced T1w and T2w liver imaging and flow-sensitive GRE-sequences of the liver to detect increased vessel density. This was followed by a time-resolved and high-resolution CE MR-angiography of the thorax. Finally a CE T1w scan of the liver and of the brain was performed, so with one CM dose a complete work-up could be performed.

RESULTS

In 34 of 59 Pts. (58 %) at least one disease expression in either brain, liver or lung was found. Cerebral AVMs were found in 6 (10 %), pulmonary AVMs 31 (53%) and liver AVMs 3 (5%) Pts. Of these, 25 only showed pulmonary AVMs and 3 only liver AVMs respectively. 6 Pts. had simultaneous AVMs in both brain and lung. No patient demonstrated AVMs in all evaluated organs. The male/female ratio of Pts. with at least one disease expression was 19/15.Additional findings related to the disease included microgyria and schizencephaly in 4 Pts. Two Pts. initially presented with stroke, one patient with cerebral abscess formation. Peripheral O2-saturation in the group of Pts. with PAVM was < 95% in 11 Pts. and < 80% in 2 Pts. In all other Pts., including those with PAVM and stroke, O2 saturation was normal. 20 Pts. with PAVM underwent interventional therapy of PAVMs, with the result of a normal O2 saturation in 18 / 20 pts., 2 patients had diffuse PAVMs and saturation was significantly increased post occlusion of the larger PAVMs. Nose bleeding as a major symptom of the disease was found in 12 of 34 Pts. (35%) with visceral disease expression.

CONCLUSION

MRI is a feasible one stop screening method for evaluation of disease expression in brain, liver and lung in children of Pts. diagnosed with HHT. Together with genetic testing, MRI can give important information of visceral manifestation of this autosomal dominant disease with variable expression.

CLINICAL RELEVANCE/APPLICATION

Since in our study population even pts. without any clinical signs of the disease suffered from PAVMs and related complications like stroke or brain abscess, screening for possibly live-threatening AV-Malformations is necessary and MRI can provide an overview of disease expression of HHT with the goal of normal quality of life and life expectancy.

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T2-SPNMMI

Nuclear Medicine & Molecular Imaging Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPNMMI-1 ROLE OF PET-CT METABOLIC METRICS IN PREDICTING SURVIVAL IN RECTAL CANCER PATIENTS

Marta Vaillant, MD (*Presenter*)
Gonzalo Cuesta Domingo, MD (*Abstract Co-Author*)
Eliseo Vano Galvan, PHD (*Abstract Co-Author*)
Cristina Rodriguez Rey (*Abstract Co-Author*)
Paloma Dauden (*Abstract Co-Author*)
Cristina G. Wakfie Corieh, MD (*Abstract Co-Author*)
Luisa F. Leon, MD (*Abstract Co-Author*)
Patricia Romero Fernandez, MBBS (*Abstract Co-Author*)
Pedro Nespral Torres, MD (*Abstract Co-Author*)

PURPOSE

Rectal cancer is one of the most common malignanciesof the digestive tract. Its management poses challenges due to its anatomical location and silent progression. We aim to analyze the independent prognostic value of metabolic parameters from [18F-FDG]PET-CT in patients with rectal cancer

METHODS AND MATERIALS

We conducted a retrospective cohort study (2020-2023) including 59 patients with rectal cancer referred for staging with [18F-FDG]PET-CT. Clinical, imaging, and metabolic variables were collected, including MTV, SUVmax, and SUVmean of the primary lesion. Tumor-related death was defined as the primary endpoint during follow-up. A multivariate Cox regression analysis was performed to identify independent prognostic predictors. Model discrimination capacity was assessed using Harrell's C-index.

RESULTS

The mean age was 65.62 ± 12.06 years, with 49.15% of the cohort being male. Adenocarcinoma was the predominant histological subtype (98.31%). Nine patients (15.25%) presented with metastatic disease at diagnosis. The mean values for the metabolic parameters were: MTV 16.55 ± 20.44, SUVmax 21.36±8.07, and SUVmean 12.29 ± 4.62. The average follow-up time was 35.15 months. In the univariate analysis, MTV (HR 1.039; 95% CI 1.010-1.069; p=0.007) was the only metabolic parameter significantly associated with the event, along with surgery, radiotherapy, nodal involvement on PET/CT, and the presence of metastases. In the multivariate Cox regression analysis, surgery (HR 0.142; 95% CI 0.024-0.850 ; p=0.033), radiotherapy (HR 0.085; 95% CI 0.013-0.580; p=0.012), and MTV (HR 1.037; 95% CI 1.008-1.068; p=0.014) remained as independent prognostic factors. Harrell's C-index demonstrated excellent discriminative ability of the final model (0.931; 95% CI 0.873-0.989)

CONCLUSION

In our cohort, MTV emerged as an independent prognostic factor for mortality in patients with rectal cancer, indicating that higher MTV values are associated with decreased survival.

CLINICAL RELEVANCE/APPLICATION

This study underscores the prognostic utility of metabolic tumor volume (MTV) derived from [18F-FDG]PET-CT in patients with rectal cancer. MTV was identified as an independent predictor of tumor-related mortality, with higher values correlating with poorer survival outcomes. These findings suggest that MTV could enhance current risk stratification strategies and support more personalized treatment planning in rectal cancer management.

T2-SPNMMI-2 A DEEP-LEARNING APPROACH TRAINED ON SIMULATED DATASET FOR PET IMAGE QUALITY ENHANCEMENT: VALIDATION ON A MULTI-CENTER, MULTI-VENDOR STUDY

Thomas C. Arnold, PhD (*Presenter*)
Muzi Guo (*Abstract Co-Author*)
Lei Xiang (*Abstract Co-Author*)

PURPOSE

Positron emission tomography (PET) has demonstrated significant diagnostic value in various oncological applications. However, its clinical utility is often limited by long acquisition time. While reducing scan duration can improve efficiency, it inevitably compromises image quality. Recent advances in deep learning have led to the development of PET image denoising techniques. However, many of these methods suffer from undesirable image blurring. In this study, as it is challenging to acquire real paired low-resolution (LR) and high-resolution (HR) PET dataset, we propose a deep-learning based method trained on simulated datasets for super-resolution of PET images. Our objective is to evaluate the performance and generalizability of this algorithm in a realistic multicenter, multivendor environment clinically.

METHODS AND MATERIALS

The training dataset comprised 150 subjects scanned with the ^{18}F-FDG tracer on a Biograph Vision Quadra system. High-resolution (HR) ground-truth images were reconstructed with a matrix size of 440×440×644. To generate LR counterparts, the HR images were retrospectively processed through the following steps: (1) convolved with Gaussian functions of 2 mm, 3 mm, and 4 mm full-width at half-maximum (FWHM) to mimic the point spread function (PSF) of a PET imaging system, and (2) downsampled to isotropic voxel sizes of 2 mm, 3 mm, and 4 mm, respectively. The test dataset comprised 30 cases collected from three hospitals using different PET/CT scanners: a Biograph64 TruePoint, a Vereos PET/CT, and a Discovery 710. For quantitative assessment, the SNR and CNR were calculated for low-dose scans w/ and w/o enhancement.

RESULTS

The enhanced images demonstrated superior visual quality with improved delineation of both physiological and pathological structures when compared to low-count scans, achieving even better performance than standard-count scans. Furthermore, quantitative measurements of ROIs in enhanced low-count images showed

agreement with standard scan. From a quantitative perspective, the SNR and CNR were improved by an average of 31.2% and 22.6%, respectively.

CONCLUSION

The deep-learning approach trained on simulated dataset could significantly improving the contrast and sharpness of low-count PET after denoise without sacrificing image quality.

CLINICAL RELEVANCE/APPLICATION

The high-quality publicly available dataset acquired using advanced imaging systems can be leveraged to develop deep learning algorithms for enhancing low-quality PET images obtained from outdated PET/CT scanners. Our proposed method significantly improves tumor and tissue delineation, which is particularly valuable for clinical applications such as myocardial blood flow quantification and whole-body assessment.

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T2-SPNPM

Noninterpretive Skills (Beyond Imaging) Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPNPM-1 ENVIRONMENTAL IMPACT OF PATIENT TRAVEL FOR OUTPATIENT MEDICAL IMAGING

Jimin Lee (*Presenter*)
Hayley Panet (*Abstract Co-Author*)
Kate Hanneman, MD, MPH (*Abstract Co-Author*)

PURPOSE

Patient travel for medical appointments generates substantial greenhouse gas (GHG) emissions. However, there is limited data on specific estimates for medical imaging. The purpose of this study was to determine GHG emissions due to patient travel for outpatient medical imaging.

METHODS AND MATERIALS

In this retrospective cross-sectional study, outpatient medical imaging performed at an academic medical imaging department covering 5 hospital sites was evaluated between April 2022 and March 2025. Patient travel for each imaging procedure was calculated as double the distance between the centroid of each patient's residential postal code and the location of the hospital site where the imaging was performed. Travel-related GHG emissions were calculated as 400 grams carbon dioxide equivalents (CO_2e) per mile driven in an average passenger vehicle. Patient-travel related GHG emissions that could be avoided by scheduling multiple imaging procedures in the same patient on the same day were estimated.

RESULTS

A total of 672,442 outpatient medical imaging procedures were performed during the study period (224,147 per year) in 112,197 unique patients (54% female, mean age 54.7±17.7 years). Median total travel distance was 16.0 miles (IQR 5.9, 37.2) per imaging procedure. Annual total patient travel-related GHG emissions were 4979 metric tons CO_2e/year, equivalent to 1038 homes' electricity use. Overall, median patient travel-related GHG emissions were 6.4 kg CO_2e (IQR 2.4, 14.9) per imaging test. Patient travel-related emissions differed by imaging modality, highest for interventional procedures (9.6 kg [IQR 3.7, 23.5]), followed by CT (7.2 kg [IQR 2.7, 16.4]), MRI (6.2 kg [IQR 2.3, 15.4]), and ultrasound (4.9 kg [IQR 1.9, 11.6]), $P<0.001$ for all comparisons. For diagnostic imaging, total GHG emissions from patient travel were 2.3 times higher than total modality-specific use-phase GHG emissions. Among patients with multiple outpatient imaging procedures, bundling imaging appointments that had been performed in the same patient within 30 days but not on the same day would reduce annual patient travel-related GHG emissions by 733 metric tons CO_2e/year (14.7% reduction compared to baseline), equivalent to 153 homes' electricity use.

CONCLUSION

Patient travel for outpatient medical imaging generates substantial GHG emissions, equivalent to 1038 homes' electricity use at a single medical imaging department in one year.

CLINICAL RELEVANCE/APPLICATION

This data can be used to inform strategies to reduce travel-related GHG emissions in radiology such as scheduling multiple imaging appointments on the same day. Future studies can explore the incremental impact of coordinating outpatient imaging with other procedures and clinic visits on the same day.

T2-SPNPM-2 CAN AI KEEP UP WITH LUNG CANCER RESEARCH? A COMPARATIVE EVALUATION OF LLMS FOR RADIOLOGY LITERATURE SUMMARIZATION

Sarah Meribout, MD (*Presenter*)
Seyedehelaheh Hosseini, MD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate and compare the performance of various large language models (LLMs) in retrieving and summarizing original radiology research articles on lung cancer. Specific goals included assessing LLM retrieval accuracy, summarization relevance and completeness, tabulation reliability, and overall usability.

METHODS AND MATERIALS

We conducted a comparative analysis of six commercially available LLMs, both general and medical (ChatGPT 4.o DeepSearch, OpenEvidence, Consensus.ai, Qwen 2.5Max, DeepSeek, and Gemini DeepSearch), across three tasks. (1) Medical Article Retrieval: From PubMed, AI tools were instructed to identify original radiology research articles published in December 2024 on lung cancer using standardized prompts. Results were compared with MeSH-based Medline searches. (2) Summarization: Quality was assessed using two metrics on relevant retrieved articles: Relevance Fraction (proportion of relevant information) and Completion Fraction (proportion of predefined required facts correctly identified). Manually extracted gold-standard summaries and checklists were created for verifying LLM outputs. (3) Tabulation: Each model's ability to extract and structure key information in tabular form was tested for accuracy and completeness. A Usability Index (1-5 scale) was also assigned based on research efficiency and interface performance.

RESULTS

Out of 102 retrieved articles in December 2024 with MeSH Advanced Search, 62 were deemed eligible. ChatGPT extracted 8 articles (9.7%); other models retrieved =1. ChatGPT had a relevance fraction of 92% and 95% completion rate. Gemini DeepSearch achieved 74% relevance but 98% completion. Qwen and DeepSeek produced concise summaries with high relevance (97-100%) but lower completion rate (81-91%). Consensus.ai repeatedly failed to generate usable outputs. In tabulating relevant information, all functional models achieved a 100% accuracy and 91-100% completeness. Usability scores were highest for ChatGPT (3), with others scoring =1.5 due to limitations in handling longer text, slow or failed responses, or lack of retrieval functionality.

CONCLUSION

Most LLMs have a limited role in searching relevant research publications within the years of their specified search updates. However, ChatGPT DeepSearch showed the best overall performance across retrieval, summarization, and usability tasks, though it still missed relevant articles compared to manual PubMed searches.

CLINICAL RELEVANCE/APPLICATION

Both generic and medicine-targeted LLMs provide incomplete retrieval of the latest research literature, traditional MeSH-based Medline search provides best retrieval rates; most LLMs excel in tabulating details of retrieved research article.

T2-SPNPM-3 ERGONOMICS AND MUSCULOSKELETAL HEALTH IN SONOGRAPHER

Sabrina Bintalib, BSc, MPH (*Presenter*)
Pauline Soh (*Abstract Co-Author*)
Li Ern Tang (*Abstract Co-Author*)
Le Yi Ruth Wong (*Abstract Co-Author*)

PURPOSE

Sonographers worldwide face a high risk of work-related musculoskeletal disorders (WMSDs) due to prolonged static postures, repetitive movements, and physically demanding tasks, with reported prevalence rates between 63% and 98.7%. However, limited research has examined these risks within Southeast Asian contexts. This study investigated the prevalence of WMSDs among sonographers in Singapore and explored associations with demographic factors and ergonomic awareness.

METHODS AND MATERIALS

A cross-sectional online survey was conducted among 68 sonographers across 24 public and private healthcare institutions in Singapore (ethics approval: SIT IRB RECAS-0414). Eligible participants were aged 20-69 years with at least one year of professional experience. The Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was used to assess the prevalence, severity, and impact of WMSDs. Ergonomic awareness was categorized as Good (scores 6-7), Moderate (4-5), or Poor (1-3). Logistic regression analyses evaluated associations between demographic factors and WMSD risk, while nonparametric tests examined relationships between ergonomic awareness and WMSD prevalence.

RESULTS

WMSDs were reported by 98.5% of respondents, with 25% indicating that discomfort interfered with work. The most affected areas were the shoulders (85.3%), back (83.8%), and neck (67.7%), while lower limb discomfort was minimal. Sonographers aged over 40 years had 7.25 times greater odds of experiencing back-related WMSDs ($p<0.04$). Although 76.5% demonstrated good ergonomic awareness (mean score 6.23±0.16), prolonged scanning sessions exceeding three hours without breaks significantly increased WMSD risk ($p<0.05$), while post-scan stretching reduced risk ($p=0.01$).

CONCLUSION

Despite high ergonomic awareness, WMSDs remain highly prevalent among sonographers, highlighting a persistent knowledge-practice gap. Age and scanning duration are key risk factors.

CLINICAL RELEVANCE/APPLICATION

These findings emphasize the urgent need for practical ergonomic interventions, including mandated break protocols and stretching programs, to reduce WMSD risk globally and to support a sustainable sonography workforce.

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T2-SPNR

Neuroradiology Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPNR-1 CEREBRAL MICROBLEEDS IMAGED BOTH IN-VIVO AND EX-VIVO: AN MRI AND NEUROPATHOLOGY STUDY IN A COHORT OF COMMUNITY-BASED OLDER ADULTS

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Grant Nikseresht, MS (*Abstract Co-Author*)
Abdur Raquib Ridwan, PhD (*Abstract Co-Author*)
Shengwei Zhang, PhD (*Abstract Co-Author*)
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PURPOSE

Cerebral microbleeds (CMBs), seen as small hypointense spots on T 2 * -weighted gradient echo MRI, are primarily small brain hemorrhages. CMBs are common in community-based older adults and are linked to increased risk of intracerebral hemorrhage and stroke.To date, the link between CMBs in in-vivo and ex-vivo MRI has not been systematically investigated in older adults. In this study, CMBs that appear in both in-vivo and ex-vivo MRI were investigated and the association of these findings with neuropathologies were assessed.

METHODS AND MATERIALS

The longitudinal study included 37 community-based older adults who participated in aging studies. All participants underwent cognitive function testing and brain MRI annually. Whole brain 3D-T 1 w MPRAGE (1×1×1mm 3), and multi-echo gradient-echo (ME-GRE) (0.7×0.7×1.3mm 3) MRI were acquired in-vivo using 3T scanners. After death and autopsy, one cerebral hemisphere 3D multi-echo spin-echo (ME-SE) (0.6×0.6×1.5mm 3) and ME-GRE (1×1×1mm 3) of each participant was imaged ex-vivo with 3T scanners. Following ex-vivo MRI, all hemispheres underwent pathologic assessment including vascular pathologies like cerebral amyloid angiopathy (CAA), arteriolosclerosis, atherosclerosis, gross and microscopic infarcts. CMBs were annotated on the last acquired in-vivo before death and ex-vivo ME-GRE blinded to all pathologic, clinical and other imaging data. The ex-vivo CMB mask was first transformed to ME-SE space, then registered to the MIITRA atlas. The in-vivo CMB mask for the corresponding ex-vivo hemisphere was registered to MPRAGE and subsequently registered to the MIITRA template. The two CMB masks for each participant were then superimposed in MIITRA atlas to assess chronological changes in CMB characteristics. In-vivo and ex-vivo CMBs that overlapped exactly were considered to be the same CMBs and denoted as matched CMBs.

RESULTS

Of the 37 participants, 13 (35%) had at least one CMB in in-vivo, 22 (59%) had at least one CMB in ex-viv, 21 (57%) showed exact match between in-vivo and ex-vivo CMBs. In most of the mismatched cases, ex-vivo CMB counts were higher than in-vivo. The ex-vivo CMB counts were higher than in-vivo in participants with higher antemortem intervals, higher CAA burden (odd ratio: 3.6, $p < 0.1$).

CONCLUSION

This study combined in-vivo and ex-vivo MRI with pathological data from 37 older adults within a community cohort. This investigation showed that CMBs observed during life persist in the brain and can be detected on ex-vivo MRI. More CMBs develop over time in individuals CAA.

CLINICAL RELEVANCE/APPLICATION

We demonstrated that cerebral microbleeds (CMBs) detected in-vivo were also detected ex-vivo. Ex-vivo CMBs can be reliably utilized to develop biomarkers for age-related neuropathologies.

T2-SPNR-3 IDENTIFICATION OF THE OUTER SUBARACHNOID SPACE IN PATIENTS AFTER ANEURYSM CLIPPING SURGERY

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Yumi Tai (*Abstract Co-Author*)
Tomoko Ochi (*Abstract Co-Author*)
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PURPOSE

Subarachnoid lymphatic-like membranes (SLYMs) have recently been identified. SLYMs are the fourth meningeal layer in the arachnoid space and are considered impermeable membrane structures, as they do not allow the passage of hemoglobin or even dextran with a molecular weight as small as 3 kDa. Consequently, the subarachnoid space (SAS) is subdivided into outer and inner compartments. Physical rupture of the SLYMs can occur during craniotomy clipping. This study aimed to identify normally invisible SLYMs on MRI and investigate the appearance of abnormal outer SAS in patients who underwent aneurysm clipping surgery.

METHODS AND MATERIALS

We retrospectively analyzed 19 out of 29 patients who underwent craniotomy clipping surgery at our institution in 2023, excluding four patients who did not undergo postoperative T2-weighted image and six patients whose MRI was not performed within 30 days after surgery. The mean age was 65.8 years, with 13 females and 6 males. Fifteen patients had ruptured aneurysms and four had unruptured aneurysms. Head MRI was performed at an average of 7.6 days postoperatively. Based on the anatomical fact that the superficial cerebral veins run along the SLYM, membrane-like structures accompanying these veins were interpreted as SLYMs on MRI. A fluid area located lateral to these membranes was considered to be an enlarged outer SAS. The thickness of this space was measured on both the craniotomy and contralateral sides. For patients with available follow-up imaging, changes in the size of the outer SAS were also evaluated over time.

RESULTS

An enlarged outer SAS was observed in 16 patients, with a mean thickness of 5.4 mm (standard deviation 2.42). In seven patients, an enlarged outer SAS was also found on the contralateral side, with a mean thickness of 3.9 mm (standard deviation, 1.64). Among the 16 patients with an enlarged outer SAS, 11 underwent follow-up imaging: the outer SAS disappeared in 8 patients, persisted in 2 patients, and evolved into hemorrhage in 1 patient.

CONCLUSION

An enlarged outer SAS was identified in a relatively large number of patients after aneurysm clipping surgery. Follow-up observations showed that the outer SAS disappeared in the majority of patients.

CLINICAL RELEVANCE/APPLICATION

Visualization of the outer subarachnoid space on postoperative MRI may serve as indirect evidence for the presence of SLYMs, supporting the anatomical concept of compartmentalization within the subarachnoid space. This enhanced understanding of membrane-based neuroanatomy may contribute to more accurate interpretations of cerebrospinal fluid dynamics as well as the pathophysiology of conditions such as subpial fluid collections and subarachnoid hemorrhage.

T2-SPNR-4 ALTERED SUPERFICIAL WHITE MATTER IN ADOLESCENTS WITH CONDUCT DISORDER: A DIFFUSION MRI STUDY OF REPRODUCIBLE U-FIBER BUNDLES

Panshi Liu (*Presenter*)

PURPOSE

To investigate superficial white matter microstructural alterations in adolescents with conduct disorder (CD) by analyzing the fractional anisotropy (FA) of reproducible U-fiber bundles, and to compare these findings with typically developing controls (TC) using diffusion MRI.

METHODS AND MATERIALS

A total of 331 adolescents with CD were included, and 331 age-, sex-, and socioeconomic status-matched TC adolescents were selected using a propensity score matching approach from a publicly available dataset. Diffusion-weighted MRI data were processed using a tractography pipeline in MRtrix to generate two million anatomically constrained streamlines, with lengths ranging from 10 to 50 mm. Streamlines were filtered for U-shaped morphology using the Scilpy toolbox and further refined by excluding outliers. Reproducible U-fiber bundles were identified by retaining streamlines present in at least 75% of participants, an empirically determined threshold, resulting in 78 consistent bundles. DTI microstructural measures of FA values were computed for each of the 78 U-fiber bundles. Because the U-fiber data were highly correlated, we used principal component analysis (PCA) to extract the most relevant components that accounted for the primary variance. Linear mixed-effects (LME) models were used to assess group differences, with group (CD vs. TC) treated as a fixed effect.

RESULTS

Four principal components (PCs) were retained based on visual inspection of the scree plot: PC1, PC2, PC3, and PC4, encompassing 39, 19, 8, and 12 U-fiber bundles, respectively. LME model results showed significant group differences in PC1 (ß = 0.6949, P FDR = 0.0386) and PC4 (ß = 0.5527, P FDR = 0.0106). These findings suggest that FA values in the corresponding U-fiber bundles were lower in the TC group, indicating relatively higher FA in adolescents with CD in these superficial white matter pathways.

CONCLUSION

Our findings suggest that atypical superficial white matter microstructure, reflected in increased FA of reproducible U-fiber bundles, may be a characteristic neurodevelopmental feature of CD in adolescence.

CLINICAL RELEVANCE/APPLICATION

These structural differences, identifiable through diffusion MRI, underscore the potential of U-fiber-based biomarkers in differentiating developmental psychopathologies and advancing precision psychiatry in adolescent populations

T2-SPNR-5 TEXT-PROMPTED AI WITH VESSEL-VOLUME GUIDANCE FOR ACCURATE ANTERIOR LVO CLASSIFICATION ON CT ANGIOGRAPHY

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PURPOSE

This study aims to evaluate and compare the performance of AI-based CT angiography analysis for classifying anterior large vessel occlusion (LVO), depending on the application of automated text-prompting guided by vascular volume information.

METHODS AND MATERIALS

We used 1,862 CTA cases of acute ischemic stroke to train the classification model. To extract vascular volumes, the input images were resampled to 1-mm isotropic voxels and intensity-normalized. Cerebral vessels were manually segmented by two neuro-experts, covering the distal cavernous segment of the internal carotid artery (ICA) to the distal middle cerebral artery (MCA). Right and left vessel volumes were quantified and converted into an English sentence (e.g., "Right ICA is larger: R 1,119 mm^3, L 878 mm^3; ratio 1.27"). The CTA source images and the generated sentence were then tokenized using a frozen text encoder (CLIP (ViT-B/32)). An independent test set (total = 284; LVO-positive = 142, LVO-negative = 142) was collected, with the ground truth determined by an experienced neuro-interventionist. The performance of the text-prompted network was compared to that of an identically configured image-only network. Ensemble-based inference was performed using combined 5-fold cross-validated models for both networks.

RESULTS

The text-prompted network demonstrated higher performance than the image-only network (AUC = 0.982 vs. 0.968; accuracy = 0.949 vs. 0.912). It identified five additional true positives while reducing the number of false positives and negatives. As a result, sensitivity and specificity improved from 90% to 94%, and from 92% to 96%, respectively.

CONCLUSION

Embedding vessel-volume text prompts in a CTA-based LVO classifier significantly enhances the automated detection of ICA and MCA occlusions, while reducing false alerts compared to an image-only approach.

CLINICAL RELEVANCE/APPLICATION

Integrating quantitative vessel-volume descriptions as text prompts can strengthen automated LVO triage and support faster, more reliable endovascular treatment decisions.

T2-SPNR-6 ENHANCED NEUROVASCULAR IMAGING WITH ULTRA-HIGH-RESOLUTION CT AND DEEP LEARNING-BASED IMAGE RECONSTRUCTION: FOCUS ON INTRACRANIAL VEINS AND SINUSES

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Antoine Sanner (*Abstract Co-Author*)
Marc A. Brockmann, MD (*Abstract Co-Author*)
Ahmed Othman, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic benefits of deep learning-based image reconstruction for venous neurovascular imaging using Ultra-High-Resolution CT (UHR-CT) in comparison to standard hybrid iterative reconstruction (HIR) applied to UHR-CT datasets.

METHODS AND MATERIALS

This retrospective, single-center study included 33 consecutive patients who underwent cranial computed tomography (CCT) and venous computed tomography angiography (CTA) to exclude sinus or venous thrombosis, post-interventionally after stent implantation for hydrocephalus, or to assess the anatomical relationship of sinus/venous structures in cases of intra-axial tumors. Imaging was performed using a UHR-CT system. Hybrid iterative image reconstruction (HIR) was applied to UHR-CTA datasets, which were reconstructed with a 0.25 mm slice thickness and a 1024 x 1024 reconstruction matrix. Additionally, a vendor-specific deep learning algorithm, trained for neurovascular analysis, was applied to the UHR-CTA datasets (DL-UHR-CTA), also reconstructed with a 0.25 mm slice thickness and a 1024 x 1024 reconstruction matrix. Quantitative analyses included the signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) using software tools. Qualitative assessments of image quality, contrast, noise, artifacts, diagnostic confidence, and assessability of various sinuses and intracranial veins were conducted by three radiologists using a 4-point Likert scale.

RESULTS

SNR and CNR values in DL-UHR-CTA significantly outperformed UHR-CTA ($p < 0.05$). Qualitative analysis showed that DL-UHR-CTA provided significantly better overall image quality, contrast, diagnostic confidence, and assessability across all vessel segments, with fewer artifacts and less noise compared to UHR-CTA and NR-CTA ($p < 0.05$).

CONCLUSION

Deep learning-based reconstruction of UHR-CT images in neurovascular imaging significantly improves overall image quality, vascular delineation, SNR, and CNR compared to hybrid iterative reconstruction alone.

CLINICAL RELEVANCE/APPLICATION

These enhancements may improve the anatomical understanding of the sinus and intracranial veins and be helpful in assessing pathologies such as thrombosis.

T2-SPNR-7 HYBRID DIFFUSION (HYDI): NEURITE ORIENTATION DISPERSION AND DENSITY IMAGING (NODDI) AND DIFFUSION KURTOSIS MRI OF THE SPINAL CORD AS BIOMARKERS OF ALS DISEASE PROGRESSION IN INDIVIDUALS CARRYING C9ORF72

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Devon M. Middleton (*Abstract Co-Author*)
Laura Krisa (*Abstract Co-Author*)
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PURPOSE

Familial ALS is most often associated with pathogenic expansion of C9orf72 . Timely diagnosis can be limited by the absence of early markers of disease progression, between the onsets of cellular change and clinically observable muscle weakness. While cervical motor function offers survival prognosis, the predictive role of neuroimaging in those at genetic risk remains of interest. The standalone clinical utility of diffusion tensor imaging (DTI) is limited by low specificity. Kurtosis imaging (DKI) characterizes non-gaussian diffusion of water molecules in the presence of microstructural hindrances. Neurite orientation dispersion and density imaging (NODDI) allows voxel-wise compartmentalization of diffusion signal as intracellular, extracellular, or isotropic/CSF. The derived orientation dispersion index (ODI) corresponds to wider variations in directionality, providing a more inclusive view of neuronal microstructure. This study examines DTI and higher-order microstructural (NODDI/DKI) metrics in the cervical spinal cord as potential early biomarkers of latent ALS progression in asymptomatic C9orf72 carriers (C9+).

METHODS AND MATERIALS

Clinical and MRI data were obtained from four C9orf72 carriers and six age- and sex-matched, neurologically intact controls (mean age 41 years). The C9+ group was also scanned after six months. Images of the cervical spinal cord (C1-C7) were acquired using a 3.0T Siemens Prisma MRI scanner system with 64-channel and 24-channel coils, with T1 and T2 anatomical sequences and a custom inner field-of-view hybrid diffusion (iFOV-HYDI) MR sequence. Diffusion metrics were extracted after motion correction, coregistration, and model fitting. Results were examined by group and spinal level using t-tests and Pearson correlation coefficients.

RESULTS

Group-wise comparisons showed significant differences in ODI and axial kurtosis (AK) at both time points between control and C9+ groups, mostly at C3-C6. Paired t-tests of the C9+ group at baseline and follow-up showed a statistically significant increase in average MK and RK of the cervical cord, and increased FA at C5 and C6. Sporadic but significant changes of AD, MD, KFA, and ICVF were noted.

CONCLUSION

Higher-order microstructural models in diffusion MRI produce distinct observable differences between study groups as compared to standard diffusion tensor data. With a small sample size, the consistency and clinical relevance of these changes warrant ongoing recruitment and analysis.

CLINICAL RELEVANCE/APPLICATION

Continued follow-up of asymptomatic C9+ subjects may clarify temporal change and correlation of diffusion MRI and NODDI with clinical progression of disease, offering insight into improved sensitivity of radiologic biomarkers for ALS.

T2-SPNR-8 CLINICAL VALIDATION OF A COMMERCIALLY AVAILABLE AI TOOL FOR EMERGENCY INTRACRANIAL HAEMORRHAGE DETECTION ON NCCT

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Bruno A. Rocha, MD, PhD (*Abstract Co-Author*)
Carlos Jorge da Silva, PhD, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic performance of a commercially available AI tool for detecting ICH on non-contrast head CT, using expert radiologist consensus as the reference standard.

METHODS AND MATERIALS

This retrospective study included 973 anonymized non-contrast head CT scans from routine clinical practice, representing a mix of hemorrhagic and non-hemorrhagic cases. The AI tool was tested for its ability to detect brain hemorrhages, with ground truth labels determined by consensus review from two board-certified neuroradiologists. Diagnostic performance was assessed using the area under the receiver operating characteristic curve (AUC).

RESULTS

The AI tool demonstrated strong diagnostic performance across various hemorrhage subtypes, with high AUC values: 0.885 for intracranial hemorrhage, 0.905 for pericerebral hematoma, 0.898 for subdural hematoma, 0.827 for subarachnoid hemorrhage, 0.918 for intraparenchymal hemorrhage, and 0.948 for intraventricular hemorrhage. The tool showed high specificity (>0.94), making it effective for ruling out hemorrhages. Sensitivity varied from 0.43 (subdural hematoma) to 0.79 (intracranial hemorrhage), with potential for improvement through post-deployment threshold adjustments. Negative predictive value (NPV) was high (0.71-0.98), supporting triage use, while positive predictive value (PPV) ranged from 0.46 to 0.90, highlighting the need for radiologist confirmation.

CONCLUSION

The AI tool demonstrated strong performance, with high specificity and NPV across multiple hemorrhage subtypes. Its ability to detect both common and critical hemorrhages supports its role in emergency and high-volume settings. Adjusting thresholds could improve sensitivity, optimizing its clinical utility.

CLINICAL RELEVANCE/APPLICATION

AI-assisted CT interpretation can expedite diagnosis, reduce missed findings, and assist radiologists in delivering timely care, particularly in high-demand environments. It can also reduce clinician workload and improve patient outcomes by aiding early intervention in cases of brain haemorrhage.

T2-SPNR-9 DEVELOPMENT OF INTRACRANIAL ATHEROSCLEROTIC DISEASE AND ISCHEMIC STROKE RISK IN BRAIN TUMOR PATIENTS: A LONGITUDINAL STUDY;PRELIMINARY FINDINGS

Mohamed Hassan, MD (*Presenter*)

PURPOSE

As brain tumor patient survival improves, acute ischemic stroke (AIS) is a growing concern in this population [1,2]. . Since intracranial atherosclerotic disease (ICAD) is a leading cause of stroke globally [3], we developed a unique intracranial vessel wall MRI (IVW) database to longitudinally assess ICAD and AIS incidence in brain tumor patients.

METHODS AND MATERIALS

we retrospectively reviewed imaging for brain tumor patients (diagnosed from 1984 to 2024) at our oncology center from 2018 to 2025. Demographic and clinical data, including the brain tumor (primary or metastasis, WHO grade and IDH mutation) and therapy details (surgery, radiation, and chemotherapy) and cardiovascular risk factors , were recorded. All patients underwent brain MRI with IVW surveillance during follow-up. we reviewed each IVW for the presence of vasculopathy and associated features. For ICAD, plaque prevalence, pattern of involvement, circumferential location, total plaque number, arterial segment of involvement and the degree of ICAD lumen stenosis were assessed. Additionally, AIS occurrence was assessed as an endpoint event.

RESULTS

To date, 1,300 patients have been included. A preliminary analysis of 350 patients (mean age 51.9 years, 38.9% male) showed that 78.9% had primary brain tumors, and 72.0% underwent surgery. Median follow-up was 3.5 years, with 37.7% mortality. Of the tumors, 230(65.7%) were primary glial tumors (WHO Grade I: 6.2%, Grade II: 16.5%, Grade III: 17.4%, Grade IV: 25.6%). 74.5% patients underwent radiation therapy, 52.3% patients underwent chemotherapy; and 45.2% underwent both. Table presents the IVW findings. At baseline, no cases of vasculitis or moyamoya disease were observed. However, 4 patients (1.1%) were found to have an aneurysm, and 2 patients (0.8%) had arterial dissection. Atherosclerosis was present in 36.5% of patients, with 22.3% having multiple plaques. A total of 291 plaques were identified, of which 238 (81.8%) showed enhancement. Specifically, 194 (66.7%) plaques exhibited grade 1 enhancement, while 48 (16.5%) had grade 2 enhancement. Over time, plaque prevalence increased to 41.4%, with 25.7% having multiple plaques. Among these, 81.5% of plaques showed enhancement, including 64.8% with grade 1 enhancement and 61 18.2% with grade 2 enhancement. AIS occurred in 5.1% of patients, with 8 out of 12 cases having plaques in the stroke-affected vascular territory.

CONCLUSION

In this study, we observed a significant prevalence of intracranial atherosclerotic plaques among brain tumor patients, with an increase in plaque burden over time.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the importance of early detection and management of ICAD to mitigate stroke risk and improve patient outcomes.

T2-SPNR-14 FINE-TUNED SEGMENT ANYTHING MODEL FOR AUTOMATIC INTRACRANIAL ANEURYSM SEGMENTATION IN TIME-OF-FLIGHT MR ANGIOGRAPHY: COMPARISON WITH NON-RADIOLOGIST PHYSICIANS

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PURPOSE

This study aimed to evaluate the performance of a Segment Anything Model (SAM)-based Artificial Intelligence (AI) model fine-tuned for automatic detection and segmentation of intracranial aneurysms on Time-of-Flight MR angiography (TOF-MRA).

METHODS AND MATERIALS

The AI model, fine-tuned on 397 TOF-MRA scans, enhances SAM by integrating convolutional neural network-based encoder features and a self-prompting module for tiny lesion segmentation. The AI model and two non-radiologist physicians assessed 30 aneurysm-containing TOF-MRA scans not used in training. We compared patient- and lesion-wise sensitivity, lesion-wise positive predictive value (PPV), segmentation accuracy (Dice Similarity Coefficient, DSC), and patient-wise segmentation time. DSC was measured based on manual annotations by a neuroradiologist with 15 years of experience. The same comparisons were conducted in subgroups stratified by aneurysm size (small <5 mm vs. large =5 mm), location, and lobularity.

RESULTS

Among the 30 TOF-MRA scans, a total of 52 aneurysms were detected and segmented. Of these, 84.6% were small, 40.4% were in the middle cerebral artery, and 78.8% were unilobular. The AI model achieved 76.7% patient-wise sensitivity, 82.7% lesion-wise sensitivity, 84.3% PPV, and a median DSC of 69.7 (IQR 48.4-78.4), showing comparable performance to human readers—Reader 1: 63.3%, 69.2%, 80.0%, and 71.2 (IQR 52.3-81.7), respectively; Reader 2: 63.3%, 69.2%, 85.7%, and 73.4 (IQR 62.3-77.8), respectively. The AI model completed segmentation in a median time of 0.74 min (IQR 0.65-0.79), notably faster than human readers (both $P < .001$). In size-stratified analysis, the AI model showed a trend toward higher sensitivity (81.8%) for small aneurysms than human readers (both 63.6%), reaching statistical significance compared to Reader 2 ($P = .039$) and borderline significance compared to Reader 1 ($P = .077$). The AI model yielded similar segmentation accuracy between small and large aneurysms ($P = 1.000$), while human readers tended to show higher accuracy for large aneurysms (Reader 1: $P = .086$; Reader 2: $P = .014$). No significant differences were found within each location or lobularity subgroup.

CONCLUSION

The SAM-based AI model showed a tendency toward higher sensitivity for detecting small aneurysms than non-radiologist physicians. It also achieved consistent segmentation performance across aneurysm sizes, unlike human readers whose accuracy showed a declining trend for small aneurysms. Additionally, it completed segmentation markedly faster than the physicians.

CLINICAL RELEVANCE/APPLICATION

Fine-tuned SAM-based AI model may assist non-expert clinicians in detecting small aneurysms reliably, particularly in settings with limited neuroradiologist support.

T2-SPNR-15 TOPOLOGICAL DISRUPTION OF WHITE MATTER NETWORKS IN ANTIPSYCHOTIC-TREATED SCHIZOPHRENIA WITH METABOLIC SYNDROME: A DTI GRAPH THEORY STUDY

Ying LI (*Presenter*)

PURPOSE

Patients with chronic schizophrenia often develop metabolic syndrome (MS) during antipsychotic treatment, potentially altering white matter microstructure. This study examines white matter network topology in schizophrenia patients with MS using DTI graph theory, and explores correlations with MS indicators.

METHODS AND MATERIALS

The study included 26 schizophrenia patients with MS (SZ-MS), 22 without MS (SZ-nMS), and 24 healthy controls (HC). White matter networks were reconstructed from DTI data and analyzed using graph theory. Group differences in network topology were assessed ANCOVA with Bonferroni correction, and correlations with clinical measures (e.g., BMI, waist/hip circumference) were evaluated.

RESULTS

At the global level, compared with the HC group, both patient groups showed increased normalized clustering coefficient and small-worldness, with decreased local efficiency (all $p < 0.05$). Furthermore, the SZ-MS group demonstrated an increase in small-world networks and decreases in global and local efficiency (all $p < 0.05$). At the nodal level, both patient groups exhibited reduced NE and increased NLp versus HC in the prefrontal cortex, left precentral/postcentral gyri, parietal cortex, bilateral thalamus, and right superior temporal gyrus (all $p<0.05$). Compared to SZ-nMS, the SZ-MS group showed more pronounced NE reductions and NLp increases in the prefrontal cortex, left angular gyrus, right superior parietal gyrus, and right superior temporal gyrus (all $p<0.05$). Notably, NE in left triangular part of superior frontal gyrus ($r=-0.358$), right dorsolateral superior frontal gyrus ($r=-0.322$), left angular gyrus ($r=-0.425$), and right superior temporal gyrus ($r=-0.353$) inversely correlated with waist circumference, while NLp showed positive correlations ($r = -0.356$, $r = -0.35$, $r = -0.416$, $r = -0.349$) in these regions.

CONCLUSION

SZ-MS exhibits distinct white matter network disruptions, featuring enhanced small-worldness but impaired information transfer efficiency. Notably, these patients showed more pronounced NE reductions and NLp increases in the prefrontal cortex, left angular gyrus, right superior parietal gyrus, and right superior temporal gyrus. These alterations significantly correlated with metabolic indices, suggesting MS may exacerbate white matter damage in schizophrenia.

CLINICAL RELEVANCE/APPLICATION

Chronic schizophrenia patients with MS show more severe white matter network topological disruptions, providing neuroimaging evidence for MS-associated neuropathology.

T2-SPNR-17 DIAGNOSTIC EVALUATION OF A NOVEL ACCELERATED 2D FAST SPIN ECHO-BASED FLAIR IMAGING AT 3T

Chen-Hua Chiang, MD (*Presenter*)
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PURPOSE

Routine whole brain high 2D fast spin echo-based (FSE) FLAIR imaging can take 4-5 minutes at 3T using routine methods, limiting clinical use.

METHODS AND MATERIALS

Twenty-five consecutive patients underwent brain MRI at 3T, which included FSE 2D FLAIR (TR/TE 8000/78, auto TI, FOV 220x220, Acquisition Matrix 320x224, Echo Train Length 14, Flip Angle 160, acquisition time 3:21 minutes) and a novel VORTEX (VERSE SAR reduction, Optimized RF waveform, Refocus flip angle modulation, Tuned Hyper Echoes, External volume suppression, X-factor spin efficiency) FLAIR (TR/TE 8000/102, auto TI, FOV 220x220, Acquisition Matrix 320x224, Echo Train Length 29, Flip Angle 180, 2:17 minutes). Two board-certified neuroradiologists independently performed blinded, randomized, head-to-head qualitative assessments using a published 5-point scale for: motion artifact, perceived noise, gray-white matter (GM/WM) differentiation, perceived sharpness, and overall diagnostic quality. Discrepant ratings were resolved by adjudication from a third neuroradiologist. Interrater agreement was quantified using weighted Cohen ? statistics. Superiority testing was performed using a one-sided Wilcoxon signed-rank test while equivalence was assessed using two one-sided Wilcoxon tests with a pre-specified equivalence margin of ±1 point.

RESULTS

In the 25 (mean age: 62.1 ± 17.2 years; 18 females, 7 males) patients, almost perfect interrater agreement was observed for GM/WM differentiation (? = 1.00, $p < 0.001$), with substantial agreement for motion artifact (? = 0.73, $p < 0.001$) and fair agreement for perceived noise (? = 0.26, $p = 0.040$) was observed. Perceived sharpness and overall diagnostic quality demonstrated high raw agreement (96% and 92%, respectively), although ? values were low due to low rating variability. VORTEX FLAIR demonstrated significantly better perceived noise ratings compared to standard FLAIR (FDR-adjusted $p = 0.012$). The remaining 4 categories demonstrated statistical equivalence within a ±1-point margin.

CONCLUSION

VORTEX FLAIR significantly improved perceived noise ratings and was equivalent to standard 2D FLAIR across all other image quality domains, while reducing scan time by 32%, supporting the use of VORTEX FLAIR in routine clinical practice.

CLINICAL RELEVANCE/APPLICATION

2D fast spin echo-based FLAIR imaging is an important part of routine brain MRI protocol. However, acquisition time for high resolution 2D FLAIR can be more than 4 min. We have evaluated a prototype 2D fast spin echo-based FLAIR technique at 3T and demonstrated that this method is feasible with 32% scan time reduction compared to the standard 2D fast spin echo-based FLAIR.

T2-SPNR-18 MRI-LEVEL DIAGNOSTIC PERFORMANCE IN NEURODEGENERATION CLASSIFICATION ON HEAD CT AIDED BY SUPER-RESOLUTION SYNTHETIC MRI

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Alger Remirata (*Abstract Co-Author*)
Qicong Sun (*Abstract Co-Author*)
Thomas Welton, PhD (*Abstract Co-Author*)
Shi Ni Phua (*Abstract Co-Author*)
Jia Shuen Yee (*Abstract Co-Author*)
Wei Liang Hong (*Abstract Co-Author*)
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Sarat K. Sanamandra, MBBS, FRCR (*Abstract Co-Author*)
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Eng King Tan (*Abstract Co-Author*)
Beng Chin Ooi (*Abstract Co-Author*)
Ling Ling Chan, MBBS, FRCR (*Abstract Co-Author*)

PURPOSE

Accurate brain parcellation is crucial for identifying regional brain atrophy in neurodegenerative disorders. While this capability is commercially available on MRI, it is lacking on CT, a fast, accessible and economical imaging modality. To address this gap, we developed an automated multistage brain parcellation pipeline for neurodegeneration classification using head CT.

METHODS AND MATERIALS

We collected paired head CT-MRI data from (1) 486 prospectively recruited subjects (385 healthy controls, 101 with dementia or parkinsonian disorders) who underwent same-day scans and (2) 586 retrospectively recruited patients (429 without focal intracranial lesions, 157 with dementia or parkinsonian disorders) who underwent same-month scans across scanner mix and field strengths (1.5T and 3T). All MRI comprised 3D T1-weighted MPRAGE with 1 mm 3 isotropic resolution. Synthetic MR images were generated from CT data using FreeSurfer's deep learning-based SynthSR. Lobe-based brain parcellation was performed on both CT-derived synthetic MRI and directly acquired MPRAGE MRI images using FreeSurfer. Brain structure volumes from both hemispheres were used as features in the classification pipeline, with all volumetric measurements normalized by age and intracranial volume (ICV). We employed resampling techniques to address class imbalance. Using a 30:20:50 data split, we trained, validated and tested gradient boosting classifiers (CatBoost, XGBoost, and LightGBM) to perform classification of patients with neurodegeneration.

RESULTS

CT-derived synthetic T1-weighted MRI showed high similarity to directly acquired MPRAGE, with a Dice similarity coefficient of 0.91 ± 0.05 and normalized root mean square error of 1.15 ± 0.39. Volume difference was minimal (1.76%) and not statistically significant ($p = 0.59$). CatBoost-based binary classifier using brain volume features from synthetic MRI achieved an ROC-AUC of 0.82 in distinguishing healthy controls from patients, comparable to the MRI benchmark (AUC 0.83).

CONCLUSION

SynthSR enables generation of high-fidelity synthetic T1-weighted MRI from CT data, allowing robust brain parcellation and classification of neurodegeneration from head CT with diagnostic performance on par with the commercial MRI standard.

CLINICAL RELEVANCE/APPLICATION

Head CT is an indispensable tool for exclusion of intracranial haemorrhage in the Emergency Department given the silent epidemic of adult fall-related head injuries, and constitutes significant neuroradiology caseload. Automated MRI-level diagnostic performance in neurodegeneration classification using head CT holds promise as an opportunistic screening tool for detection of neurodegeneration and triage for early rehabilitative measures.

T2-SPNR-19 A MULTITASK MULTIMODAL NEUROIMAGING AND GENETIC FRAMEWORK FOR JOINT PREDICTION OF COGNITIVE DECLINE AND CONVERSION TIME IN PRECLINICAL ALZHEIMER'S DISEASE

Gorkem Durak, MD (*Presenter*)
Salma Hassan (*Abstract Co-Author*)
Mostafa Salem (*Abstract Co-Author*)
Vijay R. Papineni, FRCR,MBBS (*Abstract Co-Author*)
Ayman Elsayed (*Abstract Co-Author*)
Mohammad Yaqub (*Abstract Co-Author*)

PURPOSE

To address the critical need for early detection tools in preclinical Alzheimer's Disease (AD), we developed and validated a novel AI approach capable of simultaneously predicting cognitive decline and time-to-conversion, informing timely intervention decisions.

METHODS AND MATERIALS

We developed MAGNET-AD, a multimodal approach integrating longitudinal structural and functional MRI scans, genetic data, and clinical assessments from 1,787 clinically normal older individuals (ages 65-85) with elevated amyloid levels from the A4 study. Brain MRIs were segmented to identify 32 distinct brain structures. Radiomic features were extracted from each structure while functional MRI (fMRI) data captured functional connectivity patterns. A foundational model, pretrained on large-scale neuroimaging datasets including dementia patients, was leveraged to extract rich anatomical embeddings that captured subtle structural variations relevant to early neurodegeneration. All data modalities were fused using a spatiotemporal graph neural network architecture, representing brain regions and genetic markers as interconnected nodes evolving over time. The model was evaluated using a five-fold cross-validation.

RESULTS

MAGNET-AD achieved a concordance index of 0.858 for conversion time prediction and a mean squared error of 1.983 for PACC prediction, significantly outperforming existing approaches. The model maintained robust performance even with limited temporal data. Model interpretability analysis revealed progressive shifts in the importance of brain regions across visits, with attention patterns aligning with the established Braak staging of AD pathology progression. Visualization of regional importance across longitudinal visits showed increasing attention to temporal, parietal, and frontal regions at later visits, consistent with known patterns of tau and amyloid spread.

CONCLUSION

MAGNET-AD demonstrates superior capability in modeling the complex interplay between genetic factors and longitudinal brain changes in preclinical AD, providing both accurate predictions and interpretable insights into disease mechanisms that correlate with established neuropathological staging.

CLINICAL RELEVANCE/APPLICATION

MAGNET-AD enables clinicians to identify high-risk patients earlier in disease progression, prioritize resources for those with faster predicted conversion times, and monitor treatment efficacy through changes in predicted trajectories. The model's attention maps provide visual confirmation of disease progression patterns aligned with Braak staging, offering clinically interpretable validation that supports adoption in clinical practice.

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T2-SPOB

OB/Gynecology Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPOB-3 THE VALUE OF MDIXON-QUANT AND DWI QUANTITATIVE TECHNIQUES IN DIFFERENTIATING AGGRESSIVE FROM NON-AGGRESSIVE ENDOMETRIAL CARCINOMA: A COMPARATIVE ANALYSIS

Wei Kong (*Presenter*)

PURPOSE

To compare the value of apparent diffusion coefficient (ADC) and the modified Dixon-Quant (mDixon-Quant) technique in differentiating aggressive from non-aggressive endometrial carcinoma (EC).

METHODS AND MATERIALS

The data of 78 patients with EC confirmed by operation and pathology were retrospectively analyzed, including 30 aggressive cases and 48 non-aggressive cases. The preoperative MRI sequences included diffusion-weighted imaging (DWI) and mDixon-Quant imaging. After post-processing, fat fraction (FF), T2 * , transverse relaxation rate (R2 *), and apparent diffusion coefficient (ADC) maps were obtained. The FF, T2 * , R2 * and ADC mean values in lesions of the two groups of cases were measured by two radiologists (with more than 10 years of experience in MR diagnosis of pelvic diseases, both), who were blind to the pathological data, in the registered fusion maps which was based on fat suppression T2-weighted imaging. The independent-samples t -test or Mann-Whitney U test was performed to analyze the differences of each parameter values between the two groups. The receiver operating characteristic curve was used to evaluate the efficiency of the parameters with statistical difference in differentiating aggressive and non-aggressive of EC. Area under the curve (AUC), corresponding cut-off value, sensitivity and specificity were calculated.

RESULTS

The T2 * value in the aggressive group was significantly lower than that in the non-aggressive group, while the R2 * and ADC values were higher (all $P < 0.05$). There was no statistically significant difference in FF value between the two groups ($P > 0.05$). Based on a single parameter diagnosis, when T2 * value was 60.71 ms, the sensitivity was the highest (86.7%), and when R2 * value was 20.59 Hz, the specificity was up to the highest (79.2%). The AUCs of T2 * , R2 * , ADC and combined T2 * + R2 * +ADC values for differentiating the two groups of ECs were 0.799, 0.785, 0.656 and 0.799, respectively. The AUC of combined T2 * + R2 * +ADC values was not statistically different from those of T2 * , R2 * and ADC values (all $P > 0.05$).

CONCLUSION

Our study shows that mDixon-Quant and DWI techniques can differentiate aggressive from non-aggressive EC, which has the certain clinical utility, with better performance of T2 * value.

CLINICAL RELEVANCE/APPLICATION

According to the International Federation of Obstetrics and Gynecology (FIGO) 2023 guidelines, aggressive or non-aggressive histological type of EC has become an important basis for staging and treatment. The MR quantitative techniques can reflect the biological behavior, with the potential as a noninvasive tool to provide the reference for clinical treatment.

T2-SPOB-4 TIME-DEPENDENT DIFFUSION MRI FOR NON-INVASIVE DIFFERENTIATION OF CERVICAL CANCER: CORRELATION WITH PATHOLOGICAL CHARACTERISTICS

Wenyi Yue, MD (*Presenter*)
Junzhong Xu, PhD (*Abstract Co-Author*)
Chaoyang Jin (*Abstract Co-Author*)
xiaoyu jiang (*Abstract Co-Author*)
Dandan Zheng (*Abstract Co-Author*)
Qi Yang, MD (*Abstract Co-Author*)

PURPOSE

Time-dependent diffusion MRI enables cellular-level characterization of tissue microstructure but remains understudied in cervical lesions. Our study aimed To assess time-dependent diffusion MRI-derived microstructural parameters for the noninvasive differentiation of cervical lesions and the pathological characteristics of cervical cancer (CC).

METHODS AND MATERIALS

This prospective study included 102 patients with clinical suspicion of CC or cervical intraepithelial neoplasia (CIN) who underwent time-dependent diffusion MRI between January 2024 and February 2025. The IMPULSED method was performed to extract microstructural parameters, including cell diameter, intracellular volume fraction (vin), cellularity, and extracellular diffusivity (dex), along with three apparent diffusion coefficient measurements. Pearson correlation analysis was performed to evaluate the association between microstructural parameters and histopathological features. Diagnostic performance was assessed using the area under the receiver operating characteristic curve (AUC).

RESULTS

A total of 74 women who underwent colposcopy or surgery were enrolled. Time-dependent diffusion MRI-derived microstructural parameters can not only differentiate among cervical squamous carcinoma (CSC), cervical adenocarcinoma (CA), and CIN lesions ($P <.05$) but also demonstrate the feasibility to distinguish CC cohorts with various pathological characteristics ($P <.05$). v in exhibited the highest single-parameter AUC of 0.85 for distinguishing CSC from CA. For CSC vs CIN, D 17Hz achieved the best AUC (0.82). In distinguishing CA from CIN, cellularity achieved the highest individual AUC (0.75). Moreover, microstructural parameters demonstrated robust performance in classifying tumor grade (AUC, 0.76), tumor stage (AUC, 0.87), lymph-vascular space invasion status (AUC, 0.77), lymph node metastasis status (AUC, 0.94), Ki67 expression level (AUC, 0.74), and parametrial invasion status (AUC, 0.79). These parameters also showed strong correlations with corresponding pathological features ($r = 0.59$-0.82; $P<.01$).

CONCLUSION

This study presents the first application of time-dependent diffusion MRI in CC, demonstrating that cellular-level microstructural parameters offer superior diagnostic performance in distinguishing cervical neoplastic subtypes and classifying histopathological features in CC.

CLINICAL RELEVANCE/APPLICATION

These findings lay the groundwork for exploring the integration of preoperative time-dependent diffusion MRI into CC management to inform treatment planning, which will be validated using larger samples in future studies.

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T2-SPPD

Pediatric Imaging Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPPD-1 T1 RELAXATION TIME MEASUREMENT USING CS-MP2RAGE FOR PEDIATRIC MYELINATION ASSESSMENT

Younghee Yim, MD, PhD (*Presenter*)
Leehi Joo, MD (*Abstract Co-Author*)
Hye Shin Ahn, MD (*Abstract Co-Author*)
Jungbin Lee, MD (*Abstract Co-Author*)

PURPOSE

Despite quantifying myelination is essential for evaluating a wide range of clinical conditions, there is currently no established gold standard for its assessment. Quantitative mapping of MRI relaxation times is expected to provide reliable information to uncover the subtler changes than standard MRI. This study aimed to assess the clinical feasibility of accelerated quantitative T1 mapping using compressed sensing magnetization-prepared 2 rapid acquisition gradient echoes (CS-MP2RAGE) in children, as a method for T1 relaxation time measurement.

METHODS AND MATERIALS

A total 34 pediatric subjects (age range 18 months to 15 years) who underwent brain MRI, including CS-MP2RAGE sequence for growth screening without pathological MRI findings, were evaluated. Whole-brain T1 mapping was performed using a 3T MRI scanner. Mean T1 relaxation times were automatically calculated for brain structured based on volumetric segmentation from the T1 maps generated by CS-MP2RAGE. T1 relaxation times were analyzed across 36 brain regions, including the corpus callosum, white matter, deep gray matter and brain stem. Subsequently, we derived regression analysis for mean value and confidential interval.

RESULTS

Strong negative correlations were observed between T1 relaxation times in the basal ganglia structures, cerebral and cerebellar white matter, brain stem and the age of subjects ($r = -0.6$ - -0.7, $p < 0.001$). When analyzing the relationship between brain volume and T1 relaxation time, brain white matter- excluding the occipital lobe- also demonstrated strong negative correlations ($r = -0.6$ - -0.7, $p < 0.001$), while the basal ganglia and brain stem showed moderate negative correlations ($r = -0.4$ - -0.5, $p < 0.001$). Overall, T1 relaxation times in the pediatric brain decreased rapidly across all regions during the first three years of life and stabilized thereafter. The mean acquisition time for the CS-MP2RAGE was approximately 4 minutes, representing a ~ 50% reduction compared to the standard protocol.

CONCLUSION

Quantifying T1 relaxation time with CS-MP2RAGE based T1 mapping may help detect subtle changes in the pediatric brain in affordable scan time. This approach may facilitate the early detection of subtle alterations in brain tissue, enabling timely intervention or prevention strategies in pediatric patients.

CLINICAL RELEVANCE/APPLICATION

CS-MP2RAGE enables reliable T1 mapping with an affordable scan time of approximately 4 minutes. Since T1 relaxation time measurement using CS-MP2RAGE can allow for consistent qualitative evaluation of myelination and other subtle alteration of brain tissue, so we can expect early detection of possible abnormality and timely intervention in pediatric patients.

T2-SPPD-4 ALTERED SPONTANEOUS BRAIN ACTIVITY IN OBESE CHILDREN: A RESTING-STATE FUNCTIONAL MRI STUDY

Xin Wang, MD (*Presenter*)

PURPOSE

To identify resting-state neural signatures differentiating pediatric simple obesity (Simple OB) from obesity with metabolic syndrome (OB+MS) and establish their clinical-behavioral correlates.

METHODS AND MATERIALS

This prospective study enrolled 55 obese children (35 Simple OB, 20 OB+MS) and 24 age- and sex-matched healthy controls. Participants underwent resting-state fMRI (ALFF/fractional ALFF [fALFF] mapping), anthropometric assessments, metabolic profiling, and validated behavioral questionnaires (CEBQ/PAQ-C). Group differences in regional neural activity were analyzed via ANCOVA (covariates: age/sex) with Tukey's post-hoc testing. Significant clusters were correlated with clinical-behavioral measures using Pearson's coefficients.

RESULTS

(1) Group Differences: The OB+MS group demonstrated significantly higher ALFF in the right fusiform gyrus ($p = 0.0029$) and right precuneus ($p < 0.0001$) compared to the Simple OB group. Both obese groups showed increased ALFF versus HC in the right fusiform gyrus (Simple OB: $p = 0.0002$; OB+MS: $p < 0.0001$), right superior occipital gyrus (both $p < 0.0001$), and left inferior temporal gyrus (Simple OB: $p < 0.0001$; OB+MS: $p = 0.0001$). (2) Clinical Correlations: Right fusiform gyrus ALFF correlated with BMI ($r=0.6937$), TBF% ($r=0.2675$), ALT ($r=0.3853$), and AST ($r=0.3579$). Right precuneus ALFF associated with BMI ($r=0.3429$), TG ($r=0.2697$), DBP ($r=0.3737$), and HDL-C ($r=-0.3181$). Right superior occipital gyrus ALFF correlated with BMI ($r=0.6365$) and DBP ($r=0.2968$). (3) Behavioral Correlations: Left inferior temporal gyrus ALFF negatively correlated with CEBQ Emotional Undereating scores ($r=-0.5205$). Right superior occipital gyrus ALFF negatively associated with PAQ-C scores ($r=-0.4776$). (4) fALFF Findings: The OB+MS group exhibited higher fALFF in the right orbital middle frontal gyrus versus Simple OB ($p = 0.0002$), correlating with FBG ($r=0.3150$). Both obese groups showed increased fALFF in the left inferior temporal gyrus and right cingulate/paracingulate gyri versus HC (all $p < 0.0001$).

CONCLUSION

This study identified distinct neurofunctional signatures in pediatric obesity subtypes: (1) OB+MS showed hyperactivity in right fusiform gyrus and precuneus correlating with liver enzymes and lipids; (2) obese groups had occipitotemporal hyperactivity reflecting adiposity; (3) orbitofrontal hyperactivity in OB+MS linked to hyperglycemia. Behavioral correlations showed temporal/occipital ALFF inversely related to eating and activity.

CLINICAL RELEVANCE/APPLICATION

Right fusiform and precuneus ALFF increases may serve as neuroimaging biomarkers for early detection of metabolic syndrome in pediatric obesity, guiding targeted monitoring and intervention.

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T2-SPPH

Physics Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPPH-2 QUANTIFICATION ACCURACY, CONSISTENCY, AND IMAGE QUALITY IN DEEP-LEARNING CT RECONSTRUCTION KERNELS OPTIMIZED FOR PULMONARY IMAGING

Fong Chi Ho, MS (*Presenter*)
Mojtaba Zarei, PhD (*Abstract Co-Author*)
Steve Bache (*Abstract Co-Author*)
Ben Hauser (*Abstract Co-Author*)
Amar Kavuri (*Abstract Co-Author*)
Bryan O'Sullivan-Murphy, MD,PhD (*Abstract Co-Author*)
Ehsan Samei, PHD (*Abstract Co-Author*)
Ehsan Abadi, PhD (*Abstract Co-Author*)

PURPOSE

State-of-the-art deep-learning image reconstruction (DLIR) kernels have been specifically trained and optimized for chest CT. However, their performance remains to be established in terms of quantitative accuracy, consistency, and image quality. This study aimed to evaluate whether a newly developed suite of DLIR Lung kernels improves biomarker measurement accuracy, consistency, and image quality compared to the established technique of adaptive statistical iterative reconstruction (ASiR).

METHODS AND MATERIALS

Low-dose lung cancer screening CT scans were acquired from 50 patients. Sinograms were reconstructed using an FDA-cleared software (TrueFidelity, GE) with both ASiR and DLIR techniques, each with three denoising strengths and two slice thicknesses using the Standard kernel. Additionally, the DLIR technique included a Lung kernel. To complement the patient data, physical phantoms (Mercury, Gammex, and Kyoto) were imaged and quantified to systematically assess image quality and quantification accuracy. Lung imaging biomarkers included lung density (Perc15, LAA-950) and airway morphology (WA%, Pi10). Quantitative consistency was evaluated by computing per-patient differences (?) in relative to a reference setting. Tracheal HU and inter-patient variability were also analyzed to assess measurement robustness across reconstruction settings. Image quality metrics included modulation transfer function (MTF), noise power spectrum (NPS) and global noise index (GNI).

RESULTS

Compared to ASiR, DLIR-Lung reconstructions improved spatial resolution by up to 24%. When the highest denoising strength was applied, image noise was reduced by 36% in DLIR-Standard and 8% in DLIR-Lung. DLIR-Lung at high denoising strength demonstrated the most accurate and consistent tracheal air HU (-990.1±44.0) and enabled the visualization of the most distal airway generations (9.3 ± 0.7), outperforming ASiR kernels (<7).

CONCLUSION

DLIR-Lung reconstructions, particularly at high and medium strengths, consistently outperformed DLIR-Standard and ASiR in image quality, airway visibility and biomarker accuracy. Compared to ASiR-Standard and DLIR-Standard, DLIR-Lung showed lower noise, more airway generation detectability and more consistent quantification of lung density and airway wall area. These findings highlight the potential of DLIR-Lung for robust and consistent quantitative chest CT analysis.

CLINICAL RELEVANCE/APPLICATION

The study highlights that DLIR, using a kernel optimized for pulmonary imaging, improved image quality and enabled accurate and consistent quantification of both density- and airway-based biomarkers. These advancements may lead to improved diagnostic accuracy and management of pulmonary conditions.

T2-SPPH-5 COMPARISON OF LUNG TUMOR VOLUMES ACROSS 3D CT, 4D CT AND 4D CBCT MODALITIES AND THEIR RELATION TO BREATHING AMPLITUDE

Sunyoung Jang, PhD (*Presenter*)
Zhonglu Wang, PHD (*Abstract Co-Author*)
Kamal Jyot Kota, MS (*Abstract Co-Author*)
Joseph A. Miccio, MD (*Abstract Co-Author*)
Alexei Chvetsov, PhD (*Abstract Co-Author*)
Mitchell Machtay, MD (*Abstract Co-Author*)

PURPOSE

To compare lung tumor volumes measured on free-breathing CT, 4D CT AIP, 4D CT MIP, and 4D CBCT AIP in SBRT patients, and to assess whether anterior-posterior (A-P) breathing amplitude relates to the inter-modality volume differences.

METHODS AND MATERIALS

Fifteen patients with lung tumors underwent free-breathing 3D CT and 4D CT imaging for SBRT planning and 4D CBCT for SBRT image guidance prior to treatment delivery. The 4D acquisitions were performed using an abdominal compression belt. Gross tumor volumes (GTVs) were contoured using MIM software's edge detection tool on all imaging modalities. A-P breathing amplitudes were extracted from the RGSC system. Friedman and Wilcoxon signed-rank tests with Bonferroni correction were used for volume comparison. Bland-Altman analysis and intraclass correlation coefficient (ICC) were used to assess agreement. Spearman's rank correlation was used to evaluate the relationship between breathing amplitude and volume differences.

RESULTS

Significant differences in target volumes were observed among modalities (Friedman test, $p < 0.00001$). IGTVs derived from 4D CT MIP (median: 2.26 cc), which captured the full extent of tumor motion, were significantly larger than those from 3D CT (1.36 cc), 4D CT AIP (1.41 cc), and 4D CBCT AIP (1.88 cc) ($p < 0.05$). Motion-averaged images (4D CT AIP and 4D CBCT AIP) demonstrated similar tumor volume estimates; Bland-Altman analysis confirmed tight consistency between AIP-based

modalities. The ICC across all modalities was 0.878, indicating good reliability and agreement. No significant correlation was found between A-P amplitude (avg: 3.8 mm) and volume differences (Spearman ? = 0.02-0.25, p > 0.36).

CONCLUSION

Lung tumor volumes derived from 3D CT, 4D CT, and 4D CBCT were consistent and reliable with compression-based motion management. A-P breathing amplitude with the compression belt does not significantly correlate with tumor volume differences across imaging modalities. Incorporating 4D CBCT for patient setup provides an effective verification of target localization prior to radiation delivery in lung SBRT.

CLINICAL RELEVANCE/APPLICATION

This study supports the use of 4D CT and 4D CBCT with an abdominal compression belt as a reliable method for motion management. The lack of correlation between A-P breathing amplitude and inter-modality volume differences suggests that abdominal compression effectively reduces variability from respiratory motion. Incorporating 4D CBCT imaging during patient setup enables accurate verification of tumor positioning and alignment with planning volumes for precise dose delivery. These findings reinforce the clinical value of 4D imaging in motion-managed SBRT and support the integration of 4D CBCT as an effective image guidance tool.

T2-SPPH-6 GPU ACCELERATED SINGLE PHOTON IMAGING SIMULATION—VALIDATION AND PERFORMANCE EVALUATION

Zhihua Qi, PhD (*Presenter*)

PURPOSE

To validate a GPU accelerated single photon imaging simulation software library and evaluate its performance through tests based on NEMA standards, with a focus on sensitivity and spatial resolution in both planar and SPECT acquisition modes.

METHODS AND MATERIALS

The software library was written in C and Python with CUDA extensions. In the simulation of photon interactions, Woodcock tracking was utilized for efficient tracking of photons across the voxelized geometry. The angular response function method was used for efficient modeling of the interactions of the incident photons with collimators, a key aspect unique to single photon imaging. Simulations of phantom acquisitions by a Symbia Intevo SPECT/CT system (Siemens Healthineers, Erlangen, Germany) were performed and the results were compared against those obtained via experimental acquisition. A selected group of tests based on NEMA standards [4] were included in our work: (1) system planar sensitivity, (2) system volume sensitivity, (3) system spatial resolution without scatter, (4) whole-body system spatial resolution, and (5) SPECT reconstructed spatial resolution. Simulations were run on a PC equipped with an Intel Core i5-11400 CPU and an NVIDIA GeForce RTX 3060 GPU. SPECT reconstructions of the simulated data were performed using the MLEM algorithm in CASToR.

RESULTS

Based on the simulations, the system planar sensitivity and the system volume sensitivity were 335.90 cpm/μCi and 8.92×10^5 cps·mL/MBq, respectively. Their differences from the experimental measured values were 3.55% and 8.25%, respectively. The FWHM across the line source from the simulated and experimentally acquired images also agreed with within approximately 10% (3.51 mm vs 3.88 mm on trans-axial slices).

CONCLUSION

The GPU-accelerated software library for single photon imaging simulation is capable of simulating realistic images mimicking those acquired by clinical system. It can provide valuable guidance to Theranostic treatment through clinically oriented simulations.

CLINICAL RELEVANCE/APPLICATION

The software library allows rapid simulation (on the order of minutes without the need of extensive computing resources) of realistic clinical images acquired by Gamma camera systems. It would add value to numerous Theranostic applications, such as the optimization of quantitative imaging protocols to support post-treatment dosimetry and quick assessment of clinical outcomes through virtual clinical trials.

T2-SPPH-8 DUAL-PARAMETER OPTIMIZED ULTRA-LOW-DOSE CT FOR LUMBAR BONE MINERAL DENSITY ASSESSMENT: A PROSPECTIVE VALIDATION OF RADIATION REDUCTION AND DIAGNOSTIC ACCURACY

Mengqiang Xiao, MMEd (*Presenter*)
Rulin Xu (*Abstract Co-Author*)
Jun Chen (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility of a novel dual-parameter optimized ultra-low-dose CT (ULD-CT) protocol for quantitative lumbar bone mineral density (BMD) assessment, comparing its radiation dose, image quality, and diagnostic performance against standard-dose CT (SD-CT).

METHODS AND MATERIALS

In this prospective study, 245 patients scheduled for lumbar surgery underwent paired CT examinations using SD-CT (120 kV/250 mAs) and ULD-CT (100 kV/30 mAs) protocols. Radiation dose parameters (CTDIvol, DLP, and effective dose [ED]), objective (noise, signal-to-noise ratio, contrast-to-noise ratio) and subjective image quality (5-point Likert scale) were compared between groups. Volumetric BMD (vBMD) was measured on quantitative CT datasets, and subjects were categorized as having normal bone mass, osteopenia, or osteoporosis according to American College of Radiology criteria. Diagnostic accuracy was evaluated using receiver operating characteristic (ROC) curve analysis.

RESULTS

ULD-CT reduced radiation dose by 92.5% compared to SD-CT (ED: 0.88 vs. 11.68 mSv; CTDIvol: 1.93 vs. 25.66 mGy, both P < 0.001). Despite lower objective (P = 0.001-0.01) and subjective image quality (P < 0.001), ULD-CT maintained diagnostic acceptability (scores =3; interobserver ICC = 0.73). ULD-CT showed slight BMD overestimation but no significant differences in gender, age, or osteoporosis subgroups (P > 0.05). ROC analysis demonstrated high diagnostic accuracy (AUC: 0.986-0.996), with sensitivity/specificity of 94.74-100% and 95.74-98.01%, respectively.

CONCLUSION

The dual-parameter optimized ULD-CT protocol substantially reduces radiation exposure while preserving sufficient image quality and high diagnostic accuracy for lumbar BMD assessment. This approach provides a safe and effective alternative for osteoporosis screening and longitudinal bone health monitoring in clinical practice.

CLINICAL RELEVANCE/APPLICATION

The implementation of a dual-parameter ULD-CT protocol in routine clinical practice offers a significant advancement for early osteoporosis screening, particularly in high-risk populations. Its marked reduction in radiation dose allows for safe, repeated evaluations, enhancing patient management and follow-up care, especially in those with degenerative spine conditions or requiring frequent monitoring.

T2-SPPH-9 EXPOSURE OF THE POPULATION TO IONISING RADIATION FROM DIAGNOSTIC MEDICAL IMAGING PROCEDURES IN FRANCE IN 2022

Celian MICHEL (*Presenter*)
Julie SAGE (*Abstract Co-Author*)
Aurelie Isambert (*Abstract Co-Author*)

PURPOSE

This study aims to establish data on the exposure of the French population to ionising radiation from medical imaging for diagnosis purposes (conventional, dental and interventional radiology, computed tomography and nuclear medicine) for the year 2022 and to analyse evolution in such data.

METHODS AND MATERIALS

The study is based on diagnostic imaging procedures taken from the National Health Data System Sample, representing approximately 2 % of the healthcare consumption of the population covered by the French health insurance schemes. In accordance with European recommendations, the exposure of individuals to ionising radiation from diagnostic procedures was assessed in terms of effective dose. Population exposure was estimated by associating an average effective dose with each type of procedure. The average effective dose associated with each procedure was determined as close as possible to clinical practice in 2022, thanks to the collection of dosimetric data in the frame of diagnostic reference levels.

RESULTS

In 2022, 42.6 % of the French population underwent one or more diagnostic imaging procedure, slightly down compared to 2017 (45.4 %). Compared with 2017, the overall annual frequency of procedures has fallen by around 8 %, from 1,181 to 1,083 procedures per 1,000 beneficiaries in 2022. This overall decrease is mainly due to a reduction of around 19 % in conventional radiology procedures. In contrast to this general trend, the frequency of CT scan procedures and diagnostic nuclear medicine procedures increased by around 11 % and 22 % respectively. The average per caput annual effective dose has risen very slightly to 1.57 mSv in 2022, compared with 1.53 mSv in 2017. Although CT scan accounts for only a small number of procedures (15.6 %), it increased and remained by far the highest contributor to collective effective dose (75.6 %). Nuclear medicine, the second largest contributor to collective effective dose, also increased. This was the modality with the largest increase between 2017 and 2022, both in frequency and, consequently, in contribution to collective effective dose.

CONCLUSION

Despite the fall in the frequency of conventional radiology procedures, leading to a fall in the total frequency of procedures, and despite a general trend towards lower doses per procedure, the French population's exposure to medical diagnoses remained stable.

CLINICAL RELEVANCE/APPLICATION

This study, carried out every 5 years at ASNR, makes it possible to monitor the national trends for the frequencies and doses of diagnostic medical imaging procedures and contributes to the UNSCEAR’s surveys to obtain this data at an international level.

T2-SPPH-12 DWI WITH ZONALLY MAGNIFIED OBLIQUE MULTI-SLICE TECHNIQUE (ZOOM DWI) VS. CONVENTIONAL DWI: INFLUENCE TO IMAGE QUALITY AND ADC EVALUATION IN PATIENTS WITH MEDIASTINAL TUMORS

Yoshiyuki Ozawa, MD, PhD (*Presenter*)
Takahiro Ueda, MD, PhD (*Abstract Co-Author*)
Masahiko Nomura, MD, PhD (*Abstract Co-Author*)
Natsuka Yazawa (*Abstract Co-Author*)
Kaori Yamamoto (*Abstract Co-Author*)
Yuichiro Sano, RT (*Abstract Co-Author*)
Masato Ikedo (*Abstract Co-Author*)
Masanori Ozaki (*Abstract Co-Author*)
Takeshi Yoshikawa, MD (*Abstract Co-Author*)
Daisuke Takenaka, MD (*Abstract Co-Author*)
Yoshiharu Ohno, MD, PhD (*Abstract Co-Author*)

PURPOSE

DWI with zonally magnified oblique multi-slice technique (Zoom DWI) is able to obtain DWI with smaller field-of-view (FOV) than conventional DWI (cDWI) in routine clinical practice. It enables imaging without aliasing artifacts in the phase-encoding direction by rotating the excitation pulse by a specific angle relative to the refocusing pulse,, and narrowing the FOV also helps reduce distortion caused by echo planar imaging. However, no one tested Zoom DWI for image quality and apparent diffusion coefficient (ADC) measurement improvements with cDWI in patients with mediastinal tumors. The purpose of this study was to directly compare the influence of Zoom DWI to image quality and ADC evaluation with cDWI in patients with mediastinal tumors.

METHODS AND MATERIALS

Thirty consecutive patients with mediastinal tumors underwent short-tau inversion recovery (STIR) imaging, Zoom DWI and cDWI at a 3T MR systems. For quantitative image quality comparison between both DWIs, long and short axis diameters of tumor at the slice demonstrated the maximum cross-sectional area of the tumor on STIR images and each DWI were measured. Moreover, ADC value and signal-to-noise ratio (SNR) of the tumor and muscle were also assessed by region of interest (ROI) measurements. On qualitative image quality evaluations, overall image quality, artifact and diagnostic confidence were determined by two radiologists on each DWI and ADC map. To determine the capability for improving distortion on Zoom DWI, long- and short axis diameters (LA and SA) were correlated between STIR and each DWI by Spearman’s correlation. Moreover, the limits of agreement of LA and SA between STIR image and each DWI were also assessed by Bland-Altman analysis. To compare quantitative and qualitative image quality indexes between two DWIs, paired t test or Wilcoxon’s signed rank test were performed.

RESULTS

On correlation between STIR imaging and each DWI, Zoom DWI (LA: $r=0.99$, $p<0.0001$; SA: $r=0.99$, $p<0.0001$) showed significant and better correlations than cDWI (LA: $r=0.98$, $p<0.0001$; SA: $r=0.97$, $p<0.0001$). The limits of agreement of Zoom DWI (LA: -0.84 ± 3.40 mm, SA: -0.32 ± 1.61 mm) were smaller than those of cDWI (LA: -4.11 ± 4.37 mm, SA: -2.56 ± 2.15 mm). ADC values of tumor on Zoom DWI was significantly higher than that of cDWI ($p< 0.01$). Zoom DWI showed significantly better qualitative image quality indices than cDWI ($p<0.01$).

CONCLUSION

Zoom DWI can improve image distortion and has influence to image quality and tumor ADC measurement as compared with conventional DWI.

CLINICAL RELEVANCE/APPLICATION

Zoom DWI can improve image distortion and has influence to image quality and tumor ADC measurement as compared with conventional DWI.

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T2-SPRO

Radiation Oncology Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-SPRO-1 ASSESSMENT OF RADIOBIOLOGICAL EFFECTS OF CARBON ION IRRADIATION IN RAT GLIOMA BASED ON SPECTRUM CT

Yu feng Li, MMedSc (*Presenter*)

PURPOSE

Application of energy-spectrum CT for continuous and multiple observations of the effects of Carbon ion irradiation (CIR) on the proliferative activity and invasiveness of rat C6 glioma in vivo.

METHODS AND MATERIALS

Establish rat C6 glioma models. Conduct energy-spectrum CT and CT perfusion scans on tumor-bearing rats. Integrating HE and immunohistochemical staining with energy spectrum CT, we developed a multi-parametric quantitative model for rat glioma assessment; then employed this model to monitor trends in tumor proliferation, apoptosis, and invasiveness before and post-CIR 7th and 14th days in different dose. Monitor and document the physical signs and survival duration of tumor-bearing rats. Mark the rat as moribund when it refuses to eat or has severe motor impairment. Collect the whole brain and perform HE staining and immunohistochemical staining for Ki-67, a-SMA, VEGF, and CD34.

RESULTS

Enhanced energy-spectrum CT scans on the 12th day post-surgery revealed a 90% tumor formation rate, with tumor diameters ranging from 1.8 to 3.8 mm (mean 2.27 mm). CT perfusion revealed elevated CBF, CBV, and PS in the central versus peripheral tumor regions. Similarly, the solid region demonstrated higher CT 70keV , iodine concentration (IC), and spectral curve slope (K) compared to the periphery. 7 days post-CIR, the 1 Gy group exhibited decreased blood perfusion in the solid-area, while the periphery showed increased perfusion, enhanced invasiveness, and more pronounced abnormal vasculature. By day 14, the tumor size had slightly increased, and all spectral parameters were gradually increasing. The 2 Gy group exhibited a reduction in tumor size, with further expansion of internal liquefactive necrosis, and a decrease in all spectral parameters. Ki-67 proliferation index was reduced, a-SMA staining showed incomplete tumor vasculature, VEGF and CD34 expression decreased, along with a reduction in mature tumor vessel count. Compared to the 0 Gy group, which had a maximum survival time of 32 days (median 27 days), tumor-bearing rats in 2 Gy group exhibited a significantly longer maximum survival time of 49 days (median 37 days).

CONCLUSION

CIR effectively reduces glioma proliferation and invasiveness. The energy spectrum CT-based multi-parametric model quantifies glioma malignancy and allows for continuous, non-invasive assessment of heavy ion irradiation therapy in rat gliomas.

CLINICAL RELEVANCE/APPLICATION

Carbon ion radiotherapy shows promise for treating refractory recurrent gliomas, but clinical samples are limited. This study developed a non-invasive, dynamic multi-parametric quantitative model to evaluate the efficacy of CIR in inhibiting proliferation and invasiveness of rat C6 gliomas, providing a basis for its clinical use.

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T5A-SPBR

Breast Imaging Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPBR-1 RETROSPECTIVE EVALUATION OF MAMMOGRAM-BASED AI RISK ASSESSMENT IN WOMEN WITH DENSE BREASTS UNDERGOING SUPPLEMENTAL SCREENING

Samuel B. Ogunlade (*Presenter*)
Amie R. Leon, DO (*Abstract Co-Author*)
Santo Maimone IV, MD (*Abstract Co-Author*)
Andrey Morozov, MD (*Abstract Co-Author*)
Chidi T. Nwachukwu, MD (*Abstract Co-Author*)
Kristin A. Robinson, MD (*Abstract Co-Author*)
Haley P. Letter, MD (*Abstract Co-Author*)

PURPOSE

Image-based AI risk models assess short-term breast cancer risk and outperform traditional tools, including questionnaire-based models. Triaging women with dense tissue and no other high-risk factors remains a clinical challenge; thus, our institutions offer molecular breast imaging (MBI) as supplemental screening tool. This study assesses the accuracy of an AI model in predicting short-term breast cancer risk in women with dense breasts not identified as high risk by traditional models.

METHODS AND MATERIALS

A retrospective IRB-approved study included 416 screening mammograms with digital breast tomosynthesis from 2018-2023 at 3 academic breast imaging centers. Mammograms were initially negative or benign and classified as BIRADS c or d density, with all patients undergoing MBI within one year as supplemental screening. Of these, 70 (16.8%) were diagnosed with histologically confirmed breast cancer within two years, and 346 (83.2%) were selected as non-cancer controls. Mammograms were retrospectively processed using an AI model to generate risk and density scores, and analyses, including ROC and subgroup comparisons, were performed using SPSS version 28.

RESULTS

The study population had a mean age of 61 ± 10 years. The AI system classified 1 (0.2%) mammogram as category a, 124 (29.8%) as b, 210 (50.5%) as c, and 81 (19.5%) as d. Overall mean risk score was higher in cancer (0.43 ± 0.42) than in non-cancer cases (0.37 ± 0.40), but not statistically significant ($p = 0.239$). Subgroup analysis showed the mean risk scores in cancer vs non-cancer patients to be 0.42 vs 0.41 ($p = 0.883$), 0.45 vs 0.38 ($p = 0.358$), and 0.39 vs 0.23 ($p = 0.080$) in categories b, c, and d respectively, suggesting increasing separation and trend toward significance with higher density. ROC showed a similar trend, as AUC was 0.56 ($p = 0.892$), 0.61 ($p = 0.255$), and 0.75 ($p = 0.049$) for categories b, c and d respectively, with statistical significance in category d. In category d, risk score threshold of 0.14 yielded 69.3% sensitivity and 61.1% specificity, indicating the AI model's stronger diagnostic performance in women with extremely dense breasts.

CONCLUSION

While the AI-generated risk score did not significantly distinguish cancer from non-cancer across all dense breast cases, it showed a trend of improved performance with increasing density. In category d, the model achieved statistically significant discrimination, suggesting potential retrospective value in identifying risk where mammography is least effective.

CLINICAL RELEVANCE/APPLICATION

Women with dense breasts are challenging to triage for supplemental screening; AI-based risk models may be integrated into clinical workflows to prospectively identify those at elevated short-term risk not captured by traditional tools.

T5A-SPBR-2 MAMMOGRAMS AS FINGERPRINTS: PATIENT MATCHING USING MAMMOGRAMS

Michael E. Partrick, MD (*Presenter*)
Wei-Hsiang Hung (*Abstract Co-Author*)
John Graham-Knight (*Abstract Co-Author*)
Reece Walsh (*Abstract Co-Author*)
Ramon Lawrence (*Abstract Co-Author*)
Rasika Rajapakshe, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate whether Artificial Intelligence (AI) can determine if a pair of mammograms taken at different times belong to the same patient.

METHODS AND MATERIALS

A dataset of 17,828 patients were randomly sampled from a cohort who had at least two screening mammograms between February 5, 2019, and December 31, 2022. All examples were taken using HOLOGIC Inc. machines, and selected such that the 4 common mammographic views (RCC, LCC, LMLO, and RMLO) were present. Images were resized to 256x256, and an ablation study on image size tested 64x64, 128x128, and 512x512 pixels. Two clustering algorithms were tested using a feature extractor and cosine similarity: ResNet50V2, pretrained on ImageNet-1k and finetuned as a classification model in which each unique identity is taken as a different class; and a Siamese configuration consisting of three ResNet50V2 neural networks, including anchor, positive, and negative sub-networks and trained using contrastive triplet loss. Half of the test data consisted of matching pairs (two mammograms of the same view from the same patient at different times), and the other half were non-matching pairs (two mammograms of the same view from different patients). Anchor images were selected randomly. Negative examples were selected randomly from the same mammographic view for different patients. Positive examples were selected from the same mammographic view for the same patient at different times. Metrics included accuracy and F1-score.

RESULTS

The best distance thresholds for the classification Model and the Siamese model were found to be 0.738, and 0.723, respectively. The verification accuracies achieved were 97% for the classifier, and 93% for the Siamese model. The classification model achieved its best performance at 256x256, whereas the Siamese model at 512x512 achieved accuracy of 93%.

CONCLUSION

Patient matching using only mammographic images is possible with high accuracy. The classifier trained on mammographic images outperformed the Siamese model. Image resolution was determined to be an important factor in performance, with higher resolutions generally performing better.

CLINICAL RELEVANCE/APPLICATION

With real-world data at scale, ensuring data integrity across multiple institutions becomes a challenge. An AI capable of determining if two mammograms come from the same patient, combined with a record linkage model, can be used to mitigate data leakage in AI training and reduce manual review, which is both labor-intensive and inefficient.

T5A-SPBR-4 AI-BASED MAMMOGRAPHY SCORES FOR PREDICTING PATHOLOGIC AXILLARY METASTASIS AFTER NEOADJUVANT CHEMOTHERAPY IN BREAST CANCER PATIENTS

Na Lae Eun, MD, PhD (*Presenter*)
Ji Hyun Youk, MD (*Abstract Co-Author*)
Jeong-Ah Kim, MD, PhD (*Abstract Co-Author*)
Eun Ju Son, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to develop and validate nomograms based on AI-derived mammography scores, in combination with clinicopathologic features, to predict axillary metastasis after neoadjuvant chemotherapy (NAC) in breast cancer patients.

METHODS AND MATERIALS

We retrospectively analyzed breast cancer patients who underwent NAC followed by definitive breast and axillary surgery between January 2014 and December 2019. The AI mammography score, generated using a deep learning algorithm (Lunit INSIGHT MMG), was categorized into quartiles and evaluated for its association with axillary metastasis, defined as residual tumor in axillary lymph nodes at final pathology. Patients were randomly divided into training and validation cohorts in a 7:3 ratio. Multivariable logistic regression was performed incorporating AI scores and clinicopathologic variables, and nomograms were developed. Model performance was evaluated using the area under the receiver operating characteristic curve (AUC).

RESULTS

A total of 359 women were included (mean age ± standard deviation: 49.5 ± 9.5 years). In multivariable logistic regression analysis, both mid-treatment and post-treatment AI mammography scores were significantly associated with axillary metastasis. The highest quartile of the mid-treatment AI mammography score was associated with increased odds of axillary metastasis compared to the lowest quartile (OR = 2.526; 95% CI, 1.212-5.266; p = 0.0134). Similarly, the highest quartile of the post-treatment AI mammography score demonstrated a strong association (OR = 3.733; 95% CI, 1.709-8.155; p = 0.001). Additional independent predictors of axillary metastasis included initial suspicious lymph node assessment (OR = 5.788 for mid, p = 0.0004; OR = 6.087 for post, p = 0.0004), estrogen receptor (ER) positivity (OR = 5.659 for mid, p < .0001; OR = 6.021 for post, p < .0001), and HER2-negative status (OR = 0.135 for mid, p < .0001; OR = 0.114 for post, p < .0001). The prediction models achieved AUCs of 0.844 and 0.839 in the training set, and 0.854 and 0.858 in the validation set for mid- and post-treatment scores, respectively.

CONCLUSION

Mammography-based AI scores, when combined with initial lymph node assessment, ER positivity, and HER2-negative status, demonstrated strong predictive value for axillary metastasis after NAC in breast cancer patients.

CLINICAL RELEVANCE/APPLICATION

AI-based mammography scores may assist in identifying patients with residual axillary metastasis and support the tailoring or de-escalation of axillary surgery in selected breast cancer patients undergoing NAC.

T5A-SPBR-5 ARTIFICIAL INTELLIGENCE (AI)-BASED MAMMOGRAPHY SCORES FOR PREDICTING PATHOLOGIC COMPLETE RESPONSE IN BREAST CANCER PATIENTS RECEIVING NEOADJUVANT CHEMOTHERAPY

Na Lae Eun, MD, PhD (*Presenter*)
Ji Hyun Youk, MD (*Abstract Co-Author*)
Jeong-Ah Kim, MD, PhD (*Abstract Co-Author*)
Eun Ju Son, MD, PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to develop and validate nomograms based on AI-derived mammography scores, combined with clinicopathologic features, to predict pathologic complete response (pCR) after neoadjuvant chemotherapy (NAC) in breast cancer patients.

METHODS AND MATERIALS

We retrospectively analyzed breast cancer patients who underwent NAC followed by definitive breast and axillary surgery between January 2014 and December 2019. The AI score, derived from a deep learning algorithm (Lunit INSIGHT MMG), was categorized into quartiles and evaluated for association with pCR, defined as the absence of invasive cancer in the breast. Patients were randomly allocated into training and validation sets in a 7:3 ratio. Multivariable logistic regression was performed using the AI score and clinicopathologic variables, and a nomogram was constructed. Model performance was assessed by the area under the receiver operating characteristic curve (AUC).

RESULTS

A total of 359 women were included (mean age ± standard deviation: 49.5 ± 9.5 years). In multivariable logistic regression analysis, both mid- and post-treatment AI mammography scores were significantly associated with pCR. Compared to the lowest quartile, the second, third and fourth quartiles of the mid-treatment AI mammography score showed significantly lower odds of achieving pCR, with adjusted odds ratios (ORs) of 0.204 (95% CI, 0.042-0.984; p = 0.0477), 0.210 (95% CI, 0.060-0.734; p = 0.0145), and 0.159 (95% CI, 0.072-0.352; p <.0001), respectively. Similarly, the post-treatment AI mammography score demonstrated strong associations, with ORs of 0.158 (95% CI, 0.043-0.577; p = 0.0052) and 0.113 (95% CI, 0.068-0.373; p <.0001) for the third and fourth quartiles, respectively. Additional independent predictors of pCR included PR negativity (OR = 0.121 for mid, p < .0001), HER2-positive status (OR = 8.223 for mid, p < .0001; OR = 15.211 for post, p < .0001), and HER2-positive (OR = 6.217 for post, p = 0.0001) and triple negative subtype (OR = 12.355 for post, p <.0001). The developed mid- and post-treatment prediction models achieved AUCs of 0.869 and 0.870 in the training set, and 0.751 and 0.786 in the validation set for predicting pCR.

CONCLUSION

The AI-based mammography score, in combination with PR negative, and HER2-positive status and HER-2 positive/triple negative subtype, demonstrates significant utility in predicting pCR in breast cancer patients receiving NAC.

CLINICAL RELEVANCE/APPLICATION

Mammography-based AI scores may help identify patients predicted to achieve pCR and support future exploration of surgical de-escalation in selected cases among breast cancer patients receiving neoadjuvant chemotherapy.

T5A-SPBR-6 HEAD-TO-HEAD COMPARISON OF CONTRAST-ENHANCED MAMMOGRAPHY AND MRI IN ASSESSING THE TUMOR RESPONSE TO NEOADJUVANT THERAPY IN BREAST CANCER: A PROSPECTIVE, MULTIREADER STUDY

Simin Wang, MD (*Presenter*)
Jinhui Li (*Abstract Co-Author*)
Jiawei Li, PhD,MD (*Abstract Co-Author*)
Xigang Shen (*Abstract Co-Author*)
Chao You, MD (*Abstract Co-Author*)
Tingting Jiang (*Abstract Co-Author*)
Yajia Gu (*Abstract Co-Author*)

PURPOSE

To compare contrast-enhanced mammography (CEM) and MRI in the evaluation of the tumor response to neoadjuvant therapy (NAT) in breast cancer.

METHODS AND MATERIALS

Patients who underwent CEM and breast MRI at the same period (within 7 days) before and after NAT were prospectively enrolled in this study. Three readers with different levels of experience independently assessed the images and classified the tumor response following NAT. Radiological complete response (rCR) was defined as the absence of a suspiciously enhanced area. The residual lesion extent was calculated as the total diameter of all enhanced lesions. Pathologic complete response (pCR) was defined as the absence of invasive carcinoma or ductal carcinoma in situ. The sensitivity, specificity, and accuracy of CEM and MRI in determining pCR were calculated per reader and averaged with a generalized estimating equation (GEE). The agreement in the tumor response and residual tumor extent between imaging and pathology was assessed by kappa and intraclass correlation coefficient (ICC) analyses.

RESULTS

Fifty-seven patients (age: 47 ± 10 years) were enrolled, 32/57 of whom (36.8%) achieved pCR. In determining pCR, the estimated average sensitivity, specificity, and accuracy were 0.778, 0.714, and 0.754, respectively, for CEM and 0.714, 0.944, and 0.860, respectively, for MRI (all P values > 0.050). The tumor response evaluated on CEM and MRI was moderately to substantially consistent with the pathological response (average ? = 0.524 and 0.686). Both imaging modalities slightly overestimated the residual lesion extent (mean overestimations: 1.7 mm and 2.7 mm). In ICC analysis, CEM and MRI showed poor consistency with pathology (average ICCs = 0.4467 and 0.449, respectively).

CONCLUSION

Compared with MRI, CEM showed comparable but slightly lower accuracy, higher sensitivity, and lower specificity in predicting pCR after NAT. In assessing residual tumor extent, CEM and MRI showed similar performance and tended to overestimate the pathological extent. CEM could be an acceptable alternative to MRI in certain patients undergoing NAT.

CLINICAL RELEVANCE/APPLICATION

1. Providing an insight into the accuracy of CEM and MRI in assessing tumor response to NAT in breast cancer.2. Providing false-positive and false-negative examples in evaluating pCR to promote the clinical application of CEM.

T5A-SPBR-7 TRIPLE NEGATIVE BREAST CANCER: DIFFERENTIAL IMAGING FEATURES BASED ON MENOPAUSAL STATUS AND RACE

Cherie M. Kuzmiak, DO (*Presenter*)
David S. Sailer, MD, BS (*Abstract Co-Author*)
Thad Benefield (*Abstract Co-Author*)

PURPOSE

To determine if menopausal status and race affects the imaging features of triple-negative breast cancer (TNBC).

METHODS AND MATERIALS

This IRB-approved retrospective study reviewed the clinicopathologic data and imaging features of patients diagnosed with invasive ductal TNBC from January 1, 2014 to March 30, 2023. There were 199 patients, of whom 67 (33.7%) were pre- and peri-menopausal and 132 (66.3%) were postmenopausal. Data analysis was performed using chi-square or Fisher's Exact Test, and a P-value < 0.05 was considered significant. Subgroup analysis of Black and White patients was also performed.

RESULTS

Sixty-six percent (44/67) of the TNBCs in the premenopausal group were a round or oval shaped mass, while an irregular shaped mass comprised 50.5% (65/129) in the postmenopausal group (P = 0.041). Three (2.3 %) TNBCs were out of the mammographic field-of-view. Forty-two percent (28/67) of the TNBCS in the premenopausal group had indistinct margins, whereas 51.2% (66/129) of the postmenopausal group had spiculated margins (P = 0.011). Associated calcifications were present in 29.5% (20/67) of the TNBCs in the premenopausal group versus 24.8% (32/129) (P=0.395). In subgroup analysis, a round/oval shaped TNBC was more common in both premenopausal and post-menopausal Black patients, 76.9% (20/26) and 54.5% (24/45) (P = 0.061). However, 57.1% (44/79) of TNBCs in post-menopausal white women were irregular and 61.0% (47/79) had spiculated margins (P < 0.009).

CONCLUSION

Menopausal status and race should be considered in the imaging features of TNBC. This data may further assist in the understanding of the biology of TNBC and lesion characteristics by race

CLINICAL RELEVANCE/APPLICATION

Triple negative breast cancer (TNBC) accounts for approximately 10-20% of newly diagnosed breast cancers. It is clinically defined by the absence of expression of the estrogen receptor and progesterone receptor and lacks overexpression of the human epidermal growth factor receptor-2. Invasive ductal carcinoma, no special type, comprises the majority of TNBCs and are associated with a high nuclear grade and elevated metastatic potential. TNBC occurs more commonly among Black and premenopausal women, especially those that have a BRCA1 or PALB2 germline mutation. TNBCs may mimic a benign lesion, such as a fibroadenoma, on imaging which could possibly delay diagnosis. Hormone levels play a significant role in breast cancer pathogenesis. Menopause with a reduction in hormone levels could affect not only cancer development but possibly influence the imaging features.

T5A-SPBR-8 READER STUDY: COMPARING INTERPRETABLE AI TO BLACK BOX AI IN THE PRESENCE OF SYSTEMATIC MODEL ERROR

Alina Barnett (*Presenter*)
Luke Moffett (*Abstract Co-Author*)
Yanchen Ou (*Abstract Co-Author*)
Giyoung Kim (*Abstract Co-Author*)
Fides Schwartz, MD (*Abstract Co-Author*)
Lars J. Grimm, MD (*Abstract Co-Author*)
Connie E. Kim, MD (*Abstract Co-Author*)

Sujata V. Ghate, MD (*Abstract Co-Author*)
Derek L. Nguyen, MD (*Abstract Co-Author*)
Eun L. Langman, MD (*Abstract Co-Author*)
Joseph Lo, PhD (*Abstract Co-Author*)
Cynthia Rudin (*Abstract Co-Author*)

PURPOSE

To investigate how readers respond to machine learning models that provide explanations of their decisions compared to models that cannot, using a breast lesion diagnosis task.

METHODS AND MATERIALS

An observer study was conducted with 8 readers (4 attending radiologists and 4 trainees) interpreting 140 breast lesions retrospectively using an AI model (malignancy AUC 0.72, 95% CI: 0.63-0.82). The AI scored the mass margin and the likelihood of malignancy. Readers classified mass margin and estimated mass malignancy in two settings: a black box setting where they received only the malignancy score, and an interpretable setting where they also received the margin score and self-explanation. In both settings, systematic model error was introduced by underestimating the malignancy scores, and the error was not revealed to readers. The order of the settings was randomized with a 4-week washout period.

RESULTS

The interpretable interface had greater reader-model concurrence for mass margins (trainees 60.0% (337/560), attendings 55.0% (302/549)) than the black box (trainees 43.9% (246/560), attendings 45.9% (257/560)). Adding interpretability did not change malignancy AUC (interpretable interface: 0.77, 95% CI: 0.71-0.84; black box interface: 0.77, 95% CI: 0.71-0.84). Attendings expressed higher confidence in their margin classifications when using the interpretable interface (74.0, 95% CI: 69.9-78.0) than the black box (64.6, 95% CI: 59.6-69.7), but trainees did not (interpretable: 60.5, 95% CI: 56.0-65.1; black box: 58.7, 95% CI: 54.5-63.0). Readers changed their mass margin decisions in a coherent manner, adjusting their malignancy likelihood scores accordingly (i.e., spiculated margins have higher scores than obscured margins).

CONCLUSION

In both the interpretable and black box settings, trainees adopted the same error as the model (predicting lower malignancy scores) but attendings did not. Both trainees and attendings adopted the margin classifications of the interpretable model.

CLINICAL RELEVANCE/APPLICATION

Systematic model bias and other model errors are a known risk when introducing AI models in the clinic. By observing how readers respond to these errors, we can make more informed decisions regarding clinical deployment.
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T5A-SPCA

Cardiac Imaging Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPCA-1 FRACTIONAL FLOW RESERVE FROM COMPUTED TOMOGRAPHY ANGIOGRAPHY: A DEEP-LEARNING BASED METHOD FOR IDENTIFYING VESSEL-SPECIFIC ISCHEMIA IN CORONARY ARTERY DISEASE

Claudia Gulli, MD (*Presenter*)
Ludovica Lanzafame (*Abstract Co-Author*)
Silvio Mazziotti (*Abstract Co-Author*)
Giorgio Ascenti, MD (*Abstract Co-Author*)
Tommaso D'Angelo, MD, PhD (*Abstract Co-Author*)

PURPOSE

Coronary computed tomography angiography (CCTA) combined with non-invasive fractional flow reserve (FFR) is a guideline-recommended approach for assessing lesion-specific ischemia in patients with stable chest pain and intermediate-grade stenoses. Although invasive FFR and Instantaneous Wave-Free Ratio (iFR) remain the gold standard, non-invasive FFR offers an efficient alternative to guide clinical decision-making. Recently, artificial intelligence (AI) based methods have enabled non-invasive estimation of FFR from Coronary Computed Tomography Angiography (CCTA), conventionally known as FFR derived from computed tomography (FFR-CT). This study evaluates the diagnostic performance of an AI deep-learning based FFR-CT software (CorEx, Spimed) for detecting vessel-specific ischemia in patients with coronary artery disease (CAD), using Invasive Coronary Angiography (ICA) and pressure-based measurements as reference standards.

METHODS AND MATERIALS

The retrospective multicenter analysis included 210 coronary vessels from 70 patients (17 females, 53 males) who underwent both CCTA and ICA within an average interval of 51 days. AI-based FFR-CT values =0.80 were considered indicative of hemodynamically significant stenosis. Invasive FFR or iFR values (significant =0.8 or =0.89, respectively) served as the reference standard.

RESULTS

On a per-patient basis, the model demonstrated excellent diagnostic accuracy, with an Area Under the Curve (AUC) of 0.930 (95% Confidence Interval [CI]: 0.843-0.977; p < 0.0001), sensitivity of 96.0% (95% CI: 86.3-99.5%), and specificity of 90.0% (95% CI: 68.3-98.8%). Kappa agreement was substantial (? = 0.860; 95% CI: 0.727-0.993). On a per-vessel basis, AUC was 0.872 (95% CI: 0.819-0.914), with sensitivity of 84.8% (95% CI: 73.9-92.5%) and specificity of 89.6% (95% CI: 83.4-94.1%). Agreement remained substantial (? = 0.729; 95% CI: 0.630-0.828).

CONCLUSION

These findings support the AI-based FFR-CT model as a reliable non-invasive alternative to invasive physiological assessment of lesion-specific ischemia in CAD patients, with high diagnostic accuracy. Calcium score of the stenotic vessels had a significant detrimental effect on the diagnostic accuracy of of the AI-based software.

CLINICAL RELEVANCE/APPLICATION

The integration of AI-based fractional flow reserve derived from computed tomography (FFR-CT) into the diagnostic workflow would enable accurate assessment of vessel-specific ischemia without the need for invasive procedures. This approach may enhance patient safety, reduce procedural risks and healthcare costs.

T5A-SPCA-2 ACCURACY OF DUAL-ENERGY COMPARED TO STANDARD CHEST X-RAY FOR DETECTION OF CORONARY ARTERY CALCIFICATIONS AS AN OPPORTUNISTIC SCREENING TOOL

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PURPOSE

Coronary artery calcification (CAC) is a well-established marker of coronary artery disease (CAD) and an indicator of increased cardiovascular risk. Dual-energy chest X-ray (DEX-CXR) may improve conspicuity of CAC compared to standard chest X-ray (CXR), but its diagnostic performance has not been well characterized. Our study aimed to compare the accuracy of DEX-CXR versus standard CXR for identifying CAC, using non-ECG-gated chest CT as the reference standard.

METHODS AND MATERIALS

Fifty-two patients (mean age 63.9 ± 18.6 years) undergoing imaging for non-cardiac indications received both DEX-CXR and standard CXR in an emergency setting. Chest CT scans acquired within one year of radiography served as the reference. Three readers independently assessed the standard CXR, DEX-CXR, and CT for CAC, in this order, with an appropriate washout period between reads, with CAC presence determined by consensus of two readers. Inter-reader agreement was measured with intraclass correlation coefficients (ICCs). Reader confidence and diagnostic performance were compared using paired t-tests and McNemar's test, respectively.

RESULTS

Inter-reader agreement was higher for DEX-CXR (ICC = 0.82; 95% CI: 0.74-0.89) than standard CXR (ICC = 0.63; 95% CI: 0.48-0.75). Reader confidence was consistently greater with DEX-CXR (p < 0.05). DEX-CXR significantly outperformed standard CXR in detecting CAC, with higher sensitivity (75% vs. 28%) and accuracy (87% vs. 67%; p < 0.01).

CONCLUSION

Dual-energy chest X-ray significantly improved sensitivity and reader agreement for detecting coronary artery calcification compared to standard chest X-ray. These findings suggest that DEX-CXR could serve as a cost-effective, low-radiation, and widely accessible tool for opportunistic cardiovascular risk screening, particularly in emergency and urgent care settings where chest radiographs are commonly performed. If validated in larger studies, this approach could fundamentally expand the reach of early coronary artery disease detection and prevention.

CLINICAL RELEVANCE/APPLICATION

DEX-CXR could serve as a cost-effective, low-radiation, and widely accessible tool for opportunistic cardiovascular risk screening.

T5A-SPCA-3 PERFORMANCE OF DUAL-ENERGY CHEST X-RAY, COMPARED TO STANDARD CXR AND CT, FOR DIAGNOSIS OF CLINICALLY CONFIRMED CORONARY ARTERY DISEASE

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PURPOSE

Coronary artery calcification (CAC) is a key marker of coronary artery disease (CAD) and cardiovascular risk. Computed tomography (CT) is the reference standard for CAC detection, but is limited by cost, accessibility, and radiation exposure. Standard chest X-ray (CXR) lacks sensitivity for CAC, whereas single-exposure dual-energy chest X-ray (DEX-CXR) has shown promise but remains understudied. Our purpose is to compare the performance of DEX-CXR for clinically confirmed CAD detection with that of standard CXR and non-ECG-gated chest CT.

METHODS AND MATERIALS

This study included a 45-patient subset of a larger 52-patient cohort (mean age 64.3 ± 18.7 years; 22 females, 23 males), including 39 with clinically confirmed CAD and 6 without CAD based on coronary angiography, stress testing, or MRI. All patients underwent standard CXR, DEX-CXR, and non-ECG-gated chest CT. Three readers independently assessed these for CAC, in this order, with an appropriate washout period between reads. CT findings were established by consensus of two readers, with the presence of any CAC considered evidence of CAD. Inter-reader agreement was measured with intraclass correlation coefficients (ICC). Sensitivity, specificity, positive predictive value (PPV), negative predictive value, and accuracy, were calculated with the clinical diagnosis as reference standard. Logistic regression was used to compare performance.

RESULTS

Inter-reader agreement was higher for DEX-CXR (ICC = 0.80; 95% CI: 0.69-0.87) than for standard CXR (ICC = 0.64; 95% CI: 0.48-0.76). DEX-CXR outperformed standard CXR in sensitivity (71.8% vs. 30.8%) and accuracy (75.6% vs. 40.0%), with equivalent specificity and PPV (100%). Performance of DEX-CXR was comparable to CT (sensitivity: 71.8% vs. 76.9%; accuracy: 75.6% vs. 80.0%). Logistic regression confirmed superior performance of DEX-CXR over standard CXR (OR = 4.64; p = 0.001), with no significant difference compared to CT (OR = 0.77; p = 0.61).

CONCLUSION

Dual-energy chest X-ray demonstrated diagnostic accuracy for CAC detection that approaching that of a non-gated CT reference standard, with significantly improved CAD detection compared to standard CXR. Given its lower radiation dose and wider accessibility, DEX-CXR may represent a practical, cost-effective opportunistic screening tool for coronary calcium detection and cardiovascular risk assessment.

CLINICAL RELEVANCE/APPLICATION

Dual-energy chest X-ray offers a practical, low-dose, and accessible alternative to CT for coronary calcium detection and cardiovascular risk screening in routine care.

T5A-SPCA-4 COMPARATIVE DIAGNOSTIC PERFORMANCE OF CT-FFR AND CCTA IN PATIENTS WITH DIFFERING CORONARY ARTERY CALCIUM BURDENS

KIM YEON JUN (*Presenter*)
Sung Min Ko, PhD (*Abstract Co-Author*)
JUN SIK KIM (*Abstract Co-Author*)
GIYONG AN (*Abstract Co-Author*)
Sung-Jin Cha, BS (*Abstract Co-Author*)

PURPOSE

To compare the diagnostic performance of computed tomography (CT) fractional flow reserve (FFR) and coronary computed tomography angiography (CCTA) in identifying functionally significant stenosis in patients with varying degrees of coronary artery calcium (CAC) scores.

METHODS AND MATERIALS

This retrospective study included 101 patients with suspected coronary artery disease, stratified into two groups based on CAC scores: <400 (low calcification) and =400 (high calcification). Each coronary artery branch was evaluated individually, and anatomical stenosis was classified as <50% or =50%. The diagnostic performances of CCTA (=50% stenosis) and CT-FFR (=0.80) were compared using invasive FFR (=0.80) as the gold standard. Sensitivity, specificity, PPV, NPV, and AUC were calculated for comparison.

RESULTS

For patients with low CAC scores (<400), CT-FFR showed superior diagnostic performance compared to CCTA: sensitivity (70% vs. 100%, $p < 0.05$), specificity (91% vs. 14%, $p < 0.05$), PPV (82% vs. 40%, $p < 0.05$), NPV (84% vs. 100%, $p = 0.19$), and accuracy (84% vs. 45%, $p < 0.05$). The AUC was significantly higher for CT-FFR (0.84 vs. 0.63, $p < 0.05$). For patients with high CAC scores (=400), CT-FFR also demonstrated superior performance: sensitivity (76% vs. 100%, $p < 0.05$), specificity (76% vs. 4%, $p < 0.05$), PPV (73% vs. 47%, $p < 0.05$), NPV (79% vs. 100%, $p = 0.33$), and accuracy (76% vs. 48%, $p < 0.05$) (Table .1). The AUC was higher for CT-FFR (0.80 vs. 0.69, $p = 0.26$) in per-patient analysis and significantly higher in pooled vessel analysis (0.93 vs. 0.72, $p < 0.05$). In the pooled vessel analysis, the accuracy of CCTA dropped from 0.74 to 0.60, and AUC dropped from 0.81 to 0.72 as the calcium burden increases, but the accuracy of CT-FFR dropped only slightly from 0.95 to 0.91 and AUC from 0.96 to 0.93 (Fig .1).

CONCLUSION

CT-FFR maintains superior diagnostic performance across both CAC Burdens. This advantage is more pronounced in patients with severe calcification, where the performance of CCTA dropped prominently.

CLINICAL RELEVANCE/APPLICATION

CT-FFR is a reliable non-invasive method for identifying functionally significant stenosis, even in the presence of significant calcification.

T5A-SPCA-5 Yunlong Hu (*Presenter*)

APPLICATION OF LOW DOSE ONE-STOP MYOCARDIAL PERFUSION IMAGING COMBINED WITH DEEP LEARNINGIMAGE RECONSTRUCTION IN CORONARY ARTERY DISEASE

PURPOSE

This study aims to explore the feasibility of the low dose "one-stop" myocardial computed tomography perfusion(CTP) combined with deep learning image reconstruction(DLIR) which could comprehensively assess patients suspected of coronary artery disease(CAD) in a single scan.

METHODS AND MATERIALS

94 consecutive patients underwent the 70kV "one-stop" CTP with suspected CAD and 62 gender- and age-matched patients underwent conventional CCTA were included.All CTP images were reconstructed using filtered backprojection(FBP) and high level DLIR(CTP-DL group).A CCTA phase acquired from the CTP was reconstructed using two different algorithms: ASIR-V 50%(CCTA-CTP group),which is similar to the conventional CCTA, and ASIR-50% combined high level DLIR(CCTA-CTP-DL group).The contrast media(CM) and effective dose(ED) were recorded.The signal-to-noise ratio(SNR),contrast-to-noise ratio(CNR) and noise of all groups were recorded.Patients were divided into three groups[normal(0%,n=14),nonsignificant(1%-49%,n=31),and significant stenosis(50%-100%,n=49)] on the basis of degree of coronary stenosis.The cardiac function,myocardial strain and myocardial blood flow(MBF) of each subgroups were analyzed.

RESULTS

Compared to then conventional CCTA protocol,the ED of "one-stop" CTP reduced by 40.4% (4.72mSv±0.39 vs 7.92mSv±1.8,p<0.05),and CM volume reduced by 8% (52.14mL±5.44 vs 56.48mL±9.14,p<0.05).The SNR and CNR of CTP were lower than CTP-DL(SNR:18.48±3.12 vs 24.78±2.95;CNR:15.76±2.79 vs 21.53±2.87,all p<0.05),but the noise of CTP were higher(43.2±3.6 vs 30.4±3.4,p<0.05).About the CCTA phase,there were significant differences in the noise of CCTA-CTP,CCTA-CTP-DL and conventional CCTA(32.28±2.25 vs 20.13±2.04 vs 18.6±1.61,all p<0.05).The SNR and CNR of CCTA-CTP were lower than CCTA-CTP-DL(all p<0.05),but there was no significant difference between CCTA-CTP-DL and conventional CCTA(all p>0.05).The left ventricular ejection fraction,the absolute values of left ventricular global strain and MBF gradually decreased as the coronary stenosis increased(all p<0.05).

CONCLUSION

The low-dose "one-stop" CTP combined DLIR could reduced the image noise and improve image quality.Compared to the conventional CCTA protocol,the "one-stop" CTP reduced the ED and CM usage while providing the information of coronary anatomy,LV cardiac function, LV global strain and myocardial perfusion without the image quality decreasing.

CLINICAL RELEVANCE/APPLICATION

Compared to conventional CCTA,the low-dose "one-stop" CTP can reduce the ED and CM volume without the image quality decreasing,and the comprehensive information it provided can completely evaluate the patients with all risk of CAD.

T5A-SPCA-7 BIAS-CORRECTED SYNTHETIC MYOCARDIAL EXTRACELLULAR VOLUME QUANTIFICATION USING PHOTON-COUNTING CT: VALIDATION AGAINST MRI IN A CLINICAL COHORT

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Milan Vecsey-Nagy, MD, PhD (*Abstract Co-Author*)
Jose Osoria-Velasquez, MD (*Abstract Co-Author*)
James Griggers (*Abstract Co-Author*)
Fabian Bamberg, MD, MPH (*Abstract Co-Author*)
Akos Varga-Szemes, MD, PhD (*Abstract Co-Author*)
Tilman S. Emrich, MD (*Abstract Co-Author*)

PURPOSE

To validate synthetic hematocrit-derived myocardial extracellular volume (ECV) quantification from late enhancement photon-counting CT (PCD-CT) against cardiac MRI as a reference standard, and to evaluate the impact of a bias correction model.

METHODS AND MATERIALS

In this post-hoc analysis, patients underwent same-day cardiac MRI and delayed enhancement PCD-CT using full spectral acquisition mode (collimation: 144 × 0.4 mm). MRI-based ECV was calculated from T1 mapping with synthetic hematocrit, while CT-derived ECV was computed using iodine maps and hematocrit estimated from virtual non-contrast blood pool attenuation. The partition coefficient (?) was defined as the ratio of myocardial to blood pool enhancement and served as an intermediate parameter for ECV computation. Agreement between modalities was assessed using Bland-Altman analysis, intraclass correlation coefficients (ICC), and Pearson correlation. A linear regression model was applied to correct for systematic bias in CT-derived ECV.

RESULTS

A total of 27 patients (mean age 52.9 ± 17.2 years, 52% female) were included. Mean ? values were similar between modalities (?_MRI = 0.513 ± 0.073 vs. ?_PCD-CT = 0.501 ± 0.082, p = 0.518), indicating comparable extracellular contrast distribution. PCD-CT significantly overestimated MRI-derived ECV (42.1 ± 8.7% vs. 33.8 ± 8.1%, p<0.001), with a mean bias of -8.3 percentage points and poor agreement (ICC = 0.38). After applying linear bias correction (adjusted ECV = 0.522 × PCD-CT ECV + 11.83), the adjusted CT values aligned more closely with MRI (35.0 ± 4.8% vs 33.8 ± 8.1%, p = 0.373), with reduced bias (-1.2 percentage points) and improved reliability (ICC = 0.51). However, wide limits of agreements persisted.

CONCLUSION

Synthetic hematocrit-based ECV quantification from PCD-CT is technically feasible and correlates moderately with MRI. Bias correction mitigates systematic overestimation and improves agreement.

CLINICAL RELEVANCE/APPLICATION

PCD-CT enables spectral myocardial tissue characterization and ECV quantification without blood sampling. This approach has the potential to streamline cardiac imaging workflows and broaden access to tissue-based biomarkers. While individual variability persists, continued optimization may support the integration into routine clinical decision-making and future prognostic applications.

T5A-SPCA-8 INTEGRATIVE CMR-TRANSCRIPTOMIC ANALYSIS IDENTIFIES PERSISTENT CARDIAC REMODELING MECHANISMS IN ELDERLY MALE BABOONS PRENATALLY EXPOSED TO SYNTHETIC GLUCOCORTICOIDS

Bowen Yang, PhD (*Presenter*)
Hillary F. Huber, PhD (*Abstract Co-Author*)
Laura Cox (*Abstract Co-Author*)
Peter Nathanielsz (*Abstract Co-Author*)
Geoffrey D. Clarke, PhD (*Abstract Co-Author*)

PURPOSE

Synthetic glucocorticoids (sGC) administered during potential preterm aid fetal lung maturation but may predispose offspring to lifelong cardiac dysfunction. This study integrates quantitative cardiac magnetic resonance imaging (qCMR) with transcriptomic and mitochondrial analyses to find potential mechanisms causing cardiac remodeling in elderly male baboons prenatally exposed to sGC.

METHODS AND MATERIALS

Left ventricular (LV) function and strain were measured in 12 elderly male baboons (8 control [CTR], 4 sGC-exposed) using qCMR (Siemens TIM Trio 3T). RNA sequencing on LV myocardial tissue identified differentially expressed genes (adj. $p<0.05$, $|\log2 \text{ fold-change}|>1$). A Seahorse™ XF Analyzer measured mitochondrial function (electron transport chain [ETC] complexes I, II, IV), with protein expression quantified via western blot. Correlations were revealed between qCMR parameters, mitochondrial traits, and DEG in 7 subjects (3 CTR, 4 sGC).

RESULTS

The sGC group had increased LV sphericity ($p<0.05$), reduced global longitudinal and radial strains ($p<0.04$), and increased paracardial lipids ($p=0.02$). There were 63 upregulated and 20 downregulated DEGs, implicating fibrosis (TGFB2, POSTN), inflammation (IL33), and metabolism (FBP1) pathways. ETC Complex I respiration ($p=0.002$) and NDUFV2 protein expression ($p=0.048$) were reduced. Integrated analyses confirmed correlations between fibrosis-associated genes and heart function, including TGFB2 vs. LV shortening ($r=-0.83$, $p=0.02$), IL33 vs. early diastolic strain rate ($r=-0.92$, $p=0.004$), and metabolic gene FBP1 vs. LV shortening ($r=0.86$, $p=0.01$).

CONCLUSION

Prenatal sGC exposure programs persistent cardiac dysfunction through coordinated mitochondrial impairment, transcriptomic reprogramming, and LV remodeling that appears in elderly male baboons. Linking qCMR and molecular data reveals critical pathways driving cardiac vulnerability.

CLINICAL RELEVANCE/APPLICATION

Combining qCMR with molecular profiling provides insights into lifelong cardiovascular risks from prenatal glucocorticoid exposure, aiding early biomarker discovery and targeted therapeutic interventions.

T5A-SPCA-9 EVALUATION OF NON-DILATED LEFT VENTRICULAR CARDIOMYOPATHY PATIENTS WITH REDUCED AND PRESERVED LEFT VENTRICULAR EJECTION FRACTION USING CARDIAC MAGNETIC RESONANCE FEATURE TRACKING TECHNOLOGY

Chunlong Yan (*Presenter*)

PURPOSE

To investigate the diagnostic value of cardiac magnetic resonance imaging feature tracking (CMR-FT) in evaluating patients with non-dilated left ventricular cardiomyopathy (NDLVC) and either reduced or preserved left ventricular ejection fraction (LVEF).

METHODS AND MATERIALS

A total of 30 patients with NDLVC-reduced LVEF (LVEF < 50%, NDLVC-rLVEF group) and 30 patients with NDLVC-preserved LVEF (LVEF=50%, NDLVC-pLVEF group) who underwent CMR examination in Beijing Anzhen Hospital from January 2020 to December 2024 were retrospectively analyzed. Additionally, 30 individuals without cardiovascular disease and normal CMR findings were selected as the control group. Using the CVI42 post-processing software, conventional left ventricular functional parameters and 2D/3D global strain parameters were obtained, including LVEF, left ventricular end-diastolic volume (LVEDV), left ventricular end-systolic volume (LVESV), left ventricular stroke volume (LVSV), left ventricular cardiac output (LVCO), left ventricular mass at end-diastole (LV mass at ED), global radial strain (GRS), global circumferential strain (GCS), and global longitudinal strain (GLS). Group differences in these parameters were analyzed. The diagnostic efficacy of strain parameters in NDLVC patients with reduced LVEF was evaluated using receiver operating characteristic (ROC) curve analysis.

RESULTS

(1) Compared to the control group, the NDLVC-rLVEF group was older ($P < 0.05$). Compared to the NDLVC-pLVEF group, the NDLVC-rLVEF group was older ($P < 0.05$) and had a higher prevalence of hyperlipidemia and alcohol consumption history. (2) Compared to the control group, the NDLVC-pLVEF group showed a significant increase in LV mass at ED ($P < 0.05$). Compared to the NDLVC-pLVEF group, the NDLVC-rLVEF group exhibited significantly increased LVESV and LV mass at ED ($P < 0.05$), while LVSV, LVCO, LVEF, absolute values of GRS, GCS , GLS were significantly reduced ($P < 0.05$). (3)ROC curve analysis showed that GRS, GCS, GLS in both 2D and 3D modalities exhibited superior diagnostic performance in differentiating the NDLVC-rLVEF group from the NDLVC-pLVEF group.

CONCLUSION

CMR-FT technique demonstrates significant diagnostic value in differentiating NDLVC patients with both reduced and preserved LVEF. Both 2D and 3D strain parameters exhibit high diagnostic efficacy. In the progression of NDLVC, an increase in left ventricular mass occurs first, followed by impaired left ventricular systolic function and reduced left ventricular function.

CLINICAL RELEVANCE/APPLICATION

CMR-FT technology demonstrates significant diagnostic value in differentiating NDLVC patients with both reduced and preserved left ventricular ejection fraction (LVEF).

T5A-SPCA-15 LAYER-SPECIFIC STRAIN TO DISTINGUISH BETWEEN ACUTE MYOCARDIAL INFARCTION AND ACUTE MYOCARDITIS: A MACHINE LEARNING APPROACH

Yanping Su (*Presenter*)
Chenying Lu (*Abstract Co-Author*)
Jiansong Ji, MD (*Abstract Co-Author*)

PURPOSE

This study aims to develop a machine learning (ML) model utilizing layer-specific myocardial strain derived from cardiac magnetic resonance (CMR) to differentiate acute myocardial infarction (AMI) from acute myocarditis (AM).

METHODS AND MATERIALS

A total of 114 patients diagnosed with AM (n = 52) and AMI (n = 62) between December 2017 and May 2025 were retrospectively included. All patients underwent CMR scanning, and left ventricular myocardial strain analysis was performed, including global and regional strain parameters, particularly layer-specific strain. Feature selection was conducted using 1,000 bootstrap resampling combined with LASSO regression. 5 ML algorithms were used to construct the predictive models, with feature reduction implemented to minimize model complexity. Model performance was assessed by 10-fold cross-validation, with the area under the curve (AUC) used as the primary evaluation standard. Finally, SHapley Additive exPlanations (SHAP) analysis was employed to assess the contribution of each variable in differentiating AM from AMI.

RESULTS

When the number of features was reduced to 5, the logistic regression (LR) model achieved an AUC of 0.873 (95% CI: 0.851, 0.892), demonstrating relatively optimal performance. The model included 5 predictive factors: age, end-systolic apical subendocardial circumferential strain (ESACS_endo), apical longitudinal strain (ALS), lactate dehydrogenase (LDH), and creatine kinase-MB (CK-MB). Additionally, the model's sensitivity was 0.700 (95% CI: 0.661, 0.739), specificity was 0.868 (95% CI: 0.843, 0.896), Brier score was 0.150 (95% CI: 0.141, 0.161), F1 score was 0.754 (95% CI: 0.722, 0.783), positive predictive value (PPV) was 0.816 (95% CI: 0.781, 0.852), and negative predictive value (NPV) was 0.775 (95% CI: 0.743, 0.806).

CONCLUSION

The ML model developed using non-contrast-enhanced CMR demonstrates high accuracy in differentiating AM from AMI, with layer-specific strain parameters playing an important role in the diagnostic process. This model has the potential to expand the clinical applications of CMR, reduce unnecessary invasive procedures, thereby optimizing clinical decision-making and improving personalized treatment strategies.

CLINICAL RELEVANCE/APPLICATION

ML model differentiating AM from AMI.
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T5A-SPCH

Chest Imaging Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPCH-2 EVALUATION OF IMPAIRED LUNG DEFORMATION DURING EXPIRATION IN COPD USING FOUR-DIMENSIONAL DYNAMIC-VENTILATION CT

Yanyan Xu, MD, PhD (*Presenter*)
He Chen (*Abstract Co-Author*)
Sheng Xie (*Abstract Co-Author*)
Min Xu, PhD (*Abstract Co-Author*)

PURPOSE

To investigate lung deformation in patients with COPD during expiration using four-dimensional (4D) dynamic-ventilation CT and quantitatively evaluate the potential differences in strain-related parameters in patients with varying severities of airflow limitation.

METHODS AND MATERIALS

A total of 61 patients clinically diagnosed with COPD underwent spirometry and 4D dynamic-ventilation CT. Strain measurements were performed using a modified version of the computational fluid dynamics analysis software. Strain-related parameters derived from the whole expiration phase (PS max-all , PS mean-all , and Speed max-all) and the first 2 s of the expiration phase (PS max2s , PS mean2s , and Speed max2s) were divided by the changes in lung volume to adjust for the degree of expiration. Comparisons of strain-related parameters among GOLD I (mild airflow limitation), GOLD II (moderate airflow limitation), and GOLD III-IV (severe airflow limitation) were made using the nonparametric Kruskal-Wallis test. Furthermore, the correlations between the strain-related parameters and the degree of airflow limitation were assessed using Spearman correlation analysis. $P < 0.05$ was considered statistically significant.

RESULTS

A total of 61 patients with COPD, including 29 with GOLD I, 18 with GOLD II, 6 with GOLD III, and 8 with GOLD IV, were enrolled in the final analysis. Strain-related parameters showed negative correlations with the GOLD classification. Compared with the strain-related parameters derived from the first 2s of the expiration phase, those derived from the whole expiration phase were more closely correlated with lung function changes.

CONCLUSION

Decreased lung deformation during expiration was associated with loss of lung function. Strain-related parameters, especially those derived from the whole expiration phase, showed promising potential in indicating the severity of airflow limitation in patients with COPD.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that reduced lung deformation during expiration, measured by 4D dynamic-ventilation CT strain analysis, correlates with worsening airflow limitation in COPD, offering a novel imaging biomarker for disease severity assessment. The findings highlight the clinical potential of whole-expiration-phase strain parameters in evaluating functional impairment and optimizing COPD management strategies.

T5A-SPCH-3 PREDICTION OF EARLY RECURRENCE AFTER BRONCHIAL ARTERIAL CHEMOEMBOLIZATION IN NON-SMALL CELL LUNG CANCER USING DUAL-ENERGY CT: AN INTERPRETABLE MODEL BASED ON THE SHAP METHODOLOGY

Feng Ye (*Presenter*)
Jianfei Tu (*Abstract Co-Author*)

PURPOSE

This study aims to investigate the role of dual-energy computed tomography (DECT) in predicting the early recurrence to bronchial artery chemoembolization (BACE) in patients with non-small cell lung cancer (NSCLC) who have failed first-line therapy.

METHODS AND MATERIALS

Clinical and imaging data were retrospectively collected from patients with NSCLC who underwent BACE at Wenzhou Medical University Affiliated Fifth Hospital between October 2023 and June 2024. A machine learning model was constructed using logistic regression (LR) based on 5 virtual monoenergetic images (VMIs) derived from the arterial and venous phases. Deep learning models were constructed using 3 convolutional neural networks (CNNs): ResNet50, ResNet101, and ResNet152, based on iodine maps. The optimal Radscore, DLscore, and clinical features were combined to construct a comprehensive model. The performance of the models was evaluated using the area under the receiver operating characteristic curve (AUC). The SHAP (Shapley Additive exPlanations) framework was applied for model interpretability.

RESULTS

A total of 196 patients were enrolled in this study (the training cohort, n=158; the testing cohort, n=38). The machine learning model based on 100 keV (AUC=0.751) demonstrated superior performance compared to other VMIs. The deep learning model based on the ResNet101 method (AUC=0.791) showed better performance than other approaches. The hybrid model combining Radscore-100keV-A, Radscore-100keV-V, DLscore-ResNet101-A, DLscore-ResNet101-V, and clinical features exhibited the best performance (AUC=0.798) among all models.

CONCLUSION

DECT holds promise in predicting the early recurrence of BACE for NSCLC patients who have failed first-line therapy, offering valuable guidance for clinical treatment planning.

CLINICAL RELEVANCE/APPLICATION

This study provides a new approach for screening first-line treatment failed non-small cell lung cancer patients who can benefit from BACE.

T5A-SPCH-4 DEEP LEARNING-BASED AUTOMATED SEGMENTATION OF PULMONARY VESSELS ON CHEST CT

Rui Zhao (*Presenter*)
Shaoze Luo (*Abstract Co-Author*)
Longfei Zhao (*Abstract Co-Author*)
Qiqi Xu, MBBS, MMEd (*Abstract Co-Author*)
Ruijie Zhao (*Abstract Co-Author*)
Jiaru Wang (*Abstract Co-Author*)
Ran Xiao (*Abstract Co-Author*)
Sirong Piao (*Abstract Co-Author*)
Ying Ming (*Abstract Co-Author*)
Wei Song, MD (*Abstract Co-Author*)

PURPOSE

Pulmonary vessels have similar CT attenuation to nodules, which can cause pulmonary vessel segmentation algorithms to incorrectly segment nodules as vessels, resulting in many false positives. Moreover, the insufficient segmentation of small vessels poses an additional challenge. To address these issues, we developed a novel pulmonary vessel segmentation algorithm that enhances nodule differentiation while improving the accuracy of small vessel segmentation.

METHODS AND MATERIALS

A total of 427 chest CT examinations, performed between June 2021 and December 2021, were collected from multiple institutions in different countries. These CT examinations included both non-contrast (n = 214) and contrast (n = 213) CT examinations. As a reference, pulmonary vessels were manually segmented by senior radiologists. We designed a nodule recognition module and a vessel optimization module, which included training weight adjustment and Centerline Recall (Cl-Recall) Loss, to construct the vessel segmentation model. A 3D U-Net-based model was trained to perform pulmonary vessel segmentation on 370 chest CT examinations and was tested on 57 chest CT examinations. Performance metrics included Cl-Recall, Dice similarity coefficient (DSC), and false positive ratio (FPR). The performance of our model was compared with that of the nnUNet-v2 model, developed by the German Cancer Research Center.

RESULTS

The FPR of our model in the nodule over-segmentation is 0.036, while that of the nnUNet-v2 model is 0.052. The vessel Cl-Recall and DSC of our method are 0.941 and 0.932, while those of the nnUNet-v2 model are 0.772 and 0.860. In summary, our model can better avoid nodule over-segmentation and segment more complete vessels.

CONCLUSION

The nodule-aware and small vessel-optimized pulmonary vessel segmentation algorithm we designed can effectively avoid over-segmentation of pulmonary nodules and achieve superior vessel segmentation performance.

CLINICAL RELEVANCE/APPLICATION

The deep learning segmentation algorithm for pulmonary vessels enables precise visualization of pulmonary arteries and veins on chest CT. Accurate segmentation of pulmonary vessels is crucial for both disease diagnosis and surgical planning.

T5A-SPCH-5 A NOMOGRAM FOR PREOPERATIVE PREDICTION OF INVASIVENESS IN SOLITARY PULMONARY ADENOCARCINOMA: A MULTICENTER STUDY

Xiaocui Liu (*Presenter*)

PURPOSE

To develop and validate a clinically predictive model for preoperatively assessing invasiveness in solitary pulmonary adenocarcinoma.

METHODS AND MATERIALS

From January 2020 to December 2024, patients with solitary pulmonary nodules who underwent preoperative CT scans in four centers were included. The patients were divided into a training dataset and an external testing dataset. Based on postoperative histopathology, patients were categorized into group A (atypical adenomatous hyperplasia, adenocarcinoma in situ, and minimally invasive adenocarcinoma) and group B (invasive adenocarcinoma). Univariate and multivariate logistic regression analyses were performed in the training dataset to identify independent risk factors and establish a clinical prediction model, which was then validated in the testing dataset. Receiver operating characteristic curve analysis quantified discriminative ability, while the Hosmer-Lemeshow test assessed calibration. Clinical utility was evaluated through decision curve analysis, and a nomogram was generated to visualize individualized risk probabilities.

RESULTS

Four hundred and forty-eight patients were included, with 335 patients in the training dataset (Group A 156; Group B 179) and 113 patients in the external testing dataset (Group A 53; Group B 60). Four independent predictors were identified in the training dataset: CYFRA 21-1 (OR 4.175, 95% CI 1.253-13.904; p = 0.020), maximum diameter (OR 1.247, 95% CI 1.143-1.361; p < 0.001), density type (OR 6.604, 95% CI 3.519-12.393; p < 0.001), and air bronchogram (OR 3.149, 95% CI 1.406-7.051; p = 0.005). The nomogram model demonstrated robust diagnostic performance and generalizability, achieving AUCs of 0.925 (95% CI: 0.897-0.953) in the training set and 0.895 (95% CI: 0.829-0.961) in the testing set. The accuracy was 0.863 in the training dataset and 0.876 in the testing dataset. The sensitivity was 0.872 and 0.833, while the specificity was 0.853 and 0.925 in the training and testing cohorts, respectively.

CONCLUSION

The integration of tumor markers with CT imaging features enables preoperative noninvasive prediction of invasiveness in pulmonary adenocarcinoma presenting as solitary pulmonary nodules.

CLINICAL RELEVANCE/APPLICATION

Given the widespread availability and affordability of CT and serological tests worldwide, this model can be easily implemented even in resource-limited regions. Therefore, it holds potential for clinical translation, providing a basis for precise individualized treatments.

T5A-SPCH-6 IMPROVING RECURRENCE PREDICTION IN NSCLC PATIENTS USING A MULTIMODAL DEEP LEARNING MODEL WITH CLINICAL DATA AND DEEP IMAGE FEATURE INTEGRATION VIA DIMENSIONALITY TRANSFORMATION

Hye Ryun Kim (*Presenter*)
Kyongmin S. Beck, MD, PhD (*Abstract Co-Author*)
Jin Hyoung Kang (*Abstract Co-Author*)
Helen Hong, PhD (*Abstract Co-Author*)

PURPOSE

The aim of this study is to improve recurrence prediction by incorporating clinical data into representative image features derived from the tumor region using a multimodal deep learning(DL) model. Our proposed network enables the extraction of deep image features, focusing on intratumoral and peritumoral contextual information using CT images and tumor masks. Additionally, it employs clinical risk predictor selection and dimensionality transformation to effectively integrate clinical data with deep image features, addressing the inherent dimensional imbalance.

METHODS AND MATERIALS

The dataset used in this study comprised clinical data and CT images of 166 NSCLC patients (99 non-recurrent, 67 recurrent). Sixteen prognostic clinical variables were collected from electronic medical records. First, univariate, and multivariate analyses identified N stage, Vascular invasion, and LDH as independent clinical risk predictors. Second, the multimodal DL model extracted deep image features, focusing on tumor location through the tumor-centric attention module. Third, a dimensionality transformation module was introduced, consisting of a condensation layer to distill high-dimensional image features and an expansion layer to enrich low-dimensional clinical features. The transformed features were concatenated for multimodal fusion and used for recurrence prediction through a fully connected classifier.

RESULTS

We conducted 5-fold cross validation for the evaluation of our proposed model. The proposed multimodal DL model, which integrates selected clinical risk predictors with deep image features via dimensionality transformation, achieved the highest performance across all metrics, with an accuracy of 87.93%, sensitivity of 82.09%, specificity of 91.89%, and AUROC of 0.87. Ablation studies showed performance declined when omitting either component, with the lowest AUROC (0.82) observed when both were excluded. The model without dimensionality transformation showed reduced performance(accuracy: 79.48%, AUROC: 0.80), highlighting its role in feature alignment.

CONCLUSION

The incorporation of risk predictor selection and dimensionality transformation modules substantially improves multimodal deep learning performance by enabling balanced feature representation and effective cross-modal integration for recurrence prediction. (This work was supported by the NRF grant funded by the Korea government MIST.(No. RS-2023-00214043 and No. RS-2023-00207947)).

CLINICAL RELEVANCE/APPLICATION

Identifying patients at low and high-risk patients of recurrence can be used for postoperative treatment plans, such as adjuvant chemotherapy.

T5A-SPCH-7 EVALUATING LARGE LANGUAGE MODELS FOR RADIOLOGY REPORT GENERATION FROM MAMMOGRAMS AND CHEST X-RAYS

Sonali Sharma, BSc (*Presenter*)
Ojasvi Sharma (*Abstract Co-Author*)
Shreya Udupa (*Abstract Co-Author*)
Charlotte J. Yong-Hing, MD, FRCPC (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of ten state-of-the-art large language models (LLMs) in generating structured radiology reports for screening mammograms and chest X-rays, focusing on diagnostic accuracy, anatomical localization, completeness of findings, follow-up recommendation frequency, and hallucination rates.

METHODS AND MATERIALS

A dataset of 1,000 de-identified radiology cases was assembled, consisting of 500 screening mammograms (balanced across BI-RADS categories 1-5) and 500 chest X-rays (equally divided between normal and pneumonia findings). Gold-standard free-text reports verified by board-certified radiologists served as reference. Each case was processed by the following LLMs using the prompt "Please generate a structured radiology report": GPT-4 Turbo, GPT-4o, GPT-1.0, Google Gemini 1.5 Flash, Google Gemini 1.5 Pro, Grok Beta, Grok-2, Claude 3.5 Sonnet, Claude 3.7 Sonnet, and Mistral Large. Outputs were independently scored for diagnostic accuracy, anatomical localization, completeness of reported findings, appropriateness of follow-up recommendations, and presence of hallucinations. Inter-rater reliability exceeded ? = 0.80 across all metrics.

RESULTS

For mammography, GPT-4o achieved the highest performance with 81% diagnostic accuracy, 89% location accuracy, 92% finding completeness, 21% appropriate follow-up recommendation rate, and a hallucination rate of 67%. Claude 3.7 Sonnet followed closely with 79% diagnostic accuracy and the lowest hallucination rate (8%). For chest X-rays, GPT-4o again led with 93% diagnostic accuracy, 98% location accuracy, and 93% completeness, though it demonstrated a 25% hallucination rate. Claude 3.7 Sonnet and GPT-1.0 showed similar diagnostic performance with hallucination rates under 10%.

CONCLUSION

GPT-4o and Claude 3.7 Sonnet exhibit strong capabilities in generating structured radiology reports, particularly in diagnostic and localization accuracy. However, challenges persist in achieving consistent finding completeness, generating appropriate follow-up recommendations, and minimizing hallucinations. These findings underscore the importance of domain-specific training and cautious clinical integration.

CLINICAL RELEVANCE/APPLICATION

LLM-generated structured radiology reports may reduce documentation burden and enhance standardization, but current limitations in accuracy and reliability necessitate their use as assistive tools under clinician supervision. Further fine-tuning and validation are required before safe clinical deployment.

T5A-SPCH-10 IPN-TOOLKIT: AN AUTOMATED DETECTION AND CONSISTENCY CLASSIFICATION ALGORITHM FOR INDETERMINATE PULMONARY NODULES

Abhinav Suri, BA, MPH (*Presenter*)
Ashley E. Prosper, MD (*Abstract Co-Author*)
William Hsu, PhD (*Abstract Co-Author*)

PURPOSE

With the rise in lung cancer screening, the number of indeterminate pulmonary nodules (IPNs), defined as focal opacities 6-30mm in diameter without clear prognostic indicators, has increased. Risk stratification of IPNs is critical to minimizing unnecessary scans and biopsies. While models have been made for IPN risk quantification, development is hampered by the need to manually annotate lesions which is time-consuming and requires a high level of expertise to perform reliably. Using artificial-intelligence methods, we aimed to create a fully automated algorithm that could both detect IPNs and characterize their consistency. Such an algorithm can be used for cohort data mining and individual patient burden calculation of IPN prevalence and characteristics.

METHODS AND MATERIALS

We used diagnostic and lung cancer screening CT scans from three large patient cohorts (National Lung Screening Trial [NLST], the Lung Image Data Consortium [LIDC], and our institution's patients, n=2670 scans). 4287 and 1361 IPNs were included in the training and testing dataset, respectively, and were annotated experienced radiologists. We trained/evaluated four open-source lung nodule detection algorithms to assess accuracy specifically for IPN detection accuracy (as many algorithms are only validated on large, solid nodules). Detection boxes of predicted nodules (cropped from CT and resized to 50x50x50 voxels) were then classified as either solid, part-solid, non-solid, other (comprising classes such as cystic and semi consolidation nodules), or background (i.e., false-positive detection from previous step) using a convolutional neural network (ResNet18). Overall detection rates and area under the receiver operator characteristic curve (AUC) for each nodule consistency class and background are reported.

RESULTS

MONAI was the best lung-nodule detection algorithm (found 95% of nodules but with high false positives). The macro AUC for the characterization algorithm was 0.85 with non-solid nodules being the best class (AUC=0.89) and other nodules being the worst class (0.79). Classification was slightly better on diagnostic scans (macro AUC 0.87) vs screening scans (0.83). Macro AUC did not vary by a large amount across sites (macro AUC range 0.85-0.86).

CONCLUSION

We were able to create an automated algorithm for detection and classification of IPNs. Future studies include taking resultant outputs from this model and creating/validating a IPN risk stratification model in a large longitudinal cohort.

CLINICAL RELEVANCE/APPLICATION

Our tool can be used for automated IPN detection and characterization at both the patient level and at the cohort level for risk-stratification model development.

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Nov. 30 – Dec. 4
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T5A-SPER

Emergency Radiology Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPER-3 DIAGNOSTIC PERFORMANCE OF THE SKULL BASE JAGGED SIGN IN ADULTS WITH SEIZURES AND INCREASED INTRACRANIAL PRESSURE

Farbod Khalaj (*Presenter*)
Kamand Khalaj, MD, MPH (*Abstract Co-Author*)
Elham Tavakkol, MD (*Abstract Co-Author*)
Arash Kamali, MD (*Abstract Co-Author*)

PURPOSE

This study evaluates the sensitivity and specificity of the Skull Base Jagged Sign (SJS) on brain MRI and CT scans in adult patients with normal or elevated intracranial pressure (ICP) presenting to the emergency department, with or without idiopathic unprovoked seizures. Building on prior research linking bone remodeling to ICP changes, we aim to further define structural imaging markers of elevated ICP. To assess the diagnostic utility of SJS, we compared its prevalence across 4 distinct patient groups.

METHODS AND MATERIALS

In this IRB-approved retrospective study, adults aged 18-40 who underwent lumbar puncture and either brain MRI or CT scan at our institution were included. Patients were divided into 4 groups: Group 1 (elevated ICP with seizures, n=27), Group 2 (normal ICP with seizures, n=39), Group 3 (elevated ICP without seizures, n=52), and Group 4 (controls, n=39), who had normal opening pressure and unremarkable clinical, imaging, and CSF findings. SJS, defined as sharp bony remodeling in the posterior medial cranial fossa on coronal T2-weighted MRI or CT, was evaluated by two independent observers. Sensitivity, specificity, and predictive values were calculated.

RESULTS

SJS was most frequent in Group 1 (elevated ICP with seizures), present in 88.9% of cases, followed by 71.2% in Group 3 (elevated ICP without seizures) ($p=0.07$). It was significantly more common in Group 1 compared to Group 2 (normal ICP with seizures), where it appeared in 46.2% of patients (88.9% vs 46.2%, $p<0.001$), and also more frequent in Group 3 compared to the control group (Group 4), where it was present in only 30.8% (71.2% vs 30.8%, $p<0.001$). The difference between Group 2 and Group 4 (46.2% vs. 30.8%) was not statistically significant ($p=0.16$). For predicting seizures in patients with elevated ICP (Groups 1 & 3), SJS showed a sensitivity of 88.9% and a specificity of 28.8%. Among seizure patients (Groups 1 & 2), SJS had a sensitivity of 88.9% and specificity of 53.8% for detecting elevated ICP. In patients with normal ICP (Groups 2 & 4), SJS yielded a sensitivity of 46.2% and specificity of 69.2% for predicting seizures ($p=0.16$). For diagnosing elevated ICP in patients without seizures (Groups 3 & 4), SJS demonstrated a sensitivity of 71.2% and specificity of 69.2%.

CONCLUSION

The Skull Base Jagged Sign shows high sensitivity and may be a useful screening marker on brain MRI or CT scans for detecting elevated ICP in patients presenting to the emergency department, regardless of seizure status.

CLINICAL RELEVANCE/APPLICATION

The Skull Base Jagged Sign may aid in the early identification of elevated intracranial pressure on brain MRI or CT scans, supporting timely diagnosis and management in patients presenting to the emergency department with or without seizures.

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T5A-SPGI

Gastrointestinal Imaging Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPGI-2 IMPACT OF BODY COMPOSITION ON EARLY RECURRENCE IN PATIENTS WITH RESECTABLE PANCREATIC CANCER

Bingjie Liu (*Presenter*)
Jing Zhu (*Abstract Co-Author*)
Haopeng Yu (*Abstract Co-Author*)
Xi Jiao Liu (*Abstract Co-Author*)
Yuqi Wang (*Abstract Co-Author*)
Yu Li (*Abstract Co-Author*)
Zixing Huang (*Abstract Co-Author*)
Bin Song (*Abstract Co-Author*)

PURPOSE

Despite increasing evidence suggesting that body composition is a predictor of poor prognosis in patients with pancreatic cancer, its association with early recurrence remains undetermined. In this study, we investigated the influence of body composition on early recurrence in patients with pancreatic cancer following surgical resection.

METHODS AND MATERIALS

Three hundred eighty-five patients who were diagnosed with pancreatic cancer and underwent curative surgery between January 2014 and December 2021 were retrospectively included. Preoperative CT at the third lumbar vertebral level was performed to ascertain the skeletal muscle index (SMI) and density (SMD), subcutaneous and visceral adipose tissue (SAT and VAT) indices and density. Clinical, biochemical and pathological information was collected. The associations of these factors with early recurrence were evaluated via the Kaplan-Meier method and univariable and multivariable Cox proportional hazards models.

RESULTS

Two hundred eighteen (57%) patients experienced early recurrence. A total of 156 (41%), 159 (41%), 189 (49%), and 144 (37%) patients had sarcopenia, myosteatosis, high SAT and high VAT, respectively. Cox regression multivariate analysis revealed that myosteatosis (HR: 1.63 (95% confidence interval (CI) 1.22~2.17, P<0.001) and high VAT (HR: 1.51 (95% CI 1.12~2.03), P=0.005) were independent factors contributing to early recurrence after surgery, whereas sarcopenia and SAT were not significantly associated. In addition, the newly proposed scoring system incorporating these independent prognostic factors demonstrated good predictive accuracy (AUC=0.724) and effective stratification of patients into high- and low-risk groups.

CONCLUSION

The present study revealed that myosteatosis and high VAT were associated with early recurrence, whereas sarcopenia and SAT were not. The incorporation of body composition analysis into preoperative assessments may improve risk stratification and guide personalized management strategies.

CLINICAL RELEVANCE/APPLICATION

This study explores whether CT-derived body composition parameters, such as myosteatosis and visceral adiposity, can predict early recurrence after curative-intent resection for pancreatic cancer. By integrating imaging and biochemical markers, we aim to develop a practical preoperative scoring system to aid in individualized risk stratification. This tool could help guide perioperative management decisions and improve patient selection for neoadjuvant or adjuvant therapies, using routinely acquired CT data in a cost-effective and clinically accessible manner.

T5A-SPGI-3 EARLY DETECTION OF PANCREATIC ADENOCARCINOMA RECURRENCE: IS CIRCULATING TUMOR DNA BETTER THAN CA 19-9?

Luke A. Ginocchio, MD (*Presenter*)
Andrew Ruff, MD (*Abstract Co-Author*)
Paul Smereka, MD (*Abstract Co-Author*)
Chenchan Huang, MD (*Abstract Co-Author*)

PURPOSE

To determine if circulating tumor DNA (ctDNA) is a more reliable biochemical marker for detecting pancreatic adenocarcinoma (PDAC) recurrence than carbohydrate antigen 19-9 (CA 19-9).

METHODS AND MATERIALS

55 consecutive patients (average age 71.9 years, 32 males, 23 females) who had pathologically proven PDAC recurrence following Whipple with postoperative CT studies and ctDNA values available between 11/1/2021 and 7/17/2024, were included. Images from the 114 CTs were anonymized and subsequently reviewed by three radiologists using a 5-point Likert scale for numerous imaging indicators of disease recurrence.

RESULTS

In 47/55 (85.5%) patients, ctDNA was elevated prior to imaging recurrence. 18 of these patients (38.3%) with imaging recurrence had a negative corresponding CA 19-9. All 18 of these cases corresponded to a ctDNA <22.2 ng/mL, with 88.9% (16/18) corresponding to a level <3.5 ng/mL. For 3 cases, all readers agreed on unlikely/no imaging evidence of overall recurrence, yet ctDNA was positive at time of initial postoperative CT (average 0.13 ng/mL), and these patients subsequently developed recurrent disease. On average, ctDNA was positive 94.2 days before disease recurrence was confirmed. Intraclass correlation coefficient for 'Overall Recurrence' likelihood was 0.72, indicating good reader agreement for imaging recurrence.

CONCLUSION

ctDNA was elevated in 85.5% of cases of disease recurrence, confirming its role as a reliable biochemical marker for detecting pancreatic adenocarcinoma recurrence. In addition, ctDNA was more sensitive than CA 19-9 for early disease recurrence in 38.3% of cases, suggesting improved detection of early recurrence. In the three cases in which all readers agreed on no convincing evidence of recurrence, ctDNA was positive, albeit low, potentially allowing for detection of disease recurrence earlier than imaging.

CLINICAL RELEVANCE/APPLICATION

ctDNA is a promising biochemical marker for detecting pancreatic adenocarcinoma recurrence, offering a potentially more sensitive replacement for CA 19-9 and may lead to earlier recurrence detection than imaging alone, resulting in improved patient outcomes.

T5A-SPGI-4 SPECTRAL CT AND CLINICAL PARAMETER INTEGRATION FOR PREOPERATIVE IDENTIFICATION OF PERINEURAL INVASION IN ADVANCED GASTRIC CANCER WITHOUT LYMPH NODE METASTASIS

Tiezhu Ren, MD, MMEd (*Presenter*)

PURPOSE

Node-negative advanced gastric cancer with perineural invasion-positive has a significantly increased chance of staging migration, and the choice of treatment regimen should be equivalent to that of node-positive patients. The purpose of this study was to investigate the utility of combining clinical and spectral computed tomography (CT) parameters in the preoperative evaluation of perineural invasion (PNI) in node-negative advanced gastric cancer (AGC).

METHODS AND MATERIALS

We retrospectively analyzed 127 patients with GC. All cases were confirmed by pathology, underwent spectral-CT examination, and were divided into positive group (n=88) and negative group (n=39) depending on PNI occurrence. Clinical characteristics, including demographic information, serum tumour markers, and gastroscopic pathological information, were collected. The effective atomic number (Zeff), iodine concentration (IC), and water concentration were measured in the arterial (AP) and venous (VP) phases. Intra-group correlation coefficient (ICC) was used to test the consistency of the results of each parameter measured by two observers. Parameter differences between the two groups were compared, and diagnostic performance was evaluated. Because of the imbalance between the two groups, we further used the F1 score to compare performances.

RESULTS

The PNI-positive group's histological grade, Borrmann type, Zeff, and IC were substantially greater than those of the negative group (AP-Zeff, 8.80±0.11 vs 8.15±0.13; VP-Zeff, 8.84±0.24 vs 8.31±0.65; AP-IC, 19.07±5.19 vs 14.42±3.97; VP-IC, 22.09±5.04 vs 15.65±4.24, all $p < 0.05$). The evaluated efficiency of the combination of clinical and spectral-CT parameters was superior to that of individual parameters. The clinical parameters combined with Zeff and IC in AP and VP exhibited good evaluation efficacy (AUC=0.854, F 1 =0.888, sensitivity=86.2%, specificity=79.4%, PPV=0.915).

CONCLUSION

Clinical and energy spectral-CT parameters exhibited considerable value in the preoperative evaluation of PNI in AGC. The combination of clinical and spectral-CT parameters exhibited a favorable performance in predicting PNI in AGC. The combined parameter model can further improve prediction efficiency and provide an effective tool for clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

The combination of clinical parameters and spectral-CT is a valuable approach to predicting PNI in GC. The combined parameter model can further improve prediction efficiency and provide an effective tool for clinical decision-making.

T5A-SPGI-6 QUANTITATIVE MRI PARAMETERS IN PATIENTS WITH TYPE 1, TYPE 2 DIABETES, AND LATENT AUTOIMMUNE DIABETES IN ADULTS (LADA): A CORRELATION PROSPECTIVE STUDY

Benedetta Masci, MD (*Presenter*)
Marta Zerunian, MD (*Abstract Co-Author*)
Stefano Nardacci, MD (*Abstract Co-Author*)
Damiano Caruso, MD, PhD (*Abstract Co-Author*)
Marco Francone, MD, PhD (*Abstract Co-Author*)
Andrea Laghi, MD (*Abstract Co-Author*)

PURPOSE

To identify differences in quantitative MRI biomarkers among patients with type 1 diabetes (T1D), type 2 diabetes (T2D), and latent autoimmune diabetes in adults (LADA).

METHODS AND MATERIALS

In this prospective single-center study, 40 diabetic patients (T1D, T2D, LADA), aged 50-60 years were enrolled, from September 2023 to September 2024. The patients included underwent 1.5T upper abdominal MRI with axial proton density fat fraction (PDFF) and magnetic resonance elastography (MRE) sequences. Quantitative assessment included liver PDFF (L-PDFF), pancreatic PDFF (Pa-PDFF), liver stiffness (LS), and pancreatic volume (Pa-Vol). Two radiologists performed image analysis. Manual segmentation was performed with 3DSlicer v4.10.2. Statistical analysis included one-way ANOVA for group comparisons and Spearman's rank correlation for associations.

RESULTS

Hepatic steatosis (L-PDFF >5.5%) was observed in 27% of the population. Elevated liver stiffness (>2.4 kPa) suggestive of inflammation or low-grade fibrosis was present in 55% of the population. Pancreatic volume reduction was identified in 32% of the population. L-PDFF values significantly differed between T2D, T1D and LADA patients (T2D: 6.15 % ± 3.04; T1D: 2.45 % ± 0.35; LADA: 2.8 % ± 1.13; $p < 0.00023$); furthermore, Pa-PDFF did not show significant differences among groups ($p = 0.304$). In T1D patients, L-PDFF significantly correlated with Pa-PDFF ($p < 0.0001$); this association was not observed in T2D or LADA. Pa-Vol differed among groups (T2D: 50.9 ± 2.76 cm^3; T1D: 44.1 ± 4.17 cm^3; LADA: 45 ± 2.2 cm^3;), with significant differences between T2D and LADA ($p < 0.0001$).

CONCLUSION

Quantitative MRI identified significant differences in pancreatic volume and hepatic fat accumulation across diabetes types, particularly between T2D and LADA. These findings support MRI as a promising non-invasive tool to phenotype diabetic patients and monitor disease progression.

CLINICAL RELEVANCE/APPLICATION

Quantitative abdominal MRI detects significant differences among different diabetes subtypes, offering a reliable, non-invasive imaging biomarker approach to evaluate metabolic organ involvement.

T5A-SPGI-8 LONG TERM PROGNOSIS OF INDETERMINANT LESIONS IN THE CIRRHOTIC LIVER: INSIGHTS FROM THE LI-RADS 3 NEUTRAL CATEGORY

Aymen Bahsoun, BS, MD (*Presenter*)
Juliana Ramirez (*Abstract Co-Author*)

Radhika Rajeev, MD (*Abstract Co-Author*)
Meredith Reed (*Abstract Co-Author*)
Reve Chahine, MD, FRCR (*Abstract Co-Author*)
Mishal Mendiratta-Lala, MD (*Abstract Co-Author*)
Shane A. Wells, MD (*Abstract Co-Author*)
Hero K. Hussain, MD, FRCR (*Abstract Co-Author*)

PURPOSE

Liver Imaging Reporting and Data System (LI-RADS) category 3 represents indeterminate lesions with estimated malignancy risk of 30-40% 1 . LR-3 lesions require monitoring at 3-6-month intervals 2 , which can be resource and time-consuming. We aimed to assess the outcomes of LR-3 lesions in cirrhotic patients at our center and identify predictors of malignant and benign outcomes.

METHODS AND MATERIALS

We conducted a retrospective chart review of patients with LR-3 lesions identified between 2019-2021. Data collected included imaging characteristics, lesion outcomes over a follow-up period of 3-48 months, reader's experience, and the coexistence and category of additional lesions. Patient-specific variables included age, sex, etiology of cirrhosis, and liver treatment status (treatment-naïve or previously treated).

RESULTS

795 LR-3 observations in 427 patients (41% previously treated), 86% observations exhibited isolated arterial phase hyperenhancement, and 17% had ancillary features. After follow-up, 26% of LR-3 lesions were upgraded, 58% downgraded, and 16% remained unchanged. The highest-grade coexisting lesion was LR-5 in 26%, LR-4 in 19%, and LR-3 in 35%. No significant differences in outcomes were observed based on reader's experience or the type of major LI-RADS imaging characteristics. LR-3 lesions in treatment-naïve vs treated livers had lower upgrade rates (17% vs 38%, p< 0.001; HR 0.71, p<0.001) and higher downgrade rates (69% vs 44%, p<0.001; HR 1.78, p<0.001). Alcohol-related cirrhosis as well as Hepatitis C cirrhosis were associated with LR-3 upgrade to (HR 1.61, 95% CI, p=0.01,). Lesions with ancillary features were approximately twice as likely to upgrade and 34% less likely to downgrade (HR 2.07, 95% CI, p=0.004; HR 0.64, 95% CI, p=0.03).

CONCLUSION

Post-treatment liver status, the coexistence of other LI-RADS lesions, alcoholic cirrhosis, and ancillary features were associated with malignant outcomes. Identifying predictors of LR-3 outcome may help refine surveillance strategies and reduce resource burden.

CLINICAL RELEVANCE/APPLICATION

Certain characteristics may tailor follow-up intervals for LIRADS 3 lesions.

T5A-SPGI-9 EVALUATION OF SALINE INFUSION MRI FISTULOGRAM IN PERIANAL FISTULA: A CROSS-SECTIONAL STUDY

Sachin Virmani, MD (*Presenter*)

PURPOSE

To evaluate the accuracy and usefulness of normal saline infusion in MR-Fistulogram in the diagnosis of peri- anal fistula.

METHODS AND MATERIALS

Study design Cross-sectional study Study population : clinical diagnosed peri anal fistula patients Study duration: 18 months Sample size n ~ 107• Conventional MRI and MRI with saline MR Fistulogram using Philips-1.5-Tesla Three Planes • Section thickness: 3 mm • Axial, coronal and sagittal: T2• Axial and coronal: STIR / T2 FS

RESULTS

Participants ranged from 5 to 75 years, with most aged 36-45 (32.7%), followed by 46-55 (23.3%). Males predominated (89.7%; M:F = 8:1). Drivers were the most common occupation (15.8%). Saline MRI identified internal openings 1 and 2 in 93.4% and 6.5% of cases, respectively, while conventional MRI identified 84.1% and 0.9%, missing 16 cases. Both methods showed posterior internal openings, with Intersphincteric and Transsphincteric types in 59.8% and 38.3%. Internal opening-to-anal verge distance of 2.1-3.0 cm was noted in 16.8% (saline MRI) and 22.4% (conventional). Fistula diameter was 2-3 mm in 37.3% (saline) and 1-2 mm in 32.7% (conventional). Most were left-sided (57%), with external openings commonly at 6 o'clock (15.8%). Secondary branches were seen in 46.7%. Saline MRI showed 2 ramifications in 14.9%, while conventional MRI showed 1 in 19.6%. Horseshoe tracts were noted in 9.3%. Abscesses were absent in 60.7%; simple and horseshoe abscesses were seen in 29.9% and 9.3%. Perianal inflammation was present in 48.5%. Thin tracts were seen more with saline MRI (93.4% vs. 65.5%). Thick tracts were seen in 98.1% of both. Statistically significant correlation was noted between modalities. Conventional MRI was highly specific (100%) for 2 openings but less sensitive (81.2%) for 1. Saline MRI showed perfect specificity, PPV, and NPV for detecting secondary tracts and 2 ramifications (p < 0.0001).

CONCLUSION

MR imaging with normal saline provides a precise definition of the fistulous track, along with its relationship to pelvic structures, and allows identification of secondary fistulas or abscesses. MRI using normal saline as a contrast agent has a specificity and sensitivity comparable to those obtained in studies using gadolinium contrast agents either intravenously or as a local agent. Normal Saline can thus act as a cheaper alternative as well, and we can avoid contrast-related reactions to gadolinium-based contrast agents in the evaluation of perianal fistula.

CLINICAL RELEVANCE/APPLICATION

This improved imaging capability aids in precise surgical planning, ultimately reducing recurrence rates. The technique is non-invasive and free of radiation exposure, making it a safer alternative to conventional imaging methods

T5A-SPGI-10 INTRAINDIVIDUAL COMPARISON OF 3-T AND 5-T GD-EOB-DTPA-ENHANCED MRI IN EVALUATION OF HEPATOCELLULAR CARCINOMA: INITIAL RESULTS

Shao Peng Li II, DO (*Presenter*)
Ying Liu (*Abstract Co-Author*)
Lianxin Liu (*Abstract Co-Author*)
Dawei Yin (*Abstract Co-Author*)
Peng Wang (*Abstract Co-Author*)
Mengqiu Liu (*Abstract Co-Author*)
Zhichao Feng, MD (*Abstract Co-Author*)
Runyu Tang (*Abstract Co-Author*)
Xiaopeng Song (*Abstract Co-Author*)

PURPOSE

To compare the value of Gd-EOB-DTPA-enhanced magnetic resonance imaging (MRI) at 5.0 T and 3.0 T in the diagnosis of hepatocellular carcinoma (HCC).

METHODS AND MATERIALS

Prospective recruitment of 25 suspected HCC patients and underwent plain and Gd-EOB-DTPA-enhanced, including arterial phase(AP), portal vein phase(PVP), transition phase(TP), and hepatobiliary phase(HBP) at 5.0 T and 3.0 T. For TP and HBP at 5.0 T, artificial intelligence-assisted compressed sensing (ACS) and parallel imaging (PI) were applied and compared. Two abdominal radiologists independently evaluated the image quality, including objective indices and subjective image quality scores. At

the same time, the detection rates of HCC imaging features were compared. Cohen's Kappa test was performed to assess the consistency between the two readers. Paired Chi-square or Student's t test was used to compare the differences in objective, subjective scores and the detection rate of imaging features.

RESULTS

All subjective scores were good to excellent at both 5.0 T and 3.0 T. The contrast enhanced images, had significantly higher SNR, CNR, CR and subjective scores than 3.0 T (all p <0.05). The subjective and objective scores of TP and HBP images were significantly higher with ACS than PI (all p <0.05). The detection rate of enhancing "capsule", coronary enhancement on AP, intra-lesion arterial vessels, and peritumoral hypointensity on the HBP were all higher on 5.0T MRI than 3.0T. Voxel sequences based on ACS technology can further improve the detection rate of enhancing capsule and peritumoral hypointensity on the HBP(p <0.001, p =0.037, respectively).

CONCLUSION

The image quality of Gd-EOB-DTPA enhanced MRI at 5.0T is better than that at 3.0 T. The use of 5.0 T enhanced scanning combined with ACS technology can improve the display of HCC imaging features, and improve the diagnostic accuracy of HCC.

CLINICAL RELEVANCE/APPLICATION

Gd-EOB-DTPA-enhanced MRI based on 5.0 T provides excellent image quality, improving hepatocellular carcinoma detection and display of imaging features.

T5A-SPGI-11 CLINICAL AND TECHNICAL FACTORS PREDICTING DIAGNOSTIC VS. NON-DIAGNOSTIC POINT-OF-CARE QUANTITATIVE ULTRASOUND (US) FOR LIVER STIFFNESS

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PURPOSE

Point-of-care ultrasound (POCUS) for liver stiffness quantification will revolutionize screening for metabolic dysfunction-associated steatotic liver disease (MASLD), a leading cause of liver failure. However, ultrasound (US) as a technique remains limited or non-diagnostic due to a variety of factors. We aim to examine potential clinical and technical factors that lead to diagnostic vs. non-diagnostic US quantification of liver stiffness.

METHODS AND MATERIALS

Veterans (n=101) with obesity (body mass index > 30) and/or type 2 diabetes were enrolled in an IRB-approved study in 2022-2024. Liver stiffness and fat measurements were obtained using US auto point shear wave elastography (auto-pSWE) and US derived fat fraction (UDFF) (Siemens ACUSON Sequoia with DAX transducer, software revision VA30B). Same-day MRI elastography (MRE) and proton density fat fraction (PDFF) were also performed (Siemens MAGNETOM Vida Fit). Diagnostic US auto-pSWE measurements passed a two-step process that required IQR/median <0.6 and 4-point manual image review. Clinical factors include patient age, gender, body mass index (BMI), and type 2 diabetes status (DM2). Technical factors include operator type (radiologist vs. non-radiologist), auto-pSWE value, US region of interest (ROI) depth in centimeters (cm), number of valid auto-pSWE boxes (out of 15 total), and MRI PDFF to determine any effects of underlying hepatic steatosis. Spearman rank correlation and logistic regression analyses were performed.

RESULTS

Of 101 veterans enrolled (median age 68 years, range 37-75 years), most were male (n=90) and obese (median BMI 31.6, range 19.3-49.1) with DM2 (n=84). Spearman rank correlation between US auto-pSWE and MRE for diagnostic US values was 0.28 (p<0.001) and for non-diagnostic US values was 0.03 (p=0.89). Logistic regression analysis showed that a non-radiologist operator (p=0.007), greater US ROI depth (p=0.02), greater patient age (p=0.03), and female gender (p<0.001) were significant predictors for non-diagnostic US auto-pSWE measurements.

CONCLUSION

Non-diagnostic liver US elastography values are associated with US operator type (non-radiologist), greater US ROI depth, greater patient age, and female gender. We were unable to detect an effect for other clinical or technical factors.

CLINICAL RELEVANCE/APPLICATION

Radiologists should be aware that clinical factors including patient age and gender and technical factors including US operator and US ROI depth can affect whether POCUS liver elastography is non-diagnostic.

T5A-SPGI-12 A MULTIMODAL MACHINE LEARNING MODEL INTEGRATING ENDOSCOPIC ULTRASOUND AND CTRADIOMICS FOR DIFFERENTIATING GASTROINTESTINAL STROMAL TUMORS FROM LEIOMYOMAS: A MULTICENTER STUDY

Xiao Zhang (*Presenter*)
Jiao Jiao (*Abstract Co-Author*)
Boyun Li (*Abstract Co-Author*)
Mingzhu Li (*Abstract Co-Author*)
Weifang Yu (*Abstract Co-Author*)
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PURPOSE

To assess the potential of a multimodal machine learning model incorporating clinical information, endoscopic ultrasound (EUS), and CT radiomics for differentiating gastrointestinal stromal tumors (GISTs) from gastrointestinal leiomyomas (GILs).

METHODS AND MATERIALS

A total of 108 patients were retrospectively enrolled from January 2020 to October 2024. These patients were divided into a training cohort from centers 1 and 2, comprising 79 patients with 356 lesions, and an independent validation cohort from center 3, comprising 29 patients with 147 lesions. Clinical data, including demographic features, laboratory test results, and EUS morphological features, were analyzed using univariate logistic regression to identify significant variables. Radiomics features were extracted from two-dimensional lesions in preprocessed non-contrast EUS and CT images, with a total of 651 features extracted for each lesion. After applying downsampling, causal inference, Pearson correlation analysis, and Relief algorithm, a highly corrected and non-redundant feature set was obtained. The optimal radiomics model was constructed by comparing various classifiers across five-fold cross-validation, generating patient-level radscores (EUS-radscore and CT-radscore) through the averaging and weighting of lesion-level outputs. A multimodal machine learning model integrating the significant clinical variables, EUS-radscore, and CT-radscore was further explored. Model discrimination and clinical usefulness were evaluated using the area under the curve (AUC), decision curve analysis (DCA), and clinical impact curve (CIC), respectively.

RESULTS

None of the clinical variables demonstrated a significant correlation with the differentiation task following univariate logistic regression analysis. The CT-radscore, derived from 18 features, demonstrated superior performance compared with the EUS-radscore, which was based on 4 features ($P < 0.05$). A multimodal model integrating CT-RadScore and EUS-RadScore achieved AUC values of 0.965 (95% CI: 0.949-0.981) in the training cohort and 0.946 (95% CI: 0.924-0.969) in the validation cohort, demonstrating superior performance to single-modality models ($P < 0.05$). DCA and CIC analysis further confirmed the superior clinical usefulness of the multimodal model.

CONCLUSION

The multimodal machine learning model incorporating EUS and CT radiomics has shown a significantly enhanced capability in differentiating GISTs from GILs compared to single-modality approaches.

CLINICAL RELEVANCE/APPLICATION

The current study provides an enhanced multimodal diagnostic tool to accurately differentiate GISTs from GILs, facilitating tailored treatment strategies and improving patient outcomes.

T5A-SPGI-15 DEEP LEARNING CT RECONSTRUCTION IMPROVES LIVER METASTASES DETECTION

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PURPOSE

Detection of liver metastases on abdominal CT is crucial in medical imaging but can be challgenging. New deep-learning image reconstruction (DLIR) algorithms are based on convolutionnal neural network trained on high quality image datasets to provide higher quality abdominal CT at same radiation doses compared to iterative reconstructions. The main purpose of the study was to assess if DLIR could allow an increase in the detection of liver metastases by comparing three different strengh levels of DLIR and a conventionnal iterative reconstruction method. Secondary objective was to compare metastases conspicuity for each reconstruction.

METHODS AND MATERIALS

CT scans of the abdomen and pelvis of 121 patients performed for cancer initial assessment or follow-up were compared. The inclusion criterion was the presence of at least one hypoattenuating liver metastasis described in the radiology report. For each patients, one iterative reconstruction 50%-ASiR-V and three deep-learning reconstructions were obtained using the DLIR algorithm TrueFidelity at different strength levels: DLIR-low (DLIR-L), DLIR-medium (DLIRM), and DLIR-high (DLIR-H). For each reconstruction, two double-blinded radiologists counted up to a maximum of ten metastases. Overall image quality, image noise reduction, hepatic metastases visibility and hepatic metastases contour definition were also assessed using a five-point scal by both radiologists. In cases where both readers found more metastases with DLIR-H than ASiR-V or vice versa, a third independent radiologist blindly evaluated the number of lesions on both reconstructions to confirm or disprove the difference.

RESULTS

A higher number of metastases was detected by the senior reader (R2) with DLIR-high: 7 (2-10) (median (Q1-Q3); total 733) versus 5 (2-10) respectively for DLIR-medium, DLIR-low, and ASiR-V ($p < 0.001$). The junior reader (R1) found no significant difference in metastases number between reconstructions. For 12 patients, both readers simultaneously found a higher number of metastases with DLIR-H compared to ASiR-V. This was confirmed by the third radiologist for ten patients. Image quality and noise reduction were lower for ASiR-V and increased with deep learning levels. Metastases visibility and contour definition were better for DLIR-H for both readers.

CONCLUSION

High-strength DLIR improved visibility of liver metastases and led to a statistical increase in the number of detected hepatic metastases compared to iterative reconstruction.

CLINICAL RELEVANCE/APPLICATION

Deep learning-based reconstruction at high strength allows an increase in liver metastases detection compared to hybrid iterative reconstruction and can be used to help overcome the limitations of CT.

T5A-SPGI-16 DIAGNOSTIC PERFORMANCE OF CONVENTIONAL AND QUANTITATIVE ULTRASOUND IN DETECTING HEPATIC STEATOSIS IN CHILDREN: A SYSTEMATIC REVIEW AND INDIVIDUAL PARTICIPANT DATA META-ANALYSIS

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PURPOSE

To review the literature systematically and perform individual participant data (IPD) meta-analysis on the accuracy of conventional ultrasound (CUS) and quantitative ultrasound (QUS) in assessing hepatic steatosis in children.

METHODS AND MATERIALS

We performed a systematic literature review using the MEDLINE database to identify studies published in English through June 2024 concerning diagnostic performance of CUS or QUS for assessing hepatic steatosis in children. Six CUS and 15 QUS studies were eligible (one study investigated both). QUS parameters included controlled attenuation parameter (CAP), hepatorenal index (HRI), and attenuation coefficient (AC). Risk of study bias was assessed across 4 domains (patient selection; index test; reference standard; flow and timing) using the Quality Assessment of Diagnostic Accuracy Studies-2 critical appraisal checklist. Study authors were asked to share raw data for IPD meta-analysis. Areas under the receiver operating characteristic curve (AUCs) and, at optimal Youden index-based thresholds, sensitivity and specificity were computed, along with their 95% confidence intervals (CIs).

RESULTS

All selected studies were considered at risk for bias. Sensitivity/specificity pairs from the 6 CUS studies ranged from 48%/97% to 100%/11%; Youden indices (sums of sensitivity and specificity) ranged from 111% to 145%. Authors of the CUS studies did not share IPD, precluding meta-analysis. Based on IPD metanalysis of 4 studies (n=252 participants), CAP had 0.79 AUC (95% CI: 0.71, 0.87) and, at an optimal threshold of 278 dB/m, 73% sensitivity (95% CI: 66%, 78%) and 78% specificity (95% CI: 62%, 89%). Based on IPD metanalysis of 3 studies (n=159), HRI had 0.79 AUC (95% CI: 0.71, 0.86) and, at an optimal threshold of 1.76, 57% sensitivity (95% CI: 43%, 70&) and 89% specificity (95% CI: 81%, 94%). Based on IPD metanalysis of 4 studies (n=277), AC had 0.92 AUC (95% CI: 0.88, 0.95) and, at an optimal threshold of 0.66 dB/cm/MHz, 78% sensitivity (95% CI: 70%, 85%) and 94% specificity (95% CI: 89%, 98%).

CONCLUSION

CUS has inconsistent diagnostic accuracy for hepatic steatosis in children. Among QUS techniques, CAP and HRI showed modest performance, while AC demonstrated high diagnostic accuracy. All studies showed risk of bias, highlighting a need for higher-quality research.

CLINICAL RELEVANCE/APPLICATION

CUS, CAP, and HRI lack sufficient diagnostic accuracy for clinical use in pediatric hepatic steatosis. AC may offer a reliable noninvasive alternative pending further validation.

T5A-SPGI-17 INTEROBSERVER AGREEMENT AND ACCURACY OF VARIOUS MR SEQUENCES FOR SIZE MEASUREMENT OF PANCREATIC CYSTIC LESIONS: A PRELIMINARY STUDY

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Naveen Rajamohan, MD,MBBS (*Abstract Co-Author*)
Yin Xi, PhD (*Abstract Co-Author*)
Lakshmi Ananthakrishnan, MD (*Abstract Co-Author*)
Takeshi Yokoo, MD, PhD (*Abstract Co-Author*)
Gaurav Khatri, MD (*Abstract Co-Author*)

PURPOSE

Pancreatic cystic lesions (PCLs) are seen in 20-44% of abdominal MRIs and have variable risk profile for transformation to pancreatic adenocarcinoma. Size is a common feature used in all the guidelines to predict their malignant potential. The purpose of this study is to determine the MRCP sequence that yields the highest inter-reader agreement for measurement of PCLs and compare PCL measurements on various MRCP sequences to endoscopic ultrasound (EUS).

METHODS AND MATERIALS

This single center retrospective study included 56 patients who underwent MRCP and EUS for PCLs within 1 year of each other. PCLs less than 1 cm on MRI and without corresponding EUS measurement were excluded. Three blinded body-trained radiologists (R1, R2, R3) with variable experience levels measured the maximum cyst diameter on 3D-MRCP, radial MRCP, axial T2-weighted (T2w), and coronal T2w sequences. Inter-reader agreement was assessed using intra-class coefficient (ICC) and reproducibility coefficient (RDC). Mean absolute deviance and Bland Altman plots were used to compare measurements on MRCP and EUS.

RESULTS

78 PCLs from 56 patients were included. The mean cyst size on EUS was 20mm, and mean on different sequences ranged from 19-23mm. The ICCs between three radiologists were 0.94, 0.94, 0.92, and 0.94, for measurements on 3D-MRCP, radial MRCP, axial T2w, and coronal T2w sequences, respectively. No significant differences were observed in the ICC across sequences ($p > 0.05$). No significant difference was observed in RDC between readers across sequences with RDCs ranging from 6.1-6.9mm ($p>0.05$). Mean absolute deviance between various sequences and EUS ranged from 2.46-2.62mm, also not statistically different ($p>0.05$).

CONCLUSION

While there was excellent relative agreement for measurement of PCLs between three radiologists in terms of ICC on all MRCP sequences, the RDC as a measure of absolute agreement between readers was larger than expected. The mean absolute deviances between all the MRCP sequences and EUS were small. There were no significant differences between sequences for measurement of pancreatic cystic lesions.

CLINICAL RELEVANCE/APPLICATION

Our study found similar agreement between readers for PCL measurements on various MRCP sequences and in comparison to EUS, suggesting that all sequences are feasible if used consistently. However, our study's RDC of >6 mm suggests greater absolute variability on MRCP measurements than previously thought. To our knowledge, this is the first study to report RDC when comparing reproducibility measurements in PCLs. Based on our findings, the current Kyoto guideline's criterion of growth rate = 2.5 mm per year as a worrisome feature may need to be reconsidered.

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T5A-SPGU

Genitourinary Imaging Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPGU-1 ASSESSMENT OF PROSTATE SHAPE DIFFERENCES USING AN ATLAS BASED APPROACH IN PROSTATE CANCER PATIENTS WITH AND WITHOUT EXTRAPROSTATIC EXTENSION ON 3 TESLA BIPARAMETRIC MRI

GOURAV MODANWAL (*Presenter*)
Sena Azamat (*Abstract Co-Author*)
Naoto Tokuyama (*Abstract Co-Author*)
Zelin Zhang (*Abstract Co-Author*)
Abhishek Midya (*Abstract Co-Author*)
Martin J. Sanda, MD (*Abstract Co-Author*)
Mohammad Hajiha (*Abstract Co-Author*)
Anant Madabhushi, PhD (*Abstract Co-Author*)

PURPOSE

Extraprostatic extension (EPE) is a critical factor in determining eligibility for nerve-sparing surgery and focal therapy in prostate cancer. However, identifying EPE on biparametric prostate MRI (bpMRI) is challenging due to the subtle nature of capsular invasion. While features like the length of capsular contact may suggest the presence of EPE, this feature suffers from high inter-reader variability. In this study, we explored the hypothesis that an atlas-based approach would allow for discernment of prostate shape differences between EPE-positive (EPE?) and EPE-negative (EPE?) patients on bpMRI.

METHODS AND MATERIALS

Fifty-five patients with clinically significant prostate cancer underwent bpMRI using a Philips Ingenia 3T scanner. Axial T2-weighted (T2w) images were acquired with the following parameters: TR = 3,184 ms, TE = 100 ms, FOV = 240 × 240 mm², and slice thickness = 3 mm. EPE status was determined based on histopathological examination of radical prostatectomy specimens. Prostate glands were segmented from T2w images using an in-house based deep learning model. Population-based prostate gland atlases for the EPE? and EPE? cohorts (denoted by A + and A - respectively) were generated using a multi-reference registration pipeline, including rigid and deformable steps, followed by histogram matching to produce group-average prostate gland maps. All gland segmentations were then rigidly registered to A - for spatial alignment. Signed distance functions were computed from aligned masks, and the prostate surface was extracted as the zero-level isosurface. Gaussian curvature and surface normals were calculated for each mesh. To enable spatially localized analysis, each prostate surface was divided into 12 anatomical regions. Regional curvature and surface orientation metrics were extracted, and group differences were assessed using the Mann-Whitney U test.

RESULTS

The cohort consisted of 55 patients (mean age 70 ± 7 years; PSA 19 ± 19 ng/mL), including 18 EPE + and 37 EPE - cases. Surface morphometry revealed significant differences in curvature and surface normal orientation between groups. Notable differences were observed in the apex and mid-gland regions.

CONCLUSION

The atlas-based approach enabled the detection of subtle capsular shape differences in the apex and mid-gland regions between patients with EPE? and EPE?. This finding is consistent with previous studies that identified shape related features of the prostate capsule, such as capsular bulge, as significant indicators of EPE.

CLINICAL RELEVANCE/APPLICATION

Atlas-based shape analysis identifies subtle prostate surface changes in EPE + patients, potentially improving preoperative staging accuracy and surgical planning for nerve sparing approaches.

T5A-SPGU-2 T1 RATIO DERIVED FROM T1-WEIGHTED IMAGING PREDICTS RENAL OUTCOMES IN TYPE 2 DIABETES: A SEMIAUTOMATED TLCO-BASED PROGNOSTIC TOOL

Shaopeng Zhou, MD (*Presenter*)
Chaobo Li (*Abstract Co-Author*)
Haiyi Wang, MD (*Abstract Co-Author*)

PURPOSE

Diabetic kidney disease (DKD) has become the leading cause of end-stage renal disease (ESRD). However, noninvasive diagnostic modalities for early detection and risk stratification remain insufficiently developed. Although the loss of corticomedullary differentiation (CMD) on T1-weighted imaging (T1WI) is a well-recognized indicator of renal insufficiency, its assessment continues to be subjective, and its prognostic implications have yet to be fully elucidated. This study aims to quantify CMD loss using a novel 12-layer concentric objects (TLCO) method and assess its prognostic significance in chronic kidney disease (CKD) patients with type 2 diabetes mellitus (T2DM).

METHODS AND MATERIALS

In this prospective cohort study, 92 patients with T2DM underwent T1WI from February 2019 to January 2024. Patients were stratified into early and advanced CKD groups using an estimated glomerular filtration rate (eGFR) cutoff of 60 ml·min?¹·1.73 m?². The 12 iso-thick layers from the cortex to the medulla was generated using TLCO method on the T1WI of the right kidney. Mean T1 signal intensities (SI) from layers 9-11 (representing the cortex) and layers 3-5 (representing the medulla) were used to calculate two parameters: T1 relative signal intensities (RSI) = (cortical T1 SI - medullary T1 SI) / (cortical T1 SI + medullary T1 SI), and T1 ratio = cortical T1 SI / medullary T1 SI. Variables with $p < 0.05$ in the univariate analysis were entered into the multivariable Cox proportional-hazards regression model.

RESULTS

Patients in the early CKD group exhibited significantly higher T1 RSI and T1 ratio compared to those in the advanced CKD group (0.048 vs. 0.028, 1.102 vs. 1.060; all $p < 0.001$). Multivariate analysis revealed that systolic blood pressure, hemoglobin, cystatin C and lower T1ratio (T1 ratio = 1.084) were independent predictors of adverse renal outcomes. Specifically, a lower T1 ratio was associated with a worse prognosis (hazard ratio [HR] = 5.456, 95% CI: 2.047 - 14.540, $p < 0.001$).

CONCLUSION

T1 ratio derived from conventional T1WI via TLCO is a reproducible, clinically actionable biomarker for CKD progression in T2DM, independently of biochemical parameters, including eGFR.

CLINICAL RELEVANCE/APPLICATION

The TLCO-derived T1 ratio serves as a reliable MRI biomarker for CKD progression. Its integration into routine MRI protocols could assist clinicians in assessing renal injury and facilitating risk stratification.

T5A-SPGU-3 PHOTON-COUNTING CT RADIOMICS FOR CHARACTERIZING ABDOMINOPELVIC CALCIFICATIONS USING MULTI-ENERGY FEATURES

Jacob Sharafuddin, BA (*Presenter*)
Ahmed Benghatnsh, MD (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)
Ramandeep Singh, MD, MBBS (*Abstract Co-Author*)

PURPOSE

To evaluate radiomics applied to spectral post-processing (SPP) images from photon-counting detector CT (PCCT) for differentiating urinary stones, vascular plaques, and phleboliths.

METHODS AND MATERIALS

This IRB-approved retrospective study included 114 adults (74M:40F; mean age 62.9 Y SD ±14.4 years) scanned using PCCT (Siemens NAEOTOM Alpha). The confirmed stone types included calcium oxalate (CaOx; n=20) and calcium phosphate (CaPhos; n=10). Semiautomatic segmentation of stones (S; renal/ureter/bladder, n=182), plaques (PL; renal and iliac arteries, n=132), and phleboliths (PH; n=116) was performed in syngo.via (RadiomicsV1_4_5, Siemens Healthineers, Forchheim, Germany). Radiomic features were extracted from single axial SPP images to generate virtual monoenergetic images (VMI 40-190 keV at 10 keV intervals), virtual non-contrast (VNC), and iodine maps. Post-contrast imaging served as ground truth. A total of 854 radiomic features - including original (n=110) and wavelet-transformed (n=744) - were analyzed using a random forest classifier, univariate and multivariate logistic regression. Receiver operating characteristic curves were generated to calculate area under the curve (AUC) values.

RESULTS

Radiomic analysis achieved the highest accuracy in differentiating plaques (PL) from phleboliths (PH) with an AUC of 0.97. The most predictive features included original GLCM correlation (OR: 1.63), wavelet-LLH first-order 90th percentile (OR: 1.40), wavelet-HLL NGTDM coarseness (OR: 1.19), and shape compactness (OR: 267). Differentiation between stones (S) and plaques (PL) showed an AUC of 0.93. Key radiomic features included four first-order metrics-minimum (OR: 1.35), mean (OR: 1.16), median, and skewness (OR: 1.23) - as well as wavelet-transformed texture features from GLCM, GLRLM, and GLSZM matrices. Inverse variance (OR: 1.66), correlation (OR: 1.24), and gray-level non-uniformity (OR: 1.29) effectively captured spatial heterogeneity. Distinguishing stones (S) from phleboliths (PH) yielded an AUC of 0.82, with overlapping predictive features reflecting intensity and texture-based differences among calcified structures. For differentiating CaOx and CaPhos stones, the best AUC was 0.69.

CONCLUSION

Radiomics applied to spectral PCCT allows for accurate differentiation between urinary tract stones, vascular plaques, and phleboliths.

CLINICAL RELEVANCE/APPLICATION

Radiomics has the potential to improve CT diagnostic workflows by enabling more precise and non-invasive characterization of calcifications in the abdominopelvic region in challenging clinical scenarios.

T5A-SPGU-5 PREOPERATIVE PREDICTION OF RENAL CLEAR CELL CARCINOMA GRADINGWITH EXTRACELLULAR VOLUME FRACTION IN DUAL-ENERGY SPECTRAL CT: CT ENHANCEMENT VALUE OR IODINE CONCENTRATION MEASUREMENT

Jian He (*Presenter*)
Jianying Li, PhD (*Abstract Co-Author*)
Yijun Liu (*Abstract Co-Author*)

PURPOSE

To compare the value of extracellular volume fraction (ECV) calculated from CT enhancement values (?HU, between contrast and non-contrast scans) based on 120kVp-like images and iodine concentration (IC) measurements from iodine maps in dual-energy spectral CT (DEsCT) in preoperatively predicting the pathological grading of renal clear cell carcinoma (ccRCC).

METHODS AND MATERIALS

A retrospective analysis was conducted on 100 pathologically confirmed ccRCC patients who underwent triple-phase contrast-enhanced DEsCT between November 2021 and July 2024. Among them, 64 were in the low-grade group (WHO/ISUP grades 1 and 2) and 36 in the high-grade group (WHO/ISUP grades 3 and 4). Tumor CT values in the non-contrast, arterial phase (AP), venous phase (VP), and delayed phase (DP) were measured on the 120 kVp-like images to obtain ?HU for AP, VP, and DP. IC for the enhanced tumors during the three phases was measured on the iodine maps. Hematocrit (HCT) values were recorded, and ECV based on ?HU and IC were calculated using respective formulas. The predictive performance of using ECV for predicting the pathological grading of ccRCC was evaluated using the receiver operating characteristic curve (ROC), and differences in area under the curve (AUC) were compared.

RESULTS

ECV calculated from both ?HU and IC showed that the high-grade ccRCC group had higher values than the low-grade group ($P<0.05$). The AUC values for distinguishing ccRCC pathological grades were 0.780, 0.901, 0.697 with ECV calculated from ?HU, and 0.790, 0.923, and 0.743 with ECV calculated from IC, in the three phases, respectively. The ECV prediction performance in VP was relatively higher, with sensitivities and specificities of 86.11%, 84.37% from ?HU and 83.33%, 92.19% from IC, respectively. The AUC with ECV calculated from IC in VP had the best diagnostic performance (all $P<0.05$).

CONCLUSION

ECV values obtained in DEsCT have moderate to high accuracy to preoperatively predict the pathological grading of ccRCC, with the value calculated based on IC measurement in VP providing the best performance.

CLINICAL RELEVANCE/APPLICATION

ECV obtained using iodine concentration measurement in the venous phase in DEsCT may be used to preoperatively predict the pathological grading of ccRCC.

T5A-SPGU-6 PREDICTION OF ISUP GRADE OF CLEAR CELL RENAL CELL CARCINOMA BASED ON DEEP NEURAL NETWORK AND DUAL-ENERGY SPECTRAL CT:A SMALL SAMPLE STUDY

Tian Xin, MMed (*Presenter*)
Dong Han, MD (*Abstract Co-Author*)
Yongjun Jia, MMed (*Abstract Co-Author*)

PURPOSE

To predict the ISUP grading of clear cell renal cell carcinoma (ccRCC) based on deep neural network and dual-energy spectral CT.

METHODS AND MATERIALS

118 cases of ccRCC, with 80 in low-grade and 38 in high-grade were collected. There were 41 females and 77 males, ranging from 26 to 88 years in age. Lesion characteristics, including tumor location, size, growth pattern, capsule, necrosis, cystic change, calcification, intertumoral artery, perinephric fat invasion, venous involvement, enlargement of lymph nodes, metastasis, enhancement mode and enhancement uniformity were evaluated by a radiologist on the 70keV CT images. The 40-140keV CT attenuation number, effective atomic number (Effective-Z) were measured on the monochromatic image sets and iodine concentration (IC) were measured on the iodine (water) material decomposition images. The slopes of the spectral curve were calculated using 40keV, 70keV and 100keV CT numbers: ? 1 =(HU 70keV -HU 40keV)/30 and ? 2 =(HU 100keV -HU 40keV)/60. The above parameters and patients' clinical information underwent dimensionality reduction by using recursive feature elimination (RFE). The deep neural network was then used to build a model using the significant parameters, and a random search was used to optimize the model parameters. The model was evaluated by 10-fold cross-validation.

RESULTS

A total of 37 variables were created and were dimensionally reduced by RFE. The use of 9 features generated the highest accuracy (Figure 1), including growth pattern, size, enlargement of lymph nodes, Effective-Z, ? 1 , ? 2 , IC, necrosis and 40keV CT number. The above 9 features were used as input to build a deep neural network model. After optimization, the model included two hidden layers, each of which included eight neurons (Figure 2). The model predicted that the AUC of ISUP grading of ccRCC was 0.835, and the AUC was 0.828 after 10-fold cross-validation. In order of importance, these features were size, enlargement of lymph nodes, necrosis, Effective-Z, growth pattern, ? 2 , IC, ? 1 and 40keV CT number.

CONCLUSION

The deep neural network model based on dual-energy spectral CT to predict the ccRCC ISUP grading has good performance.

CLINICAL RELEVANCE/APPLICATION

The deep neural network model based on dual-energy spectral CT to predict the ISUP grading of ccRCC can provide a reference for evaluating the prognosis of patients.

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T5A-SPHN

Head & Neck Imaging Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPHN-1 HABITAT IMAGING RADIOMICS INCREASES THE ACCURACY OF A NOMOGRAM FOR PREDICTING KI-67-POSITIVITY IN LARYNGEAL SQUAMOUS CELL CARCINOMA

Yumeng Dong (*Presenter*)
Zengyu Jiang (*Abstract Co-Author*)
Sheng He, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the value of applying habitat imaging (HI) radiomics on venous-phase computed tomography (CT) images from laryngeal squamous cell carcinoma (LSCC) patients, as part of a nomogram to predict Ki-67 positivity, an indicator of poorer LSCC prognoses.

METHODS AND MATERIALS

Clinical and CT imaging data from 128 LSCC patients, divided into training (89) and testing (39) groups, were analyzed. Conventional and HI radiomics features were extracted from enhanced venous phase images, either from the entire tumor (conventional) or 3 sub-regions (HI). Radiomics models were established, based on 5 machine learning algorithms, while clinical characteristics were analyzed by both uni- and multi-variate logistic regression analyses for their associations with Ki-67 positivity. Afterwards, a predictive nomogram was constructed by combining clinical characteristics, conventional radiomics, and HI radiomics.

RESULTS

The only clinical characteristic strongly predictive for Ki-67-positivity is the degree of differentiation (low/medium vs. high). Additionally, HI radiomics was significantly more accurate than conventional for predicting Ki-67-positivity. The most accurate model, though, was the predictive nomogram, with areas under the curve of 0.945 (training) and 0.871 (testing), which was significantly higher than for clinical characteristics, conventional radiomics and HI radiomics models alone; it also had the highest net benefit, and thus greatest clinical utility under decision curve analysis.

CONCLUSION

HI radiomics features were more accurate for predicting Ki-67-positivity in LSCC than conventional radiomics. However, the combination of those features with conventional radiomics and the degree of differentiation in a predictive nomogram yields the most accurate model for Ki-67-positivity.

CLINICAL RELEVANCE/APPLICATION

We found that HI radiomics, which extracted features from each of the 3 LSCC tumor subregions defined by K-means clustering, was more accurate than conventional radiomics that extracted features from the entire tumor ROI, for predicting Ki-67 positivity. This may be due to the HI subregional data being able to reflect the intra-tumoral heterogeneity. Furthermore, the combination of HI with conventional radiomics features, as well as the degree of differentiation in a predictive nomogram yielded the most accurate model for predicting Ki-67-positivity. Therefore, applying HI radiomics to supplement conventional radiomics and clinical characteristics could aid in obtaining non-invasive, accurate predictions of Ki-67-positivity in LSCC prior to surgery, in turn providing an important basis for clinical decision-making.

T5A-SPHN-3 ENHANCED DEFINITION OF THE TEMPORAL BONE AT BONE-AIR INTERFACE USING A STAIR-UTE MRI SEQUENCE

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PURPOSE

Ultrashort (UTE) and Zero echo time (ZTE) MRI techniques are emerging as an alternative to CT scans for assessing cortical bone, with potential to reduce ionizing radiation exposure in children and patients who require serial imaging for treatment surveillance. While current MRI techniques are not yet able to match routine clinical CT resolution, we developed an optimized short TR adiabatic inversion recovery ultrashort echo time (STAIR-UTE) MRI sequence for improved definition of the intricate structures at the air-bone interface of the temporal bone. This study aims to evaluate the potential for a radiation-free alternative for lateral skull base assessment within clinically acceptable acquisition times.

METHODS AND MATERIALS

A 3D STAIR-UTE sequence was used on a 3T GE MR750 scanner, acquiring data from one volunteer (24y, F) with a 12-channel head coil. The following data acquisition parameters were used: repetition time/inversion time (TR/TI)=160/71ms, echo time (TE)=0.032ms, inversion pulse bandwidth=1000Hz, field of view (FOV)=220×220×240mm 3 , flip angle (FA)=12°, acquisition matrix=192×192×120 (reconstructed to 256×256×240), slice thickness=2mm (reconstructed to 1 mm), receiver bandwidth=166kHz, and reconstructed voxel size=0.86×0.86×1.0mm 3 . Total scan time was ~5 minutes. We compared the acquired images with temporal bone CT and ZTE MR images published in literature 1-4 and from other subjects. Non-contrast temporal bone CT was acquired on a GE Revolution CT scanner with 140kV and 235mA, 20cm FOV, and 0.625mm slice thickness, reconstructed using Visage PACS. Non-contrast ZTE MR imaging of the skull base was acquired on a GE 3T Signa Premier scanner with TR=512ms, TE=0.016ms, NEX=1, FOV=15cm, and slice thickness=1mm.

RESULTS

Fig 1 shows that STAIR-UTE MRI provides clearer bone details and better air-bone interface definition than conventional ZTE, overcoming its key limitations. Unlike ZTE synthetic CT, it directly highlights bone during acquisition without post-processing. While CT still offers the highest resolution, STAIR-UTE delivers comparable contrast and improved fine detail visualization.

CONCLUSION

The optimized 3D STAIR-UTE MRI sequence enables clear details of the temporal bone in radiation-free acquisition. In the future, we plan to explore the use of compressed sensing and deep learning techniques to enhance image quality and scan efficiency further.

CLINICAL RELEVANCE/APPLICATION

The STAIR-UTE MRI sequence provides a radiation-free alternative to CT for detailed temporal bone imaging, making it particularly valuable for children and patients needing repeat scans. It offers high bone contrast and clear air-bone interface definition, enabling more efficient diagnosis in a single scan.

T5A-SPHN-4 VISUALIZATION OF THE EXTRA-FORAMINAL CADAVERIC VAGUS NERVE ON HIGH-RESOLUTION 3D ISOTROPIC CISS MRI: INITIAL EXPERIENCE FROM SPARC-REVA

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PURPOSE

Current clinical MRI does not routinely allow for visualization of the vagus nerve (the tenth cranial nerve, CN X). CN X plays a pivotal role in autonomic regulation. Because of its wide distribution throughout the body and its many branches, CN X injury frequently occurs in association with neck or thoracic surgery. With recent advances in CN X stimulation strategies, techniques for CN X visualization also have implication for epilepsy and drug-resistant depression. The purpose of this research is to evaluate the extent to which CN X can be visualized on high resolution 3D isotropic CISS 3T MRI in human cadavers from its origin at the jugular foramen to the abdomen, correlated to the gold standard of anatomic dissection.

METHODS AND MATERIALS

Our research is a part of the $15 million NIH SPARC-REVA initiative which aims to map the gross anatomy, morphology, ultrastructure, and fiber types of 100 CN Xs to ultimately improve the efficacy of existing autonomic neuromodulation therapies. It is the most comprehensive mapping of CN X to date, from the perspectives of sample size, range of imaging modalities, lengths of nerve, and imaging resolutions. 50 embalmed cadavers were scanned with a 3T MRI scanner using 3D isotropic 0.5-0.6 mm resolution CISS; a total of 100 CN X were examined. Two readers independently evaluated visualization of the segments of the main trunk of CN X according to a qualitative scale ranging from 1 to 5 with 5 being the best. CN X was then dissected from the brainstem to abdomen, and anatomic-radiologic correlation was performed, to confirm the findings on MRI.

RESULTS

CN X was best visualized in the the infrahyoid neck (4.065 ± 1.08) and superior thoracic (3.99 ± 1.04) segments. CN X was not as visible in the suprahyoid neck (3.01 ± 1.59) and inferior thoracic region (1.89 ± 1.10). The abdominal segment was not visualized. The visualization of left CN X was better than that of the right.

CONCLUSION

In cadavers the use of 3T CISS MRI allows visualization of portions of the extraforaminal CN X in the neck and chest. These data may aid in the translation of this work into clinical imaging for diagnosis of disorders of the autonomic nervous system and procedural targeting.

CLINICAL RELEVANCE/APPLICATION

The future integration of CISS MRI for visualizing CN X in living subjects, with reasonable imaging acquisition times, holds great promise for routine diagnostic and therapeutic imaging. The proximity of CN X to the skin in the cervical region, along with excellent imaging visualization results, suggests potential for developing percutaneous procedures in this area. We aim to enhance the visualization of CN X, facilitating its adoption as a standard diagnostic and therapeutic tool in clinical practice.

T5A-SPHN-6 A COMPARATIVE EVALUATION OF THREE COMMERCIAL AI-BASED CEPHALOMETRIC ANALYSIS TOOLS IN ORTHODONTICS

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PURPOSE

Cephalometric analysis (CA) is an indispensable diagnostic tool in orthodontics for treatment planning and outcome assessment. Manual CA is time-consuming and prone to variability.

METHODS AND MATERIALS

This study aims to compare the accuracy and repeatability of CA results among three commercial AI-driven programs: CephX, WebCeph, and AudaxCeph. This study involved a retrospective analysis of lateral cephalograms from a single orthodontic center. Automated CA was performed using the AI programs, focusing on common parameters defined by Downs, Ricketts, and Steiner. Repeatability was tested through 50 randomly reanalyzed cases by each software. Statistical analyses included intraclass correlation coefficients (ICC3) for agreement and the Friedman test for concordance.

RESULTS

One hundred twenty-four cephalograms were analyzed. High agreement between the AI systems was noted for most parameters (ICC3 > 0.9). Notable differences were found in the measurements of angle convexity and the occlusal plane, where discrepancies suggested different methodologies among the programs. Some analyses presented high variability in the results, indicating errors. Repeatability analysis revealed perfect agreement within each program.

CONCLUSION

AI-driven cephalometric analysis tools demonstrate a high potential for reliable and efficient orthodontic assessments, with substantial agreement in repeated analyses. Despite this, the observed discrepancies and high variability in part of analyses underscore the need for standardization across AI platforms and the critical evaluation of automated results by clinicians, particularly in parameters with significant treatment implications.

CLINICAL RELEVANCE/APPLICATION

The integration of AI-driven cephalometric analysis tools in orthodontic practice represents a significant advancement in diagnostic accuracy, efficiency, and workflow optimization. This study provides a comparative evaluation of three commercially available AI-based software tools, offering clinicians practical insights into their relative performance, reliability, and usability.

T5A-SPHN-7 ARTIFICIAL INTELLIGENCE IN CBCT-BASED ASSESSMENT OF ENDODONTIC TREATMENT OUTCOMES

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PURPOSE

The aim of this study was to assess the diagnostic accuracy of the AI-driven platform Diagnocat for evaluating endodontic treatment outcomes using cone beam computed tomography (CBCT) images.

METHODS AND MATERIALS

A total of 55 consecutive patients (15 males and 40 females, aged 12-70 years) referred for CBCT imaging were included. CBCT images were analyzed using Diagnocat's AI platform, which assessed parameters such as the probability of filling, adequate obturation, adequate density, overfilling, voids in filling, short filling, and root canal number. The images were also evaluated by two experienced human readers. Diagnostic accuracy metrics (accuracy, precision, recall, and F1 score) were assessed and compared to the readers' consensus, which served as the reference standard.

RESULTS

The AI platform demonstrated high diagnostic accuracy for most parameters, with perfect scores for the probability of filling (accuracy, precision, recall, F1 = 100%). Adequate obturation showed moderate performance (accuracy = 84.1%, precision = 66.7%, recall = 92.3%, and F1 = 77.4%). Adequate density (accuracy = 95.5%, precision, recall, and F1 = 97.2%), overfilling (accuracy = 95.5%, precision = 86.7%, recall = 100%, and F1 = 92.9%), and short fillings (accuracy = 95.5%, precision = 100%, recall = 86.7%, and F1 = 92.9%) also exhibited strong performance. The performance of AI for voids in filling detection (accuracy = 88.6%, precision = 88.9%, recall = 66.7%, and F1 = 76.2%) highlighted areas for improvement.

CONCLUSION

The AI platform Diagnocat showed high diagnostic accuracy in evaluating endodontic treatment outcomes using CBCT images, indicating its potential as a valuable tool in dental radiology.

CLINICAL RELEVANCE/APPLICATION

The study supports the integration of AI into endodontic diagnostics, especially in practices utilizing CBCT, to improve the precision and reliability of post-treatment evaluations.

T5A-SPHN-8 FOCUS-MUSE DWI OUTPERFORMS MUSE AND FOCUS DWIS IN ORBITAL IMAGING QUALITY AND STAGING THYROID-ASSOCIATED OPHTHALMOPATHY

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Fei-Yun Wu (*Abstract Co-Author*)
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PURPOSE

To compare FOCUS, MUSE and FOCUS-MUSE diffusion-weighted imagings (DWIs) in orbital imaging quality and staging performance for the patients with thyroid-associated ophthalmopathy (TAO).

METHODS AND MATERIALS

Sixty-seven patients with TAO who underwent FOCUS, MUSE, and FOCUS-MUSE DWIs were enrolled. Both qualitative (artifacts and geometric distortion, overall image quality, and sharpness of boundaries) and quantitative parameters (geometric distortion ratio [GDR], signal-to-noise ratio [SNR], apparent diffusion coefficient [ADC] value of extraocular muscles (EOM), and normalized ADC [nADC] value of EOM) were assessed across the three sequences. Additionally, nADC values of EOMs and their mean value were compared between active and inactive TAO groups, and diagnostic performances for the active phase were evaluated.

RESULTS

FOCUS-MUSE DWI exhibited significantly fewer artifacts and geometric distortion, superior overall image quality, enhanced sharpness of boundaries, higher SNR and lower GDR compared to both MUSE and FOCUS DWIs (all $P<0.05$). The ADC values of EOMs and their mean value were generally lower in FOCUS-MUSE DWI than those in FOCUS DWI (all $P<0.05$) and those in MUSE DWI (all $P<0.05$, except for that of superior EOM). The nADC values of EOMs and their mean value showed no significance among the three DWIs (all $P>0.05$), except for that of superior EOM. Furthermore, active TAOs showed higher nADC values across all EOMs and higher mean nADC values compared to inactive TAOs in FOCUS-MUSE, MUSE and FOCUS DWIs (all $P<0.05$). The mean nADC value of FOCUS-MUSE DWI (AUC, 0.893; sensitivity, 91.3%; specificity, 71.6%) performed better than that of MUSE DWI (AUC, 0.713; sensitivity, 54.3%; specificity, 80.7%; $P<0.001$) and FOCUS DWI (AUC, 0.730; sensitivity, 47.8%; specificity, 90.9%; $P<0.001$) in staging TAO.

CONCLUSION

FOCUS-MUSE DWI provides superior image quality and staging performance in assessing TAO compared to MUSE and FOCUS DWIs. We recommend its use for evaluating TAO patients in clinical practice.

CLINICAL RELEVANCE/APPLICATION

FOCUE-MUSE DWI outperforms MUSE and FOCUS DWIs in orbital imaging quality and staging TAO. Our findings may offer valuable insights into the benefits of FOCUS-MUSE DWI relative to MUSE DWI and FOCUS DWI in the context of TAO and other orbital diseases.

Nov. 30 – Dec. 4
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T5A-SPIN

Imaging Informatics Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPIN-1 IASLC GRADING OF INVASIVE LUNG ADENOCARCINOMA VIA RADIOMICS-BASED DIFFERENTIATION OF HIGH-GRADE PATTERNS AND PREDOMINANT SUBTYPES

Sunyi Zheng, PhD (*Presenter*)
Jing Wang (*Abstract Co-Author*)
Zhaoxiang Ye (*Abstract Co-Author*)
Xiaonan Cui, MD,PhD (*Abstract Co-Author*)

PURPOSE

Accurate classification of the International Association for the Study of Lung Cancer (IASLC) grades in invasive non-mucinous adenocarcinoma (ADC) can aid in the prediction of patient prognosis and treatment planning. The IASLC grading system considers both high-grade patterns and predominant subtypes. Following the system, this study aimed to explore the feasibility of predicting high-grade patterns and predominant subtypes for IASLC grading with radiomics.

METHODS AND MATERIALS

A total of 529 ADCs from patients who had undergone radical surgical resection were randomly assigned to training and validation cohorts in a 7:3 ratio. Radiomics features were extracted based on annotated tumor regions. A two-step radiomics framework was constructed for IASLC grading, comprising two distinct submodels: the first identified whether high-grade patterns constituted more than 20% of the tumor, while the second differentiated between lepidic and acinar/papillary predominant subtypes. The final IASLC grade was determined by integrating outputs from both submodels. For comparison, a one-step radiomics model was also developed to directly predict IASLC grades from radiomic features. Model performance was evaluated using the area under the curve (AUC), sensitivity, and specificity, and statistical comparisons of AUCs between models were conducted using the DeLong test.

RESULTS

In the two-step radiomics model, the submodel for high-grade pattern prediction achieved AUCs of 0.95 and 0.96 in the training and validation datasets, whereas the submodel for predicting predominant subtypes obtained AUCs of 0.83 and 0.78. Considering the results of both submodels, the two-step radiomics model achieved high AUCs of 0.95, 0.85, and 0.96 for IASLC grades 1, 2, and 3, respectively, on the validation set. While its performance was comparable to the one-step model for grade 1 (0.95 vs. 0.92), the two-step model significantly outperformed the one-step model in discriminating grades 2 and 3 (p-values < 0.001), where the one-step model only achieved AUCs of 0.53 and 0.81, respectively. In terms of sensitivity and specificity, the two-step model presented higher sensitivity for grade 3 (0.89 vs. 0.74) and greater specificity for both grades 2 and 3 (0.89 vs. 0.79; 0.85 vs. 0.74) than the one-step model on the validation set.

CONCLUSION

Using radiomics to separately predict high-grade patterns and predominant subtypes enables accurate IASLC grading in ADCs. The proposed two-step radiomics approach has the potential to support clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

Radiomics features can accurately classify IASLC grades in ADCs by predicting high-grade patterns and predominant subtypes, potentially aiding clinical decision-making.

T5A-SPIN-2 CONSISTENCY OF REPEATED OUTPUTS AS MEASURE OF DIAGNOSTIC CONFIDENCE IN MULTIMODAL LARGE LANGUAGE MODELS ON RADIOLOGIC IMAGE INTERPRETATION

Taewon Han (*Presenter*)
Jaeseung Shin, MD, PhD (*Abstract Co-Author*)
Kyowon Gu, MD (*Abstract Co-Author*)
Jeong Hyun Lee, MD (*Abstract Co-Author*)

PURPOSE

To evaluate output consistency as a confidence measurement metric in multimodal large language models (LLMs) interpreting radiological images and compare its reliability with each model's self-reported confidence score.

METHODS AND MATERIALS

From 311 quizzes in the Korean Society of Ultrasound in Medicine digital platform, we selected 75 multiple-choice cases. Six multimodal-LLMs were evaluated —three reasoning-focused (o1, Claude-3.7-Sonnet, Gemini-2.5-Pro) and three general-purpose models (GPT-4o, Claude-3.5-Sonnet, Gemini-1.5-Pro) —with temperature fixed at 1.0. Two confidence measurement metrics were assessed: (i) self-reported confidence by multimodal-LLMs using prompts that elicited direct confidence percentages with answer, and (ii) consistency-based metrics derived from 20 repeated interpretations per case expressed as relative entropy (R_H) calculated as 1 - H/log2k (H = Shannon entropy, k = number of repetitions). Receiver Operating Characteristics (ROC) analysis for discrimination and Spearman correlation (r) between accuracy and each metric was conducted. Additionally, model calibration was assessed using Expected Calibration Error (ECE).

RESULTS

Consistency-based metrics, R_H, demonstrated significant correlation with diagnostic accuracy for Claude-3.7-Sonnet (r=0.310, p =0.007), Gemini-2.5-Pro (r=0.347, p =0.002), and GPT-4o (r=0.318, p =0.006). For self-reported confidence, only GPT-4o showed a statistically significant —but weak—correlation (r = 0.231, p = 0.046). Consistency-based metrics yielded higher AUCs than self-reported confidence—0.661 (95% Confidence Interval [CI], 0.543-0.767) for Claude-3.7-Sonnet, 0.690 (95%CI, 0.573-0.792) for Gemini-2.5-Pro, and 0.669 (95%CI, 0.551-0.773) for GPT-4o—whereas the best AUC achieved by self-reported confidence was 0.623 (95 % CI, 0.503-0.732) in GPT-4o. For consistency-based metrics, Regular ECE (10-bin) ranged from 0.313-0.485, while optimal-bin ECE ranged from 0.276-0.478 across models.

CONCLUSION

In multimodal LLMs applied to radiologic interpretation, output consistency is a more reliable indicator of diagnostic confidence than the models' self-reported confidence score, showing stronger correlations with accuracy and superior discrimination.

CLINICAL RELEVANCE/APPLICATION

Consistency-based confidence metric quantifies multimodal-LLM uncertainty in radiologic interpretation, flagging questionable reads for radiologist review, streamlining clinical workflows, and safeguarding patient care.

T5A-SPIN-3 TASK-SPECIFIC LANGUAGE MODELS OUTPERFORM GENERAL LLMS IN STRUCTURED INFORMATION EXTRACTION FROM MULTIMODALITY RADIOLOGY REPORTS

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Yuli Wang (*Abstract Co-Author*)
Jing Wu (*Abstract Co-Author*)
Linmei Zhao, MD, PhD (*Abstract Co-Author*)
Cheng Z. Zhu (*Abstract Co-Author*)
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PURPOSE

Large language models (LLMs) have demonstrated strong performance in general clinical text analysis. However, their effectiveness in complex, task-specific radiology applications remain uncertain. This study assess the effectiveness of modality-specific RadGraph models in extracting clinical entities and relationships from radiology reports, compared to general-purpose LLMs.

METHODS AND MATERIALS

RadGraph is an annotation model designed to identify clinical entities and their relationships in radiology reports. To evaluate its modality-specific performance, we curated a multi-modality dataset consisting of 800 expert-annotated reports from cardiac MRI for detailed tissue characterization, CT pulmonary angiography (CTPA) for pulmonary vasculature evaluation, head CT for rapid assessment of acute conditions, and abdominal ultrasound for non-invasive evaluation. The RadGraph model was fine-tuned separately for each modality, aiming to enhance its structured information extraction capabilities. As benchmarks, we evaluated GPT-4.1, LLaMA-3.2-3B-Instruct and DeepSeek-R1 using 0-shot, 1-shot, and 5-shot prompting with detailed task prompt definitions. Performance was assessed on a held-out test set of 180 reports using macro F1 scores for both named entity recognition (NER) and relation extraction tasks.

RESULTS

The fine-tuned RadGraph model achieved macro F1 scores of 0.801 for NER and 0.631 for relation extraction, demonstrating a significant performance advantage over the LLM benchmarks. GPT-4.1 obtained 0.186, 0.481, and 0.620 (NER) and 0.029, 0.225, and 0.352 (relations) under 0-shot, 1-shot, and 5-shot prompting, respectively. LLaMA-3.2-3B-Instruct scored 0.117, 0.150, 0.317 (NER) and 0.017, 0.034, 0.068 (relations), while DeepSeek-R1 reached 0.073, 0.502, 0.570 (NER) and 0.081, 0.297, 0.355 (relations). Fine-tuning RadGraph for specific imaging modalities resulted in a 12.5% improvement in NER and a 28.3% improvement in relation extraction, compared to a baseline model trained solely on chest X-ray reports. Performance gains were consistent across all modalities, underscoring the importance of domain-specific training.

CONCLUSION

Task-specific fine-tuning of language models yields significantly better performance in complex radiology report annotation tasks than general LLMs, even with few-shot prompting. Our modality-specific RadGraph model demonstrates superior robustness and accuracy across multiple imaging domains.

CLINICAL RELEVANCE/APPLICATION

Fine-tuned RadGraph models provide a scalable, domain-adapted framework for extracting structured clinical information from radiology reports, supporting automated report generation and downstream clinical applications.

T5A-SPIN-4 TOWARDS HYPER-PERSONALISED RADIOLOGY REPORTING: A SCALABLE AUTONOMOUS OPTIMISATION PIPELINE FOR IMPROVING CHEST X-RAY REPORT GENERATION QUALITY

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Suvrankar Datta, MD, MBBS (*Abstract Co-Author*)

PURPOSE

Recent advances in Large Language Models (LLMs) promise transformative gains for radiology report dictation and generation, yet performance remains limited by generic and static prompts that ignore the distinct narrative fingerprints of individual radiologists. We present one of the world's first autonomous prompt optimisation pipelines that learns a bespoke prompt for an individual radiologist, leverages two state-of-the-art (SOTA) optimisers, and demonstrably improves the report quality beyond SOTA levels.

METHODS AND MATERIALS

A multi-institutional dataset of 100 Chest X-ray dictation-report pairs from four radiologists (20 pairs of Training Set and 5 pairs of Test Set per radiologist), each having distinctive reporting style was assembled. Each study's dictated keywords were first converted to baseline non optimised reports by Qwen-3 8B using a single baseline prompt. The prompt was then fed to two SOTA optimisers DSPy (MIPROv2) and TextGrad along with 20 pairs of Training Set reports, and optimised for ROUGE-L (chosen to capture style metrics better than factual accuracy metrics) which generated personalised radiologist-specific prompts. These personalised prompts were reapplied to Qwen-3 along with the dictations from the test set, yielding 5 optimised report sets per radiologist per optimiser. The paired Wilcoxon signed-rank test was used to compare ROUGE-L scores between baseline and hyper-personalised reports, quantifying performance gains.

RESULTS

DSPy (MIPRO v2) improved ROUGE-L by ? = 0.14 ± 0.07 compared to baseline (p = 0.0001). TextGrad improved ROUGE-L by ? = 0.18 ± 0.08 compared to baseline (p = 0.0001). Inter-optimiser comparison favored TextGrad over DSPy (? difference = 0.04, p = 0.0990), though the difference didn't reach strong statistical significance (p = 0.05).

CONCLUSION

Our autonomous pipeline converts a baseline generic report into a radiologist-specific hyper-personalised report, delivering significant gains in lexical and stylistic fidelity. Both DSPy and TextGrad consistently outperform the baseline, without any statistically significant inter-optimiser difference, demonstrating scalable, model-agnostic improvements without the need for model fine-tuning.

CLINICAL RELEVANCE/APPLICATION

Hyper-personalised prompt optimisation enables rapid, bespoke tailoring of AI-generated chest X-ray reports to individual radiologist styles. This eliminates the computational and regulatory overhead of model fine-tuning and facilitates hyper-personalised radiology report generation at scale without human intervention.

T5A-SPIN-5 STYLE-AWARE RADIOLOGY REPORTING: A SCALABLE AUTONOMOUS OPTIMISATION PIPELINE FOR IMPROVING HEAD CT REPORT GENERATION QUALITY

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PURPOSE

Recent advances in Large Language Models (LLMs) promise transformative gains for radiology report dictation and generation; however, their performance remains limited by generic, static prompts that fail to capture the distinctive narrative style of individual radiologists. We present one of the first autonomous prompt optimisation pipelines tailored for individual radiologists, leveraging two state-of-the-art (SOTA) optimisers to demonstrably enhance report quality for head CT beyond current benchmarks.

METHODS AND MATERIALS

A multi-institutional dataset of 100 head CT dictation-report pairs from four radiologists (20 pairs in the training set and 5 pairs in the test set per radiologist), each with a distinctive reporting style, was assembled. Dictated keywords from each study were initially converted into baseline non-optimised reports using Qwen-3 (8B) and a single baseline prompt. This prompt was subsequently optimised using two SOTA optimisation frameworks viz., DSPy (MIPRO v2) and TextGrad, guided by ROUGE-L scores (selected to better capture stylistic fidelity in addition to factual accuracy), resulting in hyper-personalised radiologist-specific prompts. These personalised prompts were reapplied to Qwen-3 with the dictated keywords from the test set, yielding five optimised report sets per radiologist per optimiser. Performance gains (? ROUGE-L) were tested for significance using a paired Wilcoxon signed-rank test for each optimiser versus baseline.

RESULTS

DSPy (MIPRO v2) improved ROUGE-L by ? = 0.13 ± 0.06 compared to baseline (p < 0.001). TextGrad improved ROUGE-L by ? = 0.06 ± 0.16 compared to baseline (p = 0.19), not reaching statistical significance (p = 0.05). Inter-optimiser comparison favored DSPy over TextGrad (? difference = 0.07, p = 0.07).

CONCLUSION

Style-aware prompt tuning through autonomous pipelines significantly enhances CT-head report quality; DSPy yields the largest lexical gain, validating scalable, radiologist-specific optimisation. While both optimizers show performance gains over baseline, DSPy demonstrates consistently superior performance with statistically significant gains in ROUGE-L scores.

CLINICAL RELEVANCE/APPLICATION

Optimised prompting elevates AI report fidelity, avoiding the computational overheads associated with model fine-tuning at the individual radiologist level. Our findings demonstrate that style-aware prompt tuning can significantly enhance the quality and personalization of LLM-generated CT head reports, validating the pipeline's potential to scale without additional human intervention.

T5A-SPIN-6 XCOMPOSITION: MULTIMODAL DEEP LEARNING MODEL FOR ESTIMATION OF BODY COMPOSITION METRICS USING CHEST X-RAY

Ehsan Alipour, MD, PhD (*Presenter*)
Samuel Gratzl (*Abstract Co-Author*)

PURPOSE

Body composition metrics—such as visceral adipose tissue, subcutaneous adipose tissue, and skeletal muscle volume—are important predictors of cardiovascular disease, diabetes, and cancer outcomes. While recent advances in artificial intelligence (AI) have enabled automated extraction of these metrics from CT and MRI scans, such imaging modalities are costly, may involve radiation exposure, and are not routinely available for many patients. In this study, we propose a deep learning approach to estimate body composition metrics using chest radiographs combined with a small set of routinely collected clinical variables.

METHODS AND MATERIALS

We identified a retrospective cohort of patients with both non-contrast abdominal CT scans and chest radiographs within 3 months from our institutional dataset. Tissue segmentation was performed on CT images using TotalSegmentator. We calculated volumetric and L3-level body composition metrics, including subcutaneous and visceral fat volumes, skeletal muscle and bone indices, and aortic calcification scores. A multitask, multimodal deep learning model was trained to estimate these reference metrics using chest radiographs and select clinical variables (age, sex, height, and weight). The data was split into train, validation and test sets with a ratio of 0.7:0.1:0.2. Huber loss was used to train the deep learning model. Pearson's correlation between the predicted and ground truth values was used to measure the final performance. The XComposition python package was developed based on the multimodal deep learning model and is publicly available on GitHub.

RESULTS

The final cohort included 1,118 patients, with a mean age of 67 (±17) years, height of 1.67 (±0.2) meters, and weight of 78 (±20) kilograms. The multimodal model outperformed models trained on imaging or clinical variables alone. It achieved a Pearson correlation of 0.85 (95% CI: 0.81-0.88) for subcutaneous fat volume, 0.76 (0.65-0.80) for visceral fat volume, and 0.72 (0.65-0.78) for vertebral bone volume in the hold-out test set.

CONCLUSION

While prior work has focused on AI-based extraction of body composition metrics from CT and MRI, our study presents a novel approach using chest radiographs—a more accessible and lower-cost imaging modality. This method has the potential to scale body composition analysis across larger patient populations using widely available clinical data.

CLINICAL RELEVANCE/APPLICATION

This study presents a low-cost, scalable method to estimate body composition metrics using chest radiographs and basic clinical data, enabling broader use in routine care and population health studies without requiring CT or MRI.

T5A-SPIN-7 MEASURES OF DIAGNOSTIC ACCURACY IN MULTI-CLASS CLASSIFICATION: A SIMULATION STUDY

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PURPOSE

Multi-class outcomes are becoming increasingly common in medical AI research, including recent studies involving large language models (LLMs). In this context, we compared diagnostic accuracy metrics used in machine learning and statistical approaches through simulation.

METHODS AND MATERIALS

Ten metrics were evaluated under various multi-class classification settings: M-index, macro/micro-averaged ROC, weighted macro-averaged ROC, nominal and ordinal Obuchowski's indices, Matthews correlation coefficient (MCC), polytomous discrimination index (PDI), correct classification probability (CCP), and R-squared. In the simulation, predictors were generated from normal and exponential distributions. Predicted probabilities for each category were obtained using multinomial logit models. Simulation scenarios included both balanced and imbalanced class distributions. To assess the metric behavior beyond simulations, we applied the metrics to adult-type diffuse gliomas classification using multimodal transformer models on two datasets: The Cancer Genome Atlas (TCGA), and the University of California, San Francisco (UCSF).

RESULTS

The M-index demonstrated stable performance across various simulation settings, regardless of the distribution used to generate predictors or class imbalance. ROC-based metrics—particularly micro- and macro-averaged ROC—tended to be overestimate performance under severe class imbalance. Among these, micro-averaged ROC showed greater bias compared to other ROC-based metrics when predictors were generated from exponential distributions. Each metric exhibited consistent distribution-specific trends, while the effect of class imbalance varied by metric. Application to real-world datasets revealed trends similar to the simulation results. In the TCGA dataset which had mild class imbalance, differences between the M-index and ROC-based metrics were smaller compared to the more imbalanced UCSF dataset. PDI and MCC values were consistently lower than other metrics in both datasets.

CONCLUSION

The M-index provided stable estimates regardless of predictor distribution or class imbalance, supporting its use as a reliable metric. Although PDI and MCC were nearly unbiased under normal distributions, their relatively lower values should be noted. Micro-averaged ROC tended to overestimate performance under severe class imbalance, making it less suitable in such scenarios. This study offers practical guidance for selecting appropriate metrics in multi-class medical imaging analyses.

CLINICAL RELEVANCE/APPLICATION

This study supports the selection of appropriate metrics for multi-class diagnostic evaluations, contributing to more reliable and interpretable clinical decision-making.

T5A-SPIN-8 STRESS-TEST AND RADIOLOGIST BLINDED VALIDATION OF MULTIMODAL FOUNDATION MODELS ON AN UNSEEN CHEST RADIOGRAPH DATASET USING A NOVEL MULTI-METRIC EVALUATION FRAMEWORK

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PURPOSE

Prior validations of state-of-the-art Multimodal Foundation Models (FM) have relied solely on automated metrics, missing crucial clinical and stylistic nuances in radiology reporting. We present a radiologist-blinded validation of three leading models (LLaVa-Rad, GPT4o, CheXagent) on chest radiographs using a novel IndicCXR dataset. Our methodological innovations include: (1) a cryptographically-secured randomized blinding protocol, (2) a clinically-calibrated radiologist-validated scoring rubric, and (3) systematic stress-testing on an underrepresented population dataset.

METHODS AND MATERIALS

Five radiologists evaluated outputs from 20 chest radiographs each (10 normal, 10 abnormal) across three AI models using our web-based evaluation console with randomization by fisher-yates shuffle. Each CXR report received 12 distinct evaluations (1,200 total data points) across four domains: Diagnostic Accuracy, Clinical Utility, Report Completeness, and Language Clarity & Style (scored 1-5). Composite scores (max 20) were computed per report. Critical diagnostic error was defined as a score = 2 in the Diagnostic Accuracy domain. Non-parametric statistical tests (Kruskal-Wallis, Cochran's Q, McNemar) were used to assess model differences.

RESULTS

LLAVA-Rad achieved the highest overall quality with a composite median score of 15 (IQR 12-19), significantly outperforming GPT-4o 12.5, (IQR 7.3 - 16, $p = 0.014$) but not ChexAgent 16.5 (IQR 7 - 17, $p = 0.25$). Most striking was LLaVa-Rad's maintenance of diagnostic performance on abnormal radiographs (median Diagnostic Accuracy = 3) versus GPT-4o and ChexAgent (both 1, $p < 0.001$). Critical diagnostic error rates were lowest for LLaVa-Rad (24.3 %) compared to GPT-4o (51.4 %) and

ChexAgent (44.3 %) ($p < 0.001$). Median scores for Clinical Utility mirrored this trend (LLaVa-Rad = 4, GPT-4o = 2.5, ChexAgent = 4), while language-based metrics (Completeness, Clarity) showed no significant inter-model difference (all medians = 4).

CONCLUSION

Our work quantifies the significant gap between linguistic competence and diagnostic accuracy in FM-generated AI CXR reports and establishes LLaVa-Rad as the current best-performing model for clinical deployment.

CLINICAL RELEVANCE/APPLICATION

Radiologist review is indispensable and to make such expert validation practical at scale, we introduce an open-source evaluation stack: a novel IndicCXR dataset, a scoring rubric, and a blinded graphical user interface that any lab can fork to benchmark radiology report generation models.

T5A-SPIN-9 CHATGPT-GUIDED DIFFUSION GENERATES REALISTIC SYNTHETIC TUMORS, BOOSTING EARLY CT DETECTION OF LIVER, PANCREAS, AND KIDNEY CANCERS

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Kang Wang, MD,PhD (*Abstract Co-Author*)
Yang Yang, PhD (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)
Zongwei Zhou, PhD (*Abstract Co-Author*)

PURPOSE

To investigate whether descriptive text about tumors extracted from medical reports written by radiologists can enhance the performance of AI-based cancer diagnosis of different organ tumors from CT images.

METHODS AND MATERIALS

We developed a generative model, termed TextoMorph, that synthesizes tumors conditioned on tumor shape, location, and descriptive text. Using ChatGPT-4o, we extracted tumor-relevant descriptions from medical reports. This created a dataset of CT scans with tumor masks and textual annotations. A Denoising Diffusion Probabilistic Model (DDPM) was then trained to generate tumors based on input CT images, masks, and descriptive text, allowing control over visual traits such as attenuation and margins. During inference, this model produces diverse synthetic tumors—hypodense, hyperdense, ill-defined, or well-defined—which augment the training data for organ-specific cancer detection. To evaluate diversity and heterogeneity in the synthesized tumors, we conducted a Radiomics pattern analysis. Specifically, we extracted 102 texture-based features from synthetic tumors and computed pairwise cosine similarity to measure mean variance and standard deviation. Higher values indicate broader variation in tumor appearance, which is critical for training robust and generalizable AI models. These synthetic tumors were used to augment real datasets, and the resulting models were evaluated on both internal and external CT cohorts for liver, pancreas, and kidney tumor detection, segmentation, and classification.

RESULTS

TextoMorph improved early tumor detection sensitivity by 8.5% for liver, 4.2% for pancreas, and 3.9% for kidney tumors. It enhanced segmentation Dice scores by 6.3% for liver and 9.0% for pancreas. In a Visual Turing Test, radiologists misclassified synthetic tumors up to 45.0% of the time, confirming high realism. Radiomics analysis showed greater heterogeneity, with a mean variance of 1.14 for liver tumors. Classification sensitivity improved from 61.9% to 79.0% for malignant and 50.7% to 70.8% for cystic tumors. In large kidney tumors, targeted synthesis increased sensitivity by 9.1% and segmentation Dice by 4.7%.

CONCLUSION

The descriptive text from medical reports shows significant potential for improving the performance of AI-based cancer diagnosis models for different organ tumors from CT images.

CLINICAL RELEVANCE/APPLICATION

The addition of descriptive text to generate diverse tumor images can enhance medical imaging analysis by expanding training datasets, thereby improving model generalization and robustness. It enables the simulation of rare cases, providing valuable data for clinical training, individualized treatment planning, and early diagnosis and screening.

T5A-SPIN-10 CANCERVERSE: ROBUST SEGMENTATION OF 16 MAJOR CANCERS IN COMPUTED TOMOGRAPHY

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Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

To develop an AI-integrated, annotation pipeline that, in collaboration with radiologists, can automatically and precisely segment 16 tumor types in body CTs, and in turn, enhance radiologists' clinical productivity and impact.

METHODS AND MATERIALS

We retrospectively collected 800 volumetric CT scans (1997-2024), randomly sampled from routine clinical studies to reflect real-world variability in age, pathology, scanners, body regions, sequences, and institutions. Each CT scan contains at least one pathologically confirmed tumor across 16 organs, including the adrenal gland, bladder, bone, breast, colon, duodenum, esophagus, gallbladder, kidney, liver, lung, pancreas, prostate, spleen, stomach, and uterus. Tumors were annotated voxel-wise using an AI-integrated pipeline involving three iterative steps: (1) testing AI on unannotated data, (2) revising AI predictions by radiologists, and (3) fine-tuning AI on newly annotated data. These steps are repeated over time to progressively enhance both annotation quality and AI performance, continuing until the dataset is fully annotated and the AI model is well-trained. In this study, we recruited 23 board-certified radiologists (each with over six years of experience) to either create annotations from scratch—during the initial phase when annotated data was insufficient—or to revise AI predictions once annotated data become available. A key innovation of our pipeline is leveraging the consistency between AI predictions before and after fine-tuning to prioritize CT scans for radiologist revision—transforming traditionally time-consuming and costly random-revision strategies into a targeted, efficient, and scalable annotation pipeline.

RESULTS

Across 800 CT scans, all tumors in 16 organs were annotated voxel-wise by a team of 23 board-certified radiologists. Compared to traditional random-revision strategies, our AI-integrated pipeline reduced manual annotation time from five minutes to 20 seconds per tumor—a 92% reduction—while preserving high-quality annotations. The AI model that was integrated to this annotation pipeline achieved an average sensitivity of 52.1% and specificity of 72.5% for detecting tumors across the 16 organs in external validation (n = 1,760).

CONCLUSION

Our AI-integrated annotation pipeline enables efficient, high-quality tumor segmentation across 16 organs, reducing radiologist annotation time by 92% while maintaining accuracy.

CLINICAL RELEVANCE/APPLICATION

This efficient pipeline can accelerate the creation of large, expert-annotated datasets needed to train and validate AI models for multi-organ cancer detection in clinical CT imaging, and potentially other imaging modalities.

T5A-SPIN-11 AGENT-BASED UNCERTAINTY AWARENESS IMPROVES AUTOMATED RADIOLOGY REPORT LABELING WITH AN OPEN-SOURCE LARGE LANGUAGE MODEL

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Gili Focht, MSc, MBA (*Abstract Co-Author*)
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Talar Silvi Hagopian, MD (*Abstract Co-Author*)
Dan Turner, MD,PhD (*Abstract Co-Author*)

PURPOSE

To improve the reliability and performance of Large Language Models (LLMs) in extracting structured data from radiology reports, particularly in domains with complex and non-English texts (e.g., Hebrew), by incorporating agent-based uncertainty-awareness method to achieve trustworthy predictions in medical applications.

METHODS AND MATERIALS

This retrospective study analyzed 9,683 Hebrew radiology reports from Crohn's disease patients (2010-2023) across several medical imaging providers. A subset of 512 reports was manually annotated for six gastrointestinal organs and 15 pathological findings, while the remaining data was automatically annotated using the HSMP-BERT model. Structured data extraction used Llama 3.1 (Llama 3-8b-instruct), an open-source LLM, with Bayesian Prompt Ensembles (BayesPE) leveraging six semantically equivalent prompts for uncertainty estimation. An Agent-Based Decision Model synthesized multiple prompt outputs into five confidence levels for calibrated uncertainty, compared against three entropy-based models. Performance was assessed via accuracy, F1 score, precision, recall, and Cohen's Kappa, both before and after filtering high-uncertainty cases.

RESULTS

The agent-based model outperformed the baseline across all metrics, achieving an F1 score of 0.3967, recall of 0.6437, and Cohen's Kappa of 0.3006. After filtering high uncertainty cases (= 0.5), the F1 score increased to 0.4787 and Kappa to 0.4258. Uncertainty histograms showed clear separation between correct and incorrect predictions, with the agent-based model exhibiting the best-calibrated uncertainty predictions.

CONCLUSION

Incorporating uncertainty-aware prompt ensembles and an agent-based decision model significantly enhances the performance and reliability of LLMs in structured data extraction from radiology reports, offering a calibrated and interpretable approach for high-stakes medical applications.

CLINICAL RELEVANCE/APPLICATION

Uncertainty-aware prompt ensembles and agent-based decision models improve the accuracy and reliability of LLMs for structured data extraction from radiology reports, especially in non-English medical domains. This approach enhances confidence calibration, reducing misinterpretation risks and supporting safer AI integration in clinical workflows for radiology and gastroenterology.

T5A-SPIN-12 AI-BASED DETECTION AND GRADING OF CALCIFICATION IN CORONARY ARTERIES, AORTA, AND AORTIC VALVE USING CHEST CT SCANS

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Mohammed Jabeer (*Abstract Co-Author*)
Shweta Tyagi (*Abstract Co-Author*)
Jitender Singh (*Abstract Co-Author*)
Anuj Chandalia (*Abstract Co-Author*)
Abhinav Jain, DNB,MBBS (*Abstract Co-Author*)

PURPOSE

Calcifications in the coronary arteries, aorta, and aortic valve are linked to higher cardiovascular risk but often go unnoticed in routine chest CT scans. While cardiac CT is mostly recommended for heart disease evaluation, these calcifications can be incidentally detected on standard chest CTs. We propose an AI-based system to automatically detect and quantify these calcifications in non-contrast chest CTs, generating a DICOM overlay with calcium segmentation and a report detailing the calcium and severity findings. By leveraging existing chest CTs, this approach reduces the need for additional imaging, minimizing radiation exposure and healthcare costs, while enabling earlier diagnosis and improved patient outcomes.

METHODS AND MATERIALS

This study builds on a deep learning framework using convolutional neural networks to detect and segment calcifications in the coronary arteries, aorta, and aortic valve from non-contrast chest CTs. The model is trained on a curated dataset of 3,000 CT cases. Our system produces multilabel segmentations to localize calcifications. For each CT scan, an automated report is generated using a large language model (LLM), summarizing calcium scores for coronary arteries, aortic valve, and aorta with risk stratification, and aortic diameter measurements. Expanding on our previous chest CT solution for lung nodule detection, this system adds incidental cardiovascular findings and can be integrated into existing AI platforms to enhance clinical utility.

RESULTS

We evaluated our approach on a test set of 100 chest CTs, achieving a sensitivity of 97%, a precision of 85.8%, and an F1 score of 95% for the multi-label calcium segmentation model. The overall accuracy reached 94%. All results were independently verified by two radiologists.

CONCLUSION

Several organizations like the Society of Cardiovascular Computed Tomography (SCCT), the Society of Thoracic Radiology (STR), the British Society of Cardiovascular Imaging/British Society of Cardiac Computed Tomography (BSCI/BSCCT), and the British Society of Thoracic Imaging (BSTI) recommend reporting incidental findings in non-contrast and non-gated chest CT scans. In alignment with these guidelines, our approach enables automated detection and severity grading of cardiovascular calcifications, using chest CTs, with strong performance metrics indicating its feasibility for integration into clinical workflows.

CLINICAL RELEVANCE/APPLICATION

Our AI-based approach enables automated detection and grading of cardiovascular calcifications from routine thoracic CT scans. This will assist physicians with efficient reporting and actionable risk insights, supporting early assessment and clinical decision-making without requiring additional imaging.

Abstract Archives of the RSNA, 2025

T5A-SPIR

Interventional Radiology Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPIR-2 TIPS AS THE FIRST-LINE STRATEGY FOR SECONDARY PREVENTION OF SCHISTOSOMIASIS-RELATED VARICEAL BLEEDING: A COMPARATIVE STUDY WITH ENDOSCOPIC THERAPY PLUS NONSELECTIVE BETA-BLOCKERS

Yu Lei (*Presenter*)

PURPOSE

To compare the efficacy and safety of transjugular intrahepatic portosystemic shunt (TIPS) with endoscopic therapy combined with nonselective beta-blockers (NSBBs) in schistosomiasis-associated variceal bleeding.

METHODS AND MATERIALS

A retrospective analysis was conducted on 67 patients with schistosomal liver disease who had a history of gastroesophageal variceal bleeding. Thirty-seven patients underwent TIPS creation (TIPS group), while 30 patients received endoscopic therapy combined with NSBBs (EC-NSBBs group). The study compared the rates of rebleeding, overt hepatic encephalopathy, overall survival, and treatment-related adverse events between the two groups.

RESULTS

The cumulative probability of variceal rebleeding was significantly lower in the TIPS group compared to the EC-NSBBs group (HR = 0.09, 95% CI: 0.03-0.31, Log-rank P < 0.01). There were no statistically significant differences between the two groups in terms of overt hepatic encephalopathy (P = 0.38) and survival rates (P = 0.94). In the TIPS group, portal vein thrombosis, ascites, and pleural effusion gradually decreased after 6 months, while these complications increased in the EC-NSBBs group. The incidence of adverse events was not statistically different between the two groups. Multivariate Cox analysis identified treatment modality (HR = 0.16, 95% CI: 0.04-0.58, P < 0.01), CTP score (HR = 4.03, 95% CI: 1.11-14.70, P = 0.03), and variceal diameter (HR = 1.21, 95% CI: 1.00-1.46, P = 0.04) as predictors of rebleeding.

CONCLUSION

Compared with endoscopic therapy combined with NSBBs, TIPS significantly reduces the rebleeding rate in patients with schistosomiasis-related varices without increasing the incidence of hepatic encephalopathy.

CLINICAL RELEVANCE/APPLICATION

Our study revealed that the TIPS is notably more effective than endoscopic therapy combined with NSBBs in decreasing the rebleeding rate among patients suffering from variceal bleeding associated with schistosomiasis, without raising the risk of hepatic encephalopathy. This insight is particularly valuable for clinical practice in areas where schistosomiasis is endemic. By serving as a potent secondary preventative measure, TIPS not only mitigates the likelihood of recurrent bleeding but also enhances patients' survival quality and overall life expectancy. Additionally, our research highlights the necessity for tailored treatment plans, indicating that clinicians should take into account individual patient factors, including their Child-Turcotte-Pugh (CTP) score and varice diameters, when determining the most appropriate course of action.

T5A-SPIR-3 DESIGN AND EVALUATION OF AN ULTRA-FINE FULLY CT-VISUALIZED ANCHORING SYSTEM FOR CT-GUIDED PULMONARY NODULE LOCALIZATION

He Zhao (*Presenter*)
Lei Miao (*Abstract Co-Author*)
Xiao Li (*Abstract Co-Author*)

PURPOSE

Localization devices are widely used for video-assisted thoracoscopic resection of small pulmonary nodule (SPNs). However, there remains an unmet clinical need for an anchoring device deployable via ultra-fine delivery systems (=21G) that offers both full radiopacity under imaging guidance and retrievability without surgical intervention. This study evaluates the feasibility, safety, radiopacity, and retrievability of a novel ultra-fine fully CT-visualized (UF-CV) anchoring device for SPN localization.

METHODS AND MATERIALS

The UF-CV anchoring device underwent ex vivo biomechanical testing (comparing initial pulling forces with four-hook anchors) and in vivo porcine experiments (including robot-assisted implantation, CT visualization assessment, and feasibility of non-surgical retrieval).

RESULTS

Optimized UF-CV anchors (1.5-loop configuration, 3 mm diameter) demonstrated equivalent anchoring performance to four-hook anchors (1.29 ± 0.31 N vs. 1.42 ± 0.21 N) in ex vivo testing. In vivo deployment achieved 100% technical success (6/6 swine) with excellent targeting accuracy (1.4 ± 0.5 mm from nodule margins). Postoperative CT confirmed full radiopacity in all cases. While pneumothorax occurred in 66.7% (4/6) of cases following nonsurgical retrieval, all of them resolved spontaneously without intervention.

CONCLUSION

The UF-CV anchoring device provides safe and effective pulmonary nodule localization with full radiographic visibility and retrievability, representing a promising preoperative solution for SNPs.

CLINICAL RELEVANCE/APPLICATION

The clinical relevance of this study lies in its introduction of a novel Ultra-Fine Fully CT-Visualized (UF-CV) anchoring device for preoperative localization of small pulmonary nodules (SPNs). This device addresses critical unmet needs in current localization practices by offering several advantages. Firstly, it can be deployed via an

ultra-fine delivery system (=21G), minimizing iatrogenic trauma. Secondly, it provides full radiopacity under CT guidance, enhancing visibility during imaging surveillance. Thirdly, it is retrievable without surgical intervention, overcoming the limitations of permanent implantation and associated complications. The study's results indicate that the UF-CV anchor demonstrates comparable anchoring performance to existing four-hook anchors while offering superior radiopacity and retrievability, which could potentially improve the safety and efficiency of pulmonary nodule localization procedures in clinical practice.

T5A-SPIR-4 LARGE-BORE MECHANICAL THROMBECTOMY FOR ACUTE PULMONARY EMBOLISM: SAFETY, EFFECTIVENESS, AND PROGNOSTIC FACTORS IN A REAL-WORLD TERTIARY CENTER COHORT

Leila Haghani, MD,MPH (*Presenter*)
Danielle Millner Balagtas (*Abstract Co-Author*)
Dalena Huynh (*Abstract Co-Author*)
Shabaz Khan (*Abstract Co-Author*)
Kyle Halligan (*Abstract Co-Author*)
Neil Resnick, MD (*Abstract Co-Author*)
Ningcheng Li, MD, MS (*Abstract Co-Author*)

PURPOSE

To evaluate the safety, effectiveness, and prognostic factors of large-bore mechanical thrombectomy (LBMT) for acute pulmonary embolism (PE) in a real-world, all-comer population of high and intermediate-risk patients at a tertiary care center.

METHODS AND MATERIALS

This retrospective cohort study analyzed 49 consecutive patients (63.3% male, mean age 62.5±17.7 years) undergoing LBMT for acute PE from December 2018 to April 2025. The cohort comprised of an all-comer population reflecting real-world complexity at a tertiary center: 57.1% high-risk and 38.8% intermediate-high per European Society of Cardiology criteria, with Pulmonary Embolism Severity Index (PESI) of 160.9±51.5. Patients typically excluded from clinical trials—including those with malignancy (61.2%), metastatic disease (14.3%), and non-improvement despite systemic thrombolytics (20.4%)—were included. Procedural outcomes, survival at 48 hours, 1 month, and 3 months, adverse events, and mortality predictors were examined. Statistical methods included logistic regression, Cox proportional hazards models, and Kaplan-Meier survival estimates.

RESULTS

LBMT improved pulmonary artery pressure in 84.5% of patients (mean decrease 7.18 plus/minus 6.07 mmHg). Survival was 100% at 48 hours, 93.9% at 1 month, and 81.6% at 3 months (median follow-up 6.3 months). By risk stratification, high-risk patients had 67.9% 3-month survival, while intermediate-risk patients had 100% (log-rank p=0.03). Society of Interventional Radiology (SIR) moderate or higher adverse events included post-procedural vasopressor requirement (46.9%) and International Society on Thrombosis and Haemostasis (ISTH) major bleeding (20.4%). Independent mortality predictors were metastatic disease (HR 8.50, 95% CI 2.26-31.94, p=0.002), PESI (HR 1.02 per point, 95% CI 1.01-1.04, p=0.006), and neutrophil-to-lymphocyte ratio (HR 1.02 per unit, 95% CI 1.01-1.03, p=0.003).

CONCLUSION

In a real-world tertiary care setting, LBMT demonstrates safety and effectiveness for acute PE, with excellent survival in intermediate-risk patients and clinically meaningful outcomes in high-risk populations often excluded from clinical trials. Metastatic disease, PESI score, and neutrophil-to-lymphocyte ratio emerge as powerful independent prognostic markers for risk stratification and clinical decision-making.

CLINICAL RELEVANCE/APPLICATION

This study adds to the growing evidence (the FLAME study and the high-risk cohort of the FLASH study) to incorporate LBMT into the management pathways for patients with high-risk PE.

T5A-SPIR-5 CIRCULATING ENDOTHELIAL CELLS (CECS) AS BIOMARKER FOR THERAPY RESPONSE AND RELAPSE ASSESSMENT IN ARTERIOVENOUS MALFORMATIONS (AVMS)

Vanessa F. Schmidt, MD (*Presenter*)
Melanie Kimm (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
Max Seidensticker (*Abstract Co-Author*)
Moritz Wildgruber, MD, PhD (*Abstract Co-Author*)

PURPOSE

Arteriovenous malformations (AVMs) are heterogenous in their clinical, cellular and genetic appearance, they are diagnostically and therapeutically challenging. Radiological imaging combined with clinical findings still represents the gold standard in following therapeutic response and in determing a possible relapse. Although elevated levels of circulating endothelial cells (CECs) have been described in cardiovascular diseases such as myocardial infarct and artherosclerosis, their clinical impact as potential biomarker for treatment response and relapse events in vascular malformations has not yet been investigated.

METHODS AND MATERIALS

CECs of 28 consecutive patients of the prospective multicenter APOLLON study (DRKS00021019) with simple or combined extracranial AVMs, were analyzed using the CellSearch system. The detection of CECs in this system is based on magnetic isolation using CD146-coupled naoparticles and a subsequent immunofluoresence staining. CECs are defined as CD105+CD45-DAPI+ cells whereas leukocytes are CD105-CD45+DAPI+. Using healthy control samples, the cut off for CECs was determined at 60 CEC/ 4 ml peripheral blood.

RESULTS

We present for the first time the correlation of CEC enumeration with response to embolization therapy and disease relapse in AVM patients. 15/28 patients (54%) of the patients already presented increased CEC numbers at baseline (566 +- 1400). In 12/28 patients (43%) we were able to determine a decrease in CEC numbers during therapy in combination with an improvement of symptoms. To date, we observed a clinically manifest recurrence in 4/28 patients (14%), regarding these, we could parallelly determine a corresponding increase of CECs in those cases with clinical and radiological relapse (4/4, 100%).

CONCLUSION

Using the established and quality controlled CellSearch system for CEC analysis allows to detect and quantify CECs in AVM patients over a time frame of several years.

CLINICAL RELEVANCE/APPLICATION

Our results indicate that CECs could be a potential biomarker for AVM activity helping to evaluate and potentially predict treatment response. Furthermore, using liquid biopsy analysis of CECs could help to establish a patient-friendly system for early detection of relapse events.

T5A-SPIR-6 EFFICACY AND SAFETY OF IMAGE-GUIDED LUNG BIOPSIES: INSIGHTS FROM 27559 PROCEDURES FROM THE MULTINATIONAL DEGIR REGISTRY DATA 2018-2024

Max Eberts (*Presenter*)
Raya Juliane Serger, MD (*Abstract Co-Author*)
Abdullatif Kocak, MD (*Abstract Co-Author*)
Marcel Opitz, MD (*Abstract Co-Author*)
Johannes Haubold, MD (*Abstract Co-Author*)

Benedikt M. Schaarschmidt, MD (*Abstract Co-Author*)
Michael Forsting, MD (*Abstract Co-Author*)
Sebastian Zensen, MD (*Abstract Co-Author*)

PURPOSE

Image-guided lung biopsies play a crucial role in diagnosing pulmonary lesions, yet comprehensive large-scale data on their effectiveness and safety are scarce. This study analyzes the technical success, diagnostic yield, and complication rates of these procedures based on data from the German Society for Interventional Radiology and Minimally Invasive Therapy (DeGIR) registry data.

METHODS AND MATERIALS

In this retrospective analysis 27,559 image-guided lung biopsies from 212 centers between 2018 and 2024 were included. Technical success was defined as verified needle placement within the target lesion. Complications were categorized according to the Society of Interventional Radiology (SIR) guidelines.

RESULTS

Inpatient procedures accounted for 95.95% (26,443/27,559) of cases, and local anesthesia was performed in 97.45% (26,857/27,559). CT-guidance was used in 99.41% (27,396/27,559) of interventions. The overall technical success rate was 97.71% (26,929/27,559), and histological representativeness reached 90.5% (22,140/24,560). While technical success rates were comparable between inpatient and outpatient settings (97.75% vs. 96.77%, p=0.032), histological representativeness was higher among inpatients (90.37% vs. 85.11%, p<0.001). The overall complication rate was 19.44% (5,357/27,559), with major complications occurring in 4.87% (1,343/27,559) of biopsies. Higher complication rates were observed in patients with coagulation abnormalities.

CONCLUSION

Image-guided lung biopsies demonstrate high technical success and histological representativeness, accompanied by a moderate overall complication rate of about 20% and a rate of major complications of about 5%. Despite similar technical success, inpatient procedures yield superior histological quality. These findings underscore the need to carefully select patients and balance procedural benefits against potential risks, particularly in patients with coagulation disorders. Elevated complication rates - especially in outpatients and those with coagulation disorders - underscore the need to carefully select patients and balance procedural benefits against potential risks.

CLINICAL RELEVANCE/APPLICATION

This large-scale registry study confirms the high efficacy and acceptable safety profile of image-guided lung biopsies, supporting their routine clinical use.

T5A-SPIR-7 TRANSPULMONARY CHEMOPERFUSION VERSUS TRANSPULMONARY CHEMOEMBOLISATION FOR LUNG MALIGNANCIES: A PROSPECTIVE RANDOMIZED STUDY

Thomas J. Vogl, MD, PhD (*Presenter*)
Tatjana Gruber-Rouh (*Abstract Co-Author*)
Hamzah Adwan, MD (*Abstract Co-Author*)

PURPOSE

To evaluate unresectable lung metastases of different primary lesions and primary lung cancers treated by transpulmonary chemoperfusion (TPCP) or transpulmonary chemoembolization (TPCE) regarding size and ADC values.

METHODS AND MATERIALS

In this prospective randomized study 60 patients (30 women, 30 men; mean 64.5 years; range 29-84 years) were included who were treated by TPCP (n=30) or TPCE (n=30). Malignant lesions were from primary lung cancers (n=15), colorectal (n=13), breast cancer (n=10), and other primaries (n=22). All patients were treated via a transfemoral venous approach selectively into the segmental pulmonary artery using Cisplatin and Mitomycin C. The TPCE patients additionally received EmboCept S for the embolization. Follow-up was performed using MRI and CT in 3-month intervals post final therapy session.

RESULTS

No major side effects were observed. In the TPCE group, mean value in the change of volume was 0.97 +/- 0.54, in the TPCP group 1.43 +/- 1.14 (p=0.08). Change of the ADC value was 1.08 +/- 0.33 in TPCE and 1.13 +/- 0.50 in TPCP (p=0.7). According to the RECIST 1.1 criteria, TPCE patients showed stable disease (SD) in 19 cases (70.37%), partial response (PR) in 4 cases (14.81%) and progressive disease (PD) in 4 cases (14.81%). 3 patients were lost to follow-up. The TPCP group showed 21 cases (75%) of SD, 1 case of PR (3.57%) and 6 cases of PD (21.43%). Two patients were lost to follow-up. The overall survival time in the TPCE group was 732.70 +/-379.41 days, in the TPCP group 552.82 +/- 350.23 days (p=0.09). The progression-free time had a p-value of 0.14 (TPCE: 554.07 +/- 397.49 days; TPCP: 405.36 +/- 324.37 days

CONCLUSION

TPCE and TPCP can be safely performed. TPCE resulted in a more stable treatment outcome and a better prognostic trend than TPCP, even though the study did not show a statistically significant difference between TPCE and TPCP concerning overall survival.

CLINICAL RELEVANCE/APPLICATION

Interventional treatment using TPCP and TPCE results in improved survival rates in patients with unresectable lung metastases

Abstract Archives of the RSNA, 2025

T5A-SPMK

Musculoskeletal Imaging Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPMK-3 ASSESSING SOFT TISSUE SARCOMA RESPONSE TO TREATMENT USING DYNAMIC CONTRAST-ENHANCED MAGNETIC RESONANCE IMAGING (DCE-MRI): A SYSTEMATIC REVIEW

Peyman Mirghaderi, MD, MPH (*Presenter*)
Hyeyun Lee, MD (*Abstract Co-Author*)
Sara Haseli, MD (*Abstract Co-Author*)
Arash Azhideh, MD, MPH (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)

PURPOSE

To systematically evaluate the role of dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) in assessing treatment response in soft tissue sarcomas (STS), focusing on qualitative, semi-quantitative, and quantitative parameters.

METHODS AND MATERIALS

Following PRISMA guidelines, four databases were searched (PubMed, Embase, Scopus, Web of Science) for studies assessing DCE-MRI response in STS. Inclusion criteria encompassed all studies evaluating response to neoadjuvant therapy or other treatments before surgical resection using DCE-MRI. Two reviewers independently screened and extracted data using Covidence. The methodological quality was appraised using the QUADAS-2 tool. Parameters assessed included Ktrans, Ve, Kep, time-to-peak, wash-in/wash-out rates, and time-intensity curve patterns.

RESULTS

Fifteen studies (1992-2024) involving 221 patients were included. DCE-MRI was used to assess STS response across various treatment regimens (chemotherapy, radiotherapy, chemoradiotherapy). Quantitative parameters such as Ktrans and Kep demonstrated strong correlations with histopathological necrosis (e.g., C-statistics up to 0.97 for late-post-treatment Kep). Ve and PS also differentiated responders from non-responders. Semi-quantitative markers like iAUC60 , steepest slope , and wash-in/wash-out rates were predictive of therapeutic effect. Qualitative metrics such as time-intensity curve (TIC) patterns —especially transitions to type II— accurately distinguished responders. Compared to RECIST, DCE-MRI consistently provided superior predictive performance. Across studies, limitations included protocol heterogeneity, small sample sizes, and lack of standardized thresholds.

CONCLUSION

DCE-MRI provides multifaceted insights into STS treatment response across varying techniques. Quantitative parameters, especially Ktrans and Kep, are promising for objective, early response prediction beyond conventional size-based metrics like RECIST. However, semi-quantitative and qualitative methods also hold clinical value. Standardized protocols and multicenter validation are needed for clinical integration.

CLINICAL RELEVANCE/APPLICATION

DCE-MRI may overcome limitations of RECIST by capturing functional and vascular tumor changes, offering a non-invasive, early biomarker for response in soft tissue sarcoma management.

T5A-SPMK-4 IS THE 'LAMBDA SIGN' STILL VALID? A COMPARATIVE ANALYSIS OF DISTAL TIBIOFIBULAR SYNDESMOSIS MORPHOLOGY AND RECESS DIMENSIONS

Joao Vieira, MD (*Presenter*)

PURPOSE

To evaluate the morphology of the distal tibiofibular syndesmosis in individuals without ankle joint pathology and compare it with the height of the syndesmotic recess.

METHODS AND MATERIALS

This retrospective cohort study included 100 consecutive patients without clinical or radiological evidence of ankle joint pathology. The morphology of the distal tibiofibular syndesmosis was assessed 1 cm above the tibiotalar articular line using axial T1-weighted MRI sequences. A subjective classification categorized the syndesmosis as crescent-shaped, triangular-shaped, or flat-shaped. The height of the syndesmotic recess was measured on coronal intermediate-weighted fat-suppressed images at its point of maximal extent.

RESULTS

The height of the syndesmotic recess differed significantly among morphological types ($p = 0.037$). The flat-shaped group ($n = 11$) showed the highest mean recess height (13.3 ± 5.9 mm), followed by the crescent-shaped ($n = 46$; 11.3 ± 2.8 mm) and the triangular-shaped group ($n = 43$; 10.0 ± 3.1 mm). There were no statistically significant differences in age or gender across the morphological groups.

CONCLUSION

The morphology of the distal tibiofibular syndesmosis significantly influences the height of the syndesmotic recess in individuals without ankle pathology. Understanding these anatomical variants is essential for correctly identifying a normal recess and avoiding misdiagnosis of pathology on imaging studies.

CLINICAL RELEVANCE/APPLICATION

The flat-shaped distal tibiofibular syndesmosis is associated with a significantly higher syndesmotic recess compared to other morphological types and also exceeds, on average, the commonly accepted normal height of approximately 1 cm. Awareness of these variations can improve diagnostic accuracy in the evaluation of the distal syndesmosis and reduce false-positive findings.

T5A-SPMK-7 RELIABLE DETECTION OF BONE METASTASES ON CT SCANS WITH ARTIFICIAL INTELLIGENCE

Nor-Eddine Regnard, MMed (*Presenter*)
Stephane Charlon (*Abstract Co-Author*)
Marion Durteste (*Abstract Co-Author*)
Jules Bayet (*Abstract Co-Author*)
Alois Pourchot (*Abstract Co-Author*)
Jeanne Ventre, PhD (*Abstract Co-Author*)
Jean-Denis Laredo, MD, PhD (*Abstract Co-Author*)
Andreas Brendlin, MD, PhD (*Abstract Co-Author*)
Saif Afat, MD (*Abstract Co-Author*)

PURPOSE

Bone metastases are a frequent and serious occurrence in patients with advanced solid tumors, particularly in prostate, breast, and lung cancers. Metastases can lead to skeletal-related events that impair patients' quality of life. Early detection of these lesions on CT scans is therefore critical to enable timely therapeutic intervention and improve patient prognosis. However, identifying bone metastases on CT scans remains a labor-intensive task that is prone to error. This study evaluated the performance of a novel artificial intelligence (AI) software, BoneCT (Gleamer, Paris, France), for detecting both osteolytic and sclerotic bone metastases on CT scans, and compared its diagnostic accuracy to that of radiologists.

METHODS AND MATERIALS

We conducted a retrospective multicenter study using CT scans from private clinical practices in France, Brazil, and the United States, focusing on adult patients aged =18 years. Scans covered the thoracic, abdominal, and pelvic regions. Two expert musculoskeletal radiologists annotated all osteolytic and sclerotic metastases to establish the ground truth using prior and follow-up scans, when available, and radiology reports. A third radiologist with over 35 years of experience resolved discrepancies. Four radiologists independently reviewed the same scans with limited clinical data (age, sex, and indication). We compared their performance to that of the AI software using ROC and FROC analyses.

RESULTS

The final dataset included 249 CT scans (mean age 71±14 years; 95 women, 154 men), with 133 cases (53%) positive for at least one bone metastasis. Among these patients, 191 (77%) had a known primary cancer, while 58 (23%) did not. The analysis specifically examined lesions =20 mm. The AI software achieved a patient-wise triage sensitivity of 99% [96%, 100%] and a lesion-wise sensitivity of 80% [73%, 87%] for 1.6 [1.3, 2.3] false positives per scan. In comparison, radiologists demonstrated a patient-wise sensitivity of 96% [93%, 99%] and a lesion-wise sensitivity of 76% [74%, 79%] at a mean false positive rate of 1.1 [0.7, 1.4] per scan. Notably, the AI's sensitivity did not significantly differ between osteolytic and sclerotic metastases ($p = 0.15$).

CONCLUSION

This AI solution demonstrated excellent diagnostic performance for detecting both osteolytic and sclerotic bone metastases on CT scans, on par with the performance of experienced radiologists. By offering a reliable tool for cancer surveillance and incidental metastasis detection, AI stands to optimize radiology workflows.

CLINICAL RELEVANCE/APPLICATION

By achieving radiologist-level performance in detecting bone metastases on CT, a novel AI solution is positioned to markedly improve efficiency across oncology and general radiology workflows.

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T5A-SPNMMI

Nuclear Medicine & Molecular Imaging Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPNMMI-1 LOW-COUNT WHOLE-BODY PET WITH DEEP LEARNING IN A MULTICENTER, MULTI-TRACER AND EXTERNALLY VALIDATED STUDY

Maarten Larmuseau, DPhil (*Presenter*)
Justine Maes (*Abstract Co-Author*)
Charles Carron (*Abstract Co-Author*)
Camille Steenhout (*Abstract Co-Author*)
Ludovic D'Hulst (*Abstract Co-Author*)
Simon Dekeyser (*Abstract Co-Author*)
Tomas Brants (*Abstract Co-Author*)

PURPOSE

The growing use of PET imaging in oncology and neurodegenerative diseases has raised concerns about radiation burden and healthcare costs. Although amyloid and tau tracers support early Alzheimer's diagnosis, high tracer costs and reimbursement delays limit access. Deep learning offers a solution: in-silico image enhancement allows for high-quality PET scans at reduced dose or time, improving safety and affordability. Yet, model training must address generalizability across tracers and centers, quantitative accuracy in lesions, and noise-level mismatch between training and clinical data.

METHODS AND MATERIALS

We evaluated NUCLARITY, a CNN-based PET enhancement tool, in a blinded, multi-center, multi-tracer study. PET list-mode data from 65 subjects across three European hospitals were used to simulate 50%-dose/time scans. Four tracers were included: 18F-FDG, 18F-PSMA, 68Ga-PSMA, and 68Ga-DOTATATE. Scans were acquired with GE and Siemens systems. NUCLARITY enhanced the low-count reconstructions using a residual encoder-decoder CNN. Six physicians rated diagnostic image quality (DIQ, 1-5) and diagnostic confidence (DC, 1-3), and identified lesions across six anatomical regions. Two readers delineated VOIs on standard-count (SC) scans, enabling quantitative SUV comparisons with the enhanced low-count scans (LCE).

RESULTS

Mean DIQ was 4.1 (SC) vs. 3.6 (LCE); DC was 2.8 vs. 2.5. Across 243 segmented lesions, CCCs for SUVmean and SUVmax were 1.00 and 0.99, respectively. Bland-Altman plots showed minimal bias. Of 46 abnormal regions on SC, 43 were also detected on LCE (sensitivity: 0.93, specificity: 0.99, F1: 0.96). Inter-scan agreement was 0.70 (18F) and 0.66 (68Ga); inter-reader agreement was 0.47 (SC) and 0.44 (LCE).

CONCLUSION

NUCLARITY demonstrates robust performance across tracers and scanners, suggesting its clinical readiness. Future work will focus on broader validation and clinical decision impact.

CLINICAL RELEVANCE/APPLICATION

NUCLARITY enables diagnostic-quality PET imaging at half the dose or scan time, maintaining lesion detectability and quantitative integrity. This supports reduced radiation exposure and cost without compromising clinical utility. The tool may be especially valuable in surveillance imaging or dose-sensitive populations, improving access to PET across oncology and neurology.

T5A-SPNMMI-2 SURFACE-MODIFIED IRON OXIDE NANOPARTICLE-BASED MRI T_1 CONTRAST AGENTS

Li Wu, MD, PhD (*Presenter*)
Sihan Chen (*Abstract Co-Author*)

PURPOSE

This study aims to investigate the effects of different surface modifiers on both particle size distribution and relaxivity of iron oxide nanoparticles, with the goal of identifying the optimal modifier that demonstrates superior dispersibility and enhanced relaxivity performance.

METHODS AND MATERIALS

Firstly, ultrasmall Fe2O3 nanoparticles were synthesized via a thermal decomposition method, followed by size characterization and X-ray photoelectron spectroscopy (XPS) elemental analysis. The as-prepared aqueous Fe2O3 nanoparticles were then modified with mesoporous SiO2, dendritic mesoporous SiO2, bovine serum albumin (BSA), and polyethylene glycol diacrylate (PEG-DA), respectively. After size characterization of the modified nanoparticles, in vitro MRI imaging was performed under a 0.5 T magnetic field to measure their longitudinal (r1) and transverse (r2) relaxivity values and evaluate their imaging performance.

RESULTS

Under TEM, ultrasmall Fe2O3 nanoparticles showed regular morphology, uniform distribution, and a mean diameter of 13.82 ± 1.89 nm (Figure 1a). XPS analysis of the Fe 2p spectrum confirmed Fe2O3 formation (Figure 1b). Mesoporous SiO2 could not coat aqueous ultrasmall Fe2O3 nanoparticles (Figure 1c), while dendritic mesoporous SiO2 encapsulated them but yielded unstable systems unsuitable for relaxivity measurement (Figure 1d). BSA-coated nanoparticles degraded after one week, showing poor stability and precluding relaxivity analysis (Figure 1e). In contrast, PEG-DA-coated nanoparticles exhibited excellent dispersibility, with r1/r2 relaxivities of 0.077/0.082 mM?¹ s?¹ (r2/r1 = 1.06 at 0.5 T). T 1 WI signal intensity increased with Fe concentration, consistent with T1 contrast agent characteristics (Figure 1f and Figure 1g).

CONCLUSION

PEG-DA modified iron oxide nanoparticles exhibit good monodispersity and stability. Meanwhile, they possess excellent T 1 relaxation properties and thus have greater potential to serve as MRI T1 contrast agent based on Fe2O3@PEG-DA.

CLINICAL RELEVANCE/APPLICATION

Compared with clinically commonly used gadolinium-based contrast agents, iron oxide nanoparticle-based contrast agents exhibit higher biological safety. Additionally, PEG-DA modification of iron oxide nanoparticles can enhance biocompatibility and T 1 WI performance, thereby making iron oxide nanoparticle-based T 1 contrast agents more promising for clinical applications.

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T5A-SPNPM

Noninterpretive Skills (Beyond Imaging) Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPNPM-1 AUGMENTING THE DATASET OF A RAG-BASED RADIATION ONCOLOGY PATIENT CHATBOT THROUGH SYNTHETIC QUESTION-ANSWER GENERATION AND AUTOMATED EVALUATION

Philip Dawny Philip, BA (*Presenter*)
Ayush Agarwal (*Abstract Co-Author*)
Jerry Zhu, MS (*Abstract Co-Author*)
Poonam Yadav, PhD (*Abstract Co-Author*)
Jacob John, BEng, MS (*Abstract Co-Author*)
Sagnik Sarkar, MS (*Abstract Co-Author*)
Peng (Troy) Teo, PhD (*Abstract Co-Author*)

PURPOSE

The rapid adoption of AI chat assistants in radiation oncology highlights the need for scalable, accurate dataset validation. This study evaluates the effectiveness of LLMs in generating and assessing synthetic medical Q&A pairs, benchmarking automated and statistical evaluation methods against expert human ratings to enable reliable automated dataset validation.

METHODS AND MATERIALS

We extracted reference content from information hosted on three authoritative radiation oncology websites and employed Llama 31.-70B with structured prompts to generate corresponding patient-style questions. Each QA pair underwent a three-tier assessment: (1) LLM self-evaluation using structured grader chains, (2) scoring with RQUGE, a reference free metric that assesses question quality by measuring how well the generated question can be answered, and (3) expert review by board-certified radiation oncologists for medical accuracy, relevance and clarity. To support automated dataset validation, we used ROC analysis to identify the optimal threshold for RQUGE scores and applied weighted Cohen's Kappa to calibrate LLM self-evaluation scores against expert ratings.

RESULTS

The results reveal systematic differences among evaluation methods: LLM scores are generally higher and less variable than human scores, while RQUGE scores are consistently lower. Both LLM and RQUGE scores show modest but significant positive correlations with human ratings, though LLM-human alignment is stronger. ROC analysis yields an AUC of 0.58 for RQUGE based classifier, reflecting limited discriminative power. Cohen's Kappa score is 0.105 for an LLM score threshold of 4, with percentage agreement improving slightly to 48.67% after thresholding. Using this threshold, LLM classification achieves 88% accuracy against human ground truth.

CONCLUSION

Structured prompts allow LLMs to generate clinically relevant questions for RAG-based radiation oncology chatbots. Though self-evaluations show optimism bias, thresholding improves alignment with expert ratings. With calibrated scoring, LLMs can reduce reliance on manual review in synthetic dataset generation.

CLINICAL RELEVANCE/APPLICATION

RAG-based LLs improve safety in radiation oncology by retrieving responses from curated content, reducing hallucinations. Their effectiveness however, depends on robust QA datasets. This study shows that Llama 3.1 can generate clinically relevant questions and self-assess quality. Calibration with expert ratings and reference-free metrics like RQUGE enables scalable, automated QA curation for safe patient chatbot deployment.

T5A-SPNPM-3 PAPERLESS RADIOLOGY: CHALLENGES, ACCEPTANCE, AND NET PROMOTER SCORE TRENDS IN A LARGE IMAGING CENTER

Patricia M. Carrascosa, MD, PhD (*Presenter*)
Carlos Capunay, MD (*Abstract Co-Author*)
Juan Cruz Gallo, MD, MD (*Abstract Co-Author*)
Patricio J. Sita (*Abstract Co-Author*)
Valeria Szymanowski (*Abstract Co-Author*)

PURPOSE

The benefits of paperless systems include streamlined workflows, reduced environmental impact, and improved data sharing, while limitations involve potential technological barriers, cybersecurity risks, and patient/physician reluctance. The objective of this study is to evaluate whether Argentine patients and referring physicians are prepared for a transition to a paperless system by analyzing their acceptance levels through Net Promoter Score (NPS) measurements before and after implementation.

METHODS AND MATERIALS

This study was conducted at one of the largest imaging centers in Buenos Aires, performing over 70,000 imaging studies monthly across multiple imaging department. To assess patient and referring physician satisfaction and acceptance of the paperless transition, we measured the Net Promoter Score (NPS) monthly. Our institutional goal was to maintain an NPS above 80. The transition to a paperless system began in August 2024 in two imaging departments: conventional radiology and dental radiology. NPS scores were collected globally and individually from January to August 2024 (pre-implementation phase) and from August to December 2024 (post-implementation phase). We then compared the results to determine any significant differences before and after implementation.

RESULTS

The global NPS before the implementation of global paperless imaging department was 81.53, but after implementation, it dropped to 73.84%. When analyzing individual departments, the results showed: PET-CT 80/80; nuclear medicine 76.9/80; MRI 82.1/80.6; mammography 89.6/81.2; densitometry 86.2/88.3; US 78.6/78.7; CT 75.8/61.1; dental radiology 81.5/75.9; conventional radiology 80/46.5; cardiology 70.8/85; referring physician 80/52.

CONCLUSION

Our initial experience demonstrated that the transition to a paperless radiology system resulted in a significant drop in NPS, particularly in the first two imaging departments where it was implemented. This decline suggests that additional efforts are required to educate and prepare patients and referring physicians for the benefits of a paperless system before its full implementation. Future strategies should focus on improved communication, training programs, and user-friendly digital solutions to facilitate adoption and enhance satisfaction levels.

CLINICAL RELEVANCE/APPLICATION

The transition to a paperless workflow in radiology aims to optimize efficiency, reduce costs, and enhance patient and referring physician experience.

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T5A-SPNR

Neuroradiology Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPNR-1 DAPAGLIFLOZIN RESTORES ODOR-INDUCED FUNCTIONAL INTEGRATION OF POC CIRCUIT, BUT NOT LOCAL OLFACTORY NEURAL ACTIVATION IN PATIENTS WITH TYPE 2 DIABETES: A 16-WEEK RANDOMIZED COMPARATIVE STUDY

Xin Li (*Presenter*)
Bing Zhang, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the effects of dapagliflozin, liraglutide, or acarbose treatment on the directed functional connectivity of the primary olfactory cortex (POC) circuit and local activation under odor stimulation in patients with type 2 diabetes (T2D).

METHODS AND MATERIALS

The 16-week randomized, parallel-group, open-label trial included 36 patients with T2D inadequately controlled with metformin, who were randomized (1:1:1) to receive dapagliflozin, liraglutide or acarbose. Simultaneously, 36 healthy controls were recruited. All participants underwent olfactory task functional MRI, along with a battery of olfactory and cognitive tests, both at baseline and postintervention.

RESULTS

After 16 weeks, dapagliflozin restored odor-induced functional integration of the POC-sensorimotor cortex-middle temporal cortex circuit (Gaussian random field correction applied), whereas liraglutide and acarbose did not. Dapagliflozin also tended to improve attention ($P = 0.071$). In contrast, liraglutide enhanced odor-induced activation in the left hippocampus, which was not observed with dapagliflozin and acarbose. The decreased odor-induced directed functional connectivity was associated with improvements in lipid levels and changes in olfactory threshold, executive function, and memory performance (all $P < 0.05$).

CONCLUSION

These results suggest that dapagliflozin and liraglutide exhibit distinct neuroprotective effects. While liraglutide enhances activation in local olfactory-related regions, dapagliflozin facilitates functional integration within neural circuits. This highlights the importance of targeting both metabolic and neural pathways to manage T2D-related cognitive decline.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the potential of dapagliflozin and liraglutide as neuroprotective agents and underscore the importance of targeting both metabolic and neural pathways in the management of T2D-related cognitive decline. Further research is needed to elucidate the long-term effects of antidiabetic drugs on brain health and to identify optimal treatment strategies for patients at high risk of dementia.

T5A-SPNR-3 ASSOCIATION BETWEEN DIFFUSION TENSOR IMAGING ALONG THE PERIVASCULAR SPACE (DTI-ALPS) AND GLOBAL COGNITIVE SCORES IN BOSTON PUERTO RICAN HEALTH STUDY (BPRHS)

Mahsa Alborzi Avanaki, MD (*Presenter*)
Yi Guan (*Abstract Co-Author*)
Bang-Bon Koo (*Abstract Co-Author*)
Chia Hsin Cheng (*Abstract Co-Author*)
Yu-Ming Chang, MD, PhD (*Abstract Co-Author*)
Tammy Scott (*Abstract Co-Author*)
Katherine Tucker (*Abstract Co-Author*)
Rafeeque A. Bhadelia, MD (*Abstract Co-Author*)

PURPOSE

DTI-ALPS has been used as a surrogate for brain's glymphatic system responsible for removal of toxic proteins and other waste materials. While lower DTI-ALPS has been associated with cognitive decline, mechanism of relationship is not fully understood. Our purpose was to investigate: (1) the association between DTI-ALPS and demographic, genetic and cerebrovascular risk-factors, hippocampal volumes (HV) and Global Cognitive Scores (GCS), and (2) to study HV has any mediation role in association between DTI-ALPS and GCS.

METHODS AND MATERIALS

A total of 198 BPRHS participants (153 female; mean age 67.9 ± 6.7 years) who underwent MRI and had complete demographic, genetic, cardiovascular (hypertension and diabetes), and GCS profile data were included. MRI scans included 3-mm DTI (32 directions) and 3D MPRAGE images for DTI-ALPS and HV analyses. DTI-ALPS was calculated using both the manual and automated ROI placements. The GCS was derived as the average of the z-scores from multiple cognitive tests, including the word list learning, recognition, percentage retention, Stroop test, letter fluency, digit span forward and backward, clock drawing, and weighted figure copying. The effects of age, sex, apolipoprotein E4 (APOE) profile, and the presence of hypertension (with or without diabetes) on DTI-ALPS, HV, and GCS were assessed using linear models. The association between DTI-ALPS, HV and GCS was studied using correlation and mediation analysis.

RESULTS

Automated DTI-ALPS measurements were strongly correlated with manual method ($r=0.58$) and provided normally distributed data for analysis. Lower DTI-ALPS scores were associated with increasing age ($P<0.007$) and the coexistence of diabetes and hypertension ($P<0.001$). DTI-ALPS was significantly affected by hypertension and diabetes in both younger subjects (age<=median age of 66) and older subjects (age>66yo, $P<0.05$), whereas HV and GCS were only significantly affected in the older age group ($P<0.05$). No relationship was seen between DTI-ALPS and sex, APOE4 carrier status or with hypertension individually. The relationship between DTI-ALPS and GCS appeared to be mediated through HV ($P<0.001$).

CONCLUSION

DTI-ALPS scores are associated with GCS, but this relationship appears to be mediated through hippocampal atrophy. These significant correlations suggest that DTI-ALPS may serve as a noninvasive biomarker reflecting brain structural integrity and cognitive status in aging populations with cardiovascular risk factors.

CLINICAL RELEVANCE/APPLICATION

DTI-ALPS may serve as a noninvasive marker for cognitive function and brain integrity in older adults with cardiovascular risk factors.

T5A-SPNR-4 PIVOTAL MULTICENTER VALIDATION OF A DEEP LEARNING SOFTWARE FOR AUTOMATIC DETECTION OF ACUTE INTRACRANIAL HEMORRHAGE

Tae Jin Yun, MD (*Presenter*)
Jin Wook Choi, MD, PhD (*Abstract Co-Author*)
Hoon Na (*Abstract Co-Author*)
Miran Han, MD (*Abstract Co-Author*)
Woo Sang Jung (*Abstract Co-Author*)
Ji Ye Lee, MD, PhD (*Abstract Co-Author*)
Roh-Eul Yoo, MD, PhD (*Abstract Co-Author*)
Inpyeong Hwang, MD (*Abstract Co-Author*)
Sun Won Park, MD, PhD (*Abstract Co-Author*)

PURPOSE

Acute intracranial hemorrhage (ICH) is a critical neurologic emergency where timely diagnosis directly affects outcomes. Non-contrast brain CT remains the gold standard for initial detection; however, subtle or atypical hemorrhage subtypes can be easily overlooked, especially under emergency pressure. Artificial intelligence (AI)-based computer-aided triage and notification (CADt) systems may expedite identification of critical cases, enhancing diagnostic accuracy and workflow efficiency.

METHODS AND MATERIALS

We performed a retrospective pivotal study across 13 demographically diverse U.S. hospitals to assess the performance of Hyper Insight-ICH, an AI-powered CADt software, in detecting acute ICH on non-contrast axial brain CT. The cohort included 394 adults (198 ICH, 196 normal). Ground truth was established by consensus of board-certified neuroradiologists. The software employed a hybrid architecture of hemorrhage detection module (based on supervised training) and anomaly detection module (based on unsupervised training). Primary outcomes were sensitivity and specificity; secondary endpoints included AUROC, predictive values, and notification time. Subgroup analyses focused on ICH subtypes, CT scanner vendors, and patient demographics.

RESULTS

The software achieved excellent diagnostic accuracy, with 95.45% sensitivity, 98.47% specificity, and an AUROC of 0.9864. Median alert time was 15.8 seconds, supporting real-time triage. Subgroup analysis by ICH subtype showed consistently high sensitivity: 97.30% for intraparenchymal, 97.67% for intraventricular, 97.65% for subarachnoid, 94.69% for subdural, and 100.00% for epidural hemorrhages. The tool consistently performed well across CT vendors and patient demographics.

CONCLUSION

This FDA-aligned pivotal trial shows that the AI-based triage tool provides rapid and reliable detection of diverse ICH subtypes, including challenging patterns such as subarachnoid or subdural bleeds. With consistent performance across clinical and technical subgroups and real-time notification capability, it is well-positioned for integration into emergency radiology settings as a Class II CADt device. Its high performance underscores the clinical utility of AI-driven triage to enhance vigilance and reduce diagnostic delays in acute neuroimaging.

CLINICAL RELEVANCE/APPLICATION

An AI-based triage tool enables fast and accurate detection of acute intracranial hemorrhage on brain CT, demonstrating high sensitivity across all major hemorrhage subtypes and a median alert time of less than 16 seconds. Its consistent performance supports integration into emergency workflows to reduce diagnostic delays and improve clinical outcomes.

T5A-SPNR-5 RADIOLOGICAL MARKERS OF BRAIN HEALTH AFFECT SURVIVAL IN ELDERLY GLIOBLASTOMA PATIENTS

Parisa Arjmand (*Presenter*)
Sree Gongala (*Abstract Co-Author*)
Wassim O. Malak, MD (*Abstract Co-Author*)
Prashant Vempati (*Abstract Co-Author*)
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PURPOSE

This study investigates whether radiological markers of brain health, assessed on pre-operative MRI, independently predict overall survival (OS) in elderly glioblastoma patients, beyond conventional clinical and tumor-specific factors.

METHODS AND MATERIALS

In this retrospective study, we analyzed 144 patients aged =65 years with newly diagnosed IDH-wildtype glioblastoma and a pre-operative MRI from 2012-2024 at a single academic center. Tumor features and brain health markers—including global cortical atrophy (GCA), white matter hyperintensities (WMH), microbleeds, lacunar infarcts, and perivascular spaces—were rated by neuroradiologists. Clinical data (e.g., age, KPS, MGMT status) and treatment details were extracted from records. Kaplan-Meier and Cox proportional hazards models (univariate and multivariate) were used to assess associations between these brain health markers and OS.

RESULTS

Median age at diagnosis was 72.6 years. Most patients (56.9%) were male. Common brain health findings included mild-to-moderate GCA (44.4%) and WMH (54.8%). Satellite lesions (45.1%) and ependymal involvement (79.9%) were frequent tumor features. Univariate analysis showed that moderate-to-severe GCA (HR ~1.9, p <0.01), WMH (HR ~2.1, p <0.01), lacunar infarcts (HR ~1.7, p <0.05), and satellite lesions (HR ~1.5, p <0.05) were significantly associated with decreased OS. Ependymal involvement also predicted worse survival (HR ~1.7, p <0.01). However, in multivariate models adjusting for age, KPS, and MGMT status, none of the imaging-based brain health markers remained independently significant, suggesting collinearity with age and frailty.

CONCLUSION

Radiological markers of brain health—including GCA, WMH, and lacunar infarcts—are significantly associated with increased mortality in elderly glioblastoma patients. Additionally, tumor characteristics such as deep brain location, ependymal involvement, and the presence of satellite lesions negatively influence survival. Notably, these imaging-based features demonstrate prognostic value independent of chronological age, underscoring their clinical relevance. Future research should focus on incorporating these radiological markers into comprehensive prognostic models alongside clinical and molecular parameters to improve risk stratification and guide personalized treatment planning.

CLINICAL RELEVANCE/APPLICATION

MRI-based brain health markers offer a complementary lens to assess prognosis in elderly glioblastoma beyond tumor and molecular features. Incorporating these into clinical evaluation may improve treatment personalization by identifying patients less likely to tolerate aggressive therapy due to underlying neurovascular vulnerability.

T5A-SPNR-6 PREDICTION OF BRAIN INVASION OF MENINGIOMA BY ADC HISTOGRAM ANALYSIS: RELATIONSHIP WITH KI-67 PROLIFERATION INDEX

Guiqin Chen (*Presenter*)
Junlin Zhou, PhD (*Abstract Co-Author*)

PURPOSE

Predicting whether meningioma has brain invasion before operation is helpful to guide surgical decision-making and treatment, and is helpful to the prognosis of meningioma. The purpose of this study is to predict the brain invasion of meningioma by using the histogram parameters of apparent diffusion coefficient (ADC) before operation, and to further study the relationship between ADC histogram parameters and Ki-67 proliferation index

METHODS AND MATERIALS

133 cases of meningioma confirmed by pathology in our hospital from January 2021 to December 2024 were retrospectively collected, and were divided into brain invasion group and non- invasion group according to the pathological results. The preoperative clinical data, ADC data and postoperative pathological characteristics were collected. Using Firevoxel software to extract ADC histogram parameters of meningioma patients before operation . We statistically analyzed the ADC histogram parameters of the two groups, and determined the characteristic parameters with significant differences between the two groups. In addition, we used receiver operating characteristic curve (ROC) and binary logistic regression analysis to evaluate the accuracy of distinguishing ADC histogram parameters, and discussed the relationship between ADC histogram parameters and Ki-67 in meningioma.

RESULTS

ADC histogram parameters have certain ability to distinguish meningioma brain invasion. Age,ADCmin, ADCp1, ADCvrriance, and ADCcoefficient of variation among ADC histogram parameters showed statistically significant differences between invasion group and non- invasion group meningiomas (all $P < 0.05$).The combination of ADC histogram parameters and clinical routine features showed the best ability to distinguish meningioma brain invasion, and the area under the curve (AUC) was 0.778 (95% CI, 0.692-0.860). The ADCmin ($r = -0.256$, $p=0.003$) and ADCp1 ($r =-0.309$, $p < 0.001$) were negatively correlated with the proliferation index of Ki-67 (Bonferroni correction) .

CONCLUSION

As a non-invasive method, ADC histogram parameters combined with clinical features have potential clinical value in preoperative diagnosis of meningioma brain invasion

CLINICAL RELEVANCE/APPLICATION

It is helpful to formulate surgical strategies and predict prognosis.

T5A-SPNR-7 PHYSIOLOGICAL IMPLICATIONS OF ORIGINAL AND VARIANT DIFFUSION TENSOR IMAGE ANALYSIS ALONG THE PERIVASCULAR SPACE (DTI-ALPS) METRICS IN OBSTRACTIVE SLEEP APNEA

Toshiaki Taoka, MD, PhD (*Presenter*)
Kunihiro Iwamoto (*Abstract Co-Author*)
Seiko Miyata (*Abstract Co-Author*)
Rintaro Ito, MD, PhD (*Abstract Co-Author*)
Koji Kamagata, MD, PhD (*Abstract Co-Author*)
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PURPOSE

To investigate the associations between diffusion tensor imaging (DTI)-derived perivascular diffusivity metrics—including the ALPS-index and its variant forms—and polysomnography (PSG)-derived sleep parameters in patients with suspected obstructive sleep apnea (OSA), aiming to elucidate the physiological implications of both global and region-specific indices in relation to sleep quality and architecture.

METHODS AND MATERIALS

Fifty participants (mean age 50.0 ± 14.0 years) underwent overnight PSG and two brain MRI sessions (4 PM and 9 AM) on a 3T scanner. DTI-based parameters included the standard ALPS-index and three variant indices calculated in distinct regions of the corpus callosum: ccgALPS (genu), ccbALPS (body), and ccsALPS (splenium). Sleep metrics assessed included sleep latency, REM sleep latency, total sleep time, wake after sleep onset (WASO), and sleep efficiency. Correlation analyses were conducted between both the standard and variant ALPS metrics and sleep parameters for each MRI session (Day 0 and Day 1). Changes across sleep (delta) were also analyzed. Scatter plots were generated to visually demonstrate the relationships between diffusivity metrics and sleep parameters.

RESULTS

The standard ALPS-index at 4 PM showed moderate correlations with REM latency ($r = -0.47$), total sleep time ($r = 0.33$), and sleep efficiency ($r = 0.29$). Similar trends were observed at 9 AM. Among the variant indices, ccbALPS exhibited a weak negative correlation with sleep latency ($r = -0.25$). Additionally, diffusivity metrics within the corpus callosum, such as ccbDyy and ccbFA, were positively associated with sleep efficiency ($r = 0.30$-0.45). Changes in delta ccsDzz across the sleep period were inversely correlated with Stage N3 sleep ($r = -0.41$), suggesting sensitivity to deep sleep. These findings indicate that both the standard and variant ALPS indices capture aspects of sleep-related microstructural changes in the brain.

CONCLUSION

DTI-derived indices, particularly the ALPS-index and corpus callosum variant indices, show significant associations with key PSG-derived sleep metrics, suggesting their potential utility as non-invasive markers of sleep quality. The inclusion of variant ALPS indices provided complementary insights into region-specific diffusivity changes associated with sleep architecture, enhancing the understanding of sleep-related neurofluid dynamics.

CLINICAL RELEVANCE/APPLICATION

DTI-based diffusivity metrics, including the ALPS-index and its variants, may serve as surrogate imaging biomarkers of sleep quality, offering insights into neurofluid dynamics and brain health in sleep disorders such as OSA.

T5A-SPNR-9 PLASMA GFAP AS A MEDIATOR BETWEEN WHITE MATTER INTEGRITY AND TAU PATHOLOGY IN ALZHEIMER DISEASE-DERIVED COGNITIVE IMPAIRMENT: INSIGHTS FROM A NODDI STUDY

Xinru Xu (*Presenter*)

PURPOSE

Neurite Orientation Dispersion and Density Imaging (NODDI) is an advanced diffusion MRI method offering microstructural insights into brain tissue. This study aims to elucidate the relationship between WM microstructure alterations and plasma biomarkers in Alzheimer's Disease (AD) and whether NODDI metrics improved diagnostic accuracy compared that only relied on plasma biomarkers (alone and in combination).

METHODS AND MATERIALS

The study involved 59 cognitively unimpaired (CU) and 47 CI participants, including individuals with mild cognitive impairment and AD. Tract-Based Spatial Statistics (TBSS) was used to assess microstructural alterations in WM fiber tracts via Diffusion Tensor Imaging (DTI) and NODDI metrics. Correlation and multiple linear regression analyses were conducted to investigate the relationships between plasma biomarkers (Aß 42/40, p-Tau181, p-Tau217, NfL, and GFAP), NODDI and DTI indices in WM fiber and neuropsychological scale scores at baseline and longitudinal changes. Structural equation models explore relationships among plasma biomarkers, white matter injury and cognitive function. Receiver operating characteristic (ROC) analyses were performed to evaluated the ability of NODDI and DTI index in WM and plasma biomarkers for distinguishing between CI and CU individuals.

RESULTS

CI participants exhibited significantly deteriorated WM microstructural integrity, as reflected by decreased Fractional anisotropy(FA) and Neurite density (NDI) values in specific brain regions. NDI values showed significant correlations with AD-related plasma biomarkers [(NDI&p-Tau181 ($r=-0.136$, $P<0.001$) and NDI&GFAP ($r=-0.185$, $P<0.001$)], as well as cognitive function. Mediation analysis indicated that WM microstructural alterations, as measured by NDI, partially and fully mediated the relationship between plasma p-Tau181, Aß42/40, and subsequent cognitive decline. Furthermore, combination of NDI and p-Tau181 provided superior performance in distinguishing CU from CI individuals (area under the ROC curve = 0.93) and predicting longitudinal cognitive decline.

CONCLUSION

NDI is more sensitive than taditional DTI index (FA) in diagnosing cognitive impairment and predicting cognitive decline associated AD. Plasma p-Tau181 appears to contribute to cognitive decline by promoting GFAP level and synaptic density changes in WM.

CLINICAL RELEVANCE/APPLICATION

The current study demonstrates that NDI may provide additional valuable diagnostic and prognostic information regarding cognitive changes in AD. Our findings highlight the role of neurite density in white matter and tau patholofy as key disease modifiers, with potential implications for disease-modifying trials targeting individuals with AD.

T5A-SPNR-11 IMAGE SYNTHESIS OF DOUBLE INVERSION RECOVERY-LIKE SERIES FOR ENHANCED CONTRAST AND FOCAL CORTICAL DYSPLASIA VISUALIZATION

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Zechen Zhou (*Abstract Co-Author*)
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Ajit Shankaranarayanan (*Abstract Co-Author*)
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PURPOSE

In focal cortical dysplasia (FCD) type II, pathological regions typically present with blurring of the gray-white-matter junction and subcortical white matter hyperintensities. This study evaluates the utility of synthesized double inversion recovery like images in enhancing the visibility of those features, while maintaining high structural consistency.

METHODS AND MATERIALS

Building on our earlier work, where we synthesize STIR-like image from T1-weighted and T2-weighted spine series[2], we repurpose it for a novel application, to use T1w and T2-FLAIR brain images to synthesize a DIR-like (Syn-DIR) image. The study evaluated on the dataset with 85 individuals with epilepsy due to FCD II and 85 healthy controls. It also includes manually labeled lesion masks.To assess changes at the gray-white-matter junction, gray-white-matter contrast ratios(GWCR) were computed under three conditions: (1) healthy control set, (2) FCD-labeled regions, and (3) non-FCD regions. Wilcoxon signed-rank tests were performed to evaluate statistical differences across conditions. Additionally, to assess the sensitivity to FCD lesions, the drop in subcortical white matter hyperintensity was quantified both inside and outside the lesion areas on the FCD cohort.For evaluating structural consistency, dice similarity coefficients were computed using derived segmentation masks from T2 FLAIR and SynDIR volumes independently. Dice scores within major brain regions were averaged across cases to quantify segmentation agreement.

RESULTS

Figure A shows a representative case of FCD. SynDIR achieved significantly higher GWMC scores than FLAIR across all conditions(Table). Within the FCD cohort, GWMCD on SynDIR was significantly greater than that on T2-FLAIR (SynDIR: 0.2762 ± 0.1425, FLAIR: 0.0774 ± 0.0634; $p < 0.001$; Figure B). It suggests SynDIR provides a substantial enhancement in depicting the gray-white matter junction and enhanced sensitivity to cortical abnormalities.The average subcortical hyperintensity with SynDIR was 1.3305 ± 0.1694, which is significantly larger than that with FLAIR(1.5757 ± 0.2771)(Figure C). It indicates SynDIR is more sensitive to the hallmark FCD signal abnormalities associated. In Figure D, all major brain structures demonstrated high structural agreement between FLAIR and SynDIR segmentations(exceeding a Dice score of 0.85). Regions such as the Basal Ganglia and Brainstem achieved particularly high agreement, indicating strong spatial consistency.

CONCLUSION

In conclusion, SynDIR demonstrates better GM/WM junctions, enhanced sensitivity to signal abnormality, and segmentation consistency.

CLINICAL RELEVANCE/APPLICATION

Synthetic DIR can accelerate scan times by eliminating the need to collect DIR series.

T5A-SPNR-12 MODERATE ADVERSE EVENTS IN MR-GUIDED FOCUSED ULTRASOUND VIM THALAMOTOMY FOR TREMOR: A CASE SERIES AND STRATEGIC MODIFICATIONS

Toshio Yamaguchi, MD, PhD (*Presenter*)

PURPOSE

MR-guided focused ultrasound thalamotomy (MRgFUS) is an incisionless neurosurgery for treating essential tremor (ET) and tremor-dominant Parkinson’s disease (TDPD). While severe adverse events (AEs) are rare, moderate complications may occur. Clarifying their mechanisms is essential for improving safety. We describe moderate AEs after MRgFUS and clarify their mechanisms.

METHODS AND MATERIALS

We analyzed consecutive 273 cases (235 ET, 38 TDPD) treated with MRgFUS from June 2019 to March 2025. All procedures targeted the Vim nucleus using repeated sonications within the therapeutic range (50-55°C), monitored by MR thermometry. AEs requiring hospitalization beyond one week were classified as moderate.

RESULTS

Four cases (1.4%) experienced notable moderate AEs. Case 1 (ET, SDR=0.42) Remaining tremor led to added lateral sonication, resulting in lesioning of the internal capsule. Persistent gait and speech disturbance remained at 2 years, along with tremor recurrence. Case 2 (ET, SDR=0.6) Vc lesioning caused long-term hand/face sensory disturbance and dysphagia. Anatomical variation placed the Vim/Vc border more anteriorly than usual. ? Countermeasures: Improved initial targeting using 3D imaging of the Vim/Vc and thalamic internal capsule borders; revised lesioning sequence starting from posterolateral Vim; skull segment analysis for thermal prediction. Case 3 (ET, SDR=0.36) Postoperative hypotonia and gait disturbance occurred due to pre-existing cervical/lumbar severe stenosis (double crush syndrome). Walking

aids were still required at 2 years. ? Countermeasures: Preoperative screening for spinal stenosis; prioritize spine surgery if indicated. Case 4 (TDPD, SDR=0.47) Cavitation occurred at low energy (681J), causing transient dysarthria and agitation. Tremor remained improved with minimal medication without long-term deficits.

CONCLUSION

Most complications occurred in early-stage of our experience and were preventable. Refining targeting and patient selection protocols significantly reduced AEs. Cavitation remains unpredictable, requiring continued vigilance.

CLINICAL RELEVANCE/APPLICATION

Although infrequent, sharing moderate AEs and their causes supports safer implementation of MRgFUS.

T5A-SPNR-14 RISK FACTORS AND PROGNOSIS OF POST-STROKE PNEUMONIA IN PATIENTS WITH ANTERIOR CIRCULATION LARGE-VESSEL OCCLUSION FOLLOWING MECHANICAL THROMBECTOMY

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Yu Sun (*Abstract Co-Author*)
Tao Ren (*Abstract Co-Author*)
Song Liu (*Abstract Co-Author*)
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Luotong Wang (*Abstract Co-Author*)
Chao Tian SR, MD (*Abstract Co-Author*)

PURPOSE

To identify risk factors associated with post-stroke pneumonia (PSP) in patients undergoing mechanical thrombectomy for anterior circulation large vessel occlusion, and to develop a predictive model combining clinical and CT imaging parameters.

METHODS AND MATERIALS

We retrospectively analyzed data from patients with acute ischemic stroke (AIS) due to anterior circulation large vessel occlusion who underwent mechanical thrombectomy between April 2020 and October 2023. Patients were categorized into PSP and non-PSP groups based on the development of PSP during hospitalization. Outcomes were assessed at 90 days using the modified Rankin Scale (mRS). Logistic regression analysis was employed to determine independent predictors of PSP based on clinical characteristics and CT imaging parameters. Model performance was evaluated using receiver operating characteristic (ROC) curve analysis.

RESULTS

Among 106 patients included, 48 (45%) developed PSP. Multivariate logistic regression identified age =70 years (OR = 3.181, 95% CI: 1.059-9.555, P = 0.039), dysphagia (OR = 4.693, 95% CI: 1.171-18.807, P = 0.029), and the presence of diabetes (OR = 0.216, 95% CI: 0.066-0.713, P = 0.012) as independent predictors of PSP. The optimal threshold of perfusion volume (Tmax >6 seconds) for PSP prediction was 142 mL, yielding an AUC of 0.635 (95% CI: 0.526-0.739), with 77% sensitivity and 53% specificity. A combined model incorporating both clinical and CT perfusion (CTP) features showed improved predictive accuracy, with an AUC of 0.72 (95% CI: 0.52-0.89), sensitivity of 69%, and specificity of 75%. PSP was independently associated with unfavorable outcomes (90-day mRS >2; OR = 3.226, 95% CI: 1.232-8.451, P = 0.017).

CONCLUSION

Age =70 years, dysphagia, and diabetes were identified as independent factors associated with PSP in patients with anterior circulation large vessel occlusion. A predictive model combining clinical characteristics and CTP enhances the accuracy of PSP risk estimation.

CLINICAL RELEVANCE/APPLICATION

Patients with AIS who develop PSP face an increased risk of poor outcomes. Early identification using an combined clinical-imaging model may facilitate timely interventions and improve patient prognosis.

T5A-SPNR-15 CLINICAL APPLICATION OF A TRIPLE-LOW PROTOCOL COMBINED WITH DEEP LEARNING RECONSTRUCTION IN BRAIN PERFUSION CT: A PROSPECTIVE STUDY

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Xin Qin (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Feng Chen, MD, PhD (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To assess the performance of a triple-low protocol (80 kV/80 mA, 40 mL contrast, 4 mL/s) combined with deep learning image reconstruction (DLIR-H) in brain perfusion CT (CTP), compared to a conventional protocol (80 kV, 120 mA, 50 mL, 5 mL/s) with iterative reconstruction (ASIR-V 50%).

METHODS AND MATERIALS

A total of 102 patients with suspected acute ischemic stroke (AIS) were prospectively enrolled and randomly assigned to the conventional or triple-low group (n=51 each). All patients underwent brain CTP scans, generating four datasets (GroupA: conventional+DLIR-H, Group B: conventional+ASIR-V, Group C: triple-low+DLIR-H, Group D: triple-low+ASIR-V). Radiation and contrast doses were recorded. Objective image quality was assessed by CT values, standard deviation (SD), signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and perfusion parameters (CBV, CBF, Tmax, MTT, TTP). Subjective image quality was evaluated independently by two senior radiologists using a 3-point scale (0=poor, 1=moderate, 2=good).

RESULTS

The triple-low group showed significantly lower radiation dose (effective dose: 1.51 vs 2.27 mSv, P<0.001) and reduced contrast volume (40 vs 50 mL) with slower injection rate (4 vs 5 mL/s). CT values across gray and white matter regions were comparable (P>0.05), except for minor differences (<2 HU) in temporal and parietal white matter. Image noise (SD) differed in the frontal region (P<0.05) but not elsewhere; DLIR-H under triple-low conditions (group C) consistently showed lower SD than conventional ASIR-V (group B), without statistical significance. SNR was slightly higher in temporal regions (P<0.05), but pairwise comparisons between groups C and B revealed no significant differences. CNR was significantly better in the parietal lobe in group C compared to group B (P<0.05), suggesting enhanced contrast with the triple-low protocol. Perfusion parameters (CBF, CBV, MTT, TTP) remained stable across groups (P>0.05). Although Tmax showed small differences (<0.5 s) in some regions, no significant differences were found between reconstruction methods under identical scan settings. Subjective scores (Kappa > 0.6) showed good interobserver agreement. All images were diagnostically acceptable, with group C slightly outperforming in gray-white differentiation, ischemia contrast, homogeneity, and artifact suppression, though without statistical significance.

CONCLUSION

The triple-low protocol combined with DLIR-H provides comparable image quality and stable perfusion results while significantly reducing radiation and contrast exposure.

CLINICAL RELEVANCE/APPLICATION

This strategy supports safer, more efficient stroke imaging by optimizing dose and contrast without compromising diagnostic confidence.

T5A-SPNR-16 ELECTRON DENSITY AND EFFECTIVE ATOMIC NUMBER OF NORMAL ADULT BRAIN TISSUES: AGE-RELATED CHANGES AND CORRELATION WITH MYELIN CONTENT

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Masanori Nakajo, MD (*Abstract Co-Author*)
Misaki Gohara (*Abstract Co-Author*)
Kiyohisa Kamimura, MD, PhD (*Abstract Co-Author*)
Junki Kamizono (*Abstract Co-Author*)
Koji Takumi, MD, PhD (*Abstract Co-Author*)
Takashi Yoshiura, MD, PhD (*Abstract Co-Author*)

PURPOSE

Electron density (ED) and effective atomic number (Z eff) are emerging quantitative CT parameters, and are increasingly applied in clinical settings recently. However, few studies have reported in vivo measurements of ED and Zeff in normal brain tissues. To address this gap, we used dual-energy CT (DECT)-derived ED and Zeff maps to characterize normal-appearing adult brain tissues, evaluate age-related changes, and investigate correlations with myelin partial volume (V my) derived from synthetic MRI.

METHODS AND MATERIALS

Thirty adult patients (35-84 years old) who underwent both DECT and synthetic MRI were retrospectively analyzed. Conventional CT value (CT conv), ED, Z eff , and Vmy were measured in normal-appearing gray matter (GM) and white matter (WM) ROIs (780 ROIs in total), and were compared between WM and GM. Correlations were analyzed between V my and DECT parameters. Moreover, regression analysis was used to generate mathematical models of V my using CT-derived parameters. Correlations between patients' age and DECT parameters were also analyzed.

RESULTS

V my was significantly greater in WM than in GM, while CT conv , ED and Z eff were significantly lower in WM than in GM (all $p < 0.001$). Z eff showed stronger negative correlation with V my (? = -0.756) than CT conv (? = -0.705) or ED (? = -0.491). Multiple regression analysis including Z eff and ED as independent variables increased the model's explanatory power (R 2 = 0.675) compared to a model involving Z eff alone (R 2 = 0.606). ED showed weak to moderate negative correlations with age mainly in WM regions (? from -0.204 to -0.450). Conversely, Z eff showed weak to moderate positive correlations with age mainly in WM (? from 0.211 to 0.549). CT conv showed negligible correlations with age in all regions.

CONCLUSION

This study revealed distinct GM-to-WM differences in ED and Z eff , along with a major contribution of myelin on the atomic number difference which results in the GM-to-WM contrast on non-contrast brain CT. ED and Z eff can be used as CT markers for myelination in normal adult brain. Furthermore, this study revealed opposing age-related changes in ED and Z eff , which may offer a novel opportunity for CT-based evaluation of aging of brain tissues.

CLINICAL RELEVANCE/APPLICATION

This study for the first time characterized ED and Z eff in the normal brain tissues, which is essential for interpreting their pathological changes in brain diseases.

T5A-SPNR-17 NOVEL KERNELIZED GRANGER CAUSALITY APPROACH UNMASKS FUNCTIONAL CONNECTIVITY SIGNATURES IN PARKINSON'S DISEASE

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Axel Wismueller, MD, PhD (*Abstract Co-Author*)
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Larry Stockmaster, BEng (*Abstract Co-Author*)
Nathan Hadjiyski (*Abstract Co-Author*)

PURPOSE

To evaluate the efficacy of large-scale Kernelized Granger Causality (lsKGC) analysis of resting-state fMRI in distinguishing between Parkinson's disease patients and healthy controls, with emphasis on its potential value as an objective imaging marker in radiological assessment.

METHODS AND MATERIALS

We analyzed resting-state fMRI data from 30 subjects (15 Parkinson's disease patients, 15 matched healthy controls) collected at Karolinska Institute, Stockholm, Sweden. Using a 200-region brain atlas, we constructed directional connectivity matrices representing causal influences between brain regions. The discriminative power of lsKGC was compared against standard connectivity approaches (cross-correlation, local models, and anti-symmetric correlation) through 10-fold cross-validation. Classification performance was evaluated using AUC, accuracy, and F1-score metrics, with statistical significance assessed by Wilcoxon signed-rank tests.

RESULTS

The lsKGC method demonstrated robust classification performance (AUC: 0.850±0.124, accuracy: 0.800±0.000, F1-score: 0.811±0.023) compared to conventional cross-correlation (AUC: 0.828±0.133, accuracy: 0.753±0.085, F1-score: 0.720±0.105). Statistical analysis confirmed significant improvements in discriminative capability ($p = 1.009 \times 10^{-4}$ for lsKGC vs cross-correlation, $p = 3.117 \times 10^{-4}$ for lsKGC vs. local models). Connectivity alterations were most prominent in motor networks and basal ganglia circuits, consistent with known pathophysiological changes in Parkinson's disease.

CONCLUSION

Our findings demonstrate that lsKGC analysis can effectively detect differences in functional brain connectivity between Parkinson's disease patients and healthy controls. This technique provides complementary information to standard radiological assessments by capturing directional influences between brain regions that may reflect underlying pathophysiological processes.

CLINICAL RELEVANCE/APPLICATION

The lsKGC methodology offers radiologists a quantitative approach to assess functional connectivity alterations in Parkinson's disease. This technique could potentially enhance research applications in movement disorders and provide objective imaging markers that complement conventional structural and functional neuroimaging.

T5A-SPNR-19 SPATIOTEMPORAL GRAPH-BASED FRAMEWORK WITH DEFORMATION FIELD GUIDANCE FOR NEW T2-W MULTIPLE SCLEROSIS LESION DETECTION

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Mostafa Salem (*Abstract Co-Author*)
Salma Hassan (*Abstract Co-Author*)
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Mohammad Yaqub (*Abstract Co-Author*)

PURPOSE

Longitudinal magnetic resonance imaging (MRI) is crucial for MS diagnosis and monitoring. New brain lesions serve as a reliable biomarker for disease progression. However, manual process is time-consuming and prone to inter-observer variability. Automated, accurate methods for detecting new T2-w lesions are essential to improve diagnostic reliability and streamline assessments. In this study, we propose a Deformation Field-Guided Spatiotemporal Graph-Based Framework for detecting new T2-w MS lesions.

METHODS AND MATERIALS

We utilize the MSSEG-II dataset, which includes 3D FLAIR scans from 100 MS patients across 15 MRI scanners. The training set consists of 40 scans, and the testing set includes 60 scans (25 without new lesions). Longitudinal scans are rigidly registered and preprocessed using brain extraction, bias field correction, and intensity normalization. Deformation fields (DFs) are computed to capture lesion-specific changes. We formulate lesion detection as a heterogeneous spatiotemporal graph neural network (GNN) using an encoder-decoder architecture. The model constructs a heterogeneous spatiotemporal graph from baseline and follow-up MRI scans, where nodes are connected by two spatial edge types and one temporal edge type. Temporal edges incorporate DF embeddings as attributes, effectively capturing lesion evolution patterns that are clinically relevant for disease progression assessment.

RESULTS

Evaluated on the MSSEG-II test set, our model achieves state-of-the-art (SOTA) performance with an F1 score of 0.65, sensitivity of 0.74, positive predictive value of 0.65, and a mean segmentation Dice score of 0.55, significantly outperforming existing methods ($p < 0.05$). In the 25 cases without new lesions, the model produced only 3 false positives. These results highlight our model's efficacy in MS new lesion detection.

CONCLUSION

The proposed framework surpasses existing SOTA approaches in both sensitivity and specificity by leveraging a heterogeneous spatiotemporal graph neural network that encodes intra-scan spatial dependencies and inter-scan temporal dynamics. The integration of deformation field-informed temporal edge attributes facilitates precise modeling of lesion evolution, enabling robust detection of new T2-w MS lesions across heterogeneous MRI acquisitions

CLINICAL RELEVANCE/APPLICATION

The proposed deformation field-guided spatiotemporal graph framework enhances the detection of new T2-w lesions in longitudinal MRI by modeling lesion-specific morphological changes and inter-scan spatial dependencies. This enables robust, observer-independent quantification of disease activity, offering clinically reliable support for MS progression assessment and therapeutic decision-making.

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T5A-SPOB

OB/Gynecology Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPOB-1 IMAGING MODALITY-ADAPTIVE DEEP LEARNING (IMADL) MODEL PREDICTS IMMUNOTHERAPY RESPONSE AND PROGNOSIS IN PATIENTS WITH CERVICAL CANCER

Jingjing You (*Presenter*)
Bin Zhang, MD (*Abstract Co-Author*)

PURPOSE

No predictive biomarkers can reliably identify patients with advanced cervical cancer who will benefit from immunotherapy. We aimed to develop a deep learning model to predict immunotherapy outcomes in these patients.

METHODS AND MATERIALS

A total of 380 patients with advanced cervical cancer who received immunotherapy were assigned to training (n=228), validation (n=38), and test (n=114) cohorts. We developed an imaging modality-adaptive deep learning (IMADL) model to predict immunotherapy response, progression-free survival (PFS), and overall survival (OS). We also constructed an IMADL PLUS model integrating clinical and radiological data. The interpretability of the IMADL model was conducted using hematoxylin and eosin (H&E)-stained whole slide images. Ten classes of morphological features were extracted from each nucleus and aggregated into 150 patient-level features. Spearman correlation analysis was used to evaluate the correlation between deep features and pathologic features.

RESULTS

In predicting immunotherapy response, the IMADL and IMADL PLUS models achieved similar AUCs of 0.79 and 0.81, and outperformed the clinical model in the test cohort. Similarly, the IMADL PLUS model showed comparable performance to the IMADL model but superior performance to the clinical model in predicting PFS (C-index: 0.73 vs. 0.71 vs. 0.65) and OS (C-index: 0.74 vs. 0.71 vs. 0.59). There were 57, 79, and 9 deep-nuclear pairs with moderate correlation in the tasks of predicting immunotherapy efficacy, PFS, and OS, respectively.

CONCLUSION

Our IMADL model demonstrates promise in predicting immunotherapy response and prognosis in cervical cancer. Additionally, we provide biological meaning at the cellular level for the model, enhancing the comprehension of model predictions.

CLINICAL RELEVANCE/APPLICATION

First, unlike previous studies that mainly relied on a single modality, we integrated multimodal CT and MRI images of primary and metastatic lesions, which is consistent with clinical practice and enhances generalizability of the deep learning model. Second, we interpreted the model-derived deep features by correlating nuclear morphological features quantitatively extracted from available H&E-stained whole slide images. Our IMADL model exhibited satisfactory performance in the prediction of immunotherapy response and prognosis for cervical cancer. This is the first attempt to investigate the potential application of deep learning in predicting immunotherapy benefits of cervical cancer and elucidate the cross-scale correlation between macroscopic imaging and microscopic pathological features, enhancing the understanding the tumor microenvironment of cervical cancer.

T5A-SPOB-2 IN-VIVO MRI-BASED PLACENTAL MORPHOLOGY ASSESSMENT

Dafna Ben Bashat, PhD (*Presenter*)
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PURPOSE

To evaluate in-vivo placental morphology using MRI in fetuses with fetal growth restriction (FGR) compared to appropriate-for-gestational-age (AGA) fetuses, and to investigate correlations with gestational age and fetal body volume.

METHODS AND MATERIALS

The study included 141 fetuses (102 AGA, 39 FGR) in the third trimester who underwent fetal MRI. Placental and fetal body segmentations were generated using deep learning models and refined manually. Shape features were extracted using PyRadiomics and in-house algorithms were used to separate and quantify the maternal and fetal placental surfaces. Umbilical cord insertion location was manually annotated, and a centricity index (CI) was calculated.Statistical analysis: Mann-Whitney U and Spearman correlation evaluated group differences and associations with gestational age and fetal body volume. Inter-observer agreement for CI was assessed using ICC. Logistic regression with L1 regularization and feature selection identified the most predictive features for distinguishing FGR from AGA.

RESULTS

In AGA fetuses, placental elongation negatively correlated with gestational age ($p=0.01$). Several morphology features (e.g., volume, surface area, maternal and fetal surface areas) were significantly correlated with fetal body volume ($p<0.05$). FGR placentas showed significantly smaller volume, diameters, and surface areas ($p<0.005$), and higher surface-to-volume ratio ($p=0.002$). CI was higher in FGR ($p=0.004$), indicating more marginal cord insertion. A model using five top-ranked features (CI, minor axis length, placental volume, max 2D diameter, and maternal-to-total surface area ratio) achieved 81.8% accuracy in classifying FGR vs. AGA, with 88% recall for AGA and 62% for FGR.

CONCLUSION

MRI-based placental morphological features, including cord insertion centricity, placental size, and maternal interface area, differ significantly between FGR and AGA fetuses. These parameters also correlate with fetal growth in AGA pregnancies.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the clinical potential of in-vivo MRI-derived placental morphology as a non-invasive biomarker for identifying fetuses at risk of growth restriction and cases of placental insufficiency, offering a pathway for early diagnosis and intervention beyond standard ultrasound-based methods.

T5A-SPOB-3 AIMING HIGHER: DIAPHRAGMATIC IMAGING IN THE EVALUATION OF ENDOMETRIOSIS

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PURPOSE

To investigate correlations between pelvic endometriosis subtypes and diaphragmatic endometriosis (DE), with the aim of identifying patients who may benefit most from diaphragmatic imaging.This study aims to assess whether DE is more frequently associated with deep infiltrating endometriosis (DIE), peritoneal, or ovarian endometriosis; to identify specific DIE subtypes more commonly related to DE; and to determine any preferential laterality or hepatic segmental distribution patterns.

METHODS AND MATERIALS

This retrospective observational study analyzed data from patients diagnosed with pelvic endometriosis who underwent imaging that included diaphragmatic evaluation between 2022 and April 2025. The protocol consisted of T1-weighted images with fat saturation acquired in three orthogonal planes: coronal, axial, and sagittal. The sagittal plane was routinely obtained over the right hemidiaphragm, given the higher prevalence of right-sided diaphragmatic endometriosis. In cases with clinical suspicion of left-sided thoracic involvement (e.g., left shoulder pain or pleuritic symptoms), an additional sagittal T1 fat-saturated sequence was also acquired over the left hemidiaphragm.Radiologist reports were reviewed for the presence of diaphragmatic lesions. Pelvic endometriosis was categorized into ovarian, peritoneal, and DIE, with further subclassification of DIE by anatomical location (uterosacral ligaments, rectovaginal septum, bladder, etc.). Correlations between pelvic endometriosis subtypes and DE were analyzed, along with assessment of lesion laterality and hepatic segment involvement.

RESULTS

DE was identified in 4.8% of patients. It was significantly more prevalent in those with DIE (61.5%) compared to those with isolated peritoneal or ovarian endometriosis. Intestinal involvement was observed in 34.6% of cases, and 42.3% also had adenomyosis. Diaphragmatic lesions were predominantly right-sided (96%) and most frequently affected hepatic segments VII and VIII. All lesions showed evidence of bleeding.

CONCLUSION

The findings suggest that diaphragmatic endometriosis is more likely to occur in patients with extensive or posterior compartment deep infiltrating endometriosis. Routine evaluation for diaphragmatic lesions should be considered, particularly in patients with severe DIE, given the high prevalence and right-sided segmental pattern of involvement.

CLINICAL RELEVANCE/APPLICATION

Incorporating diaphragmatic assessment into the diagnostic workflow for patients with deep pelvic endometriosis may improve detection of extrapelvic disease, guide surgical planning, and potentially alleviate unexplained thoracic symptoms.

T5A-SPOB-4 COMPARISON OF CAPABILITIES FOR IMAGE QUALITY IMPROVEMENT WITH SCAN TIME REDUCTION AMONG CURRENTLY USED PROPELLER METHOD, STANDARD PARALLEL IMAGING METHOD AND MODIFIED PROPELLER METHOD WITH NEWLY DEVELOPED PARALLEL IMAGING METHODS ON ROUTINE FEMALE PELVIC MRI

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Masahiko Nomura, MD, PhD (*Abstract Co-Author*)
Takeshi Yoshikawa, MD (*Abstract Co-Author*)
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Yoshiharu Ohno, MD, PhD (*Abstract Co-Author*)

PURPOSE

To compare capabilities for image quality improvement with scan time reduction among standard parallel imaging (PI), currently used PROPELLER method and modified PROPELLER method with newly developed PI method on routine female pelvic MRI.

METHODS AND MATERIALS

37 female patients with various pelvic diseases underwent T2WIs by standard PI method, currently used PROPELLER method and modified PROPELLER and newly developed PI methods. At each examination, scan time was recorded in all patients. To compare quantitative assessment among three methods, signal-to-noise ratios (SNRs) of uterine corpus, cervix and ovary and contrast-to-noise ratio (CNR) between endometrium and myometrium were determined by ROI measurements. On comparison of qualitative assessment among all methods, overall image quality (OIQ), artifact and diagnostic confidence level (DCL) were assessed by 5-point scales. To compare the capabilities for scan time reduction and quantitative image quality improvements, scan time, SNRs and CNR were compared among three protocols by Tukey's HSD test. On comparison of qualitative image quality improvements, each index was compared among three protocols by Wilcoxon signed-rank test.

RESULTS

Mean scan time of modified PROPELLER and newly developed PI method (171.5 ± 6.4 sec) was significantly shorter than that of currently used PROPELLER method (340.0 ± 52.7 sec, $p<0.001$). Each SNR of modified PROPELLER and newly developed PI method was significantly higher than that of standard PI (uterine corpus: $p<0.001$, cervix; $p=0.023$ and ovary: $p=0.022$), although there was no significant difference of CNRs among three protocols. Medians of OIQ and artifacts of modified PROPELLER with newly developed PI method (OIQ: 5, artifact: 1) and current used PROPELLER method (OIQ: 4, artifact: 2) were significantly superior to those of standard PI method (OIQ: 3, $p<0.001$; artifact: 3, $p<0.001$). Medians of DCL for modified PROPELLER (median: 5) and currently used PROPELLER (median: 5) were significantly higher than that of standard PI. (median: 4, $p<0.001$).

CONCLUSION

Modified PROPELLER method with newly developed PI method is considered as having better potentials for scan time reduction or image quality improvements, when compared with currently used PLOPELLER method or standard PI on female pelvic MRI.

CLINICAL RELEVANCE/APPLICATION

Modified PROPELLER method with newly developed PI method is considered as having better potentials for scan time reduction or image quality improvements, when compared with currently used PLOPELLER method or standard PI on female pelvic MRI.

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T5A-SPPD

Pediatric Imaging Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPPD-1 PROSPECTIVE COMPARISON OF STANDARD AND DEEP LEARNING-RECONSTRUCTED 3D TURBO SPIN-ECHO MRI OF THE PEDIATRIC KNEE

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Ani Maroyan (*Abstract Co-Author*)
Andy Tsai, MD, PhD (*Abstract Co-Author*)
Eric L. Tung, MD (*Abstract Co-Author*)
Yi-Meng Yen (*Abstract Co-Author*)
Patrick Johnston, MSc (*Abstract Co-Author*)
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PURPOSE

To evaluate whether a deep learning (DL)-reconstructed 3D turbo spin-echo (TSE) sequence can reduce acquisition time in pediatric knee MRI without compromising diagnostic accuracy.

METHODS AND MATERIALS

In this prospective IRB-approved study, 123 pediatric patients (mean age: 14.1 ± 2.6 years) underwent knee MRI using standard and DL-reconstructed 3D TSE sequences. A dataset consisting of all sequences in random order was independently reviewed by two pediatric musculoskeletal radiologists and one pediatric radiology fellow. A 5-point scale assessed visibility of the menisci, anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), and cartilage. The same scale assessed image quality, signal-to-noise ratio (SNR), sharpness, diagnostic confidence, and artifacts. Scores and acquisition times were compared using the Wilcoxon signed-rank test. Diagnostic accuracy was evaluated in 29 arthroscopy-confirmed cases by comparing sensitivity and specificity between sequences using McNemar's test for ACL tear, meniscal tear, cartilage defect, and osteochondritis dissecans (OCD). MRI findings for OCDs, cartilage defects, and meniscal tears were considered concordant with surgery only when the location matched.

RESULTS

The DL-reconstructed sequence significantly reduced acquisition time compared to the standard 3D protocol (median 3.80 vs. 5.67 minutes, $p < .001$). Median subjective scores for image quality, sharpness, diagnostic confidence and SNR were all 4 or higher for both DL and standard protocols. Readers expressed a slight but measurable preference for the standard sequence with respect to image quality, sharpness, and diagnostic confidence ($p < .05$), while SNR scores were higher for the DL sequences ($p < .001$). PCL and lateral meniscus visibility were higher with DL ($p = .003$), with no significant difference observed for the ACL, articular cartilage, or medial meniscus. Diagnostic accuracy was high for both protocols, with no significant differences in sensitivity or specificity detected by McNemar's tests.

CONCLUSION

The DL-reconstructed 3D TSE sequence maintained diagnostic accuracy compared to the standard 3D protocol while enabling substantially faster acquisition. Although it was associated with slightly lower subjective image quality scores, it also demonstrated improved anatomic visibility and higher SNR than the standard sequence.

CLINICAL RELEVANCE/APPLICATION

DL-reconstructed 3D MRI can substantially reduce acquisition time in pediatric knee imaging while maintaining diagnostic accuracy and improving anatomic visibility.

T5A-SPPD-2 IMPROVED RIGHT-SIDED HEMODYNAMICS USING 4D FLOW MRI IN PATIENTS UNDERGOING TRANSCATHETER PULMONARY VALVE IMPLANTATION (TPVI) FOR PULMONARY VALVE REGURGITATION IN REPAIRED TETRALOGY OF FALLOT

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Yoshiaki Morita (*Abstract Co-Author*)
Masaru Shiotani, RT (*Abstract Co-Author*)
Yasutoshi Ohta, MD, PhD (*Abstract Co-Author*)
Keizo Murakawa (*Abstract Co-Author*)
Tetsuya Fukuda, MD, PhD (*Abstract Co-Author*)

PURPOSE

Transcatheter pulmonary valve implantation (TPVI) has recently been performed as a less invasive treatment for pulmonary valve regurgitation (PR) after repaired tetralogy of Fallot (TOF).Cardiac MRI is commonly used to evaluate cardiac function and pulmonary regurgitation fraction (PRF) using cine imaging and 2D phase-contrast (2DPC). 4D Flow MRI provides more detailed hemodynamic evaluation, such as flow quantification in any vessels and energy loss (EL) due to abnormal flow. However, few data exist on right-sided detailed hemodynamic changes post-TPVI. We evaluated the hemodynamic changes before and after TPVI using 4D Flow.

METHODS AND MATERIALS

Twelve repaired TOF patients who underwent Harmony valve TPVI were included. All underwent cardiac MRI (cine, 2DPC, 4D Flow) before and within one year post-TPVI using a 3T scanner. We measured LV end-diastolic/systolic volumes (LVEDV/LVESV), ejection fraction (LVEF), RV end-diastolic/systolic volumes (RVEDV/RVESV), and ejection fraction (RVEF) using cine imaging. Flow analysis was performed using 2DPC to measure pulmonary artery (PA) effective total flow (difference between forward and backward volume) and PRF. 4D Flow MRI evaluated flow volume of right pulmonary artery (RPA) and left pulmonary artery (LPA), in addition to main PA. Also, EL was calculated in two regions: (1) PA to RPA/LPA and (2) within RPA/LPA.

RESULTS

In all cases, the procedure was successful and symptoms improved after TPVI. After TPVI, RVEDV/RVESV and PRF significantly decreased ($p<0.05$), while RVEF significantly deteriorated ($p<0.05$). LV parameters showed no significant change. PA effective total flow increased ($p<0.05$). In 4D Flow assessment, LPA flow volumes

significantly increased ($p<0.05$), while no significant change in RPA flow. There was no significant change in average EL from PA to RPA/LPA before and after TPVI, while a significant decrease in average EL within RPA/LPA ($p<0.05$) before and after TPVI, suggesting TPVI improves flow efficiency within bilateral pulmonary artery.

CONCLUSION

TPVI reduced RV volume load and improved effective pulmonary flow, especially in LPA, despite RVEF deterioration. EL assessment showed enhanced right-sided flow efficiency. Conventional MRI combined with 4D Flow allowed detailed evaluation of postoperative hemodynamics and may serve as a useful tool for therapeutic assessment.

CLINICAL RELEVANCE/APPLICATION

This study suggests that 4D Flow enables the more detailed assessment for pulmonary flow and energy efficiency changes after TPVI. Comprehensive assessment using conventional MRI and 4D Flow MRI, including energy loss analysis,may serve as a robust tool for post-procedural monitoring and risk stratification.

T5A-SPPD-3 DEEP LEARNING-ENHANCED ZERO ECHO TIME SILENT MR IMAGING OF THE INFANT BRAIN WITHOUT SEDATION

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Young Hun Choi, MD, PhD (*Abstract Co-Author*)
Jae-Yeon Hwang, MD (*Abstract Co-Author*)
Sun Won Park, MD, PhD (*Abstract Co-Author*)

PURPOSE

Acoustic noise reduction is critical in infant brain magnetic resonance (MR) imaging to avoid sedation, and deep learning (DL)-based reconstruction offers the potential to enhance MR image quality. This study aimed to evaluate the effect of DL-based reconstruction on the image quality of zero echo time (ZTE) sequence in infant brain MR imaging and to assess its clinical applicability.

METHODS AND MATERIALS

This retrospective study included 63 infants with a postmenstrual age of 16 months or younger who underwent brain MR imaging between July 2022 and October 2024. The control group (n = 38) underwent sedated three-dimensional T1-weighted magnetization-prepared rapid gradient-echo (MPRAGE) imaging, while the experimental group (n = 25) underwent unsedated inversion recovery-prepared ZTE imaging, with and without DL-based reconstruction (referred to as ZTEDL and ZTE, respectively). Three pediatric radiologists independently evaluated five image quality metrics—image noisiness, sharpness of gray-white matter differentiation, artifacts, lesion conspicuity, and overall image quality—for the three sequences using a 5-point Likert scale. Signal uniformity was assessed based on the coefficient of variation across eight regions of interest. Differences among sequences were evaluated using the Mann-Whitney U test with Bonferroni correction, and inter-rater agreement was assessed using Cohen's kappa.

RESULTS

ZTEDL demonstrated the highest mean scores for image noisiness, sharpness of gray-white matter differentiation, artifacts, and overall image quality across all readers. No significant differences were observed between MPRAGE and ZTEDL, while ZTEDL showed better image quality compared to ZTE (all $p < 0.017$). Lesion conspicuity did not differ among sequences. Inter-rater agreement was almost perfect (? > 0.800) for most metrics, with substantial agreement (? = 0.784-0.787) observed for sharpness and artifacts. Signal homogeneity was highest in ZTEDL for white and gray matter (all $p < 0.001$), whereas no significant difference was observed between ZTEDL and ZTE for cerebrospinal fluid ($p = 0.681$).

CONCLUSION

DL-based reconstruction for silent ZTE imaging significantly improves image quality and could reduce the need for sedation in infant brain MR imaging.

CLINICAL RELEVANCE/APPLICATION

Conventional MR imaging is often challenging in infants due to acoustic noise, and DL-based reconstruction with silent ZTE may reduce the need for sedation while preserving image quality.

T5A-SPPD-4 DEVELOPMENT AND VALIDATION OF A DEEP LEARNING-BASED ALGORITHM FOR QUANTIFYING BRONCHIOLITIS OBLITERANS IN PEDIATRIC COMPUTED TOMOGRAPHY

Chanyoung Rhee, MD (*Presenter*)
Young Hun Choi, MD, PhD (*Abstract Co-Author*)
Jae-Yeon Hwang, MD (*Abstract Co-Author*)
Sun Won Park, MD, PhD (*Abstract Co-Author*)

PURPOSE

Bronchiolitis obliterans (BO) is a progressive airway disease that requires early detection and intervention in children, with computed tomography (CT) playing a crucial role in identifying its characteristic features. This study aimed to develop and validate a deep learning-based algorithm for quantifying bronchiolitis obliterans (BO) on pediatric chest computed tomography (CT).

METHODS AND MATERIALS

This retrospective study included 80 children (36 males; median age, 10 years; age range, 6-17 years) with suspected BO who underwent inspiratory and expiratory chest CT between January 2018 and May 2021. The deep learning-based BO quantification model (DLBO) was developed using 30 CT scans (26 training, 4 internal validation) with a 3D nnU-Net, using radiologist-segmented air-trapping as the ground truth. To test model robustness, 22 CT scans with varying respiratory phases, reconstruction methods, kernel types, and slice thicknesses were acquired. To compare DLBO results with semiquantitative radiologist grading, 28 CT scans were analyzed. The paired t -test was used to compare the results across the CT parameters, and Kendall rank correlation was used to assess the agreement between the DLBO and radiologist grading.

RESULTS

DLBO performance was robust across reconstruction methods, kernel types, and slice thicknesses, while air-trapping volumes were higher on inspiratory than expiratory CT ($p < 0.001$). During internal validation, the model achieved a Dice similarity coefficient of 85.41% ± 3.28%, sensitivity of 85.14% ± 7.66%, and precision of 86.21% ± 3.92%. Compared with radiologist semiquantitative grading, the DLBO exhibited strong to very strong positive correlations across all lobes, with Kendall's tau-b values of 0.790 (left upper lobe), 0.796 (left lower lobe), 0.711 (right upper lobe), 0.662 (right middle lobe), and 0.755 (right lower lobe), and an overall coefficient of 0.729.

CONCLUSION

The DLBO accurately quantified air-trapping in pediatric BO on CT, demonstrating high concordance with radiologist grading and robustness to varying CT parameters.

CLINICAL RELEVANCE/APPLICATION

In clinical practice, measuring air-trapping is challenging due to its time-consuming and subjective nature. The DLBO can accurately evaluate BO severity in pediatric chest CT and has the potential to assist clinicians.

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T5A-SPPH

Physics Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-SPPH-2 LOW KEV VIRTUAL MONOENERGETIC RECONSTRUCTIONS IN PHOTON-COUNTING CT FOR SOFT-TISSUE TASKS WITH WEAK ENERGY DEPENDENCE: PERFORMANCE COMPARISON WITH DUAL-ENERGY CT AND OPTIMAL ENERGY LEVEL

Hiroki Kawashima, PhD (*Presenter*)
Katsuhiro Ichikawa, PhD (*Abstract Co-Author*)
Yasuhiro Kawahara (*Abstract Co-Author*)
Kyo Noguchi, MD (*Abstract Co-Author*)

PURPOSE

One of the potential benefits of photon counting CT (PCCT) is the improved performance of low keV virtual monoenergetic (VM) imaging. This improvement would work well for an iodine-related task because of its strong energy dependence; however, effect on soft-tissues known to have weak energy dependence has not been investigated in detail. The purpose of this study was to investigate performance improvements for a soft-tissue task using PCCT, comparing with dual source dual energy CT (DS DECT).

METHODS AND MATERIALS

Two rod-shaped inserts (3 mg/mL iodine and soft tissue equivalent materials) were placed into the water bath phantom with a diameter of 300 mm, which resembled the X-ray absorption of the adult abdomen. This phantom was scanned with two CT systems: PCCT with 120 kV and DS DECT with 80/Sn150 kV at the standard and the low radiation dose levels (volume CT dose index of 15 and 5 mGy). VM images were generated with energy levels from 40 to 80 keV in steps of 5 keV. The attenuation differences (i.e., contrast) and task transfer function were measured in each insert, and the noise power spectrum was measured in the uniform water region. The detectability index was computed using them combined with the task function and compared as a function of the VM energy levels.

RESULTS

For the iodine task, the contrast increased by approximately 3.2 times by changing the VM energy levels from 70 keV to 40 keV. The detectability index tended to increase as the energy level decreased. The highest values were 18.0 and 13.6 for PCCT 40 keV and DS DECT 40 keV, respectively, at 15 mGy, and 13.4 and 9.6 at 5 mGy. For the soft tissue task, the increase in the contrast was limited at the low VM energy levels. In the low energy VM levels, the detectability indices of PCCT were 3-14% higher than those of DS DECT at 15 mGy and 5-30% higher at 5 mGy; however, the highest value was achieved around 70-80 keV in both scanners and both radiation dose levels.

CONCLUSION

The optimal energy level varies depending on diagnostic tasks. PCCT significantly improved the performance of low keV images with iodine-related tasks; however, VMI at 70 keV would be a better choice than that at low keV for the soft tissue task imaging, even with improved performance of low keV imaging from PCCT than DS DECT.

CLINICAL RELEVANCE/APPLICATION

In a non-contrast CT examination for soft tissue visualization, the conventional 70 keV should be used even with PCCT, as the low keV images are not advantageous.

T5A-SPPH-4 OPTIMIZING ACQUISITION PARAMETERS MAY IMPROVE AI PERFORMANCE IN SCREENING BREAST TOMOSYNTHESIS

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Aimilia Gastounioti, PhD (*Abstract Co-Author*)

PURPOSE

While technical factors in digital breast tomosynthesis (DBT) affect radiologist performance, their influence on AI cancer detection remains unclear. We hypothesize that tailoring the DBT acquisition technique to a patient's breast density may improve AI performance. We used real-world AI implementation data to examine whether a DBT acquisition optimization technique enhances a commercial AI tool's performance and whether it does so equitably across breast density and racial groups.

METHODS AND MATERIALS

We retrospectively evaluated screening data from a commercial AI algorithm implemented at our institution from January-September 2023 (17,244 screening DBT exams; 83 cancers; Selenia Dimensions, Hologic Inc.). The AI algorithm produces a case score for each exam reflecting the likelihood of cancer. Exams were stratified into subgroups of key DBT acquisition parameters (kVp and mAs). For each breast density level, the "optimized" DBT acquisition technique was defined as the kVp/mAs subgroup for which the AI case score was most predictive of whether an exam would be recalled (assigned BI-RADS 0), as measured by ROC analysis. We then used pathology outcomes to test whether the optimized DBT acquisition technique improved cancer detection by AI, both overall and in subgroups by breast density (with not dense defined as BI-RADS category A and B and dense defined as category C or D) and race (White vs. Black/African American).

RESULTS

The optimized DBT acquisition technique significantly improved cancer detection AUC in White women (0.899 vs. 0.766, p=0.014), but not in Black women (0.839 vs. 0.799, p=0.722). There was a larger improvement when using optimized acquisition in the dense breast subgroup (0.87 vs 0.72) relative to the not-dense group (0.90 vs 0.86); however, AI performance improvement in density subgroups did not achieve statistical significance.

CONCLUSION

DBT acquisition optimization may improve cancer detection for AI, but perhaps not across racial subgroups. Differences may reflect sample size limitations or correlations between race and density, but the interplay between density, race, and DBT acquisition parameters on AI performance warrants further study.

CLINICAL RELEVANCE/APPLICATION

Patient-specific DBT acquisition strategies based on breast density may improve AI performance in cancer detection, potentially resulting in more accurate and personalized breast cancer screening.

T5A-SPPH-5 DEEP LEARNING RECONSTRUCTION FOR ENHANCING IMAGE QUALITY AND NODULE ACCURACY IN ULTRA-LOW-DOSE CHEST CT

Siqi Qu (*Presenter*)
Zhiming Xiang (*Abstract Co-Author*)
Qiuxing Chen (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of deep learning image reconstruction (DLIR) on image quality and quantitative assessment of pulmonary nodules in ultra-low-dose chest CT (ULDCT), compared to adaptive statistical iterative reconstruction (ASIR-Veo).

METHODS AND MATERIALS

In this prospective study, 98 patients with pulmonary nodules underwent both standard-dose CT (SDCT) and ULDCT. ULDCT protocols were adjusted based on body mass index (BMI). SDCT images were reconstructed using ASIR-Veo at 50% strength (ASIR-V50%) and served as the reference. ULDCT images were reconstructed using ASIR-V50%, deep learning image reconstruction (DLIR) at medium (DLIR-M) and high (DLIR-H) levels. Nodule detection rates and nodule diameters from each ULDCT reconstruction were compared with SDCT results. Image quality was assessed by measuring the standard deviation (SD) of CT attenuation in lung and subcutaneous fat tissues to evaluate noise, as well as the signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) of lung tissue.

RESULTS

A total of 668 pulmonary nodules were identified on SDCT. The detection rates for ULDCT reconstructed with ASIR-V50%, DLIR-M, and DLIR-H were 97.46% (651/668), 97.90% (654/668), and 98.35% (657/668), respectively. SDCT had an effective dose of 3.74 ± 1.55 mSv, whereas ULDCT had a reduced dose of 0.48 ± 0.11 mSv, marking an 85.96% reduction ($P < 0.05$). Regarding image quality, noise (measured as the SD of CT attenuation) increased from DLIR-H to DLIR-M to ASIR-V50%, while both SNR and CNR decreased in the same order ($P < 0.05$). Bland-Altman analysis showed the percentage differences in maximum nodule diameter between SDCT and ULDCT reconstructed with ASIR-V50%, DLIR-M, and DLIR-H were -0.76% (mean difference: -1.75 to 0.23), 0.42% (mean difference: -0.59 to 1.44), and 0.83% (mean difference: -0.23 to 1.89), respectively. No statistically significant differences in nodule diameter were observed among the three reconstruction methods compared to SDCT ($P > 0.05$). DLIR-M yielded the smallest deviation in nodule size measurements compared to SDCT, suggesting higher measurement accuracy than ASIR-V50% and DLIR-H.

CONCLUSION

DLIR-M significantly enhanced image quality and maintained higher pulmonary nodule detection rates compared to ASIR-V50%, with nodule measurements in ULDCT more closely aligned with those from SDCT.

CLINICAL RELEVANCE/APPLICATION

Under BMI-adjusted ULDCT protocols, the use of DLIR-M significantly enhances image quality, ensuring accurate detection and characterization of pulmonary nodules. This approach effectively reduces radiation exposure while improving diagnostic accuracy, thereby providing valuable support for clinical pulmonary nodule screening.

T5A-SPPH-7 DOSE AT THE FOOT OF INTERVENTIONAL RADIOLOGISTS. SHOULD WE BE WORRIED?

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Lucia Gallego (*Abstract Co-Author*)
Nicolas Cherbuin (*Abstract Co-Author*)
Fouad Georges Akkari (*Abstract Co-Author*)

PURPOSE

The use of fluoroscopy-guided techniques during interventional procedures results in radiation exposure to medical staff. While it is well established that operators closest to the patient receive significant doses to the lead apron and eye lens, few studies have measured the dose at foot level. Our study quantifies radiation doses received by main operators in the interventional radiology (IR) theatre at both the chest and feet.

METHODS AND MATERIALS

The first part of this study involved measurements using an anthropomorphic phantom to simulate the patient. These were conducted in two rooms: the interventional neurology suite, equipped with a biplane AZURION system (Philips), and the IR room for abdominal procedures, equipped with an Alphenix 4D-CT (Canon). The irradiated anatomical area varied by specialty: the head for neuroradiological procedures, and the abdomen for IR. Measurements were performed using the standard leaded protections in place (table skirt or ceiling shield). The protocol used was the most common. Dose rates were measured for the first operator at the eye lens, chest, waist, and foot levels. Data were extrapolated to estimate the annual dose received by the operator for an average workflow. In a second phase, 3 radiologists were equipped with whole-body optically simulated luminescence (OSL) dosimeters, placed both above and beneath the lead apron, as well as two additional OSL worn on the left ankle and at the tip of the left shoe. Measurements were collected over a six-month period in 2025. Fluoroscopy time, cumulative air kerma and dose area product were recorded for each intervention.

RESULTS

Phantom results show that, if protective equipment is used correctly, upper body dose rates are low and do not exceed 5 mSv per year. In contrast, dose rate measured at foot level ranges from 0.1 (fluoroscopy) to 4.3 mSv/h (fluorography). This corresponds to an estimated annual dose at the foot ranging between 56 to 168 mSv, depending on the operator's activity. Clinical measurements show an average net dose of zero under the apron and 1.5 mSv above it. In contrast, for unprotected areas, the ankle received an average annual dose of 3.8 mSv (1.2-6.5), while the foot received 22 mSv (13.3-36).

CONCLUSION

Phantom doses indicate that the dose to the operators' feet well exceeds the annual whole-body dose limit of 20 mSv. Doses to radiologists are more reassuring, with current average values around 20 mSv. To optimize radiation protection for operating room staff, protective equipment needs to be adapted, such as by lengthening table skirts.

CLINICAL RELEVANCE/APPLICATION

Our study provides insight into radiologists’ exposure around the patient, particularly at foot level, and supports the implementation of appropriate radiation protection measures.

T5A-SPPH-8 SYNTHESIZING HIGH QUALITY 3D TOF-MRA THROUGH MULTI-MODAL DIFFUSION MODEL

Tianen Yu (*Presenter*)
Xin-Yu Song (*Abstract Co-Author*)
Lei Xiang (*Abstract Co-Author*)
Yuehua Li (*Abstract Co-Author*)
Tao Zhou (*Abstract Co-Author*)

PURPOSE

3D Time-of-Flight (TOF) Magnetic Resonance Angiography (MRA) generates high-contrast images by leveraging blood flow velocity differences, eliminating the need for contrast agents and making it ideal for visualizing vascular structures. However, the scan time for TOF-MRA images is relatively long, and the image quality is not good due to the inherent noise. In this study, we propose a novel multi-modal diffusion model to synthesize TOF images by utilizing T1-w, T2-w and FLAIR images. Experiments are conducted to evaluate the image quality of the synthesized images both qualitatively and quantitatively.

METHODS AND MATERIALS

We collected different modality images from 140 patients, including brain T1-w, T2-w, FLAIR and TOF-MRA scans. Among these, scans from 98 patients were used for training, 14 scans for validation, the remaining 28 for test. To comprehensively exploit the anatomical-pathological complementary features embedded in T1-w, T2-w, and FLAIR images, we propose a Multi-modal Diffusion Model (MMDM) that incorporates modality-specific diffusion modules based on the Brownian Bridge diffusion process and a cross-modal dynamic fusion module. Additionally, an innovative maximum intensity projection (MIP) loss function and noise-adaptive weighting strategy are designed to achieve stable synthesis of TOF-MRA images. For the 42 validation and test cases, the trained MMDM was applied to the paired T1-w, T2-w and FLAIR images. Subsequently, we calculated the Peak Signal-to-Noise Ratio (PSNR), Structural Similarity (SSIM), and Root Mean Square Error (RMSE) between the output and the ground truth (GT) on both TOF and axial MIP images.

RESULTS

Qualitative evaluation and comparative experiments conducted on 42 validation and test cases demonstrate that proposed MMDM effectively synthesizes TOF images compared to other models, significantly reducing the noise and artifacts present in the original TOF images. Modality ablation experiments further indicate that the combined use of the three modalities yields the best performance. The synthesized images exhibit enhanced arterial contrast and successfully reconstruct most of the vessels in the MIP image. Additionally, quantitative results demonstrated a high similarity between the synthesized TOF and the GT TOF, with metrics showing a PSNR of 32.216, a SSIM of 0.880, a RMSE of 0.0223 and statistical significance at $a<0.005$.

CONCLUSION

The proposed MMDM can synthesize TOF images of higher quality with fewer artifacts, enhancing the convenience and efficiency of vascular disease diagnosis.

CLINICAL RELEVANCE/APPLICATION

Our proposed method facilitates the acquisition of high-quality TOF images with minimized noise and artifacts, thereby aiding in the diagnosis of cerebrovascular diseases.

T5A-SPPH-9 COMPARING FEASIBILITY OF LOW-TUBE-VOLTAGE PROTOCOL WITH LOW-IODINE DELIVERY RATE AND HIGH-TUBE-VOLTAGE PROTOCOL WITH HIGH-IODINE DELIVERY RATE IN HEAD AND NECK CT ANGIOGRAPHY

Junjun Li (*Presenter*)

PURPOSE

To evaluate radiation dose and image quality of a double-low head and neck CT angiography (CTA) protocol reconstructed utilizing high-strength deep learning image reconstructions (DLIR-H) compared to standard adaptive statistical iterative reconstruction (ASIR-V) protocol in non-obese patients.

METHODS AND MATERIALS

This prospective study included 66 patients scheduled for head and neck CTA due to vascular diseases. Patients were prospectively included and randomly assigned into three groups: group A (80kVp, DLIR-H, iodine delivery rate [IDR]=1.2 g/s) and noise index (NI) of 10, group B (80kVp, DLIR-H, IDR=1.0 g/s) and NI of 15; While conventional group C (100 kVp, ASiR-V50%, IDR=1.4 g/s)and NI of 10.The CT attenuations and standard deviations (SDs) of the sternocleidomastoid muscle (SCM) at the level of hypopharynx and epiglottis and the cerebral white matter (WM) at the level of splenium of corpus callosum were measured. The signal-to-noise ratio (SNR), contrast-to- noise ratio (CNR) of vessels were calculated value were measured. Image quality analysis was evaluated by two radiologists. Radiation and contrast dose, and objective and subjective image quality were compared across the three groups.

RESULTS

There was no significant difference in patient characteristics between the three groups ($P >0.05$). Compared to group C, group A and group B significantly reduced effective radiation dose by 53.73%, 29.85%, CM dose by 28.57%,14.28% and injection rate by 32.50%,21.75% (all $P <0.001$). The three groups differed significantly in terms of background noise (all $P <0.05$) with group A having the lowest value. The three groups differed significantly in SNR and CNR values in all vessels (all $P <0.05$) with group A having the highest value. The two radiologists had excellent agreement (Kappa value>0.8) in the subjective scores of head and neck CTA images and with group A having the highest value (4.30±0.55 vs. 4.02±0.46 and 4.07±0.55) ($P >0.05$).

CONCLUSION

DLIR-H combined with 80-kVp CCTA with an IDR 1.2 significantly reduces radiation and contrast medium exposure while improving image quality compared to conventional 100-kVp with 1.4 IDR protocol in patients.

CLINICAL RELEVANCE/APPLICATION

Low radiation and low contrast medium dose head and neck CTA protocol is feasible with high-strength deep learning reconstruction and high-concentration contrast medium without compromising image quality.

T5A-SPPH-10 CORONARY CTA WITHOUT ELECTROCARDIOGRAPHIC (ECG) TRIGGERING: A FEASIBILITY STUDY

Tingting Qu (*Presenter*)

PURPOSE

To investigate the feasibility of performing coronary CTA (CCTA) without ECG triggering (ECG-less) using the second-generation whole-heart motion correction algorithm (SSF2).

METHODS AND MATERIALS

A total of 41 patients underwent CCTA on a 16-cm wide detector CT scanner using either ECG-less mode (n=20) or conventional ECG-triggering mode (n=21) were included. All images were generated with SSF2. The coronary arteries (diameter greater than 1.5mm) on CCTA images were qualitatively rated on a 5-point scale from 1 (nondiagnostic) to 5 (excellent) by two radiologists blinded to the scanning mode. Coronary arteries were segmented into the 18 segments by the Society of Cardiovascular Computed Tomography and scored individually. Radiation dosage, image quality scores for the individual segments, the three main branches, and the overall image of the two groups were compared by the sample T test and Wilcoxon test.

RESULTS

There were no significant difference in patient demography and radiation dose (CTDIvol (mGy): 18.6±5.0 vs. 17.0±6.4, $p=0.384$); and DLP (mGy-cm): 271.2±73.6 vs. 259.8±99.3, $p=0.680$) between the ECG-less and ECG-triggering groups. The ECG-less group evaluated a total of 225 coronary arteries, while the ECG group evaluated

255 coronary arteries. There were no significant differences in the scores of all segments, the three main branches, and the overall image between the two groups (all $p > 0.05$).

CONCLUSION

The SSF2 provides reliable support for CCTA scanning in ECG-less mode. Compared with the conventional ECG-triggering mode, ECG-less CCTA significantly simplifies the examination process while maintaining excellent image quality and without radiation dose increase.

CLINICAL RELEVANCE/APPLICATION

ECG-less CCTA may be used in certain clinical situations to simplify the examination process while maintaining excellent image quality and without radiation dose increase.

T5A-SPPH-11 EFFECT OF COMBINING VIRTUAL MONOCHROMATIC IMAGING AND METAL ARTIFACT REDUCTION ALGORITHMS IN SPECTRAL COMPUTED TOMOGRAPHY ON METAL ARTIFACT REDUCTION FOR INTRACAVITARY BRACHYTHERAPY IN CERVICAL CANCER

Yining Chen (*Presenter*)
Zheng Zeng (*Abstract Co-Author*)
Junfang Yan (*Abstract Co-Author*)
Fuquan Zhang (*Abstract Co-Author*)

PURPOSE

To evaluate the effectiveness of combining virtual monochromatic imaging (VMI) with metal artifact reduction (MAR) algorithms in reducing artifacts from intracavitary applicators in cervical cancer brachytherapy.

METHODS AND MATERIALS

A total of 50 cervical cancer patients scheduled to undergo intracavitary brachytherapy were included in the study, and their spectral computed tomography (CT) images were acquired. VMI±MAR images were reconstructed at 40-140 keV. CT attenuation and image noise were used to calculate signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) for the most prominent artifact, and artifact index (AI) for the cervix, bladder, and rectum, compared between VMI+MAR and VMI+no-MAR. Additionally, the potential geometric distortion to the titanium applicator on the images was assessed by measuring the long axis, short axis, and long-to-short axis ratio. Subjective image quality was scored on a 5-point Likert scale, focusing on artifact reduction, soft tissue contrast, and contouring preference.

RESULTS

VMI+MAR significantly reduced AI in the cervix (34.74%-88.51%) and rectum (11.31%-81.35%) across all energy levels ($p < 0.05$). SNR increased from 0.70-1.00 to 1.75-1.97 (95.00%-152.11%, $p < 0.001$), and CNR improved from 90 keV onwards ($p < 0.05$). Among all levels, 140 keV + MAR achieved the highest SNR/CNR and lowest AI. Distortion analysis showed that with increasing VMI energy, the measured long and short axes of the titanium applicator decreased, and the long-to-short axis ratio approached 1 ($p < 0.001$), suggesting that 140 keV + MAR is optimal for preserving structural accuracy. Furthermore, subjective scores confirmed its superiority in artifact reduction (4.00±0.00) and contouring preference (4.00±0.00) (all $p < 0.001$).

CONCLUSION

High-energy VMI combined with MAR, particularly at 140 keV, offers optimal artifact reduction, geometric accuracy, and clinical usability in cervical cancer brachytherapy.

CLINICAL RELEVANCE/APPLICATION

Improvement of image quality in VMI+MAR may help applicator reconstruction and structure delineation in CT-based brachytherapy.

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T5B-SPBR

Breast Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPBR-1 TARGETED RISK STRATIFICATION IN WOMEN UNDER 50 USING AN IMAGE-ONLY AI MODEL: ADDRESSING THE RISE IN BREAST CANCER INCIDENCE IN YOUNGER WOMEN

Elizabeth A. Morris, MD (*Presenter*)
Constance D. Lehman, MD, PhD (*Abstract Co-Author*)
David Miller (*Abstract Co-Author*)
Emily Hipp (*Abstract Co-Author*)
Mark Scully (*Abstract Co-Author*)
Lora D. Barke, DO (*Abstract Co-Author*)
Louie Enriquez, MD, JD (*Abstract Co-Author*)
Christiane K. Kuhl, MD, PhD (*Abstract Co-Author*)
Toni W. Vomweg (*Abstract Co-Author*)
Philippe Raffy, PhD (*Abstract Co-Author*)

PURPOSE

The fastest-growing incidence of breast cancer is now among women under age 50, especially those in their 40s and even late 30s. Although women under 50 are experiencing the steepest rise in breast cancer incidence, guidelines for screening this population remain variable and uptake is limited. We evaluated whether an image-only AI model could identify women under 50 with 5-year cancer risk comparable to routinely screened age groups, to support targeted, risk-adapted screening in younger women.

METHODS AND MATERIALS

An image-only AI model was trained on 421,499 mammograms from 27 facilities in Europe, South America, and the U.S., using a deep convolutional neural network and calibrated on an independent test set to generate 5-year risk estimates. The model was applied to 255,641 consecutive bilateral 2D full-field digital screening mammograms from January 2011 through December 2016, drawn from six facilities in the U.S. and one in Europe. Patient demographics were extracted from electronic health records, and cancer outcomes were obtained from local tumor registries. Predicted 5-year risk was categorized using NCCN thresholds: average (<1.7%), intermediate (=1.7% to <3.0%), and high (=3.0%). Age groups included <40, 40-49, 50-69, and =70. Five-year cancer incidence was computed using Turnbull time-to-event estimates accounting for interval censoring, and the log-rank test was used for group comparisons.

RESULTS

Cancer incidence increased progressively with both AI-predicted risk (1.3%, 2.7%, 5.9%; $p < 0.001$) and age group (1.8%, 1.8%, 3.0%, 4.9%; $p < 0.001$). Across all age groups, AI-predicted risk categories consistently identified increasing cancer incidence from average to intermediate to high risk ($p < 0.001$). Among women aged 40-49 (n = 66,630), 58.2% were average risk (1.1% cancer), 25.8% intermediate (2.2%), and 16.0% high (3.7%). Among women aged 50-69 (n = 149,919), 57.1% were average (1.3%), 27.3% intermediate (2.7%), and 15.6% high (6.1%). In women under 40 (n = 3,599), 66.8% were average (1.6%), 22.3% intermediate (1.7%), and 10.9% high (4.2%). These findings demonstrate that a substantial proportion of younger women have cancer risk profiles comparable to routinely screened populations.

CONCLUSION

An image-only AI model stratifies risk across all age groups and identifies high-risk subpopulations under age 50 whose cancer incidence exceeds that of routinely screened women over 50. This may enable more targeted, risk-adapted screening in younger women.

CLINICAL RELEVANCE/APPLICATION

Where screening for women under 50 is limited or delayed and given rising incidence of breast cancer in younger women, AI risk models may support more effective screening in younger women by identifying those who may benefit most.

T5B-SPBR-2 MR ELASTOGRAPHY FOR BREAST CANCER: BREAST STIFFNESS AND LOCAL TUMOR STIFFNESS AS POTENTIAL PROGNOSTIC IMAGING BIOMARKERS

Jeremiah Sanders, PhD (*Presenter*)
Jun Chen, PhD (*Abstract Co-Author*)
Kay Pepin, PhD (*Abstract Co-Author*)
Roger C. Grimm, MS (*Abstract Co-Author*)
Richard L. Ehman, MD (*Abstract Co-Author*)
Bhavika K. Patel, MD (*Abstract Co-Author*)

PURPOSE

Magnetic resonance elastography (MRE) is a quantitative imaging technique that measures mechanical properties of tissues. It has the potential to provide in vivo measurements of global breast stiffness, an emerging parameter not yet standardized in clinical practice. Integrating MRE into breast cancer diagnostics may yield a clinically derived novel biomarker with prognostic value.

METHODS AND MATERIALS

Sixteen patients with confirmed breast cancer underwent diagnostic breast MRI combined with MRE. Diagnostic scans included at least Dixon and dynamic contrast enhanced (DCE) series. MRE was performed using a pillow-like passive driver positioned between the breasts over the sternum while the patient was prone position in a standard breast coil. 40-Hz vibrations were transmitted to the passive driver from an active driver (Resoundant, Inc., Rochester, MN). Breast MRE data were acquired from 40 axial slices using a modified 3D-GREMRE pulse sequence. 3D wave images were processed with 3D multiple-model direct inversions without directional filtering. Tumors and whole-breast ROIs were segmented on DCE and co-registered MRE magnitude images using intensity thresholding and manual adjustments in MIM (v7.3.5).

ROIs were transferred to the stiffness maps, and stiffness values were summarized for the tumor, the affected breast global stiffness, and the contralateral breast global stiffness

RESULTS

Most patients had dense breasts (n=3 were BI-RADS B, n=11 were BI-RADS C, and n=2 were BI-RADS D). Tumor stiffness averaged 3.09 kPa (range: 1.44-5.13 kPa), higher than contralateral breast global stiffness (1.66 kPa; 1.02-2.61 kPa). Relative stiffness differences between the tumor vs contralateral breast were 60.68 % (19.86-159.40 %), and 5.78 % (-6.13-13.58 %) between affected breast (with tumor) vs. contralateral breast. The relative global breast stiffness difference was higher for patients with invasive ductal carcinoma (IDC) compared to those patients with ductal carcinoma in-situ (DCIS) (median: 8.52% vs. -0.65%).

CONCLUSION

In this clinical study, breast global stiffness was moderately elevated in tumor-burdened breasts—particularly in IDC—and significantly higher in tumors compared to contralateral normal breast tissue. MRE may provide complimentary imaging biomarkers for breast cancer. Future studies with larger patient populations are warranted to validate these findings.

CLINICAL RELEVANCE/APPLICATION

Breast and tumor stiffness assessed via MRE may represent clinically meaningful imaging biomarkers with prognostic diagnosis potential in breast cancer and treatments.

T5B-SPBR-3 CLINICAL UTILITY OF ARTIFICIAL INTELLIGENCE FOR DETECTION AND SUSPICION EVALUATION OF BREAST LESIONS ON MRI IN BREAST CANCER PATIENTS

Na Young Jung, MD (*Presenter*)
Moon Hyung Choi, MD (*Abstract Co-Author*)
Seung Eun Jung, MD, PhD (*Abstract Co-Author*)
Robert Grimm, PhD (*Abstract Co-Author*)
Heinrich von Busch (*Abstract Co-Author*)
Dongyeob Han, PhD (*Abstract Co-Author*)
Kai Geissler, MSc (*Abstract Co-Author*)
Markus Wenzel, PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to assess the clinical utility of an artificial intelligence (AI) model for detecting and evaluating lesions on dynamic contrast-enhanced breast magnetic resonance imaging (MRI) in patients with pathologically proven breast cancer.

METHODS AND MATERIALS

This study included 294 patients (mean age, 57 years; range, 26-90) with biopsy-proven breast cancer who underwent breast MRI between January 2022 and January 2024. A total of 490 lesions were identified: 52 lesions categorized as suspicious by a breast radiologist aware of the cancer site, 115 detected by the AI model alone, 321 by both, and two additional pathologically proven lesions that were missed by both. Preoperative biopsy revealed 319 malignant, 4 atypical, and 34 benign lesions; however, 2 atypical and 4 benign lesions were upgraded to malignancy after surgery. The remaining 133 lesions were clinically followed. The AI lesion detection models were previously trained on 2952 patients from 10 clinical institutions using a two-stage approach: a 3D U-NET was used for lesion segmentation, and subsequently, a 3D Swin Transformer was used for lesion suspiciousness rating (AI score, 1-100). The AI score was applied to both AI-detected lesions and radiologist-segmented lesions that were initially missed by AI. The diagnostic performances of the AI model and the radiologist were compared using sensitivity, precision, and F1-score, and imaging/pathologic predictors of AI correctness were analyzed. Receiver operating characteristic (ROC) curve analysis was performed using the AI score.

RESULTS

For total lesions, AI achieved 91.6% sensitivity, 69.7% precision, and 0.792 F1 score, vs. radiologist's 99.7%, 89.0%, and 0.940. For primary lesions (n=295), AI achieved 94.5%, 99.3%, and 0.969, vs. radiologist's 99.3%, 99.7%, and 0.995. For additional lesions (n=195), the AI was 69.2%, 17.2%, and 0.276 vs. the radiologist's 100%, 43.8%, and 0.609. The average false-positive number for AI per patient was 0.44. The significant predictors of accurate AI detection were lower breast parenchymal enhancement and whether the lesion was a primary tumor. The areas under the curve (AUC) for the total, primary, and additional lesions were 0.829, 0.791, and 0.710, respectively.

CONCLUSION

Even without prior knowledge of tumor location, the AI model accurately detected primary lesions, suggesting its potential as an adjunct in the clinical interpretation of breast MRI. However, the detection of additional lesions remains a challenge, with limitations including high false positives and reduced sensitivity of small or subtly enhancing tumors.

CLINICAL RELEVANCE/APPLICATION

AI-assisted MRI reading has the potential to improve diagnostic accuracy and workflow efficiency in breast cancer evaluation.

T5B-SPBR-5 PREDICTIVE VALUE OF TEMPORAL DIFFUSION SPECTROSCOPY MRI AT DIFFERENT DIFFUSION TIMES FOR PATHOLOGICAL COMPLETE RESPONSE IN BREAST CANCER AFTER NEOADJUVANT CHEMOTHERAPY

Jie Ding (*Presenter*)
Diwei Shi (*Abstract Co-Author*)
Caixia Fu (*Abstract Co-Author*)
Chao You, MD (*Abstract Co-Author*)
Junzhong Xu, PhD (*Abstract Co-Author*)
Hua Guo (*Abstract Co-Author*)
Yajia Gu (*Abstract Co-Author*)

PURPOSE

To explore the predictive performance of temporal diffusion spectroscopy at different diffusion times for pCR in breast cancer and to compare it with the tumor long diameter change rate measured by RECIST1.1and conventional ADC.

METHODS AND MATERIALS

A total of 209 patients were enrolled according to the inclusion and exclusion criteria. 142 patients underwent long diffusion time (Dt-long) TDS scan before neoadjuvant therapy, and were divided into pCR group (56 cases) and non-pCR group (86 cases) according to the postoperative pathological results after neoadjuvant therapy. 67 patients underwent short diffusion time (Dt-short) TDS scan and were divided into pCR group (17 cases) and non-pCR group (50 cases) according to postoperative pathological results. Cell parameters (Vin, diameter, cellularity, Dex) and derived ADC values of the TDS technique were calculated separately for different diffusion times. Paired t-tests, Wilcoxon tests, Kruskal-Wallis tests, and Mann-Whitney U tests were used to compare TDS parameters pre- and post-NAC and between pCR and non-pCR groups, depending on data distribution. Univariate and multivariate logistic regression identified independent predictors of pCR. Binary logistic regression models were constructed, and ROC curves with Delong tests compared the predictive performance of TDS-derived models, conventional ADC, and RECIST1.1 longest diameter change rate ($P < 0.05$ considered statistically significant).

RESULTS

Post-NAC, derived ADC values increased at both diffusion times, while cellularity and Vin decreased. Changes in TDS parameters were more pronounced in the pCR group than in the non-pCR group. The predictive performance of the TDS parameter model under long and short diffusion time was higher than that of conventional ADC under the same diffusion time (AUC Dt-long 0.741 vs. AUC ADC 0.664,P=0.041; AUC Dt-short 0.886 vs. AUC ADC 0.722,P=0.004) and the corresponding percentage change of tumor length in RECIST1.1% (AUCDt-long 0.741 vs. AUC REC IST1.1 % 0.538, P=0.004; AUC Dt-short 0.886 vs. AUC REC IST1.1 % 0.579, P=0.002). The Dt-short model demonstrated superior predictive performance compared to Dt-long (AUC Dt - short 0.886 vs. AUC Dt - long 0.741, P = 0.02).

CONCLUSION

TDS-based models at different diffusion times better than conventional ADC and RECIST1.1 longest diameter change rate in predicting pCR in breast cancer. The Dt-short model exhibits superior predictive performance compared to Dt-long.

CLINICAL RELEVANCE/APPLICATION

It provides reference for selecting reasonable diffusion time in clinical application of TDS technique to predict pCR in breast cancer.

T5B-SPBR-6 NEW BIOMARKERS' EXPLORATION WITH DYNAMIC CONTRACT ENHANCEMENT AND DIFFUSION MRI FOR PREDICTING PATHOLOGICAL RESPONSE TO NEOADJUVANT CHEMOTHERAPY IN BREAST CANCER

Yanbo Li (*Presenter*)
Hong Lu (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of the potential MRI biomarkers on predicting the response to neoadjuvant chemotherapy (NAC) and explore if new nomogram can be developed to improve pCR (ypT0) prediction.

METHODS AND MATERIALS

692 breast cancer patients who received NAC followed by surgery were included, and all underwent MRI examinations before and after completion of NAC on three system (Discovery MR750, GE Healthcare; Signa Pioneer, GE Healthcare; and Signa Infinity Excite II, GE Healthcare). The clinicopathological variables were recorded, and MRI variables were assessed. The ADC and WIS were calculated on Advantage Workstation (AW 4.6, GE Healthcare). The patients were separated into the training and validation cohort. Univariate comparison, univariable and multivariable logistic regression analyses were conducted in training cohort to identify independent predictors for pCR prediction. A nomogram was developed, and its performances were evaluated using the receiver-operator characteristic curves (ROC) in both training and validation cohort. The area under the ROC, sensitivity and specificity were also calculated. Calibration curve was plotted to evaluate the accuracy and reliability of the multi-parametric model.

RESULTS

The training cohort comprised 418 patients (median age, 47 years; IQR, 39-54 years), and the validation cohort included 274 patients (median age, 46 years; IQR, 38-55 years). Hormone receptor (HR)-negative, Ki67 index, rimed enhancement pre-NAC, tumor size post-NAC, WIS post-NAC, and ADC value post-NAC were found independently associated with pCR. Our newly developed nomogram showed superior predictive performance compared to the Kim model, with an AUC of 0.92 versus 0.89 (P = .008) in the training cohort, and 0.89 versus 0.86 (P = .043) in the training cohort.

CONCLUSION

New biomarkers including WIS and ADC were found helpful in post-NAC pCR prediction after exploration based on our single central data. Our nomogram, integrating clinicopathological and imaging biomarkers, demonstrated superior predictive performance for pCR compared to the existing Kim model.

CLINICAL RELEVANCE/APPLICATION

Our combined model may be helpful for individual treatment planning in breast cancer.

T5B-SPBR-7 SPEED AND ACCURACY: CAN WE HAVE BOTH? A COMPARATIVE STUDY OF RADIOLOGIST INTERPRETATION STYLES FOR AUTOMATED ULTRASOUND

Ashley I. Huppe, MD (*Presenter*)
Yulei Jiang, PhD (*Abstract Co-Author*)
Onalisa D. Winblad, MD (*Abstract Co-Author*)
Allison Aripoli, MD (*Abstract Co-Author*)
Jessica K. Peterson, MD (*Abstract Co-Author*)
Camron B. Smith, DO (*Abstract Co-Author*)
Molly Hill, MD (*Abstract Co-Author*)
Marc F. Inciardi, MD (*Abstract Co-Author*)

PURPOSE

Ultrasound improves breast cancer detection for patients with dense breast tissue and federal breast density notification laws may lead to increased utilization. AUS generates multiple acquisitions with reconstructed orthogonal planes for each breast. Interpretation times are lengthened when both coronal and transverse AUS images undergo full review, known as coronal-transverse interpretation (CTI). Literature supports the utility of the coronal view for cancer detection, which may decrease interpretation time if used as a primary interpretation style (coronal-focused interpretation, CFI). This study evaluated whether CFI is non-inferior in accuracy to CTI and decreases interpretation time.

METHODS AND MATERIALS

In a retrospective multireader multicase receiver operating characteristics (ROC) study, 11 radiologists interpreted a cancer-enriched set of 100 AUS cases (40 cancers, 60 normal/benign). Each case was interpreted using CFI with full viewing of the coronal images and utilization of transverse images as needed. Radiologists then viewed each case with CTI style. BI-RADS assessments for both interpretation styles were recorded for each case as 0, 1 or 2 and, if 0, diagnostic BI-RADS assessment for up to 3 lesions in each breast. Likelihood of malignancy score (0-100%) was also recorded. Interpretation times were obtained. Performance metrics were compared between CFI and CTI.

RESULTS

Seven readers were academic radiologists and all reported spending 80-100% of time dedicated to breast imaging. Clinical AUS volume ranged between 1 and 14 studies per day. Sensitivity for cancer detection (BI-RADS 4a or above) improved significantly from 76% (CFI) to 84% (CTI) (95% CI [3%, 14%]). Specificity (BI-RADS 3 or below) decreased significantly from 69% (CFI) to 63% (CTI), (95% CI [-10%, -3%]). On average, one additional cancer was detected for 1.6 additional false positives (FP) with CTI vs. CFI. CFI reduced interpretation time by 2.1 minutes per case (CFI: 3.0 minutes, CTI: 5.1 minutes). Area under the ROC curve of CTI was significantly better than CFI (p=0.02).

CONCLUSION

Compared with CFI, AUS CTI style results in improved cancer detection though increases FPs and interpretation time. This study supports CTI to ensure AUS provides the reported benefit of additional cancer detection. Further studies evaluating alternative methods to decrease interpretation time, such as with artificial intelligence, are warranted.

CLINICAL RELEVANCE/APPLICATION

Recently mandated breast density legislation may result in increased use of automated ultrasound (AUS), which generates large image data sets. An AUS interpretation style that uses primarily coronal reformats, known as CFI, may reduce radiologist interpretation time and encourage adoption of AUS.

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Nov. 30 – Dec. 4
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T5B-SPCA

Cardiac Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPCA-2 PERFORMANCE EVALUATION OF PRECISION LOW CONTRAST MEDIUM WITH DEEP LEARNING IMAGE RECONSTRUCTION IN PROSPECTIVE ECG-TRIGGERING CORONARY CT ANGIOGRAPHY:A PILOT STUDY

Luotong Wang (*Presenter*)
Dian Yuan (*Abstract Co-Author*)
Jie Liu (*Abstract Co-Author*)

PURPOSE

To assess the use of 100 kVp low contrast medium injection protocol on image quality and diagnostic performance of Coronary CT angiography (CCTA) in patients with extensive range body mass index (BMI) and heart rate (HR), in comparison with the conventional scan protocol with normal contrast media.

METHODS AND MATERIALS

In this prospective study, 105 patients undergoing prospective ECG-triggering CCTA were randomly assigned to 3 groups with contrast media injection protocols with bolus tracking technique: Reference group, 0.7 ml CM per kg patient weight (ml/kg); -14% contrast media (CM) group(`-` represents a reduction of contrast media volume compared to the reference group), 0.6 ml/kg; -28% CM group, 0.5 ml/kg. High-level deep learning image reconstruction (DLIR-H) was used for image reconstruction with a thickness and interval of 30%-80%, and the newest snapshot freeze technique was used to correct motion artifacts. For the objective assessment, the CT values of the superior vena cava (SVC), pulmonary artery (PA), ascending aorta (AA), left atrium (LA), left ventricle (LV), left main artery (LM) and proximal segment of the right coronary artery (RCA) were measured and analyzed. Two radiologists with over 10 years of experience assessed all the images based on the subjective evaluation of the image noise, motion artifact, vessel attenuation, and edge sharpness using a 5-point Likert scale.

RESULTS

The groups show comparable baseline characteristics, such as age (p=0.555), BMI(p=0.453), HR(p=0.525). The volume of contrast media was 45.33 ± 9.40, 40.34 ± 7.43 and 34.60 ± 6.68 ml for 3 groups ($p < 0.001$). The vessels CT value of -14% CM group and -18% CM group respectively compared with the reference group, show no difference on SVC, PA, AA, LA, LV, LM, RCA (all $p > 0.05$). The overall subjective image quality and diagnostic confidence for groups were similar ($P = 0.809$; $P = 0.768$).

CONCLUSION

The use of 100 kVp low contrast medium injection protocol could maintain the image quality and diagnostic performance of CCTA .

CLINICAL RELEVANCE/APPLICATION

Employing a 100 kVp low contrast medium injection protocol may preserve the image quality and diagnostic capabilities of CCTA, while allowing a reduction of the contrast medium to 0.4 ml/kg for patients with a wide range of BMI and HR.

T5B-SPCA-5 RAPID SCREENING OF HFPEF USING A RESIDUAL 1D-CNN ON CARDIAC MRI-DERIVED TIME-SERIES LEFT VENTRICULAR VOLUME DATA

Jeeyeon Kim, MD (*Presenter*)
Junyoeng Ko (*Abstract Co-Author*)
Byoung Wook Choi, MD, PhD (*Abstract Co-Author*)

PURPOSE

Heart failure with preserved ejection fraction (HFpEF) remains diagnostically challenging due to its heterogeneous presentation and subtle diastolic pathophysiology. This study aims to develop a rapid, fully automated screening tool for HFpEF using a residual one-dimensional convolutional neural network (1D-CNN) applied to time-series left ventricular (LV) volume data derived from cardiac MRI.

METHODS AND MATERIALS

We retrospectively analyzed patients who underwent both cardiac MRI and transthoracic echocardiography within a one-month interval between 2019-2023 were retrospectively reviewed. Inclusion criteria required a left ventricular ejection fraction (LVEF) = 50% on MRI. Diastolic dysfunction was defined by meeting =3 of the following four echocardiographic criteria, based on ASE/EACVI guidelines: (1) left atrial volume index > 34 mL/m², (2) tricuspid regurgitant velocity > 2.8 m/s, (3) septal e' velocity < 7 cm/s, and (4) E/e' ratio > 14. Normal controls met ?1 of these criteria.Cardiac cine MRI data from 1060 subjects (447 HFpEF, 613 controls) were processed. LV volumes were automatically segmented across cardiac phases and interpolated into uniform time-series using linear interpolation and cubic spline smoothing. These temporal features were input into a residual 1D-CNN for classification. Model training was conducted on a single NVIDIA T4 GPU and completed in 232 seconds. For comparison, peak filling rate normalized to end-diastolic volume (PFR/EDV) was calculated from the LV volume curves.

RESULTS

On an independent test set (89 HFpEF, 126 controls), the residual 1D-CNN achieved an AUC of 0.78 and an accuracy of 0.707. Inference time for the entire test set was only 0.093 seconds, demonstrating exceptional computational efficiency. In contrast, PFR/EDV showed no statistically significant difference between groups, likely due to the limited temporal resolution of standard clinical cine MRI protocols.

CONCLUSION

This residual 1D-CNN model enables rapid, automated HFpEF screening based on LV volume time-series data from cardiac MRI. Unlikely to conventional diastolic function markers, which are constrained by imaging resolution, the model operates robustly on routine clinical images and offers scalable integration into existing workflows. Prospective validation is warranted to assess clinical utility

CLINICAL RELEVANCE/APPLICATION

This AI-driven CMRI approach supports fast, reproducible HFpEF screening with minimal user input, potentially improving early diagnosis and reducing dependence on manual diastolic function assessment across diverse healthcare environments.

T5B-SPCA-6 LARGE LANGUAGE MODELS FOR CAD-RADS 2.0 EXTRACTION FROM CORONARY CT ANGIOGRAPHY REPORTS: A MULTI-INSTITUTIONAL STUDY

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PURPOSE

To evaluate the performance of large language models (LLMs) in extracting Coronary Artery Disease Reporting and Data System (CAD-RADS) 2.0 components from coronary CT angiography (CCTA) reports and assess the impact of prompt engineering strategies, addressing the challenge of maintaining consistency in standardized CCTA reporting.

METHODS AND MATERIALS

In this retrospective study, we collected 319 synthetic CCTA reports from six institutions (one primary and five external institutions). From the primary institution, 150 reports were collected: 100 for prompt development and 50 for internal testing. The remaining 169 reports from external institutions served as the external test set. Board-certified radiologists established reference standards following CAD-RADS 2.0 guidelines. Six LLMs (GPT-4, GPT-4o, Claude-3.5-Sonnet, o1-mini, Gemini-1.5-Pro, and DeepSeek-R1-Distill-Qwen-14B) were evaluated using an optimized prompt, exploring chain-of-thought and many-shot learning strategies. Performance was assessed using accuracies for each CAD-RADS 2.0 component (stenosis severity, plaque burden, and modifiers). McNemar's test and Spearman's correlation were used for statistical analyses.

RESULTS

This study analyzed 319 synthetic CCTA reports generated to reflect institutional reporting patterns. Claude-3.5-Sonnet and o1-mini achieved accuracy of 0.98 (48/49) for stenosis severity in internal testing, while GPT-4o achieved 0.94 (157/167) in external testing. All models showed high accuracies across both test sets for plaque burden (0.93-1.00) and modifiers (0.99-1.00). Chain-of-thought enhanced GPT-4's performance, improving stenosis severity accuracy by 0.14 ($p=0.065$) and 0.19 ($p<0.001$) and plaque burden accuracy by 0.16 ($p=0.016$) and 0.15 ($p<0.001$) in internal and external testing, respectively. Many-shot learning improved Gemini-1.5-Pro's plaque burden accuracy in external testing from 0.928 to 0.997 ($p=0.021$).

CONCLUSION

Our multi-institutional study demonstrates the high performance of large language models in extracting Coronary Artery Disease Reporting and Data System 2.0 components from coronary CT angiography reports when enhanced with advanced prompt engineering techniques.

CLINICAL RELEVANCE/APPLICATION

Large language models with optimized prompting strategies can accurately extract CAD-RADS 2.0 components from coronary CT angiography reports, potentially improving standardization in clinical reporting, reducing radiologist workload, and enhancing communication of findings among healthcare providers, which may ultimately lead to more consistent patient management decisions.

T5B-SPCA-8 DIAGNOSTIC PERFORMANCE OF AN AI-BASED MODEL FOR NON-INVASIVE CT-FFR ESTIMATION COMPARED TO INVASIVE FFR IN CORONARY ARTERY DISEASE

Abdulhamid Hajkhalil (*Presenter*)
Charles Philippe Douek (*Abstract Co-Author*)
Charles De Bourguignon (*Abstract Co-Author*)

PURPOSE

Accurate assessment of coronary stenosis severity is essential for clinical decision-making, particularly for guiding revascularization. Invasive fractional flow reserve (FFR) remains the gold standard for evaluating the functional significance of coronary lesions, but its routine use is limited by procedural risks, cost, and technical complexity. Recently, artificial intelligence (AI) models have emerged as promising tools to estimate FFR non-invasively using coronary CT angiography (CCTA) data. This study aimed to evaluate the diagnostic performance of a deep learning-based model, CorEx (Spimed-AI, Paris, France), in predicting functionally significant coronary stenoses compared with invasive FFR, and to assess its potential to reduce unnecessary invasive procedures.

METHODS AND MATERIALS

In this retrospective study, we included 43 patients with a total of 48 coronary arteries evaluated by both invasive coronary angiography (ICA) and non-invasive FFR estimation using the CorEx model. CCTA images were acquired using Dual layer CT (4 cm detector) Iqon and (8 cm detector) 7500 (Philips, Haifa) between 2015 and 2024. For each artery, invasive FFR was measured using a pressure wire during ICA and served as the reference standard. A lesion was considered hemodynamically significant if FFR was = 0.80. The CorEx deep learning model analyzed 9 curved multiplanar reconstruction (cMPR) JPEG images of the full artery to classify each case as either positive or negative for functional ischemia. Diagnostic performance was assessed through sensitivity, specificity, accuracy, F1-score, and Cohen's kappa coefficient for agreement with invasive FFR.

RESULTS

CorEx achieved a diagnostic accuracy of 70.0% in predicting functionally significant lesions. Sensitivity was 73.7%, specificity 79.3%, and F1-score 71.8%. Among the 48 arteries analyzed, there were 14 true positives, 23 true negatives, 6 false positives, and 5 false negatives. Agreement with invasive FFR was moderate, with a Cohen's kappa of 0.506 (95% CI: 0.252-0.759; SE = 0.129). For arteries with invasive FFR values in the gray zone]0.75-0.80], the AI model correctly classified 50% of cases. Furthermore, when excluding these uncertain cases, the classification accuracy increased to 88%.

CONCLUSION

The CorEx AI model demonstrates moderate to good diagnostic performance for non-invasive FFR estimation. It shows promising potential to reliably identify functionally significant coronary stenoses and reduce unnecessary invasive procedures.

CLINICAL RELEVANCE/APPLICATION

This AI tool can help identify significant coronary lesions from CCTA, reducing unnecessary invasive procedures and improving coronary artery disease management

T5B-SPCA-9 IMPROVED MYOCARDIAL T1 AND T2 MAPPING PRECISION WITH DEEP LEARNING RECONSTRUCTION

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Yoko Kato, MD, PhD (*Abstract Co-Author*)
Yoshimori Kassai, MS (*Abstract Co-Author*)
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PURPOSE

Quantitative assessment of myocardial T1 and T2 values allows objective evaluation of abnormalities and provides the means for comparison and to follow the disease over time. However, as in the applications of many imaging biomarkers, the sensitivity of T1 and T2 in detecting abnormality is limited by the precision of their measurements. High precision ensures reproducibility and the establishment of reference values, which is particularly important for the population-based studies when subtle changes of T1 and T2 are usually encountered. Recently, deep learning reconstruction (DLR) have been employed to enhance MRI image quality by noise reduction with image sharpness improvement. In this work, we applied the DLR on T1 and T2 mapping images and evaluated their performance in reducing the standard deviation (SD) in myocardial T1 and T2 quantification.

METHODS AND MATERIALS

All participants were imaged using a 3T MRI systems (Canon Medical Systems). T1 mapping was acquired pre- and post-contrast using a gradient echo based MOLLI 5(3)3 sequence. T2 mapping was performed pre-contrast using a T2-prepared gradient echo sequence. A vendor-provided deep learning reconstruction (Precision IQ Engine, PIQE, Canon Medical Systems) was applied to reconstruct the acquired original T1 and T2 images for the generation of T1 and T2 maps. PIQE utilized DLR to reduce noise and applied 3-fold zero-padding interpolation to increase the reconstruction matrix. Myocardial T2, pre- and post-contrast T1, and extracellular volume (ECV) values were extracted and paired student t-test was used for comparison between T1 and T2 values with and without PIQE. $P < 0.05$ was used for statistical significance.

RESULTS

A total of 90 studies were included. SD of myocardial T1 and T2 values were all reduced with PIQE reconstruction ($P < 0.001$). The average SD reduction of native T1 was 7 ms (16% reduction) with PIQE. The native T1 values were marginally increased by 5 ms ($P < 0.0001$). Myocardial T2 values remined the same but their SD were reduced by 2ms ($P = 0.0004$).

CONCLUSION

Our results showed improved precision in myocardial T1 and T2 mapping by applying the deep learning-based reconstruction. The ability to reduce the standard deviation has potential to increase the statistical power of detecting subtle abnormalities due to diffuse fibrosis or edema.

CLINICAL RELEVANCE/APPLICATION

Improved precision in cardiac T1 and T2 mapping by deep learning reconstruction was demonstrated in 90 in-vivo studies. The ability to reduce the standard deviation increases the statistical power of detecting subtle abnormalities.

T5B-SPCA-10 OPERATIONAL COSTS OF 4D FLOW MRI: A BREAK-EVEN ANALYSIS

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Michael Markl, PhD (*Abstract Co-Author*)
Bradley D. Allen, MD, MS (*Abstract Co-Author*)
Maria Ibanez (*Abstract Co-Author*)

PURPOSE

Aortic hemodynamics derived from 4D flow MRI (4DF) have shown advantages for risk stratification and treatment planning in patients with aortic valve disease, aneurysms, and dissection. However, clinical adoption has been limited due to high costs, long scan times, and low reimbursement. We quantify these barriers to identify break-even points and assess methods of improving clinical adoption.

METHODS AND MATERIALS

We modeled costs, resource utilization, and reimbursement under base scans of cardiac MRI, MR angiography, adult congenital, and 4DF add-on. Price estimates were generated from market research by the purchasing department at a large academic medical center in 2024 USD. Time estimates were derived from workflow efficiency studies at the same center. Reimbursement rates were from CMS for 2024b. The opportunity cost of 4DF was the margin from utilizing incremental scanner time for a mixture of alternate studies. Break-even points were modeled as the scan volume needed for the yearly margin of performing 4DF to exceed performing the base scans alone. Sensitivity analyses were performed for ranges of CPT 75565 reimbursement, 4DF exam time, and 4DF annual software cost.

RESULTS

The incremental variable cost per 4DF scan was $101.40 at a 15-minute scan time, after accounting for the opportunity cost of scanner utilization. Break-even points were calculated across reimbursement ranging from $40-65/unit of CPT 75565, annual software costs of $10,000-70,000, and 4DF scan times of 5-20 minutes. At a 15-minute scan time and reimbursement of $47.87/unit of CPT 75565, break-even points ranged from 112 to 778 scans as software cost increased from $10,000 to $70,000. Highly accelerated 4DF with a 5-minute scan time produced break-even points ranging from 64 to 444 scans as software cost increased from $10,000 to $70,000.

CONCLUSION

Long scan times and high resource utilization limit the financial viability of 4DF outside of high-volume centers.

CLINICAL RELEVANCE/APPLICATION

Further development of accelerated 4DF imaging techniques and expanded reimbursement criteria are needed to enable wider clinical adoption.

T5B-SPCA-11 CLINICAL DATA AND CARDIAC SPECTRAL PCCT RADIOMICS: IMPROVING CATH LAB TRIAGE IN ACS

Ulrich Schmid (*Presenter*)
Andreas Brendlin, MD, PhD (*Abstract Co-Author*)
Jan M. Brendel (*Abstract Co-Author*)
Saif Afat, MD (*Abstract Co-Author*)

PURPOSE

Many ACS patients undergo cardiac CT and same-day catheterization, but only a fraction require stenting, risking resource overuse. Photon-counting detector CT (PCCT) offers unique spectral data. We investigated five classification approaches: if clinical data ("C"), radiomics derived from mixed ("M") and spectral PCCT High/Low Energy bins ("HL"), early fused clinic+mixed ("CM") or clinic+spectral ("CHL") datasets excel in classifying patients needing same-day coronary stenting, hypothesizing that the inherent informational gain of PCCT may help improve resource stratification.

METHODS AND MATERIALS

We retrospectively analyzed PCCT cardiac scans from 96 patients undergoing same-day cardiac catheterization (15 received stents). Clinical data, along with radiomics from automatically generated myocardial AHA segments (Syngo.via), were fed to an identical machine-learning pipeline comprising SMOTETomek, StandardScaler,

multiple feature selection steps (Univariate Selection, XGBoost Importance Filter, ElasticNet, Correlation Filtering, and RFECV), and an XGBoost classifier with hyperparameter tuning via BayesSearchCV. Performance was assessed on a test set via Matthews Correlation Coefficient (MCC). Models were compared using Bayesian (posterior distributions, BFs, HDIs) and frequentist (bootstrapping, adj. P) analyses.

RESULTS

Clinical data (C) alone had limited value (MCC: 0.427, HDI: [0.321, 0.530]). For radiomics-only, spectral (HL; MCC: 0.726, HDI: [0.617, 0.826]) significantly outperformed mixed (M; MCC: 0.513, HDI: [0.393, 0.626]), confirmed by frequentist (HL vs M: Diff=0.213; P<0.001) and Bayesian analyses (HL-M Diff: 0.213, HDI: [0.052, 0.369]; BF10=2.56). Fusing clinical data yielded best results: CHL (MCC: 0.966, HDI: [0.929, 0.996]) performed highest, followed by CM (MCC: 0.954, HDI: [0.911, 0.991]). Bayesian comparisons showed CHL superior to C, M, and HL (BF10>100). CHL vs CM showed mean diff 0.012 (HDI: [-0.049, 0.069]; BF10=0.04), with no significant frequentist difference (P=0.737), indicating CHL was not decisively superior to CM, despite higher MCC.

CONCLUSION

Clinical data alone is insufficient for predicting stenting. Spectral PCCT radiomics (HL) outperform mixed (M) for radiomics-only models. Fusing clinical and radiomics data (CM, CHL) markedly improves performance over non-fused methods, achieving highest MCCs. While CHL had the highest MCC, it was not decisively superior to CM in pairwise comparisons. Thus, fusing clinical data with spectral PCCT radiomics promises improved post-CT stratification and optimized cath lab triage.

CLINICAL RELEVANCE/APPLICATION

Improved Patient Stratification Optimized Resource Allocation Enhanced Clinical Decision Support

T5B-SPCA-13 MASKED AUTOENCODERS FOR EARLY NEUROLOGICAL OUTCOME PREDICTION IN POST-CARDIAC ARREST PATIENTS USING MULTI-VIEW HEAD CT SCANS

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Nathan Hadjiyski (*Abstract Co-Author*)
Ashley Proctor (*Abstract Co-Author*)
Chloe Zhang (*Abstract Co-Author*)
Thomas W. Johnson, MD,PhD (*Abstract Co-Author*)
Olga Selioutski (*Abstract Co-Author*)
Regine Choe (*Abstract Co-Author*)
Imad Khan (*Abstract Co-Author*)
Axel Wismueller, MD, PhD (*Abstract Co-Author*)

PURPOSE

Cardiac arrest often leads to hypoxic-ischemic brain injury and coma. Accurate neurologic prognostication remains challenging and typically delayed =72 h post-return of spontaneous circulation (ROSC) to mitigate potential confounding variables. However, this 72-hour interval could be critical for reducing the likelihood of false-positive prognoses, as early prognosis can significantly aid clinicians and families in making informed patient management decisions. To address this challenge and improve patient outcome prediction, we propose a deep learning based method using axial, coronal and sagittal head CT scan reconstructions for neurological outcome prognostication using scans taken within the first 24 hours after ROSC.

METHODS AND MATERIALS

The study involved a total of 309 CT scans from 208 adult patients collected from a single institution. The patient data was categorized into good (CPC 1, 2) and bad (CPC 3, 4, 5) neurological outcomes. In this work we used a Video Masked Autoencoder (Video-MAE) based classifier to predict neurological outcomes. We trained two variants of Video-MAE on the head CT scans acquired within the first 24 hours of ROSC: VideoMAE-Ax: Trained on axial head CT reconstructions. VideoMAE-ACS : Trained on axial, coronal, and sagittal CT reconstructions for each study.

RESULTS

VideoMAE-Ax AUC-ROC 0.79; sensitivity 0.80; specificity 0.67; PPV 0.69; NPV 0.78; accuracy 0.73. VideoMAE-ACS AUC-ROC 0.84; sensitivity 0.85; specificity 0.71; PPV 0.74; NPV 0.83; accuracy 0.78. In a direct comparison on the same test set with VideoMAE-Ax, the VideoMAE-ACS model trained on axial, coronal, and sagittal reconstructions displayed improved prognostic performance on AUC-ROC score, sensitivity, specificity, PPV, NPV, and accuracy.

CONCLUSION

This study presents a masked autoencoder-based AI model designed for the prognostication of post-cardiac arrest patients through joint anatomical understanding of axial, coronal, and sagittal reconstructions of head CT scans. Our findings suggest that this approach significantly enhances prognostic accuracy in comparison to methods that rely solely on axial CT reconstructions for early neurological prognostication within 24 hours after the arrest.

CLINICAL RELEVANCE/APPLICATION

Our VideoMAE-ACS model can aid clinicians in providing reliable prognostication using head CT scans taken within the first 24 hours post-ROSC. Integrating this method into the critical care workflow can contribute to reducing uncertainty in early decision-making and improve treatment plans in comatose cardiac arrest survivors.

T5B-SPCA-14 BMI-ADAPTIVE IMAGE OPTIMIZATION IN TRIPLE-LOWCORONARY CTA VIA DEEP LEARNING IMAGE RECONSTRUCTION

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Feng Chen, MD, PhD (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Xiaoyan Lei (*Abstract Co-Author*)

PURPOSE

This study aimed to assess the efficacy of high-strength deep learning image reconstruction (DLIR-H) in enhancing image quality for coronary CT angiography (CTA) conducted under a “triple-low” protocol—low radiation dose, low contrast volume, and low injection flow rate—across patients with different body mass index (BMI) categories.

METHODS AND MATERIALS

Between August 2024 and April 2025, 47 patients with suspected coronary artery disease were prospectively enrolled and divided into three BMI-based cohorts: group A (<24 kg/m², n=20), group B (24-28 kg/m², n=21), and group C (>28 kg/m², n=6). All underwent coronary CTA using the APEX CT system with individualized tube voltage settings (70-100 kVp) and contrast protocols (35-55 mL at 3.0-5.0 mL/s). Imaging included both systolic and diastolic phases. Reconstructions were performed using DLIR-H and adaptive statistical iterative reconstruction at 50% strength (ASIR-V 50%). Two radiologists independently rated image quality on a 5-point Likert scale (1=non-diagnostic, 5=excellent), blinded to reconstruction method. Radiation dose metrics (CTDIvol, DLP, and ED) were documented. Interobserver consistency was measured with Cohen’s kappa.

RESULTS

Effective radiation dose showed a positive correlation with BMI (group A: 0.77±0.14 mSv; group C: 2.02±0.58 mSv; P=0.004). DLIR-H consistently outperformed ASIR-V 50% in image quality across all BMI groups and cardiac phases. In group A, DLIR-H achieved scores of 4.2±0.4 (diastole) and 4.0 (systole), significantly higher than ASIR-V 50% (3.1±0.3 and 3.0, respectively; P<0.001), with excellent inter-rater reliability (Kappa=0.868-1.0). In group B, DLIR-H received 4.3±0.5 in diastole compared to 3.0±0.2 for ASIR-V 50%, with similar advantages during systole (P<0.001, Kappa=0.824). In group C, DLIR-H scored 4.3±0.6 (diastole) and 4.0 (systole),

outperforming ASIR-V 50% (2.8±0.4 and 3.0; P=0.022 and P=0.019), also with high agreement (Kappa=0.877-1.0). DLIR-H reliably maintained image scores =4 across all BMI categories, whereas ASIR-V 50% largely ranged between 3-4.

CONCLUSION

DLIR-H markedly enhances image quality in coronary CTA using a three-low strategy, with pronounced benefits in overweight and obese individuals, supporting its role in high-noise, low-dose imaging environments.

CLINICAL RELEVANCE/APPLICATION

The findings underscore DLIR-H's value in achieving diagnostically robust coronary CTA under low-dose, low-contrast, and low-flow conditions. Its stable performance across BMI levels, particularly in higher BMI patients, positions it as a critical tool for advancing patient-specific, low-risk cardiovascular imaging strategies.

T5B-SPCA-15 HOW MUCH DEMOGRAPHIC AND ANATOMICAL INFORMATION DO SLVH CLASSIFIERS LEARN FROM CHEST-XRAYS?

Basudha Pal (*Presenter*)
Rama Chellappa (*Abstract Co-Author*)
Muhammad Umair, MBBS (*Abstract Co-Author*)

PURPOSE

Severe left ventricular hypertrophy (SLVH) is a key marker of cardiovascular risk, but echocardiography and cardiac MRI remain limited by cost and access. Chest X-rays (CXRs) are more accessible, yet most deep learning models for SLVH classification rely on intermediate anatomical measurements or demographic inputs, introducing error propagation and confounding. Our framework detects SLVH using only CXR images and binary labels, with no anatomical or demographic supervision. Beyond classification, we assess how much models encode attributes like age, sex, and cardiac structure, though this information is not provided during training.

METHODS AND MATERIALS

We curated a balanced dataset from the CheXchoNet database by sampling equal numbers of SLVH positive and negative cases, however preserving original split ratios. The final set includes 11,190 images from 6,021 patients for training, 658 from 361 for validation, and 534 from 310 for testing. We train ResNet and Vision Transformer backbones with classification heads, optimize with binary cross entropy loss, and select best checkpoints using validation AUROC. We evaluate which clinical factors are implicitly encoded using Mutual Information Neural Estimation (MINE) to compute 'expressivity', which is a measure of the statistical dependence between learnt features and patient attributes that are not seen during training. MINE uses a lightweight auxiliary network trained to distinguish true feature-attribute pairs from random matches by optimizing a variational objective to estimate dependencies in high dimensional space.

RESULTS

Although predicting SLVH from CXRs using only binary labels is a challenge, ResNet achieves AUROC 0.760 (95% CI: 0.718-0.802) and AUPRC 0.731 (95% CI: 0.669-0.786), while ViT achieves AUROC 0.816 (95% CI: 0.781-0.850) and AUPRC 0.803 (95% CI: 0.755-0.849). Expressivity analysis shows a consistent pattern across models: Age > Sex > Interventricular Septal Diameter (IVSDd) > Left Ventricular Posterior Wall Diameter (LVPWd) > Left Ventricular Internal Diameter (LVIDd) at end diastole. Age, sex, and wall thickness are strongly encoded while LVIDd shows comparatively lower expressivity, consistent with its association with dilation rather than hypertrophy.

CONCLUSION

We show that SLVH can be predicted directly from CXRs without structural or demographic supervision. Further, MINE quantifies which factors are implicitly encoded, aligning model behavior with clinical understanding.

CLINICAL RELEVANCE/APPLICATION

CXRs can support SLVH screening without advanced imaging or added patient data. Mutual information analysis provides a systematic approach to interpret what deep models learn and ensures predictions reflect clinically meaningful patterns.

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T5B-SPCH

Chest Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPCH-1 SPECTRAL CT DIFFERENTIATION OF ACTIVE AND INACTIVE INFLAMMATION IN INTERSTITIAL LUNG DISEASE

Ran LIN (*Presenter*)
Yajun Ding (*Abstract Co-Author*)
Xilai Chen (*Abstract Co-Author*)
Yu Deng (*Abstract Co-Author*)

PURPOSE

Interstitial Lung Disease (ILD) comprises a group of pulmonary disorders characterized by diffuse parenchymal abnormalities, alveolar inflammation, and/or interstitial fibrosis.Differentiation between these entities on HRCT remains challenging and often requires post-treatment follow-up for distinction. Clinically, it is difficult to adjust individualized treatment plans based solely on HRCT findings. To investigate whether spectral CT-derived parameters can differentiate between active inflammation and inactive inflammation in interstitial lung disease (ILD).

METHODS AND MATERIALS

35 ILD patients who underwent pre-treatment spectral CT and had >3-month follow-up high resolution CT (HRCT) were enrolled. 125 lesions were classified into active/inactive inflammatory subgroups according to the absence or presence of radiologic resolution on follow-up HRCT. The following parameters were measured in the pulmonary arterial phase: lesion iodine concentration/water content (IC/ WC), aortic iodine concentration (A_IC)/water content (A_WC) at the same level, along with unenhanced effective atomic number (Effz) and CT attenuation values. Normalized parameters were calculated as: normalized iodine concentration (NIC=IC/A_IC) and normalized water concentration (NWC= WC/A_WC). Differences in spectral CT parameters between active and inactive inflammation groups were analyzed using Mann-Whitney U tests. Parameters showing statistical significance in univariate analysis were further incorporated into binary logistic regression to develop a spectral CT-based discriminative model (DE model), with diagnostic performance evaluated by the area under the receiver operating characteristic curve (AUC).

RESULTS

A total of 44 active inflammatory lesions and 81 inactive lesions were identified. Both IC (16.51 ± 6.00) and NIC (0.21 ± 0.13) in active inflammatory ILD were significantly higher than those in inactive disease (11.98 ± 5.22 and 0.14 ± 0.08, respectively; all $p<0.001$). Effz also showed significant differences between the two groups ($p<0.016$) However, no statistically significant difference was found in other parameters. The DE model achieved the highest diagnostic performance (AUC=0.731), outperforming individual parameters (IC: AUC=0.708; NIC: AUC=0.683).

CONCLUSION

Spectral CT-derived IC and NIC effectively differentiate between active and inactive inflammation in ILD , with the multiparametric spectral CT-based model showing superior diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that spectral CT-derived IC and NIC can effectively differentiate between active and inactive inflammation in ILD, providing valuable guidance for clinical treatment decision-making.

T5B-SPCH-3 INTERPRETABLE TRANSFORMER-BASED AI FRAMEWORK FOR CT-BASED LUNG NODULE CLASSIFICATION USING FUSED RADIOMIC TEXTURE AND MORPHOLOGY DESCRIPTORS

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Tatiana Mamaliga, MD (*Abstract Co-Author*)
Patrick T. England, MD (*Abstract Co-Author*)
Ali Mahmoud (*Abstract Co-Author*)
Asem C. Ali (*Abstract Co-Author*)
Mohamed Ghazal (*Abstract Co-Author*)
Sohail G. Contractor, MD (*Abstract Co-Author*)
Ayman S. El-Baz SR, PhD (*Abstract Co-Author*)

PURPOSE

To develop a transformer-based diagnostic framework that integrates domain-specific morphological and textural descriptors for accurate and interpretable lung nodule classification on CT imaging. We hypothesize that fusing Spherical Modified Local Ternary Pattern (SMLTP)-derived textural features and Spherical Harmonics (SH)-based morphological descriptors will significantly improve classification performance and interpretability compared to traditional convolutional neural network (CNN) approaches.

METHODS AND MATERIALS

We curated a private dataset of 707 pathologically confirmed CT scans (477 malignant, 230 benign) and utilized the LIDC-IDRI benchmark dataset (679 nodules) for external validation. The pipeline begins with segmentation of Hounsfield Unit (HU)-based Volumes of Interest (VOIs), followed by extraction of textural features using a SMLTP algorithm and morphological descriptors via HU-guided iso-surface reconstruction errors analyzed through SH. All features are processed using a 3D CNN (based on EfficientNet), and fused into a transformer-based model that encodes and classifies the VOIs. The model's performance was evaluated using accuracy, sensitivity, specificity, F1-score, and area under the curve (AUC), with additional analyses comparing individual feature contributions and prior state-of-the-art methods.

RESULTS

The proposed model achieved 99.3% accuracy and 100% sensitivity on the private dataset and 99.1% accuracy and 99.7% sensitivity on the unseen LIDC-IDRI dataset (external validation). Feature fusion outperformed individual descriptor inputs, with AUCs of 1.000 (private) and 0.9993 (benchmark). The integration of SMLTP and SH descriptors enabled the model to capture and visualize nuanced textural and morphological differences associated with malignancy, providing a layer of interpretability for clinical review. Embedded feature maps and reconstruction errors offered direct visual cues that correlated with diagnostic traits, enhancing transparency of model decision-making.

CONCLUSION

Our framework significantly enhances lung nodule classification through the integration of geometric and textural descriptors with transformer-based modeling. In addition to state-of-the-art diagnostic performance, the model provides interpretable outputs that align with clinical radiologic features, supporting its utility in real-world diagnostic workflows.

CLINICAL RELEVANCE/APPLICATION

This AI-driven diagnostic tool delivers high sensitivity and interpretability in lung nodule evaluation, addressing a critical need for early and accurate lung cancer detection, and may serve as a foundation for next-generation, clinically integrated decision support systems.

T5B-SPCH-4 A NOVEL AI STRATEGY OF COMBINING LARGE DATASET TRAINING, POPULATION SPECIFIC RETRAINING AND CONFIDENCE ESTIMATION TO IMPROVE CLASSIFICATION PERFORMANCE IN ESTIMATING PULMONARY NODULE MALIGNANCY RISK

Eduardo J. Mortani Barbosa JR, MD, MBA (*Presenter*)
Yanbo Zhang (*Abstract Co-Author*)
Yohan Kim (*Abstract Co-Author*)
Bogdan Georgescu, PhD (*Abstract Co-Author*)
Sasa Grbic (*Abstract Co-Author*)
Warren B. Gefter, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of an AI algorithm for pulmonary nodule malignancy risk estimation (DeepPNP) across lung cancer screening and high-risk, biopsy-confirmed cohorts, assessing the incremental benefit of incorporating AI model confidence estimation.

METHODS AND MATERIALS

A retrospective analysis was conducted using five cohorts. For training and validation of the DeepPNP model, the National Lung Screening Trial (NLST) dataset was combined with two malignant nodule-only cohorts, resulting in a merged dataset of 28,057 nodules, including 2,362 malignant nodules. A subset of the NLST (2,597 nodules, including 107 malignant) was retained as a test set to represent the screening scenario. Additional testing was performed on two independent cohorts with distinct compositions of high-risk, biopsy-confirmed nodules: Institution B with 411 nodules (including 177 malignant nodules) and Institution C with 1,144 high-risk, biopsy-confirmed nodules (including 871 malignant nodules). Institution C was split into train/validation/test sets with a ratio of 6:1:3. The DeepPNP model was retrained on this cohort, and an uncertainty estimation strategy was applied to identify the highest confidence nodules. Performance metrics, including sensitivity, specificity, precision, F1 score, and accuracy were analyzed across three operating thresholds.

RESULTS

DeepPNP achieved an area under the curve (AUC) of 0.962 and a sensitivity of 94.4% at 85% specificity on the NLST test set, outperforming the PanCan and Lung-RADS models. In the Institution B cohort, DeepPNP maintained high sensitivity (100%) but exhibited reduced discriminative power among biopsy-confirmed benign nodules. In the Institution C high-risk cohort, the model achieved high sensitivity (99.3%) but was unable to discriminate between high-risk, biopsy-confirmed malignant and benign nodules, with an AUC of 0.580. After model retraining on the Institution C training data, the AUC improved to 0.828 on 20% of the Institution C test data with the highest confidence.

CONCLUSION

DeepPNP outperformed established risk models in the screening cohort. Within two high-risk cohorts, the system correctly identified biopsy-confirmed malignant nodules as high-risk (100% sensitivity in Cohort B and 99.3% sensitivity in Cohort C) but was unable to discriminate benign biopsy-confirmed nodules from malignant ones. This limitation was overcome by retraining the model and removing uncertain cases, showcasing the added value of incorporating confidence estimation.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the importance of population-specific model development and retraining as well as confidence estimation when deploying an AI model in high-risk clinical cohorts.

T5B-SPCH-7 AUTOMATED 3D QUANTITATIVE ANALYSIS OF INTRAPULMONARY VASCULAR VOLUME IN VASCULITIS PATIENTS WITH PULMONARY VASCULAR INVOLVEMENT

Ying Ming (*Presenter*)
Wei Song, MD (*Abstract Co-Author*)
Ruijie Zhao (*Abstract Co-Author*)
Jiaru Wang (*Abstract Co-Author*)
Sirong Piao (*Abstract Co-Author*)
Ran Xiao (*Abstract Co-Author*)
Rui Zhao (*Abstract Co-Author*)
Qiqi Xu, MBBS, MMEd (*Abstract Co-Author*)

PURPOSE

To compare the differences in intrapulmonary vascular volume (IPVV) measured using computed tomography pulmonary angiography (CTPA) between vasculitis patients with pulmonary vascular involvement and subjects with negative CTPA findings.

METHODS AND MATERIALS

This study included imaging data from 207 patients diagnosed with vasculitis with pulmonary vascular involvement& 9; based on CTPA between March 2019 and November 2024, as well as 202 subjects who underwent CTPA between February 2019 and February 2025 and had negative findings. A computer-aided pulmonary vascular segmentation algorithm was employed to automatically measure the IPVV for each patient and subject. Quantitative assessments were conducted on the total intrapulmonary vascular volume (TIPVV), & 9;intrapulmonary arterial vascular volume (IPVVa), & 9;intrapulmonary venous vascular volume (IPVVv). Additionally, IPVVs were analyzed within five specific vessel diameter groups: 0.8 mm-1.6 mm, 1.6 mm-2.4 mm, 2.4 mm-3.2 mm, 3.2 mm-4.0 mm, and >4.0 mm. Comparisons of IPVV were performed between CTPA-negative subjects and vasculitis patients with pulmonary vascular involvement.

RESULTS

TIPVV and IPVVv showed no significant differences between CTPA-negative subjects and vasculitis patients with pulmonary vascular involvement ($P>0.05$). The IPVVa measured in CTPA-negative subjects was 47.79 (42.50, 54.01) mL·m -2 , while that in vasculitis patients with pulmonary vascular involvement was 44.69 (39.33, 52.25) mL·m -2 . The IPVVa in vasculitis patients with pulmonary vascular involvement was significantly lower than that in CTPA-negative subjects, with a statistically significant difference ($P<0.01$). Additionally, in pulmonary arteries with diameters of 0.8 mm-1.6 mm and 2.4 mm-3.2 mm, the IPVVa in vasculitis patients with pulmonary vascular involvement was significantly lower than that in CTPA-negative subjects, with a statistically significant difference ($P<0.01$). In pulmonary veins with

diameters of 1.6 mm-2.4 mm and 3.2 mm-4.0 mm, the IPVVv in vasculitis patients with pulmonary vascular involvement was higher than that in CTPA-negative subjects, with a statistically significant difference (P<0.05).

CONCLUSION

The computer-aided pulmonary vascular segmentation algorithm can automatically measure IPVV, providing a quantitative evaluation of the condition of small pulmonary vessels affected by vasculitis.

CLINICAL RELEVANCE/APPLICATION

The automated measurement of IPVV using a computer-aided pulmonary vascular segmentation algorithm enables objective and quantitative assessment of pulmonary vascular involvement in vasculitis patients.

T5B-SPCH-9 SEGMENTAL PULMONARY VEIN SLOW FLOW AS A NOVEL BIOMARKER FOR PERFUSION DEFICITS IN PULMONARY EMBOLISM: INSIGHTS FROM DUAL-ENERGY CT

Ying Zhang, MD (*Presenter*)
Ye Yu (*Abstract Co-Author*)
Yu Wang (*Abstract Co-Author*)
Huawei Wu (*Abstract Co-Author*)

PURPOSE

To assess the independent role of segmental pulmonary vein slow flow (PVSF) in pulmonary perfusion deficits (PPD) in pulmonary embolism (PE), evaluate the performance of effective atomic number (Zeff) versus iodine density (ID) for hemodynamic assessment, and explore the thrombus-PVSF-PPD relationship using dual-energy CT (DECT).

METHODS AND MATERIALS

This retrospective study included 102 PE patients undergoing dual-phase DECT. Segment-level analysis (20 segments/patient) evaluated thrombus burden (Modified Miller score), venous abnormality (absent, tenuity, PVSF), and PPD morphology. Spectral parameters (Zeff, ID) were reconstructed for quantitative analysis. Generalized linear models assessed factors associated with Zeff, with model fit evaluated using the Quasi-likelihood under the Independent Model Criterion (QICC). Generalized estimating equations and mediation analysis evaluated associations and pathways at the segment level.

RESULTS

At the segmental level (n=2040 segments), PVSF was strongly associated with PPD: PVSF segments showed significantly higher PPD prevalence (98.0%, 198/202) than absent (29.0%, 507/1749) or vein tenuity (71.9%, 64/89) segments (p<0.001). PVSF independently predicted high-risk PPD (OR=10.2) and correlated with greater Zeff reduction (p<0.001). Zeff demonstrated superior performance over ID for PPD detection (AUC=0.88 vs 0.86, p<0.001). Mediation analysis revealed PVSF mediated 16.5% (p<0.001) of thrombus-induced perfusion impairment. GLM for Zeff confirmed PVSF's significant association alongside thrombus burden and location (model fit with Gamma/log link, QICC=36.5).

CONCLUSION

Segmental PVSF, detectable by DECT, is a novel and independent predictor of PPD in PE, potentially serving as a valuable imaging biomarker for risk stratification. Zeff provides more accurate quantitative assessment of hemodynamic impairment compared to ID. The "thrombus-PVSF-PPD" axis highlights the importance of evaluating venous outflow alongside arterial obstruction in PE management.

CLINICAL RELEVANCE/APPLICATION

Segmental pulmonary vein slow flow and Zeff-based quantitative analysis using DECT provide valuable insights for risk stratification and comprehensive hemodynamic assessment in patients with pulmonary embolism, highlighting the importance of evaluating both arterial and venous compartments.

T5B-SPCH-10 METAL ARTIFACT REDUCTION IN ULTRA-LOW-DOSE CT WITH DEEP LEARNING IMAGE RECONSTRUCTION: A CATPHAN 500 PHANTOM STUDY

Bing Liu (*Presenter*)

PURPOSE

To evaluate the performance of Deep Learning Image Reconstruction (DLIR-H) in suppressing metal artifacts at ultra-low-dose (ULD) levels (80kVp/20mAs), compared with iterative reconstruction (ASIR-V 50%) and filtered back projection (FBP).

METHODS AND MATERIALS

A customized Catphan 500 phantom (CTP515 module with stainless steel clips) was scanned at ultra-low-dose (80kVp/20mAs) and conventional-dose (120kVp/50mAs) settings. Images were reconstructed using DLIR-H, ASIR-V 50%, and FBP. Quantitative metrics included: (1) CT value deviation (|?HU|); (2) background noise (s); (3) contrast-to-noise ratio (CNR); and (4) CNR loss rate. Measurements were taken from anterior, left, and right regions across three slice positions (center, ±5 mm). Statistical analysis was performed using paired t-tests (a=0.05).

RESULTS

At 80kVp ULD scanning, DLIR-H outperformed ASIR-V 50% and FBP: (1) CT value stability: DLIR-H showed the lowest mean |?HU| (41.29 HU) compared with ASIR-V 50% (43.60 HU) and FBP (45.18 HU); (2) Noise reduction: DLIR-H achieved the lowest background noise (s=29.64 HU); (3) CNR preservation: DLIR-H reached the highest CNR (2.10) with the lowest CNR loss rate (14.00%).

CONCLUSION

DLIR-H significantly reduces metal artifacts, background noise, and CNR loss at ultra-low-dose settings, indicating strong potential for clinical application in radiation dose reduction strategies.

CLINICAL RELEVANCE/APPLICATION

DLIR-H enables diagnostic-quality imaging at ultra-low doses (80kVp/20mAs), reducing radiation exposure for patients with metallic implants. Its superior artifact suppression and CNR preservation benefit frequent CT users like pediatric patients and oncology cases. Despite needing optimization in anterior artifact reduction, DLIR-H balances diagnostic efficacy and patient safety.

T5B-SPCH-12 NATURAL HISTORY AND CLINICAL CHARACTERISTICS OF PULMONARY SUBSOLID NODULES IN PEDIATRIC PATIENTS DURING THE PAST 15 YEARS

Hua Ren, MD, PhD (*Presenter*)
Hong Yu, MD, PhD (*Abstract Co-Author*)
Jianlin Wu, MD (*Abstract Co-Author*)

PURPOSE

To investigate the natural course of subsolid nodules (SSNs) in the pediatric patient population and to gain some insights on how to follow them up.

METHODS AND MATERIALS

From January 2010 to December 2024, patients aged 18 years or younger with persistent SSNs were retrospectively reviewed and assessed. The incidence of interval growth, clinical, radiologic, pathological features, and follow-up outcomes of these SSNs were investigated.

RESULTS

A total of 164 patients (median age, 17 years; range, 6-18 years; 81 women) with 217 SSNs (including 213 pure ground glass nodules [PGGNs] and four part-solid nodules [PSNs]) were analyzed and evaluated. Five of the 217 SSNs (2.3%) (three PGGNs and two PSNs) showed interval growth. One PGGN and one PSN exhibited an increase in nodule size. One PSN demonstrated an increase in solid components, and two PGGNs presented a new small solid component. The intervals from initial CT examination to growth were 12, 17, 20, 37, and 98 months. There was no occurrence of centripetal growth in the reversed halo sign GGNs. 28 SSNs (25 PGGNs, 3 PSNs) in 24 studied individuals underwent pulmonary resection, including four IVAs, 14 minimally invasive adenocarcinomas, nine adenocarcinomas in situ, and one atypical adenomatous hyperplasia. There were no lymph node metastasis and pleural invasion. One PGGN underwent microwave ablation. All patients survived without recurrence.

CONCLUSION

Only 2.3% of SSNs in children and adolescents showed subsequent growth. The much higher likelihood of these persistent SSNs in pediatric patients that represent a primary lung tumor rather than metastasis or infectious causes.

CLINICAL RELEVANCE/APPLICATION

The persistent SSNs in pediatric patients should be followed up with long intervals and appropriate surgical treatment after thoughtful discussion.

T5B-SPCH-13 INCIDENTAL PULMONARY NODULE FOLLOW UP OUTCOMES BASED ON REVISED 2017 FLEISCHNER SOCIETY GUIDELINES

Benjamin Kuo, MD, MSc (*Presenter*)
Chow Wei Too (*Abstract Co-Author*)

PURPOSE

Incidental pulmonary nodules (IPN) are routinely seen on chest computed tomography (CT). This has led to the 2017 Fleischner Society Guidelines (FSG) for IPN to minimize unnecessary CT examinations and provide clinicians with greater discretional management approaches. The main purpose of this study is to examine the follow up rates and outcomes of IPN detected on CT evaluations.

METHODS AND MATERIALS

In this retrospective study, all outpatient and inpatient CT studies from our institution with complete or partial coverage of the thorax between January 1 - February 28, 2020 were examined for pulmonary nodules. A follow up period of 4 year was used to determine the outcome of the IPN. Exclusion criteria were similar to prior FSG publication: cancer history, younger than 35 years, immunocompromised status or death during the study period. Variables and outcomes evaluated were patient demographic, study acquisition, clinical, nodule characteristics and histological result.

RESULTS

A total of 656 CT scans were evaluated, which revealed pulmonary nodules in 207 scans. The mean patient age was 66 year (SD 12 years). Further workup recommended included 51 cases (24.6%) with an mean nodule size (MNS) of 2.9cm, among which 34 cases underwent biopsy, demonstrating malignancy in 25 cases (MNS 2.8cm). Workup was declined for 17 cases of which 7 cases (MNS 3.3cm) had suspicious features for malignancy during presentation or on follow up. Standard of care CT follow up included 62 cases (30.0%, MNS 0.8cm). Two cases (MNS 0.8cm) showed interval nodule growth with suspicious features; 60 cases (MNS 0.8cm) had no detected cancer. A total of 94 cases were discharged (45.4%, MNS 0.4cm) with 1 case exhibiting features for lung metastasis on subsequent imaging. The remaining 93 cases remained negative of malignancy within the study period.

CONCLUSION

Incidental pulmonary nodule is a common finding in nearly one third of scans in our institution after excluding patients with known malignancy. Follow up of IPN demonstrated significant association of pulmonary nodule size and malignancy in line with the latest FSG. Overall lung cancer detection was 5.9%. Notably, patients who were discharged had MNS of 0.4cm with less than 1% cancer detection. Patients who were followed up by CT had MNS of 0.8cm with 3.4% cancer detection. Future priorities within our institution include initiatives to integrate AI tools for more granular risk-stratification with relevant clinical and imaging parameters.

CLINICAL RELEVANCE/APPLICATION

Our preliminary experience matching incidental pulmonary nodules and lung cancer detection with 2017 Fleischner Society Guidelines demonstrated reliable guidelines with appropriate individualized clinical flexibility.

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T5B-SPER

Emergency Radiology Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPER-1 FROM STATIC TO DYNAMIC - ADVANCING PTE DIAGNOSIS THROUGH THE LENS OF DDR

Robin B. Philip, MBBS (*Presenter*)
Priscilla Joshi, MBBS, MD (*Abstract Co-Author*)

PURPOSE

To evaluate diagnostic accuracy of Dynamic Digital Radiography (DDR) in suspected acute pulmonary thrombo-embolism (PTE) and its potential to overcome the limitations of conventional CT pulmonary angiography (CTA) . To evaluate pulmonary perfusion on follow up DDR. & 9;& 9;& 9;To correlate initial and follow up DDR findings with Transthoracic 2D echocardiography (TTE) findings.

METHODS AND MATERIALS

This prospective study evaluated diagnostic performance of DDR in adult patients with suspected PTE undergoing CTA . It was an interim analysis of 62 patients , 27(43.5 %) were females and 35(56.5 %) were males. TTE was done for patients who presented with acute onset breathlessness. Those with a suspicion of PTE were sent to radiology department for diagnostic CTA. DDR was done prior to CTA to assess pulmonary perfusion based on heat maps . The diagnostic accuracy of DDR and TTE were compared to CTA. This study assessed clinical utility of DDR and TTE with CTA as gold standard in PTE diagnosis.

RESULTS

Preliminary analysis demonstrated moderate diagnostic accuracy for DDR in suspected PTE. The test demonstrated a sensitivity of 63.16% (95% CI: 38.36-83.17%) , indicating its ability to correctly identify approximately two-thirds of individuals with PTE though with a notable degree of variability reflected in the wide confidence interval. The specificity was 57.58% (95% CI: 39.22-74.52%) , showing that it accurately classified over half of individuals without PTE. With a positive likelihood ratio of 1.49 , the test modestly increased probability of PTE being present when result is positive. Conversely, negative likelihood ratio of 0.64 suggested a slight reduction in likelihood of PTE when result was negative. Together, these metrics highlighted the test’s moderate diagnostic performance.

CONCLUSION

The results suggested DDR may offer a promising, albeit imperfect, alternative for diagnosis of pulmonary embolism in select patient populations. DDR showed a better sensitivity, positive and negative predictive values as compared to a TTE in evaluation of PTE . Additionally, DDR showed remnant pulmonary perfusion in the affected zone which CTA couldn’t.

CLINICAL RELEVANCE/APPLICATION

DDR offers several advantages, including:Reduced patient radiation dose burden . Radiation dose of perfusion DDR is one-twentieth of standard CTA. Hence, there's a significantly lower radiation exposure and repeating a DDR is far more feasible than CTA. Reduced patient compliance : Shorter breath holds minimise patient discomfort.Enhanced patient safety : Eliminates the risk of contrast-induced nephropathy.Unique assessment of pulmonary perfusion : Provides valuable information of perfusion percentages in both upper, mid and lower pulmonary zones not readily available with CTA.

T5B-SPER-2 O-DOSE MODULATION AND DEEP LEARNING RECONSTRUCTION (INFINITY) IN EMERGENCY THORACOABDOMINAL CT: OPTIMIZATION OF SPIRAL SCAN RANGE, RADIATION DOSE, AND IMAGE QUALITY

Dace Zhang (*Presenter*)

PURPOSE

To investigate the impact of different reconstruction algorithms (View iterative, Infinity deep learning), radiation doses (conventional vs. low dose), and helical scan ranges (16cm vs. 8cm) on image quality in emergency thoracoabdominal CT scans, and to optimize the scanning protocol.

METHODS AND MATERIALS

45 subjects were enrolled and divided into three groups: Group 1 (16 cm, routine dose, O-DOSE 1.3), Group 2 (8 cm, routine dose, O-DOSE 1.3), and Group 3 (16 cm, low dose, O-DOSE 0.7). All data were reconstructed using View iterative reconstruction (30%, 50%, 70%, 90%), and Infinity deep learning reconstruction (30%, 50%, 70%, 90%). Quantitative analyses were performed on image noise, CT values, Signal-to-Noise Ratio(SNR)and contrast-to-noise ratio (CNR).Subjective image quality was assessed using a 4-point scale.

RESULTS

Low-dose CT with Infinity 70% reconstruction achieved comparable SNR to conventional-dose protocols ($P > 0.05$).The 16cm scan range exhibited superior CNR compared to 8cm ($P < 0.05$).Subjective scores confirmed diagnostic acceptability for low-dose + Infinity 70% (mean score = 3.5/4).

CONCLUSION

Low-dose combined with Infinity reconstruction reduces radiation dose while maintaining diagnostic quality; the 16cm helical coverage is more suitable for combined thoracoabdominal scanning

CLINICAL RELEVANCE/APPLICATION

1.Radiation Reduction: Low-dose protocols with deep learning reconstruction reduce patient exposure while preserving image quality.2.Scan RangeStandardization: A 16cm range ensures comprehensive anatomical coverage and higher CNR, critical for detecting thoracoabdominal emergencies. 3.Workflow Efficiency: This protocol streamlines emergency imaging workflows, reducing rescans and expediting diagnosis.

T5B-SPER-3 AI ENHANCED PROSPECTIVE ACUTE ABDOMEN LOW-DOSE CT: BALANCING IMAGING PROTOCOLS, RADIATION DOSE, IMAGE QUALITY, AND ACCURACY

Andreas Brendlin, MD, PhD (*Presenter*)
Ulrich Schmid (*Abstract Co-Author*)
Saif Afat, MD (*Abstract Co-Author*)

PURPOSE

To identify the optimal low-dose CT protocol that minimizes radiation exposure while preserving high image quality and diagnostic accuracy in patients presenting with acute abdomen.

METHODS AND MATERIALS

A prospective, randomized study was conducted with 180 patients assigned to one of three CT protocols. Each protocol included standard-dose (SD) and low-dose (LD) scans reconstructed using Iterative Reconstruction (IR2) and AI Denoising (AID). Subjective image quality was assessed by radiologists evaluating diagnostic confidence, contrast, and sharpness. Objective image quality metrics, including noise and contrast-to-noise ratio (CNR), were measured. Diagnostic accuracy was evaluated through sensitivity and specificity calculations for detecting abdominal pathologies.

RESULTS

Protocol 2 LD achieved the lowest Size-Specific Dose Estimate (SSDE) at 4.83 mGy, significantly reducing radiation dose compared to Protocols 1 and 3 ($P < 0.001$). AID significantly enhanced subjective image quality in LD scans across all protocols, with Protocols 2 and 3 achieving ratings comparable to HD scans with IR2. Objective assessments showed that AID substantially reduced image noise and increased CNR in LD scans, with Protocol 2 LD exhibiting the highest CNR. In outcome analysis, both Protocols 1 and 2 demonstrated 100% sensitivity and specificity in LD scans with AID, eliminating false negatives and matching the diagnostic performance of SD scans. Protocol 3 maintained high diagnostic accuracy across all doses and reconstruction methods.

CONCLUSION

Protocol 2 with AID emerges as the most effective low-dose CT strategy, offering significant radiation dose reduction while maintaining superior image quality and diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

- Substantial Dose Reduction in Prospective Setting.- HD-Quality Equivalent Imaging from LD Scans.- Diagnostic Reliability Maintained.

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T5B-SPGI

Gastrointestinal Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPGI-1 COMPARING TEST-RETEST REPEATABILITY FOR PDFF ESTIMATION USING THREE ANALYSIS METHODS

Piper Mahn (*Presenter*)
Jacqueline Diep (*Abstract Co-Author*)
Jake Weeks, BS (*Abstract Co-Author*)
Lael Ceriani (*Abstract Co-Author*)
Tanya Wolfson, MS (*Abstract Co-Author*)
Diego Hernando, PhD (*Abstract Co-Author*)
Scott B. Reeder, MD, PhD (*Abstract Co-Author*)
Rohit Loomba, MD, MSc (*Abstract Co-Author*)
Michael S. Middleton, MD, PhD (*Abstract Co-Author*)
Claude B. Sirlin, MD (*Abstract Co-Author*)

PURPOSE

To compare test-retest repeatability of chemical-shift-encoded magnetic resonance imaging (CSE-MRI) for proton density fat fraction (PDFF) estimation using manual, automated segmentation-based, and human-corrected automated segmentation-based analysis in adults with known or suspected metabolic dysfunction-associated steatotic liver disease (MASLD).

METHODS AND MATERIALS

In this prospective, cross-sectional, single-center study, adults with known or suspected MASLD underwent abdominal 3T CSE-MRI (IDEAL-IQ, GE Healthcare) twice in a single imaging visit with complete repositioning between acquisitions. Each acquisition generated water and PDFF parametric images, which were analyzed three ways. First, regions of interest were manually placed in the nine Couinaud segments on water images and propagated to PDFF maps. Second, water images were segmented automatically using a convolutional neural network-based algorithm, and those masks were propagated to PDFF maps. Third, segmentations were corrected manually and propagated to PDFF maps. Researchers performing manual analyses and automated segmentation corrections were blinded to each other's results. Test-retest repeatability for PDFF estimation was assessed using absolute repeatability coefficient (RC), Bland-Altman (BA) bias, and intraclass correlation coefficient (ICC). 95% confidence intervals were computed for each metric. RC, ICC, and magnitude of bias were compared between methods pairwise using bootstrap-based tests. Bonferroni's correction was applied to each set of three tests.

RESULTS

Twenty-eight adults with MASLD were enrolled (11 women) with mean body mass index 35 kg/m 2 (SD 7 kg/m 2 , range 25 to 58 kg/m 2). Mean PDFFs were 11.7±7.1% for automated, 12.1±7.0% for human-corrected automated, and 11.6±7.3% for manual analyses. RC and ICC were better for automated (0.63, 0.999) and human-corrected automated (0.69, 0.999) than for manual analyses (1.18, 0.997) (all $p < 0.003$). BA biases between methods were small (-0.07% to 0.04%), not reaching statistical significance. Automated and human-corrected automated methods did not differ in any of their metrics (p from 0.46 to 0.80).

CONCLUSION

Automated segmentation-based analysis showed higher repeatability than manual analysis for PDFF estimation. Human correction of automated segmentations did not improve repeatability for PDFF estimation. Additional research is needed to generalize these results to PDFF acquisitions across other vendors, field strengths, and sample sizes.

CLINICAL RELEVANCE/APPLICATION

With further development and validation, automated segmentation-based PDFF analysis could replace manual analysis, the current clinical and research standard.

T5B-SPGI-5 THE IMPACT OF DEEP LEARNING IMAGE RECONSTRUCTIONON IMAGE QUALITY AND DIAGNOSTIC CONFIDENCE OF LIVER TUMORS AND INFERIOR VENA CAVA IN IN 40 KEV VIRTUAL MONOCHROMATIC IMAGING

Huang Caijun (*Presenter*)

PURPOSE

To investigate the effect of deep learning image reconstruction (DLIR) on the synchronous visualization of liver tumors and the inferior vena cava (IVC) in 40 keV virtual monochromatic images (VMIs).

METHODS AND MATERIALS

This prospective study enrolled 50 patients who underwent abdominal contrast-enhanced dual energy CT (DECT) imaging, 40 keV VMIs were obtained during the venous phase. Images were reconstructed with different algorithms: filtered back projection (FBP), adaptive statistical iterative reconstruction V (ASIR-V 60%), DLIR-M, and DLIR-H. Measurements included liver SD, lesion-background contrast-to-noise ratio (CNR), IVC SD, and IVC CNR. Two radiologists independently scored image quality, lesion conspicuity, IVC depiction, and diagnostic confidence using a 5-point Likert scale. Lesions were categorized as hypervascular or hypovascular based on blood supply for subgroup analysis. Noise equivalent dose (NED) and image quality index (IQF) were calculated considering image noise and radiation dose.

RESULTS

The smallest SDs of liver and IVC were observed in the DLIR-H group; there was no significant difference between ASIR-V 60% and DLIR-M, though both were lower than FBP. For liver lesion CNR, DLIR-H significantly outperformed ASIR-V 60% and FBP, while no significant difference was found between DLIR-M and ASIR-V 60%. Regarding IVC CNR, DLIR-High was the highest, followed by DLIR-M, then ASIR-V 60%, with FBP showing the lowest. In lesion conspicuity and diagnostic confidence assessments—for both hypovascular and hypervascular tumors—DLIR-H yielded superior scores compared to ASIR-V 60%. For IVC depiction and overall image quality, scores gradually decreased from DLIR-H to DLIR-M, then to ASIR-V 60%, and were lowest in FBP. The NED was lowest in the DLIR-H group, comparable between ASIR-V 60% and DLIR-M, both lower than FBP; conversely, the IQF showed an opposite trend.

CONCLUSION

40 keV VMIs with DLIR-H markedly enhances the visualization and diagnostic confidence of liver tumors and IVC, demonstrating the highest dose-to-image quality efficiency.

CLINICAL RELEVANCE/APPLICATION

The 40 keV VMIs combined with DLIR-H enhanced the visualization of tumors and the inferior vena cava, which may aid in the timely diagnosis and clinical decision-making regarding inferior vena cava thrombosis.

T5B-SPGI-6 DETERMINANTS OF PORTAL VENOUS FLOW IN AN OBESE COHORT

Raphael Tadeu Do Vale Souza, MD (*Presenter*)
Thekla H. Oechtering, MD (*Abstract Co-Author*)
Alma Spahic (*Abstract Co-Author*)
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Luke Funk (*Abstract Co-Author*)
Oliver Wieben, PhD (*Abstract Co-Author*)
Claude B. Sirlin, MD (*Abstract Co-Author*)
Scott B. Reeder, MD, PhD (*Abstract Co-Author*)

PURPOSE

4D flow MRI can be used to assess the portal venous system. However, despite the importance of portal flow to the liver, its drivers are poorly understood. This knowledge gap limits interpreting flow changes in clinical and research settings. This study aims to identify portal flow determinants in patients with obesity undergoing weight loss surgery (WLS) and its association with clinical/imaging biomarkers of liver and metabolic health.

METHODS AND MATERIALS

This IRB-approved study enrolled patients (BMI > 35 kg/m²) undergoing WLS at 2 academic centers. Subjects had 12-hr fasting visits before a pre-surgical diet, 1-2 days pre-surgery, and 12, 26, 52 wks post-surgery. At each visit, height and weight were measured and MRI (3.0T) was performed. A radial 4D flow acquisition was obtained. Two readers measured flow in proximal, middle and distal portal vein cross-sections and calculated mean flow from these planes. Proton density fat-fraction was measured via chemical shift encoded MRI. Liver stiffness was measured via 2D MRE at 60Hz. Corrected T1 (cT1, inflammation marker) was measured with commercial software (Perspectum Diagnostics, Oxford, UK). Liver volumes were calculated via a machine learning segmentation algorithm, adjusted manually by a radiologist. Spearman's ? was calculated between portal flow and measured variables, pooling data from all visits.

RESULTS

105 subjects (90 women; 44 ± 10 years) were enrolled. BMI decreased from 46 ± 7 to 35 ± 7 kg/m 2 1 yr after surgery. 375/413 of exams were included (35 excluded for poor image quality, 3 reconstruction failures). Mean portal flow correlated strongly and positively with liver volume (? = 0.49) and height (? = 0.39). It correlated weakly with weight (? = 0.32), BMI (? = 0.21) and stiffness (? = 0.13). It did not correlate with other markers.

CONCLUSION

Portal flow in patients with obesity is largely governed by structural, not inflammatory, factors. Liver volume shows the strongest correlation, consistent with greater perfusion needed for larger parenchyma. Height also strongly correlates, likely reflecting metabolic scaling with taller stature and thus larger livers. Weight and BMI show weak links, indicating adiposity alone does not proportionally increase portal flow once body size is addressed. Notably, portal flow was not meaningfully affected by liver fat, stiffness, or cT1, suggesting portal hemodynamics are insensitive to hepatic steatosis, low-grade inflammation or fibrosis.

CLINICAL RELEVANCE/APPLICATION

Portal flow scales mainly with liver size and patient height, not BMI or markers of steatohepatitis. Normalizing 4D flow MRI values to liver volume and height may improve patient-specific interpretation and support consistent reporting as clinical adoption of this technique expands.

T5B-SPGI-7 USE OF DARK ATTENUATION ORAL CONTRAST AGENT IMPROVES DELINEATION OF THIN STRUCTURES AT ULTRA-HIGH RESOLUTION AND PHOTON-COUNTING DETECTOR CT

Yuxin Sun, BS, MSc (*Presenter*)
Theresia Aschauer, MD (*Abstract Co-Author*)
Maurice Heimer, MD (*Abstract Co-Author*)
Marisa Martin, MD (*Abstract Co-Author*)
Leo Jia, MD (*Abstract Co-Author*)
Shobhit Sharma, PhD (*Abstract Co-Author*)
Steven Ross, PhD (*Abstract Co-Author*)
Andrew M. Hernandez, PhD (*Abstract Co-Author*)
Zhou Yu, PhD (*Abstract Co-Author*)
Benjamin M. Yeh, MD (*Abstract Co-Author*)

PURPOSE

To assess experimental dark borosilicate contrast material (DBCM) and conventional contrast agents for the delineation of thin structures in a line pair phantom using an EID (energy integrating detector) ultra-high resolution (UHR) and prototype photon-counting detector CT (PCD-CT) scanners.

METHODS AND MATERIALS

A line pair phantom with 11 groups of 4 alternating acrylic bars (120 HU at 120 kV) and 5 slits of equal width with increasing frequency (0.75 to 9.0 lp/cm) was serially filled with 4 different contrast agents (Air: -1000 HU, DBCM: -160 HU, Water: 0 HU, Iodine: 240 HU) and scanned in a body-sized phantom on a UHR EID-CT (Canon Aquilion Precision) and a Canon prototype PCD-CT scanner. Similar acquisition and reconstruction parameters (512 / 1024 matrix, 400 / 200 mm FOV, soft / sharp kernel) were used on both scanners. Four radiologist readers ranked images using a standard abdominal window (W/L=400/40) from best to worst delineation of the acrylic bars, with four consecutive slices randomized from each dataset. Mean rank scores were compared between contrast agents and scan parameters by Friedman's and Wilcoxon signed rank tests.

RESULTS

Mean bar delineation rank scores for DBCM were better than for Air, Water, or Iodine for a 512 matrix with soft kernel at both EID-CT and PCD-CT reconstructions (4.5 ± 2.3 vs. 20.9 ± 8.5, 15.1 ± 3.5, 25.5 ± 2.9, respectively, p<.001 for all). Similarly, DBCM outperformed conventional agents at 1024 matrix with both kernels and both scanners, p<.001 for all. Readers could resolve down to 7.0 LP/cm with DBCM -160, compared to 6.0 (Air), 4.5 (Water), and 3.0 (Iodine 240) LP/cm. Overall, less favorable rank scores were seen with EID-CT, with trend of improved performance at PCD-CT. Pooled data showed significant improvement in mean rank scores with PCD-CT vs. EID-CT (14.4 ± 8.7 vs. 18.0 ± 9.2, p<.001), and sharp vs. soft kernels (15.3 ± 10.1 vs. 17.7 ± 8.3, p<.001) but not for FOV or matrix size.

CONCLUSION

DBCM -160 HU demonstrated the best performance for delineation of bowel fold detail compared to air, neutral, or positive oral agents, regardless of scan resolution, matrix size, or kernel, with further significant improvements seen when used in conjunction with PCD-CT compared to EID-CT.

CLINICAL RELEVANCE/APPLICATION

Oral contrast profoundly affects visualization of thin structures such as bowel folds at abdominal CT, with moderately dark agents outperforming other agents, warranting clinical testing.

T5B-SPGI-8 EVALUATING MRI MULTI-ORGAN SEGMENTATION TOOLS FOR PANCREAS SEGMENTATION IN T1-WEIGHTED MRI

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Vivek Yadav, MS, BEng (*Abstract Co-Author*)
Hayit Greenspan (*Abstract Co-Author*)
Neil M. Rofsky, MD (*Abstract Co-Author*)

PURPOSE

Automated segmentation is crucial for quantitative MRI studies of the pancreas, such as correlating imaging-based biomarkers with different disease states. TotalSegmentator MRI (TS-MRI) and MRISegmenter (MRISeg) have recently been developed and are publicly available AI tools. Since an external validation of their performance has not yet been quantified extensively, this study aims to externally evaluate TS-MRI and MRISeg on a multi-center MRI T1-weighted dataset using the subgroup analysis.

METHODS AND MATERIALS

Using the publicly available PanSegData dataset we accessed 385 T1-weighted MRI scans, each from a unique patient. Scans lacking age, gender, and center information were excluded, resulting in 360 scans available for this retrospective external evaluation. Pancreas segmentation masks predicted with TS-MRI and MRISeg were compared against the radiologist-certified reference standard using Dice score (DSC). DSCs were statistically compared across different genders, ages, and scanner subgroups within each model with a p-value < 0.05 considered statistically significant. Additionally, high-dimensional features were extracted from the bottleneck layer of TS-MRI and MRISeg. These features were projected into a 2-dimensional latent space using principal component analysis (PCA) to reveal the marginal distribution difference for different subgroups.

RESULTS

The mean± std DSC (%) for MRISeg was 0.767+/-0.100, and for TS-MR was 0.684+/-0.150, respectively. MRISeg significantly outperformed TS-MRI using a paired Student's t-test (P<0.001). Within TS-MRI, significant performance differences were only observed comparing gender (P = 0.0012) and age (P = 0.0395) subgroups using Welch's Two Sample t-tests. Similarly, MRISeg's performance significantly differed across genders (P = 0.0015), age (P = 0.0188), and scanner (P = 0.0270) subgroups.

CONCLUSION

Two publicly available MRI multi-organ segmentation tools were externally benchmarked for the pancreas segmentation task with reasonable segmentation performance. Both tools showed heterogeneous performance across different patient subgroups.

CLINICAL RELEVANCE/APPLICATION

Data collected across different clinical settings can contain variations in patient cohorts and data acquisition procedures. This can contribute to performance disparities in publicly available AI segmentation tools. To ensure unbiased and trustworthy deployment of these AI models, conducting subgroup analyses is a critical step for validating model performance and identifying potential risks.

T5B-SPGI-11 TEMPORAL CHANGES IN ABLATED LIVER VOLUME AFTER RADIOFREQUENCY ABLATION EVALUATED BY THREE-DIMENSIONAL VOLUMETRIC COMPUTED TOMOGRAPHY: ASSOCIATION WITH LIVER FUNCTION AND LIVER FIBROSIS

Mayumi Higashi, MD, PhD (*Presenter*)
Masahiro Tanabe, MD (*Abstract Co-Author*)
Katsuyoshi Ito, MD (*Abstract Co-Author*)

PURPOSE

In follow-up CT after radiofrequency ablation (RFA) for hepatocellular carcinoma (HCC), some cases show a significant reduction in low-density areas after ablation, while others do not. This study evaluated the association between the degree of shrinkage of the ablated liver area over time after RFA and clinical parameters including laboratory data related to liver function and liver fibrosis.

METHODS AND MATERIALS

Patients with HCC who underwent RFA and follow-up abdominal contrast-enhanced multiphasic dynamic CT were included. Three-dimensional (3D) volumetric CT measurements of the ablated area in the liver were performed on portal-phase images. Based on the volume of the ablated area (AAV) on CT images obtained within 1 week and around 6 months after RFA, the reduction rate of AAV was calculated. The reduction rate of AAV was compared among the categories of Child-Pugh classification, modified albumin-bilirubin (mALBI) grade, FIB-4 index, and lesion location using two sample t -test and one-way analysis of variance. Simple linear regression and multiple regression analyses were conducted to assess the correlation between the reduction rate of AAV and clinical data.

RESULTS

Fifty-three lesions in 41 patients were evaluated. The reduction rate of AAV in Child-Pugh B group was significantly lower than in Child-Pugh A group (58.9 ± 7.9% vs. 70.9 ± 12.6%, p < 0.001). The reduction rate of AAV in mALBI grade 2b group (58.9 ± 9.9%) was significantly lower than in grade 1 (76.3 ± 8.7%) and grade 2a (72.2 ± 10.4%) groups (p < 0.001 and p = 0.008, respectively). In addition, the reduction rate of AAV was significantly different among the three FIB-4 index range groups (FIB-4 < 1.3, 81.8 ± 12.0%; 1.3 to = 2.67, 70.6 ± 11.6%; and > 2.67, 64.8 ± 12.3%; p = 0.040). Moreover, the reduction rate of AAV in medial and anterior segments was significantly lower than in lateral segment (62.8 ± 12.2% vs. 73.9 ± 12.4%, p = 0.037). The simple linear regression analysis showed that the reduction rate of AAV was significantly correlated with aspartate aminotransferase (AST), cholinesterase, albumin, total bilirubin (T-Bil), prothrombin time, platelet count, and FIB-4 index (p < 0.05). Then, the multiple regression analysis showed that albumin was most strongly associated with the reduction rate of AAV (p < 0.001), followed by T-Bil (p = 0.008).

CONCLUSION

The reduction rate of AAV tended to be decreased in patients with impaired liver function and significant liver fibrosis. The shrinkage of the liver area over time after ablation is suggested to be due to maintained liver regenerative reserve.

CLINICAL RELEVANCE/APPLICATION

Liver regeneration after ablation therapy can be expected in patients with preserved liver function, and can be assessed by the follow-up 3D volumetric CT.

T5B-SPGI-12 ENHANCED LARGE LANGUAGE MODEL FOR AUTOMATED EXTRACTION AND CLASSIFICATION OF LIVER OBSERVATIONS FROM UNSTRUCTURED AND STRUCTURED RADIOLOGY REPORTS

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Nick Xing (*Abstract Co-Author*)
Kang Wang, MD,PhD (*Abstract Co-Author*)
Yang Yang, PhD (*Abstract Co-Author*)
Michael A. Ohliger, MD, PhD (*Abstract Co-Author*)

PURPOSE

We investigated whether a privacy-preserving large language model could be used for automated extraction and categorization of liver observations following the Liver Imaging Reporting and Data System (LI-RADS) system for CT and MRI. Further categorization capabilities were explored through the use of Retrieval-Augmented Generation (RAG), which enhances categorization through external information sources, such as the LI-RADS® v2018 CT/MRI Core document.

METHODS AND MATERIALS

321 abdominal CT and MRI radiology reports containing LI-RADS liver observations dated between 3/29/2024-7/10/2024 were retrospectively gathered. A subset of 100 reports was selected for detailed analysis. Patient privacy was maintained using a secure HIPAA-compliant institutional instance of GPT 4-o. Major LI-RADS characteristics were extracted by the LLM: size, location, imaging characteristics, and LI-RADS category. The ground truth was established by a medical student with the guidance of an abdominal radiologist. Accuracy was assessed per report, requiring complete correctness of extracted information. For RAG analysis, we used LI-RADS censored reports. LLM then classified liver observations using characteristics, with the assistance of RAG, following LI-RADS guidelines, with or without the assistance of the LI-RADS document.

RESULTS

The study included 100 reports (CT vs MRI: 50/50; unstructured vs. structured reports: 73/27). In total, 222 liver observations were collected. ChatGPT accurately extracted liver observations from 92% of the reports. Errors in the remaining 8 reports were due to omitted lesions, inaccurate notation of major LI-RADS characteristics, and inaccurate LI-RADS scores. After report censoring, the LLM with RAG accurately classified 73% of liver observations following LI-RADS. Incorporation of the LI-RADS document with RAG improved accuracy to 84%.

CONCLUSION

ChatGPT exhibits high accuracy in extracting major LI-RADS characteristics from unstructured and structured reports. Additionally, it shows capability in categorizing liver observations following LI-RADS guidelines. This result is amplified with the addition of RAG. Further enhancement could allow for large databases for longitudinal tracking of liver observations and LI-RADS classification.

CLINICAL RELEVANCE/APPLICATION

In the future, LLMs can be utilized to generate multi-institutional LI-RADS databases for longitudinal surveillance of patients.

T5B-SPGI-13 ASSESSMENT OF CONTRAST ENHANCEMENT BOOSTING TECHNIQUES IN LOW-CONCENTRATION ABDOMINAL CT: VENDOR-AGNOSTIC VERSUS VENDOR-SPECIFIC APPROACHES

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PURPOSE

This study aimed to compare the quantitative and qualitative image quality between vendor-agnostic and vendor-specific contrast-enhanced (CE) boosting techniques in low-concentration contrast media settings, relative to standard-dose contrast media.

METHODS AND MATERIALS

A retrospective analysis was conducted on 80 patients (mean age, 64 ± 10 years; range, 34-85 years; 61 men). Two iodinated contrast concentrations were compared: 350 mg I/mL (standard-dose) and 270 mg I/mL (low-concentration). Both vendor-agnostic and vendor-specific CE-boost methods were applied to the low-concentration contrast group. Quantitative image quality metrics—including image noise, CT attenuation, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), noise power spectrum (NPS), and image sharpness—were evaluated. Additionally, qualitative image quality was assessed using a Likert scale by two independent radiologists.

RESULTS

Both the vendor-agnostic and vendor-specific boosting methods significantly ($p < 0.001$) reduced image noise and improved CT attenuation, SNR, and CNR in both vessels and liver lesions within the low-dose group, compared to the standard-dose group. The vendor-specific method was more effective at suppressing high-frequency noise, whereas the vendor-agnostic boost yielded sharper images. Subjective image analysis revealed no significant differences in vessel enhancement between either boosting method and the standard-dose contrast media group.

CONCLUSION

Both vendor-agnostic and vendor-specific CE-boost methods effectively enhance image quality and CT attenuation in low-concentration contrast media. The vendor-agnostic method demonstrated superior image sharpness, while the vendor-specific method was more efficient at reducing structured noise, presenting viable alternatives to reduce contrast dose and minimize the risk of nephropathy.

CLINICAL RELEVANCE/APPLICATION

Both boosting methods showed comparable efficacy in enhancing vessel and liver lesion conspicuity, though the vendor-specific boost method exhibited slightly superior image noise suppression and lower artificial sensation. The use of low-concentration contrast media can significantly reduce the risk of adverse events associated with high-dose contrast administration, such as nephropathy, especially in vulnerable populations.

T5B-SPGI-14 NOMOGRAM FOR PREDICTING POSTOPERATIVE COMPLICATIONS IN COLORECTAL CANCER FOLLOWING NEOADJUVANT TREATMENT USING CT HISTOGRAM AND BODY COMPOSITION ANALYSIS

Ting LU (*Presenter*)

PURPOSE

To assess the predictive value of CT-derived histogram features and body composition parameters for postoperative complications (POCs) in colorectal cancer (CRC) patients after neoadjuvant treatment (NAT), and to establish a nomogram for individualized risk stratification.

METHODS AND MATERIALS

This retrospective study included CRC patients who underwent NAT and subsequent surgery between January 2016 and December 2024. CT histogram parameters in the venous phase and body composition parameters at Pre- and Post-NAT stages were extracted using FireVoxel and SliceOmatic software. Parameters included tumor volume, mean, entropy, kurtosis, visceral fat area (VFA), visceral adipose index (VAI), intramuscular fat area (IMFA), and skeletal muscle index (SMI). Delta values (?) were calculated to reflect treatment-induced changes. Logistic regression with forward stepwise selection identified independent predictors of POCs. A multiparameter prediction model (Model_COMB) was built and visualized as a nomogram. Model performance was evaluated by area under the ROC curve (AUC), sensitivity, and specificity, with comparison to individual predictors using the DeLong test. Model calibration and clinical benefit were assessed by calibration curves and decision curve analysis (DCA).

RESULTS

Among 133 eligible patients, 42 (31.58%) developed grade = II POCs (Clavien-Dindo classification). Logistic regression analysis identified six independent predictors of POCs: dyslipidemia (OR = 4.34, P = 0.011), combined organ resection (OR = 10.79, P = 0.047), post-NAT tumor kurtosis (OR = 1.014, P = 0.015), ?tumor volume (OR = 1.008, P = 0.035), Post-IMFA (OR = 0.860, P = 0.012), and post-VAI (OR = 1.043, P < 0.001). The combined model (Model_COMB) demonstrated superior diagnostic performance with an AUC of 0.805 (95% CI: 0.724-0.887), sensitivity of 69.0%, and specificity of 82.4%, significantly outperforming any individual predictor (P < 0.05). Calibration plots showed good agreement between predicted and observed outcomes, and DCA confirmed improved net clinical benefit.

CONCLUSION

CT histogram and body composition metrics provide complementary value in predicting POCs in CRC patients after NAT. The proposed nomogram enables early identification of high-risk individuals, supporting proactive perioperative management and personalized care strategies.

CLINICAL RELEVANCE/APPLICATION

This integrated imaging-based model offers a noninvasive, quantitative approach to postoperative risk assessment in CRC, potentially guiding treatment planning and improving surgical outcomes in CRC patients undergoing NAT.

T5B-SPGI-15 SPLIT-BOLUS INJECTION PROTOCOL IN PHOTON-COUNTING DETECTOR CT OF THE UPPER ABDOMEN: IMPROVED IMAGE QUALITY COMPARED TO CONVENTIONAL INJECTION PROTOCOL IN ENERGY-INTEGRATING DETECTOR CT

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Takeru Yamaguchi, MD, PhD (*Abstract Co-Author*)
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Izumi Imaoka, MD (*Abstract Co-Author*)
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PURPOSE

Split-bolus injection protocol involves multiple contrast injections followed by a single scan, allowing the combined-phase images in a single acquisition. Photon-counting detector CT (PCD-CT) offers improved X-ray detection sensitivity expected to enhance iodine contrast compared with energy-integrating detector CT (EID-CT). This study aimed to evaluate whether split-bolus injection protocol in PCD-CT improves contrast enhancement of the upper abdomen without increasing the amount of contrast agent compared with conventional injection protocol in EID-CT.

METHODS AND MATERIALS

This retrospective study included 42 postoperative patients with pancreatobiliary disease (23 men; mean age, 73.5 years) who underwent both PCD-CT (NAEOTOM Alpha) with split-bolus injection and EID-CT with conventional injection (mean interval, 163 days). The split-bolus injection protocol was optimized using a physiology-based contrast enhancement simulation software. Total amount of contrast agent (450mgI/kg) and acquisition timing (80 s after injection) were identical between the two protocols. Image noise of the paraspinal muscle, CT values and signal-to-noise ratio (SNR) of aorta (Ao), portal vein (PV), superior mesenteric vein (SMV), liver and pancreas were measured at 70 keV and 60 keV for PCD-CT and at 120 kVp for EID-CT. Contrast-to-noise ratios (CNRs) were calculated for liver-to-lesion, and perivascular tissue-to-Ao and -PV. Qualitative image quality was assessed using a 5-point Likert scale for overall image quality, image noise, soft tissue contrast, and vessel contrast. Quantitative and qualitative results were compared between PCD-CT and EID-CT.

RESULTS

CTDI vol and DLP were comparable between PCD-CT and EID-CT. Image noise was significantly lower in PCD-CT at 70 keV (P <.001). At 70 keV, CT values of Ao, PV, and pancreas (P <.001-.047) and SNRs of all objects (P<.001-.038) were significantly higher. At 60 keV, all CT values and SNRs were significantly higher in PCD-CT (P <.001 for all). CNRs of perivascular tissue-to-Ao and -PV were significantly higher in PCD-CT at both 70 keV and 60 keV (P=<.001-.048). No significant difference in liver-to-lesion CNR was observed (P=.076-.145). Qualitative scores were significantly better for all items at 70 keV and 60 keV (P<.01 for all), except for image noise at 60 keV (P=.553).

CONCLUSION

Split-bolus injection protocol in PCD-CT improved contrast enhancement of the upper abdomen without increasing the amount of contrast agent compared with conventional injection protocol in EID-CT.

CLINICAL RELEVANCE/APPLICATION

Split-bolus injection in PCD-CT may serve as an optimal strategy for follow-up imaging to evaluate recurrence and metastasis in postoperative patients with pancreatobiliary diseases.

T5B-SPGI-16 PREOPERATIVE T STAGING OF COLON CANCER USING CT COLONOGRAPHY WITH SEPARATE EVALUATION OF THE MESENTERIC AND ANTIMESENTERIC SIDES

YUTO TANNO (*Presenter*)
Mototaka Miyake, MD, PhD (*Abstract Co-Author*)

PURPOSE

Accurate preoperative T staging is essential for determining the appropriate treatment strategy for colorectal cancer, including surgical procedure and the need for preoperative treatment. However, distinguishing between T2, T3, and T4 stages preoperatively remains challenging. We routinely perform preoperative imaging evaluations using computed tomographic colonography (CTC). Considering that the colon wall comprises two anatomical environments-the mesenteric and antimesenteric sides-we hypothesized that applying different methods for each side could improve the accuracy of depth evaluation.

METHODS AND MATERIALS

Patients with colon cancer who underwent preoperative CTC and surgery between July 2015 and December 2021 were enrolled in this study. Patients with retroperitoneal tumors, those who received preoperative treatment, and those with Tis lesions or a history of post-endoscopic resection were excluded. A total of 681 cases of colon cancer located from the cecum to the sigmoid colon were included. The CTC images were independently interpreted by a radiologist and a colorectal surgeon. In cases of discordance, a consensus diagnosis was reached through discussion, and then compared with the corresponding pathological findings.

RESULTS

Tumor locations: cecum (10.6%),ascending colon (25.1%),transverse colon (14.2%),descending colon (6.2%),sigmoid colon (43.9%). Tumors were on the mesenteric side in 67% and on the antimesenteric side in 33%. Gross classifications: type 0 (17%),type 1 (6.3%),type 2 (72.8%),type 3 (3.1%),type 5 (0.7%). The median interval between CTC and surgery was 29 days (IQR 21-42). Pathological T stages: pTis (0.9%),pT1 (13.1%),pT2 (19.2%),pT3 (55.4%),pT4a (9.5%),pT4b (1.9%). T staging accuracy for both sides were 87.1% for Tis-T2, 80.2% for T3, and 90.6% for T4a. On the mesenteric side, the accuracy were 87.7% for Tis-T2, 81.4% for T3, and 93.2% for T4a. On the antimesenteric side, the accuracy were 87.7% for Tis-T2, 81.4% for T3, and 84.9% for T4a. The overall right answer rate were 78.6% for both sides, 80.9% on the mesenteric side, and 73.8% on the antimesenteric side. Notably, the negative predictive value(NPV) for pT4a was 95.7% on the mesenteric side and 92.3% on the antimesenteric side.

CONCLUSION

Separate evaluation of the mesenteric and antimesenteric sides using CTC enables accurate preoperative T staging in colon cancer, with the high NPV for T4a.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that CTC achieves high diagnostic accuracy by independently evaluating the mesenteric and antimesenteric sides of the colon wall. Notably, the high NPV for T4a suggests that CTC can reliably rule out serosal invasion, thereby helping to avoid unnecessary aggressive interventions.

T5B-SPGI-17 PREDICTION OF CHEMOTHERAPY RESPONSE IN PANCREATIC DUCTAL ADENOCARCINOMA USING RADIOMICS OF IODINE-BASED MATERIAL DECOMPOSITION IMAGES: A PROSPECTIVE MULTICENTER STUDY

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PURPOSE

To evaluate whether radiomic features of pancreatic phase iodine-based material decomposition (MD) images derived from dual-energy CT can predict chemotherapy response in pancreatic ductal adenocarcinoma (PDAC).

METHODS AND MATERIALS

In this prospective multicenter study, we analyzed 71 participants (median age, 72 years; 39 men) with untreated, histologically confirmed PDAC who underwent pre-treatment pancreatic protocol dual-energy CT and subsequent systemic chemotherapy between January 2019 and November 2022 from four institutions. Iodine-based MD images at pancreatic phase were reconstructed with vendor-provided MD algorithms. Manual 3D tumor segmentation was performed by two radiologists using ITK-SNAP software. Texture analyses and machine learning modeling were conducted at another institution, where didn't provide case data, blinded to clinical data and treatment outcomes. In total, 1,196 features consisted of 247 first-order features and 949 second-order features were input into the prediction model of chemotherapy response using PyRadiomics. After outlier removal (±2 SD), correlation filtering ($r > 0.95$), and normalization, a random forest classifier was trained with an 8:2 train-test split and stratified 5-fold cross-validation. Hyperparameter tuning was performed using Optuna. Feature importance was assessed using Shapley additive explanations (SHAP). Interobserver reproducibility was evaluated using the Dice similarity coefficient.

RESULTS

Based on RECIST version 1.1, 25 participants were classified as responders (CR + PR) and 46 as non-responders (SD + PD). The prediction model of chemotherapy response achieved an area under the curve of 0.840 (95% confidence interval [CI]: 0.630-1.000), accuracy of 0.733 (95% CI: 0.480-0.891), sensitivity of 0.800, specificity of 0.700, positive predictive value of 0.571, and negative predictive value of 0.875. The most influential SHAP features included Gray Level Dependence Matrix (GLDM) Dependence Non-Uniformity Normalized (LoG sigma, 3mm, 3D) and GLDM Dependence Variance (original), indicating tumor heterogeneity as a key predictive factor. Interobserver reproducibility of segmentation was high, with a mean Dice coefficient of 0.927.

CONCLUSION

Radiomics of pancreatic phase iodine-based MD images from pre-treatment dual-energy CT accurately predicted subsequent chemotherapy response in PDAC and may help guide early treatment decisions.

CLINICAL RELEVANCE/APPLICATION

This non-invasive and accessible imaging-based approach may aid in early stratification of patients with PDAC undergoing systemic chemotherapy.

Nov. 30 – Dec. 4
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T5B-SPGU

Genitourinary Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPGU-1 REALITY CHECK FOR RADIOMICS: READER-DERIVED PROSTATE CANCER FEATURES DIVERGE FROM HISTOPATHOLOGY-REGISTERED GROUND TRUTH

Omer Esengur, MD (*Presenter*)
Stephanie A. Harmon, PhD (*Abstract Co-Author*)
David Gelikman (*Abstract Co-Author*)
Enis Yilmaz, MD (*Abstract Co-Author*)
Hunter Stecko (*Abstract Co-Author*)
Emma Stevenson (*Abstract Co-Author*)
Sandeep Gurram (*Abstract Co-Author*)
Bradford J. Wood, MD (*Abstract Co-Author*)
Peter Pinto (*Abstract Co-Author*)
Peter L. Choyke, MD (*Abstract Co-Author*)
Baris Turkbey, MD (*Abstract Co-Author*)

PURPOSE

To evaluate whether radiomics features derived from radiologist-annotated prostate lesions align with ground truth labels registered from whole-mount radical prostatectomy (RP) histopathology.

METHODS AND MATERIALS

This retrospective study included patients who underwent biparametric MRI between 2013 and 2022 (n = 180; 120 cases, 60 controls). All cases underwent subsequent RP. Six radiologists independently annotated lesion diameters across 120 scans (80 cases, 40 controls), with each scan reviewed by four readers. Circular segmentations were generated from the diameters in both non-expanded (single slice) and expanded (±1 slice) forms using a separate algorithm. Additionally, a single expert genitourinary (GU) radiologist manually segmented the cases prospectively. Whole-mount RP specimens were processed using patient-specific molds, and lesions were mapped and graded by an expert GU pathologist. A deep learning-based registration pipeline (ProsRegNet) was used to align cancer labels accurately onto MRI. Radiomics features (n=321) were extracted with PyRadiomics from both reader-derived and pathology-matched lesion segmentations following preprocessing (z-score normalization, low-variance feature removal, and Pearson correlation filtering). Uniform manifold approximation and projection (UMAP) was used to visualize feature distributions. Euclidean distances in UMAP space and Spearman correlations were calculated between pathology and each alternate segmentation source.

RESULTS

Pathology-based lesions formed distinct clusters. Expert manual contours showed closer proximity to pathology distributions; diameter-based contours showed broader variability. Expansion slightly improved clustering but did not improve alignment ($p = .65$). Expert manual contours were significantly closer to pathology than either expanded or non-expanded reader segmentations (both $p < .0001$). However, only 3 features from expert contours showed strong correlation with pathology (? = .6), while diameter-based contours had none. Texture and shape features showed poor reproducibility across all sources.

CONCLUSION

Radiomics features derived from radiologist-drawn diameters diverge substantially from pathology-aligned ground truth. Even expert manual contours, despite better global alignment, demonstrated limited feature-level reproducibility. These findings call for a redefinition of validation practices in radiomics, emphasizing pathology-anchored ground truth in study design.

CLINICAL RELEVANCE/APPLICATION

Radiomics research methodology must be rethought through the lens of histopathology-registered ground truth, as even expert-drawn contours fail to reproduce pathology-aligned features consistently.

T5B-SPGU-2 PROSTATE CANCER GROWTH KINETICS ON SERIAL MRI: VOLUME DOUBLING TIME AND PROGRESSION DURING ACTIVE SURVEILLANCE

Jeong Min Song, MD (*Presenter*)
Kye Jin Park, MD, PhD (*Abstract Co-Author*)
Mi Yeon Park, MD (*Abstract Co-Author*)
Sung Bin Park, MD, PhD (*Abstract Co-Author*)
Mi-Hyun Kim (*Abstract Co-Author*)
Jeong Kon Kim, MD (*Abstract Co-Author*)

PURPOSE

Understanding the volume doubling time (VDT) and growth kinetics of prostate cancer (PCa) is crucial for differentiating aggressive from indolent tumors and determining optimal MRI intervals. This study aimed to evaluate the growth kinetics and VDT of PCa using serial MRI scans and to assess time to radiologic progression using the Prostate Cancer Radiological Estimation of Change in Sequential Evaluation (PRECISE) criteria.

METHODS AND MATERIALS

Patients undergoing active surveillance (AS) or watchful waiting for prostate cancer who had at least two consecutive prostate MRI examinations prior to radical treatment between April 2016 and February 2022 were retrospectively analyzed. Three-dimensional tumor volumes were segmented on T2-weighted MRI images with reference to diffusion-weighted imaging and dynamic contrast-enhanced imaging to calculate VDT. VDT and prostate-specific antigen doubling time (PSADT) were compared across Gleason grade (GG) groups. Radiologic progression was defined as PRECISE scores of 4 or 5 on sequential MRIs. Kaplan-Meier analysis and log-rank tests were used to compare the time to radiologic progression between rapidly growing (VDT <1 year) and slowly growing tumors (VDT =1 year).

RESULTS

A total of 88 patients (mean age, 67.9 years; mean PSA, 6.4 ng/mL) with 287 prostate MRIs were evaluated. VDT and PSADT exhibited considerable variability within Gleason grade groups, with overall median values of 542 days (IQR, 284-1537) and 715 days (IQR, -336-1984), respectively. VDT showed significantly less variability compared to PSADT (P < .001). High-grade PCa (GG 4-5) demonstrated significantly shorter median VDT (293 days) compared to GG 1 (601 days) and GG 2-3 (568 days). Radiologic progression occurred in 50% of patients, with a median time to progression of 798 days. Patients with VDT <1 year exhibited significantly faster radiologic progression (median, 455 days) compared to those with VDT >1 year (P = .001), whereas PSADT was not significantly associated with radiologic progression (P = .066).

CONCLUSION

Tumor VDT exhibited substantial heterogeneity even among tumors within the same Gleason grade groups; however, it demonstrated less variability than PSADT and tended to be shorter in higher-grade tumors. Serial MRI-derived VDT may serve as a useful indicator to differentiate rapidly growing from indolent tumors in PCa.

CLINICAL RELEVANCE/APPLICATION

Prostate cancer demonstrates diverse growth kinetics, ranging from indolent to relatively rapidly growing tumors, and such behaviors can be effectively captured through serial MRI. Understanding tumor growth kinetics can inform optimal MRI scan intervals and treatment decisions, enabling individualized management and surveillance strategies.

T5B-SPGU-4 CT LYMPHANGIOGRAPHY AND MRTD FINDINGS OF CHYLOUS LEAKAGE IN THE REPRODUCTIVE SYSTEM

Jixue Feng (*Presenter*)
Rengui Wang, MD (*Abstract Co-Author*)

PURPOSE

To investigate computed tomography lymphangiography (CTL) and magnetic resonance thoraic ductography (MRTD)in patients with chylous leakage in the reproductive system.

METHODS AND MATERIALS

A total of 49 patients with genital chylous leakage without obvious causes were retrospectively collected, including vaginal chylous leakage (11 cases) and perineal chylous leakage (38 cases). The clinical manifestations were vaginal milky fluid overflow, perineal vesicles with rupture, perineal swelling with exudation. All patients underwent CT and MRTD examination of chest, abdomen and pelvis after direct lymphangiography (DLG). The imaging manifestations were analyzed. Analysis of abnormal deposition and distribution of CTL lipiodol: ? Neck: end of thoracic duct and right lymphatic duct; ? Chest: hilum and mediastinum; ? Abdomen: lumbar trunk, renal region, mesentery; ? Pelvic: whether to the contralateral reflux, reflux path, scrotum or labia, perirectal, periuterine, perivesical, iliac trunk. The imaging findings of pelvic lymphatic malformations were classified into dilated type, cystic type, swollen type and mixed type. The constituent ratio of categorical variable data was used for statistical description.

RESULTS

CTL of 49 patients showed abnormal deposition of lipiodol in different sites: ? Neck: the end of thoracic duct in 23 cases (46.9%), the end of right lymphatic duct in 9 cases (18.4%). ? Chest: hilar 9 cases (18.4%), mediastinum 16 cases (32.7%); ? Abdominal: lumbar trunk 47 cases (95.9%), renal region 16 cases (32.7%), mesentery 24 cases (49.0%). ? Pelvic: 43 cases (87.8%). Reflux path: The anterior approach was used in 37 cases (75.5%), pelvic cavity in 30 cases (61.2%), pelvic floor in 11 cases (22.4%), posterior approach in 21 cases (42.9%), scrotum or labia in 42 cases (85.7%), perirectal in 19 cases (38.8%), periuterine in 15 cases (30.6%), perivesical in 17 cases (34.7%) and iliac trunk in 48 cases (98.0) %). The imaging findings of 49 patients with pelvic lymphatic malformations were classified as dilated type in 25 cases (51.0%), cystic type in 1 case (2.0%), swollen type in 4 cases (8.2%), and mixed type in 19 cases (38.8%).

CONCLUSION

Chylous leakage in the reproductive system is a systemic lymphatic disorder. CTL and MRTD can clearly show the range, location and degree of lymphatic abnormalities, and clearly show the tissues and organs in the chest, abdomen and pelvis, which provide valuable imaging information for the diagnosis of chylous leakage in the reproductive system.

CLINICAL RELEVANCE/APPLICATION

CTL and MRTD can determine the extent and degree of chylous leakage in the reproductive system, which is of great value in the diagnosis and treatment of chylous leakage in the reproductive system.

T5B-SPGU-5 CLINICAL IMPACT OF ^{68}GA-PSMA PET/CT IN PROSTATE CANCER: IDENTIFICATION OF MESORECTAL LYMPH NODE METASTASES AND IMPLICATIONS FOR STAGING AND TREATMENT

Madiha Hijazi, MD (*Presenter*)
Joe Rizkallah (*Abstract Co-Author*)
Omar El Sardouk (*Abstract Co-Author*)
Elia Abou Chawareb (*Abstract Co-Author*)
Nina Saliba (*Abstract Co-Author*)
Albert El Hajj (*Abstract Co-Author*)
Alain S. Abi-Ghanem, MD (*Abstract Co-Author*)
Mohamad B. Haidar, MD (*Abstract Co-Author*)

PURPOSE

68Ga-PSMA PET/CT is increasingly used for initial staging in prostate cancer due to its superior ability to detect radiotracer-avid lymph nodes, including those in atypical pelvic regions often missed on conventional imaging. This study aimed to assess the clinical significance of mesorectal lymph node metastases detected by 68Ga-PSMA PET/CT in prostate cancer and their impact on staging, treatment decisions, and outcomes.

METHODS AND MATERIALS

We retrospectively reviewed 575 patients with prostate cancer who underwent 68Ga-PSMA PET/CT for staging between 2016 and 2024. PET/CT reports were assessed for uptake in the mesorectal group. Initial prostate-specific antigen (PSA) levels, Gleason score, treatment modalities, and mortality were compared between patients with and without mesorectal involvement. Functional upstaging was defined as the initiation of radiation, chemotherapy, or novel hormonal therapy following PET/CT findings. Statistical analyses included Mann-Whitney U and Fisher's exact tests.

RESULTS

Mesorectal lymph node involvement was identified in 97 of 575 patients (16.9%). These patients had significantly higher PSA levels (median 32.7 vs. 12.45 ng/mL, $p < 0.001$), higher all-cause mortality (8.2% vs. 1.3%, $p < 0.001$), and higher prostate cancer-specific mortality (3.1% vs. 0.2%, $p = 0.016$). Functional upstaging occurred in 57.7% of patients with mesorectal lymph node involvement, who were also less likely to undergo surgery (25.3% vs. 34.2%, $p = 0.015$). Gleason score did not significantly differ between groups (median 7 vs. 7, $p = 0.541$).

CONCLUSION

Mesorectal lymph node metastases detected by 68Ga-PSMA PET/CT are associated with higher PSA, increased mortality, and treatment intensification. Their detection frequently alters initial management plans, shifting patients from surgical treatment toward systemic or multimodal therapy.

CLINICAL RELEVANCE/APPLICATION

68Ga-PSMA PET/CT reveals clinically significant mesorectal lymph node metastases not routinely captured on conventional imaging. These findings drive treatment changes and highlight the value of 68Ga-PSMA PET/CT in precise staging and decision-making in modern prostate cancer care.

T5B-SPGU-6 CONTRAST ENHANCEMENT FLOW THRESHOLDS IN DIFFERENTIATING CLEAR CELL AND PAPILLARY RENAL CANCER AND ONCOCYTOMA WITH KIDNEY PERFUSION CT

Sara Babapour, MD (*Presenter*)
Alex Chung, MD (*Abstract Co-Author*)
James W. Sayre, PhD,MS (*Abstract Co-Author*)
Grace Li (*Abstract Co-Author*)
Jonathan Haimowitz (*Abstract Co-Author*)
Luke Phan (*Abstract Co-Author*)
Steven S. Raman, MD (*Abstract Co-Author*)

PURPOSE

To distinguish qualitative flow range differences in perfusion CT (CTp) contrast for differentiation of clear cell renal cell carcinoma (ccRCC) from papillary RCC (pRCC) and oncocytoma (Onc).

METHODS AND MATERIALS

A pilot cohort of 74 consecutive patients who underwent CTp (Force, Siemens Healthineers (SH), Erlangen, Germany) for a known or suspected indeterminate solid renal mass. Regions of interest ROIs were drawn on the most enhancing portion of the mass and normal ipsilateral & contralateral renal cortex on virtual reconstructions of the non-contrast, corticomedullary, & nephrographic phases were generated using Syngo Via (SH, Malvern, PA). Absolute peak Hounsfield Units (HU) values and relative values normalized by ipsilateral kidney cortex (IpCx) and contralateral kidney cortex were generated to construct the perfusion curves. Perfusion parameters were compared by a two-tailed paired sample t-test between tumors & ipsilateral cortex. Each lesion and the relevant ipsilateral kidney cortex were compared in a paired t-test among subtypes.

RESULTS

Of 74 patients who underwent pCT, 48, 12 & 14 were ccRCC, pRCC & Onc, respectively. Contrast flow and intensity thresholds were shown as a combined graph in Figure 1. Significant differences between peak ccRCC lesions within ipsilateral cortex maximum signal intensity in non-contrast and corticomedullary phases, compared to Onc lesions, paired t test in nephrogenic and excretory phases were <0.01. On the other hand, papillary maximum peak signal intensity was significantly lower than other evaluated subtypes (<0.01). As for mean enhancement, thresholds were significantly different in all phases for the three subtypes except non-contrast.

CONCLUSION

This pilot study represents CTp enhancement curves qualitatively in pathology prediction and further clinical decision making for the three most common renal lesions.

CLINICAL RELEVANCE/APPLICATION

CT perfusion qualitative parameters differ by renal mass histological subtype and may help characterize and predict malignant and benign common solid renal lesions if validated.

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T5B-SPHN

Head & Neck Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPHN-1 BENIGN THYROID NODULE APPEARANCE ON POST-RADIOFREQUENCY ABLATION ULTRASONOGRAPHIC IMAGING

Joshua Foster (*Presenter*)
Marisela Neff (*Abstract Co-Author*)
Cameron Lin (*Abstract Co-Author*)
Jack Lin (*Abstract Co-Author*)
Nikita Sharma (*Abstract Co-Author*)
Erik D. Hilborn, MD (*Abstract Co-Author*)
Jagteshwar S. Sandhu, MD (*Abstract Co-Author*)
Zoe A. Miller, MD (*Abstract Co-Author*)

PURPOSE

Thyroid nodules (TNs) affect an estimated 67% of the global population and may cause symptoms such as dysphagia, dysphonia, globus sensation, and pain. For symptomatic patients with benign TNs, radiofrequency ablation (RFA) is becoming a preferred treatment. As a relatively new treatment option, post-RFA management requires further exploration. Post-RFA TNs often show reduced volume, irregular margins, and higher TI-RADS scores on ultrasonographic (US) imaging. These findings may be interpreted as malignant, complicating management. This study investigates how benign TNs appear on US imaging at 1 and 3 months post-RFA.

METHODS AND MATERIALS

A single-center retrospective study was conducted with 10 patients (8 female, median age 46) and a total of 13 benign nodules treated with RFA. All patients had at least 2 negative biopsies prior to undergoing RFA. Ultrasound imaging was performed at 1 and 3 months post-RFA. Pre-procedure data included nodule volume (cm3), TI-RADS score, Bethesda category, US characteristics, and symptom, vascular, and cosmetic scores. At 1 and 3 months post-RFA, recorded data included nodule volume, volume reduction ratio (VRR), post-procedure symptoms, and follow-up ultrasound characteristics.

RESULTS

Of the 13 nodules treated, 11 were located in the right lobe, 1 left, and 1 in the isthmus. The median pre-procedure nodule volume was 17.35 cm3 (IQR 9.11-35.22), with a symptom score of 5 (IQR 1-6), vascularity score of 2 (IQR 1-2), and cosmetic score of 3 (IQR 2-4). At 1 month post-RFA, the volume reduced to 13.35 cm3 (IQR 4.90-18.85), with a median VRR of 50.47% (IQR 18.97-60.61). Symptom, vascularity, and cosmetic scores improved to medians of 2, 1, and 2, respectively. By 3 months post-RFA, volume decreased to a median of 6.86 cm3 (IQR 4.36-17.11), with a VRR of 53.58% (IQR 47.25-57.97). Pre-procedure nodules were frequently solid, hyperechoic/isoechoic, wider-than-tall, and well circumscribed. Post-RFA ultrasound demonstrated a variety of features including hypoechoic, heterogeneous nodules with lobulated margins, mild peripheral/internal vascularity, and occasional comet-tail artifacts. Imaging also revealed suspicious features, including coarse calcifications and punctate echogenic foci. One pre-RFA TI-RADS 3 nodule was reclassified as TI-RADS 5 at 1 month post-RFA.

CONCLUSION

RFA effectively reduces nodule size and symptoms in benign TNs. However, post-RFA ultrasound images may demonstrate new and suspicious findings, potentially leading to diagnostic uncertainty.

CLINICAL RELEVANCE/APPLICATION

Radiologists and clinicians must recognize post-RFA imaging features to avoid unnecessary interventions and ensure appropriate management.

T5B-SPHN-2 DEEP LEARNING MODEL FOR AUTOMATED SEGMENTATION AND PATHOLOGY CLASSIFICATIONS FOR CLIVAL TUMORS

Fnu Harshit (*Presenter*)
Tolga Tasdizen, PhD (*Abstract Co-Author*)
Karen L. Salzman, BS, MD (*Abstract Co-Author*)
Blair A. Winegar, MD (*Abstract Co-Author*)
Robert Rennert (*Abstract Co-Author*)
Tyler Richards, MD (*Abstract Co-Author*)

PURPOSE

This is a single institution pilot study to develop a deep learning based pipeline to automate segmentation and predict tumor pathology of skull base tumors involving the clivus.

METHODS AND MATERIALS

Multisequence axial MR images of adult patients with clival tumors were collected retrospectively from a single institution. Clival tumors were ?1.0 cm in axial diameter with confirmed pathology of either a “primary” clival mass including chordoma, chondrosarcoma, invasive pituitary neuroendocrine tumor (PitNET), nasopharyngeal carcinoma, meningioma with osseous invasion or “secondary” pathology including lymphoma, multiple myeloma/plasmacytoma, or metastasis. Individual examinations had images co-registered between series and 3D tumor segmentations performed by a board certified neuroradiologist. Images underwent intensity normalization and resampling to uniform voxel size and data augmentation. The segmentation model was trained on a customized 3D UNet architecture and utilized transfer learning by initializing the model with pre-trained weights from a brain tumor segmentation (BraTS) challenge model for 5000 iterations. A classification model to predict tumor pathology as “primary” or “secondary” was developed using image level features extracted from the fine-tuned 3D UNet segmentation model. The UNet from the segmentation model was repurposed to extract deep, case-specific feature representations. These extracted features served as input for a linear classifier, specifically designed to predict tumor subtype. The classifier was trained using a cross-entropy loss function.

RESULTS

MR imaging from 120 patients with clival tumors (63.3% primary tumors; n=76) were collected for training and testing of the deep learning models. The classification model with highest performance was a single channel T2 input, which achieved a DSC of 0.56 at a pixel level. The single channel T2 input also achieved the highest performance for the classification model, achieving an F1-score of 0.89 and accuracy of 0.80.

CONCLUSION

This study demonstrates promising potential for developing an automated deep learning based pipeline for segmentation and tumor pathology prediction for clival tumors. Larger multi-institutional datasets are necessary to improve performance and generalizability of the models.

CLINICAL RELEVANCE/APPLICATION

Clival masses due to systemic malignancy require whole body imaging for staging and are treated systemically and possibly with radiation therapy; while primary tumors of the clivus are treated with surgical resection. A reliable deep learning diagnostic model has the potential to streamline imaging workup and guide appropriate surgical and systemic treatment for clival masses.

T5B-SPHN-4 AI-ENHANCED NOISE REDUCTION IN CBCT IMAGING OF THE TEMPOROMANDIBULAR JOINT: IMPACT ON IMAGE QUALITY

Wojciech Kazimierczak, MD, PhD (*Presenter*)
Natalia Chwarscianek (*Abstract Co-Author*)
Natalia Kazimierczak (*Abstract Co-Author*)
Roza Wajer, MD (*Abstract Co-Author*)
Adrian Wajer (*Abstract Co-Author*)
Zbigniew Serafin (*Abstract Co-Author*)

PURPOSE

Temporomandibular joint disorder (TMD) is a common medical condition. Cone beam computed tomography (CBCT) is effective in assessing TMD-related bone changes, but image noise may impair diagnosis. Emerging deep learning reconstruction algorithms (DLRs) could minimize noise and improve CBCT image clarity. This study compares standard and deep learning-enhanced CBCT images for image quality in detecting osteoarthritis-related degeneration in TMJs (temporomandibular joints). This study analyzed CBCT images of patients with suspected temporomandibular joint degenerative joint disease (TMJ DJD).

METHODS AND MATERIALS

The DLM reconstructions were performed with ClariCT.AI software. Image quality was evaluated objectively via CNR in target areas and subjectively by two experts using a five-point scale. Both readers also assessed TMJ DJD lesions. The study involved 50 patients with a mean age of 28.29 years.

RESULTS

Objective analysis revealed a significantly better image quality in DLM reconstructions (CNR levels; $p < 0.001$). Subjective assessment showed high inter-reader agreement (? = 0.805) but no significant difference in image quality between the reconstruction types ($p = 0.055$). Lesion counts were not significantly correlated with the reconstruction type ($p > 0.05$).

CONCLUSION

The analyzed DLM reconstruction notably enhanced the objective image quality in TMJ CBCT images but did not significantly alter the subjective quality or DJD lesion diagnosis. However, the readers favored DLM images, indicating the potential for better TMD diagnosis with CBCT, meriting more study.

CLINICAL RELEVANCE/APPLICATION

This research supports the inclusion of AI-based noise optimization in CBCT TMJ imaging as a valuable tool to increase diagnostic accuracy, improve patient safety and standardize imaging quality in dental practice and maxillofacial surgery.

T5B-SPHN-5 WHAT TO EXPECT FROM ABLATED CERVICAL LYMPH NODES: INSIGHTS FROM A CLINICAL TRIAL USING MULTIPARAMETRIC ULTRASOUND

Pedro Naime B. Araujo I, MD (*Presenter*)
Erick F. Santos, MD (*Abstract Co-Author*)
Miriam Tsunemi (*Abstract Co-Author*)
Maria Cristina Chammas, MD, PhD (*Abstract Co-Author*)
Ricardo M. Freitas, MD, PhD (*Abstract Co-Author*)

PURPOSE

To improve radiologic interpretation and follow-up strategies based on multiparametric ultrasound (US) changes in ablated cervical lymph nodes of papillary or medullary thyroid cancer (PTC/MTC) treated with radiofrequency ablation (RFA), laser ablation (LA), or cryoablation (CA).

METHODS AND MATERIALS

This randomized trial analyzed 121 metastatic lymph nodes from 84 patients undergoing RFA, LA, or CA. Multiparametric US (B-mode, Doppler, B-flow, shear wave elastography [SWE], and contrast-enhanced ultrasound [CEUS]) was performed at baseline, 6, 12, and 24 months. Two independent evaluators assessed structural changes, vascularization, perfusion, and stiffness. Statistical analysis included repeated measures ANOVA, Kruskal-Wallis tests, and interobserver agreement (ICC, Kappa statistics).

RESULTS

Structural changes (B-mode) Volume significantly decreased over time ($p<0.001$), mostly within 6 months, with no differences among techniques ($p>0.05$). Echogenicity increased ($p=0.0415$) more in LA-treated nodes. Calcifications increased at 6 months in LA ($p=0.0001$), suggesting heat-induced response. Vascularization (Doppler/B-flow) Significant reduction at 6 months ($p<0.05$), with no differences among techniques ($p>0.05$). Tissue stiffness (SWE): SWE values decreased over time, especially in RF-treated nodes, while LA showed a progressive increase in stiffness. Perfusion dynamics (CEUS) Perfusion significantly decreased at 6 months ($p=0.0281$), with no technique-related differences ($p>0.05$). Histological subtypes and response PTC exhibited greater volume reduction than MTC ($p<0.01$). Reproducibility: Excellent agreement for quantitative parameters (ICC>0.9 for volume/vascularization). Qualitative assessments had a high interobserver agreement (Kappa>0.8, $p<0.001$). Predictors of volume reduction (logistic regression analysis): Baseline CEUS parameters were independent predictors of volume reduction after ablation ($p < 0.05$ for all). The logistic regression model demonstrated discriminative ability (AUC = 0.716), supporting CEUS as a potential biomarker of treatment response.

CONCLUSION

Multiparametric US effectively characterizes post-ablation changes. Most changes occur within 6 months and stabilize. High interobserver agreement reinforced this imaging-based follow-up strategy's reproducibility and clinical applicability. A CEUS-based predictive model demonstrated discriminative ability for treatment response.

CLINICAL RELEVANCE/APPLICATION

Findings establish expected post-ablation US patterns, aiding radiologists in differentiating treatment response from tumor persistence, optimizing follow-up, and reducing unnecessary biopsies.

T5B-SPHN-6 NEW SYSTEM FOR RAPID AUTOMATIC DIAGNOSIS OF THYROID PATHOLOGY WITHOUT A RADIOLOGIST OR SONOGRAPHER

Adam Dykie, MD (*Presenter*)
Evan El-Halawani (*Abstract Co-Author*)
Denes Szekeres, BS (*Abstract Co-Author*)
Aaron Yang (*Abstract Co-Author*)
Timothy M. Baran, PhD (*Abstract Co-Author*)
Yu Zhao, MD (*Abstract Co-Author*)
Deborah J. Rubens, MD (*Abstract Co-Author*)
Benjamin Castaneda (*Abstract Co-Author*)
Luis Revilla (*Abstract Co-Author*)
Kevin J. Parker, PhD (*Abstract Co-Author*)
Thomas Marini, MD (*Abstract Co-Author*)

PURPOSE

Thyroid disease is a prevalent healthcare issue worldwide, with evaluation often complicated by limited access to ultrasound services. Volume sweep imaging (VSI) is a technique that can be used by operators without formal training to assess the thyroid gland. Standardized sweeps of the ultrasound probe are performed over the neck based on external landmarks and saved as cine clips for subsequent interpretation. In this study, we evaluated thyroid ultrasound VSI as a diagnostic tool to measure thyroid size as well as nodule presence and size, with the goal of increasing access to imaging.

METHODS AND MATERIALS

Ultrasound-naïve medical students scanned patients at an outpatient imaging clinic using an iQ+ ultrasound probe (Butterfly Network, Burlington, MA) with thyroid VSI after undergoing a two-hour training. The cines were saved to a cloud for review. At the same visit, patients underwent a standard of care (SOC) exam of the thyroid performed on a high end Logiq E10 ultrasound (General Electric, Boston, MA) by an experienced sonographer. The thyroid lobes and isthmus were measured on VSI, and the SOC measurements were used as a reference standard. Comparison was made between VSI (interpreted by a radiology resident) and SOC (interpreted by a radiology attending) for thyroid size and nodule assessment.

RESULTS

Medical students scanned 274 patients using the VSI protocol. There was good agreement between SOC and VSI measurements of the thyroid, with all comparisons showing minimal absolute magnitude of difference. Representative examples include the right thyroid lobe in anteroposterior (AP) dimension, which was 1.78±0.53 cm on SOC versus 1.79±0.52 cm on VSI, with a mean discrepancy (VSI-SOC) of 0.004 cm (-0.024-0.032 cm 95% confidence interval (CI), p=0.79), and the left lobe in AP dimension (SOC: 1.55±0.54 cm, VSI: 1.59±0.50 cm, mean discrepancy: 0.044 cm (0.018-0.07 cm 95% CI, p=0.001)). Of the nodules identified on SOC, 87.8% (266/303) were also visualized on VSI. Nodule measurements also showed good agreement between SOC and VSI, with AP measurement of the largest nodule as a representative example (SOC: 1.14±0.66 cm, VSI: 1.12±0.63 cm, discrepancy: -0.023 cm (-0.047-0.0002 cm 95% CI, p=0.052)).

CONCLUSION

Thyroid VSI performed by ultrasound-naïve medical students after a short training allowed excellent assessment of thyroid size. There was detection of nearly 90% of thyroid nodules seen on SOC with good agreement on nodule size.

CLINICAL RELEVANCE/APPLICATION

VSI shows potential to assess and identify thyroid abnormalities and follow them over time. This approach could be improved and refined to provide diagnostically accurate low-cost assessment of the thyroid, improving health outcomes and increasing access to imaging in the global community.

T5B-SPHN-7 DEEP LEARNING IMAGE RECONSTRUCTION IN ULTRA-LOW-DOSE PARANASAL SINUS CT: SUPERIOR NOISE REDUCTION AND SHARPNESS OVER HYBRID IR

Chuluunbaatar Otgonbaatar, MD (*Presenter*)
Sangil Suh, MD, PhD (*Abstract Co-Author*)
Hackjoon Shim, PhD (*Abstract Co-Author*)
Dakyong Lee (*Abstract Co-Author*)
Juneho Choi (*Abstract Co-Author*)
Hei-Jung Jang (*Abstract Co-Author*)
Inseon Ryoo, MD (*Abstract Co-Author*)
Hye Na Jung, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to assess the quantitative and qualitative performance of ultra-low-dose computed tomography (CT) of the paranasal sinuses reconstructed using deep learning-based reconstruction (DLR), in comparison with hybrid iterative reconstruction (IR), for preoperative imaging.

METHODS AND MATERIALS

In this retrospective study, 132 patients who underwent non-contrast ultra-low-dose paranasal sinus CT (effective dose: 0.03 mSv) were included. Image datasets were reconstructed using both hybrid IR and DLR. Quantitative image quality parameters—, image noise, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), noise power spectrum (NPS), and a no-reference perceptual image sharpness index—were objectively evaluated. Additionally, two board-certified radiologists independently conducted subjective image quality assessments.

RESULTS

The ultra-low-dose CT protocol achieved a markedly reduced radiation exposure (effective dose: 0.03 mSv). DLR yielded significantly lower image noise (28.62 ± 4.83) compared to hybrid IR (140.70 ± 16.04, $p < 0.001$). Moreover, DLR significantly enhanced both SNR (22.47 ± 5.82 vs. 9.14 ± 2.45, $p < 0.001$) and CNR (71.88 ± 14.03 vs. 11.81 ± 1.50, $p < 0.001$). NPS analysis indicated a reduction in both noise magnitude and peak frequency components with DLR. The DLR method also exhibited significantly greater image sharpness (no-reference perceptual sharpness metric: 0.56 ± 0.04) than hybrid IR (0.36 ± 0.01). Subjective assessments revealed that radiologists consistently rated DLR as superior in terms of overall image quality, delineation of bony structures, including the frontal recess, middle turbinate, ostium of the maxillary sinus, and ethmoidal infundibulum, and diagnostic confidence.

CONCLUSION

Deep learning-based reconstruction substantially outperformed hybrid iterative reconstruction in ultra-low-dose paranasal sinus CT by reducing image noise, enhancing SNR and CNR, improving image sharpness, and preserving essential anatomical detail. These findings suggest DLR as a promising technique for preoperative evaluation with minimal radiation exposure.

CLINICAL RELEVANCE/APPLICATION

Ultra-low-dose CT with deep learning reconstruction should be considered for preoperative planning, as it provides sufficient image quality for evaluating fine anatomical structures while minimizing patient exposure to unnecessary radiation. Additionally, DLR preserves image quality for detecting subtle inflammatory changes and visualizing bony erosions, which are critical for clinical decision-making, including determining the need for surgical intervention or conservative medical management.

T5B-SPHN-8 A CLINICO-RADIOMICS MODEL FOR PREDICTING CAROTID BODY TUMOR INVASIVENESS IN HIGH-ALTITUDE PATIENTS

Rui Fan (*Presenter*)
Yuntai Cao, MS (*Abstract Co-Author*)

PURPOSE

Carotid body tumor (CBT) is vascular neoplasms linked to chronic hypoxia and genetic predisposition. High-altitude regions show increased CBT incidence due to hypoxia-induced carotid body hyperplasia. The situation is further exacerbated by insufficient medical resources and limited health awareness, which collectively contribute to heightened vulnerability within these populations, causing significant public health challenges. In this study, the radiomic features from computed tomography angiography (CTA) images were fused with clinical characteristics to predict the vascular or capsular invasion in CBT for patients residing in high-altitude regions.

METHODS AND MATERIALS

We analyzed 114 patients who underwent unilateral CBT resection with preoperative CTA, split into training (n=80) and validation (n=34) cohorts. Radiomic features were extracted from CTA images and refined through univariate analysis, correlation analysis, and LASSO algorithm. Tumor contour expansion by 3 mm was tested to optimize predictive performance. Invasion prediction models were developed using Logistic Regression, Random Forest, and Support Vector Machine algorithms, and evaluated via ROC curves, calibration curves, and decision curves.

RESULTS

The clinico-radiomic model achieved an area under the curve (AUC) of about 0.907 (0.799-1.000) on the validation cohort. A visual nomogram has been developed to enable rapid assessment of vascular or capsular invasion by clinicians in high-altitude regions.

CONCLUSION

We developed a clinico-radiomics fusion model for predicting vascular or capsular invasion in CBT for patients residing in Qinghai-Tibet plateau. This non-invasive approach enables preoperative assessment of vascular or capsular invasion in CBT, thereby facilitating more informed treatment strategy selection and surgical risk assessment.

CLINICAL RELEVANCE/APPLICATION

This non-invasive approach enables preoperative assessment of vascular or capsular invasion in CBT, thereby facilitating more informed treatment strategy selection and surgical risk assessment, especially for high-altitude populations with a higher incidence of CBT.

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Nov. 30 – Dec. 4
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T5B-SPIN

Imaging Informatics Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPIN-2 MULTILINGUAL VOICE-TO-TEXT TRANSCRIPTION OF CT AND MRI REPORTS USING GPT-4O: A FEASIBILITY STUDY

Philipp Prucker, MD (*Presenter*)
Felix Busch, MD (*Abstract Co-Author*)
Sebastian Ziegelmayer, MD (*Abstract Co-Author*)
Keno K. Bressem, MD (*Abstract Co-Author*)
Lisa C. Adams, MD, PhD (*Abstract Co-Author*)
Marcus R. Makowski (*Abstract Co-Author*)

PURPOSE

Large language models (LLMs) offer potential for automating and streamlining radiology reporting workflows. With the release of GPT-4o, a multimodal LLM capable of processing both text and speech, it may now be feasible to use such models as voice recognition tools for radiology reporting across multiple languages. This proof-of-concept study evaluates the feasibility and performance of GPT-4o for automated voice-to-text transcription of radiology reports in English and German.

METHODS AND MATERIALS

Three readers with varying levels of radiology experience each dictated 100 synthetic radiology reports in both English and German using GPT-4o via a mobile application. Reports covered CT and MRI studies across various anatomical regions. Transcribed reports were evaluated for error type (e.g., technical, typographical), severity (minor vs. major), and correction time. Semantic similarity and content overlap were assessed using BERTScore and ROUGE metrics, respectively, comparing the transcribed output with the original reports.

RESULTS

Error rates were comparable between languages, with most errors being minor (92.7% in German; 94.7% in English) and either technical or typographical in nature. No significant difference in correction time was found between languages; however, correction time varied by reader experience. BERTScore values were significantly higher for German reports, while ROUGE metrics showed no significant differences, indicating similar structural fidelity across languages.

CONCLUSION

GPT-4o demonstrates strong potential for multilingual voice-to-text transcription of radiology reports, with high semantic accuracy and minimal error rates in both English and German. Reader experience affected correction efficiency, but overall model performance was consistent across languages.

CLINICAL RELEVANCE/APPLICATION

Multimodal LLMs like GPT-4o may serve as cost-effective, language-agnostic alternatives to traditional medical speech recognition tools. Their use could enhance radiology workflow efficiency, particularly in multilingual settings or low-resource environments.

T5B-SPIN-7 IMPLEMENTING VISION TRANSFORMERS FOR THORAX RADIOGRAPHY: OPPORTUNITIES AND CHALLENGES

Sardi Hyska, MD (*Presenter*)
Michael Ingrisch (*Abstract Co-Author*)
Tobias Lasser (*Abstract Co-Author*)
Bastian Sabel, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to assess the performance of a Vision Transformer (ViT)- based AI model, trained on publicly available chest radiography datasets, when applied to real-world clinical data. The model’s performance in detecting pleural effusion, pneumothorax, cardiomegaly and consolidation was evaluated. Furthermore, various saliency maps were used to gain insight into model decisions and uncover potential confounders.

METHODS AND MATERIALS

The ViT, pre-trained on ImageNet and fine-tuned on over 700,000 public chest X-rays (CXR), was tested on an internal dataset of 113 CXR, including 23 pneumothorax, 29 cardiomegaly, 31 consolidation, 52 pleural effusion and 29 normal cases. Performance metrics included ROC curves, AUC, Youden index, sensitivity and specificity. To analyze confounding factors logistic regression, odds ratios and Fisher’s exact test were used.

RESULTS

The model correctly identified all normal CXR. It performed strongly on pleural effusion, reaching 96.2 % sensitivity and 98.4 % specificity. In contrast, pneumothorax detection was poor, with only 26.1 % sensitivity, despite 96.7 % specificity; saliency maps exposed pneumothorax size and visible thoracic tubes as statistically significant confounding factors. For cardiomegaly, the model detected 55.2 % of cases (96.4 % specificity), missing nearly half of true positives, whereas a concomitant pleural effusion, obscuring the heart contours, acts as a potential confounder. Consolidation was detected with 45.2 % sensitivity and 91.5 % specificity; denser consolidations were significantly more reliably identified, implicating consolidation density as a key confounder.

CONCLUSION

Implementing an AI model trained on public datasets into clinical workflows poses significant challenges, even when the model employs an advanced algorithm and was trained on vast amounts of data. While the ViT excelled at recognizing pleural effusion and normal CXRs, its sensitivity for pneumothorax, cardiomegaly, and consolidation was limited. Known confounders in other AI architectures, such as visible thoracic tubes for pneumothorax detection, were confirmed, and several new confounders, e. g. concomitant pleural effusions in cardiomegaly and consolidation density, were identified via analysis of saliency maps.

CLINICAL RELEVANCE/APPLICATION

These findings underscore the necessity of careful, real-world validation and interpretability assessment before clinical deployment. The limited sensitivity and the existence of several confounders emphasize the need for radiologists to interpret AI decisions in context and for AI developers to refine training data and model calibration. Integrating these insights into clinical workflows can support the design of more robust AI models.

T5B-SPIN-8 CLINICAL STUDY ON A DEEP LEARNING-BASED MRI-PDFF RADIOMICS-CLINICAL COMBINED MODEL FOR PREDICTING NAFLD GRADING

Dan-Dan Deng (*Presenter*)

PURPOSE

With changes in lifestyle and dietary habits, the global prevalence of non-alcoholic fatty liver disease (NAFLD) has been increasing. Accurate diagnosis of NAFLD grading (mild, moderate, severe) is crucial for treatment decisions. This study aims to develop a non-invasive MRI-PDFF-based radiomics-clinical combined model to predict NAFLD grading and improve diagnostic accuracy.

METHODS AND MATERIALS

A total of 120 patients with NAFLD confirmed by pathology and MRI-PDFF from 2023 to 2025 were enrolled (training/validation set = 80/40). Clinical and laboratory data were collected. Optimal clinical features were selected through univariate and multivariate logistic regression. A total of 107 radiomics features were extracted from MRI-PDFF images, and high-level semantic features were obtained using a 3D ResNet deep learning network. Key features were screened via LASSO regression and SHAP analysis to construct a random forest classification model. Model performance was evaluated using five-fold cross-validation, ROC curves, decision curves, and calibration curves.

RESULTS

The optimal clinical features included diabetes, HDL, LDL, TG, and CHO. Key radiomics features comprised texture heterogeneity (GLCM entropy) and skewnes and so on. The radiomics-clinical combined model achieved AUCs of 0.88 (mild), 0.91 (moderate), and 0.87 (severe) in the validation set, significantly outperforming conventional imaging diagnosis (AUC 0.75, $p<0.01$) and the standalone radiomics model (AUC 0.82, $p<0.01$). Interpretability analysis demonstrated that the combined model had superior diagnostic efficacy compared to conventional imaging and the MRI-PDFF radiomics model alone.

CONCLUSION

The MRI-PDFF-based radiomics-clinical combined model accurately predicts NAFLD grading, providing a non-invasive tool for personalized treatment. Future multicenter prospective validation will facilitate clinical translation.

CLINICAL RELEVANCE/APPLICATION

The natural progression of NAFLD patients can evolve from non-alcoholic fatty liver (NAFL) to non-alcoholic steatohepatitis (NASH), which may lead to liver fibrosis and eventually progress to cirrhosis. Therefore, early identification of the severity of NAFLD is crucial for clinical intervention to prevent fatty liver from developing into steatohepatitis. Radiomics offers a potential non-invasive approach for classifying NAFLD. Studies have shown that MRI-derived proton density fat fraction (MRI-PDFF) has the potential to replace liver biopsy as the gold standard for NAFLD diagnosis and grading. The new MRI radiomics-clinical combined model is more accurate than MRI-PDFF and can effectively measure the severity of NAFLD, thereby replacing the invasive liver biopsy.

T5B-SPIN-9 GRAPH-BASED AUTOMATED LESION TRACKING IN CANCER FOLLOW-UP USING 3D SIAMESE NEURAL NETWORKS ON ARBITRARY FIELD-OF-VIEW CT SCANS

Angel Alberich-Bayarri, MS, PhD (*Presenter*)
Alejandro Vergara Richart (*Abstract Co-Author*)
Ana Jimenez-Pastor (*Abstract Co-Author*)

PURPOSE

There is a lack of automated and reliable tools to automatically track lesion changes over time. The primary goal of this work was to address the automatic tracking of lesions in the thoracoabdominal region across time points through 3D-Siamese Neural Networks (3DSNN) and graph-based algorithms.

METHODS AND MATERIALS

A retrospective dataset of 740 longitudinal CT exams from metastatic NSCLC patients was used, with a high variability in lesion location, including lungs, lymph nodes, liver, bone, adrenal glands (39.70%, 33.79%, 10.89%, 5.23%, 3.64%, respectively) and volume (0.1-1000cm 3). First, A 3DSNN architecture was used to extract similarity scores (SS) between tumor pairs. The input to the network was a lesion-centered patch, and various configurations were evaluated, including the full 2D image, the lesion mask, and different lesion scales. Multiple strategies were tested including training from scratch, fine-tuning pretrained ResNet/Transformer architectures, and applying data augmentation techniques. An 80/20 training/test split was implemented, assuring comparable heterogeneity in terms of lesion size and location in both sets. Second, a bipartite graph was created using consecutive scans, with lesions as nodes and SS as edge features. Hungarian and ILP graph-based algorithms were assessed to track lesions across time points.

RESULTS

The best-performing 3DSNN model for lesion matching employed multiple lesion scales and the ResNet50 from scratch, achieving 95.47%/ 96.04%/94.89% in accuracy/sensitivity/specificity on the test set. The Hungarian algorithm for lesion tracking achieved accuracy/sensitivity/specificity of 90.0%/100.0%/83.33%, 81.97%/96.72%/67.21%, and 69.0%/95.28%/47.04% when the first time point contained 2, 5, and 10 lesions, respectively. We found robust metrics for stable lesions, while the tracking of appearing or disappearing lesions led to a slight decrease in performance.

CONCLUSION

3DSNNs and graphs are promising and reliable techniques to accurately track tumor lesions over consecutive time points, regardless of lesion size and region. Future work aims to improve appearing/disappearing lesions tracking via 3DSNNs and graph neural networks.

CLINICAL RELEVANCE/APPLICATION

Automate lesion tracking to streamline treatment response reporting, such as RECIST-1.1and others.

T5B-SPIN-10 AI-ASSISTED COMPRESSED SENSING WITH GADOXETIC ACID ENHANCEMENT FOR EVALUATING COLORECTAL LIVER METASTASES IN COMPLEX HEPATIC BACKGROUNDS: A PROSPECTIVE 5T MRI STUDY

Zhao Xiaoer (*Presenter*)

PURPOSE

To evaluate the diagnostic performance of 5 T multimodal MRI with AI-assisted Compressed Sensing (ACS)and gadoxetic acid-enhanced MRI (EOB-MRI) for CRLM detection while accurately assessing hepatic backgrounds, particularly for lesions =10mm.

METHODS AND MATERIALS

In this prospective, single-center study, 35 patients (26 men; mean age, 61.6±1.7 years) with 118 CRLM identified by MRI were evaluated following chemotherapy. MRI at 5 T included T1W in/out-of-phase imaging with proton density fat fraction (PDFF), Susceptibility Weighted Imaging with Fast Technique (uSwift), and a standard EOB-

MRI protocol with high resolution 3D isotropic T1W FSPGR hepatobiliary phase (HBP)using ACS(ACS- HBP) (acquisition voxel 1.2 mm^3, reconstructed voxel 0.6 mm^3, 300 slices). Assessment included hepatic steatosis (T1W in/out-of-phase imaging, PDFF-derived FF maps), hepatic iron overload (uSWIFT, PDFF-generated R2* mapping), sinusoidal obstruction syndrome (EOB-MRI portal venous and HBP), and CRLM diagnostic performance (combined EOB-MRI and DWI). Statistical analysis included inter-rater agreement (kappa statistic), diagnostic metrics (sensitivity, PPV, ROC-AUC), and generalized estimating equations for CRLM detection factors and diagnostic performance comparison, with Bonferroni correction for multiple comparisons ($p<0.01671$).

RESULTS

For CRLM detection, combined ACS- HBP and DWI sequences demonstrated superior diagnostic performance with highest sensitivity (97.2%) and positive predictive value (93.8-95.7%), particularly for small lesions (=10mm) with sensitivity of 95.7% compared to DWI alone (66.0%), GEE analysis showed hepatic background factors (SOS, HIO, fatty liver) and prior CRLM local treatment history had no significant impact on diagnostic performance (all $P > 0.05$).On HBP, lesions showed target or anti-target signs, with 93.5% (101/108) of all true positive lesions detected, including 84.6% (44/52) of lesions smaller than 10 mm.

CONCLUSION

ACS-integrated 5 T EOB-MRI demonstrates superior CRLM diagnostic performance with high sensitivity and PPV across hepatic backgrounds, including =10mm lesions.

CLINICAL RELEVANCE/APPLICATION

Detection of colorectal liver metastases (CRLM) is challenging in complex hepatic backgrounds caused by chemotherapy-associated liver injury (CALI) and prior local treatment of CRLM, necessitating advanced imaging modalities capable of providing both precise lesion detection and CALI assessment.

T5B-SPIN-11 PREDICTING PEDIATRIC RADIOLOGY PATIENTS NO-SHOWS AND EXTENDED WAIT-TIMES USING LLMS, REGRESSION, AND TREE BASED MODELS

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Xuan Liu (*Abstract Co-Author*)
Bo Gong, MD,MSc (*Abstract Co-Author*)
Laura Belsito (*Abstract Co-Author*)
Birgit B. Ertl-Wagner, MD, PhD (*Abstract Co-Author*)
Farzad Khalvati, PhD, MSc (*Abstract Co-Author*)

PURPOSE

Patients missing appointments (no-shows) is a persistent issue that often results in idle resources while delaying critical patient prognosis. Likewise, long wait times (longer than 1 hour) frustrate patients, especially pediatric patients, worsening their impressions on appointments. We conducted experiments using machine learning to predict pediatric radiology patients no-shows and long wait-times to assist scheduling teams in preparing and optimizing for these negative appointment experiences.

METHODS AND MATERIALS

Using REB-approved retrospective diagnostic imaging data from a pediatric hospital (154,935 processed datapoints ranging from 2018 to 2023), we experimented with 6 algorithms and 20 features including patient demographics and appointment specific data, trained on each task separately. These algorithms included XGBoost, Random Forest (RF), Support Vector Machine (SVM), Logistic Regression (LR), Artificial Neural Network (ANN), and ClinicalBERT, a large language model (LLM) which could better use homogenous contextual appointment data such as the reason for exam. Our LLM model pipeline augmented the tabular data into continuous text strings to leverage the bi-directional architecture and transfer learning. Finally, we utilized isotonic regression to calibrate predicted probabilities as usable risk metrics.

RESULTS

The XGBoost model had the greatest combination of the area under the ROC curve (AUC) and F1 scores (0.96 and 0.62, respectively) for predicting no-shows. For predicting long wait-times, the RF and LLM had the greatest AUC scores (0.83 and 0.82, respectively) and F1 scores (0.61 and 0.62, respectively). When analyzing feature importance, integrating contextual data into the LLM boasted a 51% improvement in F1 performance when given a reason for exam in its input. Additionally, for high risk (90% threshold) event predictions, XGBoost had the greatest no-show precision at 93%, while the RF and LLM had the greatest wait-time precision at 96%.

CONCLUSION

Our results improved performance over state-of-the-art methods, introduced a unique methodology to use LLMs on heterogeneous data within this domain, and demonstrated the importance of contextual appointment level data over solely using patient demographic features.

CLINICAL RELEVANCE/APPLICATION

The proposed model predictions can be used as stochastic input for risk-based optimized scheduling. This has the immediate application of providing more information for scheduling teams to make informed decisions with further applications through optimization. This ultimately provides targeted alternatives in equitable care for those who are at risk of negative appointment experiences.

T5B-SPIN-12 QUANTIFICATION OF IMPROVED RESIDENT PERFORMANCE ON TRAUMA RADIOGRAPHS WITH THE STANDARDIZED ELECTRONIC LEARNING LIBRARY AND APPLICATION PLATFORM (STELLA)

Eddy Zandee van Rilland, MD (*Presenter*)
Kathryn J. Stevens, MBBS, FRCR (*Abstract Co-Author*)
Marc H. Willis, DO, MMM (*Abstract Co-Author*)
Joshua Leaston (*Abstract Co-Author*)
Christopher F. Beaulieu, MD, PhD (*Abstract Co-Author*)

PURPOSE

To quantify the effectiveness of a standardized, case-based foundational curriculum for radiology residents using STELLA tools that enable objective assessments of interpretive accuracy.

METHODS AND MATERIALS

PGY-2 radiology residents on their first (radiograph-centric) musculoskeletal rotation were provided with a case-based foundational curriculum. On day 1, trainees completed a baseline "pre-test" composed of 12 "real world" trauma cases, by creating a free-text simulated report and placing arrows on perceived abnormalities using STELLA software. During the 4-week rotation, weekly one-on-one resident/faculty teaching sessions were performed across 4 topics: trauma, arthritis, hardware, and tumors. Each session included a standardized pre-reading assignment and an interactive case-based session involving 20 high-yield cases (independent of those used for testing). On the final day of the rotation, residents completed a "post-test" of 12 independent trauma cases. Pre- and post-test responses were scored using a 4-point scale reflecting both text and graphic annotation accuracy. Automated data collection included pre- and post-test mean scores (%), mean performance increase (%), normalized gain (%), question-level analysis, and resident feedback. Statistical analysis included paired t-test (significance set at $p<0.05$).

RESULTS

Eight PGY-2 radiology residents completed all components of the foundational curriculum. All 8 (100%) residents demonstrated improvement in scores between the pre-test and post-test with a mean increase in score of 30% ($p=0.00001$). The mean pre-test score was 52% (range 29-63%) and the mean post-test score was 82% (range 65-100%). Mean normalized gain, representing the percentage of available improvement that was achieved between the pre- and post-test, was 64% (range 37-100%). Question level analysis was performed to identify common areas of weakness and case appropriateness for future improvement and precision teaching. Additional task-focused modules for arthritis, hardware, and tumors have been built into STELLA.

CONCLUSION

This trauma-focused project shows the potential for a foundational teaching curriculum to improve resident skills. Moreover, it motivates use of blinded, quantitative assessment using STELLA. Similar curricula and related case sets are being developed for other radiology subspecialties and training levels.

CLINICAL RELEVANCE/APPLICATION

Continued improvement in radiology education, including the utilization of case-based learning and objective assessments is essential for trainees to achieve high levels of professional competence.

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Abstract Archives of the RSNA, 2025

T5B-SPIR

Interventional Radiology Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPIR-1 SAFETY AND EFFICACY OF ULTRASOUND-GUIDED PERCUTANEOUS TRANSTHORACIC NEEDLE BIOPSY, A RETROSPECTIVE ANALYSIS OF 3015CONSECUTIVE PATIENTS

Mengjun Shen (*Presenter*)

PURPOSE

To determine the extent to which risk factors influence the incidence of complications in ultrasound-guided percutaneous transthoracic needle biopsy and to report our clinical experience with this procedure.

METHODS AND MATERIALS

A total of 3015 patients underwent lung biopsy (males 69.85%, n=2106; females 30.15%, n=909). We recorded actual complications and assessed the following risk factors: gender, age (<50 years, =50 years), lesion size (longest diameter: <3 cm, =3 cm), lesion location (upper and middle lobes, lower lobe), lesion nature (benign, malignant), biopsy method, number of biopsy cuts (=2 times, >2 times), cutting needle size, whether a coaxial needle was used, operator experience (inexperienced: <500 lung biopsies; experienced =500 lung biopsies), and procedure time (=15 min, >15 min).

RESULTS

The diagnostic accuracy rate of the biopsy was 91.67% (n=2764), and the overall complication rate was 3.98% (n=120), with major complications at 0.17% (n=5) and minor complications at 3.81% (n=115). The overall complication rate significantly increased when biopsying lesions in the lower lobe (p =0.041), especially the rate of pneumothorax (p =0.001); benign lesions significantly increased the complication rate of hemoptysis p=0.014); the combination of fine needle aspiration (FNA) and core-needle biopsy (CB) significantly increased the complication rate of hemoptysis (p =0.034); operators with "inexperienced" significantly increased the incidence of hemoptysis during surgery (p =0.011); in terms of examination duration, the pleural reaction rate significantly increased in those with >15 min (p =0.025). Among these, "benign lesions", "the combination of FNA and CB for lung biopsy," and "inexperienced operators performing the biopsy" were independent risk factors for hemoptysis.

CONCLUSION

Our research helps to determine the importance of potential risk factors and may contribute to further reducing the incidence of complications in routine clinical practice.

CLINICAL RELEVANCE/APPLICATION

Ultrasound-guided percutaneous transthoracic needle biopsy, due to its characteristics of safety, efficiency, and cost-effectiveness, has become one of the core techniques for diagnosing peripheral lung lesions. Its clinical value is reflected not only in enabling accurate diagnosis and personalized treatment but also in providing a feasible solution for optimizing medical resource allocation.

T5B-SPIR-2 ATEZOLIZUMAB PLUS BEVACIZUMAB COMBINED WITH OR WITHOUT TRANSARTERIAL CHEMOEMBOLIZATION IN THE TREATMENT OF ADVANCED HEPATOCELLULAR CARCINOMA: A SINGLE-CENTER RETROSPECTIVE STUDY

Jing Li (*Presenter*)
Yaowei Bai (*Abstract Co-Author*)
Fu Xiong, PhD, MD (*Abstract Co-Author*)
Xuefeng Kan, MD,PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to compare the efficacy and safety of atezolizumab plus bevacizumab (T+A) in combination with transarterial chemoembolization (TACE) (T+A+TACE) and T+A for patients with advanced hepatocellular carcinoma (HCC).

METHODS AND MATERIALS

From December 2020 to August 2024, 83 patients with advanced HCC who received T+A+TACE treatment or T+A treatment in our hospital were included, and these patients were categorized into TACE+T+A group (n=52) and T+A group (n=31). The clinical outcomes between the two groups were analyzed and compared, and the prognostic factors that affected the efficacy were analyzed.

RESULTS

The median overall survival (OS) and median progression-free survival (PFS) in the T+A+TACE group were significantly longer than those of in the T+A group (OS: 22.8 vs 16.9 months, P = 0.015; PFS: 7.1 vs 4.9 months, P = 0.006). A significantly higher objective response rate (ORR) and disease control rate (DCR) that based on the modified RECIST were achieved in the T+A+TACE group than those of in the T+A group (ORR: 51.9% vs 6.5%, P < 0.001; DCR: 88.5% vs 54.8%, P < 0.001). No significant differences in adverse events (AEs) were observed between the two groups (P >0.05). The T+A+TACE treatment was identified as a protective factor for OS and PFS.

CONCLUSION

TACE further improved the efficacy of T+A treatment for patients with advanced HCC, and it did not increase the incidence of AEs. T+A+TACE treatment is a promising treatment option for patients with advanced HCC.

CLINICAL RELEVANCE/APPLICATION

Hepatocellular carcinoma (HCC) is the most common form of liver cancer and accounts for about 90% of cases. HCC often presents with no symptoms in its early stage, and is typically in an advanced stage by the time it is diagnosed, leading to an unfavorable prognosis. Atezolizumab enhances the ability of T cells to recognize and eliminate tumor cells, and bevacizumab reduces the supply of nutrients and oxygen to the tumor cells, the convergence of these two mechanisms allows the

combination of the two drugs to produce better efficacy than alone. Transarterial chemoembolization (TACE) is currently widely used in the treatment of unresectable HCC, and could also be applied for the prevention of tumor recurrences after resection of HCC. However, TACE treatment has some limitations. TACE has a good synergistic effect with targeted therapy and immunotherapy for advanced HCC, and the combination of TACE with atezolizumab (an anti-PD-L1 antibody) and bevacizumab (an anti-VEGF antibody) in patients with advanced HCC may yield promising results. However, researches on this topic are limited. In the present study, we evaluated the efficacy and safety of "T+A" in combination with TACE (T+A+TACE) as a first-line treatment for patients with advanced HCC

T5B-SPIR-3 MESENTERIC ANGIOGRAPHY FOR COLONIC DIVERTICULAR BLEEDING ON CTA: PRE-PROCEDURAL PREDICTORS OF EXTRAVASATION AND POST-PROCEDURAL OUTCOMES

Ivan Dimov, MD (*Presenter*)
Chantal Ferguson (*Abstract Co-Author*)
Tushar Garg, MD (*Abstract Co-Author*)
Omar Zurkiya, MD, PhD (*Abstract Co-Author*)
Shams I. Iqbal, MD (*Abstract Co-Author*)
Patrick D. Sutphin, MD, PhD (*Abstract Co-Author*)
Ashraf Thabet, MD (*Abstract Co-Author*)
Thomas J. An, MD (*Abstract Co-Author*)

PURPOSE

To find predictors of active extravasation during angiography for colonic diverticular bleeding confirmed by CT angiogram (CTA) and examine the effect of procedural factors on clinical outcomes.

METHODS AND MATERIALS

Mesenteric angiograms performed at three hospitals for colonic diverticular bleeding on CTA between 2016-2025 were retrospectively reviewed. Data collection included CTA-to-angiogram time, extravasation and IVC size, angiogram selectivity, provocative maneuvers, and embolization techniques. Univariate and multivariate analyses were used to find associations between pre-procedural variables and active extravasation on angiography. Clinical outcomes were compared between patients that did and did not undergo embolization.

RESULTS

117 patients (median age, 76 years (IQR 60-92), 42 women) underwent 146 total angiograms. Active extravasation was found in 40% of angiograms. CTA-to-angiogram time =4 hours (OR: 2.99, CI: 1.27 - 7.27, p = 0.01), IVC short axis =20 mm (OR: 3.52, CI: 1.33 - 10.0, p = 0.01) and age (OR: 1.05, CI: 1.01 - 1.10, p = 0.03) were independent predictors for active bleeding on angiography in a multivariate logistic model (AUC: 0.76, CI: 0.67 - 0.85, p < 0.01). Third-order angiography revealed more bleeding than first-order angiography (34% vs. 21%). 51/58 (88%) positive and 15 negative angiograms proceeded to embolization. Patients who underwent targeted embolization had less rebleeding (10% vs. 44%, p < 0.05) and fewer post-procedure colonoscopies (17% vs. 51%, p < 0.05).

CONCLUSION

Mesenteric angiography had a 40% positivity rate for diverticular bleeding after CTA, with higher yield if performed within 4 hours, sub-selectively and after adequate resuscitation. Targeted embolization decreased rebleeding and post-procedure colonoscopies.

CLINICAL RELEVANCE/APPLICATION

Patients with colonic diverticular bleeding with active extravasation on CTA should be vigorously resuscitated and undergo prompt mesenteric angiography. This increases the likelihood of visualizing active extravasation and targeted embolization, leading to less rebleeding and further procedures.

T5B-SPIR-4 NOVEL ACOUSTIC SENSOR FOR NEEDLE TRACKING AND INTERNAL ULTRASOUND IMAGING AFTER THERMAL ABLATION IN AN EX VIVO MODEL

Laetitia Saccenti, MD (*Presenter*)
Ming Li, PhD (*Abstract Co-Author*)
John W. Karanian, PhD (*Abstract Co-Author*)
William F. Pritchard JR, MD, PhD (*Abstract Co-Author*)
Andrew Mikhail, PhD (*Abstract Co-Author*)
Ashley Gallagher (*Abstract Co-Author*)
Mike Kassin (*Abstract Co-Author*)
Ifechi Ukeh (*Abstract Co-Author*)
Bradford J. Wood, MD (*Abstract Co-Author*)

PURPOSE

Ultrasound guidance for thermal ablation is real-time, portable, and lacks ionizing radiation, however, visibility in the ablation zone is limited by the formation of gas during the ablation. This study aimed to assess the feasibility of integrating an acoustic sensor for both needle tip localization with ultrasound, temperature mapping of the ablation zone, and internal imaging after radiofrequency ablation (RFA) in an ex vivo liver model.

METHODS AND MATERIALS

A novel acoustic sensor (DeepSight Technology) was integrated into the stylet of a 22G needle. The sensor interfaced with an ultrasound system and visualization software. Six RFA were performed at 30 watts for 5 minutes in a fresh bovine liver. A few seconds after each ablation (RFA probe temperature < 65°C), the needle with sensor was independently inserted through the ablation zone and then withdrawn (N=12 crossings). One additional insertion was done after 3 hours of cooling. Data collected from the sensor included location, tissue relative temperature as well as an internal B-mode ultrasound image generated from the sensor.

RESULTS

The novel dual-sensing and imaging acoustic sensor was successfully integrated into a needle stylet. Localization of the needle tip was successful throughout the ablation zones. The sensor was able to measure temperature variation (temperature ranges 25-65°C), and as expected, no variation was detected in the ablation zone after 3 hours of cooling. Internal imaging from the needle tip was able to subjectively differentiate the expected locations of non-ablated liver, ablation margins and ablation center.

CONCLUSION

A novel acoustic sensor stylet allowed successful localization of the needle tip ex vivo in ablation zones, even when nonvisible under standard ultrasound. The sensor could also monitor relative temperature, and internal imaging from the needle tip was able to differentiate ablation center and margins from non-ablated tissue.

CLINICAL RELEVANCE/APPLICATION

Tracking and imaging sensors may enhance navigation and monitoring during ultrasound-guided ablation.

T5B-SPIR-5 SEDATION PRACTICE IN ABDOMINAL INTERVENTIONAL PROCEDURES: RESULTS FROM THE 2024 SAR AND SIR COLLABORATIVE WORKFORCE SURVEY

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Hafsa S. Babar, MD (*Abstract Co-Author*)
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Francesca Rigiroli, MD (*Abstract Co-Author*)
Alexander Brook, PhD (*Abstract Co-Author*)
Gregory J. Dubel, MD (*Abstract Co-Author*)
Paul B. Lewis, MD, MS (*Abstract Co-Author*)
Andrew J. Cantos, MD (*Abstract Co-Author*)
Meghan G. Lubner, MD (*Abstract Co-Author*)
Mishal Mendiratta-Lala, MD (*Abstract Co-Author*)
Ghaneh Fananapazir, MD (*Abstract Co-Author*)
Samuel J. Galgano, MD (*Abstract Co-Author*)
Virginia B. Planz, MD (*Abstract Co-Author*)

PURPOSE

To assess current nationwide sedation practices in abdominal interventions across diverse practice settings, with the goal of detecting inconsistencies and to present an opportunity to develop recommendations for standardization of sedation protocols.

METHODS AND MATERIALS

A structured, web-based survey to identify current practice in sedation, anxiolysis, and pain management for biopsies and drainages was administered to board-certified Society of Abdominal Radiology (SAR) members performing procedures and all Society of Interventional Radiology (SIR) members between 8/9/2024 and 9/9/2024. All data were analyzed using the Kruskal-Wallis and Mann-Whitney tests.

RESULTS

After exclusion of 42 incomplete surveys, the overall response rate was 10.5% (360/3799), comprising 9.4% (318/3401) of SIR and 8.5% (34/401) of SAR members. The majority of respondents; 54% (194/360), were from private practice and 48% (171/360) of respondents had >15 years of experience. Superficial lymph node fine-needle aspiration (FNA) and aspiration only were usually performed without sedation; however, moderate sedation was utilized by 8% (27/341) and 26% (91/348) of proceduralists, respectively. Superficial soft tissue biopsies and superficial drainage with catheter placement were performed with moderate sedation by 40% (138/342) and 44% (150/343) of respondents, respectively. While parenchymal transplant kidney biopsies can potentially be performed without moderate sedation, 83% (247/298) of proceduralists still utilize it. Moderate sedation is utilized for random liver biopsies by 85% (299/350), random kidney biopsies by 89% (307/344), retroperitoneal biopsies by 92% (317/345), and deep drainage by 94% (323/345) of respondents.

CONCLUSION

Moderate sedation utilization is inconsistent amongst interventionalists in the United States and is frequently overutilized for certain procedure types. Low, but non-zero rate of utilization is noted for superficial procedures (8-44%), with much higher rates, but far from universal adoption for deep interventions (83-94%).

CLINICAL RELEVANCE/APPLICATION

The identified practice variations suggest a need for evidence-based standardization of sedation protocols for abdominal interventional procedures, as the potentially unnecessary use of moderate sedation for superficial procedures and transplanted organs impacts resource utilization and patient safety without clear clinical benefit.

T5B-SPIR-6 DEVELOPMENT AND VALIDATION OF A PERCUTANEOUSLY INSERTED OPTICAL COHERENCE TOMOGRAPHY PROBE FOR THE VISUALIZATION OF THE BILIARY SYSTEM: FIRST IN HUMAN EXPERIENCE AND EXPERIENCE IN DIFFERENTIATING BENIGN AND MALIGNANT BILIARY STRICTURES

Mohammad Mirza-Aghazadeh-Attari, MD, MPH (*Presenter*)
Clifford R. Weiss, MD (*Abstract Co-Author*)
Xingde Li, PhD (*Abstract Co-Author*)
Harjit Singh (*Abstract Co-Author*)

PURPOSE

We aim to develop and validate UHR-OCT integrated with cholangioscopy and fluoroscopy to assess its feasibility, safety, and accuracy in characterizing biliary strictures, and to develop a semantic signature for subtyping indeterminate cases.

METHODS AND MATERIALS

We developed a custom 2K-pixel linear-k spectrometer for UHR-OCT, covering 250 nm around 800 nm and achieving 1.2 mm imaging depth. Using a Ti:sapphire and continuum laser with a broadband rotary joint (20 fps, >87% throughput, -58 dB back-reflection), we enabled 3D intraluminal biliary imaging with a 4-6 French catheter (2 µm axial, 6 µm lateral resolution). The catheter had a working distance of 2 mm and achieved 2.4 µm axial (1.7 µm in tissue) and 6.8 µm lateral resolution.

RESULTS

A total of 10 patients (6 males and 4 females; median age 64) underwent evaluation with ultra-high resolution optical coherence tomography (UHR-OCT) for imaging biliary strictures during minimally invasive interventions. Seven patients had benign strictures, three had malignant ones. Imaging succeeded in 9 cases, with one failure due to catheter tip breakage. Mean procedure time was 61.33 minutes, fluoroscopy time 8.4 minutes, and OCT catheter duration 8 minutes, showing stable imaging times ($p=0.03$). UHR-OCT distinguished normal, inflamed, and malignant biliary tissues, revealing characteristic features like basement membrane disruption in malignancies, with characteristic alterations observed in malignant biliary strictures, including basement membrane disruption, increased vascularity, and loss of normal epithelial layering. The ability to visualize peri-biliary glands and distinguish inflammatory changes from malignancy suggests a potential role for UHR-OCT in reducing diagnostic uncertainty in IDBS. Additionally, the relatively stable duration of UHR-OCT imaging across cases, irrespective of procedural complexity, highlights its practicality as a real-time adjunct to standard biliary interventions. Findings suggest UHR-OCT's potential for enhancing diagnostic accuracy in indeterminate biliary strictures (Figure).

CONCLUSION

This study shows that integrating UHR-OCT with fluoroscopic and cholangioscopic imaging is feasible and safe for evaluating indeterminate biliary strictures, offering high-resolution visualization to differentiate normal, inflamed, and malignant tissue.

CLINICAL RELEVANCE/APPLICATION

UHR-OCT provides real-time, high-resolution imaging of biliary epithelium, enabling differentiation of normal, inflamed, and malignant tissue. It identifies features like basement membrane disruption and increased vascularity, helping reduce diagnostic uncertainty in indeterminate strictures and potentially limiting repeat biopsies.

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T5B-SPMK

Musculoskeletal Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPMK-1 WHOLE-TUMOR HISTOGRAM ANALYSIS OF SYNTHETIC MRI FOR THE DIFFERENTIATION OF BENIGN AND MALIGNANT SOFT-TISSUE TUMORS:A PRELIMINARY STUDY

Lei Miao (*Presenter*)
Meng Li (*Abstract Co-Author*)

PURPOSE

To determine the diagnostic potential of histogram features derived from synthetic magnetic resonance imaging (SyMRI) for the differentiation of benign and malignant soft-tissue tumors (STTs).

METHODS AND MATERIALS

72 patients with STTs of the extremities or trunk (29 benign, 43 malignant) were prospectively enrolled. Quantitative histogram features, extracted from T1, T2, and proton density (PD) images, were obtained by delineating the three-dimensional volume of interest (VOI). Patients were divided into a benign group and a malignant group according to their pathological results. Logistic regression was used to construct diagnostic models. Receiver operating characteristic (ROC) analysis was performed to assess diagnostic performance.

RESULTS

Several histogram features derived from SyMRI, such as PD_Energy, T1_Skewness and T2_Kurtosis, were significantly elevated in patients with malignant STTs ($P<0.05$). All the models constructed on the basis of SyMRI histogram features performed comparably to or better than the Clinical_Model (a model based on conventional MRI features). The Combined_Model (a model integrating histogram features from the PD, T1, and T2 maps) has the highest AUC (0.946).

CONCLUSION

Whole-tumor histogram analysis via SyMRI can distinguish benign from malignant STTs well. The Combined model incorporating features from the PD, T1, and T2 models is effective. Future efforts should focus on external validation across multiple institutions and prospective prognostic validation studies.

CLINICAL RELEVANCE/APPLICATION

Differentiating between benign and malignant soft-tissue tumors is crucial for effective treatment, but current imaging methods struggle to reliably distinguish these tumor types. Whole-tumor histogram analysis using synthetic magnetic resonance imaging identified significant differences in quantitative features between benign and malignant soft-tissue tumors with high diagnostic accuracy. This non-invasive imaging approach enhances diagnostic precision, reducing the need for biopsies and assisting clinicians in developing tailored treatment strategies for soft-tissue tumor patients.

T5B-SPMK-2 MR-BASED EVALUATION OF OSSEOUS CERVICAL NEURAL FORAMINAL STENOSIS (OCNFS) USING FAST-FIELD-ECHO RESEMBLING CT USING RESTRICTED ECHO-SPACING (FRACTURE)

Dongmei Jiang (*Presenter*)
Yuwei Pan (*Abstract Co-Author*)
Dejun She (*Abstract Co-Author*)
Shuyi Lei (*Abstract Co-Author*)
Yingying Xie (*Abstract Co-Author*)
Dairong Cao, MD (*Abstract Co-Author*)

PURPOSE

To assess the feasibility of fast-field-echo resembling CT using restricted echo-spacing (FRACTURE) for evaluating osseous cervical neural foraminal stenosis (OCNFS) compared with CT and conventional MRI.

METHODS AND MATERIALS

A total of 280 cervical foramina from 28 patients with cervical radiculopathy (CR) were analyzed on oblique sagittal CT, FRACTURE, T1WI, and T2WI from bilateral C2/3 to C6/7 segments by three readers. CT served as the reference standard to identify OCNFS. Detection rate and grade of OCNFS were assessed. Inter-modality agreements were evaluated using linear weighted Cohen's kappa (?) for grade of OCNFS. ? 2 test was used to compare detection rates of OCNFS. Receiver operating characteristic (ROC) curves and Delong's test were performed to compare diagnostic performance of different imaging modalities.

RESULTS

The inter-modality agreement of OCNFS grade was substantial between CT and FRACTURE (? =0.689-0.715), moderate between CT and T1WI (? =0.427-0.597), and moderate between CT and T2WI (? =0.462-0.604). The intra-reader and inter-reader agreement of quantitative measurements (TD, VD, and SA) was moderate to excellent for FRACTURE (ICC =0.659-0.944). The intra-reader and inter-reader agreement of OCNFS grade was moderate to nearly perfect for FRACTURE (? =0.532-0.830) . Among the 280 analyzed cervical neural foramina, 104 were diagnosed as OCNFS using CT. Detection rate of OCNFS was 96.15% (100/104) for FRACTURE, 76.92% (80/104) for T1WI, and 95.19% (99/104) for T2WI. The FRACTURE could detect more OCNFS compared to conventional T1WI sequences. The severity scoring of OCNFS was not significantly different between CT and FRACTURE, but was higher on T2WI than on CT. The area under the curve (AUC) was 0.967 (95% CI: 0.938-0.984) for FRACTURE, 0.811 (95% CI: 0.760-0.855) for T1WI, and 0.845 (95% CI: 0.798-0.886) for T2WI. The DeLong's test revealed significant differences between FRACTURE and T1WI ($Z =6.023$, $P <0.0001$), and FRACTURE and T2WI ($Z =5.437$, $P <0.0001$).

CONCLUSION

FRACTURE can provide a reliable alternative to CT for evaluating OCNFS.

CLINICAL RELEVANCE/APPLICATION

FRACTURE is a viable alternative to CT for assessing OCNFS. Combined with conventional MRI, it enables comprehensive evaluation of CNFS caused by osseous or soft tissues, simplifies the examination process, reduces ionizing radiation, and facilitates more convenient follow-up evaluations.

T5B-SPMK-3 SPORTS-RELATED CALF MUSCLE INJURIES IN PROFESSIONAL ATHLETES: DIAGNOSTIC ACCURACY OF MAGNETIC RESONANCE IMAGING (MRI) IN EVALUATION, GRADING, AND CLASSIFICATION WITH ATTEMPTS TO IMPROVE THE PREDICTION OF TIME TO RETURN TO PLAY (TTRTP), AND THE ROLE OF ARTIFICIAL INTELLIGENCE (AI)

Yasser Abd El Fattah Hassan, PhD, MSc (*Presenter*)
Sherif El Hanawy, PhD, MSc (*Abstract Co-Author*)
Moataz Elsayed (*Abstract Co-Author*)
Yasmine Atteya El Feky (*Abstract Co-Author*)

PURPOSE

Assess diagnostic accuracy of MRI in classification of sports-related recent calf muscle injuries in professional athletes, using standardized classification systems, considering their complex myo-connective anatomy to explore methods to improve prediction of TtRtP based on clinical reference standards. The study also evaluates the added prognostic value of AI-based modeling.

METHODS AND MATERIALS

Retrospective study conducted on 29 professional football players with recent calf muscle injuries between 2020 and January 2025. All participants underwent 1.5T MRI within 72 hours of injury. Injuries were classified using the British Athletic Muscle Injury Classification (BAMIC) as well as specific patterns in aponeurotic injuries and MRI classification for medial gastrocnemius muscle injuries. The reference standard for TtRtP was considered as expert-determined clinical and radiological TtRtP based on previous studies defined as the time from injury to full team training clearance, verified by the team physician and rehabilitation staff). The actual TtRtP data were recorded and compared to the reference standard . Correlations between MRI findings and TtRtP were assessed. Diagnostic performance metrics were calculated for MRI grading thresholds to predict TtRtP. Inter-observer reliability was assessed. AI-based models integrating MRI findings and clinical data were preliminarily developed and evaluated for TtRtP prediction.

RESULTS

BAMIC revealed high correlation with TtRtP (r = 0.961; AUC = 0.981), while the MRI medial gastrocnemius injury classification (r = 0.912; AUC = 0.947). The integrated BAMIC and medial gastrocnemius classification model, for medial gastrocnemius aponeurotic injuries, achieved a correlation of r = 0.974 and AUC of 0.988. When AI was applied to the integrated model, predictive correlation improved further to r = 0.987, with an AUC of 0.994 and classification accuracy of 96.3%. Sensitivity and specificity for predicting TtRtP were 95.8% and 93.6% for the integrated model, and 97.9% and 96.4% with AI enhancement. Inter-observer agreement for structured MRI evaluation was excellent (? = 0.87)

CONCLUSION

MRI provides high diagnostic accuracy in classifying calf muscle injuries in professional athletes, especially considering the complex myo-connective anatomy. MRI findings closely correlate with TtRtP, with promising AI models for diagnosis and predictive accuracy.

CLINICAL RELEVANCE/APPLICATION

Comprehensive MRI evaluation using standardized classification systems with integrated AI-based prognostic tools enables accurate prediction of return-to-play timelines in calf muscle injuries, optimize rehabilitation strategies, and enhance safe TtRtP decisions for professional athletes

T5B-SPMK-4 PREDICTING LUNG METASTASIS IN HIGH-GRADE OSTEOSARCOMA: THE ROLE OF CTA SIGNS, WITH A FOCUS ON VASCULAR WRAPPING AND INTRATUMORAL VASCULAR NETWORK

Zhendong Luo, MD (*Presenter*)
Zhiqiang Liu (*Abstract Co-Author*)
Litong He (*Abstract Co-Author*)
Tao Ai, MD (*Abstract Co-Author*)
Xinping Shen (*Abstract Co-Author*)

PURPOSE

Osteosarcoma is a highly malignant bone tumor with a high incidence of lung metastases (LM), significantly impacting the 5-year survival rate of patients. This study aims to predict lung metastasis in osteosarcoma based on computed tomography angiography (CTA) signs.

METHODS AND MATERIALS

A retrospective study was conducted involving 89 consecutive patients with osteosarcoma. Clinical features and CTA signs, including age, gender, laterality, primary site, type of bone destruction, T stage, periosteal reaction, tumor length, bone marrow involved length, vascular wrapping, and intratumoral vascular network, were evaluated. Univariate and multivariate logistic regression analyses were used to identify risk factors for LM, followed by receiver operating characteristic (ROC) curve analysis.

RESULTS

The vascular wrapping and intratumoral vascular network signs were more frequently observed in LM in patients with osteosarcoma ($P < 0.05$). The intratumoral vascular network remained an independent risk factor in multivariable regression analysis. ROC curve analysis demonstrated that the area under the curve (AUC) of the logistic regression model was 0.804, indicating good predictive accuracy.

CONCLUSION

Preliminary findings suggest that CTA signs, particularly vascular wrapping and the intratumoral vascular network, may have potential utility in predicting lung metastasis (LM) in osteosarcoma patients. The intratumoral vascular network, in particular, was identified as an independent risk factor.

CLINICAL RELEVANCE/APPLICATION

1. Osteosarcoma is often metastasizes to the lung, greatly affecting 5-year survival rate.2. Intratumoral vascular network identified as predictors of lung metastasis was included in strongly performing predictive model.3. Identifying the CTA signs early can help tailor treatment strategies.

T5B-SPMK-5 FRACT-AI: EVALUATING THE IMPACT OF ARTIFICIAL INTELLIGENCE-ENHANCED IMAGE ANALYSIS ON THE DIAGNOSTIC ACCURACY AND INTERPRETATION TIME OF FRONTLINE CLINICIANS IN THE DETECTION OF FRACTURE ON PLAIN X-RAY

James Vaz, MD (*Presenter*)
Sarim Ather, PhD, MBChB (*Abstract Co-Author*)
Alpesh Mistry, MBChB, FRCR (*Abstract Co-Author*)
Natasa Devic, MBBS, MRCS (*Abstract Co-Author*)
James Teh, MD (*Abstract Co-Author*)
Alex Novak, MBChB (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of an AI fracture detection tool on clinician diagnostic performance and interpretation time for missed fractures across specialties and seniority levels.

METHODS AND MATERIALS

500 plain radiographs (250 fracture positive, 250 fracture negative, obvious fractures excluded) were curated from Oxford University Hospitals based on NHS Resolution data for litigation relating to missed fractures. Ground truth was established by two senior musculoskeletal radiologists with disagreements arbitrated by a third. All images were inferenced by Gleamer BoneView. 18 clinicians of varying seniority from six specialties (Emergency Medicine, Trauma & Orthopaedics [T&O], Emergency Nurse Practitioners, Physiotherapy, Radiography, Radiology) were recruited to a multi-case, multi-reader study. Readers interpreted all images with and without AI assistance. Algorithm accuracy, reader AUC, sensitivity, specificity, and median interpretation time were analysed for pooled readers and prespecified subgroups based on specialty and seniority.

RESULTS

Analysis of algorithm performance against ground truth demonstrated an accuracy of 0.876 with a sensitivity of 0.892 and a specificity of 0.858. Pooled reader AUC improved from 0.883 to 0.921 (95% CI 0.858-0.907 vs. 0.901-0.942; $p < 0.001$); sensitivity from 0.828 to 0.867 ($p < 0.001$) and specificity from 0.829 to 0.904 ($p < 0.001$). Overall median interpretation time was unchanged (43.0 s to 42.5s; $p = 0.835$). By seniority, Senior Grades read significantly faster with AI (41.5 s to 35.7s; $p < 0.001$), Middle Grades slower (30.9 s to 35.2 s; $p < 0.001$), and Junior Grades unchanged (54.6 s to 52.5 s; $p = 0.250$). By specialty, T&O experienced a 3.7 s reduction in time (37.3 s to 33.6 s; $p = 0.001$), while other specialties showed no significant change.

CONCLUSION

AI algorithm accuracy was lower than in previous comparable studies reflecting the challenging dataset. Despite this AI assistance significantly enhanced reader accuracy across all groups without increasing interpretation time (except amongst Middle Grades). No difference was seen in pooled interpretation time, however senior clinician and T&O specialty subgroups reduced interpretation time while junior and middle grade readers showed no change and increased time respectively.

CLINICAL RELEVANCE/APPLICATION

Integration of AI-driven fracture detection into radiographic workflows can improve diagnostic accuracy universally and may consequently reduce litigation, but may have variable effects on reporting efficiency depending on specialty and user experience in urgent care settings. Tailored interface design and targeted training may help all users convert diagnostic gains into faster throughput.

T5B-SPMK-6 COULD BONE-RADS BE APPLICABLE ON RADIOGRAPHS?

Syeda Shabistan Intekhab, MBBS (*Presenter*)
Omar Al Mukdad, MD (*Abstract Co-Author*)
Syed I. Alam, MBBS, MD (*Abstract Co-Author*)
Sandra Abusamaan (*Abstract Co-Author*)

PURPOSE

To apply the ACR Bone-RADS for assessment of bone tumors on radiographs of adult and pediatric population and to assess its diagnostic performance.

METHODS AND MATERIALS

The bone X-rays of a limited cohort of 20 pediatric patients with bone lesions were evaluated, using a scoring system derived from the ACR Bone-RADS. The study will be expanded to include 50 radiographs of adult and pediatric population. Risk score is calculated and validated by four radiologists independently, two consultant radiologists and two radiology residents and compared with histopathological diagnosis as a reference standard. The diagnostic performance of the scoring system and inter-reader agreement were calculated.

RESULTS

Bone-RADS demonstrated high sensitivity and negative predictive value (NPV) across all four readers, indicating it is effective tool in identifying malignant tumors and ruling out benign tumors. The specificity and the positive predictive value (PPV) were low and moderate respectively indicating that a proportion of benign tumors were scored as malignant. The Intraclass Correlation Coefficient (ICC) for Bone-RADS scores among the 4 raters was 0.85, indicating excellent agreement. The result was statistically significant ($p < 0.001$). The high ICC value of 0.85 reflects strong inter-rater reliability among all four readers. The interrater agreement calculated by Cohen’s kappa for individual Bone-RADS features ranged from fair to almost perfect agreement.

CONCLUSION

The application of Bone-RADS scoring system for evaluating bony lesions in pediatric radiographs was beneficial for long bone malignancy risk stratification, offering the interpreting radiologist with a systematic framework and assisting the orthopedic oncologist in devising subsequent care strategies. In case of flat bone tumors, further radiological assessment was required.

CLINICAL RELEVANCE/APPLICATION

The study demonstrates the utility of the proposed modified Bone-RADS scoring system, making it a reliable tool for evaluating bone lesions on pediatric and adult X-rays across different levels of expertise.

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T5B-SPNMMI

Nuclear Medicine & Molecular Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPNMMI-1 SELF-ASSEMBLED PEPTIDE NANOFIBERS DEMONSTRATE TUNABLE CD38 AVIDITY

Jacqueline Godbe, MD, PhD (*Presenter*)

PURPOSE

To develop of a CD38-avid, peptide-based nanofiber for imaging and treatment of multiple myeloma

METHODS AND MATERIALS

We built upon a CD38-avid peptide previously developed in our lab, by adding a lipid tail, which templates self-assembly of the peptide into a CD38-binding nanofibers. We also intercalated hydrophobic small molecule MM therapeutics Bortezomib (BORT) and Iberdomide (IBR) into the nanofibers. Morphology of the resulting nanostructures was characterized by conventional and cryo-electron microscopy and fluorescence resonance energy transfer (FRET). BORT and IBR release were quantified with fluorescence. Affinity of CD38 for each nanofiber was characterized via fluorescence anisotropy with fluorescein-labeled CD38. Efficiency of radiolabeling with 64 Cu was assessed with TLC. Cell uptake studies were performed with CD38+ MOLP2 myeloma cells.

RESULTS

Nanofiber morphology and CD38 binding behavior is dependent on lipid tail length. These nanofibers are stable to labeling with 64 Cu and maintain morphology for at least 6 months. In vitro , nanofibers outcompete excess soluble peptide in cell uptake studies by CD38+ MM cells. Incorporation of BORT and IBR changes nanofiber morphology. Nanofibers demonstrate extended release of BORT and IBR over 72h.

CONCLUSION

Self-assembly of a CD38-binding peptide into a nanofiber improves binding behavior over the monomeric peptide to CD38 in vitro. Furthermore, these nanofibers demonstrate sustained release kinetics of MM drugs of interest such as BORT and IBR.

CLINICAL RELEVANCE/APPLICATION

CD38 is overexpressed in MM and the target of first line therapy with daratumumab. However, current CD38-targeted imaging therapies such as antibodies and peptides have unfavorable pharmacokinetics and/or low specificity. The multimeric CD38-avid nanofibers outcompete the soluble peptide for binding CD38 in vivo, making them an excellent candidate for further development. They are also excellent candidates for theranostic development by developing the 67 Cu/ 64 Cu pair as well as targeted delivery and extended release of IBR and BORT.

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T5B-SPNPM

Noninterpretive Skills (Beyond Imaging) Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPNPM-1 PATIENT AND PROVIDERS' EXPERIENCES WITH A MULTILEVEL INTERVENTION TO IMPROVE LUNG CANCER SCREENING

Gelareh Sadigh, MD (*Presenter*)
Maedeh Sharifian, MD (*Abstract Co-Author*)
Richard Echeverria (*Abstract Co-Author*)
Victoria Nguyen (*Abstract Co-Author*)
Mahnur Bharucha (*Abstract Co-Author*)
Michael Hoyt (*Abstract Co-Author*)
Aarushi Madan (*Abstract Co-Author*)
Tan Nguyen (*Abstract Co-Author*)
Sunmin Lee (*Abstract Co-Author*)
Hari Keshava (*Abstract Co-Author*)

PURPOSE

Lung cancer screening (LCS) utilization remains suboptimal. We aimed at understanding the experiences of patients and providers participating in a multilevel intervention that addresses barriers to LCS.

METHODS AND MATERIALS

Empower LCS is a single arm pilot clinical trial (NCT06000683), assessing the efficacy of a multilevel intervention (LCS decision aid, patient reminders to discuss LCS with the primary care provider (PCP), patient referrals to financial navigation, and PCP notifications of patients' LCS eligibility) on LCS completion among high-risk individuals. A total of 11 patients (5 English-, 5 Spanish-, and 1 Vietnamese-speaking) and 5 PCP participants of Empower LCS participated in a 30-minute one-on-one semi-structured qualitative interview. Interview transcripts were analyzed using a "theoretically driven thematic analysis" approach.

RESULTS

Eleven patients (mean age: 59; 73% male; 63% White; 9% Asian; 27% mixed races; and 45% Hispanic) and 5 PCPs (20% practicing in academic vs. 80% in community/FQHC) were included. Most patients believed LCS was important and were eager to discuss it with their PCP. Patients' motivations for screening included worries about their long-term smoking, positive family history, and a desire for early detection. When inquired about their perceptions of providers, some patients felt they were reluctant or hesitant to initiate full discussions of LCS, while they thought it was the provider's role to proactively discuss LCS. Some also felt providers' knowledge about LCS eligibility and communication skills could be improved. LCS barriers included scheduling difficulties and inability to get insurance authorization. When asked about their experience with Empower LCS, many stated that the intervention increased their awareness and motivation to pursue LCS and supported the idea of healthcare providers receiving prompts on that. In provider interviews, most, on the other hand, reported that they already routinely discussed smoking history to determine LCS eligibility. They felt patients were receptive to LCS and mentioned lack of awareness and insurance issues as important barriers. They believed interventions were suitable for the primary care practices, especially with efforts to enhance patient education and improve EMR alert accuracy.

CONCLUSION

Both patients and providers were receptive to LCS and thought the multilevel interventions, including the decision aid, reminders to providers, and financial navigation, had the potential to increase LCS in the routine practice.

CLINICAL RELEVANCE/APPLICATION

Understanding the perspectives of providers and patients about LCS and related interventions is essential to improving LCS adherence and ensuring the effectiveness of screening programs.

T5B-SPNPM-2 DIAGNOSTIC RADIOLOGY RESIDENT WRVU PRODUCTIVITY OVER TWO DECADES - A SINGLE INSTITUTION RETROSPECTIVE REVIEW

Josh Katz, MD (*Presenter*)
Adeel R. Seyal, MD,MBBS (*Abstract Co-Author*)
Larry Barbaras (*Abstract Co-Author*)
Karen S. Lee, MD (*Abstract Co-Author*)
Oussama Metrouh, MD (*Abstract Co-Author*)
Jeffrey L. Weinstein, MD (*Abstract Co-Author*)
Bettina Siewert, MD (*Abstract Co-Author*)
Jennifer M. Cutts, MD (*Abstract Co-Author*)

PURPOSE

Workloads for academic and private practice attending radiologists have steadily increased over the past two decades. This study evaluated diagnostic radiology resident radiologist wRVU productivity over the past 16 years to determine whether a similar trend existed with trainees.

METHODS AND MATERIALS

This single center retrospective study was IRB approved. The electronic medical record at our quaternary academic medical center was searched for radiology cases that contained a resident author from July 2006 through June 2022. Common procedural terminology (CPT) codes for these cases were also queried. Subsequently, the Medicare Physician Fee Schedule for 2023 (RVU23B) was cross-referenced with the resident CPT data so that a physician work relative value unit (wRVU) could be assigned to each CPT code. All cases were normalized to 2023 wRVU values. wRVUs were reviewed by class year and in aggregate for the 4-year residency over the study period. Data was analyzed using Spearman's rank correlation coefficient, linear regression analysis, and Mann-Kendall test using R statistical software.

RESULTS

wRVU data for 161 1st year, 159 2nd year, 158 3rd year, 159 4th year diagnostic radiology residents and 4-year aggregate data for 114 diagnostic radiology residents was reviewed. Median wRVUs declined for the 1st year residents 50 wRVUs/year, with a significant downward trend (rs = - 0.51; t = - 0.38, p = 0.035). There was a decline in the median wRVUs for the 2nd year residents by 13 wRVUs/year, respectively, however no significant upward or downward trend was noted (rs = -0.23; t = -0.38; p = 0.04 for 1st-year, t = -0.12; p = 0.54). For 3rd year residents, the median wRVUs decreased by 92 wRVUs/year with a significant downward trend (rs = -0.67; t = - 0.5; p = 0.006). 4th residents showed an increase in the median wRVUs by 132 wRVUs/year with a significant uptrend (rs = 0.79; t = 0.6; p <0.001). 4-year aggregate data showed a decrease in 59 wRVUs/year, however no significant upward or downward trend was noted (rs = -0.29; t =-0.14, p=0.511).

CONCLUSION

Diagnostic radiology residents' productivity as measured by wRVUs decreased from 2006-2022, a trend opposite that experienced by attending radiologists.

CLINICAL RELEVANCE/APPLICATION

While attending work volume increased over the past two decades, resident wRVU productivity decreased over a similar time period. This raises the question of whether a focus on productivity may be important to adequately prepare trainees for transition to clinical practice. Training experience and productivity during residency may impact successful transition to practice and may have wellness implications for early career attending radiologists.

T5B-SPNPM-3 ENHANCING RADIOLOGY WORKFLOW SAFETY: TRANSFORMER-BASED SIAMESE NETWORKS FOR AUTOMATED PATIENT IDENTITY VERIFICATION IN FOLLOW-UP PELVIC X-RAYS

Henrik Maximilian Kahl (*Presenter*)
Leon Moehring (*Abstract Co-Author*)
Denis Yang Gersdorf (*Abstract Co-Author*)
Christian Heitkamp (*Abstract Co-Author*)
Dilara Kisir (*Abstract Co-Author*)
Gerhard B. Adam, MD (*Abstract Co-Author*)
Haissam Ragab, MD (*Abstract Co-Author*)

PURPOSE

Patient misidentification in radiology, though infrequent, can lead to serious medical errors, including misdiagnosis and inappropriate treatment. This study evaluates a deep learning approach using siamese neural networks for automated detection of patient misidentification in follow-up pelvic x-rays, comparing its performance against radiologists.

METHODS AND MATERIALS

We developed a siamese network utilizing swin transformers pre-trained on ImageNet-22k. The model was trained on 2,970 pelvic x-ray image pairs resized to a resolution of 224 x 224, comprising 1,485 positive samples (same patient) and 1,485 negative samples (different patients). To improve model performance on cases with high inter-patient similarity, hard negative mining was employed. Five-fold cross-validation was implemented to enhance robustness, and an ensemble approach was used for final model inference. Model performance was assessed on an independent test set of 164 image pairs (82 positive, 82 negative) and compared against five radiologists (2 - 6 years of experience) who individually rated the similarity of the test pairs on a scale of 0-100. Statistical comparison of the model against radiologists was performed using DeLong's one-sided non-inferiority test (d = 0.05 margin).

RESULTS

The model achieved 94% accuracy (95% CI: 89 - 97%), F1 = 0.94 (0.89 - 0.97), and AUC-ROC = 0.98 (0.96 - 1.00), demonstrating non-inferiority to radiologists (AUC-ROC range: 0.95 - 0.98; d = 0.05 margin, p < 0.001). Most model errors were false negatives (incorrect same-patient rejections; 8/10), whereas radiologists' cumulative errors were mainly false positives (overlooked mismatches; 57/64). Of these radiologist-overlooked mismatches, 96% (55/57) were correctly identified by the model. The model processed cases in 0.2s versus radiologists' manual assessment time of 14.0±11.6s per pair.

CONCLUSION

Our siamese network effectively verifies patient identity in pelvic x-rays with non-inferiority to dedicated radiologist review. The system's high accuracy suggests that it could serve as a safeguard against patient identification errors, intercepting most undetected mismatches while operating at workflow-compatible speeds. Study limitations include single-center design and pelvic-specific validation.

CLINICAL RELEVANCE/APPLICATION

Implementation of this AI verification system as a secondary check in radiology workflows could significantly reduce patient misidentification incidents, potentially preventing diagnostic errors, inappropriate treatment, and patient harm. The system could provide an additional layer of safety beyond conventional identification methods, especially in high-volume or emergency settings where verification errors are more common.

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Neuroradiology Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPNR-1 LINKING METABOLIC AND BRAIN STRUCTURAL GENETICS IN MAJOR DEPRESSIVE DISORDER

Huaigui Liu (*Presenter*)

PURPOSE

To investigate the shared genetic underpinnings between major depressive disorder (MDD)-specific gray matter volume (GMV) alterations and key metabolites using meta-analytic neuroimaging and multi-omics data integration.

METHODS AND MATERIALS

A systematic literature search of PubMed and Web of Science was conducted to identify voxel-based morphometry studies reporting GMV alterations in MDD. A coordinate-based meta-analysis was performed to determine convergent GMV abnormalities. Transcriptome-neuroimaging association analysis was then conducted using the Allen Human Brain Atlas to identify genes spatially correlated with GMV alterations. Genome-wide association summary statistics for MDD (N_case = 525,197; N_control = 3,362,335) and five metabolites—glucose, hemoglobin A1c (HbA1c), HDL-C, LDL-C, and triglycerides (TG)—were analyzed using the conjunctional false discovery rate (conjFDR) approach to identify shared genetic loci. The intersecting genes from both transcriptomic and conjFDR analyses were subjected to gene ontology (GO) enrichment analysis.

RESULTS

Fifty-seven neuroimaging studies were included. The meta-analysis revealed consistent GMV reductions in the left superior temporal gyrus, left inferior frontal gyrus, and left insula in MDD. Transcriptome-neuroimaging analysis identified 2,585 genes spatially associated with these GMV changes. conjFDR analysis detected 20, 20, 195, 83, and 186 shared loci between MDD and glucose, HbA1c, HDL-C, LDL-C, and TG, respectively. Intersection analysis revealed 13 to 73 genes jointly associated with each metabolic trait and MDD-related GMV changes. GO analysis highlighted biological processes related to lipid metabolism and neurodevelopment. Notably, FADS2 emerged as a convergent gene across all analyses.

CONCLUSION

This study uncovers a shared genetic signature linking GMV abnormalities in MDD with metabolic dysfunction. These findings provide insight into the neurobiological interface between psychiatric and metabolic disorders and offer promising targets for precision medicine.

CLINICAL RELEVANCE/APPLICATION

This study reveals a shared genetic basis between structural brain alterations in MDD and metabolites such as glucose and lipid levels. The findings highlight potential molecular links between psychiatric and metabolic disorders, suggesting that comorbid metabolic dysfunction may not be secondary but genetically intertwined with MDD pathology. Identification of genes like FADS2 may inform future biomarker discovery and targeted intervention strategies. This work supports the development of integrated diagnostic and therapeutic approaches in precision psychiatry and metabolic-mental health comorbidity management.

T5B-SPNR-2 A DEEP LEARNING-BASED MICROBLEED SEGMENTATION FOR ARIA-H DETECTION AND RADIOGRAPHIC SEVERITY PREDICTION IN OUT-OF-DISTRIBUTION CASES

Yoona Hwang (*Presenter*)
Saehyun Kim (*Abstract Co-Author*)
Wooseok Jung, MSc (*Abstract Co-Author*)
Seung Hyun Lee, MD (*Abstract Co-Author*)
Chong Hyun Suh, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate a deep learning-based algorithm for automatic cerebral microbleed (CMB) segmentation in SWI MRI across severity levels. We also assess the algorithm's performance on out-of-distribution cases with extreme CMB burden. Manual detection of CMBs is time-consuming, subjective, and suffers from inter-reader variability, affecting treatment decisions. This study addresses the need for objective CMB quantification tools with proven robustness across diverse patient populations.

METHODS AND MATERIALS

We collected 565 SWI MRI scans (normal:136, mild:390, moderate:32, severe:7) from a single South Korean tertiary hospital. A neuroradiologist with 14 years of experience reviewed MRIs and labeled CMBs. The MRIs were split in a 3:1:1 ratio for training, validation, and testing. We additionally included 28 cases with >10 CMBs and 5 CADASIL cases as challenging out-of-distribution cases with extremely high microbleed burden (59-107 CMBs per case). An Attention U-Net with deep supervision was trained. Evaluation included both lesion-level and patient-level analysis across severity categories.

RESULTS

The model achieved lesion-level metrics of 91.8% sensitivity, 54.7% precision, and 68.5% F1 score in detecting microbleeds on the test set, with false positives per scan of 1.06 (114 cases). For evaluation of out-of-distribution cases at the lesion level, the model maintained 81.2% sensitivity on cases with >10 CMBs (76.5% precision, 4.46 FP/scan in 28 cases), while CADASIL cases presented challenges with 69.8% sensitivity, though higher precision (86.3%, 9.8 FP/scan in 5 cases). At the patient level, the model achieved 77.2% sensitivity, 68.3% specificity, and 82.2% precision, with performance varying by severity (86.3%, 66.7%, and 97.0% sensitivity for mild, moderate, and severe cases respectively). The average processing time was 35.4s per scan using a single V100 GPU.

CONCLUSION

The study presents an effective algorithm for CMB segmentation on SWIs across all severity levels, achieving 91.8% sensitivity in test cases. It showed adaptability in challenging cases like CADASIL (69.8% sensitivity, 86.3% precision). Error pattern analysis revealed optimization opportunities, particularly for CMBs <1mm in size. Future work will validate across diverse clinical presentations, especially in severe CMB cases.

CLINICAL RELEVANCE/APPLICATION

The deep learning approach provides efficient, objective quantification of CMBs as an assistive tool for clinicians in ARIA monitoring. The proposed method could reduce reading time, streamline clinical workflow, reduce inter/intra-rater inconsistency in MRI assessment among radiologists of varying experience levels, and guarantee more consistent treatment decisions.

T5B-SPNR-3 LONGITUDINAL ASSESSMENT OF BRAIN IRON CONTENT FOLLOWING NEOADJUVANT CHEMOTHERAPY IN BREAST CANCER BY USING QUANTITATIVE SUSCEPTIBILITY MAPPING

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Jiuquan Zhang (*Abstract Co-Author*)

PURPOSE

To evaluate the longitudinal changes in brain iron content in participants with breast cancer after NAC using quantitative susceptibility mapping (QSM).

METHODS AND MATERIALS

In this prospective study conducted from April 2021 to April 2023, breast cancer participants underwent QSM and neuropsychological test pre- and post-NAC administration. Magnetic susceptibility, neuropsychological tests and laboratory indices were compared between the two time points. In addition, the association between changes in magnetic susceptibility and neuropsychological scores and laboratory indices were assessed. The effects of chemotherapy regimens, age, and blood indicators on the magnetic susceptibility were evaluated with generalized estimating equations (GEE).

RESULTS

Seventy-one women (mean age, 48 years ± 9 [SD]) and 65 healthy controls (mean age ± SD: 47 years ± 14) were recruited for this study. All breast cancer participants and ten healthy controls complete QSM scan in two time points. Compared with baseline, participants performed significantly worse after NAC on the neuropsychological assessments. Brain magnetic susceptibility changes were found in frontal lobe, occipital lobe, putamen and hippocampus. Correlations were observed between changes in QOL scores and the magnetic susceptibility of occipital lobe ($r = 0.235$, $P = 0.048$) and hippocampus ($r = 0.239$, $P = 0.045$), and between changes in SAS scores and the magnetic susceptibility of putamen ($r = 0.263$, $P = 0.027$). GEE analysis showed the correlations between the system iron and inflammation indicators and the magnetic susceptibility of occipital lobe, frontal lobe, hippocampus and whole brains.

CONCLUSION

Brain iron content derived from QSM has changed in participants with breast cancer after NAC, and related to the cognitive performance. And chemotherapy may affect brain iron metabolism by affecting systemic iron and inflammation.

CLINICAL RELEVANCE/APPLICATION

Brain iron content has changed in participants with breast cancer after NAC, and might be affected by the systemic iron and inflammation status.

T5B-SPNR-5 COMPRESSED SENSING MPRAGE ACCELERATION FOR CLINICAL AND RESEARCH NEURORADIOLOGY PROTOCOLS

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PURPOSE

Conventional 3D T1-weighted MPRAGE is a popular brain MRI sequence with diverse applications, yet its lengthy acquisition (~5 min) time reduces throughput and increases vulnerability to motion artifacts. We sought to determine whether a compressed-sensing 3D MPRAGE (CS-MPRAGE) sequence preserves lesion detection, image quality, quantitative brain volumetry, and tissue contrast-to-noise (CNR) relative to the clinical standard MPRAGE while reducing acquisition time.

METHODS AND MATERIALS

Standard MPRAGE and CS-MPRAGE were acquired at 3T in 28 patients with suspected brain metastases and in 23 patients with relapsing-remitting multiple sclerosis (MS). Three blinded neuroradiologists independently evaluated both standard and CS-MPRAGE sequences for all patients with suspected brain metastases to assess lesion presence, count, major diameter, and image-quality domains. For the MS patients, volumetrics across 12 brain anatomic regions as well as CNR were calculated by a third-party FDA-cleared software.

RESULTS

The CS-MPRAGE sequence reduced acquisition time by 49.7%. Diagnostic accuracy, sensitivity, specificity, and predictive values for lesion detection were not statistically different between sequences (all $p > 0.60$). Among evaluations of the 18 patients with confirmed metastases, interpretations with missed lesions were infrequent (3 of 54 standard, 4 of 54 CS-MPRAGE) and involved smaller lesions than correctly identified cases, though not statistically significant (standard: 0.77 ± 0.57 cm vs. 1.36 ± 1.75 cm, $p = 0.376$; CS-MPRAGE: 0.45 ± 0.13 cm vs. 1.40 ± 1.76 cm, $p = 0.135$). CS- MPRAGE had consistently lower but still good image quality. CS-MPRAGE had statistically lower volumes across 8/12 anatomic regions but with low magnitudes of inter-sequence differences. CS-MPRAGE also had lower CNR compared to standard MPRAGE (4.18 vs 4.41, $p < 0.0001$).

CONCLUSION

Despite small volumetric differences and lower CNR, accelerated 3D CS-MPRAGE achieves comparable metastatic lesion detection accuracy and maintains good image quality compared to standard MPRAGE while reducing scan time by nearly half.

CLINICAL RELEVANCE/APPLICATION

Implementation of accelerated CS-MPRAGE into clinical workflows can significantly enhance patient throughput, reduce motion artifacts, and improve MRI resource utilization without sacrificing diagnostic accuracy.

T5B-SPNR-6 SINGLE LAYER SPHERICAL (SLS) VS SINGLE LAYER (SL) WOVEN ENDOBRIDGE DEVICE IN THE TREATMENT OF NARROW NECK INTRACRANIAL ANEURYSMS: A PROPENSITY SCORE-MATCHED ANALYSIS

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PURPOSE

Data on the use of Woven EndoBridge (WEB) devices in the treatment of narrow-neck intracranial aneurysms (NNA) are limited. We compared the efficacy and safety of single-layer (SL) and single-layer spherical (SLS) WEB devices in treating NNA.

METHODS AND MATERIALS

We conducted a multicenter retrospective analysis of adult patients with NNA (neck =4.5 mm and width-to-neck ratio =2) treated with SL or SLS WEB devices between January 2011 and December 2022. Patients with fusiform or blister aneurysms, adjunctive treatments, or devices other than SL or SLS were excluded. Propensity score matching was used to adjust for confounding variables. Outcomes included procedural complications, angiographic occlusion rates using the Raymond Roy classification, major device compaction, need for retreatment, and functional outcomes assessed by the modified Rankin Scale (mRS).

RESULTS

After matching, resulting in 101 patients in each group, baseline characteristics were well-balanced. Thromboembolic complications occurred in 2.0% of the SLS group and 5.9% of the SL group (P = 0.28). Hemorrhagic complications occurred in 1.0% of the SLS group and 6.4% of the SL group (P = 0.062). Adequate occlusion rates (Raymond Roy grades I and II) were similar between groups (96% in SLS vs. 91% in SL; P = 0.20). Major device compaction was significantly less frequent in the SLS group compared to the SL group (0% vs. 7.6%; P = 0.024). The need for retreatment was trended toward being lower in the SLS group (1.1% vs. 6.6% in SL; P = 0.12). Functional outcomes (mRS 0-1) at last follow-up were comparable (82% in SLS vs. 86% in SL; P = 0.41).

CONCLUSION

In the treatment of narrow-neck intracranial aneurysms, the SLS WEB device was associated with significantly lower rates of major device compaction compared to the SL device. Reduced compaction may lead to a lower need for retreatment.

CLINICAL RELEVANCE/APPLICATION

Overall imaging outcomes and safety profiles were similar between the two devices.

T5B-SPNR-8 HIGHER MUSCLE VOLUME IS INVERSELY RELATED TO CHRONOLOGICAL AND BRAIN AGE WHILE INCREASED VISCERAL TO MUSCLE FAT RATIO IS POSITIVELY RELATED TO CHRONOLOGICAL AND BRAIN AGE

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PURPOSE

Brain age predicted from structural brain images on T1 weighted scans can lend insight to Alzheimer's risk factors such as muscle loss with sarcopenia. We thus investigated the link between body MRI measured muscle mass, muscle to fat ratio and brain age.

METHODS AND MATERIALS

In all, 1,164 healthy participants from four sites (mean chronological age 55.17 ± 12.37 years, 52% women; 48% men; 39% non-white) were scanned on1.5T MR machines with a whole-body protocol. Whole body sequences utilized in the quantitative analyses of muscle mass were coronal T1 were used to segment total muscle volume normalized to participant height, visceral adipose tissue (VAT) and subcutaneous adipose tissue (VAT). In this process, a nnU-Net model was used for fully supervised segmentation and ITK-SNAP was used for manual annotation. Brain age was computed from T1 MPRAGE scans using a regression- based 3D Simple Fully Convolutional Network. The model was trained on in-house T1-weighted MRI scans collected from 5,500 healthy individuals, aged 18 to 89 years. Brain age gap (BAG) was calculated by subtracting chronological age from brain age. Bivariate correlations between total normalized muscle volume (TNMV) as well as VAT and SAT normalized to total muscle volume to chronological and brain age were done with partial correlations adjusted for sex with brain age analyses.

RESULTS

Mean brain age was higher than chronological age (56.04 ± 12.65, mean BAG = 0.69). Higher TNMV was related to both decreased chronological age (rp=-0.2579, p=2.524e-17) and brain age (rp =-0.2497, p=2.65e-16). VAT normalized to total muscle volume was linked to higher chronological (rp=0.3755, p=2.615e-36) and brain age (rp=0.3797, p=3.871e-37) adjusting for sex. No statistically significant links were noted with TNMV, VAT, SAT or and BAG. SAT was also not correlated in a statistically significant way to chronological or brain age.

CONCLUSION

Increasing muscle mass is related to lower chronological and brain age while visceral fat normalized to muscle volume is related to increased chronological and brain age. Lack of correlation to BAG may be due to the relatively low BAG in this sample. This work suggests improving muscle mass and reducing visceral fat may improve brain aging.

CLINICAL RELEVANCE/APPLICATION

Muscle mass as tracked on imaging can be a surrogate marker for various interventions to reduce frailty and improve brain health.

T5B-SPNR-9 AGE AND GENDER-SPECIFIC VARIATIONS IN MIDDLE CEREBRAL ARTERY DIAMETER: A COMPREHENSIVE ANALYSIS OF 656 INDIAN PATIENTS

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Sharankumar Patil (*Abstract Co-Author*)
Srinath R. Chitti JR, MBBS,MD (*Abstract Co-Author*)

PURPOSE

The Middle Cerebral Artery (MCA) diameter is a crucial anatomical parameter in neurovascular diseases and interventional procedures. Comprehensive data from the Indian subcontinent remains very limited. This study aimed to analyse age and gender-specific variations in MCA diameter among the adult Indian population.

METHODS AND MATERIALS

A retrospective analysis which was conducted on 656 patients who underwent CT angiography measured bilateral MCA diameters at their mid-points using standardized radiological protocols and stratified into eight age groups (18-30, 30-40, 40-50, 50-60, 60-70, 70-80, 80-90, and 90-98 years). Analyses were performed separately for males (n=371) and females (n=285). Statistical analyses included ANOVA for age-group comparisons and t-tests for gender comparisons within each age group.

RESULTS

The overall mean MCA diameter was significantly different between males (2.36 ± 0.29 mm) and females (2.21 ± 0.28 mm) ($p < 0.001$). Age-specific analysis revealed significant variations across different age groups. In males, MCA diameter showed a gradual increase from the 18-30 age group (2.33 ± 0.29 mm) to peak in the 60-70 age group (2.41 ± 0.30 mm). Females demonstrated a similar trend but with consistently smaller diameters, starting from 2.15 ± 0.26 mm in the 18-30 age group and reaching 2.28 ± 0.29 mm in the 60-70 age group. The most significant gender differences were observed in the younger and middle-age groups (30-60 years), with p-values ranging from 0.0002 to 0.0004. Statistical analysis revealed significant gender differences in the 18-30 age group ($p = 0.0482$), 30-40 age group ($p = 0.0003$), 40-50 age group ($p = 0.0002$), and 50-60 age group ($p = 0.0004$).

CONCLUSION

This study provides the first comprehensive analysis of age and gender-specific MCA diameter variations in the adult Indian population, demonstrating consistent gender dimorphism in MCA diameter, with males having larger vessels across most age groups, particularly in younger and middle-aged adults. The age-related variations and convergence of diameters in older age groups suggest different vascular aging patterns between genders.

CLINICAL RELEVANCE/APPLICATION

The established normative values and identified variations can guide the selection of appropriate endovascular devices and improve risk stratification in neurovascular procedures for the Indian population. The observed gender and age-specific differences emphasize the need for individualized approaches in neuro-interventional procedures, particularly in different age groups where gender differences are most pronounced.

T5B-SPNR-10 THE VALUE OF MULTIPHASE CT ANGIOGRAPHY IN PREDICTING HEMORRHAGIC TRANSFORMATION AFTER ENDOVASCULAR TREATMENT:THE ARTERIAL COLLATERALS AND VENOUS DRAINAGE

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Nina Hao (*Abstract Co-Author*)
Song Liu (*Abstract Co-Author*)
Luotong Wang (*Abstract Co-Author*)
Chao Tian SR, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to explore the quantitative diagnostic value of multiphase CT angiography (mCTA) in predicting hemorrhagic transformation (HT) and symptomatic intracerebral hemorrhage (sICH) in patients with anterior circulation acute ischemic stroke (AIS) after endovascular treatment (EVT).

METHODS AND MATERIALS

We retrospectively collected patients with anterior circulation AIS from our hospitals from April 2020 to December 2023. We assessed the arterial collateral circulation (ACC), superficial venous drainage scores (SVS), and deep venous drainage scores (DVS) based on mCTA . SVS1, SVS2, and SVS3, as well as DVS1, DVS2, and DVS3, represented SVS and DVS in the arterial, venous, and late venous phases, respectively. Patients were divided into HT and non-HT groups based on the presence of an intracranial hemorrhage on a follow-up non-contrast CT. We conducted a subgroup analysis on HT patients divided into sICH and asymptomatic intracerebral hemorrhage (aICH) subgroups. We analyzed and compared the clinical variables, ACC, SVS, and DVS on the non-HT and HT groups, as well as on the sICH and aICH subgroups. Multiparameter predictive models of HT and sICH were established using ACC (Model-HT1 and Model-sICH1), SVS and DVS (Model-HT2 and Model-sICH2), and comprehensive parameters (Model-HT3 and Model-sICH3). The performance of predictive models was evaluated and compared using the receiver operating characteristic (ROC) curve and the Delong test.

RESULTS

Finally, 127 patients were included, and 46 developed HT. HT group had a higher ratio of poor ACC than the non-HT group ($P <0.05$). A lower SVS1, SVS2, and SVS3 were observed in the HT group compared to the non-HT group (all $P <0.05$). For the subgroup analysis on HT patients, 14 had sICH, all these patients had poor ACC. A lower SVS1, SVS3, DVS1, and DVS2 were observed in the sICH subgroup than in the aICH subgroup (all $P <0.05$). In Model-HT1 and Model-HT3, ACC was the independent predictor for HT (OR, 13.924; 95%CI, 1.671-115.991; $P < 0.05$ and OR, 9.141; 95%CI, 1.149-72.723; $P < 0.05$). In Model-sICH2 and Model-sICH3, DVS2 was the independent predictors for sICH (OR, 0.1; 95%CI, 0.018-0.567; $P < 0.05$ and OR, 0.1; 95%CI, 0.018-0.567; $P < 0.05$). The ROC showed that Model-HT3 and Model-sICH2 improved the prediction efficacy (AUC, 0.789 and 0.828).

CONCLUSION

The ACC, SVS, and DVS based on mCTA were valuable for predicting the risk of HT and sICH after EVT, the combination of multiple parameters can improve the predictive efficacy.

CLINICAL RELEVANCE/APPLICATION

Our study could prompt neurologists to perform preventive intervention in high-risk patients after EVT cogently.

T5B-SPNR-14 MRI MORPHOLOGICAL FEATURES COMBINED WITH FRACTAL ANALYSIS CAN PREDICT BRAIN INVASION IN MENINGIOMAS

Xianwang Liu, MD (*Presenter*)

PURPOSE

Brain invasion in meningiomas correlates with higher recurrence rates and poorer prognosis. This study aims to investigate whether combining MRI morphological characteristics with fractal analysis can predict brain invasion in meningiomas.

METHODS AND MATERIALS

We retrospectively analyzed 112 patients with pathologically confirmed meningiomas (non-invasion group: 68, invasion group: 44). Fractal dimension (FD) and lacunarity were calculated from T1-weighted contrast-enhanced images. Differences between clinical features, MRI morphological features, and fractal features were assessed by Pearson's chi-square test and Kruskal-Wallis rank-sum test. Logistic regression analysis was used to select the optimal features and construct a prediction model. Furthermore, A nomogram was used to predict the risk of brain invasion, and a decision curve was used to verify the clinical utility of the nomogram.

RESULTS

Peritumoral edema (OR=3.5, p=0.004), irregular margins (OR=4.2, p=0.003), and FD>1.28 (OR=5.6, p<0.001) were independent predictors in predicting brain invasion in meningiomas. The combined model (morphology+FD) achieved the highest predictive performance (AUC=0.887) compared to morphological features (AUC=0.771) or FD (AUC=0.814).

CONCLUSION

Both MRI morphological features and fractal analysis can predict brain invasion in meningiomas, and their combined use further improves predictive performance.

CLINICAL RELEVANCE/APPLICATION

Accurately predicting brain invasion in meningiomas invasion is of great clinical importance. This study demonstrates that both MRI morphological features and fractal analysis can predict brain invasion in meningiomas, and their combined use further improves predictive performance, which could help guide treatment strategies for meningiomas.

T5B-SPNR-15 ALTERNATIONS IN STATIC AND DYNAMIC FUNCTIONAL CONNECTIVITY DENSITY IN TEMPORAL LOBE EPILEPSY WITH AND WITHOUT HIPPOCAMPAL SCLEROSIS

Chengru Song (*Presenter*)

PURPOSE

To comprehensively examined static and dynamic functional connectivity density (FCD) in temporal lobe epilepsy (TLE) with hippocampal sclerosis (HS) and MRI-negative TLE and its potential correlation with cognition.

METHODS AND MATERIALS

This study included 53 healthy controls (HC), 38 TLE-HS patients, 51 MRI-negative TLE patients. All participants had MRI scans of resting-state BOLD functional imaging and 3D T1WI sequence. We also recorded the cognition scores on the memory and executive screening (MES) test and auditory verbal learning test (AVLT). Using Dynamic BC software, we calculated static functional connectivity density (FCD) and corresponding temporal dynamic FCD (dFCD) utilizing a sliding window approach with a window length of 50 repetition times (TR) and a shifting step size of 10 TRs. Differences in FCD and dFCD among TLE-HS, MRI-negative TLE, and HC groups were analyzed by one-way analysis of variance (ANOVA) and post-hoc comparisons via two-sample t-tests. Furthermore, a seed-based functional connectivity (FC) analysis was executed based on those aforementioned group differences. Corrections for multiple comparisons were accomplished based on GRF theory (pvoxelwise < 0.005, pcluster-wise < 0.05). Relationships between cognitive scores and FCD or dFCD values were analyzed by Spearman correlation ($p < 0.01$). Receiver operating characteristic (ROC) curve analysis was applied to assess the distinguishing ability.

RESULTS

Cognitive decline was detected in both the TLE-HS and MRI-negative TLE groups; it was more pronounced in the TLE-HS group. Compared to the HC group, the TLE-HS and MRI-negative TLE groups both demonstrated reduced static FCD values in the temporal neocortex ipsilateral to the epileptogenic focus. However, in the TLE-HS group, the seed-based rsFC analysis results revealed larger aberrant cluster sizes of reduced FC in the ipsilateral frontal and temporal lobes. For dFCD, its elevation in the temporal neocortex ipsilateral to the epileptogenic focus was detected only in the MRI-negative TLE group. Moreover, the dFCD was significantly correlated with cognitive scores ($P < 0.05$) and revealed a moderate discrimination ability between TLE-HS and MRI-negative TLE.

CONCLUSION

The patterns of change in FCD abnormalities were similar between TLE-HS and MRI-negative TLE, which were more pronounced and widely involved in the TLE-HS group. Furthermore, dFCD may reveal more nuanced variations in MRI-negative TLE and help in discrimination.

CLINICAL RELEVANCE/APPLICATION

The combination of static FCD and dFCD could provide novel and complementary evidence to help deepen our understanding of the whole brain function’s impairment and compensatory mechanism in TLE.

T5B-SPNR-16 NOMOGRAM BASED ON CONVENTIONAL MRI FEATURES AND FRACTAL PARAMETERS FOR DIFFERENTIATING ISOLATED FIBROUS TUMORS FROM ANGIOCENTRIC MENINGIOMAS

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Wei Ren (*Abstract Co-Author*)
Mengyuan Jing (*Abstract Co-Author*)
Junlin Zhou, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate whether a nomogram based on logistic regression models of conventional MRI features and fractal parameters can differentiate between SFT and AM.

METHODS AND MATERIALS

Our research focused on the clinical and imaging data from 193 cases of AM and 140 cases of SFT with histopathological diagnosis retrospectively. The box dimension algorithm was used to extract the enlarged tumor portion's 3D fractal dimension (FD) and lacunarity (LAC) values. Further evaluation focused on routine imaging features such as tumor size, shape, necrosis/cystic changes, dural tail sign, tumor vascular pattern, peritumoral edema, enhancement pattern, and bone destruction. Multivariate logistic regression analysis was adopted for identifying independent clinical and imaging risk factors for AM and SFT. Finally, a nomogram was constructed for predictive models of AM and SFT, with model performance assessed using calibration and decision curves.

RESULTS

Compared to AM, SFT had higher FD and LAC values ($P < 0.001$). Significant differences were found in age, size, morphology, necrosis/cysts, tumor vascularity, enhancement patterns, and dural tail signs between the AM and SFT groups ($P < 0.001$). Age, size, dural tail sign, FD, and LAC could differentiate between AM and SFT independently ($P < 0.05$). The AUC, accuracy, sensitivity, and specificity of the nomogram were 0.91, 0.85, 0.82, and 0.89 respectively. The calibration curve showed that the model's predicted probabilities of AM and SFT matched the actual probabilities well, showing valid prediction model indicated by the decision curve.

CONCLUSION

Fractal parameters can be used to discriminate between AM and SFT. The nomogram based on conventional MRI features and fractal parameters is reliable for distinguishing between AM and SFT, which can be used for preoperative non-invasive radiological prediction.

CLINICAL RELEVANCE/APPLICATION

A nomogram incorporating conventional MRI features and fractal parameters (fractal dimension and lacunarity) provides a reliable, non-invasive method to differentiate solitary fibrous tumors (SFT) from angiocentric meningiomas (AM). This tool can aid radiologists and clinicians in accurate preoperative diagnosis, improving treatment planning and reducing the need for invasive procedures.

T5B-SPNR-18 CROSS-SCALE ASSESSMENT OF POST-STROKE DEPRESSION IMAGING BIOMARKERS USING COMBINED NODDI AND DTI-ALPS ANALYSIS

Yanlin Tang (*Presenter*)

PURPOSE

To establish a multi-scale imaging biomarker system for post-stroke depression (PSD) by integrating Neurite Orientation Dispersion and Density Imaging (NODDI) and Diffusion Tensor Imaging Along the Perivascular Space (DTI-ALPS) techniques. This study investigated the "glymphatic dysfunction-white matter injury" hypothesis as a mechanistic framework explaining PSD development.

METHODS AND MATERIALS

This prospective longitudinal study enrolled 120 participants (40 PSD patients, 40 non-PSD stroke patients, 40 healthy controls) who underwent standardized depression assessments and MRI scans at baseline, 3, 6, and 9 months. Using a 5.0T scanner, NODDI parameters were extracted to evaluate microscopic axonal properties, while DTI-ALPS methodology assessed white matter integrity and glymphatic system functionality through perivascular diffusion measurements.

RESULTS

PSD patients exhibited distinct white matter abnormalities characterized by increased orientation dispersion index (ODI) and fraction of isotropic water (ISO) compared to non-PSD patients and healthy controls. DTI-ALPS analysis revealed compromised glymphatic system function in PSD patients, particularly evident in periventricular regions and along the superior longitudinal fasciculus ($p<0.001$). Longitudinal analysis demonstrated early glymphatic dysfunction (within 3 months post-stroke) preceded white matter deterioration and strongly predicted later depression severity ($r=0.68$, $p<0.001$).

CONCLUSION

This study establishes the "glymphatic dysfunction-white matter injury" pathological cascade as a critical mechanistic pathway in PSD development, wherein post-stroke neurovascular uncoupling leads to impaired glymphatic system function, causing progressive white matter microstructural damage and network dysfunction manifesting as depressive symptoms. The integration of NODDI and DTI-ALPS techniques provides a novel cross-scale assessment approach that bridges microscopic axonal property alterations with macroscopic white matter integrity changes and system-level clearance function impairments.

CLINICAL RELEVANCE/APPLICATION

The identified imaging biomarkers offer objective indicators for early PSD detection and intervention guidance, enabling personalized risk stratification and preventive therapeutic strategies. The established link between glymphatic system dysfunction and depression severity underscores the potential importance of waste clearance mechanisms in mood regulation, suggesting new therapeutic avenues targeting glymphatic system enhancement for PSD prevention and treatment.

T5B-SPNR-19 PREDICTIVE VALUE OF DESH FEATURES FOR FUTURE COGNITIVE DECLINE: A LARGE COHORT STUDY IN A GENERAL ELDERLY JAPANESE POPULATION

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Sera Kasai (*Abstract Co-Author*)
Tomohiro Shintaku (*Abstract Co-Author*)
Yuka Ishimoto (*Abstract Co-Author*)
Shingo Kakeda (*Abstract Co-Author*)

PURPOSE

Disproportionately enlarged subarachnoid-space hydrocephalus (DESH) features in idiopathic normal pressure hydrocephalus (iNPH) consist of three morphological characteristics: ventricular enlargement (Evans Index, EI > 0.3), enlarged Sylvian fissures (ESF), and tight high-convexity subarachnoid spaces (THCS). In clinical practice, one or two features are more commonly observed than all three, previously defined as "incomplete DESH." While incomplete DESH is observed in elderly individuals with normal cognitive function, its prevalence and association with cognitive function remain unclear. This study investigated whether incomplete DESH predicts cognitive decline in a large elderly cohort.

METHODS AND MATERIALS

Among 2,390 health check-up participants, 1,845 subjects with normal baseline cognitive function who were available for cognitive assessment follow-up at 2-8 years, excluding those with poor MRI quality or missing data on cognitive function or covariates, were enrolled. Two neuroradiologists assessed DESH features (EI > 0.3, ESF, THCS). Cognitive decline group was defined as progression from normal to mild cognitive impairment (MCI) or dementia. Logistic regression analysis examined whether DESH features predicted cognitive decline, adjusting for age, sex, education, medical history (diabetes, hypertension, hyperlipidemia), smoking, alcohol consumption, and total brain volume.

RESULTS

At follow-up, 1,672 participants (90.6%) maintained normal cognition, while 141 (7.6%) progressed to MCI and 32 (1.7%) to dementia, totaling 173 (9.3%) with cognitive decline (cognitive decline group). Complete DESH was present in 27 participants (1.5%). Individual features showed EI > 0.3 in 123 (6.7%), ESF in 783 (42.4%), and THCS in 177 (9.6%). Two-feature combinations included EI+ESF in 60 (3.3%), EI+THCS in 5 (0.3%), and ESF+THCS in 100 (5.4%). Logistic regression revealed that THCS alone and ESF+THCS combination significantly predicted cognitive decline ($p < 0.05$), while other DESH feature combinations did not.

CONCLUSION

In cognitively normal elderly individuals, THCS alone and its combination with ESF were significantly associated with future cognitive decline.

CLINICAL RELEVANCE/APPLICATION

DESH features on brain MRI predict future cognitive decline in cognitively normal elderly individuals, providing useful information to identify at-risk individuals for early intervention.

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Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPOB-1 PRACTICE PATTERNS IN THE IMAGING EVALUATION AND PERIPARTUM MANAGEMENT OF PLACENTA ACCRETA SPECTRUM AMONG ACADEMIC MEDICAL CENTERS: INSIGHTS FROM THE SOCIETY OF ABDOMINAL RADIOLOGY UTERINE AND OVARIAN CANCER DISEASE-FOCUSED PANEL

Erin N. Gomez, MD (*Presenter*)
Jeanne M. Horowitz, MD (*Abstract Co-Author*)
Liina Poder, MD (*Abstract Co-Author*)
Amita Kamath, MD, MPH (*Abstract Co-Author*)
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PURPOSE

Placenta accreta spectrum (PAS) is a potentially life-threatening condition in which the placenta adheres to or invades the myometrium. Ultrasound (US) is the first line imaging modality for detection of PAS. MRI may serve as an adjunct when US is inconclusive or insufficient for characterization. While consensus statements exist concerning the imaging features of PAS, there is significant variation in clinical practice regarding imaging protocols, workflow, study interpretation, and peripartum management of PAS. The purpose of this study was to further characterize this variation by surveying members of the Society of Abdominal Radiology (SAR) Uterine and Ovarian Disease-Focused Panel (UOC DFP).

METHODS AND MATERIALS

An online survey regarding practice patterns in placental imaging was created using Qualtrics. Stakeholders experienced in interpreting placental US and MRI from the SAR UOC DFP contributed survey questions, representing multiple institutions. Pilot testing was conducted with radiologists who do not routinely interpret PAS imaging for readability and ease of use. Surveys were distributed to the 88 DFP members via e-mail. Data collected included practice setting, subject matter expertise, case volumes, imaging protocols, workflow and interpretation, peripartum management and challenges in the interpretation of PAS imaging. Time to complete the survey was logged for each respondent. Incomplete responses were included.

RESULTS

26 unique responses were collected (30% response rate). 9/26 respondents indicated that their institution does not perform in-house placental imaging. Of the remaining 17 respondents, 8 read MRI only, 2 read US only, and 5 read both. 2 respondents did not interpret PAS imaging but provided information regarding institutional protocols and practice. 14/17 considered themselves subject matter experts (SMEs) in PAS imaging. MRI and US volumes ranged from 1-10 and 4-10 studies per month, respectively. Reported MRI protocols varied, with all performing multiplanar T2 weighted imaging and many performing fat-saturated T1 (10/17) and diffusion-weighted imaging (7/17). Challenges identified included lack of communication with the obstetric team, suboptimal images, and lack of follow-up regarding patient outcomes. Common goals among respondents included accurate detection of PAS and guiding clinical management.

CONCLUSION

Significant variation exists in radiologic and clinical practice regarding imaging and management of patients with suspected PAS, even among SMEs.

CLINICAL RELEVANCE/APPLICATION

Awareness of practice patterns at U.S. academic medical centers provides opportunities for standardization of protocols and additional guidelines and recommendations at the society level.

T5B-SPOB-2 COMPARATIVE ANALYSIS OF ULTRASOUND ELASTOGRAPHY AND DIFFUSION-WEIGHTED MRI IN DIFFERENTIATING UTERINE MYOMETRIAL MASSES

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Ritu N. Misra, MD, MBBS (*Abstract Co-Author*)
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PURPOSE

To compare the diagnostic efficacy of Strain and Shear Wave Ultrasound (US) Elastography and Diffusion-weighted (DW) MRI in differentiating Uterine Myometrial Masses.

METHODS AND MATERIALS

Fifty patients with uterine myometrial masses, i.e., fibroid, adenomyosis, or leiomyosarcoma (LMS) on the US and fifty controls (normal myometrium) were included. All these patients underwent Transabdominal Shear Wave and Transvaginal Strain US Elastography, followed by DW-MRI. The elasticity values (kPa), shear wave velocity values (m/s), strain ratio & mean ADC values (x10 -6 mm^2/sec) were compared between the myometrial masses and the control group, as well as between adenomyosis, fibroids, and LMS, keeping histopathology (HPE) as the gold standard.

RESULTS

A significant difference in the elasticity parameters (kPa & m/s) among fibroids, adenomyosis, LMS & controls, and fibroids vs. adenomyosis was noted (P-value <0.05). However, no significant results were obtained for Strain and Shear Wave Elastography in differentiating LMS from fibroids or adenomyosis. On comparing ADC values between fibroids and LMS, a cut-off of =968.6 (x10 -6 mm^2/sec) predicted LMS with 100% sensitivity and 64% specificity.

CONCLUSION

US Shear Wave Elastography contributes significantly to the differentiation of benign myometrial masses. Being non-invasive and radiation-free, it can serve as a good add-on to the conventional US. Also, Shear Wave and Strain Elastography, and ADC values effectively differentiate myometrial mass from normal tissue. However, Strain Elastography has a limited role in differentiating among specific types. DW-MRI has a significant role in differentiating fibroids from LMS and thus should be incorporated into the routine MRI protocol of uterine masses.

CLINICAL RELEVANCE/APPLICATION

Uterine myometrial masses, including fibroids, adenomyosis, and leiomyosarcoma, present with similar non-specific complaints of abnormal uterine bleeding, pelvic pain, and distension. Many a time, they have a similar appearance on imaging as well. The final diagnosis is obtained by histopathology. However, pre-operative characterization of these masses is considered pivotal for determining the therapeutic approach and feasibility of conservative treatment. Ultrasound Elastography may help differentiate various uterine myometrial pathologies based on tissue stiffness. Diffusion-weighted MRI and the apparent diffusion coefficient (ADC), a quantitative parameter, describe the diffusion of water molecules within tissues. Malignant pathologies with increased cellularity show lower ADC values than moderately hypercellular benign pathologies.

T5B-SPOB-3 PRENATAL OPIOID EXPOSURE ASSOCIATED WITH LOWER FETAL WHITE MATTER VOLUME

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Jonathan Class, MD (*Abstract Co-Author*)
Yi Zhao, PhD (*Abstract Co-Author*)
William Reynolds (*Abstract Co-Author*)
Sanjali Kherde (*Abstract Co-Author*)
Senthilkumar Sadhasivam (*Abstract Co-Author*)
Rupa Radhakrishnan, MD, MS (*Abstract Co-Author*)

PURPOSE

Opioid use during pregnancy continues to be a significant public health challenge. Prenatal opioid exposure is associated with adverse infant and childhood outcomes, however the mechanisms of how opioids impact the developing brain are not well assessed. Published literature shows alterations in neonatal brain volumes in prenatal opioid exposure, however these results have potential for confounding by perinatal clinical factors. Therefore, in this study, we assessed the association of prenatal opioid exposure with fetal brain development.

METHODS AND MATERIALS

This was a prospective, IRB approved, multisite study that recruited pregnant women with opioid use disorder on opioid maintenance therapy and control healthy pregnant women. Fetal brain MRI was performed in the second or third trimester. Two-dimensional MR images of fetal brains were acquired using a HASTE sequence in the axial, coronal, and sagittal planes. Fetal brain images were segmented and then reconstructed in three-dimensional space using automated pipelines. Reconstructed volumes were reorientated and realigned to standard space and segmented into eight tissue layers. The association of prenatal opioid exposure and segmented brain volumes were assessed using linear regression and corrected for race, sex, gestational age, tobacco use, and polysubstance use. Benjamini-Hochberg multiple comparison correction was performed.

RESULTS

63 subjects were included in this study - 31 with prenatal opioid exposure and 32 unexposed controls. Segmented white matter volume was significantly smaller in fetuses with prenatal opioid exposure ($p = 0.003$) after multiple comparison correction. Smaller deep gray matter volumes ($p=0.023$) and smaller volume of the corpus callosum ($p=0.035$) were also associated with prenatal opioid exposure on individual comparisons but was not sustained after multiple comparison correction.

CONCLUSION

We identified significantly lower white matter volumes in prenatal opioid exposure compared to control fetuses without substance exposure, suggesting a potential impact of opioids on white matter development and maturation.

CLINICAL RELEVANCE/APPLICATION

This work assessed impact of prenatal opioid exposure on neurodevelopment by assessing brain volumes in the fetal stage. Fetal imaging could be a valuable tool to assess those who may be at greater risk of poor developmental outcomes.

Abstract Archives of the RSNA, 2025

T5B-SPPD

Pediatric Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPPD-1 IMAGING UTILIZATION IN THE OUTPATIENT AND EMERGENCY SETTING AMONG PEDIATRIC MEDICAID BENEFICIARIES AT CHILDREN'S VS. NON-CHILDREN'S HOSPITALS

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Richard A. Barth, MD (*Abstract Co-Author*)
Eric Christensen, PhD (*Abstract Co-Author*)
Andrea S. Doria, MD, PhD (*Abstract Co-Author*)
Shireen Hayatghaibi, PhD, MPH (*Abstract Co-Author*)
Cara E. Morin, PhD (*Abstract Co-Author*)
Elizabeth Y. Rula, PhD (*Abstract Co-Author*)
Marla Sammer, MD (*Abstract Co-Author*)
Andrew T. Trout, MD (*Abstract Co-Author*)
Andy Tsai, MD, PhD (*Abstract Co-Author*)
Sherwin S. Chan, MD, PhD (*Abstract Co-Author*)

PURPOSE

To report relative proportions of imaging performed on pediatric (0-17 years) patients in the outpatient setting at children's (CH) versus non-children's hospitals (NCH) in the U.S., overall and by modality.

METHODS AND MATERIALS

Using two years (2018-2019) of CMS ' Medicaid 100% Research Identifiable Files, all year 2019 pediatric outpatient claims were identified from both hospital outpatient facility and emergency department (ED) places of service. Data from 2018 were used to calculate Pediatric Comorbidity Index (PCI) for risk adjustment. CMS facility identifier was linked to 2019 American Hospital Association data. We then utilized Piper et al.'s 2020 hospital tiering assignments to determine CH and NCH. Primary outcomes were the use of computed tomography (CT), magnetic resonance imaging (MR), ultrasound (US), or conventional radiography (XR) at each visit and compared between CH and NCH. Additional covariates included age group (0, 1-2, 3-5, 6-11, 12-17 years), measure of acuity using PCI (0, 1-2, 3-6, 7), chief complaint (ICD-10 diagnosis code), and place of service (outpatient vs. ED).

RESULTS

We identified 5,474,082 Medicaid claims for inclusion. Over half (53%) of visits were to children's hospitals (CH) and 15% were in the ED. Patients visiting CH were more likely to be aged 0-5 years vs >5 years (41.2% vs 38.7%, $p<0.01$), sicker with PCI>2 (32.3% vs 22.9%, $p<0.01$), and seen in an outpatient setting (87.8% vs 81.9%, $p<0.01$) than patients at NCH. The three most frequent primary complaints among patients were the same at CH and NCH: respiratory, developmental/psychological, and injury/trauma. The most commonly used modalities overall were XR (95/1,000 visits) and US (21/1,000 visits). Use of XR was more frequent at NCH than CH (118 vs 75 per 1,000 visits, $p<0.01$), as was CT (100 vs 50 per 1,000 visits, $p<0.01$). Use of US (25 vs 17 per 1,000 visits, $p<0.01$) and MR (9 vs 5 per 1,000 visits, $p<0.01$) were higher at CH than NCH. Rate of XR utilization was higher at NCH than CH, regardless of patient age or acuity (PCI). Rate of CT utilization was higher at NCH than CH among older patients (age categories 6-11 and 12-17 years).

CONCLUSION

When imaging pediatric Medicaid beneficiaries in an outpatient setting, non-children's hospitals appear to use XR and CT more often and US and MR less often compared to children's hospitals.

CLINICAL RELEVANCE/APPLICATION

This study presents the first available data comparing imaging modality utilization between children's and non-children's hospitals, revealing notable differences that may reflect disparities in resource and personnel availability or institutional care pathways. The clinical implications of these variations remain undefined and warrant further investigation to assess their impact on patient outcomes.

T5B-SPPD-3 SAME IMAGE, DIFFERENT EYES: COMPARING CLINICIAN AND RADIOLOGIST INTERPRETATIONS IN CHEST X-RAYS FOR TB SCREENING IN HIV CARE

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Abigail Seeger (*Abstract Co-Author*)
Anna Mandalakas, MD (*Abstract Co-Author*)
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Adamson Munthali (*Abstract Co-Author*)
Brigid O'Brien, MD (*Abstract Co-Author*)
Jacob Todd, MD (*Abstract Co-Author*)
Hansel J. Otero, MD (*Abstract Co-Author*)

PURPOSE

Tuberculosis (TB) continues to be a major health threat for people living with HIV. Since 2020, the TB GAPs project has been studying TB screening methods, including chest X-rays (CXR), lab tests, and clinical assessments among children, adolescents, and adults receiving HIV care across five countries in sub-Saharan Africa. While the value of CXRs in TB screening remains debated, they're still widely used to support diagnosis. To compare how clinicians and radiologists interpret CXRs for TB screening in children with HIV, and assess how well their readings match.

METHODS AND MATERIALS

We prospectively evaluated 1,690 HIV-positive children and adolescents undergoing routine TB screening. A TB diagnosis was confirmed if treatment was started based on clinical or lab evidence. CXRs were read separately by clinicians (with access to symptoms) and radiologists (blinded to clinical info), using a structured form that included signs like lymphadenopathy, airspace opacity, effusion, nodules, and cavities. Results were grouped as positive (TB or unclear) or negative. Agreement was measured with Cohen's Kappa; we also calculated sensitivity, specificity, and AUC.

RESULTS

Overall agreement between clinicians and radiologists was fair (? = 0.318). Agreement was lowest for lymphadenopathy (? = 0.12) and highest for pleural effusion (? = 0.40); for cavities, it was nearly zero. Radiologists had 41.3% sensitivity and 95.7% specificity; clinicians had 65% sensitivity and 87% specificity. AUC was higher for clinicians (0.765 vs. 0.685).

CONCLUSION

Clinicians identified more TB cases, likely due to access to patient history, while radiologists were more confident at ruling disease out. These differences reflect the strengths and limitations of each approach. Clinician and radiologist interpretations of CXRs in pediatric HIV care often differ, likely due to differences in context and clinical input. In this setting, CXRs may be most helpful in excluding advanced TB.

CLINICAL RELEVANCE/APPLICATION

In high-burden areas like those served by the Baylor TB GAPS Centers of Excellence, clinicians using clinical context are more likely to detect TB, while radiologists excel at ruling it out. These findings highlight the importance of combining clinical and radiographic input and point to a need for stronger CXR interpretation training for clinicians, especially in settings with limited radiology support.

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T5B-SPPH

Physics Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPPH-1 IMPROVING DUAL-CONTRAST IODINE AND GADOLINIUM IMAGING WITH LOW-KV TECHNIQUE AND AI DENOISING ON CLINICAL PHOTON-COUNTING CT

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Tarique Hussain (*Abstract Co-Author*)
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Liqiang Ren, PhD (*Abstract Co-Author*)

PURPOSE

Dual-contrast imaging of iodine and gadolinium has been shown to be technically feasible using clinical photon-counting CT (PCCT). However, suboptimal tube voltage selection and noise amplification following material decomposition currently limit the detection of low-concentration iodine and gadolinium signals. This study aims to evaluate the use of a low-kV technique (70 kV) combined with an AI-based denoising algorithm to enhance the performance of PCCT dual-contrast imaging of iodine and gadolinium.

METHODS AND MATERIALS

Iodine rods (0.5, 1.0, 2.0, and 5.0 mg/mL), gadolinium rods (0.3, 0.9, and 2.2 mg/mL), and an iodine/gadolinium mixture (5/5 mg/mL) were embedded in a multi-energy CT phantom of three sizes (lateral dimensions: 20, 33, and 40 cm). Scans were performed using a clinical PCCT scanner (NAEOTOM Alpha, Siemens) at 70, 90, 120, and 140 kV. Radiation dose levels were matched across scans (CTDIvol: 3, 8, and 12 mGy for small, medium, and large phantoms, respectively). Low- and high-energy images from each scan were exported for analysis. Image-based three-material decomposition (iodine/gadolinium/water) was performed on both the original and denoised images (processed using ClariCT.AI). For each decomposed iodine and gadolinium map, circular regions of interest were placed to measure mean mass concentration (± standard deviation). Root-mean-square error (RMSE) was calculated to assess performance across tube voltages, phantom sizes, and denoising conditions.

RESULTS

Across all phantom sizes, the lowest available tube voltage (70 kV) produced the lowest RMSE values on the decomposed iodine/gadolinium maps: 0.57/0.59 (small phantom), 0.73/0.76 (medium phantom), and 1.41/1.33 (large phantom). Quantification accuracy further improved when material decomposition was performed on denoised image pairs, reducing RMSE values to 0.33/0.33 (small phantom), 0.42/0.42 (medium phantom), and 1.05/0.93 (large phantom).

CONCLUSION

The 70 kV low-kV technique, with k-edge energy well-matched to gadolinium, outperformed higher tube voltages for dual-contrast imaging. Additionally, AI-based denoising further enhanced iodine and gadolinium material decomposition performance on PCCT images.

CLINICAL RELEVANCE/APPLICATION

Enhanced material decomposition using low-kV techniques and AI denoising may improve the clinical feasibility of dual-contrast iodine and gadolinium imaging, expanding its potential for future diagnostic applications.

T5B-SPPH-2 MATERIAL DECOMPOSITION AND MOTION ARTIFACT QUANTIFICATION IN DYNAMIC PHOTON-COUNTING-DETECTOR (PCD) CT WRIST IMAGING

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Hao Gong, PHD (*Abstract Co-Author*)
Andrew Thoreson (*Abstract Co-Author*)
Chunming Gu, PhD, MS (*Abstract Co-Author*)
Nirusha Lachman (*Abstract Co-Author*)
Kristin D. Zhao, PhD (*Abstract Co-Author*)
Cynthia H. McCollough, PhD (*Abstract Co-Author*)
Shuai Leng, PhD (*Abstract Co-Author*)

PURPOSE

Wrist joint instability in movement can precede arthritis, but traditional CT systems are limited by poor connective tissue contrast and motion artifacts in dynamic imaging. Photon counting detector (PCD) CT improves these by enabling spectral dynamic imaging. This study tests the impact of motion on image artifacts and material decomposition in PCD wrist images.

METHODS AND MATERIALS

A cadaveric wrist with two fiducial markers was attached to a motion stage and scanned on a dual-source PCD-CT (NAEOTOM Alpha, Siemens), both statically and dynamically, with radial-ulnar deviation. Using a cardiac protocol to improve temporal resolution (66 ms), the cadaver was scanned at 3 motion speeds: 1.5, 1.0, and 0.75 s per cycle. 50 and 100 keV virtual monoenergetic images (VMIs) and single energy images (T3D), were reconstructed (Qr64 kernel, QIR4, 0.6/0.4 mm slice thickness/increment). Material decomposition using prior knowledge aware iterative denoising (MD-PKAID) was used to make collagen and hydroxyapatite maps. Regions of interest (ROI) measurements were taken in soft tissue and bone, and bias compared to static images was calculated at each speed. Motion artifact was analyzed at each speed, with X-ray starting angle matched. At each slice, ROIs were drawn around the fiducials and used to calculate entropy and positivity. The fiducials and low intensity regions (LIRs) were segmented and used to calculate the fold overlap ratio (FOR) and the LIR score, which measure deformation and low intensity artifacts. Wilcoxon signed rank tests were used to compare each metric across different speeds.

RESULTS

Higher motion speeds increased positivity and entropy and decreased LIR score. For positivity, LIR score and entropy all but two curves (right fiducial entropy, 1.0 and 0.75 s period) were statistically different ($p < 0.05$). Visually and quantitatively, artifacts worsened distally to the wrist. FOR showed no trend between motion speed and artifact. For material decomposition, average absolute bias was 35.4, 49.9, and 58.8 mg/cc for bone and was 53.7, 60.1, and 61.2 mg/cc for soft tissues for motion speeds of 1.5, 1.0, and 0.75 s per cycle. Soft tissue and bone blurring was observed at higher speeds.

CONCLUSION

PCD-CT enables dynamic imaging with spectral capability, but motion artifacts are still prevalent in wrist images. Positivity and LIR score accurately quantify these artifacts, but entropy and FOR do not. MD-PKAID density value bias increases for bone and soft tissue with an increase in speed.

CLINICAL RELEVANCE/APPLICATION

Identification of wrist joint instability may be possible with PCD CT dynamic imaging; however, motion affects image quality. Robust material decomposition and artifact correction for dynamic images are needed for accurate diagnosis.

T5B-SPPH-3 DEVELOPMENT OF A NEW PHANTOM FOR 3D IMAGING OF SMALL BLOOD VESSELS (WHICH ALLOWS SIMULTANEOUS MEASUREMENT OF MTF, SLICE THICKNESS, PEAK CT NUMBER, AND EFFECTIVE VOXEL SIZE)

Katsumi Tsujioka, RT (*Presenter*)

PURPOSE

Current CT devices are required to display three-dimensional images of small blood vessels, such as perforator vessels, in their entirety. Currently, the visualization ability of small blood vessels is discussed only in terms of MTF. However, MTF has the disadvantage that it cannot evaluate the contrast difference of small blood vessels. In clinical diagnosis and three-dimensional image creation, in addition to spatial resolution by MTF, blood vessel contrast is an important factor. Small blood vessel contrast is caused by the partial volume effect due to the effective voxel size of the CT device. Therefore, measurement of the effective voxel size is important for three-dimensional creation of small blood vessels. In this study, we developed a new phantom that can compare the peak CT value and effective voxel size in addition to the MTF of the CT device.

METHODS AND MATERIALS

The phantom is an acrylic cylinder with a diameter of 50 mm and a length of 300 mm, and a metal wire with a diameter of 0.1 mm is wound in a spiral shape. The spiral pitch is 5 mm per rotation. From the images after scanning, the MTF in the X-Y plane, the effective slice thickness in the Z-axis direction, and the peak CT value of the wire are measured. The effective voxel size can also be calculated. We conducted experiments on images from a conventional CT system, images from a conventional CT system using Deep Learning Reconstruction (DLR), and images from an ultra-high resolution CT (UHR-CT) system.

RESULTS

DLR and UHR-CT improved the MTF in the X-Y plane, and reduced the effective slice thickness. In addition, DLR and UHR CT increased the CT value of the metal wire.

CONCLUSION

The spiral wire phantom we developed allowed us to determine the MTF in the X-Y plane, the slice thickness in the Z-axis direction, and the peak CT value of the metal wire in a single scan. In addition, the effective voxel size could be determined from the increase in the measured CT value and the measured slice thickness. It was found that the effective voxel size was reduced in DLR and UHR CT compared to the conventional CT system.

CLINICAL RELEVANCE/APPLICATION

The ability to visualize small blood vessels cannot be properly evaluated using only the spatial resolution based on the conventional MTF. This is because this method does not allow evaluation of the change in the peak CT value of small blood vessels due to the partial volume effect. The thickness of the metal wire in this phantom is 0.1 mm. This allows accurate evaluation of blood vessels with a diameter of 0.2 mm according to the sampling theorem. The new phantom, which allows evaluation of peak CT value and effective voxel size in addition to measurement of MTF and effective slice thickness in a single scan, is suitable for accurately comparing the accuracy of 3D image creation in clinical practice.

T5B-SPPH-4 K-EDGE IMAGING FOR POST-TREATMENT EVALUATION OF ANEURYSMS: CONVENTIONAL AND PHOTON-COUNTING CT PHANTOM EXPERIMENTS

Nariman Nezami, MD (*Presenter*)
Amir Pourmorteza, PhD (*Abstract Co-Author*)
Arnaud Choux (*Abstract Co-Author*)
Brian Periku (*Abstract Co-Author*)
Scott Slavic, MS (*Abstract Co-Author*)
Zhye Yin (*Abstract Co-Author*)

PURPOSE

Effective assessment of embolization procedures relies on clearly distinguishing embolic materials from surrounding blood and contrast agents. Embolic agents are typically made radiopaque with iodine additives (e.g., ethiodized oil) or high-atomic-number metals like tantalum (Ta), tungsten (W), and platinum (Pt). This study explores the potential of spectral CT to differentiate between these embolics and iodine-based intravascular contrast agents (IBCA) using material-specific K-edge behavior.

METHODS AND MATERIALS

We created 20 aneurysm models using 3D printing and filled them with a variety of embolic agents from six manufacturers. These included metallic coils containing W and Pt, glue mixtures with ethiodized oil, LAVA, and shear-thinning embolics (Obsidio) with Ta. The models were embedded in an anthropomorphic phantom and scanned using a dual-energy, fast-kV switching CT system (GE Revolution Apex) and a deep-Si photon-counting detector (PCD) CT scanner. Virtual monoenergetic images at 40, 70, and 140 keV were reconstructed using filtered back projection algorithm with a standard kernel. Regions of interest were drawn to measure CT attenuation values for each embolic type and compared to a standard 15 mg I/mL iodine solution.

RESULTS

Embolics containing only iodine showed rapidly decreasing attenuation values with increasing energy, closely matching the IBCA mass attenuation vs energy curves. In contrast, Pt- and W-based embolics demonstrated a marked increase in attenuation at higher energies, while Ta-containing agents exhibited more stable or slightly declining curves. Although W and Ta have overlapping K-edge signatures, the co-occurrence of Pt with W helped distinguish them. These spectral trends enabled consistent differentiation among embolic types.

CONCLUSION

Spectral CT allows effective separation of iodine-based contrast from embolics composed of Pt, W, and Ta. For clearer differentiation in clinical imaging, non-iodinated embolics are preferable. Photon-counting CT, with its superior energy resolution and reduced metal artifacts, holds promise for advancing this technique further. We demonstrated that these embolic can be distinguished from IBCA with conventional spectral CT. Further work will better characterize the benefits that dSi PCCT may provide

CLINICAL RELEVANCE/APPLICATION

Accurate identification of embolic agents post-treatment can guide follow-up care and detect complications such as recanalization or migration. Spectral CT provides a non-invasive imaging tool that enhances clinical decision-making in endovascular therapies.

T5B-SPPH-6 AUTOMATED ACR MR QUALITY ASSURANCE REPORT SYSTEM FOR LARGE PHANTOM ACQUISITION

Luis Santos, MD, BA (*Presenter*)
Ji Hyun H. Lee, PhD (*Abstract Co-Author*)
Li-Yueh Hsu (*Abstract Co-Author*)
Gregg Cohen, PhD (*Abstract Co-Author*)

PURPOSE

The American College of Radiology (ACR) publishes the Large and Medium Phantom Test Guidance for the MRI Accreditation Program. The ACR Large Phantom Guidance consists of seven quality assurance (QA) tasks: Geometric Accuracy, High-Contrast Spatial Resolution, Slice Thickness, Slice Position, Image Intensity Uniformity, Percent-Signal Ghosting, and Low-Contrast Object Detectability. Technologists routinely perform manual measurements using the Picture Archiving and Communication System (PACS) viewer for these tasks that require estimating window, level, and thresholding settings. This is a time-consuming process prone to error.

METHODS AND MATERIALS

We developed a fully automated Phantom Acquisition Scan Measurements (PhantASM) pipeline based on the Hazen QA framework to automatically fetch and process phantom scans from the Philips (CareStream) PACS. We implemented the following additional tasks: Low-Contrast Object Detectability, High-Contrast Spatial Resolution, Slice Thickness, and Sagittal Geometric Accuracy. PhantASM generated human-readable reports from the processed imaging data, formatted for integration with PACS. The pipeline was validated using 500 prior acquisitions with 298 for Philips 3T and 202 for Siemens 1.5T scanners.

RESULTS

For the comparison of PhantASM automatic vs. manual measurements, the Geometric Accuracy task yielded 190 ± 0.82mm vs. 189.38 ± 0.06mm. For High-Contrast Spatial Resolution, results were 0.96 ± 0.06mm vs. 1.0 ± 0.01mm. The Low-Contrast Object Detectability task yielded 8.99 ± 1.73 vs. 9.87 ± 0.19 valid spokes. Image Intensity Uniformity results were 90.59 ± 4.13% vs. 93.38 ± 4.49%. Percent-signal Ghosting measured 0.14 ± 0.26 vs. 0.08 ± 0.07%. Additionally, the following tasks lacked manual comparison data. The Slice Thickness task yielded 5.28 ± 1.01mm. The Slice Position Accuracy task yielded 1.88 ± 1.43mm. All results are within ACR reference guidelines. For processing time, PhantASM averages 4 seconds when all seven tasks ran in parallel and 17 seconds when tasks ran sequentially. In contrast, manual measurements by technologists were estimated to take 6 to 20 minutes. A single pipeline job completed in about 30 seconds, providing a 12 to 40-fold increases in workflow efficiency.

CONCLUSION

All seven ACR QA tasks executed by PhantASM met ACR reference guidelines for quality MRI acquisitions, with results consistent across a cohort of 500 cases, including a mixture of scanner vendors and field strengths. The results are presented in a visually clear report, simplifying the QA process for technologists and significantly reducing operational time burden.

CLINICAL RELEVANCE/APPLICATION

The PhantASM workflow will improve acquisition quality, consistency, and measurement efficiency.

T5B-SPPH-7 INTER-INSTITUTIONAL CONSISTENCY OF QUANTITATIVE SPECTRAL RESULTS WITH CLINICAL PHOTON-COUNTING CT

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Martin Rybertt, BS (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)
Liqiang Ren, PhD (*Abstract Co-Author*)
Xinhui Duan, PhD (*Abstract Co-Author*)
Kishore Rajendran, PhD (*Abstract Co-Author*)
Di Zhang, PhD (*Abstract Co-Author*)
Grace Hyun Kim, PhD, MS (*Abstract Co-Author*)
Michael F. McNitt-Gray, PhD (*Abstract Co-Author*)

PURPOSE

With its technological advancements, photon-counting CT (PCCT) has enabled the incorporation of quantitative imaging into routine diagnostic radiology practices, especially for quantification of select elements (e.g. iodine) and materials (e.g. fat). While its quantitative stability over time has been previously evaluated, reproducibility of these quantitative results has not been investigated. Thus, we assessed inter-institutional quantitative reproducibility of spectral results in a commercially available PCCT.

METHODS AND MATERIALS

Four institutions scanned the same model of a commercial multi-energy CT phantom with the same configuration of tissue-mimicking and material-specific inserts on the same commercially available PCCT (Naeotom Alpha, Siemens Healthineers). At each institution, three scans were performed at a tube voltage of 140 kV and CTDI vol of 10 mGy in single-source mode. Virtual monoenergetic images (VMI) from 40 to 190 keV, iodine, and virtual non-contrast (VNC) maps were reconstructed for each scan. Images were then analyzed to measure a) error relative to the expected value of each material at each energy level and b) noise. Average relative error across repetitions and slices were calculated for each insert, institution, and spectral result. These average relative errors were then utilized to determine inter-scanner standard deviation and reproducibility coefficient (RDC) for each insert and spectral result to quantify inter-scanner reproducibility.

RESULTS

Spectral results demonstrated comparable quantification between the four scanners. Relative VMI 70 keV errors for each institution averaged 6 ± 3, 4 ± 2, 10 ± 7, and 11 ± 8 HU, respectively. Overall, inter-scanner standard deviation for VMIs decreased with increasing keV, measuring 9 ± 2, 3 ± 1, and 3 ± 1 HU for VMI 40, 70, and 190 keV, respectively. This corresponded to a RDC of 8.3 HU for VMI 70 keV. For VNC and iodine density, inter-scanner standard deviation averaged 2 ± 2 HU and 0.14 ± 0.11 mg/mL, respectively. Image noise was comparable between institutions with noise of 26 ± 2, 25 ± 2, 26 ± 2 and 26 ± 2 HU, respectively, for VMI 70 keV. An average noise of 0.92 ± 0.07 mg/mL was observed in iodine maps.

CONCLUSION

PCCT exhibited reproducible quantification and noise between scanners across spectral results. Inter-scanner reproducibility of quantitative maps in PCCT further enhances its utility for quantitative imaging in diagnostic radiology across a range of clinical applications.

CLINICAL RELEVANCE/APPLICATION

Establishing inter-scanner quantitative reproducibility is essential for ensuring consistent diagnostic interpretation and enabling the reliable use of PCCT-derived biomarkers across different clinical sites and systems.

T5B-SPPH-8 AI-DERIVED BACKGROUND PARENCHYMAL ENHANCEMENT TECHNIQUE ON CONTRAST-ENHANCED MAMMOGRAPHY: COMPARISON WITH RADIOLOGIST INTERPRETATION ACROSS AGE AND BREAST DENSITY

Tamerlan Mustafaev, MD (*Presenter*)
Margarita L. Zuley, MD (*Abstract Co-Author*)
Robert M. Nishikawa, PhD (*Abstract Co-Author*)

PURPOSE

The aim of our study was to develop and evaluate a method for automatically extracting quantitative Background Parenchymal Enhancement (BPE) characteristics on Contrast-Enhanced Mammography (CEM) using an in-house radiologist-trained AI algorithm.

METHODS AND MATERIALS

Low energy (LE) and recombined images (RI) from 1111 consecutively accrued CEM exams from an ongoing prospective diagnostic CEM trial included 982 exams with pathologically verified benign lesions and 129 studies with verified breast cancer. Patient age, radiologist-reported breast density, and BPE were collected from the research database. Our radiologist-trained, in-house AI model segmented breast density on LE images. These segmentations were applied to RI images to calculate BPE specifically within fibroglandular tissue (AI-fBPE) and fatty tissue. The AI model was a transformer-based U-net trained using publicly available datasets. We then calculated the difference between fibroglandular and fatty enhancements (AI-dBPE), thereby quantifying true fibroglandular tissue contrast. We performed two correlation analyses: (1) correlation between AI-fBPE and radiologist-reported BPE; and (2) correlation between AI-dBPE and radiologist-reported BPE. Additionally, we assessed correlations between AI-dBPE and radiologist-reported BPE for different age and breast-density groups separately. Age groups: <45 (premenopausal), 45-55 (perimenopausal), >55 (postmenopausal).

RESULTS

The correlation between AI-fBPE and radiologist-reported BPE was weak (r = 0.14, 95% CI: 0.08-0.20). The correlation between AI-dBPE and radiologist-reported BPE categories was stronger (r = 0.69, 95% CI: 0.66-0.71). For the fatty and scattered breast density group, the correlation between AI-dBPE and radiologist-reported BPE was moderate (r = 0.57, 95% CI: 0.50-0.64); for the heterogeneous and extremely dense group, this correlation was slightly higher (r = 0.60, 95% CI: 0.55-0.65). When analyzed by age, correlation between AI-dBPE and radiologist-reported BPE was strongest in women aged <45 (r=0.68, 95% CI: 0.62-0.73), followed by those aged 45-55 (r=0.66, 95% CI: 0.60-0.71), and lowest in women aged >55 (r=0.53, 95% CI: 0.47-0.59).

CONCLUSION

The AI-extracted AI-dBPE showed a strong correlation (r > 0.6) with radiologist-reported BPE, especially compared to AI-fBPE. Correlation was stronger in pre- and perimenopausal groups compared to postmenopausal women.

CLINICAL RELEVANCE/APPLICATION

AI-based quantitative assessment of BPE could serve as a reliable, robust, and standardized tool in clinical practice, reducing subjective variability in interpretation. Additionally, this technique may facilitate research to improve breast cancer risk prediction using CEM.

T5B-SPPH-11 IMPROVING CLARITY AND DIAGNOSTIC CONFIDENCE OF CORONARY STENT IN CORONARY CT ANGIOGRAPHY USING A SECOND-GENERATION WHOLE- HEART MOTION CORRECTION ALGORITHM (SSF2)

Tingting Qu (*Presenter*)

PURPOSE

To investigate the effect of a whole- heart motion correction algorithm (SSF2) on image quality and diagnostic confidence of coronary stent in coronary CT angiography (CCTA).

METHODS AND MATERIALS

Fifty-one patients (with 70 stents) underwent CCTA were included. Images were reconstructed using standard algorithm without motion correction (STD), with the first-generation snapshot freeze (SSF1) and SSF2 motion correction. Subjective scoring (5-point method) and objective evaluation of stents were performed. Subjective evaluation included the severity of stent motion artifacts, clarity of stent display, and diagnostic confidence within the stent. Objective evaluation included CT and SD values of the fat outside the stent with the most severe stent artifacts, in-stent lumen diameter, external stent diameter and severity of blooming artifact (blooming artifact = (external stent diameter - in-stent lumen diameter)/external stent diameter * 100).

RESULTS

The difference in the severity of stent motion artifacts among the three groups was statistically significant (P<0.001), with SSF2 having the lowest score (0.27±0.48) and STD the highest (1.34±1.10). The clarity of stent (4.30±0.62) and the diagnostic confidence score (3.77±1.11) of SSF2 were significantly higher than the other two groups (all P<0.001), and STD have the lowest score. There was a statistically significant difference in fat CT and SD values among the three groups (all P<0.001), with SSF2 having the lowest values, STD the highest. The stent reconstructed with SSF2 had the largest in-stent lumen diameter and the smallest blooming artifact (all P<0.001), followed by SSF1, while the STD had the smallest in-stent lumen diameter and the largest blooming artifact.

CONCLUSION

The application of SSF2 in CCTA significantly reduces the motion artifacts of coronary stents compared to STD and SSF1, resulting in better display of the coronary arteries inside the stents and improved diagnostic confidence.

CLINICAL RELEVANCE/APPLICATION

SSF2 technology can make coronary stent display clearer and improve diagnostic confidence, making it a highly recommended coronary reconstruction technique.

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T5B-SPVA

Vascular Imaging Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-SPVA-1 OPTIMIZATION COMPUTED TOMOGRAPHY PROTOCOLS: IMPACT ON VASCULAR OPACIFICATION AND IMAGE QUALITY

Hortencia Ferreira, MSc, PhD (*Presenter*)
Jose Castro, PhD (*Abstract Co-Author*)
Danielle Cristina Novais Da Silva (*Abstract Co-Author*)
Sergio S. Dertkigil, MD (*Abstract Co-Author*)
Fabiano Reis (*Abstract Co-Author*)

PURPOSE

The optimization of contrast-enhanced computed tomography angiography (CTA) protocols is essential to balance diagnostic quality and patient safety. This study evaluates how protocol modifications influence vascular opacification in aortic, carotid, and pulmonary CT exams. The primary objective was to compare different contrast administration techniques, analyzing the effects of volume, flow rate, patient age, and weight on image quality.

METHODS AND MATERIALS

A retrospective analysis was conducted on 600 consecutive CTA scans of aortic, carotid, and pulmonary, performed between June 2024 and February 2025, using a Canon Aquilion Prime SP CT scanner with 80 channels and a Stellant Medrad intelligent contrast injector (Bayer). Only patients aged 18 years or older were included. Vascular opacification was classified into three categories based on attenuation values in Hounsfield Units (HU): poor for densities below 250 HU, medium for 251-349 HU, and optimal for 350 HU or higher. Statistical analysis employed logistic regression to identify significant associations between technical parameters and image quality, with a p-value under 0.05 considered significant.

RESULTS

The results demonstrated strong statistical significance for contrast flow rate as a predictor of vascular opacification with $p=0.0023$. Patient age significantly influenced outcomes, showing $p=0.0009$, where older patients exhibited better enhancement. Weight presented an inverse correlation with $p<0.0001$, indicating reduced opacification in heavier patients. Notably, contrast volume showed no significant impact with $p=0.1763$, suggesting flow rate adjustments can effectively compensate for reduced volumes.

CONCLUSION

Protocol optimization in 80-channel CT enables consistent image quality through strategic adjustments in contrast flow rate. The findings emphasize the importance of tailoring protocols based on patient-specific factors such as age and weight, rather than relying solely on contrast volume. This approach supports diagnostic efficacy while minimizing contrast dose, enhancing safety and efficiency in clinical practice.

CLINICAL RELEVANCE/APPLICATION

The clinical relevance of this study lies in its evidence-based guidance for refining CT protocols, particularly in older and overweight populations, where personalized adjustments can improve diagnostic accuracy without increasing contrast-related risks.

T5B-SPVA-2 DIAGNOSTIC RELIABILITY OF INTRAVASCULAR ULTRASOUND VERSUS VENOGRAPHY IN CENTRAL VENOUS MAPPING FOR END STAGE RENAL DISEASE PATIENTS

Mia Zivkovic (*Presenter*)
Daniel Raskin, MD (*Abstract Co-Author*)
Abraham Levitin, MD (*Abstract Co-Author*)
Jon Quatromoni, MD (*Abstract Co-Author*)
Jennifer Montgomery, MD,PhD (*Abstract Co-Author*)
Sasan Partovi, MD (*Abstract Co-Author*)

PURPOSE

Two dimensional supradiaphragmatic central venography has it limitations due to the inherent pliability of veins as well as the dependency of the diameter on the cardiorespiratory cycle. The aim of this study is to evaluate the diagnostic reliability of intravascular ultrasound (IVUS) compared with two-dimensional venography for supradiaphragmatic central venous mapping

METHODS AND MATERIALS

A retrospective review was conducted of 14 end stage renal disease patients who underwent same-session two-dimensional venography and IVUS between January 2024 and February 2025 for assessment of the central venous system. Veins were evaluated with regard to stenotic degree and venous wall pathologies. Stenosis severity was categorized as mild, moderate, or severe based on available imaging datasets. The primary endpoint was the discordance between IVUS and two-dimensional venography. Secondary metrics included contrast volume, fluoroscopy time, and procedural complications.

RESULTS

IVUS was discordant with venography in 7/14 cases (50%). In 4 cases (29%), IVUS revealed a higher degree of stenosis and / or intraluminal wall adherent thrombus which was not visualized on two-dimensional venography. In 3 (21%) cases, IVUS downgraded the severity of stenosis. Median contrast use was 51 mL (range: 25-127 mL), and median fluoroscopy time was 7.6 minutes (range: 3.0-20.3 minutes). No immediate procedural complications occurred, specifically no IVUS related complications were appreciated.

CONCLUSION

IVUS enabled verification as well as clarification of degree of stenosis in half of the assessed end stage renal disease patient population, IVUS demonstrated superior visualization of luminal contours, wall-adherent thrombus, and vessel diameter. Therefore, IVUS can be considered complementary imaging for supradiaphragmatic central venous mapping in end stage renal disease patients.

CLINICAL RELEVANCE/APPLICATION

When added to venography, IVUS improves venous lesion characterization and stenotic degree confidence during supradiaphragmatic central venous mapping, potentially reducing misclassification of central venous stenotic severity in end stage renal disease patients.

T5B-SPVA-4 HIGHLY ACCELERATED COMPRESSED-SENSING 4D FLOW FOR SIMULTANEOUS EVALUATION OF ILIAC VASCULATURE

Qiming Liu (*Presenter*)
Xinyu Wang (*Abstract Co-Author*)
Qifan Lu (*Abstract Co-Author*)
Qi Yang, MD (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate and compare the hemodynamic parameters of the iliac arteries and veins using both conventional single-velocity encoding (VENC) and CS-accelerated multi-VENC 4D flow sequences in healthy participants.

METHODS AND MATERIALS

This study enrolled healthy participants without known cardiovascular disease between December 2023 and March 2025 at Beijing Chaoyang Hospital. Two conventional single VENC 4D flow acquisition and a multi-VENC CS-accelerated acquisition were performed (Table 1). For each participant, three arterial segments (abdominal aorta (AA), left common iliac artery (LCIA), right common iliac artery (RCIA)) and three venous segments (inferior vena cava (IVC), left common iliac vein (LCIV), right common iliac vein(RCIV)) were selected to calculate hemodynamic parameters. The 4D flow MRI data were post-processed using a freely available 4D flow processing tool, and two experienced readers quantified the mean velocity and wall shear stress (WSS). Paired-samples t-tests, Wilcoxon rank-sum tests, Pearson correlation coefficient (r), Bland-Altman analysis, and intraclass correlation coefficient (ICC) were used.

RESULTS

Baseline characteristics A total of 60 healthy participants were initially enrolled and 45 healthy participants (median age: 49 years; 64.4% male) were included for final analysis (Figure 1). A significant improvement on acquisition efficiency was observed for with an average reduction of 59%. Representative images are shown in Figure 2 . Quality control The technical variability, intra- and inter- observer ICC showed ICC > 0.8 and $P < 0.001$ for all segments. Comparison of flow parameters obtained using conventional and CS methods Arterial flow measurements are presented in Table 2 and Figure 3 . For all segments, parameters measured by CS methods were lower than those obtained using conventional methods (2.8% to 9.6%). Flow measurements for veins are presented in Table 3 and Figure 4 . All parameters exhibited underestimation with CS acquisition (5.0% to 12.0%), though the differences were less pronounced compared to arterial findings. The correlation between flow parameters obtained using both techniques, showed R values > 0.8 for all parameters (Figure 5).

CONCLUSION

This study evaluated and quantified the flow parameters of iliac arteries and veins in healthy participants using conventional and multi-VENC 4D flow techniques. Although underestimation was observed, multi-VENC 4D flow enabled comprehensive velocity and WSS assessment.

CLINICAL RELEVANCE/APPLICATION

The CS-accelerated multi-VENC 4D flow acquisition enable the rapid evaluation of both arterial and venous components of iliac vasculature but should be further evaluated in patients with venous and arterial diseases.

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W2-SPBR

Breast Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPBR-1 RECALL RATE, CANCER DETECTION RATE, AND ACCEPTABILITY OF THE FIRST ROUND OF DIGITAL BREAST TOMOSYNTHESIS SCREENING IN A DUTCH POPULATION-BASED SCREENING TRIAL

Jessie J. Gommers, MSc (*Presenter*)
Lindy Kregting (*Abstract Co-Author*)
Elle Heijnen (*Abstract Co-Author*)
Lian Pennings (*Abstract Co-Author*)
Maartje J. Smid-Geirnaerdt, MD, PhD (*Abstract Co-Author*)
Adriana M. Bluekens, MD,PhD (*Abstract Co-Author*)
Sarah D. Verboom, MSc (*Abstract Co-Author*)
Ioannis Sechopoulos, PhD (*Abstract Co-Author*)
Mireille Broeders, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the short-term screening performance and acceptability of Digital Breast Tomosynthesis (DBT) in the first round of the DBT with Advanced Reading Methods (STREAM) prospective screening trial being performed in the Dutch Breast Cancer Screening Program.

METHODS AND MATERIALS

The Dutch Screening Program includes biennial four-view Digital Mammography (DM) for women aged 50 to 74 years old. All examinations are independently double-read by screening radiologists with arbitration in case of disagreement. STREAM trial participants underwent the first of two rounds of four-view DBT screening instead of DM between July 2023 and May 2024. A comparable control group received regular DM screening in the same time period. Current analyses include first round results for recall rate (RR) and cancer detection rate (CDR). After DBT examination, participants, radiographers, and screening radiologists were asked to complete an online survey on the acceptability of DBT screening. Participants reported their experience with DBT compared to DM in the previous screening round. Radiographers and radiologists reported on the ease of use of DBT screening, and their suggestions for improvement.

RESULTS

Out of 44,682 invited screenees, 18,186 participated in the STREAM trial (41%). Among them, 488 (2.68%) were recalled, of whom 166 (9.1 per 1,000) were diagnosed with breast cancer. Control group data are not yet available, but the national monitor for 2023 reported a RR of 2.40% and a CDR of 7.5 per 1,000 with DM. The acceptability survey was completed by 10,983 participants (60%), 62 radiographers (~62%), and 25 radiologists (71%). Participants reported an average pain score of 3 (scale 0-10) for DBT, similar to an average pain score of 3.5 for DM. About half (52%) preferred DBT over DM, and 46% had no preference, mainly because they experienced no difference. The majority of radiographers (84%) reported DBT screening as 'feasible', however most radiologists (76%) reported DBT as 'feasible, but sub-optimal', mostly due to limitations in image loading and reading times.

CONCLUSION

Preliminary results suggest a modest increase in RR and an increase in CDR for DBT screening compared to DM. Control group data will be available by fall 2025. Participants have a high acceptability for DBT screening, radiographers are generally content, but radiologists request improvements to enhance workability. The feedback is being used to improve the second round of DBT screening.

CLINICAL RELEVANCE/APPLICATION

In the Dutch DM screening program, the RR is low (2023: 2.40%) while the CDR is relatively high (2023: 7.5 per 1,000). The STREAM trial will show the trade-offs between harms and benefits of DBT compared to DM screening whether DBT is acceptable to participants and professionals.

W2-SPBR-2 CHANGE IN PERCENTAGE FUNCTIONAL TUMOR VOLUME AFTER NEOADJUVANT IMMUNOTHERAPY PREDICTS RESPONSE IN HER2+ BREAST CANCER

Robert J. Weinfurtner, MD (*Presenter*)
Asha Bhatt, MD (*Abstract Co-Author*)
Shannon Falcon, MD (*Abstract Co-Author*)
Brian J. Czerniecki, MD, PhD (*Abstract Co-Author*)
Marie C. Lee, MD (*Abstract Co-Author*)
Paige Aiello (*Abstract Co-Author*)
Aixa Soyano (*Abstract Co-Author*)
Hatem Soliman (*Abstract Co-Author*)
Heather Han (*Abstract Co-Author*)

PURPOSE

To determine if functional tumor volume (FTV) analysis can help predict pCR in HER2+ breast cancer patients undergoing neoadjuvant immunotherapy.

METHODS AND MATERIALS

In a pilot study of neoadjuvant immunotherapy using dendritic cell vaccines (DC1) to treat HER2+ breast cancer, baseline and post-immunotherapy MRIs (10/1/21-8/16/2024) were retrospectively analyzed. For quantitative analysis, functional tumor volume was calculated on pre-treatment post-contrast T1-weighted MRI images using a percent enhancement threshold of 70% and signal enhancement ratio set to 0. Next, %FTV was calculated for each segmented tumor (%FTV=FTV/segmented tumor volume). Change was then calculated by subtracting the results post-immunotherapy to baseline. These were correlated with pathologic response at surgery using Mann-Whitney U test where $p<0.05$ was considered significant. FTV analysis was also compared to post-treatment pre-surgical MRI reports for diagnostic test accuracy comparison.

RESULTS

A total of 22 patients, aged 26-74, were included in the study, and 13 (59%) achieved pCR. Post-immunotherapy, increase in size and inflammatory response was reported in over 40% of patients (9 and 10/22, respectively). Post-neoadjuvant chemotherapy, MRI complete response (mCR) was reported in 14 (64%). Accuracy for mCR predicting pCR was 69% (43-85 Confidence Interval, CI). Patients achieving pCR had higher average %FTV at baseline (77% vs 59%, p=0.011). Post-neoadjuvant immunotherapy treatment, FTV increased for both pCR and non-pCR tumors (444% vs 128%, p=0.84), reflecting the reported inflammatory response for a number of tumors. However, The %FTV dropped significantly more for pCR patients (-38% vs 0%, p=0.001). Indeed, tumors with above median (-24%) decrease in %FTV achieved pCR in 100% (11/11). If above median decrease in %FTV is used to predict pCR, accuracy is 91% (71-99 CI) with sensitivity of 85%, specificity 100%, PPV 100%, and NPV 82%.

CONCLUSION

In this study, higher %FTV at baseline and above median decrease after neoadjuvant immunotherapy was predictive of pCR.

CLINICAL RELEVANCE/APPLICATION

In this study, the use of %FTV allowed prediction of pCR in patients undergoing neoadjuvant immunotherapy despite an overall average increase in total FTV for the tumors. This is helpful to account for the inflammatory response that was observed in response to neoadjuvant immunotherapy and may help tailor treatment regimens in the future.

W2-SPBR-4 ORIENTATION-BASED QUANTITATIVE MICROVASCULATURE BIOMARKERS FOR CLASSIFICATION OF BREAST MASSES

Pradeep Chaudhary (*Presenter*)
Nicholas B. Larson, PhD (*Abstract Co-Author*)
Azra Alizad, MD (*Abstract Co-Author*)
Mostafa Fatemi, PhD, PhD (*Abstract Co-Author*)

PURPOSE

In early-stage tumors, low oxygen levels trigger neovascularization. Malignant lesions generally depend on feeding vessels, leading to a penetrating vascular pattern, an early indicator of malignancy. Color Doppler imaging has visually suggested a potential link between these penetrating patterns and cancerous growth. Although contrast-free ultrasound microvessel (MV) imaging has been used to explore morphological biomarkers for tumor classification, vessel orientation patterns remain largely unexamined. This study aims to develop orientation-based MV biomarkers to enhance the differentiation between malignant and benign tumors.

METHODS AND MATERIALS

This prospective study was IRB-approved and HIPAA- compliant protocol with signed written informed consent obtained from all participants. Ultrasound microvessel (MV) imaging was used to analyze 70 breast lesions (35 benign, 35 malignant). Seven orientation-based biomarkers were extracted from original and polar-transformed images to distinguish penetrating from circumferential MV patterns. In the polar domain, radial and tangential histogram statistics (mean, kurtosis) assessed MV directionality and distribution, while the Polar Gradient Angle (PGA) captured dominant vessel orientation. In the Cartesian domain, angle-based penetration density (APD) quantified the area of penetrating MVs, and penetration-to-circumferential density (PCD) compared areas occupied by penetrating versus circumferential MVs. Each biomarker reflected a unique MV orientation feature, and their combination improved diagnostic accuracy.

RESULTS

Multivariable logistic regression classifier is used to distinguish between benign and malignant lesions. Principle component analysis was used for dimensionality reduction, with the first 3 principal components (PCs) achieving an area under curve (AUC) of 0.91, outperforming clinical BIRADS score (AUC = 0.78). Moreover, combining the 3 PCs with BIRADS further improved diagnostic accuracy (AUC=0.97).

CONCLUSION

This work introduces novel quantitative biomarkers based on microvasculature orientation from non-contrast-enhanced ultrasound. The findings suggest that orientation-based biomarkers effectively capture clinically relevant MV patterns and enhance lesion classification beyond BIRADS scores.

CLINICAL RELEVANCE/APPLICATION

Orientation-based microvessel biomarkers derived from non-contrast enhanced ultrasound improve breast lesion classification, enhance diagnostic accuracy, and lead to better patient outcomes.

W2-SPBR-5 A MULTI-CENTER STUDY EVALUATING THE IMPACT OF FAT SUPPRESSION AND B-VALUES ON BREAST LESION VISIBILITY AND ADC VALUES IN DWI

Mami Iima, MD, PhD (*Presenter*)
Erika Inoue, MD (*Abstract Co-Author*)
Masako Y. Kataoka, MD, PhD (*Abstract Co-Author*)
Ken Yamaguchi, MD (*Abstract Co-Author*)
Yukiko Tokuda, MD, PhD (*Abstract Co-Author*)
Akane Ohashi, MD,PhD (*Abstract Co-Author*)
Hiroko Satake, MD (*Abstract Co-Author*)
Takashi Ueguchi, PhD (*Abstract Co-Author*)
Kazushige Ichikawa (*Abstract Co-Author*)
Yutaka Kato (*Abstract Co-Author*)
Yoshihiro Koyama, BS (*Abstract Co-Author*)
Maya Honda, MD, PhD (*Abstract Co-Author*)
Kazunori Kubota, MD, PhD (*Abstract Co-Author*)
Tomoyuki Fujioka, MD, PhD (*Abstract Co-Author*)
Kazunori Oohashi, BSc (*Abstract Co-Author*)
Sachiko Yamada (*Abstract Co-Author*)
Denis J. Le Bihan, MD, PhD (*Abstract Co-Author*)
Takayoshi Ishimori, MD, PhD (*Abstract Co-Author*)
Shinji Naganawa, MD, PhD (*Abstract Co-Author*)
Yuji Nakamoto, MD, PhD (*Abstract Co-Author*)

PURPOSE

Clinical guidelines have recommended SPAIR as a fat-suppression method for breast DWI, while STIR might be good for screening through effective fat suppression and wide-area lesion detection. This multi-center, multi-vendor study evaluates STIR versus SPAIR and b-values of 800 and 1500 s/mm² on lesion conspicuity and ADC measurements in a phantom and clinical studies.

METHODS AND MATERIALS

A standardized breast phantom (Caliber MRI, U.S.) was scanned across Siemens, Philips, and GE platforms using STIR and SPAIR at b=800/1500 s/mm² at four institutions to evaluate fat suppression uniformity, signal level and ADC accuracy. In the clinical study, 317 participants (316 women, 1 man) with suspected breast lesions underwent 3T MRI DWI at four institutions using STIR and SPAIR at b=800/1500 s/mm², following EUSOBI/QIBA guidelines. 5 evaluators assessed lesion

conspicuity using a 5-point scale, normal breast tissue (breast composition and background parenchymal signal) using a BI-RADS based lexicon at a four-point scale, and ADC values for each combination. Statistical analysis used Wilcoxon signed-rank test with Bonferroni correction.

RESULTS

Phantom study showed excellent fat suppression and ADC correlation between STIR and SPAIR (R^2=0.95-1.0, P<0.01). STIR signal was clearly lower than SPAIR (signal ratio: 0.39-0.67, depending on T1 values, Fig.1). In the clinical study, 206 patients (205 women, 1 man) with 220 breast lesions were evaluated, excluding inadequate examinations, no DWI-detected lesions, or cases with neoadjuvant treatment. Breast composition was comparable; background parenchymal signal was lower with b=1500. SPAIR showed higher lesion conspicuity, particularly at b=1500 (b800: STIR: 2.4±1.1, SPAIR: 2.5±1.1; b1500: STIR: 2.6±1.2, SPAIR: 2.8±1.2, Fig.2A). ADC values were consistently lower at b=1500 (b800: STIR: 1.1±0.35 × 10?³ mm²/s, SPAIR: 1.0±0.35 × 10?³ mm²/s; b1500: STIR: 0.88±0.28× 10?³ mm²/s, SPAIR: 0.90±0.28× 10?³ mm²/s, Fig.2B). Comparing STIR and SPAIR at the same b-values showed no significant difference in lesion ADC values, although STIR tended to show slightly lower values at b1500. Representative cases are shown in Fig.3, showing SPAIR's superior tendency in lesion conspicuity.

CONCLUSION

Among the four imaging methods used in this study, the combination of SPAIR and b1500 tended to provide the best lesion visibility; for ADC values, b1500 was significantly lower than b800 regardless of fat suppression method, and STIR had a slightly lower value at b1500. These findings have implications for optimizing DWI protocols in clinical practice.

CLINICAL RELEVANCE/APPLICATION

For reliable ADC quantification, SPAIR is recommended due to consistent fat suppression and potentially accurate measurements.

W2-SPBR-6 EXPLORING HOW AI INFLUENCES HUMAN DECISION MAKING AND GAZE BEHAVIOUR DURING MAMMOGRAPHY INTERPRETATION

Yan Chen, PhD (*Presenter*)
Adnan Taib (*Abstract Co-Author*)
George Partridge (*Abstract Co-Author*)
Jonathan James, BMBS, FRCR (*Abstract Co-Author*)
Peter Phillips, MD (*Abstract Co-Author*)

PURPOSE

AI is increasingly being integrated into breast cancer screening workflows, yet its impact on human reader behaviour and decision-making due to automation bias remain under-explored. This study aimed to assess how AI prompts influence performance, confidence and visual search during mammogram interpretation.

METHODS AND MATERIALS

In this paired reader study, ten NHS breast screening programme readers interpreted the same set of 120 screening mammograms twice: first without AI support (Round 1, R1), and then with AI assistance (Lunit Insight MMG; Round 2, R2) following a 6-week washout. The test set was deliberately enriched with cases featuring AI false negatives (FNs, 12.5%) and false positives (FPs,18.3%), and included biopsy-confirmed malignancies, benign findings, and normal cases with three-year radiological follow-up.Visual search behaviour was monitored using eye-tracking equipment (SmartEyePro). For each read, clinical opinion was recorded using a scale (1-normal, 2-benign, 3-indeterminate, 4-suspicious, 5-malignant) and entered onto the Personal Performance in Mammographic Screening (PERFORMS) website. Performance was evaluated against the ground truth at breast level. Readers also rated their confidence in the management of a case using a 5-point Likert scale (1=not at all confidence to 5=very confident). Two-tailed paired analyses were conducted using an alpha value of 0.05.

RESULTS

The test set was chosen to contain 26 as AI true positive (TP) breasts, 15 as AI-FNs, 57 as AI true negatives (TN) and 22 as AI-FPs. The median years of experience of the human readers was 14 (interquartile range 18) and zero used AI routinely in their clinical practice during screening reading.Reader sensitivity was unchanged when AI suggested TP prompts in R2 (R1: 74%, SD 0.13; R2: 77%, SD 0.12; p = .44), whilst the specificity of humans improved for AI-TN cases (R1: 85%, SD 0.04; R2: 90%, SD 0.08; p = .03).Mean sensitivity decreased when AI failed to localise cancers (FN prompts) in R2 for the same cases in R1 (R1: 59% (SD 0.12) vs R2: 41% (SD 0.16), p < .01), Figure 1. Specificity increased when AI suggested FP prompts from 58% (SD 0.04) in R1 to 65% (SD 0.07) in R2, p = .01.Confidence in management rose when AI committed FNs (R1: 3.72 vs R2: 3.99, p < .01) and FPs (R1: 3.79 vs R2: 4.02, p = .01), with no change for TP or TN cases (p > .05). Further analyses will assess visual search patterns and reading times.

CONCLUSION

Reading with AI has demonstrated both negative and positives changes in human reading behaviour, performance and confidence.

CLINICAL RELEVANCE/APPLICATION

High diagnostic standards for AI are essential, as incorrect prompts may reduce cancer detection when used as a concurrent aid.

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W2-SPCA

Cardiac Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPCA-2 CORRELATION OF CCTA-DERIVED CARDIAC FUNCTION PARAMETERS WITH PLAQUE FORMATION IN LEFT ANTERIOR DESCENDING ARTERY MYOCARDIAL BRIDGE

Jianyu Li (*Presenter*)

PURPOSE

To explore the correlation between cardiac function parameters from coronary CT angiography (CCTA) and plaque formation in the left anterior descending artery myocardial bridge.

METHODS AND MATERIALS

126 patients with a CCTA-confirmed left anterior descending artery myocardial bridge were studied. They were divided into myocardial bridge without plaque Group (MBwP - Group), myocardial Bridge with plaque Group (MBwP+Group), and a Normal Group (NG) of healthy individuals. All underwent full-phase CCTA scanning, and parameters like ESV, EDV, EF, 17-segment End-diastolic Wall Thickness, wall Motion, and wall thickening rate were analyzed with professional software.

RESULTS

Significant statistical differences existed in age, calcium score, MB length, systolic MB stenosis, end-diastolic wall thickness (segments 2 and 9), wall displacement (segments 7, 8, and 12), and wall thickening rate (segment 7) among the three groups($P<0.05$). Correlation analysis showed MB length correlated positively with systolic MB stenosis, end-diastolic wall thickness (segment 9), and wall motion (segment 12) ($r = 0.573, 0.316, 0.295$, $P<0.05$), and there was a significant positive correlation between wall motion (segments 8, 12) and wall thickening rate (segment 7) ($P<0.05$).

CONCLUSION

CCTA-derived cardiac function parameters can assess left anterior descending artery myocardial bridge plaque formation and correlate well with left ventricular motion. They offer new insights and valuable information for early diagnosis, condition assessment, and treatment planning, enhancing the understanding of the relationship between myocardial bridges and cardiac function and improving the prognosis of coronary heart disease patients.

CLINICAL RELEVANCE/APPLICATION

The findings of this study highlight the clinical relevance of CCTA-derived cardiac function parameters in the evaluation of patients with LAD myocardial bridges. These parameters offer valuable insights for early diagnosis, prognostic assessment, and personalized treatment planning. By incorporating CCTA into clinical practice, clinicians can better manage patients with MBs, potentially improving outcomes and reducing the burden of coronary artery disease. Further research is warranted to validate these findings and explore the long-term clinical implications of CCTA-derived cardiac function parameters in patients with MBs.

W2-SPCA-4 RACIAL DISPARITIES IN CARDIOTHORACIC RATIO AND CARDIOMEGALY DIAGNOSIS CONCORDANCE: IMPLICATIONS FOR AI FAIRNESS

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PURPOSE

This study examines how label noise and discordance between automated cardiothoracic ratio measurements and radiologist-reported cardiomegaly may encode demographic information in AI models. By analyzing racial differences in concordance between quantitative values and qualitative interpretations, we aim to identify systematic labeling variations that could create algorithmic biases. Since radiologists cannot determine race from chest X-rays, observed racial disparities likely reflect systemic factors rather than direct bias, offering insights for developing fair AI systems.

METHODS AND MATERIALS

Heart and lung masks were generated on 246,904 PA chest radiographs using CheXmask methods. CTR was calculated by dividing heart mask X-axis projection by combined masks' projections. We defined CTR > 0.55 as the high CTR threshold. Cases with CTR between 0.5-0.6 were classified as uncertain and were analyzed separately. Cardiomegaly labels were extracted from reports using Llama 3.1 8b. Data was bootstrapped 1000 times with equal high CTR cases across races. Concordance between radiologist-reported cardiomegaly and measured high CTR values were calculated with 95% confidence intervals across racial groups.

RESULTS

Discordance between CTR measurements and cardiomegaly diagnoses varied across racial groups (Black: 10.6%; White: 14.2%). White patients had more discordant cases (no cardiomegaly mention despite high CTR) than Black patients. Patients with uncertain high CTR showed minimal racial differences in discordance. Manual review revealed discordances from LLM labeling errors with "stable cardiomegaly" terms and from radiologists focusing on specific clinical indications in follow-ups. These findings suggest discordance is more prominent in definite CTR cases and may reflect racial differences in cardiac imaging interpretation, automated labeling limitations, and reporting variations.

CONCLUSION

Our study reveals distinct racial disparities in CTR and cardiomegaly diagnosis discordance, which highlights potential differences in radiological interpretation and dataset labeling that may contribute to downstream AI biases if models are trained on these discordant labels.

CLINICAL RELEVANCE/APPLICATION

Race is a social non biologic construct, yet CXRs demonstrate strong encoding of this feature with downstream effects on underdiagnosis. Understanding clinical patterns and evaluating label discordance and certainty can minimize the impact of this shortcut on model performance. Dataset standards and model cards have not factored this difference for model developers.

W2-SPCA-5 CMR-BASED T2 RV/LV BLOOD POOL RATIO: A NOVEL IMAGING BIOMARKER FOR RISK STRATIFICATION IN HEART FAILURE

Siying Ma (*Presenter*)
Hongjie Hu, MD (*Abstract Co-Author*)

PURPOSE

Blood pool signals on T2 maps can reflect the oxygenation status of blood in the heart chambers. This study aimed to explore the relationships between the T2 RV/LV blood pool ratio (T2 ratio) and other clinical and imaging parameters, with a focus on evaluating its prognostic value in predicting major adverse cardiovascular events (MACE) in heart failure (HF) patients.

METHODS AND MATERIALS

A total of 217 HF patients who underwent cardiac MRI were divided into two groups: MACE and No MACE. Regions of interest were delineated in the right and left ventricular blood pools on T2 maps to calculate the T2 ratio. Clinical data and cardiac MRI parameters were compared between the two groups, and independent predictors of MACE were identified using Cox regression analysis. Correlations between the T2 ratio and other parameters were explored. Survival analyses were conducted to assess event-free survival in low, moderate, and high-risk groups. Finally, the predictive performance for MACE was compared across different models.

RESULTS

The T2 ratio was lower in MACE group (0.65 ± 0.12 vs 0.75 ± 0.12, $P < 0.001$) and was identified as an independent prognostic predictor of adverse outcomes in HF (HR: 0.966, $P = 0.044$). The association between T2 ratio and left ventricular ejection fraction (LVEF) followed distinct patterns in different ranges, with a transition around LVEF ~ 50%. Survival analysis demonstrated a stepwise decline in event-free survival from low- to high-risk groups ($P < 0.05$). Finally, the predictive model G incorporating myocardial T1 and T2 ratio demonstrated superior predictive efficacy (C-statistic: 0.806, IBS: 0.087).

CONCLUSION

A lower T2 RV/LV blood pool ratio is associated with an increased risk of MACE in HF patients. This study introduced the T2 ratio from cardiac MRI as a valuable imaging biomarker for risk stratification in HF, offering a novel method for predicting adverse outcomes and supporting clinical decision-making in the management of HF patients.

CLINICAL RELEVANCE/APPLICATION

The T2 RV/LV blood pool ratio offers a novel, non-invasive method for assessing ventricular blood oxygenation, providing insights into the pathophysiology of heart failure. This imaging biomarker has potential applications in conditions like congenital heart disease and pulmonary arterial hypertension, serving as an potential alternative to invasive procedures such as right heart catheterization. Integrating the T2 ratio with other CMR parameters, such as LGE, strain, and 2D/4D flow analysis, could enhance understanding of cardiac pathologies, enabling a more comprehensive and personalized assessment across various heart diseases.

W2-SPCA-6 MYOCARDITIS WITH PRESERVED LEFT VENTRICULAR EJECTION FRACTION IN THE RECOVERY PHASE: INSIGHTS FROM CMR AND MYOCARDIAL STRAIN ANALYSIS

Heshui Shi, MD (*Presenter*)
Mengting Huang (*Abstract Co-Author*)

PURPOSE

Myocarditis in the recovery phase, especially with preserved left ventricular ejection fraction (pLVEF), is under-studied. Residual inflammation may cause major adverse cardiovascular events (MACE). Traditional LVEF measures have limits, while myocardial strain can detect subtle changes.

METHODS AND MATERIALS

A retrospective study on 317 myocarditis patients (146 after exclusion). cardiac magnetic resonance (CMR) imaging was done with 1.5T or 3.0T scanners. Ventricular and atrial strains were measured by feature-tracking. Late gadolinium enhancement (LGE) images were evaluated. Patients were followed up, with major adverse cardiovascular events (MACE) as the primary outcome.

RESULTS

Among 146 patients (71 males, 26±16 years) ultimately enrolled, 36 experienced MACE. The median clinical follow-up duration was 36 months. The results indicated that LGE predominantly affected the basal anteroseptal (31.5%), basal inferoseptal (28.8%), basal inferolateral (32.9%), basal anterolateral (30.8%), mid anteroseptal (22.6%), mid inferoseptal (21.2%), mid inferolateral (26.0%), and mid anterolateral (26.0%) segments. Kaplan-Meier analysis demonstrated that patients with LGE had a higher risk of reaching the primary endpoint than those without LGE. Moreover, women showed a greater tendency than men to reach the primary endpoint. Patients with LV GRS values = 39.1% and LV dGCSR values = 1.1 1/s were more prone to reach the primary endpoint.

CONCLUSION

LV radial strain can indicate myocardial inflammation. Myocardial strain has prognostic value, and LGE has a complex MACE relationship. A comprehensive understanding is needed for patient management in myocarditis convalescence with pLVEF.

CLINICAL RELEVANCE/APPLICATION

Comprehensive understanding in myocarditis convalescence with pLVEF.

W2-SPCA-7 CAN CT-DERIVED MYOCARDIAL MYOCARDIAL EXTRACELLULAR VOLUME SERVE AS AN IMAGING BIOMARKER FOR TREATMENT MONITORING IN CHRONIC THROMBOEMBOLIC PULMONARY HYPERTENSION?

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Fumihiro Yoshimura, MD (*Abstract Co-Author*)
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Hiroko Takaoka (*Abstract Co-Author*)
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PURPOSE

The aim of this study was to evaluate whether CT-derived myocardial extracellular volume fraction (CT-ECV) can serve as an imaging biomarker for treatment monitoring in patients with chronic thromboembolic pulmonary hypertension (CTEPH).

METHODS AND MATERIALS

We conducted a study involving 21 patients with CTEPH who underwent balloon pulmonary angioplasty (BPA) sessions. Right heart catheterization and CT-ECV analysis were performed at baseline and approximately one year later, after the completion of BPA treatment sessions. To identify an imaging biomarker that reflects BPA-induced changes in mean pulmonary arterial pressure (mPAP), we investigated the correlation between changes in CT-ECV (?CT-ECV) and changes in mPAP (?mPAP) before and after treatment.

RESULTS

The mean change in ?mPAP across all patients was 18.8 ± 13.5 mmHg. A moderate correlation was observed between the change in ?CT-ECV at RVIP-A and ?mPAP (r = 0.56). In patients with a lower baseline mPAP (<35 mmHg =median), no significant correlation was found (r = -0.19). Conversely, in those with a higher baseline mPAP (=35 mmHg), a strong correlation was observed (r = 0.79). In univariable logistic regression analysis within the high baseline mPAP group, only ?CT-ECV at RVIP-A was significantly associated with ?mPAP (ß = 7.27 95% confidence interval: 4.56-9.98; p = <0.01). In this group, the mean CT-ECV at RVIP-A decreased from 34.9 ± 5.2% before treatment to 32.2 ± 3.4% after treatment.

CONCLUSION

In patients with CTEPH and high baseline mPAP (=35 mmHg), CT-ECV at the RVIP-A may serve as a potential imaging biomarker for treatment monitoring.

CLINICAL RELEVANCE/APPLICATION

Quantitative assessment of CT-ECV may serve as a non-invasive surrogate marker for CTEPH, potentially reducing the need for invasive mPAP measurement by right heart catheterization.

W2-SPCA-9 LUNG CANCER SCREENING CT SPECIFIC AGE- AND SEX-BASED PERCENTILES OF CORONARY ARTERY CALCIUM FOR PREDICTION OF CARDIOVASCULAR MORTALITY

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PURPOSE

Coronary artery calcium (CAC) is commonly detected on lung screening CT. However, miscalibration of what is "normal" CAC in lung screening patients based on general population reference percentiles may lead to unnecessary downstream testing. We derived lung screening CT-specific age- and sex-based percentiles for CAC. Prediction of long-term cardiovascular (CV) mortality was compared to the Multi-Ethnic Study of Atherosclerosis (MESA) CAC percentile calculator, the standard derived from 6,110 non or lesser smokers and codified in the 2019 American College of Cardiology/American Heart Association statin primary prevention guidelines.

METHODS AND MATERIALS

Coronary artery calcium score was quantified using an AI tool in 22,207 heavy smokers aged 55-74 having baseline lung screening CT in the National Lung Screening Trial (NLST). Age- and sex-based percentiles of CAC were generated. Individuals were classified as = or < 75 th percentile of CAC for age and sex, to correspond to the 75 th centile CAC threshold in the statin guidelines. 10-year cardiovascular death was the primary outcome and was compared between the lung screening CT-specific and MESA-derived CAC percentiles.

RESULTS

Lung screening CT-derived CAC percentiles down-classified 3,034 individuals (13.7%) to <75 th percentile compared to MESA. No individuals were up-classified above the 75 th percentile, due to a greater burden of CAC in NLST than MESA. Collectively, there were 691 cardiovascular deaths (3.1%) over 10 years. Cardiovascular mortality rates were 2.1% (279/13,618) in those at <75 th percentile by both the lung screening CAC and MESA calculators; 3.6% (110/3,034) in those with <75 th percentile by lung screening but =75 th by the MESA calculator; and 5.4% (302/5,555) in those with =75 th percentile by both calculators. Results were similar in stratified analyses in women and men.

CONCLUSION

Lung cancer screening CT specific CAC percentiles better stratify 10-year cardiovascular risk than the MESA percentiles derived from non- and lesser-smoking populations.

CLINICAL RELEVANCE/APPLICATION

Lung screening CT-specific CAC percentiles may improve risk stratification and reduce downstream testing triggered by incidental CAC on lung screening CT.

W2-SPCA-10 HEART FAILURE OUTCOME PREDICTION USING AI ENABLED CARDIAC CT CHAMBER VOLUMETRY COMPARED TO AHA PREVENT

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Saikiran Rapaka, PhD (*Abstract Co-Author*)
Athira J. Jacob (*Abstract Co-Author*)
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PURPOSE

This study aims to explore the capabilities of Artificial Intelligence (AI)-derived cardiac chamber volumetry calculated using coronary artery calcium (CAC) CT scans of asymptomatic patients for heart failure (HF) prediction compared to the American Heart Association's PREVENT-HF clinical risk calculator.

METHODS AND MATERIALS

This retrospective cohort study included CAC imaging between 2010-2023 from 2,966 asymptomatic patients aged 45-75 years, without known cardiac disease. CAC images were analyzed using a previously validated convolutional neural network based autoencoder model to derive chamber volumes. PREVENT-HF scores were calculated per patient. Time-dependent AUCs were calculated at 3, 5, and 10 years, modeling HF prediction performance of chamber volumetry, PREVENT-HF risk model, and their combination. Association between heart chamber volumes, PREVENT-HF and HF was assessed using Cox proportional hazard regression models.

RESULTS

The mean age of patients was 56.3 years, 42% were women, and 78% were White and 215 were diagnosed with HF within 10 years (7.2%) with mean follow-up time of 4.3 years. Higher chamber volumes for left atrium (LA), left ventricle (LV), right atrium (RA), and left myocardium were significantly associated with HF at each follow-up interval ($p < 0.01$). LA volume was most predictive with time-dependent AUC values of 0.711, 0.719, and 0.693 at 3, 5, and 10 years ($p<0.0001$). Time-dependent AUC [95%CI] of chamber volumes alone (3yr: 0.765[0.698-0.833] ($p=0.002$), 5yr: 0.764[0.697-0.823] ($p=0.047$), 10yr: 0.737[0.658-0812] ($p=0.430$)) outperformed PREVENT-HF (3yr: 0.629[0.544-0.713], 5yr: 0.673[0.602-0.745], 10yr: 0.698[0.612-0.773]). The combination of the two (3yr: 0.746[0.674-0.814] ($p<0.001$), 5yr: 0.776[0.715-0.832] ($p<0.001$), 10yr: 0.775[0.698-0.847] ($p<0.001$)) resulted in significantly better performance than PREVENT-HF.

CONCLUSION

AI-derived cardiac chamber volumetry from CAC CT increases predictive accuracy for HF when combined with clinical risk scores. LA volume demonstrates especially important predictive ability as an independent risk factor for HF.

CLINICAL RELEVANCE/APPLICATION

Cardiac chamber volumetry obtained from CAC CT can be utilized for risk stratification for HF in asymptomatic patients. This strengthens evidence supporting the clinical utility of screening cardiac CT.

W2-SPCA-11 BASELINE EJECTION FRACTION AS A PREDICTOR OF RENAL RECOVERY FOLLOWING TRANSCATHETER AORTIC VALVE IMPLANTATION (TAVI): IMPACT ON CONTRAST MEDIA MANAGEMENT

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PURPOSE

To investigate whether baseline ejection fraction (EF) can predict renal recovery after TAVI by analyzing changes in serum creatinine and estimated glomerular filtration rate (eGFR), with particular attention to the influence of contrast media.

METHODS AND MATERIALS

This retrospective cohort study includes 372 patients who underwent TAVI. Pre-procedural EF was categorized as low (<40%), mid-range (40-49%), and normal (=50%). Renal outcomes were evaluated by pre-/post-TAVI differences in creatinine and eGFR. Spearman's rank correlation assessed relationships between EF, renal outcomes, and contrast media volumes administered during planning CT and TAVI.

RESULTS

Among 372 patients (mean age 81.1 ± 5.9 years), 63.3% showed decreased creatinine and 64.2% improved eGFR after TAVI. Patients with low EF had the most pronounced eGFR improvement (+8 vs. +4 mL/min/1.73m², $p < 0.05$). EF weakly correlated with post-TAVI creatinine change ($r = -0.12$, $p = 0.03$), but not with eGFR ($r = -0.004$, $p = 0.935$). Contrast media volume correlated weakly with post-TAVI creatinine ($r = 0.149$, $p = 0.005$) and eGFR changes ($r = -0.148$, $p = 0.005$).

CONCLUSION

Baseline EF may be predictive of renal recovery after TAVI, particularly in patients with low EF. Contrast media exposure appears to play a minor yet measurable role in renal outcome.

CLINICAL RELEVANCE/APPLICATION

Recognizing baseline EF as a potential predictor of post-TAVI renal recovery supports individualized contrast media strategies. This approach can enhance procedural safety and promote sustainability by minimizing contrast-related renal complications.

W2-SPCA-12 CT-FFR COMBINED WITH LESION-SPECIFIC FAI AS A PREDICTOR OF MAJOR ADVERSE CARDIOVASCULAR EVENTS IN CORONARY ARTERY DISEASE

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PURPOSE

To investigate the predictive value of combining computed tomography-derived fractional flow reserve (CT-FFR) with lesion-specific fat attenuation index (FAI) for major adverse cardiovascular events (MACE) in patients with coronary artery disease (CAD) and to assess the incremental prognostic value of lesion-specific FAI over CT-FFR alone.

METHODS AND MATERIALS

A retrospective analysis was performed involving 240 patients with either suspected or confirmed CAD who underwent coronary computed tomography angiography (CCTA) at the Affiliated Hospital of Liaoning University of Traditional Chinese Medicine from August 2020 to December 2023. Clinical data, CT-FFR, and lesion-specific FAI were collected. Patients were divided into MACE (n=72) and non-MACE (n=168) groups based on follow-up outcomes. Statistical analyses were conducted using SPSS 26.0, with logistic regression employed to identify independent predictors of MACE. The predictive performance of CT-FFR, lesion-specific FAI, and their combination for MACE was assessed through receiver operating characteristic (ROC) curve analysis, with statistical significance established at $P<0.05$.The clinical application value of the model was assessed by Decision curve analysis (DCA).

RESULTS

Both CT-FFR and lesion-specific FAI were significant independent risk factors for MACE ($P<0.001$). The area under the ROC curve (AUC) for predicting MACE using the combined CT-FFR and lesion-specific FAI was 0.854, which was significantly higher than that of CT-FFR alone ($P<0.001$),and had a higher net clinical benefit.

CONCLUSION

The combination of CT-FFR and lesion-specific FAI demonstrates enhanced predictive value for MACE in CAD patients. Lesion-specific FAI provides incremental prognostic value over CT-FFR alone in risk stratification for adverse cardiovascular events.

CLINICAL RELEVANCE/APPLICATION

In conclusion, the combination of CT-FFR and lesion-specific FAI demonstrates predictive significance for the occurrence of adverse cardiovascular events in patients with coronary artery disease,and lesion-specific FAI has incremental predictive value for CT-FFR in predicting the occurrence of adverse cardiovascular events in patients with

coronary artery disease. Based on this model, unnecessary ICA examinations can be avoided in low-risk patients with CT-FFR>0.80 and FAI<-83.5 HU, while limited medical resources can be focused on the high-risk group with elevated FAI.CT-FFR and lesion-specific FAI are influencing factors for the occurrence of MACE, which should be actively paid attention to by the clinic, to improve the prognosis of patients.

W2-SPCA-14 ASSOCIATION OF EPICARDIAL ADIPOSE TISSUE VOLUME AND RISK OF NEW ONSET DIABETES WITH STATIN USAGE

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Jeehoon Kang (*Abstract Co-Author*)
Young Seok Cho (*Abstract Co-Author*)
Eun Ju Chun, MD, PhD (*Abstract Co-Author*)

PURPOSE

While statins are effective lipid-lowering agents, they may increase the risk of new-onset diabetes mellitus (NODM). We evaluated the association between epicardial adipose tissue (EAT), measured by coronary CT angiography (CCTA), and the risk of NODM in statin users.

METHODS AND MATERIALS

We retrospectively analyzed 841 patients (mean age 61 ± 11 years; 61% male) who underwent CCTA between November 2011 and March 2017 and received moderate- or high-intensity statins for more than 6 months. EAT thickness at specific sites (right atrioventricular groove, left atrioventricular groove, right ventricular free wall) and total EAT volume were measured in CCTA using a commercial program (Leonardo, Siemens Healthcare). NODM development was assessed during the median follow-up of 2.44 years (interquartile range: 1.58, 3.72).

RESULTS

Among the patients, 139 (17%) were high-intensity statin users and 702 (83%) medium-intensity statin users. NODM occurred in 163 patients (15.4%), with a higher but non-significant rate in high-intensity statin users (18.2% vs. 14.8%, p = 0.242). Total EAT volume was significantly greater in NODM patients than non-NODM patients (169±58 ml vs. 152±51 ml, p < 0.001). Moreover, the EAT thickness at the three measured sites were all also higher in the NODM group. Multivariate Cox regression model identified EAT volume =158 mL (Hazard ratio [HR] = 1.632), prediabetes (HR = 2.991), triglyceride to high-density lipoprotein cholesterol (TG/HDL-C) ratio =2.5 (HR = 1.584) and age (HR =1.028, per 1 year) as independent predictors for NODM. Regardless of age, patients with three metabolic risk factors (EAT volume =158 mL, prediabetes, and TG/HDL-C =2.5) had a 7.7-fold higher risk of NODM compared to those with none.

CONCLUSION

EAT volume measured by CCTA is an independent predictor of NODM alongside prediabetes, TG/HDL-C ratio, and age.

CLINICAL RELEVANCE/APPLICATION

EAT volume measured by CCTA is clinically meaningful as it independently predicts new-onset diabetes mellitus in statin users. These findings suggest that personalized risk stratification incorporating EAT assessment offers the potential to improve the management of cardiometabolic risks in statin therapy.

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W2-SPCH

Chest Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPCH-1 ASSESSMENT OF THE ACCURACY OF QUANTITATIVE LUNG FUNCTION PARAMETERS WITH DIFFERENT RECONSTRUCTION MATRICES IN CHEST CT

Xu Wang (*Presenter*)
Caiyun Mou (*Abstract Co-Author*)
Hao Chen (*Abstract Co-Author*)

PURPOSE

Assessment of the accuracy of quantitative lung function parameters with different reconstruction matrices in chest CT

METHODS AND MATERIALS

A total of54 patients who underwent chest CT and pulmonary function test (PFT) were retrospectively collected. Chest CT scans were reconstructed with different reconstruction matrices (512×512, 768×768, 1024×1024). All reconstructed images were transferred to Neusoft NeuMiva Cloud platform, and the lungs were quantitatively analyzed using the slow obstructive pulmonary screening software to obtain the percentage of low density in the lungs (LAA%-950, -910), and the airway analysis results of the wall area ratio (WA%Br0~4).The parameters of the PFT examination included the ratio of the first-second expiratory volume with exertion (FEV1) to the exertion lung volume (FVC) (FEV1/FVC), and FEV1 as a percentage of predicted value (FEV1%). One-way repeated measures ANOVA or Friedman's test was used to compare the differences in quantitative lung function parameters between the three reconstruction matrices. Spearman's rank correlation was used to analyze the correlation between CT quantitative parameters and PFT indices.

RESULTS

The differences between LAA%-950, -910 and WA% Br0~4 under different reconstruction matrices were statistically significant (all P>0.05), and LAA%-950 gradually increased with the increase of the matrix, while LAA%-910 gradually decreased; WA% Br0~4 showed a trend of gradual decrease. Different reconstruction matrices LAA%-950 and -910 were correlated with FEV1 and FEV1/FVC, and the correlation increased with the increase of the matrix, and the correlation between LAA%-950 and PFT parameters was higher than that between LAA%-910.

CONCLUSION

Different reconstruction matrices affect the stability of the quantitative CT parameters of lung function, and the correlation between the large matrix of 1024×1024 and the PFT indexes was the best. The large matrix 1024×1024 has the best correlation with the PFT index, which is helpful for the accurate assessment of lung function.

CLINICAL RELEVANCE/APPLICATION

The large matrix 1024×1024 has the best correlation with the PFT index, which is helpful for the accurate assessment of lung function.

W2-SPCH-4 DEVICE DESIGN OPTIMIZATION FOR AN AUTONOMOUS CHEST X-RAY AI TOOL

Michelle Mastrianni, PhD (*Presenter*)
Jarrel C. Seah, MBBS (*Abstract Co-Author*)
Leslie Cass (*Abstract Co-Author*)
Haylee Bosshard (*Abstract Co-Author*)

PURPOSE

Autonomous review and reporting of cases with 'unremarkable" clinical findings could alleviate radiology workload burden through significant reduction in caseload. This analysis explored the design optimization of an AI-based chest X-ray (CXR) tool that identifies "unremarkable" studies and quantified the potential case load reduction and impact on clinical safety.

METHODS AND MATERIALS

The Annalise.ai CXR3 Module, which detects 124 radiographic findings on CXR, was trained on a large, multi-institutional dataset containing chest radiographs from a large national radiology network in Australia and multiple public datasets (MIMIC-CXR, NIH Chest X-ray Dataset, and PadChest). A validation subset with 159,812 cases was used to evaluate the performance of a candidate autonomous CXR solution based on a pre-defined definition of “unremarkable” CXR findings. A multi-objective sorting algorithm (NSGA-II) was applied to optimize for both case-load reduction and clinical safety. Clinical safety was determined from the rate of critical misses. Allowed threshold ranges for exclusion were set conservatively for high-criticality findings and more liberally for low-criticality findings. The NSGA-II algorithm generated a set of optimal threshold lists. Performance was assessed by analyzing both rule-out rates and critical miss rates under various configurations.

RESULTS

A total of 19.73% of cases in the dataset were labeled as ground truth unremarkable. Standard threshold settings yielded an 18.21% rule-out rate with an overall critical miss rate of 0.29%. NSGA-II optimization increased the rule-out rate to 24-25% while simultaneously reducing the number of critical misses by approximately 25%. Alternatively, at a constant rule-out rate of 18.21%, the number of critical misses could be reduced by up to 75%.

CONCLUSION

Autonomous AI tools for chest radiography should be carefully optimized to balance workload reduction with patient safety. Adaptive thresholding based on clinical severity enables gains in caseload reduction while minimizing the risk of missing critical findings. Future work should explore the impact of various definitions of “unremarkable” CXR.

CLINICAL RELEVANCE/APPLICATION

The CXR3 AI Module supports workflow optimization through triage and decision support across multiple findings. When optimized with thresholds based on clinical severity of the findings, future autonomous applications may safely reduce radiologist workload.

W2-SPCH-5 ASSESSING INTEROBSERVER RELIABILITY IN LUNG FISSURE INTEGRITY MEASUREMENTS FOR BRONCHSCOPIC LUNG VOLUME REDUCTION

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Nafisa Reya, MD (*Abstract Co-Author*)
Jared S. Meshekow, MD (*Abstract Co-Author*)
Gerard V. Criner (*Abstract Co-Author*)
Hillel S. Maresky JR, MD (*Abstract Co-Author*)

PURPOSE

Emphysema is a progressive destructive lung disease associated with severe parenchymal hyperinflation leading to dyspnea and impaired quality of life. Bronchoscopic Lung Volume Reduction (BLVR) is a minimally invasive procedure where endobronchial valves are segmentally placed to achieve lobar occlusion in significantly diseased lobes. Lung fissure integrity is crucial in determining BLVR success, as incomplete fissures promote collateral ventilation and negate the one-way valve biomechanics. The current study assessed measurement reliability in BLVR candidate evaluation by evaluating interobserver agreement in lung fissure integrity measurements.

METHODS AND MATERIALS

A retrospective analysis included 238 patients with emphysema undergoing high-resolution CT scans. Five radiologists and one medical student assessed the integrity of the right major, right minor, and left fissures—quantified as the ratio of intact fissure length to total expected length, expressed as a percentage. Interobserver agreement was analyzed using analysis of variance (ANOVA) with Tukey's Honest Significant Difference (HSD) post-hoc test for pairwise comparisons, and forest plots displaying confidence intervals.

RESULTS

ANOVA results showed no statistically significant differences in fissure integrity measurements across readers for the right major, right minor, and left fissures (p-values of 0.554, 0.089, and 0.413, respectively). Variability was identified in right minor fissure measurements denoted by greater spread in confidence intervals. Levene's test confirmed homogeneity of variance, supporting the reliability of fissure measurement methods across trained observers.

CONCLUSION

The high degree of interobserver agreement supports the reliability of qualitative fissure integrity measurements for BLVR evaluation. The observed variability in the right minor fissure highlights potential anatomical or technical challenges, underscoring the need for standardized protocols. These findings suggest fissure integrity assessment can be effectively performed by non-specialists, potentially expanding access to BLVR evaluation in resource-limited settings. Future research should explore automated tools and standardization to further enhance measurement consistency.

CLINICAL RELEVANCE/APPLICATION

Reliable assessment of lung fissure integrity is critical for identifying appropriate candidates for Bronchoscopic Lung Volume Reduction (BLVR). This study shows that reliable measurements can be made by both specialists and non-specialists, supporting broader access to BLVR evaluations. Standardized protocols and automation may further enhance accuracy and clinical outcomes.

W2-SPCH-7 DEVELOPMENT OF A DEEP LEARNING MODEL FOR AUTOMATIC LABELING OF SEGMENTAL BRONCHI ON CHEST CT IN PATIENTS WITH PULMONARY DISEASE

Myeongjun Kim (*Presenter*)
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Sang Min Lee, MD, PhD (*Abstract Co-Author*)
Jooae Choe, MD, PhD (*Abstract Co-Author*)
Joon Beom Seo, MD, PhD (*Abstract Co-Author*)
Yura Ahn, MD (*Abstract Co-Author*)
Sohee Park, MD, PhD (*Abstract Co-Author*)
Soonyoung Lee (*Abstract Co-Author*)

PURPOSE

To develop a deep learning model that automatically identifies and labels segmental bronchi on chest CT scans of patients with pulmonary disease, and to evaluate the impact of different input-data configurations using performance metrics.

METHODS AND MATERIALS

Chest CT scans from 322 patients with asthma or COPD (2012-2022) were divided into training (n=282) and test (n=40) sets. Segmental bronchi were manually annotated into 18 anatomical segments by expert raters. A 3D full-resolution nnU-Net V2 model was developed and trained using five different input-data configurations. Performance on the test set was assessed via Dice similarity coefficient, 95% Hausdorff distance, precision, recall, and hit based metrics. The input-data configurations comprised CT volumes, binary airway masks, and distance airway masks in various combinations: Model1 (CT only), Model2 (CT + binary masks), Model3 (CT + distance masks), Model4 (distance + binary masks), and Model5 (CT + binary + distance masks). Paired t-tests were performed using Model1 (CT only) as the reference to evaluate statistical significance in performance differences among the input-data configurations.

RESULTS

The performance of each model, evaluated in terms of DSC, distance, and hit rate, is reported in Table 1 together with the results of the paired t-test. Overall, among the five input-data configurations, Model3 demonstrated statistically significant improvements compared to the reference Model1, with higher Dice similarity coefficient (DSC: 0.725, $p<0.05$), surface DSC (0.811, $p<0.05$), and hit-rate (94.3%, $p<0.05$).

CONCLUSION

Our 3D full-resolution nnU-Net V2 model—particularly the configuration represented by Model3—demonstrated robust and statistically significant accuracy in automatically labeling segmental bronchi on chest CT scans of patients with asthma and COPD.

CLINICAL RELEVANCE/APPLICATION

Substantially reducing manual annotation time and improving labeling consistency can streamline large-scale pulmonary imaging studies and routine clinical workflows. This automated approach has the potential to assist radiologists in efficient bronchial assessment and expedite treatment planning for asthma and COPD patients.

W2-SPCH-11 LUNG LOBE SEGMENTATION WITH CURRICULUM LEARNING BASED ON LOBE INCOMPLETENESS

Sungchul On (*Presenter*)
Junhyeok Ock, MSc (*Abstract Co-Author*)
Sang Min Lee, MD, PhD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

To develop a robust method for lung lobe segmentation of diseases, including chronic obstructive pulmonary disease (COPD), using a curriculum learning strategy focusing on lobe incompleteness, the proposed approach guides the model from simpler to more complex cases.

METHODS AND MATERIALS

We collected 960 inspiratory and expiratory chest CT scans—480 inspiratory and 480 expiratory—from COPD patients across 15 hospitals. Fissure incompleteness was evaluated by measuring Hounsfield Unit (HU) differences along lobar boundaries and was categorized into three difficulty levels: complete, mild, and severe. A curriculum learning strategy was applied to train three sequential stages, with 300 cases for each level. Two baseline models were also trained for comparison: 600 combined complete and mild cases and the other using all 900 cases. The same 3D nnU-Net architecture was utilized for all models, and training was performed for 500 epochs per stage with a batch size 1. A loss function combining Dice and focal losses was used. Model performance was evaluated on a test set of 60 cases, comprising 20 cases from each difficulty level.

RESULTS

The stage 2 model of curriculum learning achieved the highest Dice score of 98.28%, statistically significant compared to other models. While other models showed superior performance in specific lobes, such as the left or right upper lobe, these differences were not statistically significant compared to the stage 2 model. The stage 1 model, trained solely on complete-level data, performed well on complete test cases but failed to generalize to mild and severe cases due to a lack of exposure to complex anatomical structures. In contrast, the stage 3 model, trained on the most challenging cases, exhibited reduced performance, potentially due to catastrophic forgetting during learning cases with severe fissure incompleteness and structural variation. The stage 2 model also achieved the best overall results in mean surface distance, highlighting its robustness in segmentation accuracy and boundary precision.

CONCLUSION

We improved lung lobe segmentation by combining deep learning with anatomical insights, utilizing a curriculum learning strategy that accounts for anatomical variability and enhances the diagnosis and surgical planning for pulmonary diseases.

CLINICAL RELEVANCE/APPLICATION

Accurate lung lobe segmentation with diseases is essential for lobectomy and surgical planning procedures in actual clinical settings. Our method improves segmentation performance in cases with incomplete fissures caused by various diseases, facilitating precise anatomical localization and aiding clinical decision-making in thoracic disease assessment.

W2-SPCH-12 VALUE OF PULMONARY VASCULAR QUANTITATICE PARAMETERS IN DIAGNOSIS OF PRESERVED RATIO IMPAIRED SPIROMETRY DISEASE PATIENTS

Jianying Li, PhD (*Presenter*)
Ma Guangming, MMed (*Abstract Co-Author*)
Qiuju Fan (*Abstract Co-Author*)
Chuangbo Yang, MMed (*Abstract Co-Author*)

PURPOSE

Preserved Ratio Impaired Spirometry (PRISm) was associated with increased incidence of complications and all-cause mortality in the patients with in chronic obstructive pulmonary disease (COPD). However, there are few radiological studies related to PRISm. To investigate the CT pulmonary vascular quantitative features of Preserved Ratio Impaired Spirometry (PRISm), with the goal of establishing a nomogram model for predicting PRISm based on quantitative pulmonary vascular quantitative parameters.

METHODS AND MATERIALS

A prospective and continuous study was performed in 468 respiratory outpatients. All patients received both deep inspiratory CT, and pulmonary function test (PFT) within 1 month. According to the exclusion criteria and Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification standard, 92 cases with normal pulmonary function, and 63 cases with PRISm were included in the study. Images were analyzed using a commercial computer aided diagnosis (CAD) software. Pulmonary function parameters such as inspiratory intrapulmonary vascular volume (IPVVin), the number of blood vessels in a 40mm 2 (TNV40), 60mm 2 (TNV60), and 80mm 2 area (TNV80); the cross area of blood vessels in a 40mm 2 area (TAV40), 60mm 2 (TAV60), and 80mm 2 area (TAV80) were measured. Independent sample t test or Wilcoxon Rank- Sum test was used to compare the differences in clinical features, pulmonary function parameters and quantitative CT parameters. The predictors were obtained by binary logistics regression analysis in normal and PRISm, and the nomogram model was established.

RESULTS

There were significant differences in pulmonary function parameters, BMI, exacerbations past year, gasp between the two groups ($P<0.05$). There were significant differences in TNV40, TNV60, TNV80, TAV60 and TAV80 between the two groups ($P<0.05$). CT pulmonary vascular quantitative parameters in normal group were higher than those in PRISm group. The predictors of the nomogram model using binary logistics regression analysis to distinguish normal from PRISm were gasp and TNV60. It had a good goodness of fit (? 2 = 4.91, P = 0.77) with the area under curve (AUC) value of 0.700.

CONCLUSION

Quantitative chest CT imaging can effectively evaluate pulmonary vascular changes in PRISm patients. The nomogram based on pulmonary vascular quantitative parameters has good predictive value and provides more objective evidence for the early screening of PRISm.

CLINICAL RELEVANCE/APPLICATION

Our study will help to improve the clinical value of quantitative CT for the diagnosis and early intervention for COPD.

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W2-SPER

Emergency Radiology Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPER-2 MACHINE LEARNING PREDICTION OF ICU TRANSFER IN PATIENTS WITH BLUNT CHEST TRAUMA USING AMBULANCE, CLINICAL, AND RADIOMIC DATA

Sarah Meribout, MD (*Presenter*)
Darya Smetanina (*Abstract Co-Author*)
Ashraf Hefny Soliman (*Abstract Co-Author*)
Taleb M. Al Mansoori, MD, FRCPC (*Abstract Co-Author*)
Yauhen Statsenko (*Abstract Co-Author*)

PURPOSE

Blunt chest trauma (BCT) accounts for a significant portion of trauma-related morbidity and mortality worldwide. Accurate early prediction of Intensive Care Unit (ICU) transfer in BCT patients remains a clinical challenge, as conventional scoring systems like GCS, ISS, and AIS have limited sensitivity and specificity. We aimed to develop and validate machine learning (ML) models that integrate ambulance data, clinical parameters, laboratory values, and radiomic features from early chest CT to predict ICU transfer.

METHODS AND MATERIALS

This retrospective study analyzed 212 cases of isolated BCT admitted to a tertiary hospital over three years. Data were collected from trauma registries, electronic medical records, and early chest CT scans. The following groups of findings were added to the study dataset: (1) ambulance data: demographics, vitals, and trauma details; (2) admission data: clinical scores, laboratory and radiologic findings on admission; and (3) radiomics features. The latter were extracted from hemithoraces with PyRadiomics framework. The segmentation masks for hemithoraces were received with Total Segmentator extension for 3DSlicer. To predict ICU admission, we used a set of machine learning (ML) classifiers: XGBoost, CatBoost, Random Forest, and Decision Tree. Classification accuracy was evaluated with the standard metrics: sensitivity (Sn), and mean absolute error (MAE).

RESULTS

Among 212 patients (mean age 31 years; 86.8% male), 26% required ICU transfer. ICU patients were younger, had lower GCS scores, higher respiratory and heart rates, and more severe injuries per anatomical scores. Radiomic features significantly differed between ICU and non-ICU groups. The best-performing model (CatBoost) achieved an AUC of 0.91, sensitivity of 0.84, and specificity of 0.88. Combining clinical and radiomic features improved prediction over traditional scores alone.

CONCLUSION

ML-based models incorporating radiomics and clinical data significantly improve early prediction of ICU transfer in BCT patients. These tools may enhance triage accuracy and guide intensive monitoring and management decisions in emergency settings.

CLINICAL RELEVANCE/APPLICATION

Integrating AI with CT imaging and clinical data may provide a scalable, objective decision-support tool to optimize ICU resource allocation and improve outcomes in BCT trauma care.

W2-SPER-3 EVALUATION OF CONTRAST DOSE AND BEAM-HARDENING ARTIFACT REDUCTION IN ROUTINE CTPA USING THE ADAPTIVE LOW-CONTRAST-DOSE PROTOCOL: A COMPARISON WITH EMPIRICAL SCANNING

Xiaoying Chen (*Presenter*)
Xubin Cui (*Abstract Co-Author*)
Wanting Wu (*Abstract Co-Author*)

PURPOSE

To quantitatively and qualitatively assess the efficacy of the adaptive low-contrast-dose protocol in reducing contrast dose and beam-hardening artifacts (BHA) in CT pulmonary angiography (CTPA), compared to conventional empirical scanning.

METHODS AND MATERIALS

This retrospective analysis enrolled 188 patients suspected of pulmonary embolism who underwent spectral CTPA between February 2022 and January 2025. Participants were stratified into two groups: the adaptive low-contrast-dose group (Group A, n=84), which utilized a three-ROI test bolus to optimize scan timing and adjusted contrast injection rates based on body weight, and the empirical scanning protocol group (Group B, n=104). The study quantified CT attenuation values of pulmonary arteries, their branches, and BHA-affected muscles, and computed contrast-to-noise ratio (CNR), arteriovenous separation, and BHA in both groups. Two radiologists independently assessed image quality using a 5-point scale, evaluating pulmonary vascular opacification, BHA severity, motion artifacts, and image noise.

RESULTS

Group A (adaptive low-contrast-dose protocol) achieved a 35% reduction in contrast medium volume (26 mL vs. 40 mL, $P < 0.001$), while the mean body weight of patients was 15.38% higher compared to Group B (empirical scanning protocol) (75.0 (64.0, 86.1) VS 65.0 (57.3, 70.0), $P < 0.001$). Radiation doses were comparable between groups ($P > 0.05$). While Group A exhibited slightly lower CT values than Group B, all pulmonary artery segments in Group A met diagnostic criteria (CT = 350 HU) and maintained adequate arteriovenous differentiation (CT difference = 300 HU). No significant difference in CNR was observed. Group A demonstrated significantly reduced BHA indices (13.10 (0.00, 23.19) VS 33.30 (25.10, 54.65), $P < 0.001$) and higher subjective BHA quality scores (5 (4, 5) VS 4 (4, 5), $P < 0.001$).

CONCLUSION

The adaptive low-contrast protocol effectively reduces contrast agent volume and BHA while preserving diagnostic image quality, providing a practical optimization method for CTPA imaging.

CLINICAL RELEVANCE/APPLICATION

The adaptive low-contrast protocol effectively reduces contrast agent volume and BHA while preserving diagnostic image quality, providing a practical optimization method for CTPA imaging.
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W2-SPGI

Gastrointestinal Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPGI-1 ADVANCES IN IPMN IMAGING: DEEP LEARNING-ENHANCED HASTE IMPROVES LESION CHARACTERIZATION

Johannes Kolck, MD (*Presenter*)
Fabio Pivetta, MD (*Abstract Co-Author*)
Clarissa Hosse (*Abstract Co-Author*)
Uli Fehrenbach, MD (*Abstract Co-Author*)
Dominik Geisel, MD (*Abstract Co-Author*)

PURPOSE

The prevalence of asymptomatic pancreatic cysts is increasing due to advances in imaging techniques. Among these, Intraductal Papillary Mucinous Neoplasms (IPMN) are most common, with potential for malignant transformation, often necessitating close follow-up. This study evaluates novel MRI techniques for the assessment of IPMN.

METHODS AND MATERIALS

From May to December 2023, 59 patients undergoing abdominal MRI were retrospectively enrolled. Examinations were conducted on 3-Tesla scanners using a Deep Learning Accelerated Half-Fourier Single-Shot Turbo Spin-Echo (HASTE DL) and standard HASTE (HASTE S) sequence. Two readers assessed minimum detectable lesion size and lesion-to-parenchyma contrast quantitatively, qualitative assessments focused on image quality. Statistical analyses included Wilcoxon signed-rank and chi-squared tests.

RESULTS

HASTE DL demonstrated superior overall image quality ($p < 0.001$), with higher sharpness and contrast ratings ($p < 0.001$, $p = 0.112$). HASTE DL showed enhanced conspicuity of IPMN ($p < 0.001$) and lymph nodes ($p < 0.001$), with more frequent visualization of IPMN communication with the pancreatic duct ($p < 0.001$). Visualization of complex features (dilated pancreatic duct, septa and mural nodules) was superior in HASTE DL ($p < 0.001$). The minimum detectable cyst size was significantly smaller for HASTE DL (4.17 mm ± 3.00 vs. 5.51 mm ± 4.75; $p < 0.001$). Inter-reader agreement was for (? 0.936) for HASTE DL , slightly lower (? 0.885) for HASTE S .

CONCLUSION

HASTE DL in IPMN imaging provides superior image quality and significantly reduced scan times. Given the increasing prevalence of IPMN and the ensuing clinical need for fast and precise imaging, HASTE DL improves availability and quality of patient care.

CLINICAL RELEVANCE/APPLICATION

HASTE DL provides faster, high-quality MRI imaging, enabling improved diagnostic accuracy and timely risk stratification for IPMN, potentially enhancing patient care and addressing the growing clinical demand for efficient imaging of IPMN.

W2-SPGI-2 BEYOND THE GREY: DEFINING NON-INVASIVE BENCHMARKS WITH ADVANCED ULTRASOUND AND LAB CORRELATION IN NAFLD

Mehak Aggarwal, MBBS (*Presenter*)
Priscilla Joshi, MBBS, MD (*Abstract Co-Author*)

PURPOSE

As NAFLD becomes a global epidemic, relying on liver biopsy for diagnosis is neither practical nor sustainable. Among the various methods available to quantify liver fat, such as ultrasound, CT, and MRI, our study assessed the effectiveness of Ultrasound-Guided Attenuation Parameter (UGAP) as a non-invasive tool for quantifying hepatic steatosis. We also examined its correlation with liver stiffness (via shear wave electrography), B-mode grading, liver function tests, and lipid profile. The goal was to facilitate earlier diagnosis, prevent cirrhosis, and support informed clinical decisions through a streamlined, one-stop imaging approach

METHODS AND MATERIALS

Following ethical clearance, 124 patients with B-mode-confirmed NAFLD were enrolled. Exclusion criteria included viral hepatitis, cirrhosis, and significant alcohol intake. All patients underwent ultrasound fat grading, UGAP (dB/cm/MHz) and shear wave elastography (kPa). Blood tests included LFTs (AST, ALT, bilirubin, ALP) and lipid profile (cholesterol, LDL, HDL, VLDL, triglycerides). Pearson correlation and regression analyses were performed.

RESULTS

UGAP and elastography provided complementary insights in NAFLD assessment. UGAP showed a strong correlation with B-mode steatosis grading ($r = 0.717$) and moderate correlation with liver stiffness values ($r = 0.554$), indicating its higher sensitivity to hepatic fat and some association with increased stiffness. In contrast, elastography grades correlated weakly with UGAP ($r = 0.181$) and B-mode ($r = 0.074$), underscoring its specificity for fibrosis. In addition, UGAP showed significant associations with ALT ($r = 0.495$), AST ($r = 0.478$), and mild links to cholesterol and LDL. Elastography correlated modestly with ALT and AST, suggesting its utility in detecting fibrosis and hepatic inflammation.

CONCLUSION

UGAP emerged as a sensitive, rapid, cost-effective, and accessible single-session solution for quantifying liver fat. When combined with elastography, it provided detailed, real-time view of the fat-fibrosis continuum, reducing reliance on biopsies and supporting timely intervention

CLINICAL RELEVANCE/APPLICATION

The integration of UGAP, elastography, and biochemical markers enables early, accurate, cost effective and radiation-free evaluation of NAFLD. This non-invasive approach will allow clinicians to stratify risk, tailor interventions, and safely monitor disease progression.

W2-SPGI-3 ABBREVIATED VERSUS COMPREHENSIVE MRI PROTOCOLS IN THE SURVEILLANCE OF BRANCH-DUCT INTRADUCTAL PAPILLARY MUCINOUS NEOPLASMS (BD-IPMN): ANALYSIS OF DIAGNOSTIC PERFORMANCE, INTER-READER AGREEMENT, TIME AND COST SAVINGS

Christian Reca, MD (*Presenter*)
Cristiana Bonifacio, MD (*Abstract Co-Author*)
Riccardo Levi (*Abstract Co-Author*)
Marco Francone, MD, PhD (*Abstract Co-Author*)

PURPOSE

To compare the diagnostic value of Abbreviated MRI protocols (AP) (with/without DWI) versus a comprehensive protocol (CP) for Branch-Duct Intraductal Papillary Mucinous Neoplasms (BD-IPMN) surveillance, evaluating inter-reader agreement, cost-effectiveness and time efficiency.

METHODS AND MATERIALS

This single-center retrospective study included patients with BD-IPMN undergoing baseline and follow-up MRI between January 2018 and April 2024. CP included axial and coronal T2WI, axial fat-saturated T1-weighted images before and after contrast injection (T1WI), 2D and 3D MR MRCP and DWI images.The two APs were obtained from CP follow-up examinations: AP with DWI consisted of axial and coronal T2WI, 2D-3D MRCP, axial fat-saturated T1WI images and DWI, AP without DWI comprised only axial and coronal T2WI and 2D-3D MRCP. A senior radiologist (>20 years of experience in pancreatic imaging) and a junior radiologist (4th year radiology resident) independently and blinded analyzed each protocol using Kyoto criteria and recommended management. Inter-reader and inter-protocol agreement were analyzed using Cohen's and Fleiss' Kappa. Acquisition times and healthcare costs were compared using national reimbursement rates. ($p<0.05$ statistical significant)

RESULTS

Overall, 40 patients (25 women and 15 man) with a median age of 67 years(range 48-87 years) were included. No statistically significant differences were observed among the 3 protocols in identifying worrisome features, including high-risk stigmata, cyst size, main pancreatic duct dilation, and mural nodules.The inter-reader agreement was almost perfect (Fleiss' Kappa=0.82). Substantial inter-reader agreement (Cohen's Kappa >0.6) was observed for all protocols, with almost perfect agreement (Cohen's Kappa >0.8) in some instances. AP protocols demonstrated up to a 48% reduction in acquisition time and a 27.4% cost reduction compared to CP. The addition of DWI did not significantly improve diagnostic accuracy

CONCLUSION

APs, particularly without DWI, are reliable and cost-effective alternatives to CP for BD-IPMN follow-up, maintaining comparable diagnostic performance. Substantial inter-reader agreement highlights the reproducibility of APs, even among less experienced radiologists.

CLINICAL RELEVANCE/APPLICATION

AP without DWI can safely streamline BD-IPMN surveillance, reducing scan time and costs while maintaining diagnostic accuracy—potentially alleviating healthcare burdens and increasing MRI availability for high-demand populations.

W2-SPGI-5 IMAGING-DETECTED IMMUNE-RELATED ADVERSE EVENTS IN UNRESECTABLE HEPATOCELLULAR CARCINOMA TREATED WITH ATEZOLIZUMAB AND BEVACIZUMAB

Dong Ho Lee, MD (*Presenter*)

PURPOSE

Following the success of the IMbrave150 trial, the combination of atezolizumab and bevacizumab has been established as the standard first-line treatment for patients with unresectable hepatocellular carcinoma (HCC), owing to its significant improvement in overall survival. Immune-related adverse events (irAEs) during treatment with this regimen have been linked to better prognosis. However, the imaging characteristics of irAEs and their potential prognostic implications during atezolizumab plus bevacizumab therapy remain underexplored. This study aimed to evaluate the imaging findings related to irAEs and their impact on prognosis.

METHODS AND MATERIALS

In this retrospective cohort study, consecutive patients who received atezolizumab in combination with bevacizumab as a first-line treatment for unresectable HCC were included. All available imaging studies performed during the course of treatment were reviewed to identify irAEs. The primary objectives were to characterize the imaging findings indicative of irAEs and to assess the correlation between these findings, tumor response, and overall survival. Statistical analysis was performed to compare disease control rates and survival outcomes between patients with and without irAEs.

RESULTS

A total of 198 patients (168 males and 28 females, median age 62.5 years) treated between November 2020 and June 2023 were included in the analysis. Of these, 27 patients (13.6%) exhibited irAEs on imaging, including pulmonary infiltration (n=15), enterocolitis (n=7), mesenteric panniculitis (n=3), and lymphadenitis (n=2). The presence of irAEs identified on imaging was significantly associated with a higher disease control rate (100% in patients with irAEs vs. 67.3% in those without irAEs; $P<0.001$). Additionally, patients with imaging-detected irAEs demonstrated markedly improved overall survival rates, with estimated 1- and 2-year survival rates of 84.9% and 51.6%, respectively, compared to 50.0% and 22.8% in patients without irAEs ($P<0.001$).

CONCLUSION

The development of irAEs identified through imaging during atezolizumab plus bevacizumab treatment in patients with unresectable HCC was significantly associated with improved disease control and overall survival.

CLINICAL RELEVANCE/APPLICATION

Imaging detected irAE would have a potential to provide prognostic information for unresectable HCC patients treated by atezolizumab plus bevacizumab.

W2-SPGI-6 AUTOMATIC LIVER SEGMENTATION IN THE GENERAL POPULATION: HOW TO REDEFINE THE MORPHOMETRIC CRITERIA OF A HEALTHY LIVER?

Edouard Reizine, MD (*Presenter*)
Vincent Morard (*Abstract Co-Author*)
Sebastien Mule, MD, PhD (*Abstract Co-Author*)
Naim Jalal (*Abstract Co-Author*)
Jorge Hernandez Londono (*Abstract Co-Author*)
Vincent Leroy, MD (*Abstract Co-Author*)
Hicham H. Kobeiter, MD (*Abstract Co-Author*)
Alain Luciani, MD, PhD (*Abstract Co-Author*)

PURPOSE

To reassess the accuracy of known 2D measurements of the healthy liver and to redefine new global, three-dimensional, and segmental morphometric criteria indexed to demographic data in a general population cohort.

METHODS AND MATERIALS

A patient cohort was drawn from the data warehouse of the Assistance Publique-Hôpitaux de Paris, including all patients who underwent an abdominopelvic CT scan with a portal venous phase meeting several clinical and biological criteria excluding underlying hepatic or oncological pathology. An automatic segmentation algorithm was developed and applied to all patients, allowing extraction of the following measurements: 2D height of the right liver lobe, 2D height of the left liver lobe, total liver volume, volumetric ratio of each Couinaud hepatic segment relative to the total liver volume, dimensions of the falciform ligament space, hilar space, and diameter of the portal vein trunk. All these data were correlated with clinical variables including sex, age, height, weight, body surface area (BSA), and body mass index (BMI).

RESULTS

A total of 818 patients were available for analysis. The cohort included 52.8% women and 47.2% men, with median ages of 51 and 52 years, respectively. Median BMI and BSA were 23.4 and 1.67 for women, and 23.5 and 1.87 for men. The median height of the right and left liver lobes was 16.65 cm (IQR: 15.4-18.2) and 14.22 cm (IQR: 11.4-16.8), respectively. There was no significant difference between men and women ($p = 0.56$), but these measurements showed only moderate correlation with total liver volume (0.56 for right lobe height, 0.16 for left lobe height). Total liver volume was not correlated with age (-0.05), although a trend toward decreased mean liver volume with age was observed in men. However, total liver volume was correlated with height (0.46), weight (0.53), BSA (0.58), and BMI (0.34). For both sexes, the relative size of segments 4 and 5 decreased with age, while segments 7 and 8 increased. Lastly, the size of the falciform ligament space, hilar space, and diameter of the portal vein trunk increased with age.

CONCLUSION

Morphometric criteria for a healthy liver should be indexed not only to the patient’s body measurements but also to their age. Currently known two-dimensional measurements do not appear to be sufficiently specific or sensitive to define a liver of normal size.

CLINICAL RELEVANCE/APPLICATION

Known 2D measurements of the healthy liver should be used with caution as these criteria need to be indexed to the patient's body size and age.

W2-SPGI-7 LONG-TERM FOLLOW-UP OF FOCAL NODULAR HYPERPLASIA: WHAT IS THE NATURAL HISTORY OF THESE LESIONS?

Edouard Reizine, MD (*Presenter*)
Alain Luciani, MD, PhD (*Abstract Co-Author*)
Frederic Pigneur, MD (*Abstract Co-Author*)
Sebastien Mule, MD, PhD (*Abstract Co-Author*)

PURPOSE

To assess the natural history of focal nodular hyperplasia (FNH) over time.

METHODS AND MATERIALS

Single-center retrospective study including all patients with one or more FNH lesions characterized non-invasively by MRI with extracellular contrast agent, and, if necessary, complemented by MRI with hepatobiliary contrast agent or contrast-enhanced ultrasound.All patients were required to have undergone two cross-sectional imaging studies with contrast injection, with at least one year between the two exams. Only lesions larger than 1 cm were included. Patients whose imaging did not include a high-quality arterial phase were excluded.All lesions were measured on the arterial phase in the axial plane. Progression was defined as a =20% increase in axial diameter; regression as a =30% decrease.

RESULTS

A total of 112 patients were included, comprising 96 women (86%) and 15 men (14%), with a total of 158 lesions. The median follow-up duration was 3 years (IQR: 2.0-6.0).Most lesions remained stable over time (83/158, 53%) or regressed (50/158, 32%). When comparing progressive, stable, and regressive lesions, there was a significant difference in follow-up duration (2.0 [2.0-5.0], 4.0 [3.0-8.0], and 6.0 [4.0-9.0] years, respectively; $p < 0.001$), but no significant difference in age at baseline (40 [34-48], 40 [34-50], and 40 [36-44] years; $p = 0.98$) or initial lesion size (20 [14-36], 20 [15-28], and 18 [14-30] mm; $p = 0.650$).When analyzing follow-up intervals, most lesions were stable at 1-year follow-up (14/16, 88%) and 2 years (29/41, 71%), while most showed regression if the interval was between 5 to 10 years (23/46, 50%) or over 10 years (10/13, 77%).Combining all baseline and follow-up measurements, lesion size was significantly larger in patients under 40 years of age (21 [15-37] mm vs. 16 [11-26] mm; $p < 0.001$).Finally, in patients with multiple lesions ($n = 25$), evolution was similar across all lesions in 12 patients (48%) and varied among lesions in 13 patients (52%).

CONCLUSION

The evolution of FNH varies over time depending on both the patient and the lesion, with an overall trend toward progressive regression over the long term.

CLINICAL RELEVANCE/APPLICATION

Natural history of Focal Nodular Hyperplasia remains unclear, nevertheless there is an overall trend toward progressive regression over the long term.

W2-SPGI-9 DEEP LEARNING-BASED MULTIDIMENSIONAL MRI BIOMARKERS FOR INTERPRETABLE GRADING OF INTRAHEPATIC MASS-FORMING CHOLANGIOCARCINOMA

Liyong Zhuo, PhD (*Presenter*)
Wenjing Chen (*Abstract Co-Author*)
Xiaoping Yin (*Abstract Co-Author*)
Jianing Wang (*Abstract Co-Author*)

PURPOSE

This study aimed to develop an interpretable ensemble deep learning (DL) framework that integrates multidimensional MRI features for the preoperative prediction of histological grades in intrahepatic mass-forming cholangiocarcinoma (IMCC).

METHODS AND MATERIALS

Preoperative MRI scans from 333 IMCC patients across three multicenter cohorts (January 2018-June 2024) were retrospectively analyzed. An ensemble deep learning (DL) framework was developed by synergizing 2.5D and 3D ResNet-50 architectures. Significant variables from clinical-laboratory-imaging (ClinLabImag) features, Radiomics, and the DL model were integrated into a predictive model, and its performance was evaluated using the area under the receiver operating characteristic curve (AUC), with interpretability assessed via Gradient-weighted class activation mapping (Grad-CAM) and SHapley Additive exPlanations (SHAP) analysis.

RESULTS

The training cohort included 240 patients (median age: 60 years [IQR: 55-66]); external validation comprised 93 patients (59 years [55-65]). The DL model achieved an external validation AUC of 0.804 (95% CI: 0.712-0.896), significantly outperforming standalone 2.5D ($P = 0.025$) and 3D architectures ($P = 0.030$). The combined model integrating DL, Radiomics, and ClinLabImag features demonstrated superior generalizability (AUC: 0.843 [0.749-0.938]), outperforming Radiomics ($P = 0.019$) and clinical models ($P = 0.017$). SHAP analysis revealed DL-derived features dominated predictive contributions (72.1%), followed by Radiomics (21.6%) and clinical variables (6.3%).

CONCLUSION

The proposed interpretable ensemble DL model, which integrates multidimensional biomarkers, enhances the preoperative histological grading of IMCC. This approach demonstrates robust generalizability across multicenter cohorts. By non-invasively capturing tumor biology, this method has the potential to optimize treatment stratification and reduce reliance on invasive biopsies.

CLINICAL RELEVANCE/APPLICATION

In this multicenter study, we developed an interpretable ensemble deep learning framework integrating 2.5D and 3D MRI architectures to noninvasively predict histopathological grading preoperatively. The model holds significant value for clinicians managing IMCC, enabling earlier identification of high-grade tumors to guide aggressive surgical planning or neoadjuvant therapies while reducing reliance on invasive diagnostic procedures. By enhancing preoperative risk stratification without increasing imaging complexity, this strategy optimizes resource utilization in clinical settings, ultimately benefiting patients through personalized treatment planning and healthcare systems through reduced diagnostic delays.

W2-SPGI-13 ULTRA-HIGH-RESOLUTION PANCREATIC PROTOCOL PHOTON-COUNTING CT: IS HIGH-SPATIAL RESOLUTION IMAGING NECESSARY IN THE ASSESSMENT OF PANCREATIC DUCTAL ADENOCARCINOMA?

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Binaya Dhakal, MD (*Abstract Co-Author*)
Shravya Srinivas Rao, MD (*Abstract Co-Author*)
Ryan Chung, MD (*Abstract Co-Author*)
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PURPOSE

To investigate if high-spatial resolution imaging is necessary in the local evaluation of pancreatic ductal adenocarcinoma (PDAC).

METHODS AND MATERIALS

This retrospective study included 16 patients with PDAC who underwent ultra-high-resolution pancreatic protocol photon-counting CT and had both 1- and 0.4-mm slice images between September 2024 and April 2025. CT attenuations of the pancreas and PDAC, and background noise were measured, and then signal-to-noise ratio (SNR) of the pancreas and tumor-to-pancreas contrast-to-noise ratio (CNR) were calculated. A radiologist randomly reviewed 1- and 0.4-mm slice images and evaluated the arterial and portal venous involvements, resectability classifications, and overall image quality. Wilcoxon test and Kendall's tau rank correlation were conducted to compare the quantitative and qualitative parameters between 1- and 0.4-mm slice images.

RESULTS

The background noise was lower, and SNR of the pancreas and tumor-to-pancreas CNR were higher on 1-mm slice images than the high-resolution 0.4-mm slice images ($P < .001$ for all). The evaluations of arterial and portal venous involvements and resectability classification were equivalent between 1- and 0.4-mm slice images (Kendall's tau, 0.95-1.00; $P < .001$ for all). Overall image quality at pancreatic and portal venous phases was better on the 1-mm slice images than the high-resolution 0.4-mm slice images ($P < .001$ for both).

CONCLUSION

Assessment of PDAC was equivalent between 1- and high-resolution 0.4-mm slice images; however, 1-mm slice images had less noise, higher SNR of the pancreas and tumor-to-pancreas CNR, and better image quality, compared with 0.4-mm.

CLINICAL RELEVANCE/APPLICATION

Ultra-high-resolution photon-counting CT can provide high-spatial resolution imaging; however, image noise will be increased and may not provide additional useful information for local evaluation of PDAC compared with conventional slice thickness.

W2-SPGI-14 MULTIPLE QUANTITATIVE ULTRASOUND PARAMETERS FOR THE EVALUATION OF METABOLIC DYSFUNCTION-ASSOCIATED STEATOHEPATITIS: A PROSPECTIVE STUDY

Yun-Lin Huang, MD (*Presenter*)
Yi Dong, MD, PhD (*Abstract Co-Author*)
Ying Wang (*Abstract Co-Author*)
Juan Cheng (*Abstract Co-Author*)
Li Wei (*Abstract Co-Author*)
Rui Cheng (*Abstract Co-Author*)

PURPOSE

To develop optimized models integrating multiple ultrasound parameters to evaluate at-risk metabolic dysfunction-associated steatohepatitis (MASH) in liver biopsy-proven metabolic dysfunction-associated steatotic liver disease (MASLD) patients.

METHODS AND MATERIALS

In this prospective study, patients scheduled for liver biopsy due to clinical suspicion of MASLD or MASH were enrolled. All abdominal ultrasound examinations were performed using the Resona A20 ultrasound system (Mindray, China) with a SC7-1U probe (1.0 - 7.0 MHz). After producing an M-Ref map, the multiple ultrasound parameters were measured, including the attenuation coefficient obtained with UltraSound ATtenuation Imaging Technology (USAT) (in dB/cm/MHz), shear wave speed (SWS) (in m/s), and viscosity (in Pa·s). The at-risk MASH was defined as MASH with F2-F3 fibrosis. Receiver operating characteristic curves (AUCs) were performed to assess the diagnostic performance.

RESULTS

From November 2023 to January 2025, 52 patients (median age of 46 years) were included. The risk score model from multiple ultrasound parameters was developed using USAT, viscosity values, and SWV, which were associated with the degree of hepatic steatosis, lobular inflammatory activity, and fibrosis (all $P < 0.05$). For the USAT, the risk score was assigned using the cutoff values of USAT for detecting hepatic steatosis as follows: score 1, USAT value between 0.55 and 0.58 dB/cm/MHz (S1); score 2, USAT value between 0.58 and 0.75 dB/cm/MHz (S2); and score 3, USAT value greater than 0.75 dB/cm/MHz (S3). The risk score of viscosity was assigned using the cutoff values of viscosity as follows: score 1, viscosity value between 2.00 and 2.05 Pa·s (A2); score 2, viscosity value between 2.05 and 2.11 Pa·s (A3); and score 3, viscosity value greater than 2.11 Pa·s (A4). The risk score of SWV was assigned using the cutoff values of SWV as follows: score 1, SWV value between 1.77 and 2.01 m/s (F2), and score 2, SWV value greater than 2.01 m/s (F3). The final at-risk score was defined as the unweighted sum of each score from USAT, viscosity, and SWV values, ranging from 0 to 8. The diagnostic performance of the risk score model for detecting at-risk MASH was higher than that of ultrasound parameters alone (AUC = 0.70 vs. AUC = 0.53 - 0.66).

CONCLUSION

The risk score model integrating multiple ultrasound parameters (attenuation coefficient, viscosity, and shear wave speed) improved noninvasive diagnostic performance for detecting at-risk MASH in patients with MASLD.

CLINICAL RELEVANCE/APPLICATION

The diagnostic performance of the risk score model integrating multiple ultrasound parameters (attenuation coefficient, viscosity, and shear wave speed) for detecting at-risk MASH was higher than that of ultrasound parameters alone.

W2-SPGI-15 DISTANT FIELD DEFECT PDAC IN IPMN PATIENTS: RISK BEYOND HIGH-RISK IMAGING FEATURES

Stephen J. Kwak, MD (*Presenter*)
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PURPOSE

Field defect pancreatic ductal adenocarcinoma (PDAC) occurs independently from the intraductal papillary mucinous neoplasm (IPMN), either abutting the IPMN or elsewhere in the pancreas. Field defect PDAC is being increasingly recognized as a separate entity from conventional PDAC. Studies report that synchronous or metachronous invasive pancreatic carcinoma occurs in approximately 9.3% of patients with IPMNs. Moreover, patients remain at elevated risk for developing invasive carcinoma even after surgical resection of the IPMN. These findings highlight the critical need to understand the imaging features of field defect PDACs for early detection and management.

METHODS AND MATERIALS

3063 patients with presumed IPMNs between 2005 and 2024 were initially examined. of the 3063 patients, 408 patients had surgical resection. Of the 408 resected IPMNs, 57 patients demonstrated PDAC by pathology. Of the 57 pathologically proven PDAC with IPMN, 35 patients had a field defect PDAC that occurred independent of the IPMN. The imaging features of these 35 patients were examined, focusing on initial size of the largest cyst, number of cysts, distance between PDAC and IPMN, and presence or development of mural nodule, wall thickening, ductal dilatation, and abrupt ductal cut off. The demographic and imaging features of distant field defect PDAC and field defect PDAC abutting the IPMN were analyzed using Fischer's exact ?-square test. Continuous variables were analyzed with Student's t-test or Wilcoxon rank-sum test for normally or nonnormally distributed variables, respectively.

RESULTS

The mean age of patients was 70.3 years with no significant gender predilection. No significant differences were observed between abutting and distant PDAC in terms of cyst location, number of cysts or follow-up intervals. However, distant field defect PDACs were more likely to be present when the largest IPMN was <30 mm, did not develop mural nodules smaller than 5 mm, and did not demonstrate wall thickening compared to PDACs abutting the IPMN.

CONCLUSION

Field defect PDACs are an increasingly recognized subset of pancreatic ductal adenocarcinoma. Distant field defect PDACs are more likely to occur when the associated IPMN does not demonstrate some of the typical high-risk features of IPMNs, in this case mural nodules and thickened walls. Furthermore, distant field defect PDACs tend to occur when the initial largest cyst size is <30 mm.

CLINICAL RELEVANCE/APPLICATION

This study reinforces the concept that IPMNs increase the risk of PDAC development throughout the pancreas even in the absence of high-risk features. Moreover, our findings underscore the importance of vigilant surveillance and assessment of the remaining pancreas in patients who have undergone IPMN resection.

W2-SPGI-17 VOLUMETRIC BODY COMPOSITION ANALYSIS ON PREOPERATIVE CT SCANS IMPROVES RISK PREDICTION IN COLORECTAL SURGERY PATIENTS

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Shubha Vasisht (*Abstract Co-Author*)
Rakesh Sharma (*Abstract Co-Author*)
Gracia Vargas (*Abstract Co-Author*)
Jeffrey Duda (*Abstract Co-Author*)
Gary Wu (*Abstract Co-Author*)
James C. Gee, PhD (*Abstract Co-Author*)
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Victoria Gershuni (*Abstract Co-Author*)

PURPOSE

Malnutrition and sarcopenia are associated with worse outcomes after colorectal surgery. Preoperative risk assessment is not universal due to the logistic and resource demands of the formal nutrition care process. Lean muscle is a main component of malnutrition diagnosis. We applied a novel deep learning algorithm to automate volumetric body composition analysis using preoperative CT scans. The objective was to develop a predictive model using imaging biomarkers to identify colorectal surgery patients with increased risk of postoperative complications.

METHODS AND MATERIALS

We retrospectively analyzed elective colectomy patients from a single academic institution with preoperative abdominal CT scans (2018-2021). Volume and attenuation features from five muscle pairs and two fat depots were segmented by our deep learning algorithm. Clinical and demographic variables were extracted from electronic health record. Primary outcome was a composite variable for any postoperative complication. Elastic Net logistic regression was used to develop three predictive models: (1) clinical variables alone, (2) clinical variables + conventional L3 single-slice skeletal muscle index (SMI), and (3) clinical variables + novel volumetric imaging features. Models compared using area under receiver operator characteristic curves (AUC).

RESULTS

Among 502 patients (mean age: 61.5 years, 47% male), 20% experienced postoperative complications. Preoperative imaging revealed a high prevalence of sarcopenia (60%), myosteatosis (53%), and visceral obesity (61%) using conventional L3 slice metrics. 24% of patients received a postoperative clinical malnutrition diagnosis from dietitians. The model incorporating clinical variables and novel volumetric imaging features enhanced predictivity of post-operative complication compared to both the clinical-only and SMI models (AUC: 0.77 vs. 0.69 ($p<0.001$) and 0.70 ($p<0.001$), respectively).

CONCLUSION

Volumetric body composition analysis from routine preoperative CT scans improves preoperative risk stratification for colorectal surgery patients. Automated identification of imaging biomarkers may identify latent features of nutritional risk missed by conventional single-slice assessment methods, enabling early identification of high-risk patients who may benefit from targeted preoperative nutritional interventions.

CLINICAL RELEVANCE/APPLICATION

Automated volumetric body composition analysis from routine preoperative CT scans provides radiologists and surgeons with quantitative biomarkers for malnutrition that enhance surgical risk prediction beyond conventional methods, supporting opportunistic interventions to improve surgical outcomes.

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W2-SPGU

Genitourinary Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPGU-1 AN MRI-BASED RADIOMICS MODEL TO PREDICT MALIGNANT RENAL CYSTS IN PATIENTS WITH HLRCC

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Ali Sheikhy, MD (*Abstract Co-Author*)
Negin Jarrah, MD (*Abstract Co-Author*)
Fatemeh Homayounieh, MD (*Abstract Co-Author*)
Rabindra Gautam (*Abstract Co-Author*)
Maria Merino, MD (*Abstract Co-Author*)
Mark W. Ball, MD (*Abstract Co-Author*)
Elizabeth C. Jones, MD, MBA (*Abstract Co-Author*)
W. Marston Linehan, MD (*Abstract Co-Author*)
Ashkan A. Malayeri, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to assess the capability of quantitative MR imaging characteristics (radiomics) for predicting the nature of complex renal cysts in patients with Hereditary Leiomyomatosis and Renal Cell Carcinoma (HLRCC).

METHODS AND MATERIALS

In this retrospective study, 40 patients (mean age 47 ± 15 years; 20 male) with complex renal cysts on abdominopelvic MRI and germline FH mutations consistent with HLRCC were included. All patients underwent nephrectomy between June 2002 and May 2022, yielding 67 histologically confirmed complex cysts. Radiomic features were extracted from five MRI series [pre- and post-contrast T1-weighted images during the corticomedullary (20s), nephrographic (70s), and excretory (3 min) phases, and T2-weighted images] using SyngoVia Frontier Radiomics Software (Siemens Healthineers). Features were derived from original and filtered images (Laplacian of Gaussian, Wavelet, Square, Square Root, Logarithm, and Exponential). An Extreme Gradient Boosting (XGBoost) model was used to predict malignancy. The dataset was randomly split into 100 training and test sets (70%/30%) to evaluate performance. Metrics included AUC-ROC, accuracy, F1 score, precision, and recall.

RESULTS

Of the 67 cysts, 41 were benign and 26 malignant. The feature "Wavelet HLL glrlm Run Variance" (pre-contrast phase) contributed most to the model, followed by "Logarithm glszm Small Area Low Grey Level Emphasis," as identified by SHAP values. The XGBoost model trained on combined features from all sequences achieved the best performance with a mean F1 score of 0.85 (95% CI: 0.74-0.94) and AUC-ROC of 0.93.

CONCLUSION

Radiomics analysis is a feasible and effective approach for characterizing complex renal cysts on MRI in patients with HLRCC. Machine learning models trained on multiparametric MR data can reliably distinguish malignant from benign lesions.

CLINICAL RELEVANCE/APPLICATION

This study highlights the role of MRI-based radiomics in noninvasively predicting malignancy in HLRCC-related renal cysts. Incorporating artificial intelligence into imaging workflows may support earlier diagnosis and reduce unnecessary surgeries in this high-risk population.

W2-SPGU-2 A STUDY ON THE VALUE OF MULTI-PARAMETER DUAL-ENERGY CT IN ASSESSING MUSCLE INVASION IN BLADDER CANCER: A COMPARISON WITH THE EFFECTIVENESS OF VI-RADS

Mingyang Sun (*Presenter*)
Jiawen Luo (*Abstract Co-Author*)

PURPOSE

In clinical practice, Vesical Imaging-Reporting and Data System (VI-RADS) is the preferred imaging modality for assessing muscle invasion, yet it is not applicable to patients with contraindications to MRI.Accurate and non-invasive preoperative evaluation of the presence of muscle invasion is critical.Preoperative discrimination of MIBC using CT remains challenging. This study investigates the utility of Dual-energy CT (DECT) in assessing muscle-invasive bladder cancer(MIBC) and compares its diagnostic performance with the VI-RADS.

METHODS AND MATERIALS

In this study, the pathological findings served as the reference standard for determining the presence of muscle invasion.105 patients were included, comprising 33 cases of MIBC and 72 cases of non-muscle-invasive bladder cancer (NMIBC). In the corticomedullary and nephrographic phases, DECT parameters were measured in both the tumor body and the tumor base.DECT model was constructed using a multivariate logistic regression method. VI-RADS scoring was performed based on MRI images by two radiologists with over five years of experience in abdominal imaging.The diagnostic performance of the models in predicting muscle invasion was evaluated using receiver operating characteristic (ROC) curve analysis.

RESULTS

In DECT parameters,iodine concentration of the tumor base in the corticomedullary phase(ABIC), normalized iodine concentration of the tumor base in the corticomedullary phase(ABNIC),spectral Hounsfield unit curve slope of the tumor base in the nephrographic phase(VBK) ,effective atomic number of the tumor base in the nephrographic phase(VBZ) , Iodine concentration of the tumor base in the nephrographic phase(VBIC) and diameter(D) were independent predictors of MIBC ($p < 0.05$). The area under the curve (AUC) of the DECT model was 0.761 (95% confidence interval [CI]: 0.664 to 0.859), and the AUC of the DECT + D model was 0.925 (95% CI: 0.874 to 0.975). Meanwhile, the AUC of the VI-RADS was 0.926 (95% CI: 0.871 to 0.980). There was a statistically significant difference between the DECT model and VI-RADS ($p < 0.05$), while there was no statistically significant difference between the DECT + D model and VI-RADS ($p > 0.05$).

CONCLUSION

The majority of independent predictive factors for MIBC originate from the tumor base, implying that the tumor base may harbor crucial information for predicting muscle invasion. In the context of predicting MIBC, the combination of DECT and tumor diameter exhibits performance that is virtually indistinguishable from that of the VI-RADS.

CLINICAL RELEVANCE/APPLICATION

DECT represents a straightforward and viable method for preoperative differentiation of MIBC, particularly for patients who are ineligible for VI-RADS assessment.

W2-SPGU-3 OPTIMIZING PROSTATE MRI AT 0.55 T TO ACHIEVE DIAGNOSTIC QUALITY

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Arthur Spencer (*Abstract Co-Author*)
Gorun Ilanjian (*Abstract Co-Author*)
Jade Matthey-des-Bornels (*Abstract Co-Author*)
Jean-Baptiste Ledoux (*Abstract Co-Author*)
Clarisse Dromain, MD, PhD (*Abstract Co-Author*)
Ileana Jelescu (*Abstract Co-Author*)
Naik Vietti Violi, MD (*Abstract Co-Author*)

PURPOSE

To develop a clinically feasible low-field (0.55 T) MRI protocol for prostate imaging using deep learning reconstruction (DLR), and evaluate its performance using quantitative and qualitative image quality criteria.

METHODS AND MATERIALS

Twelve healthy male volunteers (mean age 61.5 years) underwent prostate MRI using a 0.55T scanner (MAGNETOM Free.Max, Siemens Healthineers). A bi-parametric protocol was applied, including tri-planar T2-weighted imaging (WI) and axial diffusion-weighted imaging (DWI, b 50, 800 and calculated b from 1400 to 2000, with a-hundred increment) research sequences, following PI-RADS v 2.1 guidelines. DLR was enabled for T2-WI and DWI. Automatic 3D segmentations of the whole prostate, peripheral (PZ) and transitional zones (TZ) were performed using Mint TM software. Signal-to-noise ratio (SNR) was measured in each prostate zone, as mean signal divided by standard deviation of the signal in the internal obturator muscle. Contrast-to-noise ratio (CNR) was calculated between PZ and TZ. Two expert radiologists independently evaluated image quality using PI-QUAL v2 scores for the whole exam, comparing DLR and non-DLR images for T2WI. DWI images were only reviewed with DLR as raw data were not accessible. Wilcoxon signed-rank tests assessed improvements with DLR, and interrater agreement was measured using weighted Kappa statistics.

RESULTS

Median SNR on T2-WI with DLR was 12.73 (PZ), 8.89 (TZ), and 10.95 (whole prostate, WP), and without DLR was 6.95 (PZ), 5.02 (TZ) 5.99 (WP). CNR was 4.75. DLR significantly improved SNR and CNR ($p < 0.05$) that were comparable to values previously reported from clinical prostate MRI at 3 T and 1.5 T. On ADC images, median SNR was 9.60 (PZ), 8.58 (TZ), and 8.92 (WP). Calculated b = 1500 s/mm² images showed the highest SNR (median 13.02), compared to other calculated b values. Qualitative assessment revealed an improved PI-QUAL score with DLR (p=0.036) (Fig. 1), with moderate interrater agreement (Kappa = 0.78). Seven participants achieved an optimal PI-QUAL score with DLR (3/3), four had adequate (2/3), and one had inadequate (1/3).

CONCLUSION

Prostate MRI at 0.55 T is technically feasible and, when combined with optimized protocols and DLR, can achieve diagnostic image quality. DLR significantly improved SNR and CNR, and T2-WI quality score and increased final PI-QUAL score in most cases.

CLINICAL RELEVANCE/APPLICATION

This study on healthy volunteers demonstrates the feasibility of using 0.55 T MRI for prostate imaging with diagnostic image quality. Optimized acquisition protocols and DLR significantly improve image quality, suggesting low-field MRI may represent a cost-effective and more accessible alternative higher field MRI for prostate cancer evaluation in selected clinical contexts.

W2-SPGU-4 THE STUDY OF PATHOLOGY IN CHRONIC KIDNEY DISEASE BASED ON MULTIPLE DIFFUSION MRI MODELS

Guimian Zhong (*Presenter*)

PURPOSE

This study was based on multiple diffusion MRI models (Mono, IVIM, SEM, DKI) to screen or establish non-invasive and accurate MRI diagnostic markers or models for assessing the pathological damage of chronic kidney disease (CKD).

METHODS AND MATERIALS

A total of 73 patients with CKD who underwent renal biopsy and 3T MRI examination were prospectively enrolled. According to the chronic lesion score of renal biopsy tissue, the patients were divided into mild group (n=43), and moderate to severe group (n=30), and 30 healthy controls (HCs) were recruited. According to pathological types, the patients were divided into IgA nephropathy, membranous nephropathy and other groups. MRI diffusion parameters were compared among different groups to screen out the MRI parameters that could best reflect the pathological damage and pathological type of CKD. Finally, logistic regression was used to analyze its predictive value in pathological lesions and pathological types of CKD.

RESULTS

The MRI diffusion parameters DKI_MD, IVIM_f, Mono_ADC, SEM_DDC and the combined model of multiple parameters had high diagnostic efficiency in the differential diagnosis of mild group and HCs. The AUC values in predicting early pathological injury of CKD were 0.871 (0.787, 0.939),0.762 (0.649, 0.869),0.79 (0.676, 0.89),0.878 (0.797, 0.946), and 0.895 (0.819, 0.961), respectively. The MRI diffusion parameters DKI_MD, IVIM_D, IVIM_f, Mono_ADC, SEM_DDC and the combined model of multiple parameters had high diagnostic efficiency in the differential diagnosis of the mild and moderate to severe groups. The AUC values in predicting pathological injury degree of CKD were 0.841 (0.735, 0.929),0.766 (0.65, 0.873),0.676 (0.53, 0.811),0.853 (0.754, 0.93),0.804 (0.673, 0.909), and 0.873 (0.772, 0.956), respectively. The DKI-MK value demonstrates high diagnostic efficacy in differentiating IgA nephropathy from membranous nephropathy, with an AUC of 0.831 (0.694,0.947). Partial MRI diffusion parameters had a high correlation with chronic lesion severity score, and DKI_MD (r=-0.673, P <0.001) had the highest correlation.

CONCLUSION

Multiple MRI diffusion parameters could more sensitively identify the early pathological damage of CKD and more accurately evaluate the degree of pathological damage of CKD than SCr and eGFR. The DKI-MK value had great potential in differentiating IgA nephropathy from membranous nephropathy. Partial MRI diffusion parameters could better reflect the degree of chronic disease in CKD.

CLINICAL RELEVANCE/APPLICATION

The aim of this study was to screen or establish MRI diagnostic markers or models for precise assessment of CKD pathological damage, achieving the goal of early diagnosis, early intervention, and precise treatment of CKD.

W2-SPGU-6 FEASIBILITY OF US-CT FUSION IMAGING FOR LONG-TERM MONITORING OF URETERAL STONES: A PILOT STUDY

Bar Rinott, MD
(*Presenter*)
Eyal Bercovich, MD (*Abstract Co-Author*)

PURPOSE

To assess the feasibility and diagnostic accuracy of ultrasound-computed tomography (US-CT) fusion imaging in the long-term follow-up of patients with ureteral stones, with the goal of reducing repeated CT imaging and associated radiation exposure.

METHODS AND MATERIALS

A prospective pilot study was conducted on 31 patients previously diagnosed with ureteral stones via non-contrast CT (NCCT). All patients underwent US-CT fusion imaging approximately 6 weeks post-initial diagnosis, followed by definitive assessment via ureteroscopy. US-CT fusion was performed by an experienced radiologist using anatomical landmarks for real-time CT overlay on ultrasound images. Fusion findings were compared to intraoperative ureteroscopy findings, which served as the reference standard.

RESULTS

Fusion imaging identified residual stones in 16 patients, all of whom were confirmed to have stones on ureteroscopy (true positives). In 6 patients, fusion imaging showed no stones, but ureteroscopy revealed residual stones (false negatives). There were no false positives—no cases where US-CT fusion detected stones that were not present on ureteroscopy. In 9 patients, both US-CT and ureteroscopy confirmed absence of stones (true negatives). The resulting sensitivity was 73%, specificity 100%, positive predictive value (PPV) 100%, and negative predictive value (NPV) 60%. Fusion imaging was feasible in all cases and allowed accurate anatomical localization, particularly in distal ureteral segments.

CONCLUSION

US-CT fusion imaging is a feasible modality for evaluating residual ureteral stones. While highly specific and accurate in confirming the presence of stones, its lower sensitivity suggests it may miss some small or proximally located stones.

CLINICAL RELEVANCE/APPLICATION

US-CT fusion imaging shows promise as a non-ionizing follow-up tool in the management of ureteral stones. Its ability to accurately confirm stone presence may reduce the need for repeated CT scans, potentially lowering patient radiation exposure during long-term monitoring.

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W2-SPHN

Head & Neck Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPHN-1 MULTI-MODAL ULTRASOUND-BASED DEEP LEARNING FOR CLASSIFICATION OF THYROID NODULES

Manali Saini, MEng, PhD (*Presenter*)
Tanin Adl Parvar, MD (*Abstract Co-Author*)
Mostafa Fatemi, PhD, PhD (*Abstract Co-Author*)
Azra Alizad, MD (*Abstract Co-Author*)

PURPOSE

To effectively boost the performance of classification of thyroid nodules using multi-modal ultrasound imaging integrated with customized deep learning architecture.

METHODS AND MATERIALS

This prospective study was conducted under an Institutional Review Board- approved and HIPPA-compliant protocol with signed informed consent obtained from each enrolled patient. Conventional B-mode ultrasound, shear wave elastography (SWE), and color Doppler (CD) images were acquired from 506 thyroid nodules in 423 subjects prior to biopsy. These images were concatenated and used to train a custom deep learning network. The network architecture comprised depth-wise separable convolutional layers, combined with attention-based mixed pooling and tailored self-attention mechanisms, applied for the first time in the context of thyroid nodule classification.

RESULTS

The proposed method achieved a classification accuracy (Ac) of 0. 95, a sensitivity (Se) of 0.98, a receiver operating characteristic area under the curve (r AUC) of 0. 99, a specificity (Sp) of 0. 92, an F-1 score of 0. 95 and a precision-recall AUC (pAUC) of 0. 99 on test dataset. The use of multi-modal images with the proposed deep learning model considerably improved thyroid nodule classification performance with sensitivity of 0. 98 as compared to uni-modal or bi-modal data with sensitivity of 0.51- 0. 92. Further, the proposed network with sensitivity of 0.98 outperformed the state-of-art deep learning networks with sensitivity of 0.75- 0. 94 for thyroid nodule classification while utilizing relatively smaller architecture.

CONCLUSION

The integration of multi-modal ultrasound imaging with customized deep learning network effectively and efficiently improves the overall classification of thyroid nodules, enhancing overall diagnostic performance. The proposed method outperforms state-of-the art models trained on our multi-modal dataset and achieves high sensitivity, indicating its effectiveness in accurately diagnosing malignancy.

CLINICAL RELEVANCE/APPLICATION

Integrating multimodal ultrasound with a customized deep learning network remarkably improves diagnostic sensitivity, enabling more accurate cancer diagnosis, leading to better patient outcomes through earlier and more precise treatment strategies.

W2-SPHN-2 VESTIBULAR AQUEDUCT LENGTH AS A RADIOLOGIC MARKER FOR THE PROGRESSIVE DEGENERATIVE ENDOTYPE IN MENIèRE DISEASE

Jingjing Xu (*Presenter*)
Yunchong Han (*Abstract Co-Author*)
Shuangxiang Lin, MSc (*Abstract Co-Author*)
Yuguo Wei (*Abstract Co-Author*)

PURPOSE

Menière's disease (MD) presents as two distinct endotypes: one characterized by a hypoplastic, underdeveloped endolymphatic sac (MD-hp), and the other featuring a normally developed sac that undergoes progressive degeneration (MD-dg). Accurate endotype differentiation is clinically significant for prognostic prediction, personalized patient counseling, and treatment optimization. Current diagnostic criteria rely on measuring the angular trajectory of the vestibular aqueduct (ATVA), where ATVA = 140° indicates MD-hp while ATVA = 120° suggests MD-dg. However, ATVA assessment presents technical challenges in clinical practice. This study investigates potential correlations between ATVA and alternative CT morphometric parameters that could serve as reliable discriminators between MD endotypes, utilizing the advanced imaging capabilities of photon-counting CT (PCCT) technology.

METHODS AND MATERIALS

We retrospectively analyzed temporal bone CT imaging from 49 adult patients with definite Menière's disease (MD) (62 affected ears) and 47 age-matched controls without MD or other inner ear pathology (94 ears). All measurements, including the angular trajectory of the vestibular aqueduct (ATVA) and additional temporal bone parameters, were obtained from standardized axial photon-counting CT (PCCT) images using a consistent measurement protocol.To evaluate potential diagnostic markers, we performed comparative analyses examining correlations between ATVA and other CT-derived measurements. Furthermore, available temporal bone MRI examinations were assessed to measure vestibular aqueduct length, enabling cross-modality validation of our PCCT findings.

RESULTS

The average VA length was significantly different between MD endotypes, being a mean of 2.62 (SD, 1.77) mm in patients with MD-hp and 4.55 (SD, 1.80) mm in patients with MD-dg. While PCCT-based morphometric analyses revealed no other significant endotype differences, receiver operating characteristic (ROC) analysis identified a VA length cutoff of =2.11 mm as effectively excluding MD-dg diagnosis (AUC = 0.78, accuracy = 93%). Measurement reliability was excellent, with strong interrater agreement and near-perfect correlation between CT and MR modalities.

CONCLUSION

The VA length proved to be a useful and straight forward alternative marker for distinguishing MD endotypes, being particularly useful for excluding MD-dg. Including information of the VA length should be considered a routine part of reporting in the context of MD imaging.

CLINICAL RELEVANCE/APPLICATION

PCCT offers a promising solution for imaging patients with different MD endotypes, potentially reducing the need for additional imaging or invasive diagnostic procedures.

W2-SPHN-3 DEEP LEARNING-BASED AUTOMATIC SEGMENTATION SYSTEM FOR PREDICTING CERVICAL LYMPH NODE METASTASIS IN PATIENTS WITH PAPILLARY THYROID CARCINOMA USING COMPUTED TOMOGRAPHY: A MULTI-CENTER STUDY

Jing Wen Yu (*Presenter*)
Lijian Liu (*Abstract Co-Author*)
Zhang Ya (*Abstract Co-Author*)
Yongsheng Xie (*Abstract Co-Author*)
Dehong Luo, MD (*Abstract Co-Author*)
Zhou Liu, MD, PhD (*Abstract Co-Author*)

PURPOSE

To develop and validate a preoperative deep learning-based automatic segmentation system for lymph node (LN) levels segmentation with CT imaging for prediction of LN metastasis in patients with papillary thyroid carcinoma (PTC).

METHODS AND MATERIALS

A total of 3635 lymph nodes (LNs) from 727 PTC patients in Center A who underwent CT examinations from November 2018 and February 2023 were included and divided into training and validation set at the ratio of 7:3. A total of 760 LNs from 152 PTC patients in Center B were allocated into the external test set. We use a 3D U-Net network for cervical LN levels II-VI. We extracted 1204 radiomic features from venous contrast-enhanced computed tomography (CT) images. Mann-Whitney U test, Spearman correlation analysis, and the least absolute shrinkage and selection operator (LASSO) were used in reducing the dimensionality of radiomics features in the training cohort. Then, a radiomics signature (Rad-score) was calculated as the sum of each feature multiplied by the nonzero coefficient from LASSO. Incorporating the Rad-score and CT-reported LN status, a nomogram was constructed using multivariable logistic regression. The nomograms' performance was analyzed in terms of accuracy, sensitivity, specificity, receiver operating characteristic (ROC) curves, and areas under the ROC curve (AUCs). The clinical usefulness of the nomogram was evaluated by decision curve analysis (DCA).

RESULTS

The automated segmentation model demonstrated a dice similarity coefficient (DSC) of 0.80 in volumetric tissue delineation. Based on automated segmentation imaging, a total of 18 radiomics features were used in constructing the Rad-score. The nomogram exhibited good discrimination performance of the nomogram for predicting LN metastasis in the training cohort (AUC: 0.826), internal test cohort (0.827), and external test cohort (0.856) and showed diagnostic capability comparable to the CT-reported LN status and the radiomics signature model. DCA demonstrated that the radiomic nomogram was worthy of clinical application.

CONCLUSION

Our deep learning algorithm achieves effective non-invasive segmentation and classification of LN levels. The radiomics nomogram provides a noninvasive method that incorporates radiomics features and CT-reported LN status for predicting LN metastasis in patients with PTC.

CLINICAL RELEVANCE/APPLICATION

Our deep learning algorithm enables non-invasive LN level segmentation/classification, paired with a radiomics nomogram integrating CT-reported LN status and radiomic features, offering clinicians a dual-modality tool to optimize preoperative risk stratification, reduce invasive procedures, and guide personalized surgical planning in PTC patients suspected of LN metastasis.

W2-SPHN-4 ROLE OF PET MRI IN THE EVALUATION AND RISK STRATIFICATION OF HEAD NECK LESIONS USING NIRADS

Pawan Shinkar, MD, MBBS (*Presenter*)
Likhitha Somepalli (*Abstract Co-Author*)
Mohana Vamsy (*Abstract Co-Author*)

PURPOSE

Head and neck cancers are the 7th most common malignancy globally, with high rates of locoregional recurrence. Post-treatment surveillance is challenging due to complex anatomy and therapy-induced changes. The Neck Imaging Reporting and Data System (NI-RADS) was developed to standardize follow-up imaging, primarily using CT. This study assesses the utility of PET-MRI in enhancing NI-RADS-based evaluation.

METHODS AND MATERIALS

In this prospective study, 122 patients with treated head and neck squamous cell carcinoma underwent digital time-of-flight PET-MRI 8-12 weeks post-therapy. After excluding 19 cases due to imaging artifacts or incomplete data, 103 patients were assessed for primary site recurrence and 81 for nodal disease using NI-RADS categories. Histopathological correlation and imaging follow-up served as reference standards.

RESULTS

Primary disease (n = 103) NI-RADS 1: 16 NI-RADS 2A: 22 NI-RADS 2B: 28 (15 showed regression; 5 progressed to NI-RADS 3) NI-RADS 3: 32 (27 confirmed recurrence) NI-RADS 4: 5 Nodal disease (n = 81) NI-RADS 1: 29 NI-RADS 2: 17 (14 regressed; 3 progressed) NI-RADS 3: 32 (25 confirmed metastasis, 7 reactive) NI-RADS 4: 3 PET-MRI allowed for better discrimination between post-treatment changes and active disease, especially in NI-RADS 2B and 3 categories.

CONCLUSION

PET-MRI improves diagnostic performance in post-treatment head and neck cancer surveillance by combining metabolic and high-resolution anatomical data. It enhances confidence in NI-RADS classification, particularly in indeterminate cases, reducing false positives and enabling accurate detection of recurrence.

CLINICAL RELEVANCE/APPLICATION

PET-MRI plays a pivotal role in: Differentiating post-treatment changes from true recurrence More accurately stratifying NI-RADS 2B and 3 lesions Guiding biopsy and therapeutic decisions in ambiguous cases Enhancing surgical planning and reducing unnecessary interventions Providing a safer, low-radiation alternative for long-term surveillance By improving specificity and confidence in imaging interpretation, PET-MRI contributes to more precise and individualized patient management in head and neck oncology.

W2-SPHN-6 NATIONAL MEDICARE TRENDS IN US-GUIDED THYROID FINE NEEDLE ASPIRATIONS (FNA) FROM 2019-2023: A SHIFT REVERSAL FOR NON-PHYSICIAN PROVIDERS COMPARED TO TRADITIONAL PROVIDERS

Surbhi Singh, MD (*Presenter*)
Akhil Tanwar, MD, MBBS (*Abstract Co-Author*)
Ajit Karambelkar, MD (*Abstract Co-Author*)

PURPOSE

In 2019, the introduction of new CPT codes (10005-10012) changed the way thyroid FNA were performed and billed. The new codes also incorporated the imaging modality into the FNA code itself. We review the US-guided thyroid FNAs performed by various specialties since the introduction of the new codes and also briefly touch on the protocol of thyroid FNA procedure, its clinical utility, limitations, and emerging trends based on current evidence

METHODS AND MATERIALS

Data was obtained from the Centers for Medicare & Medicaid Services Physician/Supplier Procedure Summary Master Files from 2019 to 2023. Provider specialties were determined from the Physician Specialty Classification Codes used by Medicare. Locations at which examinations were performed were determined using Medicare Place-of-Service Codes.

RESULTS

In our study, the traditional providers of thyroid care showed notable declines in FNA procedures. General Surgeons experienced a significant reduction (a 25.1% decrease), and Endocrinologists showed a comparable decline of 25.15%. This is in contrast with physician assistants who showed an increase of 48.9%.In 2018, the most common single location for a thyroid FNA was the physician office setting, with 47.1% of claims for CPT 10022. By 2023, the hospital facility claims had increased to 55.08% of claims, indicating a shift from outpatient to in-hospital location.

CONCLUSION

In our study, perhaps the most striking finding was the substantial increase in thyroid FNA procedures performed by physician assistants, who demonstrated a 48.9% growth over the study period coupled with transition from out-patient clinic to in hospital setting. This may be attributed to the RVU restructuring which happened along with the introduction of the new CPT codes in 2019

CLINICAL RELEVANCE/APPLICATION

According to a report published by the American Association of Clinical Endocrinology, restructuring of the CPT codes also resulted in reduction of (Relative work units) RVUs in 2019 which caused non-facility outpatient practices to discontinue the procedure. However, in this case the procedure is now being performed in a vastly more expensive location costing 524% more. If we consider the shift in location from Office to Facility that was seen between 2018 and 2023, with the increased cost of $584.92 in the Facility location, Medicare experienced an additional cost of $ 2,725,544 due to physicians in non-facility locations abandoning the procedure

W2-SPHN-7 DOPPLER ULTRASOUND AND DUAL-ENERGY CT FEATURES TO PREDICT CD31 EXPRESSION AS A PREDICTOR OF RECURRENCE RISK IN PAPILLARY THYROID CANCER

Yan Zhou, MD, MD (*Presenter*)

PURPOSE

To evaluate CD31 as a prognostic marker in papillary thyroid carcinoma (PTC), and to develop a model based on preoperative angiogenesis-related imaging features from Doppler Ultrasound (US) and Dual-Energy CT (DECT) to predict CD31 expression, a marker associated with recurrence risk.

METHODS AND MATERIALS

A total of 414 PTC patients (training set, 151; test set 1, 137; test set 2, 126) were included. Clinical and radiographic features, including demographics, tumor morphology, Doppler US grade, US grayscale values, and DECT parameters, were analyzed. CD31 expression was assessed via immunohistochemistry in the training set and correlated with invasive clinicopathological features and recurrence risk. Its association with clinical and imaging characteristics was examined. A logistic regression model was constructed to predict CD31 expression based on selected variables, and recurrence-free survival (RFS) analysis evaluated the model's prognostic value across all datasets.

RESULTS

CD31 expression was significantly associated with advanced tumor stage, lymph node involvement, extrathyroidal extension, and recurrence. The predictive model, incorporating Doppler US grade, unenhanced electron density (ED), arterial phase iodine concentration (IC), and venous phase iodine concentration/electron density ratio (IC/ED) demonstrated good performance for predicting CD31 expression with an AUC of 0.815 in the training set. The model was also significantly associated with RFS across all datasets (training set: $p = 0.027$; test set 1: $p = 0.008$; test set 2: $p = 0.002$), identifying high-risk patients with worse outcomes.

CONCLUSION

Preoperative imaging-based prediction of CD31 expression enhances recurrence risk assessment in PTC, providing a non-invasive tool for identifying high-risk patients.

CLINICAL RELEVANCE/APPLICATION

Doppler US and DECT features can predict CD31 expression, a marker of recurrence risk in PTC, providing a non-invasive tool to guide clinical decisions and improve patient outcomes.

W2-SPHN-8 SUBTRACTION IODINE MAPS COMBINED WITH DEEP LEARNING RECONSTRUCTION IMPROVED EVALUATION OF TEMPORAL BONE LESIONS BASED ON ENHANCEMENT PATTERNS

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Tong Su, MD (*Abstract Co-Author*)
Zhe Zhang (*Abstract Co-Author*)
Min Xu, PhD (*Abstract Co-Author*)
Jian Wang (*Abstract Co-Author*)
Jiajing Tong (*Abstract Co-Author*)
Zhengyu Jin, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate the diagnostic performance of subtraction iodine maps (SIM) combined with deep learning reconstruction (DLR) for assessing temporal bone lesions, based on different enhancement patterns between low- (<50 HU) and high-enhancement (=50 HU) subgroups, in comparison to conventional contrast-enhanced temporal bone CT imaging.

METHODS AND MATERIALS

We conducted a prospective study of 77 consecutive patients with temporal bone lesions who underwent temporal bone CT scans using a 320-detector-row scanner (Aquilion ONE Genesis Edition). All acquisitions included pre-contrast and enhanced phases, with images reconstructed using both hybrid iterative reconstruction (HIR, AIDR 3D) and DLR (AiCE). These image sets were processed using SURESubtraction software to generate three comparison groups: Enhanced-HIR, SIM-HIR, and SIM-DLR.Two experienced radiologists independently evaluated the images using a five-point scale across four qualitative parameters: overall image quality, confidence in lesion detection, lesion contour visualization, and display of temporal bone involvement. Lesions were categorized based on post-contrast enhancement characteristics using a clinically established 50-HU threshold. We compared the benefits of each reconstruction method between enhancement subgroups.

RESULTS

The SIM-DLR demonstrated superior performance compared to Enhanced-HIR across all qualitative parameters (all $p<0.05$), with excellent inter-rater agreement (? =0.872). For high-enhancement lesions, SIM provided significantly greater improvements in lesion detection confidence ($p<0.001$), contour visualization ($p<0.001$) and displaying temporal bone involvement ($p=0.03$) compared to low-enhancement lesions. DLR reconstruction showed similar trends, with high-enhancement lesions

demonstrating better lesion detection confidence (p=0.007) and contour visualization (p=0.03). However, DLR's benefits for overall image quality and bone involvement display were consistent across both enhancement subgroups (p>0.05).

CONCLUSION

The integration of SIM with DLR significantly improves temporal bone lesion assessment compared to conventional enhanced CT, particularly for hypervascular pathologies. This combined approach enhances noise reduction, anatomical delineation, and evaluation of bony involvement.

CLINICAL RELEVANCE/APPLICATION

The SIM-DLR technique provides superior visualization of lesion invasion extent in the temporal bone, offering valuable preoperative information for surgical planning, especially in vascularized tumors.

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W2-SPIN

Imaging Informatics Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPIN-1 PERSONALIZED, REAL-WORLD, AND CROSS-SILO FEDERATED LEARNING FOR BREAST CANCER DETECTION

Shandong Wu, PhD (*Presenter*)
Jun Luo (*Abstract Co-Author*)
Dooman Arefan, PhD, MSc (*Abstract Co-Author*)
Margarita L. Zuley, MD (*Abstract Co-Author*)
Chen Chen (*Abstract Co-Author*)
Jules H. Sumkin, DO (*Abstract Co-Author*)

PURPOSE

Federated learning (FL) enables multiple clients/silos to collaboratively train AI models without transferring patient data across sites, preserving privacy. Conventional FL aims to train a single global model for all clients, while personalized FL (PFL) allows individually enhanced models customized for each client. Our goal is to implement and evaluate PFL for real-world breast cancer detection on heterogeneous mammographic datasets from multiple silos.

METHODS AND MATERIALS

Multiple geographically distributed populations and mammograms acquired with varying protocols were used: Client 1-4 have 3320 (25% cancer), 3458 (17% cancer), 3101 (44% cancer), and 5202 (79% cancer) mammograms, respectively. A secondary setting runs on highly heterogeneous data stratified by Machine ID at four clients: 3140 (25% cancer), 1309 (17% cancer), 1288 (17% cancer), 1434 (11% cancer) mammograms. We implemented two in-house PFL algorithms (PFL-A1 that learns to adaptively personalize models over local data; PFL-A2 that personalizes each client's objective in a global format) published on non-medical data, and compared to (1) Local - clients independently train their own models and (2) FedAvg - a benchmark conventional FL training a consensus global model. AUC and accuracy (Acc) on client's test data were reported.

RESULTS

All FL algorithms outperformed Local models (four-client's mean AUC and Acc: 62.37% and 73.86%). FedAvg model (AUC and Acc: 64.48% and 75.43%) achieved a higher AUC of 8.59%, 3.04%, -0.25, and 0.81% on Client 1 to 4, compared to corresponding Local models. PFL-A1 (AUC: 65.89%; Acc: 76.13%) and PFL-A2 (AUC: 66.40%; Acc: 77.13%) showed large AUC increases over each local model: PFL-A1: 10.54%, 1.75%, 4.51%, 1.96% higher AUC on Client 1 to 4; PFL-A2: 9.24%, 6.69%, 3.58%, 3.66% higher AUC on Client 1 to 4. In the secondary setting, PFL also boosted each client's performance up to 7.07% for PFL-A1, and 9.69% for PFL-A2 in AUC improvement.

CONCLUSION

Personalized FL is feasible in real-world breast cancer detection, preserving privacy and dealing with heterogeneous data from multiple sites, where each site achieved improved performance than local training and conventional FL.

CLINICAL RELEVANCE/APPLICATION

Personalized federated learning shows real-world benefits and impact in meeting the growing need of AI model development/evaluation that leverages diverse multi-center datasets and preserves privacy.

W2-SPIN-2 IMPROVING RADIOLOGY RESIDENT EDUCATION WITH LOCALLY DEPLOYED AI: A PILOT STUDY ON FEASIBILITY AND EDUCATIONAL IMPACT

Orhan Unal, PhD (*Presenter*)
Taylor Sellers, BS, MD (*Abstract Co-Author*)
John E. Winterholler, MD (*Abstract Co-Author*)
Nicholas Tan, MD (*Abstract Co-Author*)
Isha Pathak, MD (*Abstract Co-Author*)
Allison M. Grayev, MD (*Abstract Co-Author*)
John W. Garrett, PhD (*Abstract Co-Author*)

PURPOSE

Attending radiologist feedback on residents' preliminary reports is a critical component of radiology education. However, increasing imaging volumes have limited opportunities for direct teaching, leaving final report revisions by attendings as an underused source of learning. Extracting structured, actionable feedback from these revisions is difficult due to variability in language and the absence of standardized frameworks. We propose that a locally deployed AI/ML solution using large language models (LLMs) can efficiently analyze and compare preliminary and final reports, generate structured feedback, and ensure PHI protection. This approach offers a scalable, privacy-preserving tool to enhance resident education.

METHODS AND MATERIALS

Impressions from overnight preliminary and corresponding final reports for chest X-ray and head CT studies were extracted via SQL queries and compiled into anonymized CSV tables. Leading open-source LLMs including LLaMA 3.1, Gemma 2.5, and Mixtral were tested using multiple zero-shot prompts to assess differences in clarity, clinical accuracy, training relevance, and specificity. Initial evaluations focused on the quality and educational alignment of LLM-generated outputs. Prompt design was iteratively refined to enhance performance and capture radiology-specific nuances.

RESULTS

LLMs effectively identified differences between preliminary and final radiology reports across key dimensions, including clarity, relevance, accuracy, and focus. Gemma2, Qwen2.5, and LLaMA3.3 showed the strongest overall performance, with Gemma2 achieving the highest clarity (4.73/5) and LLaMA3.3 the highest focus (0.95). While

Mixtral ranked lower, it was the most efficient, completing evaluations in just 9.17 seconds. In contrast, LLaMA3.1 had the longest runtime (37.18 seconds). Results also varied by prompt structure, underscoring the importance of prompt design in optimizing educational value. Quantitative validation is ongoing.

CONCLUSION

Locally deployed LLMs show strong potential in generating structured, educationally meaningful feedback from resident-attending report comparisons, while preserving PHI. This work supports the integration of AI-driven tools to enhance feedback in radiology training and strengthen educational workflows.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the feasibility of using locally hosted, open-source LLMs to provide structured feedback on resident radiology reports. The approach addresses the growing gap in direct educational feedback caused by rising imaging volumes while ensuring PHI protection through local deployment.

W2-SPIN-3 FILLING THE GAPS: ANATOMY-GUIDED DIFFUSION MODELS FOR SYNTHESIZING MISSING MRI SEQUENCES IN BRAIN TUMORS

Moinak Bhattacharya (*Presenter*)
Annie Singh (*Abstract Co-Author*)
Gagandeep Singh, MD, MBA (*Abstract Co-Author*)
Prateek Prasanna, PhD (*Abstract Co-Author*)

PURPOSE

Missing one or more MRI sequences is a frequent challenge in clinical neuroimaging, often resulting from motion artifacts, patient intolerance, or contraindications to contrast agents. However, most AI-based diagnostic and segmentation tools require all standard sequences for optimal performance. To address this, we propose a diffusion model-driven generative AI framework for synthesizing missing brain MRI sequences. Unlike conventional diffusion models that generate images from random noise and lack anatomical fidelity, our approach incorporates structural priors—Cortical Gray Matter (CGM), White Matter Tracts (WMT), Lateral Ventricles (LV), and Tumor Masks (TM)—to generate anatomically faithful and diagnostically meaningful images.

METHODS AND MATERIALS

We utilize the Brain Tumor Segmentation (BraTS) Glioblastoma dataset for model development. First, a 3D Stable Diffusion (SD) model is trained on multi-sequence MRI data. To enhance anatomical realism, we adapt a ControlNet-style finetuning pipeline, conditioning the generation process on key anatomical structures including CGM, WMT, LV, and TM. These anatomical priors are extracted from the available sequences using pre-trained segmentation models and serve as structural guidance during image synthesis.

RESULTS

For n = 78 patients, we performed image quality assessment and report a PSNR score of 18.50 ± 4.04. We also present qualitative results of the generated images stratified by MGMT methylation status (0 and 1).

CONCLUSION

Anatomy-conditioned diffusion models improve the accuracy and realism of synthesized brain MRI sequences

CLINICAL RELEVANCE/APPLICATION

This approach has direct clinical implications by enabling robust diagnostic workflows even when one or more MRI sequences are missing. The proposed model can be integrated into clinical imaging pipelines to enhance diagnostic completeness, support radiologist decision-making, and facilitate consistent AI model performance in incomplete imaging scenarios. The proposed method can also augment machine learning training by incorporating synthetic images into the dataset, thereby mitigating data bias and addressing class imbalance.

W2-SPIN-4 OPPORTUNISTIC SCREENING OF DIABETES USING AI-EXTRACTED WHOLE-BODY MRI BIOMARKERS

Songsoo Kim, MD (*Presenter*)
Dukyong Yoon (*Abstract Co-Author*)

PURPOSE

This study evaluates AI-derived imaging biomarkers from whole-body MRI to detect and predict diabetes mellitus (DM).

METHODS AND MATERIALS

Whole-body MRI data from 3,000 UK Biobank participants were segmented using TotalSegmentator on Dixon MRI water-fat sequences, and the resulting segmentation masks were used to compute volume indices and fat fractions. For DM detection, significant imaging features identified by logistic regression were included in a multivariate Extreme Gradient Boosting (XGBoost) model, evaluated with 5-fold cross-validation using the area under the receiver operating characteristic curve (AUROC). For DM prediction, significant imaging features identified via Cox regression were integrated into a Random Survival Forest (RSF) model, assessed by 5-fold cross-validation using Harrell's concordance index (C-index). Permutation tests compared imaging-based and conventional clinical models.

RESULTS

Among 2,657 participants, 123 had baseline DM. Top variables in univariate analysis included visceral fat volume index (AUROC 0.761), adrenal gland volume index (0.750), and pancreatic fat fraction (0.709). The XGBoost model achieved an AUROC of 0.764 ± 0.074 (95% CI, 0.671-0.858). Of 2,534 participants without baseline DM, 24 developed DM over a median follow-up of 4.1 years. Leading predictive variables included pancreatic fat fraction (C-index 0.746), visceral fat volume index (0.746), and adrenal gland volume index (0.740). The imaging-based RSF model demonstrated higher predictive performance (C-index 0.737 ± 0.073; 95% CI, 0.680-0.794) compared to the clinical RSF model (0.700 ± 0.097; 95% CI, 0.631-0.778), though differences were not statistically significant.

CONCLUSION

AI-derived MRI biomarkers alone demonstrated strong performance in detecting current DM and predicting future onset.

CLINICAL RELEVANCE/APPLICATION

AI-derived whole-body MRI biomarkers can be leveraged for opportunistic screening of diabetes mellitus during routine imaging. These biomarkers enable radiologists to identify hidden metabolic abnormalities—such as increased visceral fat or pancreatic fat or adrenal gland volume—indicative of increased diabetes risk, facilitating earlier diagnosis and improved risk stratification for disease progression.

W2-SPIN-6 FUSION OF VISION TRANSFORMER AND CNN FEATURES FOR COVID-19 DETECTION IN LUNG CT SCANS

Ahmet Er (*Presenter*)
Berrin Er (*Abstract Co-Author*)
Olivier Gevaert, PhD (*Abstract Co-Author*)

PURPOSE

To assess the effectiveness of pre-extracted features from DINOv2-L/14-reg, a vision transformer trained with self-supervision, and ConvNeXtV2-L, a fully convolutional masked autoencoder framework, in whole-lung CT analysis for COVID-19 detection, we explored whether frozen, slice-level features from these models, combined using various fusion and aggregation strategies, could construct accurate patient-level representations.

METHODS AND MATERIALS

We analyzed 3,780 CT series from 2,297 CT scans in the MIDRC database, each linked to PCR results. Scans were labeled positive if a PCR test was positive within 14 days prior to imaging, and negative if at least two PCRs were negative within ±7 days and no positives were recorded. Lung parenchyma was segmented using TotalSegmentatorV2 and normalized using dataset-specific statistics. Slice-level features were extracted using pretrained ResNet101, DINOv2, and ConvNeXtV2 models; radiomics features were extracted using PyRadiomics. For feature fusion, we evaluated simple concatenation and proposed a gated cross-channel fusion method integrating DINOv2 and ConvNeXtV2 features. To construct patient-level representations from variable-length slice features, we tested mean pooling and attention-based strategies, including self-attention and gated attention pooling. A fully connected network was trained on aggregated features, while XGBoost was used for PyRadiomics features. We employed nested cross-validation with Optuna-based hyperparameter optimization and evaluated performance using AUROC and F1 score.

RESULTS

Of the 3,780 CT series included in the analysis, 1,954 were labeled as positive and 1,826 as negative. Mean pooling consistently outperformed other aggregation strategies and was used in subsequent experiments. Patient-level representations from ConvNeXtV2 (AUROC: 0.879, F1: 0.796) and DINOv2 (AUROC: 0.873, F1: 0.788) outperformed both ResNet101 (AUROC: 0.852, F1: 0.767) and PyRadiomics features (AUROC: 0.807, F1: 0.743). The proposed gated cross-channel fusion model achieved the highest overall performance (AUROC: 0.884, F1: 0.800).

CONCLUSION

The gated-fusion cross-channel model combines DINOv2 and ConvNeXtV2 using a learnable gating mechanism to dynamically balance and integrate their complementary representations, enhancing performance in multi-view data. The gating mechanism adaptively weights features from both backbones based on their relevance, ensuring optimal fusion for downstream applications.

CLINICAL RELEVANCE/APPLICATION

Our findings highlight the potential of transfer learning with advanced pretrained models for automated COVID-19 detection from lung CT scans.

W2-SPIN-8 ENSEMBLED MONITORING MODEL (EMM): A FRAMEWORK FOR AUTOMATED REAL-TIME ASSESSMENT OF CLINICAL AI

Zhongnan Fang, PhD (*Presenter*)
Andrew Johnston, MD, MBA (*Abstract Co-Author*)
Lina Cheuy (*Abstract Co-Author*)
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Arogya Koirala, BS, MS (*Abstract Co-Author*)
Derrick Laurel, BA, ARRT (*Abstract Co-Author*)
Andrew W. Campion, MD (*Abstract Co-Author*)
Michael Iv, MD (*Abstract Co-Author*)
Akshay Chaudhari, PhD (*Abstract Co-Author*)
David B. Larson, MD, MBA (*Abstract Co-Author*)

PURPOSE

With the surge in AI tools for healthcare, monitoring of medical AI systems has become increasingly critical. While FDA-approved AI tools typically undergo pre-deployment or retrospective evaluation, there remains a significant gap in real-time, case-by-case confidence assessments while using commercial AI systems. This absence of immediate verification can erode trust in AI and create considerable risks, e.g. undetected AI errors may lead to misdiagnosis and ultimately compromise patient care. We introduce the Ensemble Monitoring Model (EMM) to provide robust confidence measurements, without requiring access to internal AI components or intermediate outputs.

METHODS AND MATERIALS

EMM is inspired by clinical consensus practices where confidence can be evaluated through multiple expert reviews. In our use case, EMM integrates five architecturally diverse sub-models trained to detect intracranial hemorrhage (ICH) on brain CT, the same intended task as the primary model (model being monitored). For each case, the outputs from these five models were compared against the primary model's prediction to quantify agreement and establish confidence level. With EMM, cases were systematically stratified into confidence categories, enabling customized suggested actions. Technical factors affecting EMM development were also explored.

RESULTS

We evaluated EMM using a large, diverse dataset (N=2,919). Results demonstrated EMM's ability to effectively characterize cases by confidence level, where high-confidence cases typically featured large, high-contrast hemorrhages, while low-confidence cases presented small, subtle hemorrhages or ICH-mimicking features. By applying appropriate thresholds, EMM successfully stratified AI predictions into increased, similar, and lower confidence categories. Importantly, the system's effective identification of low-confidence cases enables targeted manual review, significantly improving overall ICH detection accuracy.

CONCLUSION

EMM effectively quantifies confidence in individual AI predictions for real-time assessment without requiring access to the black-box AI's internal components. This valuable tool enables physicians to estimate the confidence of each prediction and take customized actions based on different confidence levels, not only improving trust in AI but enabling radiologists to use AI more efficiently.

CLINICAL RELEVANCE/APPLICATION

EMM is a practical and effective tool for quantifying case-by-case confidence in black-box AI. By enabling customized actions based on confidence levels, EMM can reduce misdiagnosis risks and increase radiologists' efficiency. The technical considerations shared provide best practices for successfully translating EMM to other tasks.

W2-SPIN-9 NEW DEVELOPMENT OF A QUALITY ASSURANCE STRUCTURE REPORT (QASR) FOR ACCEPTANCE AND CONSTANCY TESTING

Hideki Yaku (*Presenter*)
Yoshihisa Muramatsu, PhD, RT (*Abstract Co-Author*)
Keiichi Nomura, PhD (*Abstract Co-Author*)
Keisuke Fujii, PhD (*Abstract Co-Author*)
Michael F. McNitt-Gray, PhD (*Abstract Co-Author*)

PURPOSE

Acceptance and constancy tests for X-ray medical devices have been standardized in IEC standards. However, the data flow of medical device management information for conducting these tests has not been standardized. The purpose of this study is to develop a new quality assurance structure report (QASR) for medical device management that allows information related to acceptance and constancy tests to circulate within an organization and to achieve digital transformation (DX).

METHODS AND MATERIALS

The target medical device was a CT system. Inspection orders for each evaluation element (CT Number Assessment, Image Noise, Uniformity, etc.) were generated on our local RIS using the appropriate local and national standard codes. The order code specified the acceptance or constancy test as well as the type (water) and size (320 mm?) of the phantom. The order information was registered with the CT scanner using Modality Work List (MWL), which is translated automatically to the desired scan and reconstruction parameters. The reconstructed images and CT-RDSR files were obtained and then transferred to the analysis workstation. A dedicated

application was used to automatically analyze these images according to IEC standards and generate the corresponding CT- QASR, which contains all of the testing results.

RESULTS

The order information was traced through the Scheduled Procedure Step Description, CT scanning, image transfer, analysis, and generation of the QASR and database and all steps were performed smoothly. In the CT-QASR, the desired test results (CT values, Image Noise, and Uniformity) were accurately and automatically calculated versus manual calculations, along with information on scanning conditions and study instruments, and displayed in the Data Intelligence tools.

CONCLUSION

Newly developed quality assurance structured reports (QASRs) have brought the data flow of testing and results for medical device management information much closer to standardization.

CLINICAL RELEVANCE/APPLICATION

With the development of a new quality assurance structured report (QASR) with phantom information, medical device (CT scanner) management information can be networked and shared between users and maintenance vendors, as well as among groups, regions, and government agencies.

W2-SPIN-10 COMPARISON OF STUDY TURNAROUND TIMES FOLLOWING IMPLEMENTATION OF AN IN-HOUSE WORKFLOW OPTIMIZER AND REAL-TIME DATA DASHBOARD

Neil Malhotra, MD (*Presenter*)
Duane L. Schonlau, MD (*Abstract Co-Author*)
Scott D. Steenburg, MD (*Abstract Co-Author*)

PURPOSE

To determine report turn around time (TAT) changes before and after the implementation of a real-time data dashboard and radiologist workflow optimizer.

METHODS AND MATERIALS

Retrospective analysis of two 6-month periods before (1/1/2022 to 7/1/2022) and after (10/1/2024 to 4/1/2025) the implementation of the dashboard and workflow optimizer was performed at a single large health system. Two patient classes were compared (E= ER patients and I = inpatients). Total imaging volumes were obtained during the two time periods. Median TAT, mean TAT and TAT standard deviation were calculated. A single-tail Student's t test was used to compare report mean TATs, an F-test to compare TAT standard deviation, and a Mann-Whitney U test to compare median TATs between the two groups.

RESULTS

Prior to workflow optimizer and dashboard implementation, median TAT, mean TAT and TAT standard deviation were 0.33 hrs, 0.97 hrs and 1.31 hrs for class E patients (Table 1), and 0.97 hrs, 4.47 hrs and 8.35 hrs for class I patients (Table 2), respectively. Following implementation of the workflow optimizer and dashboard, median TAT, mean TAT and TAT standard deviation was 0.33 hrs, 0.62 hrs and 0.75 hrs for class E patients and 0.82 hrs, 3.89 hrs and 6.47 hrs for class I patients, respectively. There was a statistically significant reduction in mean TAT ($p< 0.01$) and report TAT standard deviation ($p< 0.001$) for both class E and I patients. One confounding factor is a 10% increase in the number of radiologists in the post-implementation period.

CONCLUSION

Our institutional dashboard and workflow optimizer empowered departmental and division leaders to make changes to better optimize radiologist workflows. This resulted in statistically significant reduction in average turnaround times for both emergency department and inpatients. The greatest improvement was in the reduction in mean report TAT and TAT standard deviation, indicating a more efficient allocation of exams and radiologist resources in the after-implementation period. While the distribution of the median values of TAT in the E and I classes pre- and post-implementation were found to be statistically significant, this is not likely to be practically significant as the median values are equal in the E class and near-equal in the I class.

CLINICAL RELEVANCE/APPLICATION

1. The use of a real time data dashboard and workflow optimizer resulted in significant improvement in report turnaround times for both emergency department and inpatients, with the greatest improvement in the reduction in mean report TAT and TAT standard deviation. 2. These findings indicate that the use of these in-house developed tools resulted in a more efficient allocation of exams and radiologists.

W2-SPIN-11 PREDICTION AND WARNING OF CT TUBE FAILURE: A DATA-DRIVEN METHODUSING LONG-TERM TIME-SERIES FORECASTING

Hanyu Li (*Presenter*)

PURPOSE

Computed tomography (CT), a cornerstone in modern diagnostic imaging, relies on the X-ray tube that are prone to filament burnout after extended use, leading to unexpected equipment failures and disruptions in patient care. To address this critical issue, this study proposes a data-driven predictive maintenance framework for CT equipment, focusing on early detection of filament burnout to enable timely intervention.

METHODS AND MATERIALS

Using operational data from Philips Maximus Rotalix Ceramic (MRC) tubes, which are collected remotely via the Phillips Remote System (PRS) Internet of Things (IoT) platform across 40 different locations, this study employs a long-term time-series forecasting model to predict future filament current trends. Based on these predictions, a three-stage warning system is proposed: (1) initial warning when filament current drops below 3600mA, (2) detection of a sudden drop in filament current, and (3) final warning when filament current approaches burnout.

RESULTS

The results show the mean absolute error among three latest time-series forecasting models are not exceed to 0.1035 and max absolute error not exceed to 0.6398, which means the difference in model prediction accuracy will only cause a prediction error of the filament burnout time of at most 15.3552 hours. The reliability of the three-stage warning system with the maximum prediction of 15.5 days on the first stage and 7 days on the third stage with 86.7% accuracy.

CONCLUSION

This study presents a comprehensive prognostic framework for CT X-ray tube filament failure prediction, aiming to reduce medical risks and costs caused by maintenance. By developing a novel tube-current-based down-sampling method, filament current fluctuations have been effectively eliminated in data collecting period. The new data segment method helps to reduce data-processing time to make real-time predictions. By identifying and validating latest time-series forecasting models and establishing three-stage warning system, a maximum of 22.5-day accurate warning system has been developed, which helps avoid 1,323,000 yuan or 15% to 20% unit price of the tube per CT scanner in financial loss caused by the failure.

CLINICAL RELEVANCE/APPLICATION

This study aims to establish a warning system, which aims to detect filament burnout in advance to offer sufficient time for hospitals to make maintenance plans to prevent medical risks and avoid financial loss caused by unplanned downtime. For hospitals, early warning can help departments adjust appointment strategy to avoid temporary cancellation of appointment and improve patient satisfaction.

W2-SPIN-12 REPRESENTATION-FOCUSED BATCH SAMPLING ENHANCES PERFORMANCE OF EFFICIENTLY ADAPTED FOUNDATION MODEL FOR DETECTING NEONATAL PNEUMOPERITONEUM ON CROSS-TABLE LATERAL RADIOGRAPHS

Junseong Lee,
BS (*Presenter*)
Yeonsu Kim (*Abstract Co-Author*)
Changhyun Park, MSc (*Abstract Co-Author*)
Hee Mang Yoon, MD, PhD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the effectiveness of adapting a vision foundation model (VFM) with a representation-focused custom batch sampling strategy for pneumoperitoneum (PP) classification on neonatal intensive care unit (NICU) lateral plain radiographs.

METHODS AND MATERIALS

An internal dataset of cross-table lateral abdominal x-rays (N=688; 45% PP+) from NICU of a tertiary hospital was split (train/validation/test: N=462/114/112) without patient overlap; gold standard (absence of PP, indeterminate, and presence of PP) was determined via review of clinical, surgical, and follow-up image records by 3 pediatric radiologists (5,12,26 years of experience). An external dataset (N=125; 33% PP+) from 11 other tertiary hospitals was labeled by consensus of 2 pediatric radiologists (12,15 years of experience) and 1 fourth-year radiology resident. Indeterminate cases were treated as PP+ to maximize sensitivity. The RAD-DINO (RD) LVM was fine-tuned using Low Rank Adaptation (LoRA). To address data heterogeneity and improve representation, a custom batch sampling strategy (C+) prioritizing PP cases with uncommon distribution (mid-to-lower abdominal free air) was developed and compared against standard sampling (C-). LoRA was applied to self-attention Query/Value matrices (M-) and additionally to MLP layers (M+ ablation). Performance comparisons included RD+LoRA configurations, RD Zero-Shot, RD Full Fine-Tuning (fFT), and CNNs using AUC, accuracy (Acc), and sensitivity (Sens), with statistical comparisons via DeLong/McNemar tests. Explainability used ReciproCAM/Grad-CAM.

RESULTS

The custom sampling (C+) demonstrated benefits over standard sampling (C-) in external validation. Comparing RD+LoRA (M-), C+ improved AUC (0.885 vs. 0.936; $p<0.001$), and Acc (0.74 vs. 0.90; $p<0.001$). Additionally applying LoRA to MLP layers (M+) further improved Acc (0.90 vs. 0.94; $p<0.001$), when using C+. Our resulting best config, RD+LoRA (C+,M+), surpassed the best CNN (ResNext50: Acc 0.93 vs. 0.94; Sens 0.83 vs. 0.85; $p>0.05$) despite lower AUC (0.959 vs. 0.935; $p<0.001$). RD+LoRA (C+,M+) significantly outperformed RD fFT externally (AUC 0.935 vs. 0.896, $p<0.001$; Acc 0.94 vs. 0.87, $p=0.012$; Sens 0.85 vs. 0.71, $p=0.031$), indicating improved robustness.

CONCLUSION

Adapting a VFM with LoRA fine-tuning, enhanced by representation-focused batch sampling, enables robust PP detection on NICU radiographs, achieving clinically relevant metrics while substantially lowering training cost.

CLINICAL RELEVANCE/APPLICATION

This approach confirms that VFMs can be effectively and efficiently adapted for specialized medical imaging tasks, aided by custom sampling for robustness and interpretability. The resulting model offers potential for clinical decision support.

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W2-SPIR

Interventional Radiology Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPIR-1 INTEGRATED VS. INDEPENDENT IR: A COMPETITIVENESS COMPARISON WITH SURGICAL SPECIALTIES

Philip Schertz, DO, MBA (*Presenter*)
Min Jung (*Abstract Co-Author*)
Ghazwan M. Kroma, MD (*Abstract Co-Author*)

PURPOSE

The introduction of IR residency programs has changed the training pathways for students pursuing careers in IR. This study aims to evaluate trends in the number of Integrated IR residency applicants and Diagnostic Radiology (DR) residents pursuing Independent IR fellowships over the past five match cycles. Furthermore, this study works as an aid in assessing the competitiveness of Integrated IR pathways within the National Resident Matching Program (NRMP) by comparing the competitiveness with two specialties that also offer integrated programs (Vascular and Thoracic).

METHODS AND MATERIALS

NRMP data for Integrated IR from 2020-2024 were collected. Proxy variables of total number of IR applicants, number of IR PGY1 and PGY2 positions, number U.S. senior applicants to IR, and number of U.S. seniors matching into Integrated IR were collected. Comparative data for two other integrated specialties were collected as well. Number of U.S. MD grad fellowship applicants, number of Independent IR programs and positions, and number of U.S. MD grad matches were collected from NRMP. Additionally, similar data for two other integrated specialties were collected.

RESULTS

From 2020 to 2024, Integrated IR programs saw notable growth. PGY1 IR programs rose from 22 to 28, with positions increasing 34% (38 to 51). U.S. MD senior applicants grew 23% (152 to 187), yet the 2024 match rate remained low at 21% (40/187). PGY2 IR programs increased slightly (66 to 69), with positions up 13% (121 to 137) with match rate of 52%. Integrated Vascular expanded from 59 to 79 programs (75 to 100 positions, +33%) during the same interval, with a 2024 match rate of 77.4% —much higher than IR. Integrated Thoracic showed slower growth in comparison: 29 to 34 programs and 38 to 48 positions (+26%). In 2024, it showed a 56% match rate. Independent IR fellowships declined in U.S. MD applicants (132 to 87, -34%), while positions stayed stable (172 to 167). Vascular and Thoracic fellowships saw applicant increases of 16% and 33%, respectively. Vascular positions grew (118 to 131), while Thoracic remained stable (96 in both years).

CONCLUSION

Overall, Integrated IR programs remain competitive among other integrated specialties. This highlights the need for improved application strategies for interested medical students. Furthermore, the Independent IR fellowship showed a downward trend in the applicant number.

CLINICAL RELEVANCE/APPLICATION

An increase in the population, proportion of elderly, and advancing technology suggest that the need for IR will continue to grow, leading to a surge of clinical demand and applicant interest. However, the number of available residency positions has not increased in comparison. This can potentially limit workforce growth and limit access to IR services in the future.

W2-SPIR-2 GENERATIVE ADVERSARIAL NETWORK-BASED CONTRAST ENHANCEMENT: SYNTHETIC LOW-KEV IMAGING FOR LOWER EXTREMITY VENOGRAPHY IN DUAL-ENERGY CT

Shigeng Wang (*Presenter*)
Yijun Liu (*Abstract Co-Author*)

PURPOSE

Dual-energy computed tomography (DECT) is an important imaging modality for lower extremity venous vascular imaging, typically utilizing low-keV imaging with iodine-based contrast agents to enhance venous visualization. Nevertheless, low-keV imaging faces significant challenges: the limited availability of DECT in clinical practice, particularly in community healthcare settings with under-resourced infrastructure, and inadequate iodine contrast uptake in patients due to renal insufficiency or hemodynamic limitations. This study introduces a novel method using generative adversarial networks (GANs) for synthetic low-keV imaging in lower extremity CT venography.

METHODS AND MATERIALS

A total of 212,480 lower extremity venous dual-energy CT images were acquired from 265 subjects (42 males, 23 females; mean age 48 years, range 25-72 years). All cases included conventional keV (70 keV) baseline images and corresponding low-keV (50 keV) contrast-enhanced images. To generate “synthetic” low-keV images, a CycleGAN framework was implemented to establish the mapping relationship between conventional keV images and target low-keV images. The dataset was partitioned into training (70%), validation (20%), and test (10%) sets. A multi-scale structural similarity loss function was employed to enhance vascular edge detail generation. The radiologists were presented with a 70 keV input image and asked to choose between a real low-keV image and synthetic low-keV images generated by CycleGAN corresponding to this 70 keV image (Turing test).

RESULTS

The performance of the CycleGAN model was evaluated using a combination of quantitative and qualitative analyses. For the entire dataset, in the test set, the mean square error (MSE) was 0.0046, while the structural similarity index (SSIM) was 0.45. The qualitative evaluation was validated through a visual Turing test conducted by five radiologists with varying levels of clinical experience. In clinical validation, the “synthetic” 50 keV images demonstrated a sensitivity of 91.7% and a specificity of 96.3% for detecting deep vein thrombosis.

CONCLUSION

This study verifies that the CycleGAN model effectively generates clinically diagnostic synthetic low-keV images of lower extremity CT venography.

CLINICAL RELEVANCE/APPLICATION

This approach offers a novel pathway for safer vascular imaging protocols, particularly benefiting institutions without dual-energy CT and patients with inadequate iodine contrast uptake.

W2-SPIR-3 RENAL BIOPSY PERFORMED DURING MICROWAVE ABLATION OF T1 RENAL CANCER USING A COAXIAL GUIDE WITH A SPRING-LOADED BLUNT TIP STYLET: FOCUS ON DIAGNOSTIC YIELD AND ONCOLOGIC OUTCOME

Melanthi Tsikna, MD, MSc (*Presenter*)

PURPOSE

To retrospectively evaluate feasibility of a coaxial guide with a spring-loaded blunt tip stylet during single session biopsy and microwave ablation (MWA) of T1 renal cell carcinoma. For this purpose, diagnostic yield, oncologic outcome and safety were assessed.

METHODS AND MATERIALS

Institutional database research identified all patients who underwent concomitant percutaneous, computed tomography-guided biopsy and microwave ablation. A 15 Gauge coaxial guide with a spring-loaded blunt tip stylet was percutaneously placed in the target tumor. Coaxially first a 18Gauge biopsy needle was inserted for sampling followed by a 16Gauge microwave probe. The modified CIRSE classifications system was used for complications' reporting. All patients were followed-up for at least 2 years with either CT or MRI scan according to individual characteristics.

RESULTS

A total of 15 patients (mean age: 67.8±3.4 years) with 17 renal tumors (mean diameter of the malignancies treated was 2.77±0.43cm) were included for evaluation. Technical success was achieved in all cases. Diagnostic yield was 100% (clear cell RCC n=13 papillary RCC n=3, oncocytoma: n=1). Overall, metastasis-free and recurrence-free survival were 100%, 100% and 94.12% at 1 and 2 years respectively [one tumor (5.88%) demonstrated local recurrence during the 1-year follow-up; patient underwent surgery (radical nephrectomy)]. Grade 1a complications were recorded in 2 (13.3%) patients (limited perinephric haematomas requiring nothing but observation).

CONCLUSION

Concomitant performance of percutaneous biopsy and microwave ablation using a coaxial biopsy guide with spring-loaded blunt tip stylet is feasible, safe and efficacious for the management of T1 renal cell cancer.

CLINICAL RELEVANCE/APPLICATION

The combined use of a spring-loaded blunt tip stylet within a coaxial guide enables efficient, single-session percutaneous biopsy and microwave ablation of T1 renal tumors, offering precise histological diagnosis and effective local tumor control. This technique streamlines patient care, reduces procedural burden, reduces the number of procedures and associated recovery times, and may serve as a valuable option in the minimally invasive management of early-stage renal cell carcinoma, especially in patients where surgical intervention poses higher risk.

W2-SPIR-4 EFFICACY OF TRANSARTERIAL EMBOLIZATION FOR RESISTANT SHOULDER PAIN: A META ANALYSIS

Kameel Khabaz, BA (*Presenter*)
Sammy Allaw (*Abstract Co-Author*)
Qian Yu, MD (*Abstract Co-Author*)
Osmanuddin S. Ahmed, MD (*Abstract Co-Author*)

PURPOSE

To perform a systematic review and meta-analysis evaluating the impact of peri-articular transcatheter arterial embolization (TAE) on patient-reported pain scores and objective shoulder range-of-motion in refractory adhesive capsulitis, rotator-cuff tendinopathy, and calcific tendonitis.

METHODS AND MATERIALS

Pubmed and SCOPUS searches were performed for all papers on TAE for shoulder pain or common shoulder conditions; this resulted in 317 articles on Pubmed and 692 on SCOPUS, totalling 730 articles after removal of duplicates. Articles were then screened for relevant English-language human studies, excluding case reports, reviews, and editorials; this produced 17 studies for analysis. We performed three subgroup analyses—one each for numerical pain scores, abduction range of motion (ROM), and external rotation ROM—using standardized mean change differences (SMCR) to capture within-subject improvements from baseline to final follow-up. Effect sizes were pooled under a random-effects framework. Statistical heterogeneity was quantified with Cochran's Q, I^2, and t^2; 95 % confidence intervals were computed.

RESULTS

Eleven studies were included with a total of 329 patients. Average age was 53.7 years, with 219 women and 110 men. Follow-up ranged from 60 to 180 days post-TAE. The pooled SMCRs indicate pain reduction at the final follow-up time point, with the pooled estimate (SMCR = -2.54, 95% CI: -3.41 to -1.66) indicating a large overall improvement despite pronounced between-study heterogeneity (I2 = 90.1%). Studies demonstrated improved range of motion for shoulder abduction (SMCR = 1.54, 95% CI 1.07 to 1.97) and shoulder external rotation (SMCR = 0.60, 95% CI 0.43 to 0.77) with lower heterogeneity (I2 = 62.8% and 0.0%, respectively).

CONCLUSION

Our pooled analysis showed statistically significant improvements in pain scores, abduction, and external rotation range of motion following TAE compared to baseline in patients with selected shoulder pathologies. Further studies with direct comparison against other treatment options are needed to better understand the efficacy of TAE against conventional conservative treatment options.

CLINICAL RELEVANCE/APPLICATION

Transarterial embolization (TAE) is a promising treatment modality for shoulder pathologies. While several studies examine TAE, current evidence suffers from small patient cohorts, varied methodologies, and the lack of a control group. This study aims to characterize the existing body of evidence and provide a more reliable estimate for the efficacy of TAE in improving functional outcomes in patients with shoulder pathologies.

W2-SPIR-5 TRANSARTERIAL EMBOLIZATION IN ADHESIVE CAPSULITIS: INTERMEDIATE TERM RESULTS FROM THE FIRST STUDY IN INDIA

Aprateem Mukherjee, MD, FRCR (*Presenter*)
Niraj N. Pandey, MD (*Abstract Co-Author*)

PURPOSE

Adhesive capsulitis is a poorly understood chronic condition characterised by pain and restricted mobility of the shoulder joint. The pathophysiology of this process is still unclear with a combination of chronic inflammatory fibroblastic process, angiogenesis and synovitis with fibrotic contracture of rotator intervals, capsules and ligaments. Few studies have shown embolization of arteries supplying abnormal vascular areas in such condition can relieve pain and symptoms. The goal of our study was to demonstrate the safety and efficacy of transarterial embolization in adhesive capsulitis and whether it can improve pain and shoulder mobility in these patients.

METHODS AND MATERIALS

12 consecutive patients with adhesive capsulitis on clinical examination and non-relieved with conservative management for 3 months were taken for transarterial embolization (TAE). Adverse events, Visual analogue scale (VAS), night time VAS and range of motion of the affected shoulder was assessed at baseline, 1 week, 1 month, 3 months and 6 months.

RESULTS

Abnormal vascularity around the rotator interval was identified in all patients on angiography. Embolization of these abnormal neo-vessels was performed using Imipenem cilastin particles via a microcatheter in all patients. Right transfemoral arterial access was used for embolization in 10 patients while transbrachial arterial access was used in 2 patients. No major or minor complications were observed in the patients. Mean VAS score improved from 8.5 ± 0.47 at baseline to 3.7 ± 0.78 at 1 week, 2.6 ± 0.78 at 1 month, 1.8 ± 0.93 at 3 months' and 1.5± 0.91 post procedure. Rapid relief of pain was seen in all patients at 1-week post procedure. Mean night-time VAS scores also improved from 8.7 ± 0.56 at baseline to 4.1 ± 0.86 at 1 week, 3.4 ± 0.78 at 1 month 2.3 ± 0.5 at 3 months' and 2.2 ± 0.4 at 6 months' post procedure.

CONCLUSION

Adhesive capsulitis showed abnormal neo-vessels in the region of rotator interval and transarterial embolization of these abnormal vessels in adhesive capsulitis appears to a be feasible and safe procedure with no major adverse effects in this pilot study followed up to 6 months. TAE appears to provide quick pain relief and early mobility in the affected shoulder in these patients.

CLINICAL RELEVANCE/APPLICATION

Transarterial embolization appears to be a novel, safe and effective treatment for quick relief of pain in chronic painful adhesive capsulitis.

W2-SPIR-6 MUSCLE AND FAT MATTER: AUTOMATED CT BODY COMPOSITION IMPROVES PROGNOSTIC STRATIFICATION IN HEPATOCELLULAR CARCINOMA UNDERGOING RADIOEMBOLISATION

Johannes M. Ludwig, MD, ARRT (*Presenter*)
Hannah Luisa Steinberg-Vorhoff, MD (*Abstract Co-Author*)
Johannes Haubold, MD (*Abstract Co-Author*)
Benedikt M. Schaarschmidt, MD (*Abstract Co-Author*)
Sven Koitka, MSc (*Abstract Co-Author*)
Jens M. Theysohn, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the prognostic value of CT-based body composition markers for survival in patients with hepatocellular carcinoma (HCC) treated with selective transarterial radioembolization (SIRT).

METHODS AND MATERIALS

A total of 198 patients (77.3% men, median age: 71 years) who underwent SIRT between 2010 and 2021 were included in the study. A deep learning algorithm was used for automated body composition analysis (BCA) from abdominal CT scans to perform 3D volumetry of body tissues incl. visceral adipose tissue (VAT), intra- and intermuscular adipose tissue (IMAT), skeletal muscle (SM), and bone (B). BC parameters and ratios were dichotomized at the median gender specifically due to significant gender differences ($p<0.05$). The Cox proportional hazard model for univariate (UVA) and multivariate (MVA) analyses (hazard ratio; 95%CI, p-value) and Kaplan-Meier analyses (survival in months; 95%CI) were performed.

RESULTS

The median survival time of the study cohort was 18.5 (15.1-23.4) months. Median survival according to BCLC stages A (14.6%), B (60.6%) & C (24.8%) were: 25.1 (15.1-56.8), 20.9 (15.6-30.4), and 12.6 (9.2-19.2) months, respectively (UVA; p=0.009). Regrading BC-parameters, patients with values greater than the median had a favourable hazard ratio for SM mass (0.67; 0.48 - 0.92; p=0.014), SM/B (0.7; 0.51 - 0.97; p=0.03), (SM + VAT)/B (0.64; 0.47 - 0.89; p=0.007), SM/(B + IMAT) (0.7; 0.51 - 0.97; p=0.029), and (SM + VAT)/(B+I MAT) (0.65; 0.47 - 0.9; p=0.009) with high correlations between BC-parameters; thus (SM + VAT)/B was selected for MVA. Additionally, patients with normal serum albumin and non-elevated levels of C-reactive protein, aminotransferase (AST), alkaline phosphatase (AP), and gamma-glutamyl transamidase (GGT) were associated with a significant survival benefit. In MVA BCLC-Stage (A: 0.49; 0.28 - 0.83), B: 0.72; 0.49 - 1.05, C: 1; p=0.025), non-elevated AST levels (0.6; 0.41 - 0.86; p=0.006) and (SM + VAT)/B (0.7; 0.55 - 0.97; p=0.033) remained significant. Subanalysis revealed that the (SM + VAT)/B ratio can further stratify BCLC B patients, with a prolonged survival for patients with values above the median of 25.7 months (17.8 - 36.6) compared to 15.6 months (9.4 - 23.0) for those with lower values (log-rank, p=0.02). Substratification in BCLC C patients was not significant.

CONCLUSION

The fully automated, CT-based body composition analysis with the independent prognostic (SM + VAT)/B volume ratio for survival may facilitate the identification of patients who may benefit more from SIRT, also within BCLC B patients.

CLINICAL RELEVANCE/APPLICATION

The use of fully automated CT-based body composition analysis may be an easily accessible tool to further improve the risk stratification of patients with HCC treated with SIRT.

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W2-SPMK

Musculoskeletal Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPMK-2 OUTCOME OF IMAGE GUIDED PECTORALIS MINOR INFILTRATION AND SCAPULOTHORACIC BURSA INJECTION FOR THE MANAGEMENT OF SCAPULOTHORACIC ABNORMAL MOTION

Abdulmonem S. Alkhateeb (*Presenter*)
Mohammed Alfaqih, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the outcomes of image guided pectoralis minor microtenotomy/Infiltration and Scapulothoracic bursa Injection for the management of scapulothoracic abnormal motion (STAM).

METHODS AND MATERIALS

In this IRB approved retrospective study, 64 patients with clinical diagnosis of STAM Type 1, and underwent image-guided scapulothoracic Triamcinolone injection and/or pectoralis minor microtenotomy and Infiltration (Triamcinolone or Botulinum toxin) were reviewed between June 2023 and March 2025. Patients were divided into 2 groups for subgroup analysis : Group A: Patients presenting with STAM and focal tenderness over the coracoid process, and Group B: Patients presenting with STAM but no focal tenderness over the coracoid process. Patient outcomes after the intervention were assessed with the Numerical Pain Scale, Constant score, and Shoulder Subjective Value. Data were analyzed by Student's t-test.

RESULTS

37 patients who met inclusion and exclusion criteria were included in this study. Average age at the time of intervention was 43 years (±13), 46% of patients were female, and average follow-up after intervention was 10 months (±5, range from 2 to 22 months). Significant improvements in numerical pain scale , Constant scores, and shoulder subjective value. Numerical Pain scale improved from 8 to 2, Constant score improved from 76 to 92, shoulder subjective value improved from from 30% to 80% ($P < 0.01$). Subgroup analysis included Group A and Group B. Group A included 17 patients, and Group B included 20 patients. No statistically significant difference between these two groups in terms of numerical pain scale, shoulder subjective value, and Constant score was found ($P > 0.01$). One patient in Group A with history of breast implants reported temporary arm heaviness after pectoralis minor microtenotomy/Infiltration lasted for 3 months.

CONCLUSION

Significant outcome improvement regarding pain, function, and quality of life in patients with clinical diagnosis of STAM type 1 after image guided pectoralis minor microtenotomy/Infiltration and/or Scapulothoracic bursa injection.

CLINICAL RELEVANCE/APPLICATION

In patients with symptomatic STAM type 1, image guided pectoralis minor microtenotomy/Infiltration with either Botulinum toxin or Triamcinolone; And scapulothoracic bursa Triamcinolone Injection is an effective nonoperative option. Pre intervention patient counseling regarding possible temporary arm weakness after pectoralis minor microtenotomy/Infiltration is advised.

W2-SPMK-3 A PREDICTIVE MRI RADIOMICS MODEL FOR IMPROVED SOFT TISSUE SARCOMA SUBTYPE DIFFERENTIATION

Laetitia Perronne, MD, MSc (*Presenter*)
Nicolo Gennaro, MD (*Abstract Co-Author*)
Mirinae Seo, MD (*Abstract Co-Author*)
Zuzanna Kobus, MD (*Abstract Co-Author*)
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Seth Pollack, MD (*Abstract Co-Author*)
Pedro Hermida De Viveiros (*Abstract Co-Author*)
Yuri Velichko, PhD (*Abstract Co-Author*)

PURPOSE

Soft tissue sarcomas (STS) are rare and heterogeneous tumors with overlapping imaging characteristics, making imaging-bases histologic subtype differentiation challenging. We aimed to develop an MRI-based radiomics model to differentiate key soft tissue sarcoma subtypes and a common benign mimic, the intramuscular myxoma.

METHODS AND MATERIALS

This IRB-approved retrospective study included 302 patients with histologically confirmed soft tissue tumors: undifferentiated pleomorphic sarcoma (UPS, n=70), myxofibrosarcoma (MFS, n=57), myxoid liposarcoma (mLPS, n=60), leiomyosarcoma (LMS, n=67), and myxoma (MYX, n=48). All patients underwent MRI, including fat-suppressed T2-weighted and post-contrast T1-weighted images. Tumors were manually segmented, and radiomic features were extracted from all available sequences in all planes. GLCM features were collected at intervoxel distances ranging from 1 to 5 mm. The dataset was split into training (70%) and held-out testing (30%) sets. To classify STS subtypes using pre-treatment imaging, a multiclass XGBoost machine learning model was developed, employing a two-stage feature selection strategy involving importance and redundancy filtering. The optimal number of features and model hyperparameters were determined through 5-fold cross-

validation on the training set. The final model demonstrated robust classification performance on the held-out test set. Performance metrics included accuracy, sensitivity, specificity, and predictive values.

RESULTS

The model demonstrated a strong overall accuracy of 79% (95% CI: 0.69-0.87, $p < 0.001$). High sensitivity was observed for MYX (0.93), LMS (0.83), mLPS (0.83), and UPS (0.71), coupled with specificity greater than 0.92 across these subtypes. However, MFS exhibited lower sensitivity (0.69) and was frequently misclassified as mLPS or UPS. Positive predictive values ranged from 0.69 for MFS to 0.88 for LMS. Negative predictive values exceeded 0.91 for all subtypes.

CONCLUSION

Radiomics-based classification showed promising performance for distinguishing most STS subtypes and benign tumors on MRI. However, differentiating MFS remains challenging due to imaging overlap with other aggressive subtypes. This model could potentially aid radiologists in non-invasive STS subtyping, guiding biopsy and treatment planning.

CLINICAL RELEVANCE/APPLICATION

A radiomics predictive model could serve as a valuable non-invasive tool to support radiologists in differentiating STS subtypes, potentially guiding biopsy strategies and optimizing personalized treatment planning.

W2-SPMK-4 MULTI-IMAGE MUSCULOSKELETAL ULTRASOUND INTERPRETATION USING A LARGE LANGUAGE MODEL

Jyun-Ping Kao (*Presenter*)
Chung-Ping Chen (*Abstract Co-Author*)
Wen-Shiang Chen (*Abstract Co-Author*)

PURPOSE

Traditional AI models in medical imaging analyze static images, whereas radiologists synthesize information across multiple frames, particularly in musculoskeletal ultrasound (MSK US). We present the first application of a Large Language Model (LLM) to interpret multiple MSK US frames simultaneously. Our model generates a comprehensive diagnostic impression integrating findings across all inputs, mimicking the radiologist's multi-frame review process.

METHODS AND MATERIALS

We fine-tuned a multimodal LLM (Llama 3.2 11B), on 100 shoulder US exams (80 training, 20 validation/testing) from 100 patients. Each exam included 12 frames and a corresponding radiologist-written impression. The model received all frames and was trained to generated a unified impression covering exam laterality and key anatomical structures (e.g. Biceps, Subscapularis, AC joint, Supraspinatus, Infraspinatus, and Bursa) and relevant pathologies. Performance was evaluated by comparing the LLM's output to reference reports using BERTScore, BLEU, and RadGraph F1 metrics.

RESULTS

The model achieved an average BERTScore F1 of 0.80, a BLEU of 0.72, and a RadGraph F1 of 0.45, and correctly indicated laterality in all cases, suggesting it can provide a human-like impression. Minor differences in wording or findings in the generated impression significantly affected the metrics, suggesting that a consistent training impressions and output structure may improve performance. The model was less reliable for subtle findings (e.g. tear conditions, calcifications) that were underrepresented in training, indicating that targeted fine-tuning could improve sensitivity.

CONCLUSION

This pioneering study demonstrates three key innovations: (1) application of LLM for multi-image MSK US interpretation and producing a coherent radiologist-style report; (2) validation that LLMs can potentially recognize anatomical structures without traditional object-detection networks; (3) identification of LLM limitations specific to MSK US interpretation, providing a clear roadmap for future development. These advances establish a foundation for next-generation AI assistance of MSK US in clinical settings.

CLINICAL RELEVANCE/APPLICATION

Given the operator-dependent nature of MSK US, our LLM-based approach provides a standardized method for interpreting multi-frame examinations, potentially reducing variability and enhancing diagnostic consistency. By synthesizing complex findings across frames, it can augment clinical workflows, improve report efficiency, and minimize the risk of overlooked findings, thereby increasing diagnostic confidence.

W2-SPMK-5 SARCOPENIA AND INCREASED SUBCUTANEOUS FAT DENSITY AS PROGNOSTIC IMAGING BIOMARKERS IN SOFT TISSUE SARCOMA

Chung-Jung Lin, MD (*Presenter*)
Hung Ta H. Wu, MD, MBA (*Abstract Co-Author*)
Ching-lan Wu, MD (*Abstract Co-Author*)
Han-Ying Lin, MD (*Abstract Co-Author*)
Hong-Jen Chiou, MD (*Abstract Co-Author*)

PURPOSE

While sarcopenia has been recognized as a key prognostic marker in many cancers, its impact in soft tissue sarcoma (STS) remains less defined. This study investigates the relationship between CT-derived body composition and clinical outcomes in STS patients receiving chemotherapy, and validates the use of L2 vertebral level measurements as a practical alternative to L3.

METHODS AND MATERIALS

We retrospectively analyzed 84 STS patients treated with gemcitabine-based chemotherapy from January 2010 to August 2024. Skeletal muscle and fat indices were assessed from chest CT scans at both L2 and L3 levels. Sarcopenia was diagnosed based on established skeletal muscle index (SMI) thresholds. Associations with progression-free survival (PFS), overall survival (OS), and chemotherapy toxicities were evaluated.

RESULTS

Sarcopenia was identified in 30.9% of patients. Sarcopenic individuals exhibited lower albumin (3.29±0.68 vs. 3.73±0.48 g/dL, P=0.005), elevated white blood cell counts (P=0.048), and reduced dyslipidemia prevalence (P=0.018). Sarcopenia was an independent predictor of worse OS (HR=2.032, P=0.023), with median OS significantly shorter (92±88 vs. 340±59 days, P=0.020). Higher subcutaneous adipose tissue density (SAD) at L2 also predicted poorer survival (HR=1.015, P=0.050). L2 and L3 body composition metrics showed excellent correlation (r=0.90, P<0.001), supporting the use of L2 imaging in clinical practice. Sarcopenic patients faced markedly higher rates of severe chemotherapy-related anemia (69.2% vs. 43.1%, P=0.023) and diarrhea (38.5% vs. 17.2%, P=0.036).

CONCLUSION

Our findings establish sarcopenia and increased SAD as independent imaging biomarkers of poor prognosis in STS, while endorsing L2-level assessments as a flexible alternative for body composition analysis in routine chest CT imaging

CLINICAL RELEVANCE/APPLICATION

Body composition imaging at L2 transforms routine CT scans into powerful predictors of sarcoma outcomes

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W2-SPMS

Multisystem Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPMS-1 ASSOCIATION BETWEEN MRI-BASED QUANTIFICATION OF LIVER IRON AND CARDIOVASCULAR DISEASE: A UK BIOBANK PROSPECTIVE COHORT STUDY

Feier Ding, PhD (*Presenter*)
Xinya Zhao (*Abstract Co-Author*)
Takashi Ota, MD, PhD (*Abstract Co-Author*)
Toru Honda, MD (*Abstract Co-Author*)
Hideyuki Fukui, MD, PhD (*Abstract Co-Author*)
Atsushi Nakamoto, MD, PhD (*Abstract Co-Author*)
Noriyuki Tomiyama, MD, PhD (*Abstract Co-Author*)

PURPOSE

Liver iron concentration is acknowledged as the optimal surrogate for evaluating iron status, which is closely related to cardiovascular diseases (CVD). We aimed to explore the associations between magnetic resonance imaging (MRI)-based quantification of liver iron and CVD.

METHODS AND MATERIALS

This population-based study used data mainly from the UK Biobank. Liver iron content was measured using MRI. Cox regression analysis and Mendelian randomization analysis was performed to explore the association between liver iron content and cardiovascular events. Polygenic risk scores were calculated to investigate the effect of genetic susceptibility. Mediation analyses were performed using two-step Mendelian randomization analysis.

RESULTS

A total of 21266 participants (mean standard deviation [SD] age: 63.8 [7.6] years; 12610 females [59.3%]) were enrolled in the prospective observational study. Compared to lower liver iron content individuals, the hazard ratio (HR) of higher liver iron content were 0.75 (95% CI, 0.60-0.93, P=0.002) for CVD, with similar results as a continuous variable (HR=0.51, 95% CI, 0.35-0.76, P<0.001). Participants with high genetic risk and low liver iron content had a 118% increased risk of CVD (HR=2.18, 95% CI, 1.29-3.69) and a 170% increased risk of coronary heart disease (CHD) (HR=2.70, 95% CI, 1.40-5.23) compared to those with low genetic risk and high liver iron content. Mendelian Randomization analysis suggested a causal role of liver iron content in CHD (odds ratio [OR]=0.92, 95% CI, 0.87-0.97) and myocardial infarction (OR=0.93, 95% CI, 0.86-0.99), with low-density lipoprotein cholesterol and total cholesterol mediating 49.7% to 54.5% of the causal effects.

CONCLUSION

Our study highlights MRI-based liver iron quantification as a valuable non-invasive biomarker, lower liver iron content may be associated with a higher risk of CVD and cardiovascular events. Liver iron levels may causally influence CVD through blood lipid regulation and enhance prediction and intervention.

CLINICAL RELEVANCE/APPLICATION

MRI-based liver iron quantification offers a practical, non-invasive tool for cardiovascular risk assessment. Given its association with CVD and its partial mediation through lipid levels, it may help identify high-risk individuals—particularly those with genetic susceptibility—and guide early, targeted prevention or lipid-lowering interventions in clinical practice.

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W2-SPNMMI

Nuclear Medicine & Molecular Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPNMMI-1 VARIATION IN THE IMAGE QUALITY ACROSS THE AXIAL FOV OF SIEMENS BIOGRAPH QUADRA PET/CT SCANNER

Mercy Akerele, PhD (*Presenter*)
Azadeh Eslambolchi, MD (*Abstract Co-Author*)
Justin Mikell, PHD (*Abstract Co-Author*)
Richard Laforest, PhD (*Abstract Co-Author*)

PURPOSE

Long axial field-of-view (LAFOV) scanners are fast gaining prominence due to their numerous applications for simultaneous multiple organs scanning. For LAFOV scanners longer than 1 m, the image quality (spatial resolution, contrast and noise metrics) can vary significantly across the FOV. This study aims to evaluate the variation in image quality across the FOV as a function of lesion size.

METHODS AND MATERIALS

This work was done on the Siemens Biograph Quadra PET/CT scanner (106 cm axial FOV), using a modified NEMA phantom with two sets of six spheres (first set 10, 13, 17, 22, 28, 37 mm and second set 4, 6, 8, 10.2, 12, 15 mm). The spheres and background were filled with approximately 1 mCi 18 F-FDG, resulting in a sphere-to-background ratio of 11.08. Images were acquired at four bed positions across the FOV with standard clinical reconstructions using the high sensitivity (HS) and the ultra-high sensitivity (UHS) settings. The activity was extracted from the reconstructed images using the actual sphere sizes to estimate the RC and CoV. A large ROI was placed in the uniform background region to estimate the CRC and contrast. The RC and CRC were fitted using the EANM model. Finally, the % variation across the FOV for each sphere size was estimated as the difference between the maximum and minimum value divided by the mean.

RESULTS

As expected, the RC, CRC, CoV and contrast at each position in the FOV all improve with increasing sphere size. The UHS has slightly improved RC than HS, with 84% and 82% recovery, respectively, for the largest sphere size. The variation across the FOV is around 5% for both HS and UHS, and this improves with increasing sphere size to about 0.1%. Similarly, the UHS has slightly improved CRC than HS, with 83% and 80% recovery, respectively, for the largest sphere size. The variation across the FOV is slightly less for UHS (7.4%) than HS (9.2%), and this improves with increasing sphere size to about 0.1%. Though the UHS has slightly improved contrast than HS (UHS = 2.63 and 9.49; HS = 2.40 and 9.17 for the smallest and largest spheres), the noise (CoV) is increased (UHS = 12.8% and 20.9%; HS = 8.9% and 20.1% for the smallest and largest spheres). This increased noise in UHS could be attributed to the difference in reconstruction settings. However, the variation in contrast and CoV across the FOV is substantially lower for UHS (3% and 15%) than HS (6% and 28%), except for the smallest sphere where the variation is up to 6% and 84% respectively.

CONCLUSION

The variation in RC, CRC, CoV and contrast across the FOV depends largely on the lesion size, and secondarily on the reconstruction settings.

CLINICAL RELEVANCE/APPLICATION

Accurate knowledge of, and compensation for the FOV variation will enhance accurate and reliable lesion quantification in multi-organ and multi-region imaging

W2-SPNMMI-2 VOLUMETRIC FDG PET/MR FOR STAGING AND RESPONSE ASSESSMENT OF IGG4-RELATED DISEASE INVOLVING THE SALIVARY AND LACRIMAL GLANDS: IMAGING RESULTS OF A PHASE II STUDY OF ZANUBRUTINIB

Kip E. Guja, MD, PhD (*Presenter*)
Nancy Pham, MD (*Abstract Co-Author*)
Mehdi Khalighi (*Abstract Co-Author*)
Benjamin L. Franc, MD (*Abstract Co-Author*)
Mrudula Penta, MD (*Abstract Co-Author*)
Tobias Lanz (*Abstract Co-Author*)
Mariani Deluna (*Abstract Co-Author*)
Yuhan Liu (*Abstract Co-Author*)
Robert Fairchild (*Abstract Co-Author*)
Audra Horomanski (*Abstract Co-Author*)
Matthew Baker (*Abstract Co-Author*)

PURPOSE

To evaluate immunoglobulin G4-related disease (IgG4-RD) involving the salivary and lacrimal glands on [18F]FDG PET/MRI with metabolic and volume-based measurements, before and after treatment with Zanubrutinib, in a phase II proof-of-concept study (NCT04602598).

METHODS AND MATERIALS

This study was conducted at a single center in the US. Eligible patients with symptomatic IgG4-RD affecting the submandibular and/or lacrimal glands, refractory to glucocorticoids, and meeting 2019 ACR/EULAR Criteria for IgG4-RD, were treated with zanubrutinib for up to 24 weeks. Imaging endpoints included change in volume and metabolic activity of the submandibular and/or lacrimal glands on FDG-PET/MRI at post-treatment week 24, as determined by two radiologists blinded to scan order. Clinical endpoints included IgG4 serum concentration and patient reported outcomes.

RESULTS

Ten patients were enrolled; most were male (70.0%), Asian (60.0%), with a median age of 58 (range, 38-74) years. Prior treatments included prednisone (10 patients), rituximab (5 patients), and azathioprine (2 patients). No patients were on glucocorticoids or immunosuppressive treatment at time of enrollment or during the study. All patients had both lacrimal and submandibular gland disease. At week 24, mean changes from baseline were -45.4% (17.4) for lacrimal gland volume ($p < 0.001$) and

-30.0% (18.6) for submandibular gland volume ($p < 0.001$). Reductions were observed in SUVmax, total metabolic lesion volume (MLV), and total lesion glycolysis (TLG), including a mean (SD) change in lacrimal gland SUVmax of -2.3 (2.9; $p = 0.01$), submandibular gland SUVmax of -2.1 (3.4; $p = 0.05$), MLV of -20.7 cm 3 (22.4; $p = 0.05$), and TLG of -91.6 g/mL x cm 3 (98.5; $p = 0.05$). The mean (SD) change in the serum IgG4 concentration over 24 weeks was -417.0 mg/dL (410).

CONCLUSION

FDG PET/MR demonstrated statistically significant reduction in volume and metabolic activity of the salivary and lacrimal gland after treatment with Zanubrutinib. These imaging endpoints correlated clinically with reduced in serum IgG4 levels. Our results demonstrate efficacy of Zanubrutinib and the utility of FDG PET/MRI with metabolic and volume-based indices in IgG4-RD staging and treatment response assessment.

CLINICAL RELEVANCE/APPLICATION

IgG4-related disease is a systemic fibro-inflammatory condition characterized by diffuse or focal organ enlargement with pathogenic IgG4-positive B-cells. The Bruton tyrosine kinase inhibitor Zanubrutinib can decrease B cell activation and proliferation with lower risk of B-cell depletion. We report assessment of IgG4-RD involving the salivary and lacrimal glands on FDG PET/MRI with metabolic and volume-based indices, before and after treatment with Zanubrutinib, in a phase II study.

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W2-SPNPM

Noninterpretive Skills (Beyond Imaging) Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPNPM-1 INTELLIGENT SCHEDULING IN TELERADIOLOGY USING AI FORECASTING OF STUDY VOLUME AND RADIOLOGIST AVAILABILITY

Sivasailam Kalyan (*Presenter*)
Harini T (*Abstract Co-Author*)
Vasantha Kumar Venugopal, MD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a scheduling optimization system that uses AI to forecast radiology workload and match it with radiologist availability and efficiency patterns.

METHODS AND MATERIALS

General: A temporal forecasting model based on LSTM architecture was trained on 2 years of historical imaging volume data from 70 hospitals. A reinforcement learning scheduler adapted shift allocations based on radiologist efficiency and availability data. Context and Intervention: The model forecasted hourly imaging volume for each modality and mapped radiologist capacity accordingly. Alerts and recommendations were embedded into the shift planning dashboard. Study of the Intervention: Simulated deployment was conducted for a 6-week prospective window. Outcomes were benchmarked against traditional manual scheduling methods. Measures/Metrics: Forecast accuracy (mean absolute percentage error), turnaround time (TAT), radiologist idle/busy ratio, and shift overrun occurrences.

RESULTS

Forecasting accuracy (MAPE): 7.8%TAT improved by 15.2% across modalitiesRadiologist idle/busy ratio optimized by 18.6%Shift overruns reduced from 9.3% to 2.4%

CONCLUSION

AI-driven forecasting and scheduling systems significantly enhance resource allocation and reduce workflow inefficiencies in teleradiology. This promotes timely reporting, reduces fatigue, and optimizes patient care delivery across distributed networks.

CLINICAL RELEVANCE/APPLICATION

Teleradiology plays a critical role in delivering timely diagnostic services across healthcare networks, especially during off-hours and high-demand periods. This study demonstrates how AI-based forecasting and scheduling can significantly reduce turnaround times and radiologist fatigue by aligning workforce deployment with real-time workload patterns. Implementing such systems can enhance diagnostic efficiency, improve patient care continuity, and support more sustainable radiology operations in diverse and distributed clinical settings.

W2-SPNPM-2 WEEKLY VIRTUAL CASE CONFERENCE SERIES: OVER THREE YEARS OF GLOBAL RADIOLOGY EDUCATION AND OUTREACH

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Mohammad Jalloul, MD (*Abstract Co-Author*)
Hermon M. Derbew, MD (*Abstract Co-Author*)
Monica Miranda-Schaeubinger, MD,MSc (*Abstract Co-Author*)
Sydney Wieczkowski (*Abstract Co-Author*)
Yadel Mekete (*Abstract Co-Author*)
Janet Reid, MD, FRCPC (*Abstract Co-Author*)
Anne Marie Cahill, MBBCh (*Abstract Co-Author*)
Youck Jen Siu Navarro, MD (*Abstract Co-Author*)
Abass Noor, MD (*Abstract Co-Author*)
Kassa Darge, MD, PhD (*Abstract Co-Author*)
Hansel J. Otero, MD (*Abstract Co-Author*)

PURPOSE

Access to subspecialized pediatric radiology training remains limited in many low- and middle-income countries (LMICs). We report on the implementation and perceived impact of a weekly virtual educational program designed to address this gap and supplement training.

METHODS AND MATERIALS

Sessions featured weekly interactive virtual case discussions and game-based modules for radiology residents guided by USA-based radiology faculty. A descriptive evaluation was done to assess the perceived impact of the sessions from 2021-2024 on residents at 11 partner institutions across Africa, Asia, and Central America. Data included session attendance and post-session surveys to gather satisfaction ratings on a 5-point scale as very poor, poor, neutral, good, or very good on aspects like faculty communication, engagement, image quality, and clinical relevance of cases. Percentages were calculated for imaging modalities, cases presented, and survey ratings obtained.

RESULTS

Between 2021 and 2024, 105 sessions were conducted, averaging 60-70 residents per session. Faculty discussed 750 cases covering a range of subspecialties: pediatric body imaging (434 cases, 57.9%), neuroradiology (302 cases, 40.3%), and fetal imaging (15 cases, 2%). Cases frequently involved multiple modalities: 290 MRI (38%), 267 radiography (35%), 166 ultrasound (22%), 157 CT (21%), and 30 fluoroscopy (4%). Analysis of 539 survey responses indicated high satisfaction, with most residents rating the following as “good” or “very good”: ease of communication with faculty (91%), faculty engagement and support (95%), image quality and organization (97%), and clinical relevance of cases presented (96%). Furthermore, the overall content quality was rated “good” or “very good” by over 90% of residents.

CONCLUSION

This weekly imaging case review series is a well-received program for supplementary pediatric radiology education, demonstrated by sustained participation and consistently high participant-perceived value. The program addresses a critical need for subspecialty training support in LMICs, with potential for expanded outreach and research collaborations.

CLINICAL RELEVANCE/APPLICATION

This project addresses the shortage of pediatric radiology expertise in LMICs by supplementing subspecialty education, aiming to improve diagnostic skills, and enhance the quality of patient care in these regions.

W2-SPNPM-3 FROM SOLO TO SYMPHONY: HOW MDM PARTICIPATION ENHANCES PROSTATE MRI INTERPRETATION

Pat Rohan, MBBS (*Presenter*)
Conor Brosnan, MBChB (*Abstract Co-Author*)
James W. Ryan, FFR(RCSI), MBBCh (*Abstract Co-Author*)
Ruth M. Dunne, MBBCh (*Abstract Co-Author*)
Martina M. Morrin, MD (*Abstract Co-Author*)

PURPOSE

To evaluate whether consistent participation in multidisciplinary team meetings (MDMs) improves the diagnostic performance of radiologists interpreting prostate MRI. We hypothesised that radiologists engaged in MDMs would demonstrate higher diagnostic accuracy and better cancer detection rates by integrating clinical context into imaging interpretation.

METHODS AND MATERIALS

We conducted a retrospective analysis of 116 consecutive patients who underwent prostate MRI at outside institutions without a formal prostate cancer MDM but were referred to our specialist service to undergo cognitive fusion biopsy. MRI reports from non-MDM readers were compared with re-interpretations by radiologists who regularly participate in weekly prostate cancer MDMs. Data collected included PIRADS v2.1 scores, lesion size and location, PSA density (PSAD), and biopsy histology. Clinically significant prostate cancer (csPCa) was defined as ISUP grade group =2. Diagnostic metrics including sensitivity, specificity, positive and negative predictive values (PPV, NPV), and area under the ROC curve (AUC) were calculated using thresholds of PIRADS =3 and =4. Interobserver agreement was assessed using kappa statistic. Logistic regression evaluated the relationship between PSAD and csPCa stratified by PIRADS score.

RESULTS

At a PIRADS =4 threshold, the MDM group achieved significantly higher specificity (40% vs 13%, p = 0.039) and greater overall accuracy (AUC 0.69 vs 0.55). Sensitivity remained high in both groups (MDM: 100%, non-MDM: 96%). Cancer detection rates (CDRs) were higher in the MDM group at PIRADS 4 (56% vs 50%) and PIRADS 5 (94% vs 86%). Interobserver agreement between groups was moderate (? = 0.62), with best agreement at PIRADS 5 (? = 0.77) and lowest at PIRADS 3 (? = 0.40). Logistic regression demonstrated a significant association between increasing PSAD and likelihood of csPCa at PIRADS 4 in both groups.

CONCLUSION

Regular engagement in multidisciplinary team meetings significantly improves the specificity and diagnostic confidence of radiologists interpreting prostate MRI. These findings suggest that MDM participation enhances interpretation through integration of imaging with clinical and pathological context.

CLINICAL RELEVANCE/APPLICATION

Embedding radiologists in multidisciplinary prostate cancer teams enhances diagnostic accuracy in prostate MRI, supporting improved patient selection for biopsy and treatment. This study underscores the broader value of noninterpretive collaboration in radiologic practice and provides evidence for its integration into routine imaging pathways.

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W2-SPNR

Neuroradiology Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPNR-1 VISUAL-SOMATOSENSORY CONNECTIVITY DISRUPTION IN CERVICAL SPONDYLOTIC MYELOPATHY: ASSOCIATIONS WITH SPINAL CORD METRICS AND CLINICAL SEVERITY

Shuting Huang (*Presenter*)
Weiyin Vivian Liu (*Abstract Co-Author*)
Long Yu Deng (*Abstract Co-Author*)
Zhang Qiya (*Abstract Co-Author*)
Xiangyu Tang (*Abstract Co-Author*)

PURPOSE

Cervical spondylotic myelopathy (CSM) is a prevalent degenerative condition characterized by spinal cord compression, leading to sensorimotor deficits and, in some cases, cognitive impairments. Recent neuroimaging studies reveal that CSM not only affects spinal structures but also induces functional and structural brain changes. Based on prior evidence of regional homogeneity alterations in S1, this study aimed to further investigate reorganization of S1 functional connectivity using resting-state fMRI (rs-fMRI) in CSM and assess associations with spinal metrics and clinical severity.

METHODS AND MATERIALS

A total of 62 CSM patients with herniated discs (36 males, mean age 47.6 ± 14.1 years) and 36 healthy controls (18 males, mean age 46.6 ± 9.7 years) underwent brain rs-fMRI, high-resolution 3D T1-weighted structural imaging, and quantitative synthetic MRI of the cervical spinal cord on a 3.0T MR scanner (Premier, GE Healthcare). CSM patients were stratified into T2-hyperintensity and non-hyperintensity groups based on spinal cord MRI. Quantitative metrics, including T1, T2 and PD values, were extracted at the maximal compression level (MCL). The rs-fMRI data were preprocessed with slice-timing correction, head motion correction, spatial smoothing using a Gaussian kernel with a 6-mm FWHM, nuisance covariate regression, and linear detrending, followed by fitting to a fMRI model and normalization to MNI space by registering T1w images to the MNI template using SPM12 (http://dbm.neuro.uni-jena.de/vbm/) and the DPABI toolbox (http://rfmri.org/DPABI). Seed-based correlation analysis (SCA) was performed using S1 as the seed to evaluate whole-brain FC. Connectivity strengths were extracted and correlated with spinal imaging indices and clinical scores, including the Japanese Orthopaedic Association (JOA) score.

RESULTS

In the T2-hyperintensity subgroup, FC between left S1 and the occipital lobe was significantly reduced versus both healthy controls ($P<0.001$) and the non-hyperintensity subgroup ($P=0.002$). This diminished FC was negatively correlated with the maximum spinal cord compression (MSCC) ($P=0.007$) and T1 and T2 values at MCL ($P<0.01$). Conversely, a positive correlation was observed between S1-occipital FC and JOA scores ($P=0.005$).

CONCLUSION

S1-occipital functional disconnection in CSM, particularly in T2-hyperintensity patients, correlates with compression severity and clinical impairment.

CLINICAL RELEVANCE/APPLICATION

Visual-somatosensory FC may serve as a promising neuroimaging biomarker for assessing functional disruption in CSM.

W2-SPNR-2 PENUMBRAL OXYGEN EXTRACTION FRACTION INDEPENDENTLY PREDICTS INFARCTION GROWTH IN PATIENTS WITH ACUTE STROKE

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Ameera F. Ismail, MD (*Abstract Co-Author*)
Pouya Metanat, MD, MPH (*Abstract Co-Author*)
Elham Tavakkol, MD (*Abstract Co-Author*)
Mersedeh Bahr-Hosseini (*Abstract Co-Author*)
Viktor Szeder, MD (*Abstract Co-Author*)
Geoffrey Colby, MD,PhD (*Abstract Co-Author*)
Jeffrey Saver, MD (*Abstract Co-Author*)
Vivek Yedavalli, MD, MS (*Abstract Co-Author*)
Wade S. Smith, MD,PhD (*Abstract Co-Author*)
Nerissa Ko, MD (*Abstract Co-Author*)
Cathra Halabi (*Abstract Co-Author*)
Luis Savastano (*Abstract Co-Author*)
David A. Saloner, PhD (*Abstract Co-Author*)
Daniel L. Cooke, MD (*Abstract Co-Author*)
Steven W. Hetts, MD (*Abstract Co-Author*)
S.Andrew Josephson (*Abstract Co-Author*)
Kazim Narsinh, MD (*Abstract Co-Author*)
Christopher P. Hess, MD, PhD (*Abstract Co-Author*)
David S. Liebeskind (*Abstract Co-Author*)
Kambiz Nael, MD (*Abstract Co-Author*)

PURPOSE

In patients with acute ischemic stroke (AIS) infarct growth occurs despite successful reperfusion. Oxygen extraction fraction (OEF) has shown promising results in evaluating ischemic tissue viability and can now be quantified from routinely performed dynamic-susceptibility-contrast (DSC) perfusion. We aimed to determine the association of OEF alterations within the ischemic penumbra and infarct growth in patients who underwent successful reperfusion.

METHODS AND MATERIALS

In this retrospective study, patients included if they had anterior circulation large vessel occlusion (LVO); achieved successful reperfusion (TICI 2b); had pretreatment DSC perfusion and posttreatment MRI within 48 hours from reperfusion. Penumbra and ischemic core were segmented using Tmax >6s and ADC =620×10?6 mm²/s, respectively. OEF was calculated from DSC and normalized to contralateral tissue (OEF r). Posttreatment MRI was used to calculate final infarct volume. The following variables were calculated for assessment of infarction growth: 1) Infarction growth volume: Final infarction - baseline ischemic core volume; 2) Relative infarction growth %: infarction growth vol/final infarct volume x 100; 3) Penumbra-to-infarct conversion %: infarction growth vol/penumbra vol x 100. The association between OEF r in conjunction with demographic, clinical, and other imaging variables and infarct growth variables were evaluated by univariate and multivariate analysis.

RESULTS

Penumbra OEF r was independently associated with infarct growth ($p = 0.003$). Each 0.1-unit decrease in penumbra OEF r was associated with approximately 3 mL of infarct growth ($p=0.007$), 3% increase in infarct growth% ($p=0.005$) and approximately 10% loss of penumbra ($p = 0.027$). For patients who had substantial infarct growth (>10mL), penumbra OEF r was significantly ($p < 0.0001$) lower (median: 1.62) than patients without infarct growth (median: 2.05).

CONCLUSION

Penumbra-OEF r is a promising imaging biomarker for prediction of infarct growth in AIS following successful reperfusion. Inadequate raise in penumbra-OEF r values can result in further ischemic injury and infarct growth.

CLINICAL RELEVANCE/APPLICATION

OEF which now can be calculated from commonly performed DSC perfusion is a promising imaging biomarker that can be used to further refine infarct growth prediction offering advantageous therapeutic and prognostic implications.

W2-SPNR-3 DUAL-ENERGY CT-DERIVED ELECTRON DENSITY AND EFFECTIVE ATOMIC NUMBER FOR DIFFERENTIATION OF MALIGNANT BRAIN TUMORS: A MACHINE LEARNING-BASED APPROACH

Tsubasa Nakano (*Presenter*)
Daisuke Hirahara, RT (*Abstract Co-Author*)
Tomohito Hasegawa (*Abstract Co-Author*)
Masanori Nakajo, MD (*Abstract Co-Author*)
Kiyohisa Kamimura, MD, PhD (*Abstract Co-Author*)
Daiki Tobo (*Abstract Co-Author*)
Ryota Nakanosono, MD (*Abstract Co-Author*)
Hiroaki Nagano, MD, PhD (*Abstract Co-Author*)
Koji Takumi, MD, PhD (*Abstract Co-Author*)
Ryoji Yamagishi (*Abstract Co-Author*)
Fumitaka Ejima (*Abstract Co-Author*)
Takashi Yoshiura, MD, PhD (*Abstract Co-Author*)

PURPOSE

Recently, electron density (ED) and effective atomic number (Z eff) derived from dual-energy computed tomography (DECT) have been increasingly applied in clinical settings. The clinical significance of these parameters in brain tumors has not been clarified, and their clinical application remains limited. In this study, the potential use of ED and Z eff as novel quantitative imaging biomarkers for differentiating malignant brain tumors was investigated by constructing the predictive models with machine learning (ML) analysis.

METHODS AND MATERIALS

Data pertaining to 136 patients with a pathological diagnosis of brain metastasis (BM), glioblastoma, and primary central nervous system lymphoma (PCNSL) between January 2017 and March 2023 were retrospectively reviewed. The patient data were arranged chronologically and divided into training (first 60%), validation (next 20%), and test (remaining 20%) sets. Other than DECT-derived parameters, we included apparent diffusion coefficient (ADC) derived from diffusion-weighted MRI in the analysis. The 10th percentile, mean and 90th percentile values of conventional 120kVp CT value (CT conv), ED, Z eff , and relative ADC (rADC: ADC of lesion divided by ADC of normal-appearing white matter) within contrast-enhanced tumor region were extracted as features and used for model construction. AutoGluon, an open-source ML framework, was used to automatically develop and optimize predictive models. AUC, accuracy, precision, recall, and F1-score for classifying between two groups (BMs vs. glioblastomas, BMs vs. PCNSLs, glioblastomas vs. PCNSLs) were analyzed using ML models for each of the following: DECT alone, rADC alone, and DECT + rADC.

RESULTS

In the differentiation between BMs and glioblastomas, the model with DECT features exhibited a high AUC (0.83). In contrast, the AUC of the model with rADC features was poor, and no improvement was observed even when combined with DECT. In the differentiations involving PCNSLs, models with rADC features exhibited very high diagnostic performance (BMs vs. PCNSLs: AUC = 0.97; glioblastomas vs. PCNSLs: AUC = 0.94). Although the models with DECT features were not as good as those with rADC features, combining DECT and rADC features enabled the development of the best diagnostic model in the differentiation between BMs and PCNSLs (AUC = 1).

CONCLUSION

This study suggested the potential of DECT derived ED and Z eff as novel quantitative imaging biomarkers for the differentiation of malignant brain tumors.

CLINICAL RELEVANCE/APPLICATION

CT is an indispensable routine preoperative examination for brain tumors, and this work has discovered new diagnostic possibilities from the spectral data obtained through the standard procedure.

W2-SPNR-4 RECOGNIZING IMAGING PATTERNS OF NEUROLOGICAL INJURIES IN INTIMATE PARTNER VIOLENCE:A CASE-CONTROL STUDY

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PURPOSE

To characterize neurologic injuries in Intimate Partner Violence (IPV) using radiologic data and compare injury patterns with a demographically matched control group.

METHODS AND MATERIALS

This retrospective study analyzed radiology reports from female patients who reported IPV between 2013 and 2018 (n = 1,183; 14,036 imaging reports) and age- and race-matched controls who never reported IPV (n = 4,105; 21,474 reports). Of these, 16.7% of cases and 4.8% of controls have at least one neurological injury. Neurological injury data were extracted. Incidence rates (injuries per person-year) and adjusted incidence rate ratios (aIRRs, 95% CIs) were calculated using Poisson regression, adjusting for age and ethnicity. $P < 0.05$ was considered statistically significant.

RESULTS

Cases had significantly higher incidence rates for multiple neurological injuries compared to controls. Notably, middle facial fractures (IRR 5.80, 95% CI 3.57-9.41, p<0.0001), middle subcutaneous swelling (IRR 6.42, 95% CI 3.92-10.49, p<0.0001), orbital injuries (IRR 7.77, 95% CI 2.97-20.31, p<0.0001), and extra-axial injuries (IRR 3.51, 95% CI 1.97-6.26, p<0.0001) were significantly increased in IPV cases. Specific fracture types such as mandibular fractures (IRR 25.59, 95% CI 3.06-214.01, p=0.003) and occipital fractures (IRR 17.10, 95% CI 1.77-165.35, p=0.01) also demonstrated high relative incidence. Notably, nasal bone fractures had an elevated risk (IRR 5.35, 95% CI: 3.08-9.30, p<0.0001).

CONCLUSION

Women with a history of IPV are more likely to present with facial fractures, soft tissue swelling, and orbital injuries. IPV survivors exhibited diverse trauma patterns, while controls more often had isolated intracranial injuries. These results highlight the need for careful radiologic assessment to identify characteristic injury patterns in IPV cases.

CLINICAL RELEVANCE/APPLICATION

Radiologists play a crucial role in identifying IPV by recognizing characteristic injury patterns, particularly in the craniofacial region. Early recognition can guide timely intervention and connect patients with necessary support services.

W2-SPNR-5 BASELINE CAPILLARY TRANSIT TIME HETEROGENEITY, LEAKAGE, AND CEREBRAL BLOOD VOLUME PREDICT INTRACEREBRAL HEMORRHAGE AFTER ACUTE ISCHEMIC STROKE

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PURPOSE

To evaluate the predictive role of perfusion-derived biomarkers—relative capillary transit time heterogeneity (rCTH), microvascular leakage, and cerebral blood volume (rCBV)—in the baseline ischemic core for forecasting the risk of intraparenchymal hemorrhage (IPH) following reperfusion therapy in acute ischemic stroke (AIS).

METHODS AND MATERIALS

This retrospective study included AIS patients who underwent baseline MRI including diffusion-weighted imaging (DWI) and dynamic susceptibility contrast (DSC) perfusion before reperfusion therapy, followed by post-treatment imaging within 7 days to assess for IPH. The ischemic core was defined as regions with ADC < 620 × 10?6 mm²/s. Voxel-wise maps of CTH, leakage, and CBV were generated using a Bayesian probabilistic model and normalized to the contralateral hemisphere to yield relative metrics (rCTH, relative leakage, and relative CBV). Group-wise comparisons were performed between patients with IPH and without IPH. Predictive value was assessed via univariate and stepwise multivariate logistic regression. Odds ratios (OR), 95% confidence intervals (CI), and p-values were reported. ROC analysis was performed to evaluate discriminative performance.

RESULTS

A total of 33,209 voxels for each map across infarct regions were analyzed. IPH occurred in 33 of 104 patients (31.7%) based on follow-up imaging. Patients with IPH demonstrated significantly higher values rCTH and relative leakage values, and significantly lower relative CBV in the ischemic core compared to patients without IPH ($p < 0.001$ for all). In univariate logistic regression, higher rCTH (OR = 1.15, 95% CI: 1.13-1.18, $p < 0.0001$), higher relative leakage (OR = 1.02, 95% CI: 1.02-1.03, $p < 0.0001$), and lower rCBV (OR = 0.77, 95% CI: 0.75-0.80, $p < 0.0001$) were significantly associated with IPH. In multivariate stepwise regression, all three variables remained independent predictors of IPH.

CONCLUSION

Increased rCTH and microvascular leakage, along with decreased relative CBV, in the baseline ischemic core are independent predictors of post-treatment IPH in AIS patients. These perfusion biomarkers may have potential for prediction of IPH in ais patients undergoing reperfusion therapies.

CLINICAL RELEVANCE/APPLICATION

Combining rCTH, leakage, and rCBV from baseline MR perfusion could enable hemorrhagic risk stratification, potentially informing treatment strategies and improving safety of thrombolytic and endovascular therapies in acute stroke.

W2-SPNR-6 THE RELATIONSHIP BETWEEN ACID-BASE METABOLISM IN BRAIN TISSUE DETECTED BY APTW IMAGING AND COGNITIVE FUNCTION OF PATIENTS WITH MOYAMOYA DISEASE

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PURPOSE

Assessing alterations of brain microenvironment would develop a potential target for the treatment of cognitive impairment in moyamoya disease (MMD). This study aimed to assess acid-base metabolic levels of brain tissue using amide proton transfer weighted (APTw) imaging and their relationship with cognitive function in MMD patients.

METHODS AND MATERIALS

Patients with MMD and matched healthy controls (HCs) from June 2021 to August 2024, were prospectively recruited. Subjects underwent APTw and computed tomography perfusion (CTP) imaging. All participants were examined using a 3.0T Philips Elition MRI scanner. B0-corrected APTw images were transferred to Philips InteliSpace Portal workstation for automatic calculation of APTw values. Using NeuBrainCARE brain perfusion analysis software, measurements of mean transit time (MTT) and time to peak (TTP) in regions with impaired brain perfusion were obtained. To compare with normal tissue, APTw values were also measured in the normal-appearing white matter (NAWM) of unaffected regions in the same hemispheres, the contralateral hemispheres, and the ipsilateral cerebellar hemispheres. Cognitive function was assessed using the Cambridge Automated Neuropsychological Test Battery. Comparisons between multiple groups were conducted using ANOVA or Kruskal-

Wallis H test, with Bonferroni correction for multiple comparisons. Spearman correlation analysis was used to assess the relationship between APTw values in perfusion-impaired brain tissue and MTT, and TTP, as well as their volume and density values.

RESULTS

We included 54 MMD patients and 35 HCs. Compared to HCs, MMD patients had significantly lower APTw values in perfusion-impaired tissues and NAWM of bilateral cerebral hemispheres (P <0.01) (Figure 1-3). MMD patients also performed worse cognition than HCs in several domains, including motor screening task, multi-tasking tests, paired associates learning, five-choice reaction time, rapid visual processing, stockings of Cambridge, spatial working memory, and stop signal task (P <0.05). A good correlation was observed between APTw values in perfusion-impaired brain tissue of MMD patients and cognitive impairments in different domains such as executive function, visual memory, psychomotor speed, spatial planning, and executive function (P <0.05).

CONCLUSION

The APTw value can reflect the acidosis in perfusion-impaired brain tissue of MMD patients, with brain acid-base metabolic levels potentially affecting cognitive domain function.

CLINICAL RELEVANCE/APPLICATION

APTw imaging offers a novel neuroimaging biomarker for evaluating acid-base metabolism in brain tissue, representing a potential target for future treatment of cognitive impairment in MMD.

W2-SPNR-8 PREOPERATIVE RADIOLOGIC DIAGNOSIS AND SUBTYPING OF WHO GRADE I MENINGIOMAS USING GPT 4 WITH VISION ASSISTED PATTERN RECOGNITION

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PURPOSE

To evaluate the diagnostic performance GPT-4V, a vision-enabled large language model, to identify and subtyping WHO Grade I meningiomas on preoperative MRI, and to compare its diagnostic performance with that of an experienced neuroradiologist.

METHODS AND MATERIALS

This study retrospectively included 113 patients with histopathologically confirmed WHO Grade I meningiomas. For each case, axial T1, T2, T2-FLAIR, contrast-enhanced T1, DWI, ADC, coronal T2, and sagittal T1 sequences were exported in PNG format for standardized visual review. A neuroradiologist and GPT-4V independently evaluated the anonymized images, blinded to clinical and pathological data. Reviewers assessed whether the lesion was a WHO Grade I tumor, a meningioma, and, if so, its histologic subtype. Evaluations were based on T1/T2 signal intensity, peritumoral edema, enhancement pattern, signal homogeneity, and ADC values.

RESULTS

GPT-4V correctly identified WHO Grade I tumors in 88.6% of cases (100/113), while the neuroradiologist achieved 96.4% accuracy (109/113) (p = 0.044). When asked specifically to recognize WHO Grade I meningiomas, GPT-4V achieved 77.3% accuracy (87/113), compared to 92.9% (105/113) by the neuroradiologist (p = 0.0016). Subtype predictions proved more difficult for both readers: GPT-4V correctly classified 16.8% (19/113), while the radiologist correctly classified 32.7% (37/113) (p = 0.0088).Angiomatous meningiomas were generally considered the most radiologically distinctive subtype, typically showing low T1 signal, high T2 signal, marked peritumoral edema, and homogeneous enhancement. Despite these features, they were frequently misclassified by both the model and the neuroradiologist

CONCLUSION

GPT-4V showed diagnostic performance approaching that of a neuroradiologist in detecting WHO Grade I tumors on routine MRI. However, its ability to differentiate between histologic subtypes remains limited.

CLINICAL RELEVANCE/APPLICATION

Reliable preoperative identification of WHO Grade I meningiomas may support better surgical planning and patient counseling. GPT-4V, when carefully validated, could serve as useful adjuncts in radiologic interpretation by offering consistent pattern recognition across large imaging datasets.

W2-SPNR-9 LONG-TERM BLOOD PRESSURE EXPOSURE AND CEREBRAL MICROBLEEDS: A RETROSPECTIVE STUDY FROM THE META-KLS COHORT

Liu Wenjuan (*Presenter*)

PURPOSE

The relationship between long-term blood pressure factors and cerebral microbleeds (CMBs) in community populations remains unclear. This study aimed to elucidate the associations between various long-term blood pressure factors and the occurrence of CMBs within the Kailuan cohort.

METHODS AND MATERIALS

Data were obtained from adults participating in the Multi-Modality Medical Imaging Study Based on the Kailuan Study (META-KLS), a prospective longitudinal community study initiated in 2006, involving participants aged 18-98 years. A total of 752 participants underwent brain magnetic resonance imaging (MRI) between 2021 and 2022. We calculated long-term blood pressure factors, including cumulative exposure, long-term blood pressure variability, and blood pressure trajectories, using established formulas and trajectory models. Linear regression analyses were conducted to examine the associations between these blood pressure factors and the presence of CMBs, adjusting for demographic factors, cardiovascular risk factors, and cerebral blood flow on MRI. Brain MRI outcomes included the presence and classification of CMBs.

RESULTS

A total of 752 participants were included, with a mean age of 56.4 ± 10.8 years. Of these, 448 (59.6%) were men and 304 (40.4%) were women. A diagnosis of CMBs was established in 172 individuals, accounting for 22.9% of the cohort. Cumulative systolic blood pressure (SBP) was identified as an independent risk factor for the occurrence of CMBs (OR = 1.004, 95%CI: 1.002-1.005). This association remained significant after adjusting for sociodemographic and cardiovascular risk factors (OR= 1.002, 95% CI: 1.000-1.004). Participants with deep-type CMBs had significantly higher cumulative SBP compared to those with lobar-type CMBs (P = 0.005). No significant correlations were found between the occurrence of CMBs and cumulative diastolic blood pressure (DBP), cumulative pulse pressure difference, blood pressure trajectories, or long-term blood pressure variability.

CONCLUSION

In community population, elevated cumulative SBP is an important risk factor for CMBs, particularly affecting deep brain tissue.

CLINICAL RELEVANCE/APPLICATION

Our study has several strengths. META-KLS is a community database that allows comprehensive evaluation of the relationship between various risk factors and subclinical brain diseases using multimodal medical imaging, including a wide range of volunteers aged between 18 and 98. This wide age range can also help detect

early brain lesions, and even preclinical changes in brain microstructure. Moreover, the multimodal brain MRI and high-resolution imaging that the participants undergo in this study provides for clear display and accurate diagnosis of brain diseases.

W2-SPNR-10 PREDICTORS OF CLINICAL OUTCOME AFTER ENDOVASCULAR COILING OF UNRUPTURED INTRACRANIAL ANEURYSMS

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PURPOSE

To identify patient, aneurysm, and procedural risk factors associated with neurological dependency and poor long-term outcomes following endovascular coiling of unruptured intracranial aneurysms (UIAs).

METHODS AND MATERIALS

We retrospectively reviewed all patients with UIAs treated with coiling at The Ottawa Hospital from January 2003 to July 2024. Patients treated with flow diversion, parent artery occlusion, or other intra-saccular devices were excluded. We collected clinical, procedural, and aneurysm characteristics to assess predictors of pre-discharge and long-term outcomes using the modified Rankin Scale (mRS). Multivariate logistic regression was used to identify factors associated with unfavourable outcomes (mRS 3-5).

RESULTS

A total of 202 patients (mean age 55.3 years; 76.7% female) were included. Mean clinical and imaging follow-ups were 112.5 and 51.4 months, respectively. Unfavourable mRS outcomes occurred in 4.0% at baseline, 7.4% at discharge, and 9.9% at last follow-up. Immediate post-procedure occlusion was complete in 46.5% of cases; this declined to 37.2% at final follow-up. Perioperative complication and 30-day mortality rates were 19.8% and 1.0%, respectively. Conventional coiling technique (OR 6.82, p=0.01) and perioperative complications (OR 3.84, p=0.045) were independently associated with poor short-term outcomes. Long-term outcomes were predicted by conventional coiling (OR 3.20, p=0.03) and the number of aneurysms per patient (OR 1.45, p=0.024). Aneurysm size, location, and patient demographics were not predictive.

CONCLUSION

Over 21 years, conventional coiling technique and the number of aneurysms were significant predictors of poor long-term in endovascular UIA treatment. Perioperative complications and conventional technique predicted worse short-term outcomes, while aneurysm size, location, and patient demographics did not significantly influence clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

These findings emphasize the need for careful technique selection and perioperative management in patients undergoing endovascular coiling for unruptured intracranial aneurysms. Identifying patients with multiple aneurysms and those at higher risk for procedural complications may help guide treatment planning, improve procedural safety, and optimize long-term neurological outcomes.

W2-SPNR-11 CT PERFUSION TMAX PREDICTS DEVELOPMENT OF DELAYED CEREBRAL ISCHEMIA IN ANEURYSMAL SUBARACHNOID HEMORRHAGE

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PURPOSE

Delayed cerebral ischemia (DCI) occurs in up to 30% of patients with aneurysmal subarachnoid hemorrhage (aSAH) and results in significant morbidity and mortality. There remains no reliable methodology to predict the risk of DCI. CT perfusion (CTP) has emerged as an imaging modality that provides quantitative assessment of tissue perfusion via parameters including time-to-maximum (Tmax), cerebral blood flow (CBF), and cerebral blood volume (CBV). We hypothesized that assessment of CTP metrics at multiple timepoints would help stratify the risk of developing DCI in patients with aSAH.

METHODS AND MATERIALS

We performed a retrospective review of patients with aSAH diagnosed on CT Head and CTA, presenting to our institution between January 2023 and May 2025. Demographics, clinical data, and imaging findings were collected. CTP metrics including the volume which exceeded the predefined thresholds for Tmax, CBF, and CBV were analyzed at baseline and across multiple scans. The diagnosis of DCI was established based on a new infarct on CT head or MRI during the hospital course.

RESULTS

A total of 53 patients with aSAH were included, 34 (64%) of which developed DCI. In total 19 patients had one CTP scan, while 34 had multiple scans (2.7±1.0/patient) with an average 6.2±2.5 days from the baseline scan. When comparing baseline CTP scans, the difference in volume between Tmax>6 seconds and Tmax>8 seconds was statistically significantly increased in patients that developed DCI compared to those that did not ($p = 0.03$). When comparing the mean, median, and maximum values at multiple timepoints the difference persisted, as well as when comparing the maximum and mean values of Tmax>6 between groups ($p < 0.01$). Classification tree analysis demonstrated the difference between Tmax>6 and Tmax>8 was the most important predictor for developing DCI, as if it was greater than 2.3 the risk of DCI was 90% (95% CI: 70-100%) compared to 49% (95% CI: 34-63%).

CONCLUSION

CTP may help predict the risk of DCI in patients with aSAH. Of the CTP parameters, the Tmax, (specifically Tmax>6, Tmax>8, and the difference between them), was associated with the development of DCI on both the baseline and subsequent exams. Additional research is needed to validate the use of Tmax in DCI prognostication and inform treatment decision making for these patients with aSAH.

CLINICAL RELEVANCE/APPLICATION

There is currently no reliable methodology to predict the risk of delayed cerebral ischemia in patients presenting with aneurysm subarachnoid hemorrhage despite the significant morbidity and mortality. This retrospective review suggests that CTP, particularly Tmax, may be associated with the development of DCI. CTP may have a role in prognostication and treatment decision making in patients presenting with aSAH.

W2-SPNR-13 ACTIVE LEARNING-ENHANCED BRAINSTEM SEGMENTATION ENABLES DIFFERENTIATION BETWEEN PSP AND PD

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PURPOSE

To develop an active learning-based deep learning method for midbrain and pons segmentation to potentially distinguish PSP from PD using a limited number of annotated T1-weighted MRIs.

METHODS AND MATERIALS

A total of 1,483 T1-weighted MRIs from internal and PPMI (PD) datasets were included in this study and used to develop and evaluate a midbrain and pons segmentation model based on the nnU-Net architecture. All images underwent N4 bias field correction and preprocessing with the HD-BET brain extraction algorithm. From these datasets, 18 images were randomly selected and manually annotated 10 for training and 8 for testing. After training an initial nnU-Net model, inference was performed on the remaining unlabeled data. Two physicians from the Department of Radiology, both with MD degrees and experience in neuroradiology, reviewed the predictions and identified the 8 poorest segmentations, which were then manually annotated and added to the training set. The nnU-Net model was retrained to incorporate these challenging cases. The Dice similarity coefficient (DSC) was calculated on the test dataset to compare model performance before and after retraining. Finally, the mid slices of the images are selected, and midbrain-to-pons area ratio was computed from the segmentation results and used to differentiate patients with progressive supranuclear palsy (PSP) from those with Parkinson's disease (PD).

RESULTS

For the active learning component of the study, we observed a clear improvement in segmentation performance after model retraining. The DSC for midbrain increased from 0.866 to 0.906, and for pons, from 0.919 to 0.943, indicating enhanced anatomical delineation through iterative learning. The PD group exhibited a mean ratio of 0.254 ± 0.055, while the PSP group showed a significantly lower mean ratio of 0.220 ± 0.048. This difference was statistically significant (Mann-Whitney U test, $p < 0.01$). The effect size, calculated using Cohen's d, was 0.655, indicating a moderate to strong distinction between the two groups. A representative segmentation illustration and the comparative distribution plots in Figure 1.

CONCLUSION

In conclusion, active learning markedly improves brainstem segmentation accuracy—particularly for the midbrain and pons—while significantly reducing manual annotation effort.

CLINICAL RELEVANCE/APPLICATION

his study presents an efficient and accurate method for brainstem segmentation using active learning, which reduces manual labeling effort while maintaining high precision. The derived midbrain-to-pons area ratio enables automated differentiation between PSP and PD, offering valuable support for clinical diagnosis and decision-making in neurodegenerative disorders.

W2-SPNR-14 FINE-TUNING A SMALL LARGE LANGUAGE MODEL (LLM) WITH OPTIMAL COMBINATION OF SYNTHETIC AND REAL-WORLD RADIOLOGY REPORTS FOR EFFECTIVE STRUCTURED REPORTING (SR) ON BRAIN VASCULATURE

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PURPOSE

To develop an LLM capable of transforming unstructured radiology reports on brain MRI with TOF-MRA into structured radiology reports focusing on the specific findings of brain vasculature, utilizing sequential two-stage training.

METHODS AND MATERIALS

Retrospective review of radiology reports was conducted for 1100 aneurysmal patients who took brain MRA between 2021.01 and 2024.04. Sections elaborating on aneurysm, stenosis, and occlusion were extracted from each unstructured radiology report to construct a corresponding structured report. For the LLM, BioGPT was used. Three sets of synthetic pairs of unstructured/structured reports with different sizes (25000, 50000, 100000) were generated, and used for the initial training of model. Three sets of real-world pairs of unstructured/structured reports with different sizes (300, 600, 900) were used for the subsequent fine-tuning (FT) of model. The 200 real-world unstructured radiology reports, previously unexposed to model, were used for testing. Three language metrics: BERTScore, BLEU, Cosine Similarity TF-IDF were used for the comprehensive assessment of output report from the final model.

RESULTS

The 1100 patients comprised 736 females and 364 males with a median age of 63 years (range 18-92 years). With the initial training data size fixed at 100000 report pairs, positive correlation was observed between FT data size and model performance: 900 FT data led to the highest metric output ($p < 0.0001$), followed by 600, 300, and 0. With FT data size fixed at 900, the model initially trained with 50000 or 100000 synthetic data outperformed that with 25000 synthetic data; intriguingly, the model initially trained with 50000 report pairs exhibited superior performance to the model initially trained with 100000 ($p < 0.0001$). The highest metric output was obtained from the model trained with 50000 synthetic pairs followed by FT with 900 real-world pairs: average BERTScore 0.78, BLEU 0.91, Cosine Similarity TF-IDF 0.97. SR performance of the final model differed depending on the complexity of each input test report: the highest metric output was attained for the reports only containing aneurysmal information, while the lowest metric output was obtained for the reports containing all three types of information on aneurysm, stenosis, and occlusion.

CONCLUSION

Large number of synthetic radiology reports can effectively be used in combination with small number of real-world reports to optimally refine an LLM for SR, using two-stage training.

CLINICAL RELEVANCE/APPLICATION

Using this approach, small LLMs fine-tuned for various SR can be efficiently developed and optimized even with the limited number of real-world reports, thereby facilitating the seamless integration of SR into daily radiology practice.

W2-SPNR-15 ADVANCED MRI METHODS FOR ASSESSING WHITE MATTER INJURY AND DRUG EFFICACY IN EXPERIMENTAL ISCHEMIC STROKE IN MICE

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PURPOSE

To identify multi-parametric MRI (mpMRI) biomarkers for monitoring the effects of acute ischemic stroke (AIS) over time and evaluating the efficacy of a repurposed neuroimmune cell-targeted K Ca 3.1 inhibitor drug senicapoc in attenuating AIS-induced injury to white matter (WM).

METHODS AND MATERIALS

We conducted in vivo mpMRI on mouse brains following middle cerebral artery occlusion/reperfusion (tMCAO/R)-induced AIS to acquire diffusion tensor imaging (DTI)/neurite orientation dispersion and density imaging (NODDI) parameters and assess infarct volume in the mouse brain using high-resolution T2-weighted (T2w) images. Imaging took place on a 14 Tesla (T) MR scanner on days 7 and 30-post tMCAO/R, following a 7-day drug treatment regimen with either senicapoc or a vehicle. The assessed infarct volumes calculated by T2w images were compared to DTI/NODDI parameters on regions of interest (ROIs) of both the ipsilateral (stroke-affected) and contralateral (non-stroke) sides. The DTI/NODDI data were analyzed using 2-way ANOVA to assess time effects between 10 vehicle-treated and 9 senicapoc-treated mice at 7 and 30 days post-tMCAO/R.

RESULTS

The external capsule (WM tract) in the mid-brain was analyzed on both the ipsilateral and contralateral sides using a T2w image. DTI parameters fractional anisotropy (FA), mean diffusivity (MD), and axial diffusivity (?1) showed significant AIS-induced changes ($p < 0.05$) on the ipsilateral, but not on the contralateral, side in an anatomically restricted manner corresponding to regions of acute infarction. Similarly, several NODDI parameters, including orientation dispersion index (odi), fractional intracellular volume fraction (ficvf), fractional isotropic volume fraction (fiso), and kappa, also showed significant ($p < 0.05$) AIS-induced changes on the ipsilateral, but not on the contralateral, side. Senicapoc demonstrated significant attenuating effects on AIS-induced changes in both DTI and NODDI parameters over time. Treatment with senicapoc compared to vehicle significantly attenuated AIS-induced responses in DTI parameters MD, eigenvalues ?1 and ?2 as well as NODDI parameters ficvf and odi ($p < 0.05$) in the same regions of acute infarction noted above.

CONCLUSION

This study demonstrates the potential of DTI/NODDI methods as effective tools for assessing WM injury and recovery after experimental AIS in mice. Also, these techniques show promise in monitoring the therapeutic effects of a repurposed drug, designed to blunt post-stroke neuroinflammation.

CLINICAL RELEVANCE/APPLICATION

DTI/NODDI methods provide a noninvasive and reliable approach to evaluate the progression of AIS and monitor patient responses to treatment, offering potential for advancing clinical stroke management.

W2-SPNR-17 INTRACRANIAL HEMODYNAMICS AND ENLARGED PERIVASCULAR SPACES IN CEREBRAL SMALL VESSEL DISEASE: A 4D FLOW MRI STUDY

Chang Yuan (*Presenter*)
Yan Wei Miao (*Abstract Co-Author*)

PURPOSE

To evaluate the relationship between intracranial hemodynamic alterations and the burden of enlarged perivascular spaces (EPVS) in patients with cerebral small vessel disease (CSVD) using 4D Flow MRI.

METHODS AND MATERIALS

Seventy-five patients clinically diagnosed with CSVD were prospectively enrolled. Intracranial hemodynamic parameters—including pulsatility index (PI), flow rate, mean velocity, and peak velocity—were quantitatively assessed across nine major arterial segments: bilateral internal carotid arteries (C2, C4, C7), bilateral middle cerebral arteries (M1), and the basilar artery (BA). EPVS severity in the basal ganglia (BG) and centrum semiovale (CSO) was graded using a validated visual rating scale. Ordinal logistic regression was used to examine associations between vascular parameters and EPVS scores.

RESULTS

Higher EPVS scores in both the BG and CSO were significantly associated with lower flow rate, mean velocity, and peak velocity. Elevated PI in the MCA-M1 segment was significantly associated with increased BG-EPVS burden (OR = 0.10; 95% CI: 0.01-0.95; $P < 0.05$), while increased PI in the BA was significantly associated with higher CSO-EPVS scores (OR = 7.48; 95% CI: 1.16-48.01; $P < 0.05$).

CONCLUSION

Intracranial arterial hemodynamic abnormalities, particularly increased pulsatility and reduced flow velocities, are significantly associated with regional EPVS burden in CSVD patients.

CLINICAL RELEVANCE/APPLICATION

This study reveals that intracranial hemodynamic disturbances may play a key role in the formation of enlarged perivascular spaces associated with cerebral small vessel disease.

W2-SPNR-18 DEEP-LEARNING-RECONSTRUCTED 3D TOF MRA FOR CEREBRAL ARTERIOVENOUS MALFORMATIONIMAGE QUALITY AND EVALUATION

Linshu Yang (*Presenter*)
Chunxue Wu (*Abstract Co-Author*)
Jie Lu, PhD (*Abstract Co-Author*)

PURPOSE

Cerebral arteriovenous malformations (AVMs) require precise imaging for evaluating hemorrhage risk. Time-of-flight magnetic resonance angiography (TOF-MRA) is limited by prolonged acquisition times, motion artifacts, and spatial resolution compromises from conventional acceleration techniques (e.g., GRAPPA, SENSE, CS). This study evaluates a deep learning based reconstruction (AIR™ Recon DL) for TOF-MRA to improve image quality in healthy subjects and AVM patients.

METHODS AND MATERIALS

Ten healthy subjects (mean age 22.3 years) and eight AVM patients (mean age 34.2 years) underwent 3T TOF-MRA (SIGNA Premier, GE Healthcare) with identical parameters reconstructed via DL (high noise reduction) and conventional Filter A. Quantitative analysis in healthy subjects measured SNR [(artery signal/SD of brainstem)], contrast [(vessel SI-brainstem SI)/(vessel SI+brainstem SI)], and vessel uniformity (min/max SI ratio) across nine arteries. AVM nidus SNR/contrast and qualitative feeding artery (FA)/draining vein (DV) scores (4-point scale: 4=clearly continuous; 1=undetectable) were assessed. Statistical comparisons used t-tests/Mann-Whitney U tests; interrater agreement was evaluated via ? coefficients.

RESULTS

In healthy subjects, DL TOF-MRA demonstrated significantly higher SNR (all arteries, $P <0.0001$), contrast ($P <0.0001$), and uniformity in bilateral internal carotid, anterior cerebral, and basilar arteries ($P <0.05$) versus conventional TOF. For AVM patients, DL TOF-MRA achieved superior nidus SNR (203.90±75.97 vs. 47.39±5.80, $P <0.01$) and contrast (0.5035±0.1710 vs. 0.1738±0.09, $P <0.01$). Qualitative FA/DV scores showed no significant differences between DL and conventional TOF (FA: DL 3.88±0.35 vs. TOF 3.38±0.52, $P >0.05$; DV: DL 2.88±1.12 vs. TOF 3.12±0.99, $P >0.05$). Interrater agreement for FA/DV scores was strong (? =0.68-1.00, $P <0.01$). DL improved FA visualization in 4/8 cases (Reviewer A) and 3/8 cases (Reviewer B), with limited DV enhancement (1/8 cases for both reviewers).

CONCLUSION

DL-reconstructed TOF-MRA significantly enhances quantitative image quality for cerebral arteries and AVM nidus evaluation compared to conventional methods. While qualitative FA/DV visualization improvements were modest, DL reconstruction mitigates saturation artifacts and maintains diagnostic performance, supporting its clinical potential for non-invasive AVM characterization.

CLINICAL RELEVANCE/APPLICATION

DL TOF-MRA by improving critical image quality metrics without compromising diagnostic utility, offering a promising tool for detailed AVM assessment and reducing reliance on invasive or radiation-based modalities. Larger validation studies are warranted to confirm clinical applicability.

W2-SPNR-19 RADIOMICS NOMOGRAM BASED ON MAGNETIC RESONANCE IMAGING FOR THE PREDICTION OF TUMOR PURITY IN PATIENTS WITH GLIOBLASTOMA

Qing Zhou (*Presenter*)
Junlin Zhou, PhD (*Abstract Co-Author*)

PURPOSE

Tumor purity (TP) is an intrinsic feature of the tumor microenvironment (TME), and its accurate prediction in Glioblastoma(GBM) is critical for patient prognosis. We built a radiomics model based on use preoperative magnetic resonance imaging(MRI) to predict GBM TP.

METHODS AND MATERIALS

This retrospective study involved 172 patients(training set: n = 120; test set: n = 52)with gliomas(males, 98; females, 74; age, 51.90±12.54 years). Choose the optimal data cut-off value(63%) based on the basis of the minimum p value formed by the Kaplan-Meier survival analysis and log-rank tests divided patients into high TP group(=63%)and low TP group(<63%). Sketching Region of interest(ROI) and extracting radiomics features based on contrast enhanced T1WI(CE-T1WI) and T2WI .On the training set, LASSO regression was used to select the best combination of features, and establish clinical models ,radiomics models and clinical-radiomics models .

RESULTS

The clinical model was established base on age,peritumoral edema ,tumor location, enhencenment degree and ADC value, with AUCs of 0.669 and 0.781 for the training and test sets, respectively. Radiomics model was based on 14 features, with AUCs of 0.666 and 0.783 for the training and test sets, respectively. The clinical-radiomics model had the best performance, with AUCs of 0.769 and 0.884 for the training and test sets, respectively. The calibration curve of the clinical-radiomics model nomogram showed good agreement between the estimated and actual probabilities.

CONCLUSION

The combined model nomogram can help clinicians predict GBM TP and prognosis more accurately and intuitively.

CLINICAL RELEVANCE/APPLICATION

Quantitative prediction of tumor purity to identifying novel and promising prognostic biomarkers. Radiomic nomogram may offer a more intuitive and accurate assessment of tumor purity.

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W2-SPOB

OB/Gynecology Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPOB-1 MULTIPARAMETRIC DIFFUSION MODELING ENHANCES HISTOPATHOLOGICAL DISCRIMINATION IN CERVICAL CANCER: SYNERGISTIC VALUE OF COMBINED QUANTITATIVE METRICS

Zhilin Yuan (*Presenter*)
Yonglan He, MD (*Abstract Co-Author*)
Diwei Shi (*Abstract Co-Author*)
Yuan Li (*Abstract Co-Author*)
Xin Gao (*Abstract Co-Author*)
Shangying Yang (*Abstract Co-Author*)
Chen Wang (*Abstract Co-Author*)
Chen Jing (*Abstract Co-Author*)
Jing Ren, MD (*Abstract Co-Author*)
Zhengyu Jin, MD (*Abstract Co-Author*)
Hua Guo (*Abstract Co-Author*)
Huadan Xue, MD (*Abstract Co-Author*)

PURPOSE

To compare single versus multiparametric diffusion models in discriminating cervical cancer subtypes and differentiation grades.

METHODS AND MATERIALS

101 consecutive cervical cancer patients (68 squamous cell carcinoma(SCC), 33 adenocarcinoma(AC); 42 well/moderately differentiated, 15 poorly differentiated) underwent diffusion-weighted imaging with oscillating gradient spin-echo (OGSE), pulsed gradient spin-echo (PGSE), intravoxel incoherent motion (IVIM) and diffusion kurtosis imaging (DKI) acquisitions at 3T. Quantitative parameters were derived from four diffusion models: mono-exponential (apparent diffusion coefficient[ADC] from PGSE and OGSE), bi-exponential IVIM (pure molecular diffusion [D], perfusion fraction [f], pseudo-diffusion coefficient [D*]), DKI (mean kurtosis [MK], mean diffusivity [MD]), and a multicompartment model (cell diameter [d], intracellular volume fraction [Vin], extracellular diffusivity [Dex], interchange rate between intracellular and extracellular signals [Kin]). These parameters were analyzed both individually and in combination for histologic subtype discrimination and differentiation grade assessment.

RESULTS

In cervical cancer subtyping, d, Dex, Kin, ADC PGSE , ADC OGSE20HZ , ADC OGSE40HZ , f, D, MD showed significant differences between AC and SCC (all $p < 0.05$). The optimal parameters from four diffusion models for cervical cancer subtyping demonstrated the following AUCs: ADC OGSE40HZ (AUC=0.747), d (AUC=0.720), D (AUC= 0.685), and MD (AUC=0.660). Integration of these four parameters yielded the highest diagnostic accuracy for histopathological subtyping (AUC=0.867, 95% CI: 0.790-0.945), with 78.8% sensitivity and 85.3% specificity. For tumor grading, V in , MK, and D showed significant differences (all $p<0.05$; AUCs=0.735, 0.730, 0.695), while their multimodal integration with D ex , ADC PGSE , f enhanced performance (AUC=0.884, 95%CI=0.793-0.975; sensitivity=93.3%, specificity=66.7%).

CONCLUSION

Among four diffusion-weighted imaging quantitative models, ADC OGSE40HZ and d demonstrated comparable diagnostic efficacy in histopathological subtyping, outperforming D and MD, while their multiparametric integration showed best performance in accuracy. For tumor grading, V in and MK exhibited moderate discriminative capacity, with multiparametric strategies achieving optimal diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

Quantitative diffusion parameters demonstrate efficacy in distinguishing cervical cancer histopathological subtypes and tumor differentiation, while multiparametric integration maximizes diagnostic accuracy, which may further enable preoperative risk stratification to optimize therapeutic decision-making.

W2-SPOB-3 DISCRIMINATING ACTIVE FROM FIBROTIC DEEP ENDOMETRIOSIS LESIONS USING T2-WEIGHTED MRI ALONE: A RADIOMIC AND GRAPHOMIC APPROACH

Vincenzo Lucidi, MD (*Presenter*)
Maria Chiara Di Giovanni (*Abstract Co-Author*)
Arrigo Cattabriga (*Abstract Co-Author*)
Cristina Mosconi, MD (*Abstract Co-Author*)

PURPOSE

To evaluate whether T2-weighted MRI alone, combined with AI-driven radiomic and graphomic analysis, can accurately differentiate active from fibrotic lesions in deep infiltrating endometriosis (DIE), potentially simplifying MRI protocols and guiding treatment decisions.

METHODS AND MATERIALS

In this retrospective single-center study, 89 histologically confirmed DIE lesions from 61 patients were analyzed. Only axial T2-weighted MRI scans were used. Radiomic features (n=1223) and 3D graph-based morphological features (n=78) were extracted from manual segmentations. Lesions were classified as active (glandular/stromal) or fibrotic based on histopathology. Machine learning pipelines with genetic algorithm feature selection and L2-regularized logistic regression were developed for lesion classification and pain correlation. Leave-one-out cross-validation was applied to ensure robustness.

RESULTS

Graphomic features achieved higher performance (balanced accuracy: 0.699) than radiomic features alone (0.655) in discriminating lesion types. Specific radiomic and graphomic features also correlated with pain patterns. The analysis focused on lesions with low T2 signal intensity, a common imaging finding historically linked to

fibrosis. Despite the lack of T1-weighted or contrast-enhanced sequences, AI analysis uncovered biologically active lesions within this visually homogeneous group, demonstrating potential for improved lesion characterization.

CONCLUSION

AI-driven radiomic and graphomic analysis of T2-weighted MRI can non-invasively differentiate biologically distinct DIE lesions, challenging conventional assumptions based solely on T2 signal. This approach may support protocol streamlining while enhancing diagnostic and therapeutic precision in endometriosis care.

CLINICAL RELEVANCE/APPLICATION

This study shows that radiomic and graphomic AI analysis of T2-weighted MRI alone can distinguish between active and fibrotic DIE lesions, which are visually similar but require different treatments. This opens the door to shorter MRI protocols and more personalized therapy planning

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W2-SPPD

Pediatric Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPPD-1 THE QUANTI PEDIATRIC STUDY: PHARMACOKINETICS AND SAFETY OF GADOQUATRANE IN PEDIATRIC PATIENTS UNDERGOING CONTRAST-ENHANCED MAGNETIC RESONANCE IMAGING (CE-MRI) WITH A REDUCED GADOLINIUM DOSE

Katja Glutig, MD (*Presenter*)
Elzbieta Jurkiewicz, MD, PhD (*Abstract Co-Author*)
Zhigang Gao (*Abstract Co-Author*)
Pavla Hanzlikova, MD,PhD (*Abstract Co-Author*)
YUKI YUZA (*Abstract Co-Author*)
Birgit B. Ertl-Wagner, MD, PhD (*Abstract Co-Author*)
Chris R. Hancock, MD, MBA (*Abstract Co-Author*)
Gabriele Sutter, PhD (*Abstract Co-Author*)
Candy Von Muenchhausen (*Abstract Co-Author*)
Petra Palkowitsch (*Abstract Co-Author*)
Viktoriia Fursenko (*Abstract Co-Author*)
MaximilianS Feldmueller (*Abstract Co-Author*)
Birte M. Hofmann, DVM, PhD (*Abstract Co-Author*)

PURPOSE

To investigate the pharmacokinetics (PK) and safety of gadoquatrane, a low-dose macrocyclic gadolinium (Gd) based contrast agent (GBCA), in pediatric patients from birth to<18 years undergoing contrast-enhanced MRI CE-MRI in any body region, in order to demonstrate similarity in PK and safety in the pediatric population compared to adults thus providing the basis for extrapolating the efficacy from adult to pediatric patients based on ICH E11 guidance.

METHODS AND MATERIALS

QUANTI Pediatric is an open-label phase 1/3 study, investigating gadoquatrane at a dose of 0.04 mmol Gd/kg body weight in pediatric patients. The study was conducted between July 2023 and October 2024 across 10 countries, in parallel with two phase 3 studies in adults using the same Gd dose. Patients were allocated to three age groups: 0-<2 y, 2-<12y, 12-<18y. Per pediatric and adult patient, three blood samples for PK assessment were taken post injection (p.i.) within predefined time-windows. Safety parameters such as adverse events and laboratory parameters were assessed up to 7 days p.i. In the exploratory efficacy analysis, pre- and post-gadoquatrane MRIs were evaluated.

RESULTS

Of the 105 screened pediatric patients, 93 received gadoquatrane, 59.1% were male. 62.4% of the patients underwent an MRI of the brain. For the PK assessment, 23 patients aged 0-<2y, 45 aged 2-<12y, and 24 aged 12-<18y were evaluable. Gd plasma concentrations and PK parameters were similar across all age groups and within the expected ranges. Comparison to concentration data in adults (with the same eGFR range) shows a large overlap within all three time windows. A tendency for slightly lower concentrations in pediatric patients at later time points can be explained by the slightly higher average eGFR. 16 (17.2%) patients experienced a treatment emergent adverse event (TEAE), 3 were reported as serious. 5 TEAEs (5.4%) were assessed as related to gadoquatrane by the investigator. Assessment of gadoquatrane MRI vs pre-contrast MRI showed increased mean visualization parameter scores from 1.0 to 3.3 for contrast enhancement, 3.2 to 3.7 for delineation and 2.7 to 2.9. for morphology. The overall clinical value of CE-MRI was moderately (21.5%) or substantially (62.4%) higher than pre-contrast.

CONCLUSION

Gadoquatrane exhibits similar PK and safety profiles across the 3 age groups of pediatric patients and the adults, allowing extrapolation of efficacy from adult to pediatric patients according to ICH guidance. Exploratory efficacy results support the extrapolation.

CLINICAL RELEVANCE/APPLICATION

Gadoquatrane is a GBCA for CE-MRI in development for all patient populations at a substantially reduced Gd (by 60%) and molecule dose (by 90%) compared to established macrocyclic GBCAs dosed at 0.1 mmol Gd/kg bw.

W2-SPPD-2 OPTIMIZING PEDIATRIC CHEST CT: SUPERIOR IMAGE QUALITY AND LOWER RADIATION DOSE WITH DEEP LEARNING RECONSTRUCTION

Ilaria Bianco, MD (*Presenter*)
Davide Ippolito, MD (*Abstract Co-Author*)
Cesare Maino, MD (*Abstract Co-Author*)
Davide G. Gandola, MD (*Abstract Co-Author*)
Cammillo R. Talei Franzesi (*Abstract Co-Author*)

PURPOSE

To compare image quality and radiation dose between deep learning-based and hybrid iterative reconstruction algorithms in unenhanced chest CT scans of pediatric patients.

METHODS AND MATERIALS

We retrospectively reviewed 142 unenhanced, single-phase chest CT scans performed for routine diagnostic purpose. 71 pediatric patients were examined using a 128-slice MDCT scanner (100 kV, automated mAs modulation) with a deep learning reconstruction (DLR) algorithm, while the control group of 71 patients underwent scanning with a 256-slice MDCT scanner (100 kV, automated mAs modulation) using hybrid iterative reconstruction algorithm. Subjective image quality was assessed using a 5-point Likert scale, and objective quality was evaluated by measuring Hounsfield Units (HU) and Standard Deviations (SD) in the lung parenchyma, air, tracheal

lumen, aorta and muscle. Radiation dose metrics (CTDIvol and DLP) were recorded for both groups, and the estimated effective dose (EED) was calculated using age-specific k-factors (0-11 months, 1-4 years, 5-9 years, and 10-16 years).

RESULTS

A total of 142 pediatric patients were included of whom 90 males and 52 females (median age of 10 years; IQR: 5-13). Inter-reader agreement for Likert scale image quality assessment was moderate (? = 0.432) with significantly higher subjective image quality scores for the DLR group compared to the iterative group (p = 0.03). Quantitatively, air and muscle attenuation values differed significantly between the two scanners (air: -994.5 vs -992 HU, p = 0.036; muscle: 49.4 vs 42.8 HU, p < 0.001). Image noise, assessed by standard deviation (SD), was significantly lower in the DLR group across the lung parenchyma (65.9 vs 81.3, p = 0.007), tracheal lumen (51.0 vs 69.8, p = 0.002), and muscle (11.7 vs 16.4, p < 0.001). Radiation dose metrics were significantly reduced in the DLR group (mean DLP: 49.6 vs 188.9 mGy*cm; CTDIvol: 1.6 vs 5.6 mGy; EED: 0.8 vs 3.2 mSv; all p < 0.001). Age-based sub-analysis using quartiles (0-5, 6-12, >13 years) confirmed a consistent threefold reduction in DLP and CTDIvol, and a fourfold reduction in EED across all age groups (all p < 0.001).

CONCLUSION

Deep learning-based reconstruction in unenhanced chest CT allows for significant radiation dose reduction in the pediatric population while delivering superior image quality compared to hybrid iterative reconstruction algorithms.

CLINICAL RELEVANCE/APPLICATION

This study supports the clinical implementation of deep learning-based reconstruction algorithm in pediatric chest CT, demonstrating that it enables substantial radiation dose reduction without compromising -but even improving- image quality, thereby enhancing diagnostic safety and accuracy in a vulnerable population.

W2-SPPD-3 ESTABLISHING ACCEPTABLE POSITIONING RANGES FOR ACETABULAR ANGLE MEASUREMENTS IN CHILDREN WITH CEREBRAL PALSY

Robert J. Smalley, MD (*Presenter*)
Delma Y. Jarrett, MD (*Abstract Co-Author*)
Andy Tsai, MD, PhD (*Abstract Co-Author*)

PURPOSE

Acetabular dysplasia often occurs in children with cerebral palsy (CP), which can lead to hip dislocations. The typical approach to assess for acetabular dysplasia is to measure the acetabular angle (AA) on anteroposterior (AP) pelvic radiograph. However, AA measurements rely on proper patient positioning, which may be difficult to achieve in CP patients. Knowing the effects of patient positioning on AA measurements may inform technologists on how best to position them. This study aimed to determine the effects of patient position on AA measurements in children with CP.

METHODS AND MATERIALS

Children with CP (=18-years-old) with pelvis CT and AP pelvis radiograph obtained <6 months apart (10/18-11/21) were identified. Digitally reconstructed radiographs were generated from each pelvis CT, to simulate nine different patient positions: neutral; 10° and 20° lordosis and kyphosis; and 10° and 20° right rotation and left rotation. Two pediatric radiologists measured AAs from the simulated and real pelvis radiographs. Spearman's rho was used to assess inter-rater reliability, and Wilcoxon signed rank test was used to determine statistical significance. Median absolute difference (MAD) and interquartile range (IQR) were also calculated. Taking simulated radiographs in neutral position as ground truth, we calculated MAD for each deviation of the simulated radiograph from neutral.

RESULTS

Sixty-three children (male=41; median age=8 years; range=4-18 years) were studied. On real radiographs, the two radiologists' AA measurements showed good correlation (rho=0.90, MAD=5° [IQR=2-7°]). On simulated radiographs, inter-rater reliability was either good (rho=0.75-0.90) or excellent (rho >0.90), except for simulated radiographs with 20° lordosis (rho=0.49, MAD=10° [IQR=5-14°]) which showed poor inter-rater reliability. When compared to ground truth neutral position simulated radiographs, correlation with the measurements obtained from the real radiographs was good (rho=0.89, MAD=3° [IQR=1-5°]). Similar values were obtained in simulated radiographs with kyphosis, lordosis, and rotation of 10°. However, MAD was increased at kyphosis, lordosis, and rotation of 20°. This was most pronounced at 20° lordosis (rho=0.64, MAD=6° [IQR=2-10°]).

CONCLUSION

At pelvic deviations of 20° from neutral, measurement error and inter-reader reliability decreased substantially, and is most pronounced in lordosis.

CLINICAL RELEVANCE/APPLICATION

This suggests a possible unacceptable range of deviation from neutral when obtaining pelvic radiographs in children with CP.

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W2-SPPH

Physics Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPPH-1 INTENSITY-MODULATED INVERSE GEOMETRY BEAM CT SCAN TO IMPROVE THE VISIBILITY OF REGION OF INTEREST

Tiezhi Zhang, PhD (*Presenter*)
Ziyu Shu (*Abstract Co-Author*)
Shuang Zhou, MS (*Abstract Co-Author*)
Liuxing Shen, PhD (*Abstract Co-Author*)
Ashish V. Avachat, PhD (*Abstract Co-Author*)
Mark Anastasio (*Abstract Co-Author*)
Kaiyi Yang (*Abstract Co-Author*)

PURPOSE

CT resolution is limited by X-ray exposure. In this study, we performed a feasibility study of an inverse geometry CT (IGCT) design that can improve the visibility of the region of interest through in-plane X-ray flux modulation.

METHODS AND MATERIALS

IGCT incorporates a linear array X-ray source and a linear array detector, oriented within and orthogonal to the rotation plane, respectively. A multi-slot collimator mounted on the X-ray tube shapes the emitted radiation into narrow fan beams, which are received by a multi-row photon-counting detector array. During acquisition, the system rotates slowly around a central axis, while X-ray beams rapidly scan across the subject with predetermined intensity. The intensity of each X-ray beam can be independently modulated based on the location of the region of interest (ROI), enabling accurate reconstruction of the ROI without significantly increasing the total radiation dose. The use of narrow collimated beams and photon-counting detectors also enhances scatter rejection, improving image contrast and quantitative fidelity. A benchtop prototype is currently under development, incorporating a 24-emitter linear X-ray source array and a dedicated image reconstruction algorithm.

RESULTS

Numerical experimental results indicate that even without considering the significant advantage of iGCT in suppressing scattering effects, its reconstruction accuracy is comparable to, or even better than, that of CBCT. The experiment on the Shepp-Logan phantom demonstrates the effectiveness of in-plane flux modulation, enabling high-accuracy reconstruction of the region of interest (ROI) under low total dose conditions.

CONCLUSION

In addition to maintaining scatter suppression through its narrow-beam geometry, iGCT further enables substantial dose reduction through flux modulation and achieves unprecedented resolution in selected regions of interest.

CLINICAL RELEVANCE/APPLICATION

Super-resolution CT is highly desirable for dentistry and otolaryngology clinics. For example, it enables visualization of auditory and vestibular components such as hair cells, otoliths, membranes, ions, and vasculature. In dentistry, high-resolution imaging is essential for visualizing root canal anatomy during endodontic treatment. However, the image resolution and soft tissue contrast of traditional CT systems are limited by concerns over X-ray exposure. In this study, we introduce iGCT, a system that enables dynamic flux modulation during scanning, allowing for unprecedented resolution without delivering excessive radiation to patients.

W2-SPPH-2 IMPROVED NON-RIGID REGISTRATION OF CHEST CT WITH WAVELET ENCODING AND CURRICULUM LEARNING: TOWARD ACCURATE LONGITUDINAL COMPARISON

Yamato Kohara (*Presenter*)
Ryohei Nakayama, PhD (*Abstract Co-Author*)
Motonori Nagata, MD, PhD (*Abstract Co-Author*)
Yasutaka Ichikawa, MD (*Abstract Co-Author*)
Hajime Sakuma, MD, PhD (*Abstract Co-Author*)

PURPOSE

Deep learning-based non-rigid registration often struggles in the lung field regions due to the scarcity of characteristic signal patterns. This study aimed to develop a robust non-rigid registration method leveraging wavelet encoding and curriculum learning to improve alignment accuracy.

METHODS AND MATERIALS

The training dataset included 59 normal chest CT volumes, while the test dataset consisted of 101 cases of both past and current normal chest CT volumes from the same patients. The proposed model consisted of two encoders and one decoder. The moving and fixed CT volumes were first decomposed into high-frequency and low-frequency components using wavelet transformation. The corresponding frequency components were then concatenated and input to the encoders designated for each frequency type. The two encoders independently analyzed these components, extracting coarse structural and overall information from the low-frequency components while capturing local details such as edges and textures from the high-frequency components. The decoder integrated them and predicted the displacement vector needed to align the moving and fixed CT volumes. In training the proposed model, the training CT volume was deformed using a nonlinear displacement vector generated based on random numbers. The proposed model was trained to predict the displacement vector from the volumes before and after deformation. Here, curriculum learning was introduced, beginning with small random numbers for generating the displacement vector and gradually increasing them as the training progressed.

RESULTS

The Dice coefficient, root mean squared error (RMSE), and structural similarity index (SSIM) for the proposed method were 0.97, 146.29, and 0.879, respectively. These results indicated a significant improvement compared to VoxelMorph, which had a Dice coefficient of 0.695 ($P < .001$), RMSE of 299.89 ($P < .001$), and SSIM of 0.695 ($P < .001$).

CONCLUSION

The non-rigid registration method developed in this study achieved high-precision alignment of chest CT volumes compared to the widely used conventional model, VoxelMorph.

CLINICAL RELEVANCE/APPLICATION

The developed non-rigid registration method enables high-precision alignment of chest CT volumes, which has the potential to support the detection of subtle temporal changes in lesions and the assessment of treatment effects.

W2-SPPH-3 CHARACTERIZATION OF FOCAL SPOT SIZE'S EFFECT ON MSK IMAGE SHARPNESS FOR DEEP SILICON PHOTON COUNTING

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Aria Salyapongse, MSc (*Abstract Co-Author*)
Krista McClure (*Abstract Co-Author*)
Zahra Alyani Nezhad, MSc (*Abstract Co-Author*)
Meghan G. Lubner, MD (*Abstract Co-Author*)
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Brian K. Markhardt, MD (*Abstract Co-Author*)
Nicholas C. Laucis, MD (*Abstract Co-Author*)
Scott Slavic, MS (*Abstract Co-Author*)
Zhye Yin (*Abstract Co-Author*)
Dean Zsenak (*Abstract Co-Author*)
Giuseppe V. Toia, MD, MS (*Abstract Co-Author*)

PURPOSE

To characterize the impact of focal spot size and image sharpness on a prototype deep silicon-based (dSi) photon counting detector (PCD) CT system.

METHODS AND MATERIALS

A prototype dSi PCD CT system was used to acquire 6 human subject MSK scans. Two unique subjects were scanned under prospective IRB approval; subject 1 was scanned using 4 focal spot sizes (extra small (XS), small (S), large (L), and extra large (XL)) over the knee, subject 2 using 2 focal spot sizes (XS and L) over the spine. Trabecular bone sharpness was assessed using a quantitative metric which counts the fraction of pixels within a trabecular bone region between the 0-25 th and 75-100 th percentiles (i.e., this method penalizes blurred pixels near bone and only counts true trabecular bone and true marrow) of Hounsfield units. Line profiles through bone margins were also measured.

RESULTS

Trabecular bone sharpness metric results were higher for the smaller focal spot sizes in both subjects. The knee sharpness scores were 0.50, 0.45, 0.38, and 0.33 for the knee corresponding to XS, S, L, and XL focal spots sizes, respectively. Sharpness scores for the spine were 0.50 and 0.45 for the spine, respectively. All scores were statistically significantly different ($p<0.005$) within the knee and spine subjects across focal spots. Hounsfield unit profiles exhibited higher values for smaller focal spot sizes, with the highest values for the XS focal spot on the knee and XS on the spine subject. Trabecular bone detail was essentially "washed out" when the XL focal spot was used.

CONCLUSION

Using a quantitative trabecular bone metric, smaller focal spots provided higher levels of bone detail. Line profiles also demonstrated smaller focal spots enabled higher peak boney details and narrower profiles (i.e., less blurring).

CLINICAL RELEVANCE/APPLICATION

Photon-counting detector CT undoubtedly allows higher spatial resolution compared to energy integrating scans. However improper scan settings can produce images with resolution worse than energy integrating scanners. In protocols designed to scan quickly but retrospective reformats of boney detail may be desired, such as trauma protocols with spine reformats, higher tube currents (i.e., larger focal spots) are utilized, which makes this concern about focal spot size and boney detail especially important.

W2-SPPH-4 TASK-BASED IMAGE QUALITY ASSESSMENT OF THREE DUAL-ENERGY CT PLATFORMS AND ONE PHOTON-COUNTING CT ON LOW-KEV VIRTUAL MONOENERGETIC IMAGES

Joel Greffier, PhD (*Presenter*)
CECILE SALVAT (*Abstract Co-Author*)
Lama HADID (*Abstract Co-Author*)
Jean-Paul Beregi, MD, PhD (*Abstract Co-Author*)
Djamel Dabli (*Abstract Co-Author*)

PURPOSE

To compare the spectral performance of three dual-energy CT (DECT) platforms and one photon-counting CT (PCCT) on virtual monoenergetic images (VMIs) at low-energy levels.

METHODS AND MATERIALS

A multi-energy CT phantom (Sun Nuclear) was scanned on a PCCT (Naeotom Alpha, Siemens Healthineers) and three DECT platforms: rapid kV-switching CT (KVSCT-Canon, Aquilion One Insight, Canon Medical Systems), ultrafast kV-switching (KVSCT-GE, Revolution Apex, GE Healthcare) and dual-layer CT (DLCT, CT7500, Philips Healthcare). For CT systems, acquisitions were made using classical abdomen-pelvic examination parameters and a CTDI vol at 11 mGy. Raw data were reconstructed using a slice thickness close to 1.5 mm and QIR level 3 for PCCT, DLSR level 2 for KVSCT-Canon, TrueFidelity medium level for KVSCT-GE and Spectral level 4 for DLCT. Noise power spectrum (NPS) and task-based transfer function (TTF) were evaluated from 40 to 70 keV of VMIs. A detectability index (d') was computed to model the detection task of two contrast-enhanced lesions according to keV.

RESULTS

Noise magnitude decreased from 40 to 70 keV for all DECT platforms and this decrease was greater for KVSCT-Canon (-80.2%) and less for DLCT (-14.8%). At 40 keV, the highest noise magnitude values were found for KVSCT-GE and KVSCT-Canon and the lowest for PCCT and DLCT. The average NPS spatial frequency (f av) values decreased from 40 to 70 keV (0.27 to 0.19 mm -1) for KVSCT-Canon, increased for DLCT (0.20 to 0.26 mm -1) but were similar for KVSCT-GE (0.21 ± 0.01 mm -1) and PCCT (0.23 ± 0.01 mm -1). For both blood-mimicking material plus iodine inserts at 2 and at 4 mg/ml, TTF at 50% (f 50) values increased from 40 to 70 keV. For all keV and both inserts, the highest f 50 values were found for PCCT and DLCT and the lowest for KVSCT-GE and KVSCT-Canon. For both contrast-enhanced lesions, d' values decreased from 40 to 70 keV for PCCT, DLCT and KVSCT-GE. For KVSCT-Canon, d' values peaked at 60 keV. At 40 and 50 keV, the highest d' values were found with PCCT and at 60 and 70 keV for KVSCT-Canon.

CONCLUSION

For KVSCT-Canon, the detectability of contrast-enhanced lesions was highest at 60 keV. The highest d' values were found with PCCT at 40 and 50 keV.

CLINICAL RELEVANCE/APPLICATION

For the first time, this study compared image and noise texture, spatial resolution and lesion detectability on DECT platforms incorporating the latest technological innovations from the four main CT manufacturers. At this stage, the results of the study need to be validated in clinical practice at low energy levels for the detection and/or characterization of abdominal lesions.

W2-SPPH-6 APPROPRIATENESS OF MATERIALS FOR K-EDGE IMAGING ON A DEEP SILICON PHOTON-COUNTING CT

Rick R. Layman, PhD (*Presenter*)
Zhye Yin (*Abstract Co-Author*)
Scott Slavic, MS (*Abstract Co-Author*)
Megan C. Jacobsen, PhD (*Abstract Co-Author*)

PURPOSE

K-edge imaging is a promising photon-counting CT (PCCT) application, but it is imperative to ensure the energy bins are properly assigned and calibrated for accurate material differentiation and quantification.

METHODS AND MATERIALS

5-mL NIST-traceable aqueous standards (10, 5, 2.5, 1.0 and 0.5 mg/mL) were prepared for eight elements [k-edge]: cesium [36.0 keV], gadolinium [50.2 keV], holmium [55.6 keV], ytterbium [61.3 keV], tantalum [67.4 keV], tungsten [69.5 keV], gold [80.7 keV], and bismuth [90.5 keV] (Inorganic Ventures; Christiansburg, VA & Gadavist; Whippany, NJ). Standards were placed in the inner radius of a multi-energy CT phantom (Mirion; Atlanta, GA). Axial images were acquired using a prototype dSi PCCT system (GE Healthcare; Waukesha, WI) with the following parameters: 120 kVp, 50 cm SFOV, 0.6 s rotation time, 600 mA, 1.2 mm focal spot and 40 mm collimation. Energy bins of the system were calibrated to [33,44), [44,52), [52,60), [60,80), and [80,120] keV. Bin images were reconstructed with a prototype using standard kernel, 0.42 mm slice thickness/interval and 22 cm display FOV. Plots of concentration (mg/mL) versus CT number (HU) for the k-edge containing and adjacent higher energy bins were generated for each element. Materials were considered fully resolved with PCCT if CT number was higher in one bin across all concentrations. We calculated the difference in elemental k-edge and lower threshold energy of the k-edge containing bin, defined as k-edge difference. This value was plotted against the percent attenuation difference of CT numbers (HU) in energy bins for the 10 mg/mL standards.

RESULTS

Using this set of calibrated energy bins, 2/8 materials (gadolinium and cesium) were fully resolved, with separated energy bins. Conversely, crossover between the low and high energy bins was observed for all other materials. Crossover could impact quantitative accuracy and compromise the detection limit for this energy bin configuration. Percent attenuation difference between bins was highest when the k-edge difference was small. There was a linear decrease in attenuation change between bins versus k-edge difference with a loss of 3.5% per additional keV of K-edge difference (R 2 = 0.85). Ytterbium (K-edge difference = 1.3 keV) had the highest percent difference between bins (40.9%), while bismuth (K-edge difference = 10.5 keV) had the lowest (1.7%).

CONCLUSION

For a given calibrated set of PCCT energy bins, optimal k-edge materials have small k-edge differences. Future work will investigate the detection limit for various k-edge materials.

CLINICAL RELEVANCE/APPLICATION

K-edge imaging may enable introduction of new contrast agents to the CT market for new imaging applications. dSi PCCT makes quantification of these materials feasible.

W2-SPPH-7 ASSESSING THE UTILITY OF PHOTON-COUNTING CT IN OBESE PATIENTS

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Kai Mei, PhD (*Abstract Co-Author*)
Shobhit Sharma, PhD (*Abstract Co-Author*)
Steven Ross, PhD (*Abstract Co-Author*)
Sandra S. Halliburton, PhD (*Abstract Co-Author*)
Naruomi Akino (*Abstract Co-Author*)
Ali H. Dhanaliwala, MD, PhD (*Abstract Co-Author*)
Leonid Roshkovan, MD (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)

PURPOSE

Photon-counting CT (PCCT) offers key advantages over energy integrating detector CT (EID-CT), especially in low-dose scans and imaging larger patients. As obesity rates rise, minimizing image noise is critical for diagnostic accuracy. This study evaluated the dose efficiency of a PCCT prototype using phantoms representing a range of patient sizes.

METHODS AND MATERIALS

A 3D-printed anthropomorphic pancreas phantom and the inner 20 cm section of a multi-energy CT phantom were scanned with extension rings representing the 50 th , 75 th , 85 th , and 95 th percentiles of adult waist circumference in the U.S. (elliptical diameters of 32 x 32, 30 x 40, 33 x 43, 37 x 47 cm / water equivalent diameters of 32, 34, 37, 39 cm, respectively). Scans were performed on an EID-CT (Aquilion One Insight Edition, Canon Medical Systems Corporation) and CZT PCCT prototype (Canon Medical Systems Corporation) at a tube voltage of 120 kVp and dose levels (CTDI vol) of 0.5 to 19 mGy. Images were additionally acquired for each scanner and phantom size to match the noise magnitude of PCCT filtered back projection (FBP) images of the 95 th percentile phantom at 15.5 mGy. Noise was measured on FBP to compare the noise-dose relationship between scanners. Noise-matched doses were also recorded to determine dose reduction with PCCT.

RESULTS

Improved noise performance was observed with increasing phantom size across doses. At matched phantom size and dose, PCCT demonstrated increased noise reduction relative to EID-CT as phantom size increased and dose decreased. Noise was 20 ± 9 HU less with PCCT compared to that of EID-CT with the 95 th percentile phantom at 19 mGy. This difference in noise between scanners increased at 2 mGy to 64 ± 23 HU. Smaller noise reductions of 4 ± 6 and 16 ± 10 HU were observed for the 50 th percentile phantom at 19 and 2 mGy, respectively. To match PCCT noise of the 95 th percentile phantom at 15.5 mGy, radiation doses of 7.6, 5.4, and 2.7 mGy were required for the 85 th , 75 th , and 50 th percentile phantoms, respectively. The corresponding noise-matched doses in EID-CT were 27.6, 11.8, 7.7, and 4.3 mGy for 95 th , 85 th , 75 th , and 50 th percentile phantoms, respectively, highlighting an average dose reduction of 36%.

CONCLUSION

PCCT yielded enhanced dose efficiency with lower noise compared to EID-CT at a fixed dose, enabling an average dose reduction of 36% across varying phantom sizes. This improvement is particularly impactful at larger phantom sizes and lower doses, enabling effective imaging of obese patients without compromising the image quality necessary for precise disease diagnosis and monitoring.

CLINICAL RELEVANCE/APPLICATION

This dose efficiency has important clinical implications, enabling lower dose imaging protocols for obese patients without compromising diagnostic accuracy.

W2-SPPH-8 COMPLEXED SIGNAL AVERAGE METHOD: UTILITY FOR IMPROVING DIFFERENTIATION CAPABILITY OF MALIGNANT FROM BENIGN PROSTATIC AREAS ON CONVENTIONAL DWIS AT STANDARD AND ULTRA-HIGH-B VALUES

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Natsuka Yazawa (*Abstract Co-Author*)
Kaori Yamamoto (*Abstract Co-Author*)
Yuichiro Sano, RT (*Abstract Co-Author*)
Masato Ikedo (*Abstract Co-Author*)
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Masahiko Nomura, MD, PhD (*Abstract Co-Author*)
Takeshi Yoshikawa, MD (*Abstract Co-Author*)
Daisuke Takenaka, MD (*Abstract Co-Author*)
Yoshiyuki Ozawa, MD, PhD (*Abstract Co-Author*)
Yoshiharu Ohno, MD, PhD (*Abstract Co-Author*)

PURPOSE

Diffusion-weighted imaging (DWI) has been suggested as more useful for differentiation between malignant and benign prostatic areas, when applied ultra-high b value as compared with standard b value. Recently, complexed signal average (CSA) method is tested to improve ADC measurement and normal structure visualization on DWI, especially applying higher b value. The purpose of this study was to directly compare quantitative and qualitative image qualities and differentiation accuracy of malignant from benign prostatic areas among prostatic DWIs obtained with and without CSA, when applied standard and ultra-high b values.

METHODS AND MATERIALS

54 suspected prostatic cancer patients prospectively underwent DWIs at standard (b= 1500 s/mm 2 : cDWI) and ultra-high (b=3000 s/mm 2 : UH-DWI) b values by applying CSA or standard (non-CSA) methods. According to pathological results, 93 malignant areas and 93 computationally selected benign areas were determined. For quantitative image quality assessments, signal-to-noise ratio (SNR) and apparent diffusion coefficient (ADC) of each area and contrast-to-noise ratio (CNR) between two areas were assessed by ROI measurements on all DWIs. Overall image quality, artifact and malignant area conspicuity were also evaluated by 5-point scales on each DWI. Then, all quantitative indexes were compared each other by Tukey's HSD test. Each qualitative index was compared by Wilcoxon's signed-rank test. Finally, ROC analysis was performed to compare diagnostic performance among all DWIs. Then, sensitivity, specificity and accuracy were compared among all DWIs by McNemar's test.

RESULTS

At each b value, SNR and CNR of cDWI with CSA were significantly higher than those with non-CSA ($p<0.05$). Moreover, SNR and CNR of cDWI with CSA were significantly higher than those of UH-DWI with CSA and non-CSA ($p<0.05$). Overall image quality and artifact of cDWI with CSA or non-CSA showed significant difference with those of each UH-DWI ($p<0.05$). Area under the curves (AUC) of cDWI with CSA (AUC=0.93) and UH-DWI with CSA (AUC=0.95) were significantly larger than that of cDWI with non-CSA (AUC=0.88, $p<0.05$). Moreover, AUC of UH-DWI with CSA was significantly higher than that of UH-DWI with non-CSA (AUC=0.92, $p<0.05$).

CONCLUSION

CSA mainly improves quantitative or qualitative image qualities and differentiation accuracy of malignant from benign prostatic areas on DWI with standard and ultra-high b values.

CLINICAL RELEVANCE/APPLICATION

CSA mainly improves quantitative or qualitative image qualities and differentiation accuracy of malignant from benign prostatic areas on DWI with standard and ultra-high b values.

W2-SPPH-9 IMPROVING IMAGE QUALITY AND DIAGNOSTIC CONFIDENCE FOR PATIENTS WITH HEMATURIA USING LOW-ENERGY AND THIN-SLICE VIRTUAL MONOENERGETIC IMAGES WITH DEEP LEARNING IMAGE RECONSTRUCTION

Yannan Cheng, BS,BS (*Presenter*)
Jianying Li, PhD (*Abstract Co-Author*)
Jianxin Guo (*Abstract Co-Author*)

PURPOSE

This study aimed to explore whether the use of low-energy and thin-slice virtual monoenergetic images (VMI) with deep learning image reconstruction (DLIR) in dual-energy CT Urography (DECTU) could improve the image quality and diagnostic confidence for patients with hematuria.

METHODS AND MATERIALS

Sixty-three patients who underwent DECTU were included in this study (Table 1). DECTU images in the portal phase were reconstructed at 1.25mm for the 70keV VMI with 60% adaptive statistical iterative reconstruction-Veo (ASIR-V60%) and 0.625mm for the 40keV VMI with three levels of DLIR (DLIR-L/DLIR-M/DLIR-H). Quantitative parameters (CT number, noise, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR) and edge rise slope (ERS)) were measured (Figure 1). Two experienced radiologists evaluated subjective values (image contrast, noise, sharpness, lesion conspicuity and diagnostic acceptability) using a 5-point scale (Table 2). Results were compared among the above four reconstruction protocols.

RESULTS

In comparison with the 1.25mm-70keV-ASiR-V60% images, the 0.625mm-40keV-DLIR-M and DLIR-H images had higher scores in subjective evaluation values (all $p<0.05$), with similar scores found between DLIR-M and DLIR-H images (Table 3, Figure 2 and 3). The 0.625 mm-40keV DLIR-H images had higher CT number, SNR, CNR for all abdominal structures and higher ERS for the main portal vein than the 1.25 mm-70keV-ASiR-V60% images (Table 4).

CONCLUSION

DLIR-H improves image contrast and sharpness and diagnostic confidence for patients with hematuria using 40keV VMI at thinner slice in DECTU.

CLINICAL RELEVANCE/APPLICATION

When diagnosing urinary diseases using VMI images at thinner slice and low-energy, it is recommended to use DLIR-H algorithm to obtain satisfactory image quality and diagnosis confidence with higher SNR, CNR, sharpness and lesion conspicuity.

W2-SPPH-10 C-FLAIR: FLUID ATTENUATED INVERSION RECOVERY WITH CONTROLLED CEREBROSPINAL FLUID SUPPRESSION

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Alexander Jaffray (*Abstract Co-Author*)
Armin Rund (*Abstract Co-Author*)
Stefan Steinerberger (*Abstract Co-Author*)
David K. Li, MD (*Abstract Co-Author*)
Alexander Rauscher, PhD, MSc (*Abstract Co-Author*)

PURPOSE

In fluid attenuated inversion recovery (FLAIR) magnetic resonance imaging (MRI) sequences of the brain, suppression of cerebrospinal fluid fails in the presence of strong inhomogeneities of the static magnetic field, resulting in artifactual bright signal which may obscure normal anatomy or mimic pathology. The purpose of our study was suppress artifacts in FLAIR MRI with an optimized radiofrequency pulse for inversion.

METHODS AND MATERIALS

A robust inversion pulse was designed using optimal control, incorporating robustness against field inhomogeneities directly into the cost function for pulse optimization. Experimental data with the conventional and the new inversion pulse were acquired and compared at 3 T in a phantom that exhibits strong inhomogeneities in the static magnetic field and in human participants (3 healthy volunteers, 2 patients with multiple sclerosis, one person with persistent symptoms from a concussion, 2 persons with asymptomatic white matter hyperintensities). Images were acquired with 1 cubic mm isotropic resolution, inversion time (TI) = 2400 ms, repetition time (TR) = 8000 ms, effective echo time (TE) = 300 ms. Images were assessed by a neuroradiologist with 42 years of experience.

RESULTS

In the phantom, FLAIR with controlled inversion (C-FLAIR) exhibits nearly perfect inversion in the presence of inhomogeneities in the static magnetic field, resulting in the removal of bright artifactual signal that is seen with the conventional inversion pulse. In human participants, such bright signal is near the nasal sinus with the conventional pulse but absent with the controlled inversion. Image contrast of demyelinating lesions in multiple sclerosis and in white matter hyperintensities is identical for the optimized pulse and the conventional pulse.

CONCLUSION

C-FLAIR with a robust radio frequency inversion pulse shows practical elimination of artifacts caused by incomplete inversion.

CLINICAL RELEVANCE/APPLICATION

The new type of radiofrequency pulse for inversion requires no modifications to the scanner hardware and no new data sampling and reconstruction approaches. The method can be easily adopted into routine MRI, with direct beneficial clinical impact.

W2-SPPH-11 PHOTON-COUNTING CT OUTPERFORMS CONE-BEAM CT FOR IMAGING OF ROOT-FILLED TEETH

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Markus Altenburger (*Abstract Co-Author*)
Alexander Rau, MD (*Abstract Co-Author*)
Anna Fink (*Abstract Co-Author*)
Elias Kellner (*Abstract Co-Author*)
Fabian Bamberg, MD, MPH (*Abstract Co-Author*)
Britta A. Jung (*Abstract Co-Author*)
Martin Peter Pichotka (*Abstract Co-Author*)
Wiebke Semper Hogg (*Abstract Co-Author*)
Stephan Rau, MD (*Abstract Co-Author*)

PURPOSE

This study quantitatively evaluates a clinical photon-counting-detector CT (PCD-CT) against a dedicated dental cone-beam CT (CBCT) for the visualization and measurement of submillimeter structures like accessory canals in root-filled teeth using a standardized bovine-tooth phantom.

METHODS AND MATERIALS

A jaw phantom was assembled from four bovine incisors instrumented with ProTaper Next and obturated with gutta-percha/AH+ sealer, then embedded in bovine rib. Five artificial accessory canals (diameters 1,000 µm, 800 µm, 600 µm, 400 µm, 200 µm; ±1 µm tolerance) were milled perpendicular to each root axis. The phantom underwent three repositioned scans on a Siemens NAEOTOM Alpha PCD-CT (120 kVp, 28 mAs, 1024 × 1024 matrix, 0.2 mm slices with 0.1 mm increment, QIR strength 3) and a Planmeca Viso G7 CBCT (100 kVp, 9 mA, 150 µm voxels, 30 × 50 mm FOV). Reference scans were performed at a Bruker SkyScan 1276 micro-CT (100 kVp, 17.5 µm binned pixels). Accessory canals were deemed detectable if their signal dip exceeded twice the standard deviation of adjacent noise. Canal widths were measured by full-width at half-minimum and compared to micro-CT to compute metric errors. Blooming artifacts from fillings were quantified at full-width at half-maximum. Radiation exposure was recorded as CTDIvol and DLP for CT and as DAP for CBCT. All results are reported as median [IQR], and modality comparisons employed Wilcoxon signed-rank tests (a = 0.05).

RESULTS

PCD-CT demonstrated superior performance in detecting accessory canals as it detected 100% of canals = 400 µm and 81.5% of 200 µm canals. CBCT detected 100% of canals = 800 µm, 83.3% at 600 µm, 47.2% at 400 µm, and 0% at 200 µm. Relative errors for PCD-CT remained = 5.2% for canals = 600 µm (17.7% at 400 µm; 115.9% at 200 µm) compared with 15.6-35.1% for CBCT (no data as no detection for 200 µm). Median absolute errors ranged from 29 µm to 67 µm for PCD-CT (204 µm at 200 µm) versus 105 µm to 173 µm for CBCT. Blooming was significantly lower for PCD-CT in two of four teeth ($p = 0.0039, 0.0078$), equivalent in one ($p > 0.99$), and higher in one ($p = 0.027$). Dose metrics were CTDIvol 4.85 [4.84-5.04] mGy and DLP 41.2 [41.2-43.0] mGy·cm for PCD-CT versus DAP 274 mGy·cm² for CBCT.

CONCLUSION

PCD-CT significantly outperforms dental CBCT in both detection and measurement accuracy for submillimeter accessory canals in root-filled teeth, while matching or reducing artifact distortion at clinically acceptable dose levels.

CLINICAL RELEVANCE/APPLICATION

The superior spatial resolution and artifact mitigation of PCD-CT promise improved detection of untreated accessory canals, better guidance for endodontic retreatment procedures, and the potential for opportunistic, high-resolution dental screening on routine head-and-neck CT examinations.

Nov. 30 – Dec. 4
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W2-SPVA

Vascular Imaging Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-SPVA-3 APPLICATION OF MULTI TRACKER TECHNOLOGY ON NEUVIZ EPOCH CT IN ONE-STOP ABDOMINAL CONTRAST-ENHANCED CT AND INFERIOR VENA CAVA CTV IMAGING: A PROPENSITY SCORE MATCHING CONTROLLED STUDY

Tianhe Ye (*Presenter*)
Wei Chen (*Abstract Co-Author*)

PURPOSE

To investigate the clinical value of NeuViz Epoch CT's Multi Tracker technology in achieving one-stop abdominal contrast-enhanced CT and inferior vena cava computed tomography venography (CTV) during a single examination.

METHODS AND MATERIALS

A retrospective analysis included 38 patients in the case group who underwent one-stop imaging for abdominal enhancement and inferior vena cava-phase CTV using intelligent tracking technology (Multi Tracker) between January and December 2024, and 115 patients in the control group who underwent conventional delayed scanning for inferior vena cava CTV. With scanning methods as the intervention variable and gender, age, and body mass index (BMI) as covariates, a balanced cohort (n=76) was constructed via propensity score matching (PSM, 1:1 nearest-neighbor matching with a caliper of 0.05). Subjective Likert scores for the portal vein (PV), inferior vena cava (IVC), and hepatic veins (HV), as well as objective metrics including CT values, noise (SD), signal-to-noise ratio (SNR), and contrast-to-noise ratio efficiency (CNR Efficiency), were compared between groups.

RESULTS

Covariate Balance: After matching, no significant differences were observed in sex (P=0.63), age (P=0.37), or BMI (P=0.23), eliminating confounding bias. Subjective Evaluation: The Multi Tracker group demonstrated significantly higher proportions of high-grade scores (4-5) for PV, IVC, and HV compared to the conventional group (all P<0.001), indicating substantially improved vascular visualization. Objective Metrics: The Multi Tracker group showed significantly higher liver CT values (P<0.001) and lower noise (P<0.001), reflecting superior image uniformity and contrast. Vascular quantitative parameters - CT values, SNR, and CNR Efficiency for PV, IVC, and HV - were all significantly better in the Multi Tracker group (all P<0.001), indicating enhanced vascular border clarity and tissue contrast.

CONCLUSION

This technology provides a robust imaging foundation for clinicians to conduct preoperative evaluations and extract three-dimensional venous bundle models of the portal vein, hepatic vein, and inferior vena cava, thereby enabling clinicians to gain a deeper understanding of the anatomical interrelationships among intrahepatic veins and highlighting its significant clinical value.

CLINICAL RELEVANCE/APPLICATION

High-efficiency imaging: This technology improves efficiency, reduces examination time and visits, and enhances the medical experience. Image quality: This technology provided higher quality of liver and intrahepatic veins. Clinical value: This technology is valuable and expected to be widely adopted for abdominal imaging, optimizing workflows and improving patient outcomes.

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W5A-SPBR

Breast Imaging Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPBR-1 PREDICTIVE VALUE OF DCE-MRI TUMOR HABITATS FOR ESTROGEN RECEPTOR (ER) EXPRESSION IN BREAST CANCER

Ziyi Mao (*Presenter*)
Qi Wang (*Abstract Co-Author*)
Hui Liu (*Abstract Co-Author*)
Haifa Liu (*Abstract Co-Author*)
Mengzhu Wang (*Abstract Co-Author*)
Yang Song (*Abstract Co-Author*)

PURPOSE

This study aims to assess the feasibility and accuracy of a prediction model using DCE-MRI based tumor habitats to forecast ER expression in malignant breast cancer.

METHODS AND MATERIALS

This retrospective study included 85 patients with pathologically confirmed invasive ductal carcinoma of the breast(24 ER-negative, 61 ER-positive). All underwent 3.0T breast MRI. After intravenous injection of contrast agent(0.2 mmol/kg) at a rate of 3mL/s followed by a 10-mL saline flush, DCE-MRI was acquired under free-breathing conditions for 8 minutes and 25 seconds. The scanning parameters were as follows: time resolution = 3s, field of view (FOV) = 380 × 380 mm 2 , matrix = 380 × 320, voxel size = 1.2 × 1.2 × 2.5 mm 3 . Pharmacokinetic parameters (K trans , Ve) were derived from the vendor-specific software. Volumes of interest (VOIs) were manually delineated on T1-weighted images using 3D Slicer (version 5.2.2). Subsequently, Tumor habitats based on distinct perfusion and microenvironmental characteristics were segmented using voxel-wise K trans and Ve values through K-means clustering with an in-house developed software. Three distinct tumor habitats were identified: Habitat 1 (Ve low K trans low), Habitat 2 (Ve low K trans high) , and Habitat 3 (Ve high K trans low). First-order features were extracted per habitat and compared between ER groups using Mann-Whitney U test. Features with p <0.05 were incorporated into a logistic regression model, with feature selection and model validation rigorously embedded in leave-one-out cross-validation (LOOCV) to ensure robustness. Final performance was evaluated by AUC, accuracy, sensitivity, specificity, and F1-score, with metrics averaged across all iterations.

RESULTS

Through LOOCV, 13 features were uniquely identified from Habitat 1. Among these, the top 6 features (Volume, Skewness, Mean Absolute Deviation, Kurtosis of Ve and Volume, Variance of K trans) demonstrated high stability and importance, appearing in all 85 iterations. The logistic regression model based on these features exhibited appropriate predictive performance with an AUC of 0.730 (95% CI: 0.608-0.853), accuracy of 0.741, sensitivity of 0.787, specificity of 0.625, F1-score of 0.814, Brier score of 0.179 and Hosmer-Lemeshow (HL) test p value of 0.949(? 2 =2.753, df=8).

CONCLUSION

Our logistic regression model, based on DCE-MRI-derived habitat features, effectively captures intratumoral heterogeneity and predicts ER expression in breast cancer. Notably, all discriminative features were localized to Habitat 1 (Ve low K trans low), highlighting its particular predictive value.

CLINICAL RELEVANCE/APPLICATION

This tumor habitat-based approach demonstrates clinical utility in guiding treatment decisions and improving patient outcomes.

W5A-SPBR-3 A PHYSICAL BREAST PERFUSION PHANTOM FOR VALIDATING BACKGROUND PARENCHYMAL ENHANCEMENT QUANTIFICATION IN X-RAY IMAGING

Liselot Goris, MSc (*Presenter*)
Gustavo Pacheco (*Abstract Co-Author*)
Ioannis Sechopoulos, PhD (*Abstract Co-Author*)

PURPOSE

To develop a physical breast perfusion phantom that includes different known amounts of background parenchymal enhancement (BPE) for contrast-enhanced spectral mammography (CESM) to serve as a test object for optimization and validation of quantitative BPE assessments.

METHODS AND MATERIALS

The phantom consists of a 3D-printed shell, modelled after the average-shaped compressed breast, with a shell thickness of 1.5 mm of clear resin to represent skin, and filled with coconut oil to simulate fatty tissue. A fillable 3D-printed fibroglandular tissue (FGT) insert, based on a patient model of FGT distribution, is added to the phantom. For intensity-based assessment, the FGT insert was filled with water with varying iodine concentrations (0, 0.2, 0.4, 0.6, 0.8, 1, and 2 mg I/mL). Volume-based enhancement differences are simulated by printing known amounts of resin cylinders inside the FGT insert, occupying 25%, 50% and 75% of the total volume and area to mimic non-enhancing FGT and filling the remaining volume with contrast-containing water (0.8 mg I/mL). The phantom with the several iodine concentrations was imaged with a clinical CESM system (low energy: W/Rh 29 kV/90 mAs; high energy: W/Ti 49 kV/50 mAs), and the recombined (iodine only) images were retrieved. A region of interest was placed at the center of the FGT insert to determine the relationship between digital units vs. concentration. The phantom was imaged with 0.8 mg I/mL at three different sessions to determine repeatability.

RESULTS

The FGT insert was properly filled with different iodine concentrations with no visible air bubbles. A linear BPE intensity gradient across iodine concentration levels was found (R 2 =0.998). Analysis of the volume-based validation is ongoing. The intensity measured was within 1% over the three measurements.

CONCLUSION

The phantom allows for known and repeatable BPE simulation in CESM, providing a potential tool for standardizing BPE assessment accuracy and precision in clinical imaging. It is also compatible with CE-digital breast tomosynthesis. Additionally, by filling the FGT insert with sodium-alginate beads and connecting it to a flow system, the phantom is also suitable for dynamic BPE imaging studies, which will be explored in future work.

CLINICAL RELEVANCE/APPLICATION

BPE is a known biomarker for cancer development risk and neoadjuvant chemotherapy response. BPE is currently typically assessed visually in MRI, posing variability in interpretation. The emergence of CESM and of quantitative BPE assessment methods offers benefits like objective iodine quantification and wider accessibility, but need to be validated.

W5A-SPBR-4 INTEGRATION OF GENERATIVE AND PREDICTIVE AI IN CODE GENERATION WORKFLOW FOR BREAST CANCER DETECTION

Tianshen Hu, MD (*Presenter*)
Basak E. Dogan, MD (*Abstract Co-Author*)

PURPOSE

This study explores the potential of the latest open-source LLM, DeepSeek (low computational requirements and strong reasoning/coding capabilities) to develop an AI-driven code generation workflow for breast cancer detection using screening mammograms. The goal is to enable efficient execution on consumer-grade PCs available within hospitals while enhancing explainability and controllability for radiologists.

METHODS AND MATERIALS

This study evaluates a novel code generation workflow using predictive models from the 2023 RSNA Breast Cancer Detection Competition. DeepSeek was chosen as the sample generative AI to allow local execution, minimizing security risks associated with cloud-based AI models. Unlike many black-box LLMs, DeepSeek demonstrates its problem-solving abilities through chain-of-thought (CoT) reasoning, an approach that breaks down complex tasks into more manageable steps, enabling radiologists to interpret the AI decision process, adjust sensitivity settings, fostering trust in AI-assisted diagnosis, enabling customization based on domain expertise and improving decision-making reliability. The generative tool refines and generates codes in the predictive models, integrating new technologies and radiologists' expertise via natural language prompts and local medical databases (imported through the AnythingLLM platform). To ensure fair comparison, both the original and improved predictive models are trained using the same dataset and architecture (mean-aggregation of the same type of single-image models). The results are evaluated with the same F1 score assessing precision and recall on a mammography dataset of approximately 5760 patients.

RESULTS

The 2023 RSNA Breast Cancer Detection Competition saw record high participation, making high rankings challenging. A sample workflow, applying to a top-5 competitor's solution, advanced its ranking from #5 to #1, demonstrating workflow effectiveness. Testing on the training dataset shows precision increased from 0.8406 to 0.9318 (10.8%), and recall from 0.9756 to 1 (2.5%). Testing with hidden test data indicates an F1 score increase from 0.52 to 0.55 (6%), showcasing the impact of the refined AI model.

CONCLUSION

This study highlights a promising code generation workflow, integrating predictive AI, generative AI, and radiologist expertise. It has broad applicability across medical imaging domains.

CLINICAL RELEVANCE/APPLICATION

Early detection is critical for reducing breast cancer mortality but relies on sub-specialized radiologists, whose shortages present challenges. The recent advances in open-source AI improve its explainability, automation, accuracy, and accessibility, which could help reduce global breast cancer fatalities.

W5A-SPBR-5 CORRELATION OF LESION CONSPICUITY IN CONTRAST-ENHANCED MAMMOGRAPHY (CEM) WITH TRU-CUT SCAR BIOPSY RESULTS IN THE ASSESSMENT OF ULTRASOUND-GUIDED CRYOABLATION OUTCOME

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PURPOSE

To evaluate the role of lesion conspicuity at 12-month CEM follow-up as a predictor of cryoablation outcome.

METHODS AND MATERIALS

Seventy-nine patients (mean age 85.7 yo, ±6.0) with biopsy-proven malignant breast lesions underwent Ultrasound-guided Cryoablation at our center. All B5 lesions were invasive ductal carcinomas (=35 mm), hormone positive and HER2 negative. All patients were deemed as ineligible for surgery by a Multidisciplinary meeting due to comorbidity and/or advanced age and underwent CEM as pre-procedural staging to confirm unifocality. Only patients with complete 12-month follow-up of CEM and biopsy have been included. Two radiologists in consensus evaluated LC on post-procedural CEM, categorizing it as absent, low, moderate, or high. Fisher's exact test and Cohen's Kappa coefficient were applied. CEM diagnostic performances were calculated. Gold standard was histology at 12 months on the post-procedural scar.

RESULTS

Among the 79 patients, 48 (60.8%) underwent both CEM and Biopsy at 12 months. Among them, 35 (61.4%) lesions showed no enhancement. Among the 22 (38.6%) lesions showing enhancement, 6 had low LC, 11 moderate LC, and 5 high LC. A significant fair agreement (Cohen's Kappa coefficient = 0.32 [95% CI: 0.11-0.52]) between CEM and biopsy was shown. Fisher's exact test P-value was 0.0003 reflecting a significant association between biopsy and conspicuity. Lesions with absent or low LC correlated with negative histology (B2), while lesions with residual malignant histology (B5) were associated with moderate-high LC. In assessing cryoablation efficacy, CEM demonstrated NPV of 100%, Sensitivity of 100%, Specificity of 68.6% and PPV of 27.3%.

CONCLUSION

Lesions conspicuity can help in cryoablation follow-up with CEM, since the lower the conspicuity is, the higher the chances of a successful procedure are.

CLINICAL RELEVANCE/APPLICATION

Lower lesion conspicuity on CEM indicates higher cryoablation success, useful for follow-up.

W5A-SPBR-6 IDENTIFYING WOMEN AT RISK FOR ADVANCED-STAGE BREAST CANCER USING AN IMAGE-ONLY DEEP LEARNING RISK MODEL

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Andrew R. Carney, MS (*Abstract Co-Author*)
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PURPOSE

There is growing interest in using AI-based risk models to identify women at higher risk for breast cancer, but less is known about the types of cancers these models help predict. We evaluated whether a deep learning (DL) image-only risk model effectively identifies women at high risk who later develop advanced-stage cancers, given the clinical importance of preventing late-stage disease.

METHODS AND MATERIALS

This retrospective, multisite study included consecutive women >40 years undergoing routine bilateral screening mammography across six sites (2009-2022). A 5-year image-only DL model (Mirai) was applied to index mammograms. Exams used in model development were excluded. Patient demographics were obtained from electronic health records. A cancer outcome was defined as a pathologically proven malignancy within 5 years. Cancer outcomes and American Joint Committee on Cancer (AJCC) clinical prognostic staging were obtained from regional and state tumor registries. Diagnostic accuracy was evaluated using AUCs with DeLong tests ($P < 0.05$).

RESULTS

A total of 179,354 screening mammograms from 78,817 patients met inclusion criteria (median age 59 years, IQR: 50-68). Within 5 years, 2.9% (5200/179,354) developed breast cancer: 77.3% (3888/5033) invasive and 22.7% (1145/5033) DCIS. Among 4012 cancers with staging data: 28.0% (1122) were stage 0, 60.6% (2431) stage I, 6.9% (278) stage II, 3.9% (157) stage III, and 0.6% (24) stage IV. Model AUCs for stage prediction were: 0.76 for stage 0 (95% CI: 0.75-0.78), 0.68 for stage I (95% CI: 0.67-0.69), 0.75 for stage II (95% CI: 0.72-0.77), 0.71 for stage III (95% CI: 0.66-0.76), and 0.69 for stage IV (95% CI: 0.61-0.78).

CONCLUSION

An image-only DL risk model applied at the time of screening mammography effectively identifies women at high risk who later develop advanced-stage breast cancers.

CLINICAL RELEVANCE/APPLICATION

A deep learning risk model derived from screening mammograms can identify women at elevated risk for developing advanced-stage breast cancer (e.g., stage II or higher), potentially enabling earlier interventions to reduce late-stage diagnoses and improve patient outcomes.

W5A-SPBR-7 HOW MUCH AUTOMATION BIAS IS PRESENT WHEN READING SCREENING DIGITAL BREAST TOMOSYNTHESIS IMAGES CONCURRENTLY WITH ARTIFICIAL INTELLIGENCE

Robert M. Nishikawa, PhD (*Presenter*)
Jeffrey W. Hoffmeister, MD, MS (*Abstract Co-Author*)
Emily F. Conant, MD (*Abstract Co-Author*)
Jeremy M. Wolfe, PhD (*Abstract Co-Author*)

PURPOSE

To determine the effects of automation bias when radiologists read digital breast tomosynthesis (DBT) concurrently with an artificial intelligence (AI) system.

METHODS AND MATERIALS

We retrospectively analyzed an observer study of 24 MQSA-qualified radiologists reading with and without AI. In that study, there were 260 DBT screening exams. The radiologists read each case twice: once without the AI and once with AI concurrently (i.e., the AI marks and scores were available immediately upon examining the images). Automation bias occurs when a radiologist follows the AI recommendation even though they would not give that recommendation if they read the case without AI. For cases that a radiologist recalled when reading without AI, we compared the fraction of cases recalled when reading with AI for cases recalled by AI (d1) and not recalled by AI (d2). We used a paired t-test to compare the d1 and d2 to test for automation bias. Similarly, we examined the cases that were not recalled by a radiologist when reading without AI and determined the fraction of cases recalled when reading with AI for cases recalled by AI (m1) and not recalled by AI (m2). We determined the effect of automation bias for 4 different subgroups of cases (in descending likelihood that the case contained a malignancy): screen-detected cancers (Ca), benign biopsied (B9Bx), recalled but not biopsied (RNBx), and not recalled (Neg).

RESULTS

The difference between d1 and d2 and between m1 and m2 were statistically significant ($p<0.0001$) indicating automation bias. The AI system recommended recall in Ca cases 94% (61/65), B9Bx 72% (47/65), RNBx 67% (14/21), and Neg 51% (56/109). For cases that a radiologist recalled when reading without AI and AI did not mark a lesion, the fraction of cases that the radiologist did not recall when reading with AI was Ca:65% (1.8/2.8), B9Bx:69% (4.7/6.8), RNBx:88% (2.2/2.5), and Neg:84% (8.7/10.3). For cases not recalled by the radiologist when reading without AI and AI marked a lesion, the fraction of cases the radiologists recalled when reading with AI was Ca:72% (6.4/8.9), B9Bx:43% (6.8/16), RNBx:25% (1.9/7.6), and Neg:15% (5.8/38.8) . These results indicate that automation bias was dependent on the type of case - higher % indicates more bias.

CONCLUSION

Automation bias is present when radiologists read screening exams concurrently with AI. However, the magnitude of automation bias was positive resulting in a net improvement in radiologists' performance.

CLINICAL RELEVANCE/APPLICATION

Automation bias results in some cancers not marked by AI being missed by a radiologist when reading with AI. Nevertheless, overall there is a positive effect of automation bias both in terms of more cancers being detected and a reduction in the recall rate.

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W5A-SPCA

Cardiac Imaging Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPCA-1 FEASIBILITY OF ON-SITE CT-FFR USING PHOTON-COUNTING CT FOR ASSESSMENT OF IN-STENT RESTENOSIS: A RETROSPECTIVE ANALYSIS

Felix Johannes Wasmer, MD (*Presenter*)
Thomas Germann (*Abstract Co-Author*)
Dominik Noerenberg (*Abstract Co-Author*)
Stefan O. Schoenberg, MD, PhD (*Abstract Co-Author*)
Isabelle Ayx, MD (*Abstract Co-Author*)

PURPOSE

Cardiovascular disease remains the leading cause of death globally, underscoring the need for reliable, non-invasive diagnostic tools. CT-derived fractional flow reserve (CT-FFR) enables functional assessment of coronary stenoses and is increasingly used in clinical routine. Photon-counting CT (PCCT) offers higher spatial resolution and improved artifact reduction particularly beneficial for patients with coronary stents. Combined with CT-FFR this may reduce the need for an invasive angiography. This study evaluates the feasibility and diagnostic performance of on-site CT-FFR in assessing ISR using PCCT, with correlation to invasive findings and clinical outcomes.

METHODS AND MATERIALS

This study included 19 patients (15m, 4f; mean age 65.2y) with coronary stents who underwent clinically indicated cardiac CT using photon-counting CT (PCCT) between December 2021 and February 2024. Exclusion criteria included severe image artifacts and multiple-vessel stenting. Imaging followed ESC guidelines and included both non-contrast and contrast-enhanced scans. CT-FFR was calculated using on-site software, with values =0.76 or a ?CT-FFR =0.06 considered hemodynamically significant. ICA findings and six-month clinical follow-up were collected for correlation.

RESULTS

Among 19 patients with coronary stents undergoing PCCT, ISR was confirmed in two patients by invasive angiography. CT-FFR values distal to stents were pathological (<0.76) in six cases and borderline in three. ?CT-FFR values were pathological (=0.06) in 15 of 19 cases. CT-FFR demonstrated 100% sensitivity and 81% specificity for ISR detection (PPV 16.6%, up to 33.3% after adjustment). ?CT-FFR showed similarly high sensitivity (100%) but poor specificity (22%)/PPV (6.6%). No major adverse cardiac events (MACE) were observed during six-month follow-up, except for one myocardial infarction in a stent-free vessel.

CONCLUSION

PCCT combined with on-site CT-FFR analysis is a feasible, non-invasive approach to assess in-stent restenosis (ISR), with promising diagnostic performance. CT-FFR and ?CT-FFR demonstrated high sensitivity but limited specificity and positive predictive value indicating a tendency to overestimate hemodynamic significance. Therefore, individualized interpretation of CT-FFR results is essential, and further research is needed to refine thresholds and identify co-factors that contribute to overestimation. PCCT-FFR is promising but currently prone to overestimation of ISR, requiring personalized interpretation and threshold refinement

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the potential of photon-counting CT combined with on-site CT-FFR analysis as a non-invasive tool for functional assessment of in-stent restenosis.

W5A-SPCA-2 APPLICATION AND ACCURACY OF CT-FFR IN PREDICTING MYOCARDIAL ISCHEMIA CAUSED BY TYPE A AORTIC DISSECTION

Feifei Zhou, MD (*Presenter*)

PURPOSE

To evaluate the predictive value and clinical utility of CT-FFR for perioperative major adverse cardiovascular events (MACE) in patients with TAAD.

METHODS AND MATERIALS

This retrospective study included TAAD patients who underwent coronary computed tomography angiography (CCTA) between January 2023 and February 2024. The primary endpoint was perioperative MACE within 30 days, defined as all-cause death, nonfatal myocardial infarction, or unplanned revascularization. The predictive ability of CT-FFR was assessed. Multivariable logistic regression was performed to evaluate the incremental predictive value of CT-FFR combined with coronary anatomical information and clinical risk factors. Model performance and clinical benefit were assessed using receiver operating characteristic (ROC) curves and decision curve analysis (DCA).

RESULTS

A total of 154 patients were included (median age, 54 years; 73.4% male). The cumulative incidence of MACE was 24.7% (38/154). Patients with CT-FFR =0.80 had significantly higher perioperative MACE rates (43.8% [21/48] vs. 12.3% [13/106]; P < 0.001), with most events being nonfatal myocardial infarction. Multivariable logistic regression showed that CT-FFR =0.80 was an independent predictor of perioperative MACE (OR = 7.947; 95% CI: 3.050-20.708; P < 0.001), after adjustment for confounders. The combined predictive model demonstrated improved discrimination for high-risk patients (AUC = 0.798) with good sensitivity and negative predictive value.

CONCLUSION

CT-FFR is significantly associated with perioperative MACE in TAAD patients. As a noninvasive functional assessment tool, CT-FFR may help identify high-risk patients and optimize perioperative management strategies.

CLINICAL RELEVANCE/APPLICATION

CT-FFR enables noninvasive evaluation of coronary functional ischemia in patients with type A aortic dissection (TAAD) prior to surgery. This study demonstrates that CT-FFR = 0.80 is an independent predictor of perioperative cardiovascular risk. In clinical practice, integrating CT-FFR with coronary anatomical information and established clinical risk factors may facilitate the accurate identification of high-risk patients before surgery, allowing for optimized treatment strategies and perioperative management to reduce the incidence of major adverse cardiovascular events.

W5A-SPCA-4 MULTIPARAMETRIC CMR FOR CARDIAC ASSESSEMENT IN AUTOIMMUNE DISEASE PATIENTS RECIEVING ALLOGENEIC CD19-TARGETED CAR-T TREATMENT

Xin Chen (*Presenter*)
An Sun (*Abstract Co-Author*)

PURPOSE

Autoimmune diseases often involve inflammatory myocardial injury that contributes to significant morbidity and mortality. Current immunosuppressive treatments rarely reverse established cardiac damage. CD19-targeted allogeneic chimeric antigen receptor T-cell (CAR-T) therapy offers a novel B-cell depletion strategy that can induce durable remission, but its direct effects on the heart remain unclear. This study aimed to assess whether CAR-T therapy can safely reduce myocardial inflammation and fibrosis in patients with autoimmune diseases by cardiovascular magnetic resonance (CMR) imaging markers.

METHODS AND MATERIALS

Fifteen patients with refractory autoimmune disease (8 SSc and 7 SLE) underwent a single infusion of allogeneic CD19-directed CAR-T cells. CMR and echocardiography were performed concurrently at baseline (BS), and at 1 (M1), 2 (M2), 3 (M3), and 6 months (M6) post-treatment. Some patients failed to get certain imaging performed, resulting in a total of 63 imaging time points. CMR parameters included late gadolinium enhancement (LGE) area (mm^2 and %), global native T1, and global T2 mapping. Longitudinal changes were analyzed using linear mixed-effects models(LMM), with false discovery rate (FDR) correction for multiple comparisons.

RESULTS

All patients completed follow-up CMR through 6 months without any major cardiac adverse events. Myocardial LGE diminished significantly over time: the mean LGE area decreased from 12.1 ± 6.2 mm^2 at baseline to 3.1 ± 2.5 mm^2 at 6 months ($p < 0.001$), accompanied by a reduction in LGE extent from 18.3% to 5.6% of left ventricular myocardium ($p < 0.001$). Global native T1 values also showed a significant decline (from 1351 ± 78 ms at baseline to 1309 ± 70 ms at 6 months, $p = 0.029$). In contrast, global T2 values remained stable ($p = 0.65$).Clinically, patients showed improved serologic indicators of disease activity, with decreased ESR and NT-proBNP without reaching statistical significance.

CONCLUSION

In this CMR-based pilot study, CD19-targeted allogeneic CAR-T therapy was associated with a significant regression of myocardial inflammatory injury in patients with autoimmune diseases and no evidence of cardiotoxicity. These findings suggest that CAR-T therapy not only appears safe for the heart in the short term but may also promote recovery of myocardial integrity in severe autoimmune conditions.

CLINICAL RELEVANCE/APPLICATION

This study support the cardiac safety of CD19-targeted CAR-T treatment and highlight a therapeutic benefit on the heart, thereby encouraging further clinical trials to validate these findings and to evaluate long-term cardiac outcomes in this patient population.

W5A-SPCA-8 CARDIAC CT AS A RAPID SCOUT FOR PATENT FORAMEN OVALE: DIAGNOSTIC ACCURACY AND PROGNOSTIC VALUE IN 148 PATIENTS

Lin Xiong (*Presenter*)
Wei Chen, PhD (*Abstract Co-Author*)

PURPOSE

Coronary CT angiography (CCTA) is the first-line imaging modality for evaluating cardiogenic stroke, for which patent foramen ovale (PFO) is a major underlying cause. We investigated whether the routinely acquired CCTA can single-handedly detect patent foramen ovale (PFO), grade right-to-left shunt, and predict PFO-related neurological events.

METHODS AND MATERIALS

We retrospectively analysed 148 patients (56 ± 11 years; 56% women) who underwent CCTA and contrast-enhanced transthoracic echocardiogram (c-TTE) within 3 weeks (n = 112) or CCTA before transcatheter PFO closure (n = 36). Two blinded readers recorded tunnel length/width, right- and left-atrial ostial diameters (ODRAE, ODLAE) and contrast jet. cTTE shunt grade (0-3) and follow-up for cryptogenic stroke or migraine with aura served as references. Logistic regression and ROC analysis determined CT predictors.

RESULTS

Orifice and tunnel visualisation on CCTA yielded sensitivity/specificity of 81/69 % and 71/91 %, respectively; combining findings raised specificity to 96 % (? = 0.88). ODRAE predicted massive shunt (odds ratio 1.44 per 0.1mm; AUC 0.88; optimal threshold 1.64 mm; sensitivity 84 %, specificity 77 %). The ODRAE/ODLAE ratio= 1.87 predicted neurological events (odds ratio 1.26; AUC 0.75; specificity 94 %). Reproducibility was excellent (ICC 0.709-0.909).

CONCLUSION

CCTA detects PFO with high specificity and furnishes two CT-based metrics—ODRAE and the ODRAE/ODLAE ratio—that grade shunt burden and flag patients susceptible to cryptogenic stroke or migraine, guiding timely closure referral or prophylactic therapy.

CLINICAL RELEVANCE/APPLICATION

A standard CCTA that already images the inter-atrial septum can serve as an imaging "scout," flagging PFOs that warrant confirmatory cTTE and facilitating earlier consideration of closure or prophylactic therapy—adding risk-stratification value without extending scan time.

W5A-SPCA-9 COMPARATIVE ANALYSIS OF PRE-TRANSCATHETER AORTIC VALVE REPLACEMENT CTA PROTOCOLS: OPTIMIZING RADIATION DOSE AND CONTRAST VOLUME

Curzio Santangeli, MD (*Presenter*)
Domenico De Santis, MD (*Abstract Co-Author*)
Giovanna Grazia Bona (*Abstract Co-Author*)
Tiziano Polidori, MD (*Abstract Co-Author*)
Damiano Caruso, MD, PhD (*Abstract Co-Author*)
Marco Francone, MD, PhD (*Abstract Co-Author*)
Andrea Laghi, MD (*Abstract Co-Author*)

PURPOSE

To establish the most effective and safe pre-transcatheter aortic valve replacement (TAVR) CT angiography (CTA) protocol by comparing two approaches in terms of image quality, radiation and contrast dose.

METHODS AND MATERIALS

Consecutive patients undergoing pre-procedural CTA were prospectively enrolled from January to May 2024. All exams were performed on a 128-raw CT-scanner with fixed tube voltage (80kVp) and current (399mA). High-concentration contrast agent was administered at high flow rate, based on scan time. Patients were randomly assigned into two different acquisition protocols: group A underwent an ECG-gated CTA of the thorax followed by a non-gated helical scan of abdomen and pelvis; group B underwent an ECG-gated CTA including only the heart and aortic root, followed by a non-gated helical scan of thorax, abdomen, and pelvis. Region-of-Interests were manually drawn for each patient in the aortic lumen (respectively in ascending, descending, and abdominal segments), femoral arteries, muscle, fat, and air using a dedicated software (CardIQ Xpress 2.0, GE Healthcare); vascular enhancement (HU), Contrast-to-noise Ratio (CNR) and Signal-to-noise Ratio (SNR) were assessed. Radiation dose was analyzed.

RESULTS

The final population consisted of 64 patients, 37 in group A and 27 in group B (80.6 ± 5.2 years; 49 males). Group B showed lower radiation dose compared to group A (13.7 ± 1.2 vs 15.7 ± 1.4 mSv; $p<0.001$) and lower contrast medium volume (82.9 ± 0.1 vs 90.3 ± 12.0 ml; $p=0.004$) while achieving no differences in terms of signal-to-noise ratio, contrast-to-noise ratio and subjective image quality (all $p>0.05$). Average vascular attenuation was higher in group A compared to group B (707.1 ± 120.7 vs 633.0 ± 198.6 HU; $p<0.001$); however, lumen attenuation at the aortic root was consistent across the two protocols ($p=0.077$).

CONCLUSION

Optimization of pre-TAVR CTA protocol results in lower contrast medium volume and radiation dose exposure while maintaining consistent image quality.

CLINICAL RELEVANCE/APPLICATION

To optimize contrast medium volume and radiation dose exposure of CTA protocols in patients in their elderly who are eligible for TAVR.

W5A-SPCA-11 INCREMENTAL PROGNOSTIC VALUE OF HEMODYNAMIC FORCES MISALIGNMENT BY CARDIOVASCULAR MAGNETIC RESONANCE FOR MAJOR ADVERSE CARDIAC EVENTS AFTER ST-SEGMENT ELEVATION MYOCARDIAL INFARCTION

Meng Sun (*Presenter*)

PURPOSE

The prognostic value of left ventricular (LV) hemodynamic forces (HDFs) derived from cardiovascular magnetic resonance (CMR) cine imaging in ST-segment elevation myocardial infarction (STEMI) remains unclear. This study aimed to examine temporal changes in HDFs and their ability to predict major adverse cardiac events (MACEs).

METHODS AND MATERIALS

This study retrospectively recruited 280 patients with STEMI. CMR was performed between 1 and 10 days after STEMI. LV HDFs were measured in the apex-base (A-B) and latero-septal (L-S) directions using CMR cine imaging. MACEs were defined as all-cause mortality, reinfarction, and newly diagnosed congestive heart failure. Kaplan-Meier survival analysis, Cox proportional hazards regression, and C-statistics were used to assess prognosis; receiver-operating characteristic curve analysis was used to define the cutoff value.

RESULTS

The MACEs group exhibited weaker LV suction during sys-diastolic transition than the non-MACEs group (-4.1 vs. -5.4, $p=0.003$). Multivariable analysis identified global longitudinal strain (GLS), infarct size (IS), the entire heart cycle L-S/A-B HDFs ratio, and the entire heart cycle angle f as independent predictors (all $p<0.05$). The combination of GLS, the entire cardiac cycle L-S/A-B ratio, and angle f improved MACEs prediction (C-statistic = 0.814). Both the entire cardiac cycle L-S/A-B HDFs ratio and angle f provided incremental prognostic value over GLS and IS (increase in C-statistic from 0.769 to 0.825; $p = 0.003$).

CONCLUSION

LV suction serves as a quantitative measure of LV diastolic function assessed by CMR. The entire heart cycle L-S/A-B HDFs ratio and angle f significantly enhance MACEs prediction over GLS and IS. Even without late gadolinium enhancement, GLS combined with HDFs parameters reliably predicts MACEs.

CLINICAL RELEVANCE/APPLICATION

LV HDFs by CMR cine imaging can provide quantitative parameters of LV diastolic function, addressing the limitations of CMR in quantifying LV diastolic function. Our research further incorporated the entire heart cycle L-S/A-B HDFs ratio and the entire heart cycle angle f into IS and GLS, revealing significant enhancements in forecasting future MACEs, demonstrating an additive prognostic value of HDFs parameters over IS and GLS. Notably, GLS combined with the entire-cycle L-S/A-B HDFs ratio and angle f still provides reliable prediction of MACEs. This suggests that for patients who cannot tolerate late gadolinium enhancement examination, strain and HDFs analysis using only CMR cine sequences without contrast-enhanced imaging can effectively predict the occurrence of MACEs following STEMI, which has significant implications for risk stratification and management of patients with STEMI.

W5A-SPCA-12 NONINVASIVE PREDICTION OF CORONARY HEMODYNAMIC ABNORMALITIES: THE COMPLEMENTARY ROLE OF PERICORONARY FAT ATTENUATION INDEX AND AREA STENOSIS

Zhao Jie (*Presenter*)
Jie Yuan (*Abstract Co-Author*)

PURPOSE

This study aimed to determine whether combining pericoronary fat attenuation index (FAI) with quantitative plaque analysis enhances the detection of hemodynamically significant coronary artery disease using CT-derived fractional flow reserve (CT-FFR) as the reference standard.

METHODS AND MATERIALS

We conducted a retrospective analysis of 130 consecutive patients (226 coronary lesions) who underwent coronary computed tomography angiography (CCTA) between January 2023 and September 2024 for evaluation of chest pain. All studies included FAI measurement, comprehensive plaque characterization (area stenosis [AS], diameter stenosis [DS], lesion length [LL]), and CT-FFR computation. Lesions were classified as hemodynamically significant (CT-FFR =0.8) or non-significant (CT-FFR >0.8). Statistical analysis included univariate/multivariate logistic regression, and ROC curve analysis with DeLong test for AUC comparisons.

RESULTS

The study cohort comprised 53 hemodynamically significant lesions (23.5%) and 173 non-significant lesions. Significant lesions demonstrated higher FAI values and greater AS (all $P<0.001$). While FAI, DS, and AS all showed significant predictive value in univariate analysis (AUCs: 0.823, 0.801, and 0.851 respectively), multivariate analysis identified only FAI and AS as independent predictors. The combined FAI+AS model achieved superior diagnostic performance (AUC 0.904, 95%CI 0.85-0.957) with 91.2% sensitivity and 80.0% specificity, representing a statistically significant improvement over individual parameters ($P<0.05$).

CONCLUSION

Pericoronary FAI provides incremental diagnostic value beyond traditional stenosis assessment, with the FAI+AS combination offering superior accuracy for identifying hemodynamically significant coronary lesions.

CLINICAL RELEVANCE/APPLICATION

The integration of FAI with plaque characterization in CCTA interpretation represents a promising strategy to improve noninvasive identification of functionally significant coronary artery disease. This combined assessment could optimize patient selection for invasive angiography while reducing unnecessary procedures, potentially transforming the diagnostic pathway for patients with suspected coronary artery disease.

W5A-SPCA-13 THE DIAGNOSTIC VALUE OF CMRT1MAPPING COMBINED WITH MOCO CDWIIN THE EVALUATION OF GRAY ZONE INPATIENTS WITH MYOCARDIAL INFARCTION

Xiaowei Ruan (*Presenter*)

PURPOSE

This study evaluates the diagnostic value of T1 mapping and MoCo cDWI in assessing myocardial fibrosis in myocardial infarction by comparing native T1, ECV, and DWI-derived parameters in infarct, gray zone, and normal myocardium.

METHODS AND MATERIALS

A retrospective analysis was conducted on CMR images from 19 myocardial infarction (MI) patients (case group) and 20 healthy individuals (control group). For the case group, myocardial regions were classified based on LGE signal intensity as LGE core zone (6 standard deviations above remote myocardium) and gray zone (2-6 standard deviations above remote myocardium), as well as normal myocardium. Native T1, ECV mapping, ADC, and EADC values were measured for these different myocardial regions. The same parameters were also measured for the entire myocardium of the control group.Normally distributed data were expressed as mean ± standard deviation ($\bar{x}\pm s$), and group comparisons were performed using one-way analysis of variance (ANOVA) followed by LSD test for pairwise comparisons. Non-normally distributed data were presented as median (interquartile range) . A P-value < 0.05 was considered statistically significant. Correlations between variables were assessed using Pearson correlation analysis. Receiver operating characteristic (ROC) curve analysis was used to evaluate the diagnostic value of CMR parameters for myocardial fibrosis in MI, AUC, sensitivity, and specificity were calculated for each parameter.

RESULTS

1. The four myocardial types showed significant differences in native T1, ECV, ADC, and EADC values($P < 0.05$). Pairwise comparisons revealed no significant differences between the remote healthy myocardium of MI patients and the normal control group in terms of native T1, ECV, ADC, and EADC values (all $P > 0.05$). The gray zone, remote zone, and control group had significantly lower native T1, ECV, and ADC values compared to the core infarct zone($P < 0.05$). Differences between the gray zone and the remote zone in native T1, ECV, ADC, and EADC were also statistically significant ($P < 0.05$) (Table 1).2. Native T1, ECV, and ADC in the gray zone showed a moderate correlation with ECV (Table 2).3. In ROC analysis, the diagnostic performance of native T1 combined with ADC was higher than that of T1 or ADC alone. The sensitivity and specificity for identifying the gray zone using ADC combined with T1 were 68% and 100%, respectively (Table 3, Figure 1).

CONCLUSION

Myocardial T1 mapping combined with Second MoCo cDWI can identify the gray zone in MI patients .

CLINICAL RELEVANCE/APPLICATION

Myocardial T1 mapping combined with Second MoCo cDWI has the potential to provide a new non-invasive, quantitative, contrast-agent-free method for evaluating diffuse myocardial fibrosis in clinical practice.

W5A-SPCA-14 CORRELATION BETWEEN PLAQUE BURDEN AND VASCULAR SPECIFIC MYOCARDIAL ISCHEMIA BASED ON CORONARY COMPUTED TOMOGRAPHIC ANGIOGRAPHY (CCTA)

Wan-Yi Zheng, MD (*Presenter*)

PURPOSE

The pathophysiology of myocardial infarction relates to temporal changes of atherosclerotic plaque. Lesions with denser calcification are more likely to be later-stage and stable plaques, which rarely cause acute myocardial infarction. Therefore, we aimed to quantify the correlation between plaque characteristics (calcified/noncalcified burden) and CT-FFFR defined myocardial ischemia.

METHODS AND MATERIALS

37 patients (age 62.16 ±11.61 years; 59.46% men) undergoing CCTA for suspected coronary artery disease were enrolled. Coronary artery analysis was performed for the left anterior descending (LAD), left circumflex (LCX), and right coronary artery (RCA) using validated semi-automated software to quantify total vessel volume, calcified and non-calcified plaque volumes. The correlation between plaque burden (calcified/non-calcified) and CT-FFR was analyzed on a per-vessel basis. Calcified and non-calcified burden was defined as calcified and non-calcified volume/vessel volume×100%.

RESULTS

Plaque was detected in 80 vessels (42.5% LAD, 25.0% LCX, 32.5% RCA), with quantitative analysis showing the RCA had the largest total volume (1280.93 mm^3, $p < 0.001$) while the LCA contained the greatest non-calcified plaque burden (21.52 mm^3, $p = 0.03$). CT-FFR demonstrated significant negative correlations with non-calcified plaque in both LAD ($r=-0.42$, $p < 0.001$) and RCA ($r=-0.78$, $p < 0.001$), with particularly strong association in the RCA, whereas no such correlation was observed in LCX ($r=-0.35$, $p = 0.131$). Notably, calcified plaque burden showed no significant correlation with CT-FFR in any coronary vessel (LAD: $r=-0.24$, $p = 0.165$; LCX: $r=-0.38$, $p = 0.103$; RCA: $r=-0.219$, $p = 0.271$).

CONCLUSION

Compared with calcified plaques, plaques with more non-calcified components are more likely to damage the hemodynamics of coronary arteries, thereby leading to myocardial ischemia. Especially in RCA, although its vascular volume is larger and the non-calcification burden is less, its influence on the non-calcification burden is particularly sensitive.

CLINICAL RELEVANCE/APPLICATION

These findings highlight the importance of non-calcified plaque quantification in assessing ischemic risk and support the use of CT-FFR as an imaging functional marker suggestive of vessels containing high non-calcified burden plaques.

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W5A-SPCH

Chest Imaging Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPCH-1 EXPLOITING STRUCTURAL CONSISTENCY OF CHEST ANATOMY FOR UNSUPERVISED ANOMALY DETECTION IN RADIOGRAPHY IMAGES

Zongwei Zhou, PhD (*Presenter*)
Wenxuan Li, BS (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

This study explores whether AI trained on normal chest X-rays can identify diseases by detecting deviations from healthy anatomy, reducing the need for manual annotations.

METHODS AND MATERIALS

We formulated anomaly detection as an image feature in-painting task. During training, our method learned to categorize image features of normal anatomical structures into a dictionary of recurring visual patterns (discrete features). At inference, it detects anomalies by identifying features that deviate from this learned dictionary. Specifically, we used a Transformer-based Variational Autoencoder (VAE) to learn image features. In feature space, we replaced image features with their closest matches in the dictionary and randomly masked 75% of the features. The VAE then attempted to restore the image features to reconstruct the original image. A discriminator assessed whether the reconstructed image appeared real or fake, providing feedback to refine the Autoencoder's predictions and improve image quality. Since the majority of chest X-rays in the training set were normal, the learned feature dictionary mainly reflected normal features. We developed and evaluated this method on three large-scale X-ray datasets: ZhangLab (N = 5,856; 27% normal, 73% abnormal), COVIDx (N = 29,587; 28% normal, 72% abnormal), and CheXpert (N = 29,420; 19% normal, 81% abnormal).

RESULTS

Our method outperformed 21 established unsupervised anomaly detection methods, achieving AUC gains of 8.0%, 7.0%, and 9.9% in the ZhangLab, COVIDx, and CheXpert datasets. It also improved accuracy by 7.0% in ZhangLab and 6.9% in CheXpert, with F1 score gains of 3.7% and 8.3%, respectively. Additionally, our method is interpretable as it can localize subtle anomalies (e.g., Pneumonia, Cardiomegaly, Atelectasis, etc.) in radiography using heatmaps. Our method is robust to mixed training with different normal/abnormal ratios by up to 50%.

CONCLUSION

The integration of image feature in-painting significantly improved the performance of unsupervised anomaly detection. Our method enhanced detection accuracy while reducing dependence on manually annotated datasets, as normal and abnormal labels can be automatically extracted from patient reports using NLP tools.

CLINICAL RELEVANCE/APPLICATION

This method can ease radiologists' workload by identifying suspicious areas in radiographic images, aiding in the detection of various pathologies, all classified as anomalies. Our results show that it can also detect anomalies that may not be well-annotated in the dataset, such as COVID-19 in late 2019. Its effectiveness without requiring extensive annotations makes it particularly valuable in clinical settings where annotated data is scarce.

W5A-SPCH-2 ARTIFICIAL INTELLIGENCE-BASED CT SEGMENTATION REVEALS PULMONARY STRUCTURAL CHANGES IN CONNECTIVE TISSUE DISEASES

Tengyue Yang (*Presenter*)
Xiaokun Xin (*Abstract Co-Author*)
Nan Yu, MD (*Abstract Co-Author*)
Yueyue Jing (*Abstract Co-Author*)

PURPOSE

Diagnosing pulmonary structural abnormalities in connective tissue diseases (CTDs) such as rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE) is critical yet challenging. This study aimed to evaluate the utility of artificial intelligence (AI)-based CT segmentation in identifying and quantifying pulmonary structural alterations in CTD patients.

METHODS AND MATERIALS

In this retrospective study, we used advanced AI-based CT segmentation techniques to quantify lung structural changes in CTD patients compared to healthy controls. The parameters measured included total lung volume (TLV), low attenuation area (LAA) between -200 and -700 Hounsfield units (HU), total airway volume (TAV), total airway volume for airways =2 mm (TAV2mm), total vessel volume (TVV), total vessel volume for vessels =5 mm (TVV5mm), vessel tortuosity (VT), and fractal dimension (FD). The discriminative ability of these indicators was evaluated using receiver operating characteristic (ROC) curve analysis, with the area under the curve (AUC) as the metric.

RESULTS

The CTD patient group exhibited significantly lower TLV (AUC=0.735), reduced TAV (AUC=0.665), TAV~2mm~ (AUC=0.909), TVV (AUC=0.789), and TVV~5mm~ (AUC=0.755), along with higher LAA-200--700% (AUC=0.742) and VT (AUC=0.568), compared to the healthy control group (*p*<0.001). FD was lower in CTD patients (AUC=0.472, *p*<0.001). TAV~2mm~ demonstrated the highest diagnostic efficacy for distinguishing CTD patients from controls (AUC=0.909), while the joint model achieved superior discriminative performance (AUC=0.960).

CONCLUSION

AI-based CT segmentation effectively detects early pulmonary structural changes in CTD patients, providing a robust tool for differentiating pathological alterations from normal anatomy.

CLINICAL RELEVANCE/APPLICATION

First, this method enables early identification of respiratory complications in CTDs, facilitating timely interventions to prevent irreversible lung damage. Second, it serves as a biomarker for disease severity and progression monitoring. Finally, the integration of AI tools into clinical workflows may reduce diagnostic variability and enhance radiologists' efficiency in managing CTD-related pulmonary involvement.

W5A-SPCH-8 DETECTION OF INTERSTITIAL LUNG ABNORMALITIES ON CHEST CT: COMPARATIVE EVALUATION OF RADIOMICS AND DEEP LEARNING MODELS

Masha Bondarenko, BS (*Presenter*)
Tician Schnitzler, MD, MSc (*Abstract Co-Author*)
Ali Nowroozi, MD (*Abstract Co-Author*)
Adrian Serapio (*Abstract Co-Author*)
Jaewon Jung (*Abstract Co-Author*)
Yu-Fu Wu, MD (*Abstract Co-Author*)
Jae Ho Sohn, MD, MS (*Abstract Co-Author*)

PURPOSE

To develop and compare two machine learning approaches for detecting peripheral fibrotic changes suggestive of interstitial lung abnormalities (ILA) on chest CT: a radiomics-based model and a convolutional neural network (CNN).

METHODS AND MATERIALS

A total of 1,715 chest CT scans were retrospectively collected from a tertiary academic ILD-referral center, including 440 cases with ILA and 1,275 controls without ILA. The radiomics model was built by extracting handcrafted features from segmented lung regions and applying an XGBoost classifier. The CNN model, based on a SlowFast architecture, was trained using manually annotated regions of peripheral fibrosis. Both models were evaluated on an internal test set and an independent external validation cohort from another academic ILD center. Model performance was assessed using accuracy, weighted precision, weighted recall, weighted F1-score, and area under the receiver operating characteristic curve (AUC).

RESULTS

In internal testing, the radiomics model achieved an AUC of 0.88, with an accuracy of 87%, weighted precision of 0.87, weighted recall of 0.87, and a weighted F1-score of 0.87. On external validation, the radiomics model retained an AUC of 0.81, with reduced accuracy (63%), weighted precision of 0.68, weighted recall of 0.63, and a weighted F1-score of 0.61. The CNN model demonstrated an AUC of 0.86 on the internal test set, with an accuracy of 83.4%, weighted precision of 0.69, weighted recall of 0.64, and a weighted F1-score of 0.66. On external validation, the CNN achieved an AUC of 0.79, maintaining balanced sensitivity and specificity with modest decline in overall performance.

CONCLUSION

Radiomics and CNN-based models both enabled accurate detection of peripheral fibrotic changes associated with ILA. The radiomics model offered high internal performance and interpretability, while the CNN model provided a more balanced and generalizable profile. These complementary approaches have potential for integration into clinical workflows to support early, automated detection of interstitial lung abnormalities.

CLINICAL RELEVANCE/APPLICATION

Automated radiomics and CNN-based models can aid in the early detection of interstitial lung abnormalities on chest CT, improving diagnostic accuracy and enabling earlier referral for specialized ILD care.

W5A-SPCH-9 A NOMOGRAM FOR PREDICTING PATHOLOGICAL COMPLETE RESPONSE IN NSCLC PATIENTS RECEIVING NEOADJUVANT IMMUNOTHERAPY USING CT-BASED TUMOR RIM HETEROGENEITY

Yanbo Li (*Presenter*)
Jingyi Yang (*Abstract Co-Author*)
Xiaoting Cai (*Abstract Co-Author*)
Fangyuan Qu, MD (*Abstract Co-Author*)
Ying Liu (*Abstract Co-Author*)

PURPOSE

To investigate intratumoral heterogeneity (ITH) quantification within different tumor- associated volumes of interest (VOIs) identified on pretreatment CT images in non-small cell lung cancer (NSCLC) patients, and to develop a nomogram for predicting pathological complete response (pCR) to neoadjuvant immunotherapy.

METHODS AND MATERIALS

This retrospective cohort study analyzed 229 NSCLC patients who received neoadjuvant immunotherapy followed by surgery between August 2018 and May 2024. Three distinct VOIs were delineated from pretreatment CT images: the gross tumor volume (GTV), GPTV3 (including the tumor along with a 3-mm peritumoral margin), and tumor rim volume (TRV) defined by a 3-mm inward contraction and 3-mm outward expansion from the tumor boundary. VOI subregions were segmented using K-means clustering, with the optimal cluster number being determined via the elbow criterion method. ITH scores were calculated based on local clustering and global pixel distribution. Prognostic performance assessment was conducted using logistic regression frameworks to identify the most discriminative VOI configuration, which was subsequently integrated with clinical variables. A nomogram was developed using multivariable logistic regression to predict pCR. Model performance was evaluated with AUC, calibration curves, and decision curve analysis (DCA).

RESULTS

Among the 229 patients, 105 (45.9%) achieved pCR following neoadjuvant immunotherapy. The dataset was split into a training cohort (n=160) and a testing cohort (n=69). The TRV-ITH model outperformed other VOI models in both cohorts, achieving an AUC of 0.744 (95% CI: 0.666-0.822) in the training set and 0.742 (95% CI: 0.624-0.861) in the testing set. The nomogram exhibited superior predictive performance, with AUCs of 0.811 (95% CI: 0.745-0.876) and 0.789 (95% CI: 0.683-0.895) in the training and testing sets, respectively. It achieved an accuracy of 0.744 and specificity of 0.805. Calibration curves showed good agreement between predicted probabilities and observed outcomes. DCA demonstrated that the nomogram provided greater clinical benefit than other models.

CONCLUSION

Tumor rim heterogeneity represents a promising prognostic biomarker for predicting pCR in NSCLC patients undergoing neoadjuvant immunotherapy. The nomogram incorporating ITH scores with clinical variables demonstrated robust predictive performance for pCR.

CLINICAL RELEVANCE/APPLICATION

By integrating tumor margin heterogeneity and clinical factors, the nomogram enables accurate, non-invasive prediction of pCR in NSCLC patients receiving neoadjuvant immunotherapy, thereby facilitating individualized therapeutic strategies.

W5A-SPCH-10 NEXT-GENERATION IMAGING OF ILD IN SYSTEMIC SCLEROSIS: THE ADDED VALUE OF ULTRA-HIGH-RESOLUTION PCCT

Francois Pontana, MD, PhD (*Presenter*)
Francois-Joseph FERETZ (*Abstract Co-Author*)
Yann Gaillandre (*Abstract Co-Author*)
Antoine Hutt, MD (*Abstract Co-Author*)
Suonita Khung, MD (*Abstract Co-Author*)
Paul Felloni, MD (*Abstract Co-Author*)
Benjamin Longere, MD, PhD (*Abstract Co-Author*)
Christos V. Gkizas, MD, PhD (*Abstract Co-Author*)
Jean-Baptiste Faivre, MD (*Abstract Co-Author*)

PURPOSE

To compare the detection and characterization of interstitial lung disease (ILD) elementary lesions in systemic sclerosis using ultra-high-resolution (UHR) photon-counting detector CT (PCCT) versus high-resolution CT (HRCT) from a third-generation dual-source energy-integrating detector CT.

METHODS AND MATERIALS

This retrospective study included 22 patients with systemic sclerosis and ILD (15 women; mean age: 62.8 years), each undergoing both HRCT and PCCT-UHR for follow-up with clinical and functional stability between scans. HRCT parameters: collimation 2×96×0.6 mm; pitch 2; Sn150kV; 150 mAs with automatic modulation; 1 mm slices; 512² matrix; Bl57 kernel; iterative reconstruction (ADMIRE level 4). PCCT-UHR parameters: collimation 2×120×0.2 mm; pitch 2; Sn100kV or Sn140kV depending on body habitus; automatic tube current modulation (IQ level 36); 0.2 mm slices; 1024² matrix; Bl60 kernel; QIR level 4. Image analysis included tracheal noise measurement and qualitative scoring (0-3 scale) of ground-glass opacities, intralobular reticulations, bronchiectasis, bronchiolectasis, and honeycombing on 1 mm slices.

RESULTS

The mean interval between scans was 33 ± 25 months. Despite higher image noise with PCCT-UHR (67.14 ± 13.18 HU vs 33.63 ± 5.81 HU; $P < 0.0001$), overall image quality was subjectively superior ($P = 0.0348$). PCCT-UHR yielded significantly improved visualization of ground-glass opacities ($P = 0.0003$), intralobular reticulations ($P = 0.0045$), bronchiectasis ($P = 0.0001$), and bronchiolectasis ($P = 0.0002$), with no significant difference for honeycombing ($P = 0.125$). Radiation dose was significantly lower with PCCT-UHR (CTDIvol: 2.35 ± 0.82 mGy; DLP: 77.64 ± 25.38 mGy·cm) compared to HRCT (CTDIvol: 3.35 ± 1.01 mGy; DLP: 116.77 ± 33.45 mGy·cm; $P = 0.0008$).

CONCLUSION

Ultra-high-resolution PCCT significantly enhances the detection of elementary ILD features in systemic sclerosis while reducing radiation exposure, supporting its added value in longitudinal morphological assessment.

CLINICAL RELEVANCE/APPLICATION

Ultra-high-resolution photon-counting CT enables more accurate and lower-dose detection of early fibrotic changes in systemic sclerosis-related ILD, potentially improving disease monitoring and therapeutic decision-making.

W5A-SPCH-11 CLASSIFICATION OF THYMOMAS INTO LOW AND HIGH RISK GROUPS BY RADIOMIC FEATURES AND MACHINE LEARNING

Mustafa Durmaz, MD (*Presenter*)
Tofig Hajiyev (*Abstract Co-Author*)
Sukru Mehmet Erturk, MD (*Abstract Co-Author*)

PURPOSE

To develop and evaluate a machine learning-based model using radiomic features extracted from contrast-enhanced CT (CECT) images to classify thymoma subtypes into low-risk (types A, AB, B1) and high-risk (types B2, B3) groups preoperatively.

METHODS AND MATERIALS

This retrospective study included 87 patients with pathologically confirmed thymomas who underwent CECT within one month before surgery. Tumors were segmented using ITK-SNAP software by semiautomatic methods, and 3D volumes of interest were used for feature extraction with LIFEx software. After preprocessing and harmonization (ComBat method), meaningful radiomic features were used to train three machine learning models: XGBoost-Tuning, Random Forest, and CatBoost. Patients were grouped into low-risk and high-risk categories based on WHO histology. Model performance was evaluated using test accuracy, precision, recall, F1-score, and confusion matrices.

RESULTS

Of the 87 patients, 48 were classified as high-risk and 39 as low-risk. The XGBoost-Tuning model achieved the highest test accuracy (94.4%), with a precision of 95.0%, recall of 94.8%, and F1-score of 94.5%. Random Forest achieved 83.3% accuracy and an F1-score of 82.9%, while CatBoost had the lowest performance (77.8% accuracy, 78.4% F1-score). The XGBoost model demonstrated superior discrimination between risk groups, correctly identifying 11/12 high-risk cases with only one false negative.

CONCLUSION

Radiomics-based machine learning models, particularly XGBoost, can accurately classify thymomas into risk groups using noninvasive imaging biomarkers. This approach demonstrates high performance and holds promise for aiding in the preoperative identification of low- and high-risk thymomas, especially in patients who are not candidates for invasive diagnostic procedures.

CLINICAL RELEVANCE/APPLICATION

Preoperative classification of thymoma risk using CT-based radiomics and machine learning provides a noninvasive, accurate tool to assist in surgical planning and therapeutic decision-making. This approach supports personalized care in patients with anterior mediastinal masses.

W5A-SPCH-13 FACTORS ASSOCIATED WITH LUNG CANCER-SPECIFIC MORTALITY IN LUNG CANCER SCREENING PROGRAMS

Esther Tannoury, MD (*Presenter*)
Suzanne Byrne, MD (*Abstract Co-Author*)
Mark M. Hammer, MD (*Abstract Co-Author*)

PURPOSE

Lung cancer still leads cancer mortality in both men and women. Two major clinical trials have proven lung cancer screening (LCS) to be effective in reducing lung cancer-specific mortality. The causes of persistent lung cancer-specific death despite screening were not directly investigated in those studies. Furthermore, in real world clinical implementation of LCS, additional factors may impact screening efficacy. Our objective is to identify and analyze the causes contributing to lung cancer-specific death in our screening population, highlighting factors limiting the full potential of LCS in reducing lung cancer mortality in everyday practice.

METHODS AND MATERIALS

This retrospective study reviewed all patients who were enrolled in our healthcare system's lung cancer screening program between January 2015 and June 2023. Chart reviews were performed of all patients who died after lung cancer diagnosis to first determine whether the death was attributed to lung cancer. We then performed a chart review to identify contributing factors to lung cancer-specific mortality, including: late-stage disease diagnosed at baseline screening CT; non-compliance; missed nodules; development of aggressive cancers; disease recurrence; and treatment complications.

RESULTS

During the study period, among the 15,762 patients who were screened, 694 were diagnosed with lung cancer, and 112 deaths were attributed directly to lung cancer. Potentially modifiable factors contributing to lung cancer-specific death accounted for the majority (59%) of causes, with baseline late-stage diagnosis being the leading factor (25%) followed by annual screening/follow-up non-compliance (23%), and missed nodules on CT contributing to 11% of cases. Non-modifiable contributing factors included development of an aggressive lung cancer (14%), cancer recurrence after early stage (13%), development of a second lung cancer (9%), and treatment complications (5%).

CONCLUSION

Potentially modifiable factors contributed to the majority of lung cancer-related deaths in our screening program. Interventions to improve screening uptake and follow-up compliance may be able to improve the efficacy of lung cancer screening programs.

CLINICAL RELEVANCE/APPLICATION

Identifying and addressing modifiable factors contributing to lung cancer-specific mortality despite lung cancer screening enrollment is crucial for optimizing the screening system and maximizing its mortality-reducing potential.

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Emergency Radiology Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPER-1 RADIOLOGICAL SPECTRUM OF HEAD AND NECK INJURIES IN BOMB BLAST VICTIMS: A DESCRIPTIVE STUDY

Zohaib Mallick, MBBS (*Presenter*)
Muhammad N. Ahmad, MBBS (*Abstract Co-Author*)
Muhammad Masood Alam, MBBS (*Abstract Co-Author*)
Muhammad Abdullah (*Abstract Co-Author*)
Amal Mahmood (*Abstract Co-Author*)
Fatima Bhojani, MD (*Abstract Co-Author*)
Naila Nadeem, MBBS (*Abstract Co-Author*)
Uffan Zafar, MD (*Abstract Co-Author*)

PURPOSE

Violence involving explosions remains a major cause of mass civilian trauma, particularly in terrorism-affected regions. This study aimed to evaluate the radiological findings in patients with head and neck trauma resulting from blasts in Pakistan.

METHODS AND MATERIALS

This retrospective study was conducted at Aga Khan University Hospital, Karachi, and included patients admitted with blast injuries between January 2004 and December 2024. Data was collected from hospital records and only those who underwent at least one craniocervical radiological examination were included.

RESULTS

A total of 249 patients were analyzed, predominantly male (82.3%), with a median age of 38 years. CT of the head was the most frequently used imaging modality. Foreign bodies (59.0%), cerebral edema (11.6%), and facial soft tissue injuries (16.9%) were the most common radiological findings. Secondary and secondary/tertiary blast injuries were the predominant patterns observed across all imaging stages, while quaternary injuries were absent throughout.

CONCLUSION

CT scans are crucial for detecting major injuries in bomb blast victims; however, combining imaging with thorough clinical evaluation is essential for effective treatment and long-term care.

CLINICAL RELEVANCE/APPLICATION

Understanding the radiological patterns of head and neck injuries in bomb blast victims enhances rapid triage and guides urgent interventions, especially in resource-limited settings where CT imaging plays a vital role in initial diagnosis.

W5A-SPER-2 INTENSIVE CARE UNIT PATIENTS WITH INCREASED RADIATION EXPOSURE DURING A SINGLE HOSPITALIZATION PERIOD: ONCOGENIC RISK CALCULATION

Emilio Quaia, MD (*Presenter*)
Chiara Zanon, MD,MS (*Abstract Co-Author*)
GIULIO CABRELLE (*Abstract Co-Author*)
Francesca De Monte (*Abstract Co-Author*)
Marta Paiusco, MPH (*Abstract Co-Author*)

PURPOSE

To assess the oncogenic risk related to radiation exposure in intensive care unit (ICU) patients with increased cumulative effective dose (>10 mSv) during one single hospital admission.

METHODS AND MATERIALS

This was an IRB approved observational retrospective stiudy. Two hundred seventy one patients (158 male, 113 female; median age, 66 years; interquartile range [IQR], 71-56 years) admitted to the ICU who underwent x ray examinations between october 1, 2021 and february 2025 were included. For each patient, the cumulative effective dose during a single hospital admission was calculated. Lifetime attributable risk (LAR) was estimated based on BEIR VII model to calculate additional oncogenic risk (AOR) related to radiation exposure, corresponding to the risk of cancers in patients exposed to x ray in addition to the oncogenic risk in the general population. AOR corresponds to the LAR per 100000 individuals per 0.1 Gy multiplied by cumulative effective dose/0.1.

RESULTS

The median cumulative effective dose per patient was 48.73 mSv (IQR, 20.74 - 107.19). Male patients were exposed to higher median cumulative effective dose vs female patients (53.84 [IQR, 22.34 - 124.66] vs 22.97 [IQR, 19.1 - 41.81]. AOR for all cancer was 218.85 [IQR, 80.28 - 490.51], for leukemia 36.24 [IQR, 13.33 - 84.35], and for all-solid tumors was 113.38 [IQR, 49.11 - 333.6]. Individual tumor AOR was: bladder cancer, 25.68 [IQR, 9.77 - 64.16]; breast cancer, 7.33 [IQR, 3.12 - 19.28]; colon cancer, 33.76 [IQR, 12.07 - 89.03]; liver cancer, 4.48 [IQR, 1.69 - 12.8]; lung cancer, 50.32 [IQR, 19.55- 92.05]; ovary cancer, 4.5 [IQR, 2 - 8.93]; prostate cancer, 6.13 [IQR, 0.25 - 21.49]; stomach cancer, 9.12 [IQR, 3.56 - 20.04]; thyroid cancer, 0.12 [IQR, 0.03 - 0.53]; and uterus cancer 2.18 [IQR, 0.97 - 4.47].

CONCLUSION

ICU patients with increased radiation exposure revealed elevated oncogenic risk.

CLINICAL RELEVANCE/APPLICATION

ICU patients with increased radiation exposure (>10 mSv) during one hospital admission present elevated oncogenic risk which should imply to limit radiation exposure in critical patients.

W5A-SPER-3 EVALUATION OF A TRIPLE-LOW DOSE PROTOCOL WITH DEEP LEARNING RECONSTRUCTION IN BRAIN PERFUSION CT

Haina Xu (*Presenter*)
Xin Qin (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Feng Chen, MD, PhD (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To investigate the efficacy of a triple-low dose protocol (80 kV/80 mA, 40 mL contrast at 4 mL/s) in brain perfusion CT (CTP) when combined with deep learning image reconstruction (DLIR-H), compared to a conventional protocol (80 kV, 120 mA, 50 mL at 5 mL/s) with iterative reconstruction (ASIR-V 50%).

METHODS AND MATERIALS

A prospective study enrolled 102 patients with suspected acute ischemic stroke (AIS), randomized into conventional or triple-low protocol groups (n=51 each). All underwent CTP scans, generating four datasets: Group A (conventional + DLIR-H), Group B (conventional + ASIR-V), Group C (triple-low + DLIR-H), and Group D (triple-low + ASIR-V). Radiation and contrast doses were documented. Objective image quality was assessed via CT values, standard deviation (SD), signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and perfusion parameters (CBV, CBF, MTT, TTP, Tmax). Two senior radiologists independently evaluated subjective image quality using a 3-point scale (0=poor, 1=moderate, 2=good).

RESULTS

The triple-low protocol significantly reduced radiation (1.51 vs. 2.27 mSv, $P<0.001$) and contrast volume (40 vs. 50 mL) with a slower injection rate (4 vs. 5 mL/s). CT values in gray and white matter were comparable ($P>0.05$), with minor differences (<2 HU) in temporal and parietal white matter. Image noise (SD) varied in the frontal region ($P<0.05$) but not elsewhere. Group C consistently showed lower SD than Group B, though not significantly. SNR was slightly higher in temporal regions ($P<0.05$), while CNR was significantly better in the parietal lobe for Group C vs. Group B ($P<0.05$). Perfusion parameters (CBF, CBV, MTT, TTP) were stable across groups ($P>0.05$); Tmax showed minor regional differences (<0.5 s) but no reconstruction-dependent variation. Subjective scores showed good interobserver agreement (Kappa > 0.6), with all images diagnostically acceptable. Group C slightly outperformed in gray-white differentiation, ischemic contrast, homogeneity, and artifact suppression, though differences were not significant.

CONCLUSION

The triple-low dose protocol with DLIR-H provides comparable image quality and stable perfusion results while significantly reducing radiation and contrast exposure.

CLINICAL RELEVANCE/APPLICATION

This approach enhances stroke imaging by optimizing dose and contrast use, improving safety and efficiency without compromising diagnostic accuracy.

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Gastrointestinal Imaging Wednesday Afternoon Poster Discussions I

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Sub-Events

W5A-SPGI-2 RADIOMICS-BASED RANDOM FOREST CLASSIFICATION OF COLORECTAL LIVER METASTASES ON ABBREVIATED GADOXETATE-ENHANCED MRI

Christina Lim, BSc (*Presenter*)
Robert Policelli (*Abstract Co-Author*)
Carol Johnson (*Abstract Co-Author*)
Aaron D. Ward, PhD (*Abstract Co-Author*)
Karen Dunn (*Abstract Co-Author*)
Darryl W. Ramsewak, MD (*Abstract Co-Author*)
Vibhuti Kalia, MD, FRCR (*Abstract Co-Author*)
Shelby Champion (*Abstract Co-Author*)
Natalie Grindrod (*Abstract Co-Author*)
Zahra Kassam, MD, FRCPC (*Abstract Co-Author*)
Harry R. Marshall, MD, PhD (*Abstract Co-Author*)

PURPOSE

Colorectal cancer (CRC) is the third most common cancer worldwide, with liver metastases (LM) developing in up to 50% of cases. Accurate LM detection is critical for staging and treatment. MRI with hepatobiliary contrast is the most sensitive imaging, and abbreviated protocols are increasingly used. Radiomics—quantitative image analysis—combined with machine learning (ML) offers a promising tool for lesion classification. This study evaluates whether a radiomics-based ML model trained on abbreviated multiparametric MRI can classify liver lesions as accurately as experienced abdominal radiologists. It represents the classification component of a larger ML pipeline for CRC liver lesion triage.

METHODS AND MATERIALS

We retrospectively analyzed abbreviated Gadoxetate-enhanced liver MRI (HBP, T2, DWI) from 58 patients with colorectal adenocarcinoma and suspected LM. Up to 10 lesions per patient were annotated by three abdominal radiologists and segmented in ITK-Snap, yielding 284 lesions (145 metastases, 139 benign). Ground truth was established via pathology (n=57), imaging follow-up (n=215), or surgery (n=12). Radiomic features were extracted from the lesion segmentations to train a random forest classifier. Model performance was assessed using AUC, sensitivity, specificity, and accuracy. Radiologist performance was evaluated on a representative subset of 102 lesions.

RESULTS

The ML model achieved a mean AUC of 0.898 (SD 0.03), comparable to the radiologists' mean AUC of 0.923 ($p = 0.31$, Welch's t-test). Bootstrap-adjusted AUCs confirmed robustness (AUC 0.632 : 0.935; AUC 0.632+ : 0.930). The model demonstrated a sensitivity of 0.82, specificity of 0.84, and accuracy of 83.0%. At matched sensitivity (0.82), the radiologists had a specificity of 0.88 and accuracy of 85.7%. The top 3 radiomic features in order of importance were the first-order features of 10 th percentile, mean, and root mean squared.

CONCLUSION

A radiomics-based random forest model trained on abbreviated Gadoxetate-enhanced MRI achieved diagnostic performance comparable to abdominal radiologists in differentiating colorectal liver metastases from benign lesions. This classification step, as part of a developing pipeline, has the potential to support efficient lesion triage and review, streamlining imaging workflows in CRC care.

CLINICAL RELEVANCE/APPLICATION

Radiomics-based ML applied to abbreviated Gadoxetate-enhanced MRI may enable accurate, reproducible classification of liver lesions in CRC patients, supporting radiologist interpretation and prioritization in high-throughput clinical settings.

W5A-SPGI-3 MULTI-CENTER ASSESSMENT OF HEPATIC STEATOSIS USING ULTRASOUND DERIVED FAT FRACTION (UDFF): REAL-WORLD INSIGHTS FROM A PILOT ROUTINE CLINICAL PRACTICE

Sean D. Raj, MD, MBA (*Presenter*)
Xiaowei Hong (*Abstract Co-Author*)
John Simon, MD (*Abstract Co-Author*)
Barry J. Sadegi, MD (*Abstract Co-Author*)
Lexy Alvarez (*Abstract Co-Author*)
Amanda Klunk (*Abstract Co-Author*)
Cody Kruse (*Abstract Co-Author*)
Erik Sober (*Abstract Co-Author*)

PURPOSE

To evaluate the utility of Ultrasound-Derived Fat Fraction (UDFF), a non-invasive tool for quantifying hepatic fat content, in assessing hepatic steatosis in routine clinical practice using multi-center real-world data.

METHODS AND MATERIALS

A multi-center retrospective analysis evaluated the clinical utility of UDFF in routine practice from patients referred for abdominal ultrasound at SimonMed Imaging (January-April 2025). UDFF was integrated in routine abdominal exam. Clinical indications were categorized as: abnormal labs, abdominal complaints, metabolic dysfunction-associated steatotic liver disease (MASLD), other liver disease, and non-liver disease. Patients were stratified by steatosis severity using UDFF: =5% (Normal), (5,10%](Minimal to Mild), (10,15%] (Mild to Moderate), (15, 20%] (Moderate to Severe), and >20% (Severe). BMI are classified as: <18.5 (Severely

underweight or underweight), 18.5-<25 (Normal), 25-<30 (Overweight), 30-<35 (Obese Class I), 35-<40 (Obese Class II), and =40 (Obese Class III). Sub-analyses evaluated steatosis severity by clinical indications, age, sex, and BMI.

RESULTS

The study included 811 patients (9 sites in Arizona, n=616; 4 sites in Nevada, n=195) with a median UDFF of 7% (interquartile range 5-11%). Steatosis grades were distributed as follows: 35.1% normal (=5%), 33.7% minimal to mild (5-10%), 15.7% mild to moderate (10-15%), 7.3% moderate to severe (15-20%), and 8.3% severe (>20%). Clinical indications varied significantly across grades (p<0.001), with MASLD and abnormal labs more prevalent in steatosis groups (93% and 75%, respectively) compared to the normal group. Older age and higher BMI were associated with greater steatosis severity (p<0.001), with median age increasing from 49 to 54-59 years and median BMI from 26 to 29-32 across normal to severe grades. No statistically significant difference was observed between male and female patients (p=0.5).

CONCLUSION

This real-world evidence study provides the largest reported clinical characterization of UDFF to date, revealing a substantial prevalence of hepatic steatosis, with over 60% of patients having UDFF > 5%. Hepatic steatosis severity using UDFF, is significantly elevated in patients with MASLD, abnormal labs, older age, and higher BMI. These findings underscore UDFF's utility in routine clinical practice for identifying patients at increased risk of advanced steatosis, thereby supporting its role in early detection and risk stratification.

CLINICAL RELEVANCE/APPLICATION

Integrating UDFF into routine abdominal ultrasound offers a non-invasive method to quantify steatosis severity, potentially aiding in the early detection and risk stratification of patients with MASLD and related conditions.

W5A-SPGI-4 DEEP LEARNING-BASED SUPER-RESOLUTION CT RADIOMICS ENHANCES PROGNOSIS PREDICTION FOR PATIENTS WITH HBV-RELATED ACUTE-ON-CHRONIC LIVER FAILURE

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Zhenwei Yao (*Abstract Co-Author*)
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PURPOSE

Hepatitis B virus related acute-on-chronic liver failure (HBV-ACLF) is a severe and life-threatening condition, requiring timely prognosis prediction. We aim to evaluate the efficacy of super-resolution CT radiomics in assessing the severity and predicting short-term survival of HBV-ACLF patients.

METHODS AND MATERIALS

A retrospective study was conducted on 181 HBV-ACLF patients who underwent CT scans across two medical centers. The cohort from 146 patients from our institution was divided randomly into train cohort (n = 102) and validation cohort (n =44), while an external test cohort (n = 35) patients were sourced from external clinical center. Super-resolution CT images were reconstructed using Aenerative adversarial network (GAN) hosted on the OnekeyAI Platform. Radiomics features were extracted using ITK-SNAP, and a multi-task least absolute shrinkage and selection operator (LASSO) model was employed to select non-zero radiomics features. Radiomics model were developed using Logistic Regression (LR), Random Forest and Extra Trees algorithms.

RESULTS

The super-resolution technique demonstrated superior predictive power for 28 and 90-day survival compared to traditional radiomics model [AUC of Random Forest model for 90 day survival: 0.881 vs. 0.860 in train cohort, 0.876 vs. 0.791 in validation cohort, 0.741 vs. 0.703 in test cohort]. Super Resolution model is comparable with clinical models. The nomogram model, integrating Super Resolution with the classic clinical model COSSH-ACLFs, yielded the highest predictive accuracy across all cohorts.

CONCLUSION

Super Resolution act great in predicting prognosis and significantly correlative with multi-organ failure. Further integrate Super Resolution radiomics model with clinical model presented best in predicting prognosis in HBV-ACLF.

CLINICAL RELEVANCE/APPLICATION

Integrating super-resolution CT radiomics with clinical models significantly enhances short-term survival prediction in HBV-ACLF, offering a noninvasive tool to guide timely risk stratification and clinical decision-making.

W5A-SPGI-5 RESEARCH ON PREDICTION OF PERINEURAL INVASION IN RECTAL CANCER BASED ON MRI RADIOMICS AND DEEP LEARNING

Yuxuan Wang (*Presenter*)

PURPOSE

To explore the application value of a fusion model based on MRI radiomics and deep learning in the preoperative prediction of perineural invasion (PNI) in rectal cancer (RC) patients.

METHODS AND MATERIALS

Preoperative MRI images from 404 rectal cancer patients with pathologically confirmed PNI status were retrospectively collected from the first center and randomly divided into a training set and a test set in a 7:3 ratio. Additionally, 100 cases from the second center were prospectively collected as an external validation set.The regions of interest (ROIs) were manually delineated on T2-weighted imaging (T2WI) using ITK-SNAP software. Radiomics features were extracted using PyRadiomics, and deep learning features were extracted using ResNet-50 as the base model. After multi-step dimensionality reduction to screen key features, radiomics models, deep learning models, and combined feature models were constructed using support vector machine (SVM), decision tree (DT), random forest (RF), logistic regression (LR), k-nearest neighbor (KNN), and XGBoost.Model performance was evaluated using the area under the curve (AUC), calibration curves, and decision curve analysis (DCA).

RESULTS

(1) After multi-step feature selection, we identified 26 predictive features (8 radiomics, 18 deep learning). The radiomics model achieved optimal performance using logistic regression (training/test/validation AUCs: 0.808/0.771/0.754), while the deep learning model performed best with SVM (AUCs: 0.853/0.802/0.786).(2) The fusion model significantly outperformed single-modality approaches, with SVM showing the best performance (AUCs: 0.871/0.831/0.822). The model demonstrated excellent calibration across all datasets and showed clinically meaningful benefits in decision curve analysis.

CONCLUSION

The fusion model based on MRI radiomics and deep learning demonstrates significant application value in the preoperative prediction of PNI in rectal cancer, and can provide reference for individualized treatment decision-making.

CLINICAL RELEVANCE/APPLICATION

This study constructed and validated multimodal prediction models based on radiomics features, deep learning features, and their fusion. These findings provide important methodological references for developing noninvasive preoperative prediction tools for PNI in rectal cancer, and hold significant value for guiding individualized treatment planning.

W5A-SPGI-7 DUAL-ENERGY SPECTRAL IMAGING FOR DIFFERENTIATING INTRAPANCREATIC ACCESSORY SPLEEN FROM HYPERATTENUATING PANCREATIC TUMORS ON SINGLE-PHASE CONTRAST-ENHANCED CT

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Taihei Inoue, MD, PhD (*Abstract Co-Author*)
SOICHIRO ISHIUCHI (*Abstract Co-Author*)
Sadahiro Yamamura (*Abstract Co-Author*)
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Ryuya Yoshida (*Abstract Co-Author*)
Toshinori Hirai, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic performance of dual-energy spectral imaging for differentiating intrapancreatic accessory spleen (IPAS) from hyperattenuating pancreatic tumors using single-phase contrast-enhanced CT.

METHODS AND MATERIALS

This retrospective study included 84 patients with hyperattenuating pancreatic lesions (28 IPAS and 56 non-IPAS) who underwent portal venous phase dual-energy CT (DECT) with a dual-layer spectral detector system. For quantitative analysis, signal intensities of lesions and spleen were measured on conventional images, virtual monochromatic images (VMI; 40-140 keV), virtual non-contrast (VNC) images, iodine density (ID) maps, and effective atomic number (Zeff) maps. Relative signal ratios were defined as the absolute difference between lesion and splenic signals divided by the splenic signal (values closer to zero indicate greater similarity to spleen). Quantitative variables were compared between IPAS and non-IPAS groups using the Mann-Whitney U test, and diagnostic performance was assessed using the area under the receiver operating characteristic curve (AUC). For pancreatic tail lesions (28 IPAS, 24 non-IPAS), three radiologists subjectively scored the likelihood of IPAS on a five-point scale (1=definitely non-IPAS; 5=definitely IPAS) using (1) conventional images only and (2) conventional plus spectral images. Pooled AUCs s for subjective assessments were compared using the DeLong method.

RESULTS

All relative signal ratios were significantly lower in IPAS than in non-IPAS (all $p<0.001$). AUCs for conventional, VNC, ID, and Zeff images were 0.824, 0.804, 0.951, and 0.949, respectively. VMI showed improved performance at lower energies, with AUCs increasing from 0.773 at 140 keV to 0.956 at 40 keV. For pancreatic tail lesions, subjective diagnostic performance was significantly improved with the addition of spectral information compared to conventional images alone (AUC: 0.960 vs. 0.696, $p<0.001$).

CONCLUSION

Spectral imaging derived from single-phase DECT improved the quantitative and subjective differentiation of IPAS from hyperattenuating pancreatic tumors.

CLINICAL RELEVANCE/APPLICATION

DECT-based spectral analysis of hyperattenuating pancreatic lesions enables accurate identification of IPAS using only portal venous phase imaging, potentially obviating the need for further diagnostic procedures.

W5A-SPGI-9 FLUCTUATION OF VIRTUAL NON-CONTRAST IMAGING MEASUREMENTS IN PHOTON-COUNTING ABDOMINAL CT

Ali Pourvaziri, MD, MPH (*Presenter*)
Fides Schwartz, MD (*Abstract Co-Author*)
Aaron D. Sodickson, MD, PhD (*Abstract Co-Author*)

PURPOSE

To assess variability in virtual non-contrast (VNC) Hounsfield unit (HU) measurements across contrast-enhanced phases in photon-counting abdominal CT and evaluate their correlation with iodine density.

METHODS AND MATERIALS

We retrospectively analyzed 108 patients who underwent multiphase contrast-enhanced abdominal CT on a photon-counting scanner (Naeotom Alpha, Siemens Healthineers) at two academic centers. ROIs were placed in the renal cortex, aorta, liver, and—if contrast was present—the renal collecting system in the same location on all available phases. All measurements were performed using Syngo.Via software. Mean VNC values and iodine densities were recorded. One-way ANOVA assessed VNC variation between phases in kidney, aorta, and liver in the same location in each patient. Pearson's and Spearman's tests evaluated correlations between VNC and iodine concentration for the pooled data across all phases and measured organs. Piecewise linear regression was applied to pooled data to assess threshold effects.

RESULTS

The cohort included 108 patients (59M, 49F; mean age: 66.4 ± 14.1). Phases included 36 arterial, 38 venous, 50 nephrographic, 70 delayed, and 25 split-bolus exams. VNC variability between scan phases was highest in the kidney (mean: 7.7 HU; range: 0.1-126.2; SD: 14.4), followed by the liver (mean: 4.0 HU; SD: 6.9) and aorta (mean: 4.9 HU; SD: 3.7). For the pooled data, in contrast to other organs, a moderate positive correlation in the renal collecting system between VNC and iodine was observed as the concentration increased ($r = 0.40$). A significant breakpoint at 10.39 mg/mL iodine ($F = 116.7$, $p < 10?44$) indicated minimal VNC change below this level and a steeper increase above it.

CONCLUSION

VNC values are stable in low to moderate iodine concentrations but diverge due to incomplete iodine subtraction in high-iodine settings, particularly in the renal collecting system.

CLINICAL RELEVANCE/APPLICATION

Interpretation of absolute VNC values should be cautious in regions with high iodine content

W5A-SPGI-10 ABDOMENATLAS 2.0: COMPREHENSIVE LESION ANNOTATIONS IN LIVER, PANCREAS, KIDNEY, AND COLON FOR 9,901 THREE-DIMENSIONAL COMPUTED TOMOGRAPHY

Zongwei Zhou, PhD (*Presenter*)
Xinze Zhou (*Abstract Co-Author*)
Yuxuan Zhao (*Abstract Co-Author*)
Qi Chen (*Abstract Co-Author*)
Wenxuan Li, BS (*Abstract Co-Author*)
Dexin Yu (*Abstract Co-Author*)
Alan Yuille, PhD (*Abstract Co-Author*)

PURPOSE

To create a large-scale dataset of per-voxel annotated abdominal lesions. This dataset includes lesions in the liver, pancreas, kidney, and colon.

METHODS AND MATERIALS

We first pre-trained an AI model on four publicly available datasets using the organ and lesion labels provided by each dataset. The model was then used to generate pseudo labels for 9,901 three-dimensional CT volumes, segmenting seven critical structures in the abdominal region, including the liver, pancreas, kidney, liver lesion, pancreatic lesion, kidney lesion, and colon lesion. High-quality pseudo-labels can be ensured through the following two key points: (a) A pre-trained AI model with High (or near perfect) Sensitivity and acceptable Specificity. (b) Well-designed post-processing strategies, including (I) Tumors in the range of organs, (II) Tumors greater than 1.5 mm radius. To convert pseudo labels into clinically trustworthy annotations, a team of 23 board-certified radiologists was engaged to perform detailed annotation and validation using the open-source platform 3D-Slicer. Each radiologist worked approximately 8 hours per week over a period of 6 months, during which all annotations of 9,901 volumes were thoroughly reviewed and corrected. Final annotations were confirmed through visual inspection to ensure accuracy and consistency.

RESULTS

AbdomenAtlas 2.0 is a high-quality dataset consisting of 9,901 CT volumes with four anatomical lesions (liver, pancreas, kidney, colon) annotated in detail, encompassing over 4.7 million slices. The dataset spans a wide range of patient demographics, including variations in age, gender, disease stages, and imaging protocols, collected from 89 medical centers worldwide. It includes 6937 liver tumor lesions, 390 pancreatic lesions, 4328 kidney lesions, and 190 colon lesions. The lesions display diverse morphologies including solitary, multifocal, and infiltrative lesions across different contrast phases and slice thickness. More importantly, the dataset features 5784, 238, 3693, and 78 early-stage lesions (diameter less than 20mm) in liver, pancreas, kidney, and colon respectively.

CONCLUSION

AbdomenAtlas 2.0 is a large-scale, expert-validated dataset of 9,901 abdominal CT scans with detailed lesion annotations. It captures diverse and clinically valuable cases, including thousands of early-stage lesions, providing a strong foundation for developing and evaluating AI models in abdominal lesion detection and segmentation.

CLINICAL RELEVANCE/APPLICATION

AbdomenAtlas 2.0 will be made publicly available to advance medical research, providing doctors, researchers, patients, and students with a comprehensive understanding of lesion characteristics and facilitating early lesion detection.

W5A-SPGI-12 THE HYPERDYNAMIC CIRCULATORY STATE IN CIRRHOSIS: ITS IMPACT ON ARTERIAL CONTRAST ENHANCEMENT IN HYPERVASCULAR HEPATOCELLULAR CARCINOMA

Yasuhiro Inokuchi, RT (*Presenter*)

PURPOSE

Liver cirrhosis (LC) with portal hypertension (PH) is associated with a hyperdynamic circulatory state, potentially leading to dilution of contrast material and reduced first-pass enhancement. This study aimed to evaluate the impact of PH on arterial phase contrast enhancement in hypervascular hepatocellular carcinoma (HCC) and the aorta.

METHODS AND MATERIALS

We retrospectively analyzed 26 patients with LC who underwent contrast-enhanced dynamic MDCT from February 2016 to December 2017. Eleven of these patients had 25 hypervascular HCCs and were divided into two groups: Group A (n=7, HCC=10, without PH) and Group B (n=4, HCC=15, with PH). We compared the liver-to-tumor contrast-to-noise ratio (LTC) and aortic attenuation in the arterial phase between the two groups. Correlation between LTC and aortic attenuation was also assessed.

RESULTS

Group B (with PH) showed significantly lower LTC and aortic enhancement compared to Group A ($P = 0.002$ and $P < 0.001$, respectively). A moderate positive correlation was observed between LTC and aortic attenuation ($r = 0.62$, $P < 0.001$).

CONCLUSION

Portal hypertension in cirrhotic patients may reduce arterial phase contrast enhancement in both hypervascular HCC and the aorta, likely due to a hyperdynamic circulatory state. These findings highlight the importance of considering systemic hemodynamics in the interpretation of dynamic CT imaging in LC patients.

CLINICAL RELEVANCE/APPLICATION

In cirrhotic patients with portal hypertension, decreased arterial enhancement may lead to underestimation of tumor vascularity in hypervascular HCC. Awareness of this phenomenon is essential for accurate CT interpretation and may influence diagnostic confidence and management strategies.

W5A-SPGI-13 MULTIPARAMETRIC MRI-BASED RADIOMICS NOMOGRAM TO QUANTITATIVELY PREDICT SYNCHRONOUS DISTANT METASTASIS IN RECTAL CANCE

Hao Jiang (*Presenter*)
Huijie Jiang, PhD, MS (*Abstract Co-Author*)

PURPOSE

The preoperative identification of rectal cancer(RC) patients with a high-risk of synchronous distant metastasis(SDM) is crucial for personalized management strategies and prognosis. In this study, based on multiparametric MRI radiomics features, we developed a nomogram to evaluate its predictive value for preoperative SDM of RC.

METHODS AND MATERIALS

This retrospective study enrolled 169 patients with histopathology- confirmed rectal adenocarcinoma. The radiomics features were extracted through the PyRadiomics package of the Python language, and a total of 1688 radiomics features were extracted from pretreatment multiparametric MRI. The univariate statistical tests and three feature selection methods were employed to screen clinical factors and radiomics features for predicting SDM. One clinical model, three radiomics models and clinical-radiomics model were constructed. The performance of these models was evaluated using the AUC and the DeLong test. The clinical utility of these models was assessed through calibration curve analysis and DCA.

RESULTS

Eighty-two patients (48.5%) were confirmed to have SDM. After the screening process, 4 clinical characteristics were selected. Diffusion-weighted (DW) phase images retained 8 features; T2-weighted (T2W) phase images retained 8 features; Radiomics model (DW phase and T2W phase images) retained 6 features. This nomogram model performed superior in predicting SDM of RC. In the training set, the AUC, accuracy, sensitivity, specificity and 95%CI were 0.93, 0.85 (114/134), 0.85 (55/65), 0.86 (59/69), 0.89-0.96, respectively. In the test set, five indexes of the nomogram model were 0.94, 0.89 (31/35), 0.88 (15/17), 0.89 (16/18), and 0.79-0.97, respectively. The correction plots were consistent between the predictions of the nomogram model and the actual observed probabilities. DCA showed that the nomogram model achieved the highest net benefit on the training set and the test set compared to the clinical model and the radiomics model.

CONCLUSION

The multiparametric MRI-based radiomics nomogram could achieve precise individualized prediction of SDM in patients, potentially improving the management of RC.

CLINICAL RELEVANCE/APPLICATION

Rectal cancer is the third most common malignant cause of morbidity and mortality. Distant metastasis remains the main cause of treatment failure in patients with rectal cancer. Therefore, preoperative diagnosis of colorectal cancer patients at high risk for SDM is essential for personalized management strategies. We established a radiomics nomogram for preoperative identification of high SDM risk rectal cancer patients, which can help improve decision-making and guide personalized patient management.

W5A-SPGI-14 A NOMOGRAM INCORPORATING DUAL-ENERGY CT PARAMETERS AND CLINICAL FEATURES FOR PREOPERATIVE PREDICTION OF LYMPH NODE METASTASIS IN COLORECTAL CANCER

Fene Hao (*Presenter*)
Yana Dou (*Abstract Co-Author*)

PURPOSE

To investigate the predictive value of a nomogram integrating clinical features and dual-energy CT (DECT) parameters for preoperative prediction of lymph node metastasis (LNM) in colorectal cancer (CRC).

METHODS AND MATERIALS

Clinical and imaging data of 104 CRC patients who underwent triphasic contrast-enhanced DECT scans between October 2019 and December 2024, with postoperative pathological confirmation, were retrospectively analyzed. Evaluated variables included clinical factors (age, sex, CEA, CA19-9, gross tumor type, T stage, differentiation grade) and DECT features (maximum short-axis diameter, shape, margin, density, enhancement degree of lymph nodes). Quantitative DECT parameters across three phases were measured: iodine concentration (IC), normalized iodine concentration (NIC), electron density (Rho), normalized electron density (NRho), effective atomic number (Zeff), normalized effective atomic number (NZeff), spectral curve slope (?Hu), extracellular volume fraction (ECV), and arterial enhancement fraction (AEF). Univariate and multivariate logistic regression identified independent predictors and constructed predictive models. Receiver operating characteristic (ROC) curves were used to evaluate predictive performance, with calculation of the area under the curve (AUC), sensitivity, and specificity

RESULTS

CEA, T stage,maximum short-axis diameter of lymph nodes, venous-phase NIC, delayed-phase NIC,ECVand AEF were independent predictors of CRC LNM (all $P < 0.05$). The combined nomogram achieved superior predictive performance (AUC = 0.925), significantly outperforming the clinical model (AUC = 0.688, $P < 0.05$) and showing comparable accuracy to the DECT model (AUC = 0.787, $P < 0.05$).

CONCLUSION

The developed nomogram, integrating clinical risk factors and DECT-derived parameters, demonstrates favorable preoperative predictive capability for LNM in CRC, offering a valuable tool for optimizing preoperative evaluation and personalized treatment strategies.

CLINICAL RELEVANCE/APPLICATION

This nomogram is non-invasive and highly practical, providing a novel predictive tool for the preoperative individualized assessment of lymph node metastasis in CRC patients.

W5A-SPGI-16 CT-REVEALED PALN TRIAD: A POWERFUL PROGNOSTIC MARKER FOR METASTATIC RISK IN STAGE III LEFT-SIDED COLON CANCER

Mai Ding (*Presenter*)
Zhen Guan (*Abstract Co-Author*)
Ying-shi Sun, PhD (*Abstract Co-Author*)

PURPOSE

This study establishes objective CT criteria for evaluating para-aortic lymph node (PALN) characteristics in stage III left-sided colon cancer, identifying imaging biomarkers that independently predict metastatic progression and may guide personalized adjuvant treatment strategies.

METHODS AND MATERIALS

We conducted a retrospective analysis of 127 surgically-confirmed stage III left-sided colon cancer patients (2015-2019) who underwent preoperative contrast-enhanced CT, systematically evaluating twelve PALN imaging features including size (short diameter =10mm), morphology (angulation sign defined as non-arc nodal surface), perinodal fat infiltration, and enhancement patterns, while controlling for clinicopathological factors (tumor markers, molecular profiles, and treatment data) through Kaplan-Meier survival analysis and multivariable Cox regression to identify independent predictors of 5-year metastasis-free survival.

RESULTS

Multivariable analysis revealed three PALN features as independent metastatic risk factors: maximum short diameter=10mm (HR=2.48, p=0.045), angulation sign (HR=2.64, p=0.039), and perinodal fat infiltration (HR=4.49, p=0.009), with patients exhibiting =2 high-risk features showing significantly worse 5-year metastasis-free survival compared to those with =1 feature (p<0.001) despite receiving adjuvant chemotherapy.

CONCLUSION

This study validates three specific CT-detectable PALN characteristics - size, angulation sign, and fat infiltration - as robust prognostic biomarkers that enable risk stratification in stage III left-sided colon cancer, providing radiologists and oncologists with an objective imaging framework for metastatic risk assessment.

CLINICAL RELEVANCE/APPLICATION

This study provides critical evidence that patients with stage III left-sided colon cancer exhibiting =2 high-risk PALN features (short diameter =10mm, angulation sign, or perinodal fat infiltration) on preoperative CT have significantly worse outcomes despite standard adjuvant chemotherapy. These readily identifiable imaging biomarkers enable: (1) identification of chemotherapy-resistant subgroups requiring treatment intensification (e.g., extended regimens or targeted therapies), (2) standardized risk assessment for clinical trial stratification, and (3) cost-effective prognostic evaluation using routine CT protocols.

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W5A-SPGU

Genitourinary Imaging Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPGU-1 FIRST IMPRESSIONS COUNT: HOW IMAGING ORDER IMPACTS ULTRASOUND ACCURACY IN RENAL STONES ASSESSMENT

Lara Gabrielle L. Lim, MD (*Presenter*)
Kai-Ho Fok (*Abstract Co-Author*)
Deelan Patel, MD (*Abstract Co-Author*)
Errol Colak, MD (*Abstract Co-Author*)
Michael Ordon (*Abstract Co-Author*)
Guan Huang, MD, FRCPC (*Abstract Co-Author*)

PURPOSE

Accurate detection and measurement of renal stones guides clinical decision-making, as stone size predicts spontaneous passage and selecting appropriate management. The gold standard for evaluation has been non-contrast computed tomography (NCCT) due to its high sensitivity and specificity. However, ultrasonography (US) is increasingly used to reduce radiation exposure, cost, and accessibility and has been shown to be a viable alternative imaging modality in select clinical scenarios. Prior studies show US sensitivity and specificity vary with stone size and location, and US tends to overestimate stone size. We evaluated US performance using a modern dataset at our tertiary stone referral centre, assessing the impact of imaging sequence (NCCT first or US first) on diagnostic accuracy.

METHODS AND MATERIALS

A single center retrospective study was performed between January 1, 2017 and September 30, 2022. Patients who underwent both an US and NCCT within 15 days of each other were included. The earliest pair was included for patients who had multiple pairs (n = 25). For each stone, laterality, location, and maximum long-axis size were recorded and corresponding stones were matched between modalities. Patients who had more than 8 stones were excluded as there is likely minimal benefit of US in this clinical scenario (n=34). Patients who only had ureteral stones were excluded (n=13). Statistical analysis was performed with MATLAB (R2024b, Mathworks, 2024).

RESULTS

A total of 206 patients met our inclusion/exclusion criteria (105 female, 143 male; age range 21-89; mean age 59.3 ± 1.1). A total of 454 kidney stones were identified with 121 patients having US first and 85 having CT first. US overestimated stone size (US mean 5.6 ± 0.01mm, CT mean 3.83 ± 0.02mm, $p<0.001$, CI [1.42, 2.03]) and the effect was more pronounced for smaller stones less than 4mm (mean discrepancy 2.2 ± 0.12mm) in comparison to larger stones >=4mm (mean discrepancy 0.43 ± 0.46mm, $p<0.001$). The sensitivity and specificity of US were 65.4% and 41.1%, respectively. When US was performed first, sensitivity was 65.8% and specificity dropped to 17.6%. In contrast, when CT was performed first, sensitivity was 53.5% and specificity increased to 75.0%.

CONCLUSION

US sensitivity and specificity in detecting renal stones were consistent with prior reports. We demonstrate that the specificity of US can be improved if a CT is done first. Stone size tends to be overestimated, especially for smaller stones.

CLINICAL RELEVANCE/APPLICATION

US remains operator dependent for detection of renal stones but our data reveals opportunities to improve performance if a CT is done prior. US stone size should be used cautiously to guide clinical management decisions, particularly for smaller stones.

W5A-SPGU-4 DIAGNOSTIC PERFORMANCE OF SPECTRAL CT TECHNOLOGIES IN DIFFERENTIATING URINARY TRACT STONES FROM PELVIC PHLEBOLITHS AND VASCULAR CALCIFICATIONS

Ahmed Benghatnsh, MD (*Presenter*)
Jacob Sharafuddin, BA (*Abstract Co-Author*)
Jacob Elam, MD (*Abstract Co-Author*)
Ramandeep Singh, MD, MBBS (*Abstract Co-Author*)

PURPOSE

To evaluate the performance of spectral CT technologies including first-generation photon-counting CT (PCCT) and third-generation dual-energy CT (DECT) in differentiating urinary stone subtypes from pelvic phleboliths and vascular calcifications.

METHODS AND MATERIALS

This IRB-approved retrospective study included patients who underwent spectral CT with confirmed urinary stone composition post extraction: 31 PCCT (NAEOTOM Alpha:20 calcium oxalate, 11 calcium phosphate) and 94 DECT (SOMATOM Force:52 calcium oxalate, 33 calcium phosphate). Patient age and BMI were recorded. 128 phleboliths and 76 vascular plaques were identified on PCCT, and 184 phleboliths and 131 plaques on DECT. Automatic segmentation with a stone marker was performed and attenuation values (in Hounsfield units-HU) were measured for stones, plaques, and phleboliths on syngo.via VB80D system (Siemens Healthineers, Forchheim, Germany) across multiple energy levels-PCCT (low- and high-energy 120 kV, monoenergetic 70 keV) and DECT (90 kV, Sn150 kV, and 0.6 mixed kV). Attenuation ratios (RA) were automatically generated. Non-parametric statistical analysis (Mann-Whitney U test) was performed using IBM SPSS Statistics for Windows, Version 29.0 (IBM Corp., Armonk, NY, USA). A p-value < 0.05 was deemed statistically different.

RESULTS

Both spectral CT technologies enabled reliable differentiation of urinary stones from mimicking calcifications. For calcium oxalate stones (Mean RA PCCT1.56, DECT 1.56), both DECT and PCCT demonstrated significant separation from vascular plaques, with DECT showed difference ($p<0.001$) across all energy levels and PCCT achieving $p = 0.04$ at ME70. For calcium phosphate stones (Mean RA PCCT1.51, DECT 1.70) , DECT and PCCT showed statistically significant differentiation from plaques ($p < 0.05$ and $p = 0.02$, respectively). Both modalities also significantly differentiated stones from phleboliths ($p < 0.001$). DECT distinguished calcium oxalate from phosphate stones with high statistical confidence ($p < 0.002$). Phleboliths (Mean RA PCCT1.54, DECT 1.80), plaques (Mean RA 1.60 PCCT, DECT 1.71).

CONCLUSION

Spectral CT techniques, including both PCCT and DECT, using automatic segmentation with spectral attenuation values and calculated ratios allow differentiation of urinary stones from phleboliths and vascular plaques, as well as between calcium oxalate and phosphate stone subtypes.

CLINICAL RELEVANCE/APPLICATION

These findings support the utility of spectral CT in evaluating calcified abdomen and pelvis structures and may guide further exploration of spectral data in urinary stone analysis.

W5A-SPGU-5 COMPARISON OF PROSTATE MRI IMAGE QUALITY AT 3TESLA(T) WITHOUT DEEP LEARNING RECONSTRUCTION (DLR) AND 1.5 T WITH DLR

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Mark A. Ravago, MD (*Abstract Co-Author*)
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Amita Kamath, MD, MPH (*Abstract Co-Author*)
Francisco Restrepo, PhD (*Abstract Co-Author*)
Valentin Fauveau, MSc (*Abstract Co-Author*)
Bachir Taouli, MD (*Abstract Co-Author*)
Sara Lewis, MD (*Abstract Co-Author*)
Neil M. Rofsky, MD (*Abstract Co-Author*)
Christine Chen, MD (*Abstract Co-Author*)

PURPOSE

To compare quantitative and qualitative image quality of prostate magnetic resonance imaging (MRI) at 3T without deep learning reconstruction (DLR) and 1.5 T with DLR.

METHODS AND MATERIALS

In this IRB-approved retrospective study, 100 consecutive patients (mean age 67±8.6, PSA 10.4±18.6, PSA density 0.21±0.36) referred for standard of care prostate MRI underwent 3T MRI without DLR (n=50) or 1.5T MRI with DLR (n=50) between 6/2023-4/2024. All patients underwent T2-weighted imaging (T2WI), focused (b=800) and synthetic diffusion weighted imaging (DWI), and apparent diffusion coefficient (ADC) maps were generated. For quantitative analysis, regions of interest (ROI) were placed over the whole prostate (WP), transition zone (TZ), peripheral zone (PZ), prostate lesion, obturator internus muscle (OIM), and used to calculate signal intensity (SI). Normalized SI (nSI) was calculated using the SI of the ROI divided by the SI of the OIM. Four ROIs were drawn at four corners of the image to calculate background noise; mean standard deviation from these 4 corners was recorded (D). Signal-to-noise ratio (SNR) was determined using the formula 0.66 x nSI/D * v10/3. Contrast-to-noise ratio (CNR) relative to OIM was determined by the formula SI-SI(OIM)/D. Mean SNR and mean CNR for WP, TZ, PZ and prostate lesions on T2WI, DWI and ADC at 3T without DLR and 1.5T with DLR were compared. For qualitative analysis, 3 fellowship-trained body imagers (15, 8 and 2 years of experience; blinded to 3T vs 1.5 T) independently scored T2WI, DWI and ADC images on a scale of 1-5 on 4 parameters: lesion detection, margin sharpness, artifacts and overall image quality. P-values were calculated using Wilcoxon signed rank test (for SNR, CNR) and Mann Whitney U test (for qualitative data). Interobserver agreement was calculated using Fleiss Kappa (FK).

RESULTS

1.5T MRI with DLR demonstrated higher SNR and CNR for all subgroups (WP, TZ, PZ, prostate lesion) compared to 3T MRI without DLR; with statistical significance for T2WI ($p<=0.001$), and results not statistically significant for DWI and ADC. On qualitative analysis, 3T group without DLR scored higher than 1.5 T with DLR on all parameters for all sequences (statistically significant $p<0.03$) with fair inter-observer agreement (FK 0.2-0.4), although the difference in mean scores between the 2 subgroups was small (0.3-0.6).

CONCLUSION

1.5 T MRI with DLR demonstrates superior SNR and CNR compared to 3T without DLR. On qualitative assessment, 3T scored higher on all subjective image quality parameters, although the difference in mean scores between the 2 subgroups was small.

CLINICAL RELEVANCE/APPLICATION

1.5 T with DLR can be useful for prostate imaging in institutions without 3T MRI or in low resource settings.

W5A-SPGU-6 ANALYSIS OF IMAGING PARAMETERS AFFECTING STONE DETECTION ACCURACY USING THE VIRTUAL UNENHANCEDIMAGES AT NEPHROGRAPHIC PHASE IN CONTRAST-ENHANCED DUAL-ENERGY CT UROGRAPHY

Yannan Cheng, BS,BS (*Presenter*)
Jianying Li, PhD (*Abstract Co-Author*)
Jianxin Guo (*Abstract Co-Author*)

PURPOSE

To investigate imaging parameters influencing urinary stone detection accuracy using virtual unenhanced (VUE) images at nephrographic phase (NP) in contrast-enhanced dual-energy CT urography (DECTU).

METHODS AND MATERIALS

150 patients with urinary stones (mean age: 47.51±14.42 years; males vs females: 101 vs 49) who required triphasic DECTU were included. The true unenhanced (TUE) images and VUE images at NP (VUE(NP)) were reconstructed. Per stone detection rates on the above images were recorded. Stone location, size and CT number on the TUE images were recorded and used in univariate and multivariate logistic regression analyses to investigate factors influencing urinary stone detection rate using VUE(NP) images. Thresholds for detecting urinary stones on VUE (NP) images were determined using receiver operating characteristics (ROC) analysis.

RESULTS

Three hundred and four stones were detected on TUE images; 281 stones were identified on VUE(NP) images (detection rate, 92.4%). CT number (Univariate: $p=0.002$; Multivariate: $p=0.003$) of the stones was important factor affecting the detection of stone on VUE(NP) images, while stone size (Univariate: $p<0.001$; Multivariate: $p=0.084$) and location were not (Univariate: $p=1.00$) (Tab.1 and Fig.1). The area under ROC curve (AUC) of using size and CT number for detecting stone on the VUE(NP) images was 0.96 and 0.97, respectively. And as threshold values, stones with size larger than 3.52 mm and CT number greater than 469 HU were found with high accuracy (Tab. 2).

CONCLUSION

VUE(NP) images in DECTU provide high stone detection rate and high accuracy with thresholds for stone size=3.52 mm and CT number=469 HU.

CLINICAL RELEVANCE/APPLICATION

It is feasible to detect and measure urinary stones at VUE(NP) images in DECTU with high stone detection rate and high accuracy.
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Nov. 30 – Dec. 4
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Abstract Archives of the RSNA, 2025

W5A-SPHN

Head & Neck Imaging Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPHN-2 DIFIUSION-WEIGHTED IMAGING COMBINED WITH AMIDE PROTON TRANSFER WEIGHTED IMAGING WAS USED TO DIFFERENTIATE BENIGN AND MALIGNANT PAROTID GLAND TUMORS

Feng Yu (*Presenter*)
Lijun Wang (*Abstract Co-Author*)

PURPOSE

To investigate the combination of DWI and APTw sequence in the differential diagnosis of benign and malignant parotid tumors.

METHODS AND MATERIALS

A total of 90 patients with pathologically confirmed solid parotid tumors underwent 3.0TMRI examination in our hospital were retrospectively analyzed, including 72 benign tumors and 18 malignant tumors(MT), which were further divided into four groups: pleomorphic adenoma(PA) (n=38), Warthin tumor(WT) (n=24), basal cell adenoma (BCA)(n=10) and malignant tumors. Two observers measured the ADC and APT values of the two groups of lesions.Logistic regression was used to analyze the statistically significant parameters and the diagnostic model combined with baseline data. Adopt the receiver-operating characteristics (ROC) there are differences between the curve of assessment parameters and joint diagnosis efficiency of the model. The DeLong test was used to compare the differences in the area under the ROC curve

RESULTS

(1) The inter-observer agreement of ADC and APT values was good (ICC > 0.75). (2) The ADC values of WT and MT were lower than those of PA (P<0.001). The ADC value of WT was lower than that of BCA (P<0.001). The APT values of PA, WT and BCA were significantly higher than those of MT (P<0.05). (3) The AUC of ADC, APT and their combination in the differential diagnosis of parotid PA and WT were 0.878 (P<0.001), 0.679 (P< 0.011) and 0.882 (P<0.001), respectively. The AUC of parotid PA and malignant tumor were 0.879(P<0.001), respectively. The AUC of WT and BCA were 0.883(P<0.001), 0.535(P=0.744) and 0.858(P<0.001), respectively. Delong test showed that the AUC of ADC value and their combination in the differential diagnosis of parotid PA and WT were higher than APT value (P=0.021). The AUC of WT and BCA were both larger than APT value (P=0.007). The AUC of the combination of the two values in the differential diagnosis of parotid PA and MT was greater than that of APT value (P=0.022). There was no correlation between ADC values and APT values

CONCLUSION

DWI and APT can be used to quantitatively evaluate the characteristics of parotid gland tumors. ADC value, APT value and their combination have similar efficacy in the differential diagnosis of parotid gland tumors, and the combination of ADC value and APT value has the highest efficacy in the differential diagnosis of PA and MT.

CLINICAL RELEVANCE/APPLICATION

DWI and APT can be used to quantitatively evaluate the characteristics of parotid gland tumors. ADC value, APT value and their combination have similar efficacy in the differential diagnosis of parotid gland tumors, and the combination of ADC value and APT value has the highest efficacy in the differential diagnosis of PA and MT.

W5A-SPHN-5 ASSESSING THE DIAGNOSTIC ACCURACY OF AI IN DETECTING PERIAPICAL LESIONS ON PANORAMIC AND CBCT IMAGE

Wojciech Kazimierczak, MD, PhD (*Presenter*)
Natalia Kazimierczak (*Abstract Co-Author*)
Roza Wajer, MD (*Abstract Co-Author*)
Natalia Chwarscianek (*Abstract Co-Author*)
Adrian Wajer (*Abstract Co-Author*)
Zbigniew Serafin (*Abstract Co-Author*)

PURPOSE

Periapical lesions (PLs) are frequently detected in dental radiology. Accurate diagnosis of these lesions is essential for proper treatment planning. Imaging techniques such as orthopantomogram (OPG) and cone-beam CT (CBCT) imaging are used to identify PLs. The aim of this study was to assess the diagnostic accuracy of artificial intelligence (AI) software Diagnocat for PL detection in OPG and CBCT images.

METHODS AND MATERIALS

The study included 49 patients, totaling 1223 teeth. Both OPG and CBCT images were analyzed by AI software and by three experienced clinicians. All the images were obtained in one patient cohort, and findings were compared to the consensus of human readers using CBCT. The AI's diagnostic accuracy was compared to a reference method, calculating sensitivity, specificity, accuracy, positive predictive value (PPV), negative predictive value (NPV), and F1 score.

RESULTS

The AI's sensitivity for OPG images was 33.33% with an F1 score of 32.73%. For CBCT images, the AI's sensitivity was 77.78% with an F1 score of 84.00%. The AI's specificity was over 98% for both OPG and CBCT images.

CONCLUSION

The AI demonstrated high sensitivity and high specificity in detecting PLs in CBCT images but lower sensitivity in OPG images.

CLINICAL RELEVANCE/APPLICATION

AI models can help clinicians identify periapical pathologies with greater speed and consistency, especially in early or subtle cases that can be overlooked by the human eye. This will result in increased diagnostic support and more accurate endodontic care in daily practice.

W5A-SPHN-6 EVALUATING THE RELIABILITY OF AI-ASSISTED DETECTION OF ROOT APEX PROXIMITY TO THE MANDIBULAR CANAL

Wojciech Kazimierczak, MD, PhD (*Presenter*)
Natalia Kazimierczak (*Abstract Co-Author*)
Natalia Chwarscianek (*Abstract Co-Author*)
Zbigniew Serafin (*Abstract Co-Author*)

PURPOSE

This study evaluates the diagnostic accuracy of an AI-assisted tool in assessing the proximity of the mandibular canal (MC) to the root apices (RAs) of mandibular teeth using computed tomography (CT).

METHODS AND MATERIALS

This study involved 57 patients aged 18-30 whose CT scans were analyzed by both AI and human experts. The primary aim was to measure the closest distance between the MC and RAs and to assess the AI tool's diagnostic performance. The results indicated significant variability in RA-MC distances, with third molars showing the smallest mean distances and first molars the greatest. Diagnostic accuracy metrics for the AI tool were assessed at three thresholds (0 mm, 0.5 mm, and 1 mm).

RESULTS

The AI demonstrated high specificity but generally low diagnostic accuracy, with the highest metrics at the 0.5 mm threshold with 40.91% sensitivity and 97.06% specificity.

CONCLUSION

This study underscores the limited potential of tested AI programs in reducing iatrogenic damage to the inferior alveolar nerve (IAN) during dental procedures. Significant differences in RA-MC distances between evaluated teeth were found.

CLINICAL RELEVANCE/APPLICATION

Accurate assessment of the spatial relationship between root apices and the mandibular canal is critical in avoiding complications during dental procedures such as extractions, implant placement, and endodontic treatments ultimately contributing to improved patient outcomes and reduced surgical risks.

W5A-SPHN-7 DIFFERENTIAL TUMOR INFILTRATING LYMPHOCYTE DYNAMICS ACROSS IMMUNE CHECKPOINT INHIBITORS MAY AFFECT EARLY METRICS OF RESPONSE AS MEASURED BY DIFFUSION-WEIGHTED MRI

Aaron Simon, MD,PhD (*Presenter*)
Robert Saddawi-Konefka (*Abstract Co-Author*)
Lei Gao (*Abstract Co-Author*)
Tomohiko Ishikawa (*Abstract Co-Author*)
Cynthia Zhao (*Abstract Co-Author*)
David R. Vera, PhD (*Abstract Co-Author*)
Loren K. Mell, MD (*Abstract Co-Author*)

PURPOSE

Monitoring tumor response to immune checkpoint inhibitors (ICI) is a challenge due to the disconnect between early and late responses as measured by traditional metrics. Diffusion weighted magnetic resonance imaging (DW-MRI) is a potential solution to this challenge, with early experiments suggesting DW-MRI can capture ICI-induced tumor infiltrating lymphocytes (TIL), predicting tumor response. However, different classes of ICI elicit distinct TIL responses, which could affect DWI-metrics. Here, we used a preclinical model of head and neck squamous cell carcinoma with a characteristic response to CTLA-4 and PD-1 ICIs to investigate the link between TIL dynamics and DW-MRI metrics in response to different ICIs.

METHODS AND MATERIALS

Tongues of C57BI/6 mice were orthotopically implanted with cells from the 4MOSC1 cell line on day 0. Mice underwent DW-MRI on day 4, then received anti-CTLA-4 antibodies (aCTLA4; clone 9H10) (n=29), anti-PD1 antibodies (aPD1, clone J43) (n=28), or control vector (n=27). Imaging was repeated on day 10. DW-MRI sequence: 64-shot SE EPI. Matrix: 128 x 64, in-plane resolution: 0.15 x 0.31 mm, slice thickness: 1mm. B-values: 0 and 1000s/mm 2 . A single diffusion encoding gradient direction was acquired. For each mouse, at each time point, tumor region of interest (ROI) was contoured. Within each ROI, mean apparent diffusion coefficient (ADC) was calculated. Change in tumor volume and intra-tumoral ADC from day 4 to day 10 were calculated. TIL abundance and density on day 10 were assessed by immunohistochemistry (IHC). Day 10 was selected as it precedes measurable tumor volume response in this model.

RESULTS

Fractional change in tumor volume was not significantly different between control (mean ± SEM:1.5±0.2) and aCTA-4 (1.4±0.3, p=0.6) or aPD-1 (1.4± 0.1, p=0.5). Fractional decrease in ADC was smaller in control (-0.19± 0.03) vs. aCTA-4 (-0.27±0.03, p=0.04) but not vs. aPD-1 (-0.20± 0.02, p=0.75). IHC showed significantly less TIL infiltration in control (586 ± 52 cells/mm²) vs. aCTLA-4 (1000 ± 91 cells/mm², $p < 0.0001$) but not vs. aPD-1 (727 ± 68 cells/mm², p = 0.18).

CONCLUSION

In a pre-clinical model with a characteristic response to treatment with CTLA-4 and PD-1 inhibitors, DW-MRI detected differences across treatment arms that preceded measurable changes in tumor size. Differences in DW-MRI metrics corresponded to differences in lymphocyte infiltration.

CLINICAL RELEVANCE/APPLICATION

This study supports the potential for DW-MRI in clinical monitoring of ICI-response but also suggests a complex relationship between imaging metrics and underlying physiology . Clinical studies employing DW-MRI may need to account for differential TIL responses across immunotherapeutic treatments.

W5A-SPHN-8 MAGNETIC RESONANCE ELASTOGRAPHY FOR CHARACTERIZING PAROTID TUMORS: FEASIBILITY AND PRELIMINARY RESULTS

Vitaliy Atamaniuk, MSc, BEng (*Presenter*)
Wojciech Domka (*Abstract Co-Author*)
Lukasz Hanczyk (*Abstract Co-Author*)
Marian Cholewa (*Abstract Co-Author*)
Bogdan Obrzut (*Abstract Co-Author*)
Marzanna Obrzut (*Abstract Co-Author*)

PURPOSE

Magnetic resonance elastography (MRE) is a non-invasive technique for the quantitative assessment of the biomechanical parameters of soft tissues, widely used in liver and brain imaging. Its utility in evaluating other organs—such as the parotid glands, where MRE-derived stiffness values may aid in differentiating tumor types—remains underexplored. This study aimed to assess the feasibility of using MRE with a custom-designed facial passive driver to characterize parotid tumors.

METHODS AND MATERIALS

Fourteen patients (8F, 6M; mean age 60.4 ± 11.7 years; range 39-76 years) with histologically confirmed parotid tumors underwent MRE with 80 Hz vibrations on a 1.5 T whole-body scanner. A custom passive driver was placed over the patient's face, with vibration pads bilaterally covering the parotid glands to enable simultaneous imaging. A motion-sensitive 2D GRE sequence with motion-encoding gradients in the X direction was used to capture shear wave propagation. Stiffness maps were generated using MMDI inversion, and tumor stiffness was quantified from manually drawn regions of interest. When feasible, stiffness of the contralateral healthy parotid gland was also measured (n=8). Tumor types included pleomorphic adenomas (n=7), Warthin tumors (n=5), lymphoepithelial lesions (n=2), and one mucoepidermoid carcinoma (G2). Stiffness trends across tumor types and relative to normal tissue were analyzed descriptively. Spearman's correlation was used to assess the relationship between tumor stiffness and volume. The Wilcoxon signed-rank test was used to compare tumor and healthy gland stiffness.

RESULTS

MRE acquisition succeeded in all 14 patients (15 lesions), with interpretable stiffness maps in every case. Elevated stiffness was observed in pleomorphic adenomas (mean ± SD: 3.41 ± 1.54 kPa, n=7) and the mucoepidermoid carcinoma (3.41 kPa), while Warthin tumors (2.37 ± 0.61 kPa, n=5) and lymphoepithelial lesions (2.41 ± 0.19 kPa, n=2) exhibited lower values. In eight cases where contralateral healthy gland stiffness was available (mean stiffness ± SD: 1.90 ± 0.43 kPa), tumor stiffness was consistently higher (p=0.02). No significant correlation was found between tumor stiffness and volume (rho = 0.27, p = 0.33).

CONCLUSION

MRE of the parotid tumors using a custom passive driver is feasible. Preliminary results suggest that stiffness values differ among tumor types and exceed those of healthy tissue, supporting the potential of MRE in non-invasive tumor characterization. However, larger studies are needed to validate diagnostic accuracy of this method.

CLINICAL RELEVANCE/APPLICATION

Magnetic resonance elastography may enable non-invasive biomechanical characterization of parotid tumors, supporting their differential diagnosis.

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Nov. 30 – Dec. 4
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W5A-SPIN

Imaging Informatics Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPIN-2 LABELING ACCURACY OF AN AI TOOL FOR DICOM STANDARDIZATION AND ITS IMPACT ON RADIOLOGISTS' READING TIMES

Jacob J. Visser, MD, PhD (*Presenter*)
Bina Tariq (*Abstract Co-Author*)

PURPOSE

Medical artificial intelligence (AI) tools are increasingly adopted to manage the rising volume of imaging within radiology departments,. However, AI-driven workflow improvement applications have received limited attention. One such tool is ENDEX TM , which automatically standardizes and refines DICOM metadata to ensure consistent image labeling across scanners and institutions, enabling more reliable and efficient automated hanging protocols in PACS. This study evaluates the labeling accuracy of such an AI tool for DICOM standardization and its impact on radiologists' reading times.

METHODS AND MATERIALS

A retrospective cohort study assessed the labeling accuracy of an AI-driven DICOM standardization tool and a retrospective before-after design evaluated its impact on reading times. The AI tool was applied by Telemedicine Clinic (TMC) from 40 National Health Services (NHS) Trusts in the United Kingdom (UK) between 2022 and 2024. Standardized DICOM labels (modality, body part, laterality, plane, protocol) were manually reviewed (gold standard) based on visual evaluation of the images. In a separate impact analysis reading times were compared before and after implementation of the AI tool.

RESULTS

AI-driven DICOM labeling accuracy, evaluated across imaging modalities (CR and CT) and multiple anatomic regions, ranged from 83% to 100% for body part labels, 91% to 100% for plane labels, and 88% to 100% for protocol labels. The impact analysis revealed reductions in average reading times (p-value = 0.02) for CT Abdomen (-2.9 min), Total Body (-2.2 min), Head (-0.73 min), and Temporal Bone (-2.5 min), corresponding to efficiency gains of 8% to 22%. Extrapolated annually, this equals 270 hours saved, or approximately 34 working days. No significant changes in reading time were observed for CT Chest and Sinus/Orbits.

CONCLUSION

The AI-driven DICOM standardization tool demonstrated high labeling accuracy and reduced radiologists' reading times.

CLINICAL RELEVANCE/APPLICATION

This highlight its potential to address long-standing challenges in metadata standardization and streamline radiology workflows.

W5A-SPIN-3 AUTOMATING DEEP INFERIOR EPIGASTRIC ARTERY PERFORATOR (DIEAP) FLAP PLANNING USING FOUNDATION MODEL

Maria Matilde Andrade, MSc (*Presenter*)
Nuno Loucao (*Abstract Co-Author*)
Tiago Marques (*Abstract Co-Author*)
Ricardo Vigario (*Abstract Co-Author*)
Joao Santinha (*Abstract Co-Author*)

PURPOSE

This work combines Segment Anything Model 2 (SAM2) with computer vision methods to automatically segment abdominal perforators in CT images, addressing a labor-intensive step (~2h) in preoperative planning for DIEAP flap procedures. Additionally, this approach computes the intramuscular course length, currently assessed qualitatively.

METHODS AND MATERIALS

18 abdominal CT scans from patients with breast cancer, who were eligible for DIEAP flap procedures, were used. Expert manual annotations served as ground truth.A fully automated pipeline was developed to segment and analyze the intramuscular and subcutaneous courses of perforators. Skin segmentation and the CompositIA model were used to define the abdominal muscle. A 4mm slab thickness MIP was generated to enhance vessel visibility and continuity, facilitating centerline extraction of perforators.Segmentation of the perforators was performed using SAM2, guided by positive and negative point prompts. Positive prompts were derived from the extracted centerline with a local search for high-intensity voxels, while negative prompts were obtained by identifying low-intensity voxels at regular distances and angles. Following segmentation, intramuscular length was computed along the refined centerline.Measurements were compared against expert-derived values.

RESULTS

The proposed pipeline was able to identify and segment 33/36 perforator vessels in 15/18 cases, enabling automatic quantification of intramuscular length with a median difference of 49.8mm (IQR:58mm). These discrepancies are partly explained by the conservative approach of the method and occasional oversegmentation in the reference annotations. Despite these limitations, the method shows potential for consistent and reproducible vessel characterization.

CONCLUSION

This study presents a proof-of-concept, automated approach for segmenting and characterizing the perforator vessels in CT images using non-medical imaging foundation models. While further refinement and validation are needed, the proposed method establishes a robust and reproducible baseline for future developments in automatic quantification of perforator length, tortuosity, and caliber. These findings support the potential of models to drive progress toward scalable, objective, and clinically viable tools for complex segmentation tasks in radiological workflows.

CLINICAL RELEVANCE/APPLICATION

Automated delineation of abdominal perforators can reduce workload and inter-reader variability in DIEAP flap surgical planning. This method introduces objective, quantitative vessel characterization, potentially enhancing clinical decision-making and improving surgical outcomes.

W5A-SPIN-5 ENHANCING SEGMENTATION PERFORMANCE OF INTRACRANIAL HEMORRHAGE THROUGH RELEVANT ANATOMY PRETRAINING AND CT-WINDOW STACKING IN NON-CONTRAST BRAIN CT

Joon Park, MD (*Presenter*)
Hyunki Lee (*Abstract Co-Author*)
Yereen Yoo (*Abstract Co-Author*)
Joonseo Oh (*Abstract Co-Author*)
Jongjun Won, BS (*Abstract Co-Author*)
Gil-Sun Hong, MD, PhD (*Abstract Co-Author*)
Namkug Kim, PhD (*Abstract Co-Author*)

PURPOSE

To enhance segmentation performance of intracranial hemorrhage (ICH) in brain CT by integrating brain anatomy pretraining and multi-windowing techniques, which could better emulate radiologists' diagnostic reasoning process and compare its performance to the other segmentation models.

METHODS AND MATERIALS

A segmentation network based on STUNet and nnUNet was trained using 1068 non-contrast brain CT scans including intracranial hemorrhage cases, collected from a tertiary academic hospital between January 1, 2000 and August 31, 2018. To address segmentation failures in subtle hemorrhagic regions, the models were pre-trained on brain anatomy segmentation masks including merged regions to elicit semantic representation as boundaries. Additionally, 3 CT windowing settings, Brain (WL/WW: 40/80), Subdural (WL/WW: 80/200), and Bone (WL/WW: 600/2800), were applied to provide preprocessed images with richer contrast information. An internal test and five external test sets, randomly retrieved CT scans from different institutions, were collected. Performances were evaluated using Dice coefficient, sensitivity and specificity, focusing on their ability to detect hemorrhagic regions with minimal false positives.

RESULTS

STUNet outperformed nnUNet when fine-tuned with 3 windowed images on external datasets in terms of Dice coefficient (0.61 vs. 0.58, $p=0.02$). With STUNet, fine-tuning with brain anatomy pre-trained weight offered improved specificity on both internal (0.723 (scratch) vs. 0.850 (fine-tuning with original image) vs. 0.850 (fine-tuning with 3 windowed images); $p=0.022$) and external (0.734 vs. 0.758 vs. 0.789 (listed as same sequence); $p<0.001$) datasets. With nnUNet, fine-tuning with 3 windowed images significantly improved both Dice coefficients (0.533 vs. 0.505 vs. 0.550; $p=0.02$) and specificity (0.440 vs. 0.680 vs. 0.730; $p<0.001$) on external datasets.

CONCLUSION

Combining pre-training brain anatomical structures and three-windowing image preprocessing methods robustly enhances segmentation performance for ICH, particularly in challenging faint regions. Our model could help clinicians' reading, supporting more efficient decision making in acute care settings.

CLINICAL RELEVANCE/APPLICATION

This study mimics the radiologist's diagnostic reasoning by embedding knowledge of brain anatomy and leveraging CT windowing techniques. The resulting model exhibits improved specificity and Dice scores, contributing to reduced false positives and better segmentation performance. This could lead to lessen the burden on physicians during emergency neuroimaging assessments.

W5A-SPIN-6 ANNOTATION-EFFICIENT DEEP LEARNING DETECTION AND MEASUREMENT OF MEDIASTINAL LYMPH NODES IN CT

Leo Joskowicz, PhD (*Presenter*)
Alon Olesinski (*Abstract Co-Author*)
Richard Lederman, MD (*Abstract Co-Author*)
Jacob Sosna, MD (*Abstract Co-Author*)

PURPOSE

Accurate assessment of mediastinal lymph nodes (LNs) in contrast-enhanced CT (CECT) scans is essential for cancer staging and treatment planning. Current guidelines require measurement of enlarged lymph nodes whose short axis length (SAL) is >10mm. Manual detection and measurement of LNs is, however, time-consuming and subject to observer variability.The aim of this study was to evaluate the performance of a novel annotation-efficient deep learning method for automatic detection and segmentation of mediastinal LNs in CECT.

METHODS AND MATERIALS

The semi-supervised method combines the quality advantages of expert annotations with the quantity advantages of pseudo-labeled data. It uses an ensemble of 3D nnU-Net models trained on a few expert-annotated scans to generate pseudo-labels on a large dataset of unannotated scans. The pseudo-labels are then filtered to remove false positive LNs by excluding LNs outside the mediastinum and LNs overlapping with other anatomical structures. Finally, a 3D nnU-Net model is trained using the filtered pseudo-labels. The method helps optimize the ratio of annotated/non-annotated dataset sizes to achieve the desired performance, thus reducing the manual annotation effort.We retrospectively collected 268 chest CECT studies of patients with mediastinal lymphadenopathy from ***** and from a public dataset of 710 unannotated CECT scans from the NIH. Ground truth delineations were obtained from an expert radiologist for 1,817 LNs from ***. Of the 268 scans, 134 scans were used for testing while the remaining ones were used for ensemble training in batches of 17, 34, 67 and 134 scans together with 710 unannotated scans.

RESULTS

The final 3D nnU-Net yielded a lymph node precision and detection of 0.80±0.32 and 0.81±0.33 for lymph nodes > 10mm, 0.80±0.15 and 0.63±0.25 for lymph nodes > 5mm, and 0.76±0.20 and 0.50±0.23 for all lymph nodes, respectively. The lymph node segmentation Dice scores were 0.75±0.22, 0.66±0.13 and 0.66±0.13, for these sizes. The semi-supervised models recall improvements were 11-24% (0.72-0.87) while maintaining comparable precision levels. The mean SAL difference (std) was 4.6 (4.7) mm and 2.3 (3.2) mm, respectively, within the observer variability.

CONCLUSION

Our method requires x4-10 less annotated data to achieve a performance similar to supervised models trained on the same dataset. This constitutes a significant saving in the annotation effort.

CLINICAL RELEVANCE/APPLICATION

Label-efficient automatic detection and measurement of mediastinum lymph nodes in chest CECT may help in the evaluation of patients with enlarged lymph nodes.

W5A-SPIN-7 GENERATING SYNTHETIC CHEST CT RADIOLOGY REPORTS USING LARGE LANGUAGE MODELS- A CHAMELEON DATASET STUDY

Satvik Tripathi (*Presenter*)
Ebubechukwu Enwerem (*Abstract Co-Author*)
Dana Alkhulaifat, MD (*Abstract Co-Author*)
Rupali Jain, MD,MBBS (*Abstract Co-Author*)
Meghana Muppuri (*Abstract Co-Author*)
Emiliano Garza Frias, MD (*Abstract Co-Author*)

Shawn Lyo, MD (*Abstract Co-Author*)
Scott A. Simpson, DO, MEd (*Abstract Co-Author*)
Dania Daye, MD,PhD (*Abstract Co-Author*)
Tessa S. Cook, MD, PhD (*Abstract Co-Author*)

PURPOSE

To address the limited availability of de-identified radiology datasets for AI research, we developed Chameleon , a framework for generating synthetic chest CT radiology reports using large language models (LLMs). This study aimed to evaluate different prompting strategies and conduct expert validation to optimize clinical realism, report structure, and dataset reliability.

METHODS AND MATERIALS

We utilized a HIPAA-compliant deployment of GPT-4o to generate a synthetic dataset encompassing 17 common thoracic pathologies as well as normal findings. Three prompting strategies were tested: (1) zero-shot prompting using minimal instruction, (2) one-shot prompting using a structured template with predefined report sections, and (3) few-shot prompting incorporating multiple real reference reports derived from our institutional clinical database. A total of 99 synthetic test reports were generated across these strategies and blindly evaluated by four clinical readers. Each reviewer assessed content accuracy, stylistic coherence, and formatting, and recorded strategy preference. Inter-reader agreement and qualitative feedback were collected. Based on feedback, we refined the prompting by incorporating 20 additional reference reports for improved contextual grounding.

RESULTS

Few-shot prompting consistently produced the most clinically coherent and well-structured reports. All reviewers preferred the few-shot strategy over zero-shot and one-shot approaches. A score of 96% inter-reader agreement confirmed the high fidelity and reliability of the generated outputs. The improved few-shot prompting method maintained quality at scale, as confirmed by 100% pass rate in downstream quality control. Rapid generation speed further supports the scalability of the Chameleon framework. A secondary quality control step was performed by two board-certified radiologists on a random sample of the enhanced reports, with no failure cases identified. The mean generation time was 0.23 seconds per report.

CONCLUSION

The Chameleon pilot study demonstrates that high-quality, structured, and clinically realistic chest CT radiology reports can be rapidly generated using a HIPAA-compliant LLM with optimized few-shot prompting. Expert validation supports the fidelity of the synthetic reports, enabling their use for natural language processing (NLP), LLM benchmarking, and downstream AI model training in diagnostic radiology.

CLINICAL RELEVANCE/APPLICATION

Chameleon offers a reproducible and scalable method to generate PHI-free, expert-validated synthetic radiology datasets, enabling safer and broader access to training data for NLP and generative AI applications in radiology research and education.

W5A-SPIN-8 EVALUATING LARGE LANGUAGE MODELS FOR CONTEXT-AWARE SUMMARIZATION OF EMERGENCY DEPARTMENT NOTES FOR RADIOLOGIC INTERPRETATION

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PURPOSE

To evaluate the performance of large language models (LLMs) in generating imaging-relevant summaries from Emergency Department (ED) clinical notes to support radiologic interpretation.

METHODS AND MATERIALS

A retrospective dataset of 901 unique ED notes was collected over a 3-month period, each linked to an imaging order and clinical indication. Notes were de-identified using named entity recognition and cleaned to remove extraneous content (e.g., unrelated imaging orders, medication reconciliation). When imaging results or assessments documented after image interpretation were present, they were manually removed to simulate the pre-imaging clinical context. Board-certified radiologists manually annotated each note to generate reference summaries containing only information relevant to interpreting the corresponding imaging exam. We evaluated six LLMs across two summarization strategies. The first used prompt engineering to directly generate summaries from full notes. The second was a hybrid approach: clinically relevant segments were extracted using cosine similarity between note sentence-embeddings and sentence-embeddings of the imaging exam and indication, at varying thresholds (0.05-0.5), then summarized using the same LLMs.

RESULTS

Each model's output was compared to the radiologist-generated reference summaries using multiple evaluation metrics, including BERTScore (precision, recall, F1), METEOR, ROUGE, BLEU, and semantic similarity. Statistical comparisons across models and summarization strategies were performed, and performance was evaluated at varying extraction thresholds.

CONCLUSION

LLMs show promising potential for generating context-aware summaries of ED notes that are tailored to specific imaging exam type and indication. Incorporating clinically relevant context via hybrid summarization improves alignment with expert-generated summaries. These findings may inform future tools for streamlining radiologist workflows and enhancing clinical communication.

CLINICAL RELEVANCE/APPLICATION

This project demonstrates the potential of LLMs to automate the extraction of imaging-relevant context from ED notes, offering a promising pathway to streamline radiologist workflows. Incorporating AI-driven summarization tools may reduce manual chart review time, expedite interpretation, and enhance communication of critical clinical information, supporting improved operational efficiency in radiology practice.

W5A-SPIN-9 EVALUATING MEMORIZATION RISKS IN GENERATIVE MODELS: A BENCHMARK FRAMEWORK FOR SAFE AND RELIABLE SYNTHETIC IMAGING IN RADIOLOGY

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PURPOSE

Generative AI models offer transformative potential in radiology for data augmentation, algorithm training, and privacy-preserving data sharing. However, they inadvertently memorize and reproduce sensitive patient data, posing a significant privacy risk. This study aims to systematically assess memorization behavior in generative models and establish a robust benchmark for evaluating and mitigating such risks in synthetic radiological images.

METHODS AND MATERIALS

A comprehensive benchmarking framework was developed using Self-Supervised Contrastive Networks to detect memorization in synthetic images. Various backbone architectures (DinoV2, DenseNet121, ResNet50), pretrained on both general and domain-specific datasets, were evaluated with contrastive loss functions. An anonymized dataset of 7,184 X-ray mammograms from 1,718 patients was used with patient-aware splits. A conditional diffusion model was fine-tuned on this dataset to generate synthetic mammograms. Memorization was analyzed by comparing similarity distributions between synthetic, augmented, and original images using multiple distance metrics.

RESULTS

Triplet Margin Loss consistently outperformed across all models. DinoV2 combined with Triplet Loss and Bray-Curtis distance achieved the highest detection performance, followed by DenseNet121 and ResNet50. Diffusion generated mammograms showed a shift in similarity towards original images, indicating a measurable degree of memorization. Testing with very small datasets clear memorization issues arose and could be measured and addressed. Distance metrics such as Bray-Curtis and Standardized Euclidean proved optimal for detecting subtle memorization in radiological datasets.

CONCLUSION

Our framework reliably detects memorization in generative models, providing crucial insights into privacy risks associated with synthetic radiology images. The findings highlight the susceptibility of diffusion models to memorization and offer practical guidelines for model developers to monitor and mitigate privacy risks during synthetic data generation.

CLINICAL RELEVANCE/APPLICATION

With synthetic data becoming essential for advancing radiological AI, safeguarding patient privacy is critical to clinical acceptance and trust. Ensuring synthetic data integrity, our approach not only protects patient confidentiality but also enhances the reliability and generalizability of downstream AI models — particularly in scenarios where neural networks struggle due to limited availability of high-quality data. Our method offers radiologists and AI developers a robust tool to detect hidden memorization in synthetic datasets, directly addressing privacy concerns that could hinder clinical deployment.

W5A-SPIN-10 STREAMLINING THE ANNOTATION PROCESS BY RADIOLOGISTS OF VOLUMETRIC MEDICAL IMAGES WITH FEW-SHOT LEARNING

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PURPOSE

Radiologists' manual annotations limit robust deep learning in volumetric medical imaging. While supervised methods excel with large annotated datasets, few-shot learning performs well for large structures but struggles with small ones, e.g., lesions. We aimed to evaluate a novel method that leverages the advantages of both few-shot learning models and fully supervised models while reducing the manual annotation cost.

METHODS AND MATERIALS

Our method streamlines the process of manual annotation of lesions in volumetric scans. The goal is to obtain sufficient, high-quality, expert-validated labeled data to train a fully supervised deep learning model. The method uses a pre-trained few-shot learning model with a small support set of manually annotated scans to compute initial voxel-level labels for a larger set of unannotated scans. A subset of these scans is then selected for correction by a radiologist. By prioritizing the labeled scans for corrections, it minimizes the correction effort while increasing the labels representativity. A fully supervised model is then trained on the scans with corrected labels and the support set scans and tested on an independent annotated dataset. The process is repeated for the remaining unannotated scans until satisfactory performance is obtained. We validated our method on liver, lung, and brain lesions on CT and MRI scans from 375 scans (118 abdominal CECT, 137 chest CT, 120 brain T1W-Gad MRI) with 5,933 lesions (3,422 liver, 2,090 lung, 421 brain lesions) annotated by three expert radiologists. The datasets, one for each organ, were partitioned into support, query and test sets (10 scans for support, 15 for test, and the rest for query). Performance of the model was evaluated with the % of missed and misidentified lesions. Radiologist correction effort was quantified with the number of mouse clicks required to correct a computed lesion: one click to discard a misidentified lesion and add a missed lesion, and one mouse click for each missed erroneous pixel on the computed lesion contour.

RESULTS

Our method significantly reduces the estimated lesion detection and correction effort by 34% for missed lesions, 387% for misidentified lesions, with 130% fewer lesion contour corrections, and 424% fewer pixels to correct in the lesion contours with respect to manual annotation.

CONCLUSION

Our method effectively reduces the radiologists' annotation effort of small structures to produce high-quality annotated datasets to train deep learning models. It is generic and can be applied to lesions in various organs imaged by different modalities.

CLINICAL RELEVANCE/APPLICATION

The method may speed up the development and deployment of deep learning models for the automatic detection and segmentation of lesions in volumetric scans.

W5A-SPIN-11 ASSESSING PROMPT INSENSITIVITY IN FOUNDATION MODELS FOR RADIOLOGICAL IMAGE SEGMENTATION

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PURPOSE

Text-prompted segmentation represents a potentially transformative technology for radiological workflows, but evaluation of their operational limitations and performance are limited. This study assesses the prompt-insensitivity of the BiomedParse model across segmentation tasks. We hypothesize that prompt structure, semantic complexity, and terminological specificity will modulate segmentation accuracy across diverse anatomical structures and pathological manifestations.

METHODS AND MATERIALS

We evaluated BiomedParse model across multiple out-of-domain datasets comprised of Montgomery, NSCLC-Radiomics, RIDER, COVID-19 and Infection cohorts collectively providing 6,810 chest radiographs (CXR) and 452 computed tomography (CT) volumes. We designed three evaluation experiments: (1) assessed output variations by applying identical prompts to quantify consistency; (2) evaluated semantic sensitivity of the prompt to determine the impact of linguistic variations; and (3) assessed the model's robustness when presented with ambiguous instructions. All analyses were conducted using standardized radiological metrics including Dice similarity coefficient representing overlap with ground truth.

RESULTS

Prompt-based segmentation accuracy was substantially higher in CXR (Dice score of 0.87 ± 0.04) compared to CT (0.19 ± 0.14) when using BiomedParse ontology prompts. Interestingly, CXR segmentation outputs remained identical (0.997 ± 0.003) regardless of prompt content and persistently segmented lungs even with

irrelevant anatomical prompts, indicating significant prompt insensitivity. Conversely, CT images showed minimal segmentation response regardless of prompt construction, suggesting either insufficient CT training data or inherent modality limitations. This performance disparity between CXR and CT persisted across all experimental conditions.

CONCLUSION

BiomedParse demonstrates promising performance within its pretrained segmentation vocabulary for CXRs but exhibits critical limitations in prompt sensitivity and cross-modality applications. However, the model's tendency to default to lung segmentation in CXR regardless of prompt specificity represents a concerning limitation. These results highlight the need for improved fine-tuning strategies to enhance precision and reduce erroneous segmentation.

CLINICAL RELEVANCE/APPLICATION

Text-prompted segmentation model offers significant opportunities to reduce interpretation time, enhance diagnostic precision, and standardize reporting. The model's propensity to segment lung fields in CXR regardless of prompt instructions could lead to misidentification of anatomical structures and subsequent diagnostic errors.

W5A-SPIN-12 CLINICAL EXPERIENCE MATTERS: A TURING TEST OF TRUST IN AI-GENERATED RADIOLOGY REPORTS

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PURPOSE

Understanding physicians' acceptance and trust in AI-generated reports is a critical step toward integrating AI into clinical practice. We developed a web-based interactive platform and conducted a radiology-oriented Turing test to assess if physicians and residents could distinguish between radiologist and AI-generated reports.

METHODS AND MATERIALS

Eight participants (4 attendings and residents) reviewed 48 chest X-ray cases in this test. Each case consisted of a chest X-ray image accompanied by two reports. The cases were evenly divided into three comparison groups based on report generation methods: radiologist vs. AI model 1, radiologist vs. AI model 2, and AI model 1 vs. AI model 2 (16 each condition). For each case, participants were asked to identify which report was AI-generated, rate their confidence in this judgment, and select the report they would be more inclined to adopt in clinical practice. This study was IRB approved.

RESULTS

Attendings were correct 49.9% and residents 41.1% of the time in identifying AI-generated reports, both higher than chance (33.3%), indicating that radiologists largely beat the Turning test and more so than residents. Attendings exhibited longer average response times (56.84 seconds) compared to residents (31.86 seconds), suggesting a more analytical decision-making approach, $p<.01$. Attendings had slightly more confidence than residents, but this was not significant. For both groups, for every one-unit increase in confidence, the odds of being correct increased 20%, $p=.025$.

CONCLUSION

Attendings were more likely to distinguish AI-generated reports from radiologist-generated reports than residents, and both groups were able to distinguish over chance. This suggests that clinical experience helps mitigate bias toward AI-generated content, whereas residents are more prone to perception-driven preference shifts.

CLINICAL RELEVANCE/APPLICATION

Our findings reveal important differences between attendings and residents in terms of acceptance and bias toward AI-generated reports, highlighting the need for targeted strategies to foster trust in AI tools and ensure their safe and effective integration into clinical workflows.

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W5A-SPIR

Interventional Radiology Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPIR-1 SAFETY AND CLINICAL OUTCOME OF BLEOMYCIN ELECTROSCLEROTHERAPY (BEST) TREATING LYMPHATIC MALFORMATIONS (LMS)

Vanessa F. Schmidt, MD (*Presenter*)
Florian Obereisenbuchner (*Abstract Co-Author*)
Daniel Puhr-Westerheide, MD (*Abstract Co-Author*)
Gloria Biechele, MD (*Abstract Co-Author*)
Jens Ricke, MD, PhD (*Abstract Co-Author*)
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PURPOSE

Bleomycin-Electrosclerotherapy (BEST) has recently emerged as a treatment option for slow-flow vascular malformations (SFVMs), though most studies focus on venous malformations. This study specifically evaluated safety and clinical outcome of BEST in lymphatic malformations (LMs) and lymphatic-dominant lympho-venous malformations (ld-LVMs).

METHODS AND MATERIALS

A monocentric cohort with symptomatic LMs or ld-LVMs treated by BEST was retrospectively assessed. Patient records and imaging findings were analysed with respect to clinical and procedural details. A treatment-specific, patient-reported questionnaire assessed overall clinical response (complete-, partial-, no response, and progression), subjective health-related Quality of Life (QoL; optimal, improved, unchanged, worsening), pre- and postprocedural pain (numerical rating scale, NRS) as well as postprocedural skin discoloration (yes/no). Lesion size before and after treatment was compared using measurements in three plains on MRI.

RESULTS

Overall, 27 BEST sessions were performed in 20 patients with 14 LMs and 6 ld-LVMs (11 microcystic, 5 mixed, 4 macrocystic subtypes). Patients received 1.4±0.6 BEST sessions with a median bleomycin dose of 7 mg (range 2-15 mg). After BEST, 7/20 (35%) patients reported complete response, 10/20 (50%) partial response, and 3/20 (15%) no response. No patients presented with progression. Health-related QoL was stated as optimal in 10/20 (50%) and as improved in 4/20 (20%) patients. Median pain NRS was reduced from 6 (3-10) to 2 (0-6). Postprocedural skin discoloration occurred in 11/20 (55%) patients. Follow-up MR imaging revealed lesion size reduction from mean maximum volume of 1381±1650 cm 3 to 1089±1543 cm 3 . Major and minor complications occurred after 3/27 (11.1%) BEST treatments. No differences in all outcome parameters regarding the LMs subtypes (micro-, macrocystic, mixed) were assessed.

CONCLUSION

BEST demonstrates a good clinical response as well as an acceptable risk profile treating LMs and ld-LVMs.

CLINICAL RELEVANCE/APPLICATION

BEST offers an effective therapeutic alternative also for the subgroup of microcystic lesions previously considered difficult to treat.

W5A-SPIR-2 UTILIZATION AND SITE OF SERVICE OF INTERVENTIONAL RADIOLOGY PROCEDURES PERFORMED ON MEDICARE BENEFICIARIES BETWEEN 2013-2022

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Julie C. Bulman, MD (*Abstract Co-Author*)
Victor Novack (*Abstract Co-Author*)
Ammar Sarwar, MD (*Abstract Co-Author*)

PURPOSE

To evaluate trends in utilization and site of service for IR procedures performed on Medicare FFS from 2013 to 2022.

METHODS AND MATERIALS

We analyzed data from the Medicare Physician and Other Supplier Public Use Files (2013-2022), identifying interventional radiologists (IRs) by self-designated specialty. IR services included procedures with invasive HCPCS codes (10000-69999), invasive NITOS codes (I999), and Evaluation and Management (E/M) codes (99201-99499). All procedural codes (invasive HCPCS and NITOS, excluding E/M) were grouped into Clinical Service Categories (CSCs) defined by the Society of Interventional Radiology (SIR): Interventional Oncology (IO), Neurointerventional Radiology (NIR), Pain Management/Musculoskeletal (PM/MSK), Peripheral Arterial Disease (PAD), Renal and Genitourinary (GU), Venous, and Women's Health (WH) .Pediatric IR was excluded due to its limited relevance to the Medicare population. IR codes not fitting SIR CSCs were categorized as generic procedures, injections/drainage, biopsy, feeding tubes, venous access, and endovascular interventions. Annual service rates were calculated per 100,000 Medicare Fee-for-Service beneficiaries, adjusting for yearly population changes.

RESULTS

A total of 727 unique IR procedure codes were billed during the 10-year study period. Biopsy procedures increased from 126 to 226 annual services per 100,000 beneficiaries (Compound Annual Growth Rate [CAGR]: 6.0%).? Injection/drainage procedures increased from 233 to 369 annual services per 100,000 beneficiaries (CAGR: 4.7%). IO procedures increased from 1 to 4 annual services per 100,000 beneficiaries (CAGR: 14.9 %).? PM/MSK increased from 2 to 4 annual services per 100,000 beneficiaries (CAGR: 9.6%).? PAD increased from 108 to 120 annual services per 100,000 beneficiaries (CAGR: 1.1%).? Conversely, declines were observed in GU from 218 to 154 services per 100,000 beneficiaries (CAGR: -3.4%). and WH from 2 to 1 services per 100,000 beneficiaries (CAGR: -6.7%).?Table 1 highlights the overall services and site of service in 2022. In 2022, PM/MSK and PAD were the only ones to be more frequently performed in the non-facility setting.

CONCLUSION

Over the past decade, IR services for Medicare beneficiaries have increased annually in all areas except renal procedures and women's health procedures. Pain management and peripheral arterial disease services are the only procedures performed more frequently in the non-facility setting.

CLINICAL RELEVANCE/APPLICATION

Understanding utilization trends and care settings for IR procedures among Medicare beneficiaries informs healthcare planning and policy decisions targeting access, cost, and efficiency of IR services.

W5A-SPIR-3 AI-DRIVEN PERT COORDINATION REDUCES DIAGNOSTIC DELAYS AND HOSPITAL STAY IN PE: A MULTI-YEAR EVALUATION

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Matteo Conte, MD (*Abstract Co-Author*)

PURPOSE

Prompt identification and timely multidisciplinary management of pulmonary embolism (PE) is critical for optimizing outcomes. To enhance the efficiency of our Pulmonary Embolism Response Team (PERT) and improve outcome in PE with high-risk features, we implemented an AI-driven care coordination solution (Aidoc, Tel Aviv, Israel) and evaluated its impact through a multi-year prospective registry.

METHODS AND MATERIALS

A prospective PE registry was conducted to evaluate the AI's effect on diagnostic timing and clinical outcomes. From June 2022 to May 2024, an AI solution to detect PEs with right-ventricular strain (RV/LV ratio > 1.0) on CTPA scans was integrated at our institution. We included PE with high-risk features as defined by having at least two of the three following severity criteria: ESC high/intermediate-high risk; BOVA = 3; PESI = 4. After the inclusion of 183 subjects, the study population was stratified into three consecutive 12-month groups: the pre-AI control group (June 22, 2021 - May 31, 2022); the first post-AI implementation group (June 01, 2022 - May 31, 2023); the second post-AI implementation group (June 1, 2023 - May 31, 2024). To assess the impact of AI integration, the following outcomes were evaluated: (1) time to diagnosis, defined as the interval in minutes from ED arrival - or, for non-ED patients, from PERT member notification or cardiac arrest - to CTPA study visualization; (2) thrombectomy rates; (3) ICU length of stay (LoS); (4) inpatient LoS.

RESULTS

55 (30.1%) patients represented the control group; 67 (36.6%) and 61 (33.3%) represented the AI groups. Median time-to-diagnosis was 1,96 days in the control group; 0,916 and 0,878 days in AI groups. Over time, time-to-diagnosis showed a relative reduction of 55.75% compared to baseline. Thrombectomy rates increased from 27.3% (15/55) in the control group, to 35.8% (24/67) and 36.1% (22/61) in AI groups. Mean ICU LoS decreased from 10.0 days in control group to 6.0 and 4.6 days in AI groups. Mean inpatient LoS decreased from 19.1 days in control group to 14.2 and 7.9 days in AI groups. Over time, both ICU and inpatient LoS showed a relative reduction of 54% and 58.63%, respectively.

CONCLUSION

The AI PERT care coordination solution led to a sustained >50% reduction in diagnostic delay and halved hospital and ICU length of stay over two years. These findings support AI-driven care coordination to improve efficiency and outcomes in high-risk PE population.

CLINICAL RELEVANCE/APPLICATION

AI integration in PE management streamlined diagnosis timeframe and patient LoS, improving overall outcomes.

W5A-SPIR-4 LARGE LANGUAGE MODELS (LLMS)-DRIVEN PROCEDURE PLANNING & RECOMMENDATION SYSTEM FOR INTERVENTIONAL RADIOLOGY

Shakthi K. Ramasamy, MD (*Presenter*)

PURPOSE

This project seeks to develop an AI-driven Procedure Planning & Recommendation System for interventional radiologists by integrating advanced large-language models (LLMs) with patient data and clinical guidelines. The aim is to generate evidence-based, personalized procedure recommendations that reduce cognitive load and enhance patient outcomes.

METHODS AND MATERIALS

The system combines LLMs—OpenAI GPT-4, Anthropic Claude 3, and Google DeepMind's MedPaLM—to interpret clinical data (imaging reports, laboratory values, detailed histories). A fine-tuned Hugging Face T5 model produces structured documentation of recommended interventions. Prompt-engineering frameworks ensure outputs incorporate comorbidities, anatomic nuance, and guideline statements. Retrospective case reviews, pilot deployments, and real-time validation will assess performance.

RESULTS

By synthesizing heterogeneous data, the system shortens physicians' information-retrieval time. Pilot metrics will track accuracy of recommendations, concordance with standards, decision-making speed, and complication rates versus conventional practice. Early feedback focuses on physician satisfaction and workflow fit.

CONCLUSION

The Procedure Planning & Recommendation System represents a leap toward personalized, data-driven interventional-radiology care. Leveraging state-of-the-art LLMs, it delivers actionable, context-aware guidance that can streamline planning for both routine and complex cases worldwide.

CLINICAL RELEVANCE/APPLICATION

An LLM-powered planning assistant can: Accelerate evidence-based decisions by instantly matching patient-specific details to appropriate IR techniques and devices. Reduce variability and errors through guideline-aligned, peer-review-traceable recommendations, thereby lowering complication and readmission rates. Lighten administrative burden with autogenerated, audit-ready documentation that integrates into electronic health records and billing systems. Enhance patient counselling by providing clear, data-supported rationale for selected procedures, fostering shared decision-making. Overall, the system turns disparate clinical inputs into timely, standardized, and patient-centric action plans—supporting safer, more efficient interventional-radiology practice.

W5A-SPIR-5 MICROWAVE ABLATION VS. SINGLE-NEEDLE RADIOFREQUENCY ABLATION FOR THE TREATMENT OF HCC UP TO 4 CM: A RANDOMIZED-CONTROLLED TRIAL

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Hirohito Takeuchi (*Abstract Co-Author*)
Takao Itoi (*Abstract Co-Author*)

PURPOSE

Radiofrequency ablation (RFA) is the standard treatment for small hepatocellular carcinoma (HCC), specifically for tumors <3 cm in size and numbering fewer than three, excluding surgical candidates. Microwave ablation (MWA) is an innovative approach believed to have theoretical benefits over RFA; however, these advantages are yet to be empirically verified. Therefore, we evaluated and compared the effectiveness of MWA and RFA in managing HCC tumors up to 4 cm in size.

METHODS AND MATERIALS

In this multicenter randomized controlled trial conducted across five centers in Japan, eligible participants had up to 4 tumors, each up to 4 cm in size, and were not considered for surgery. Patients were randomly assigned to undergo MWA or RFA. The primary outcome was the rate of local tumor progression (LTP), whereas secondary outcomes included overall survival (OS) and intra- and extrahepatic recurrence-free survival (RFS) at the end of the 2-year follow up.

RESULTS

In total, 240 participants were screened from July 12, 2018, to December 7, 2021. Four participants were excluded: three did not meet inclusion criteria, and one died from an unknown cause during treatment. Consequently, 119 (130 lesions) and 117 (136 lesions) participants were treated with MWA and RFA, respectively. The proportion of lesions with LTP at the 2-year follow up was significantly lower in the MWA group (20 [16.4%] lesions) than in the RFA group (38 [30.4%] lesions) (risk ratio, 0.54; p = 0.007). OS and both intra- and extrahepatic RFS did not significantly differ between groups.

CONCLUSION

MWA is more effective than RFA in reducing local tumor progression for HCC tumors up to 4 cm. However, no differences were observed in OS and RFS.

CLINICAL RELEVANCE/APPLICATION

Although MWA may offer better local tumor control than RFA, RCT differs slightly from daily clinical situations, practical and anatomical criteria for selecting the optimal technique on a lesion-by-lesion basis are required.

W5A-SPIR-6 ACCURATE MR THERMOMETRY DURING MICROWAVE ABLATION OF LIVER TUMORS USING SUSCEPTIBILITY ARTIFACT CORRECTION

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PURPOSE

Thermoablation is a first-line treatment for early-stage hepatocellular carcinoma and oligometastatic disease, as supported by various guidelines. Real-time MR thermometry using the proton resonance frequency shift (PRFS) aims at ensuring adequate thermal dosing while protecting healthy tissue. However, microwave ablation (MWA) causes tissue carbonization and vaporization, resulting in susceptibility artifacts. This study assesses background field removal techniques known from quantitative susceptibility mapping to separate these artifacts from true temperature-induced phase changes during MWA, aiming to improve MR thermometry accuracy.

METHODS AND MATERIALS

Six patient datasets from MWA procedures (Oct 2021-Aug 2022) were analyzed retrospectively. MRI was performed on a 1.5T scanner (MAGNETOM Aera, Siemens). MWA was guided by an experienced radiologist using an MR-compatible microwave system (AveCure, MedWaves) and 14G antennae. PRFS-based thermometry was based on a single-shot EPI sequence (TR/TE=2000ms/18ms, FA=90°, voxel size 2.4-2.9mm, matrix=128×128×13), with respiratory triggering at expiration. A quality-guided phase unwrapping step (Fortier et al.) was performed in MATLAB before phase subtraction from the reference time point. The Background field removal technique Laplacian Boundaray Value (LBV) known from quantitative susceptibility mapping was applied using the MEDI toolbox.

RESULTS

Local susceptibility changes from tissue burning caused dipolar-shaped temperature artifacts at the MWA site, leading to both over- and underestimation of temperature. In datasets without severe artifacts (e.g., strong cardiac pulsation), LBV effectively removed phase artifacts, revealing true temperature increases. It also restored realistic temperature patterns where B0 drift falsely indicated warming or cooling in the periphery. ROI analysis in one example (near the needle and in the liver periphery) showed significant underestimation of heating and global cooling in the periphery due to susceptibility artifacts and B0 drift. After LBV correction, the mean absolute error in the peripheral ROI (in relation to the expected 0°C) decreased from 5.13°C to 0.32°C, and the standard deviation from 2.37°C to 0.36°C.

CONCLUSION

LBV consistently improved accuracy of PRFS-based MR thermometry during liver MWA by removing susceptibility artifacts originating from tissue vaporization and carbonization at the ablation site, as well as global phase errors not originating from temperature change, such as B0 drift.

CLINICAL RELEVANCE/APPLICATION

Accurate real-time MR thermometry during MWA ensures effective treatment and enhances patient safety by enabling reliable thermal dose estimation.

W5A-SPIR-7 SAFETY AND EFFICACY OF COMBINED TREATMENT WITH PERCUTANEOUS THERMAL ABLATION AND TRANSCATHETER ARTERIAL CHEMOEMBOLIZATION (TACE) FOR HEPATOCELLULAR CARCINOMA

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Arianna Carfora (*Abstract Co-Author*)
Ameya Pathak (*Abstract Co-Author*)
Maxwell Todd (*Abstract Co-Author*)
James Yang (*Abstract Co-Author*)
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PURPOSE

This study evaluates the efficacy and safety of combined treatment involving both thermal ablation and transarterial chemoembolization (TACE).

METHODS AND MATERIALS

A 1000-case retrospective single-institution study of HCC thermal ablation was conducted from January 2013 to March 2023. 21 patients received a combined treatment of TACE and thermal ablation. Patients were seen pre-procedure in the clinic and viewed in the tumor board to receive approval for treatment. Tumor location and size were determined on CT or MRI. Readmission rates within 7 days were reviewed per chart. Survival rates were recorded at 1, 2, and 3 years. Residual disease progression was tracked with first follow-up imaging.

RESULTS

21 cases of patients with HCC who received combined treatment of TACE and thermal ablation were identified; 17 of which were diaphragmatic dome lesions. Out of the 21 cases, 16 of them had cirrhosis: 6 alcohol cirrhosis, 5 NASH, and 5 HCV Cirrhosis. All 21 of the cases were BCLC Stage A. The average tumor dimensions were 3.25±0.65m (long axis) and 2.51±0.79cm (short axis). The average survival days were 1505.38 days or 4.12 years. Rates for readmission within 7 days were 9.52%, for which the only cited reason was pain control. Pre-MELD and Post-MELD scores relative to treatment were 8.26±2.00 and 5.89±0.81, respectively, which did not differ significantly. Pre-Child Pugh and Post-Child Pugh scores were 8.89±2.70 and 6.00±0.88, respectively. Survival rates for years 1, 2, and 3 were 100.00%, 100.00%, and 93.75% respectively. The percentage of cases with residual disease progression and local tumor progression were 9.52% and 9.52% respectively. There was no evidence of liver decompensation, death, or other major perioperative complications, including diaphragmatic injury, secondary to this study’s treatment.

CONCLUSION

This study’s findings support the improved overall safety and efficacy of combined TACE and thermal ablation therapy for hepatocellular carcinoma.

CLINICAL RELEVANCE/APPLICATION

Utilizing the combined treatment involving both TACE and thermal ablation proves as a safe and efficient option for treating hepatocellular carcinoma lesions. We are in the process of comparing the outcome of treatments involving only ablation with combination TACE and ablation treatment.

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W5A-SPMK

Musculoskeletal Imaging Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPMK-3 DIAGNOSTIC THRESHOLD FOR OPPORTUNISTIC SCREENING OF CENTRAL CANAL STENOSIS USING DEEP LEARNING IN ABDOMINAL CT

Youngjune Kim, MD (*Presenter*)
Choong Guen Chee, MD (*Abstract Co-Author*)
Eugene Lee (*Abstract Co-Author*)
Joon Woo Lee, MD, PhD (*Abstract Co-Author*)

PURPOSE

To establish the dural sac area threshold for opportunistic screening of lumbar central canal stenosis in abdominal CT.

METHODS AND MATERIALS

We included 533 consecutive patients who underwent both abdomen CT and lumbar MRI within 3 months from Jan 2018 to Aug 2023. For reference standard, the grade of central canal stenosis was rated using the corresponding lumbar MRI based on Lee's central canal stenosis grade. We measured dural sac area at each lumbar vertebral level using a deep learning-based software (AVIEW, Coreline Soft). Using receiver-operating-characteristic-curve analysis, we calculated optimal threshold for differentiating 1) central canal stenosis vs. normal and 2) severe central canal stenosis vs. non-severe central canal stenosis. Subgroup analysis was performed whether the threshold may change according to lumbar vertebral levels.

RESULTS

The dural sac area threshold for diagnosing lumbar central canal stenosis was 75 mm 2 and that for diagnosing severe central canal stenosis was 62 mm 2 . In the subgroup analysis, the threshold for diagnosing central canal stenosis decreased progressively from cranial to caudal intervertebral level: 104 mm 2 for L1-2, 84 mm 2 for L2-3, 67 mm 2 for L3-4, 63 mm 2 for L4-5, and 60 mm 2 for L5-S1. The threshold for diagnosing severe central canal stenosis was were approximately 90 mm 2 for L1-2 and 60 mm 2 for L2-3 through L5-S1.

CONCLUSION

We established dural sac area thresholds for CT-based diagnosis of lumbar central canal stenosis, addressing a critical gap in opportunistic screening.

CLINICAL RELEVANCE/APPLICATION

The universal thresholds (75 mm² for stenosis, 62 mm² for severe stenosis) offer practicality in initial assessments, while level-specific values account for anatomical variability. These criteria enable reliable diagnosis of central canal stenosis in opportunistic CT screening.

W5A-SPMK-4 IMPROVING SPINAL INTERVENTION GUIDANCE: ACCURATE VERTEBRAL LEVEL IDENTIFICATION USING US-CT FUSION

Bar Rinott, MD (*Presenter*)
Moshe Maizels (*Abstract Co-Author*)
Eyal Bercovich, MD (*Abstract Co-Author*)

PURPOSE

This study evaluates the feasibility and accuracy of using a real-time ultrasound-CT (US-CT) fusion system for lumbar spine vertebral localization, a critical step in spinal interventions. Traditional imaging modalities like fluoroscopy and CT expose both patients and staff to ionizing radiation. In contrast, ultrasound (US) avoids radiation but often lacks detailed anatomical clarity for precise targeting. Recent advancements in US-CT fusion systems offer the potential to combine the benefits of both methods—enhanced visualization without radiation exposure.

METHODS AND MATERIALS

The study involved 17 patients (age range 29-88 years) scheduled for elective lumbar CT. Using a GE Logiq E9 US-CT fusion system, live US data were co-registered with previously acquired CT scans. The process included identifying key anatomical landmarks (primarily the sacroiliac joint and lumbar facet joints) to manually align the two imaging modalities. The senior radiologist then used this fusion to mark the targeted vertebral level, which was subsequently confirmed through diagnostic CT scans.

RESULTS

Results showed successful US-CT fusion and vertebral identification in all 17 cases. The system correctly identified the vertebral level in 88% of cases, with common identification at L3. Two errors occurred—one misidentified L4 as L3, and the other marked S1 instead of L3, possibly due to a displaced skin marker pin. Despite these inaccuracies, the overall accuracy suggests that this approach is a promising alternative to traditional imaging methods for spinal procedures.

CONCLUSION

In conclusion, real-time US-CT fusion is a feasible and accurate method for identifying lumbar vertebral levels, with high accuracy demonstrated in this cohort. This technology presents a radiation-free alternative to conventional fluoroscopic or CT guidance for spinal procedures, offering enhanced real-time anatomical visualization. With a learning curve, this approach may be beneficial for precise spinal interventions like nerve root blocks or facet joint injections. Further research is needed to refine the technique, expand its use to other spinal regions, and assess its performance in specific procedures.

CLINICAL RELEVANCE/APPLICATION

The implementation of US-CT fusion imaging for spinal procedures offers a significant clinical advantage by potentially reducing or eliminating patient and operator exposure to ionizing radiation, a key concern with CT and fluoroscopy. It provides enhanced real-time anatomical visualization by combining the strengths of US and CT, which could improve the safety, accuracy, and accessibility of minimally invasive spinal interventions like nerve root blocks or facet joint injections.

W5A-SPMK-7 DEEP LEARNING FOR AUTOMATIC THIGH MUSCLES SEGMENTATION ON MRI IMAGES OF PATIENTS WITH DUCHENNE MUSCULAR DYSTROPHY

Rui Yan (*Presenter*)
Wang Yile (*Abstract Co-Author*)

PURPOSE

To investigate the value of thigh muscles segmentation of patients with Duchenne muscular dystrophy (DMD) using U-Net deep learning model on MRI images.

METHODS AND MATERIALS

A total of 60 DMD patients (aged 1-12 years) who had undergone thigh MRI scans were retrospectively enrolled in this study. The dataset was randomly divided into the training set (48 cases) and test set (12 cases). For each patient , the entire slices of five thigh muscles on axial T1 MRI images were manually delineated by two skilled radiologists with 3D-Slicer toolkit. Then, a U-Net deep learning model was trained for automatic thigh muscles segmentation with training set using down- and up-sampling and loss function calculating. Performance of the model was assessed using Dice similarity coefficient (DSC) and Intersection over union (IoU),which is an index of segmentation quality ranging from 0 (no overlap) to 1 (total overlap).

RESULTS

The U-Net model exhibited strong performance for thigh muscles segmentation on MRI images(Figure 1). The mean DSC of these eleven muscles was 0.94 and the mean IoU was 0.93. Furthermore, the consuming time of eleven thigh muscles segmentation of one patient guided by U-Net model was only 30 seconds with a computer (graphics card:RTX4060Ti, software:python 3.11), much faster than about 8h of manual segmentation.

CONCLUSION

Our preliminary study shows deep learning for automatic thigh muscles segmentation on MRI images produces sufficiently accurate segmentation in seconds and demonstrates high reproducibility compared with manual segmentation.

CLINICAL RELEVANCE/APPLICATION

The datasets generated during the current study are available.

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W5A-SPMS

Multisystem Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPMS-1 PROSPECTIVE FUNCTIONAL BONE DISEASE EVALUATION OF NEWLY-DIAGNOSED MULTIPLE MYELOMA WITH COMBINED USE OF ^{18}F-FDG-PET/CT AND MULTIPARAMETRIC WHOLE-BODY MAGNETIC RESONANCE

Vincenzo Lucidi, MD (*Presenter*)
Arrigo Cattabriga (*Abstract Co-Author*)
Stefano Brocchi, MD (*Abstract Co-Author*)
Giacomo Pertile (*Abstract Co-Author*)
Alice Rossi, MD (*Abstract Co-Author*)
Stefano Fanti, MD (*Abstract Co-Author*)
Cristina Mosconi, MD (*Abstract Co-Author*)

PURPOSE

FDG-PET/CT is the most widely used imaging technique to detect bone and extramedullary disease in multiple myeloma (MM) and is recommended for response assessment by the International Myeloma Working Group. In clinical practice, it is usually associated with magnetic resonance imaging (MRI); the addition of DWI sequences in whole-body MRI (WBMRI) has further increased sensitivity and has been proposed for response assessment by MY-RADS guidelines. We present a prospective single-center study aimed at comparing PET/CT and WBMRI during diagnosis/staging of smoldering MM (SMM) and newly diagnosed MM (NDMM), and in defining treatment response in transplant-eligible (TE) and ineligible (TI) patients (pts). Secondary aims include assessing the prognostic role of the two techniques and comparing/validating imaging criteria (IMPeTuS and MY-RADS) in clinical practice.

METHODS AND MATERIALS

Pts underwent both imaging techniques at baseline. Baseline positive technique(s) have been repeated before maintenance (TI) or after 1 year of treatment (TE). IMPeTuS and MY-RADS criteria have been used for baseline staging and response assessment.

RESULTS

Between October 2022 and April 2025, 205 pts (74 SMM and 131 NDMM) underwent PET/CT and WBMRI at baseline. Among NDMM pts with CT-assessed bone disease (64%), WB-MRI was positive in 100% and PET/CT in 89%. Among the remaining 36%, WB-MRI was negative in 49% (none had PET-assessed focal lesions, FLs) and positive in 51% (63% of which also showed positive PET/CT). WBMRI detected more FLs and paraskeletal disease (PSD) than PET/CT (FLs: 76% vs 57%, p=0.0001; PSD: 30% vs 23%, p=0.0001). A slight concordance was observed for diffuse disease (DD) detection (24% vs 34%, p=0.0002, ?=0.4). DD on WB-MRI was associated with R-ISS III (p=0.008), higher monoclonal protein (p=0.02) and urinary protein (p=0.01) concentrations, and marrow plasma cell percentage (p=0.002); DD on PET/CT was not significantly related to these parameters. Among SMM pts, detection of FLs and DD was similar with both techniques (FLs: 8.1% vs 5.4%, p=0.8; DD: 5.4% vs 8.1%, p=0.04). As of April 2025, 31 pts had imaging re-evaluation, with a concordance of 93.5% between techniques.

CONCLUSION

WBMRI showed higher sensitivity than PET/CT for FLs and PSD in NDMM, with similar findings in SMM. PET/CT and WBMRI showed partial concordance for DD, but only WBMRI-defined DD correlated with clinical and laboratory variables. Preliminary results show good concordance in response assessment.

CLINICAL RELEVANCE/APPLICATION

Our data support the combined use of PET/CT and WBMRI for MM staging at baseline and suggest a potential alternative role for WBMRI in response assessment, but further expansion of the study population and more post-treatment imaging are needed.

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W5A-SPNMMI

Nuclear Medicine & Molecular Imaging Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPNMMI-2 QUANTITATIVE FDG PET/CT METRICS HIGHLY CORRELATE WITH CIRCULATING TUMOR DNA LEVELS IN PATIENTS WITH MERKEL CELL CARCINOMA

Jeffrey Xing, MD, PhD (*Presenter*)
Daniel Hippe (*Abstract Co-Author*)
Tomoko Akaike, MD (*Abstract Co-Author*)
Manisha Thakuria (*Abstract Co-Author*)
Nicole Urman, MD (*Abstract Co-Author*)
Amy Xiong (*Abstract Co-Author*)
Benjamin L. Franc, MD (*Abstract Co-Author*)
Paul Nghiem, MD, PhD (*Abstract Co-Author*)
Song Youn Y. Park, MD (*Abstract Co-Author*)
Ann Silk (*Abstract Co-Author*)
Lisa Zaba (*Abstract Co-Author*)
Kip E. Guja, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the correlation of initial staging FDG PET/CT and tumor biomarkers in patients with Merkel cell carcinoma (MCC) by comparing quantitative measures of metabolic activity on FDG PET, including SUVmax, metabolic tumor volume (MTV), and total lesion glycolysis (TLG) with circulating tumor DNA (ctDNA).

METHODS AND MATERIALS

A single center retrospective analysis of FDG PET/CT imaging data and ctDNA was conducted in a cohort of 52 patients with MCC. Longitudinal clinical records were reviewed to confirm inclusion criteria of FDG PET/CT imaging and ctDNA testing for initial staging within 28 days of each other. PET/CT images were segmented in MIM software to calculate MTV, SUVmax, and TLG, using established workflows. These PET metabolic indices were then correlated with temporally matched ctDNA collected within 28 days of PET/CT imaging.

RESULTS

Retrospective review identified 93 patients with Merkel cell carcinoma; 42 patients were excluded due to >28 day (or uncertain) time interval between PET imaging and ctDNA testing. 52 patients met inclusion criteria and had PET and ctDNA testing within 28 days, mostly within 7 days (58%). 27 patients (52%) had positive PET and 30 (58%) had a positive ctDNA test. All measures of metabolically active tumor burden (MTV, SUVmax, TLG) were highly correlated with temporally matched ctDNA levels (Spearman correlation coefficient, $r = 0.82\text{-}0.84$, $p<0.001$). In patients with a positive PET and ctDNA, there was a clear dose-dependent correlation that predicted disease burden ($r = 0.84\text{-}0.93$), $p < 0.001$).

CONCLUSION

All quantitative PET imaging measures of metabolically active burden were highly correlated with temporally matched ctDNA in patients with MCC at a single institution. Ongoing and future work will validate reproducibility across multiple institutions and timepoints beyond the initial staging.

CLINICAL RELEVANCE/APPLICATION

MCC is a rare but serious cutaneous malignancy, with clinical management similar to that of melanoma. Most patients with metastatic disease are treated with systemic immunotherapy and followed with PET/CT during the staging, initial treatment and post-treatment surveillance period. Recently, ctDNA has shown promise in both monitoring response to treatment and early recurrence of disease. Our results suggest that quantitative FDG PET metrics correlate with ctDNA levels that may be helpful for disease monitoring.

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W5A-SPNPM

Noninterpretive Skills (Beyond Imaging) Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPNPM-1 TELERADIOLOGY IN THE EMERGENCY SETTING: DIAGNOSTIC ACCURACY AND WORKFLOW IMPACT ACROSS MULTIPLE ACUTE SUBSPECIALTIES

Jainam A. Doshi, MBBS, MD (*Presenter*)
Natisha P. Arora JR, MD (*Abstract Co-Author*)
Venkatesh Somu JR, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the diagnostic accuracy of teleradiology across key acute care subspecialties and to analyze its impact on emergency department (ED) workflow efficiency, including turnaround time (TAT) and patient management timelines.

METHODS AND MATERIALS

A retrospective and prospective mixed-methods study was conducted on 4,000 emergency CT and MRI cases reported through a national teleradiology platform over a 12-month period. Cases spanned four acute subspecialties: neuroradiology, cardiothoracic, abdominal, and musculoskeletal imaging. Diagnostic concordance was assessed by comparing teleradiology reports to in-house radiologist reviews or multidisciplinary team consensus when available, using a 3-point discrepancy scale (none, minor, major). Workflow metrics such as report TAT, time-to-intervention, and ED length of stay (ED-LOS) were analyzed. Additionally, qualitative data were collected via interviews with emergency physicians regarding clinical confidence, reporting satisfaction, and system limitations.

RESULTS

Overall diagnostic concordance was 96.2%, with 2.9% minor and 0.9% major discrepancies. Subspecialty-wise concordance rates were: Neuroradiology: 98.1% Cardiothoracic: 96.5% Musculoskeletal: 95.8% Abdominal: 93.5% Mean TAT for teleradiology reports was 26 minutes (compared to 45 minutes with standard in-house reporting). ED-LOS was reduced by an average of 42 minutes per patient when reports were delivered within 30 minutes. Physicians noted improved triage and expedited decision-making, especially during night shifts. Abdominal imaging posed the most follow-up challenges, indicating a need for better subspecialty-level support.

CONCLUSION

Teleradiology demonstrates high diagnostic accuracy across emergency subspecialties, especially in neuro and cardiothoracic imaging. It significantly enhances ED workflow efficiency by reducing TAT and ED-LOS. The system is well-received by emergency clinicians, although specific areas like abdominal imaging may benefit from enhanced subspecialty input. Teleradiology is a valuable adjunct in acute care delivery, especially for resource-limited and off-hour settings.

CLINICAL RELEVANCE/APPLICATION

Teleradiology ensures rapid, round-the-clock access to radiology expertise across multiple acute care subspecialties. This model enhances diagnostic accuracy, reduces report turnaround times, and improves emergency department workflows, making it a critical tool for timely patient care—especially during nights, weekends, or in resource-limited settings.

W5A-SPNPM-2 COMPARATIVE EVALUATION OF FOUR LARGE LANGUAGE MODELS FOR SIMPLIFYING CORONARY CTA REPORTS FOR LAYPERSON COMPREHENSION

Jia Hao Chun (*Presenter*)

PURPOSE

To evaluate the effectiveness of four large language models (LLMs)—ChatGPT-4o, ChatGPT-o4mini, Deepseek-R1, and Deepseek-V3—in translating standard coronary computed tomography angiography (CTA) radiology reports into layperson-friendly language, and to determine which model produces the most comprehensible output for non-medical audiences.

METHODS AND MATERIALS

A total of 50 standard clinical coronary CTA reports were selected. Each report was processed by the same prompt through the four LLMs to generate corresponding layperson-oriented versions, resulting in 200 simplified reports. These were randomly distributed to 50 adult volunteers with no medical training, balanced across age, gender, and educational background. Each volunteer received four reports derived from the same clinical source—one from each LLM—and rated overall satisfaction using a 5-point Likert scale.

RESULTS

Reports generated by Deepseek-V3 received the highest average score, significantly outperforming the other three models ($p < 0.01$). This model minimized medical jargon most effectively and achieved the best comprehension rating (4.3 ± 0.458). ChatGPT-4o and Deepseek-R1 yielded moderate performance (3.72 ± 0.437 and 3.44 ± 0.718, respectively), while ChatGPT-o4mini produced the least readable reports (2.58 ± 0.505). Notably, ChatGPT-o4mini tended to oversimplify critical findings such as severe coronary stenosis, potentially undermining the perceived urgency of the condition.

CONCLUSION

Among the LLMs tested, Deepseek-V3 demonstrated the greatest capability in converting coronary CTA radiology reports into language understandable to the general public, enhancing readability and patient comprehension

CLINICAL RELEVANCE/APPLICATION

Effective communication of radiology findings to patients is critical for shared decision-making and adherence to treatment plans. This study demonstrates that large language models, particularly Deepseek-V3, can significantly improve the clarity and accessibility of coronary CTA reports for non-medical audiences. Integrating LLMs

into radiology workflows may enhance patient understanding, reduce anxiety, and foster more informed healthcare engagement.

W5A-SPNPM-3 A LONGITUDINAL ANALYSIS OF DIVERSITY AMONG U.S. MEDICAL SCHOOL RADIOLOGY DEPARTMENT CHAIRS

Milin Patel (*Presenter*)
Jeffrey Ding (*Abstract Co-Author*)
Faisal Khosa, FRCPC, MBA (*Abstract Co-Author*)

PURPOSE

The purpose of this study is to evaluate longitudinal trends in sex and race/ethnicity demographics among radiology department chairs at U.S. medical schools over the past 45 years. We aim to further identify whether progress has been made toward equitable representation of women and individuals from groups underrepresented in medicine (URiM).

METHODS AND MATERIALS

This retrospective study analyzed publicly available data from the Association of American Medical Colleges (AAMC) from 1977 to 2021. Department chairs were classified by sex and self-reported race/ethnicity. Categories included White, Asian, Black or African American, Hispanic or Latino, and other URiM groups. Descriptive statistics were used to assess demographic trends. All analyses were performed using Microsoft Excel.

RESULTS

From 1977 to 2021, a total of 7,981 individuals served as radiology department chairs at U.S. medical schools. Of these, 7247 (90.8%) were men and 734 (9.2%) were women. In terms of race and ethnicity, the majority of chairs were White (6725; 84.3%), followed by Asian (639; 8.0%), Black or African American (223; 2.8%), and Hispanic, Latino, or of Spanish Origin (171; 2.1%).

CONCLUSION

Despite measurable progress, women and URiM individuals remain significantly underrepresented among radiology department chairs. The end of affirmative action is expected to jeopardize the progress made and has the potential to perpetuate the lack of diversity in radiology department chair positions.

CLINICAL RELEVANCE/APPLICATION

This study underscores the need for targeted policies and practices to sustain and advance diversity in academic radiology leadership.

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W5A-SPNR

Neuroradiology Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPNR-1 STUDY OF BRAIN IRON CONTENT IN NEONATES WITH HYPERBILIRUBINEMIA(NHB) BASED ON QUANTITATIVE SUSCEPTIBILITY MAPPING (QSM)

Xing Li (*Presenter*)

PURPOSE

Neonatal hyperbilirubinemia (NHB) can lead to severe neurological disorders. Elevated iron levels in neonates have been associated with neurological dysfunction through oxidative stress, but measuring brain iron content accurately remains challenging. This study uses Quantitative Susceptibility Mapping (QSM) to analyze brain iron content in neonates with varying degrees of NHB and explore the neurological impacts of altered iron levels due to NHB.

METHODS AND MATERIALS

This study received approval from the institutional review board. It involved 97 neonates with pathological jaundice, categorized into mild-to-moderate (N1) and severe (N2) groups based on serum bilirubin levels, alongside 28 control neonates (N0 group). All underwent MRI on a 3.0T scanner. QSM utilized high-resolution iso-voxel scanning at 1mm*1mm*1mm, and quantitative magnetic susceptibility maps were generated using a Functool post-processing workstation, with regions of interest (ROIs) delineated in seven specific brain areas. Statistical analysis was conducted using SPSS 25.0, utilizing Chi-square tests for gender ratio comparisons, ANOVA for brain nucleus susceptibility values across groups, and LSD-t-tests for pairwise comparisons.

RESULTS

There was no statistically significant difference in gender distribution among the three groups. The susceptibility values observed significant differences in the right dorsal thalamus (F=3.985, P =0.021) and bilateral dentate nucleus (left: F=3.77, P =0.026; right: F=5.461, P =0.005). LSD-t tests revealed significant variations in right dentate nucleus between N0 and N2 (P =0.034), and N1 and N2 (P =0.006), and in bilateral dentate nucleus between N0 and N1 (left: P =0.027; right: P =0.012), and N0 and N2 (left: P =0.013; right: P =0.002).

CONCLUSION

This study demonstrated that elevated susceptibility values in the right thalamus and bilateral dentate nuclei correlate with increased bilirubin and iron levels in neonates with NHB. The use of QSM offers quantitative imaging evidence of brain damage in NHB neonates.

CLINICAL RELEVANCE/APPLICATION

This study demonstrated that elevated susceptibility values in the right thalamus and bilateral dentate nuclei correlate with increased bilirubin and iron levels in neonates with NHB. The use of QSM offers quantitative imaging evidence of brain damage in NHB neonates.

W5A-SPNR-2 CHARACTERIZING WHITE MATTER HYPERINTENSITIES IN PSP AND PARKINSON'S DISEASE

Yash Patel (*Presenter*)
Richard Zou (*Abstract Co-Author*)
Mikail Malik (*Abstract Co-Author*)
Maziar Emamikhah (*Abstract Co-Author*)
Alexandre Boutet, MD, PhD (*Abstract Co-Author*)
Anthony Lang (*Abstract Co-Author*)

PURPOSE

Progressive supranuclear palsy (PSP), is a form of parkinsonian syndrome that may be difficult to distinguish from Parkinson's disease, especially in the early stages of the disease. Here, we assess the difference in white matter hyperintensity (WMH) burden between PSP and PD patients, in the hopes of aiding clinical diagnosis and understanding pathogenesis.

METHODS AND MATERIALS

We evaluated the MRI scans of 67 PSP, and 67 age and sex-match PD patients from a Movement disorders clinic and PSP Centre, in Canada. The total sample consisted of 134 patients with a mean age 70 years, 67% males and 33% females. WMH were quantified from FLAIR MRI using a convolutional neural network-based tool (segcsvd-WMH). Linear regression was used to test difference in WMHvol/ICV between PSP and PD, while accounting for age, sex, MR field strength and MR manufacturer. Sensitivity analyses were performed to account for potential cardiometabolic variables associated with WMH, including a history of cardiovascular disease, smoking, hypertension, dyslipidemia, diabetes mellitus, obstructive sleep apnea, chronic kidney disease, and orthostatic hypotension.

RESULTS

Patients with PSP had a significantly higher WMH burden than PD (0.55% vs 0.29% of total ICV, respectively, Wilcoxon rank sum p-vale = 0.001). Multivariable linear regression confirmed the main effect of diagnosis (beta estimate = 0.28, se = 0.079, p = 0.00041, PSP > PD), and age (beta = 0.09, se = 0.04, p = 0.017) on WMH volume. Lastly, the effect of diagnosis was still present after accounting for 8 different cardiometabolic variables known to impact WMH burden (PSP > PD, beta estimate = 0.24, p = 0.0025). Other cardiometabolic variables significantly associated with WMH included smoking status (beta = 0.63, p-value = 0.002), and obstructive sleep apnea (beta = 0.52, p-value = 0.005).

CONCLUSION

In summary, we found greater WMH volumes in PSP patients compared with PD, suggesting an increased role of white matter structural abnormalities in PSP. These findings may provide a supportive role in diagnosis as well as expand an understanding of pathogenesis.

CLINICAL RELEVANCE/APPLICATION

PSP patients show significantly higher WMH burden than those with PD, suggesting white matter changes may aid in distinguishing PSP from PD.

W5A-SPNR-4 CHARACTERIZATION OF METABOLIC PROFILES OF LOW- AND HIGH-GRADE GLIOMAS BY 1H FID MRSI AT 7T

Mahrshi Jani (*Presenter*)
Andrew Wright (*Abstract Co-Author*)
Anke Henning (*Abstract Co-Author*)

PURPOSE

To assess metabolic profiles in patients with low grade versus high grade glioma and attempt to obtain more clinically significant data than previously published. Clinical decision-making regarding diagnosis and treatment planning will benefit from this new metabolic information.

METHODS AND MATERIALS

Data acquisition We enrolled seven high-grade glioma (grade IV; two IDH mutant) and eight low-grade glioma (grade II/III; all IDH mutant) patients for a multi-modal 7T brain tumor MRI study (Philips dSync). 2D ^{1}H FID MRSI was acquired (TE = 1.21 ms, TR = 320 ms, flip angle = 33°, matrix = 50×50, in-plane resolution = 4.4×4.4 mm², slice thickness = 12 mm), along with FLAIR, MP2RAGE, CEST, and SWI sequences. B 0 shimming was performed using a custom image-based shim tool.Data processing & Quantification MRSI image reconstruction was performed in Python, with post-processing conducted in MATLAB (The MathWorks, Natick, MA). Voxel-wise spectral fitting was carried out using LCModel. Tumor ROIs were manually delineated on FLAIR images and applied to the spectroscopic data to extract and average spectra from tumor and contralateral regions. These average spectra were also fitted in LCModel using the same basis set. Metabolite concentrations were compared between tumor and healthy tissue, as well as between low- and high-grade gliomas.

RESULTS

Figure 1 shows the metabolite maps of different metabolites overlaid on top of FLAIR images of a high-grade glioma patient (glioblastoma, IDH wildtype), who also suffered from traumatic brain injury in the past. NAA, Cho, Asp, Lac, Glu and mI+Gly changes clearly extend beyond the FLAIR based ROIs, while Cr and GSH changes are mainly observed within the ROI. Figure 2 represents a similar representation of metabolite maps for a low-grade glioma patient (oligodendroglioma grade III, IDH mutant).The respective metabolite maps show clear changes in the tumor area versus healthy brain tissue. Figure 3 shows comparision of the metabolite concentrations from lesion vs healthy tissue from the highgrade glioma patient. Figure 4 shows simillar comparision for lowgrade glioma patient.

CONCLUSION

This study demonstrates that 1H FID MRSI at 7T can detect tumor-specific alterations in 10 brain metabolites, with changes often extending beyond anatomically defined tumor boundaries, particularly in high-grade gliomas. These findings highlight the potential of metabolic imaging for personalized treatment planning and monitoring of disease progression.

CLINICAL RELEVANCE/APPLICATION

This approach offers a non-invasive means for early detection, classification, and treatment response monitoring of primary brain tumors, with the potential to improve tumor boundary delineation for treatment planning.

W5A-SPNR-6 INFLAMMATORY BIOMARKERS AND NEUROIMAGING SIGNATURES IN HIGH-ALTITUDE CEREBRAL SMALL VESSEL DISEASE: AN ALTITUDINALLY STRATIFIED COHORT STUDY

Jia Wei (*Presenter*)
Hai Hua Bao (*Abstract Co-Author*)
SHIPEI HE (*Abstract Co-Author*)

PURPOSE

The progression of cerebral small vessel disease (CSVD) is closely linked to hypoxic stress and systemic inflammation. Chronic hypoxia in high-altitude environments may exacerbate CSVD pathophysiological processes; however, research on clinical phenotypes and specific neuroimaging alterations in CSVD patients under such unique environmental conditions remains limited. This study aimed to investigate neuroimaging characteristics of CSVD across varying altitude exposures and evaluate the correlations between altitude elevation, systemic inflammatory biomarkers, and neuroimaging markers.

METHODS AND MATERIALS

This retrospective study (03/2023-10/2024) at Qinghai University Hospital stratified 309 CSVD patients into three groups based on altitude: low-altitude (1,800-2,500 m, n=96), high-altitude (2,500-3,500 m, n=124), and extreme high-altitude (=3,500 m, n=89). Neuroimaging parameters (CSVD burden, Fazekas scores, PVS counts, lacunes, WMH volumes/ratios across juxtaventricular/periventricular/deep/juxtacortical regions) were quantified via 3T Prisma MRI (T1/T2/T2-FLAIR/DWI sequences). Inflammatory indices [systemic immune-inflammation index (SII), neutrophil-to-lymphocyte ratio (NLR), monocyte and neutrophil count]were analyzed using SPSS 25.0.

RESULTS

This study enrolled 309 CSVD patients (65±10y; 53.4% male) stratified by altitude: low (2,141±215m), high (2,790±273m), and extreme high (3,732±212m). Elevation-dependent increases in systemic inflammation were observed: leukocyte count (r=0.201), neutrophils (r=0.183), monocytes (r=0.112), and SII (r=0.148)(all $p<0.05$). Despite comparable total CSVD burden and age distribution across groups, extreme high-altitude patients demonstrated significantly higher PVS counts (P=0.007). Both high-altitude groups exhibited more severe deep WMH (P=0.001), particularly in left (P<0.001) and right (P=0.003) hemispheric regions, with elevated deep WMH volume ratios (P=0.006). Extreme altitude demonstrated larger juxtacortical WMH volumes than low altitude (p=0.026), left-hemisphere predominant (p=0.004). No altitude-dependent variations emerged in periventricular/juxtaventricular WMH parameters.

CONCLUSION

Higher altitude exposure is associated with increased systemic inflammation and exacerbated neuroimaging markers of CSVD, particularly deep white matter ischemic injury and PVS enlargement.

CLINICAL RELEVANCE/APPLICATION

High-altitude CSVD necessitates close monitoring of systemic inflammation and thorough assessment of deep white matter ischemic lesions, with neuroimaging biomarkers and inflammatory profiles serving as key targets for early intervention in hypoxia-driven progression.

W5A-SPNR-7 ENHANCING TOF-MRA ANEURYSM SEGMENTATION: IMPACT OF FOCAL LOSS ON SMALL LESION DETECTION

Sahika Yayli, MD (*Presenter*)
Bradley J. Erickson, MD, PhD (*Abstract Co-Author*)

PURPOSE

Accurate segmentation of brain aneurysms in TOF-MRA is crucial for diagnosis and treatment planning. However, small lesions are often missed due to class imbalance and their subtle appearance. This study investigates whether Focal Loss can reduce false negatives and improve aneurysm detection compared to conventional Dice-based loss in deep learning models.

METHODS AND MATERIALS

We used the public Lausanne dataset comprising 284 TOF-MRA volumes (127 healthy, 157 patients with aneurysms; 198 aneurysms total). A nnU-Net model was trained for 1000 epochs using two main loss configurations: (1) Dice Loss alone, and (2) a composite loss combining Dice, Binary Cross-Entropy (BCE), and Focal Loss. In addition to experimenting with different alpha and gamma values for Focal Loss, we also trained models with varying weights assigned to the Dice, BCE, and Focal components to identify the most effective balance. Performance was evaluated using standard segmentation metrics including Dice Score, Hausdorff Distance (HD), 95th percentile HD (HD95), Relative Volume Error (RVE), and Sensitivity.

RESULTS

The model trained with a combined loss function of Focal Loss, Cross Entropy, and Dice Loss outperformed the baseline Dice-only model, showing consistent improvements across all key metrics: F1 Score improved from 0.64 to 0.84 Mean Dice improved from 0.43 to 0.46 Mean HD95 improved from 33.8 to 13.8 Mean HD improved from 48.5 to 15.7 Sensitivity improved from 0.79 to 0.82 Visual evaluation confirmed better delineation of small aneurysms. While the number of MRIs with no detected lesions slightly increased (from 2 to 4), the model yielded more true positives and fewer false negatives, indicating a meaningful gain in small lesion detection performance.

CONCLUSION

The combined use of Dice, BCE, and Focal Loss led to performance improvements across all segmentation metrics. Most notably, the number of missed aneurysms (false negatives) and segmentation errors were reduced. The focal loss-based training demonstrated better delineation of small lesions and improved sensitivity compared to standard Dice-only training.

CLINICAL RELEVANCE/APPLICATION

Focal Loss enhances aneurysm segmentation on TOF-MRA by reducing false negatives and improving detection of small lesions. This approach can help radiology AI models become more reliable in identifying clinically significant abnormalities, especially when lesion sizes are small or data is imbalanced.

W5A-SPNR-8 STANDING CONE BEAM CT MYELOGRAPHY REVEALS NEW FINDINGS IN PATIENTS WITH NEGATIVE SUPINE CT MYELOGRAMS: A CASE SERIES

Ahmed O. El Sadaney, MBBCh (*Presenter*)
Norbert G. Campeau, MD, MSc (*Abstract Co-Author*)
Troy Bellrichard (*Abstract Co-Author*)
Ian T. Mark, MD (*Abstract Co-Author*)

PURPOSE

Patients with low back pain can have supine cross-sectional imaging (MRI or CT myelogram) without identifying stenosis as a causative etiology. However, the positional nature of their symptoms suggests that the non-weight-bearing supine position may contribute to false-negative results. This case series shows that standing cone beam CT myelography can reveal additional findings in a weight-bearing state, potentially demonstrating spinal canal or nerve root compression not seen in the supine position.

METHODS AND MATERIALS

A cone beam CT myelogram was performed with the patient in a standing position using the following clinical protocol: a fluoroscopic guided lumbar puncture was performed followed by the intrathecal injection of iodinated contrast. Images of the lumbar spine were then acquired using the upright lumbar myelo 3D program at 30f/s using a scene time of 6.9 seconds. The patient was then transferred over to CT for a conventional supine myelogram.

RESULTS

Three patients were identified with new lumbar spondylosis on the standing cone beam CT myelogram that were not observed on the supine CT myelogram. Patient A is a 66-year-old male with a widely patent spinal canal on supine images, but standing myelogram demonstrates advanced spinal canal narrowing at L4-L5 on the basis of a posterior disc bulge and ligamentum flavum thickening. Patient B is a 72-year-old male who had disc vacuum phenomenon and grade 1 retrolisthesis of L4 on L5 when supine, however when standing this same level demonstrated grade 1 anterolisthesis, loss of the disc height space, and effacement of the vacuum phenomenon. Patient C is a 66-year-old female who had a right posterior disc bulge and effacement of the right lateral recess at L3-L4 that was only apparent on the standing myelogram.

CONCLUSION

Standing cone beam CT myelography is a useful tool for evaluating patients with chronic pain and negative non-weight-bearing imaging. Further studies are needed to validate the findings from this case series and to identify which patient populations may benefit most from this technique.

CLINICAL RELEVANCE/APPLICATION

Standing cone beam CT myelograms can provide new insights for patients with negative supine CT myelograms.

W5A-SPNR-10 APPLICATION OF 3D-ASL AND MRA IN THROMBOLYTIC THERAPY OF PATIENTS WITH ACUTE ISCHEMIC STROKE

Deng Jie (*Presenter*)

PURPOSE

To evaluate the clinical utility of three-dimensional arterial spin labeling (3D-ASL) and magnetic resonance angiography (MRA) in assessing cerebral perfusion and vascular stenosis in patients with acute ischemic stroke (AIS) undergoing intravenous thrombolysis (IVT).

METHODS AND MATERIALS

This study included 100 AIS patients treated with IVT within 4.5 hours of symptom onset from March 2021 to December 2023. All patients underwent MRI, 3D-ASL, and MRA before and after IVT. Patients were stratified based on MRA-detected middle cerebral artery (MCA) stenosis (positive vs. negative). Cerebral blood flow (CBF) in the ischemic penumbra (IP), contralateral mirror region, and infarct core, as well as NIHSS scores, were compared pre- and post-IVT. Pearson correlation analysis assessed the relationship between NIHSS scores and CBF in these regions. Additionally, Spearman correlation analysis evaluated the association between MCA stenosis and post-IVT rCBF/NIHSS scores.

RESULTS

CBF Changes: Pre-IVT, CBF in the infarct core was significantly lower than in the IP and contralateral regions ($P<0.05$). Post-IVT, CBF in the IP and infarct core increased significantly ($P<0.05$), while NIHSS scores decreased ($P<0.05$). CBF in the contralateral region remained stable ($P>0.05$).Correlation Analysis: NIHSS scores showed significant negative correlation with CBF in the IP and infarct core ($P<0.05$) but no correlation with the contralateral region ($P>0.05$).MCA Stenosis: MRA identified MCA stenosis in 67 patients (positive group). Compared to the negative group, positive patients had lower IP rCBF and higher NIHSS scores post-IVT ($P<0.05$). MCA stenosis was significantly negatively correlated with IP rCBF and positively correlated with NIHSS scores ($P<0.05$).

CONCLUSION

The combination of 3D-ASL and MRA provides a robust tool for evaluating post-thrombolytic perfusion in AIS patients, offering complementary value in guiding treatment decisions and predicting clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

3D-ASL and MRA are valuable in assessing penumbral perfusion and vascular stenosis in AIS patients undergoing thrombolysis, supporting precise treatment planning and improving clinical outcomes. Their integration into routine clinical practice is strongly recommended.

W5A-SPNR-11 SSPE IN PEDIATRIC POPULATION- A SERIES OF SIX CASES AND LITERATURE REVIEW

Marya Hameed, FRCR, MBBS (*Presenter*)

PURPOSE

Subacute Sclerosing Panencephalitis (SSPE) is a progressive, fatal neurodegenerative disorder resulting from persistent measles virus infection, typically emerging years after the initial illness. Despite the inclusion of the measles vaccine in national immunization programs, cases continue to arise, especially in regions with poor vaccine coverage. This case series aims to highlight the clinical and radiological spectrum of SSPE in children, advocate for the utility of imaging in early diagnosis, and call attention to the disease as a neglected public health concern in low-resource settings.

METHODS AND MATERIALS

We present six pediatric SSPE cases admitted to a tertiary government-funded hospital in Pakistan. Each case was evaluated with a detailed clinical history, neurological examination, electroencephalography (EEG), cerebrospinal fluid (CSF) analysis for measles antibodies, and brain MRI. Diagnostic challenges, treatment attempts, and outcomes were recorded to assess common patterns and the role of imaging in early identification.

RESULTS

All six patients had a history of either confirmed or suspected measles infection in early childhood, often with incomplete vaccination records. Presenting symptoms ranged from seizures, behavioral changes, and cognitive decline to motor deficits and vision loss. MRI findings included asymmetrical T2/FLAIR hyperintensities in the parieto-occipital, periventricular, or temporo-occipital regions. CSF analysis confirmed elevated measles IgG antibodies in all cases. Outcomes varied, with some patients deteriorating rapidly despite corticosteroid and antiviral therapy, while others were lost to follow-up due to socioeconomic constraints.

CONCLUSION

SSPE remains a critical, underdiagnosed complication of measles in low-income countries. Early imaging and clinical suspicion are key to diagnosis, but limited awareness and delayed presentation hinder timely intervention. Multidisciplinary support and nationwide preventive strategies are urgently needed.

CLINICAL RELEVANCE/APPLICATION

Radiologists play a pivotal role in the early detection of SSPE. Enhanced awareness among clinicians, improved vaccine outreach, and investment in diagnostic capacity are essential to prevent and manage this fatal but potentially avoidable condition.

W5A-SPNR-13 DYNAMIC FUNCTIONAL CONNECTIVITY CORRELATES WITH TRANSCRIPTOMIC AND CELLULAR FEATURES IN ALZHEIMER'S DISEASE SPECTRUM

Yan Shi (*Presenter*)
Yuanhao Li (*Abstract Co-Author*)
Renpuchi Ci (*Abstract Co-Author*)
Ning Zheng (*Abstract Co-Author*)
Wenzhen Zhu (*Abstract Co-Author*)
Yuan-Yuan Qin, MD (*Abstract Co-Author*)

PURPOSE

Alzheimer’s disease (AD) progression involves a continuum from subjective cognitive decline (SCD) to mild cognitive impairment (MCI), and eventually dementia. To uncover dynamic functional connectivity (dFC) of this progression, we characterized transient brain states using resting-state functional MRI (rsfMRI) at different AD Spectrum (ADS) stages, and mapped them to molecular pathways, spatial gene expression, and cell-type specificity.

METHODS AND MATERIALS

A total of 239 participants (31 AD, 56 MCI, 83 SCD, and 69 healthy controls [HC]) underwent 3T rsfMRI and neuropsychological assessments. Whole-brain dFC patterns were analyzed using Leading Eigenvector Dynamics Analysis (LEiDA) and K-means clustering. Brain state features showing significant group differences were spatially correlated with regional transcriptomic profiles from the Allen Human Brain Atlas (AHBA). Associated genes were further evaluated for enriched biological processes and cell-types specificity.

RESULTS

In this cohort, ten transient brain states were identified. AD patients showed reduced dwell time compared to HC (P FDR =0.003), SCD (P FDR =0.000), and MCI (P FDR =0.004), as well as reduced occupancy rate relative to HC (P FDR =0.004) in State 5, characterized by synchronized activity across the bilateral Salience/Ventral Attention Network-Frontoparietal Control Network-Default Mode Networks. State 5-related genes localized to medial prefrontal (P FDR =0.032), inferior temporal (P FDR =0.032), and orbitofrontal cortices (P FDR =0.047), enriched in “extracellular glycine-gated ion channel activity” (GO:0016933, P FDR = 0.001) and its subclass “extracellular glycine-gated chloride ion channel activity” (GO:0016934, P FDR = 0.001). These genes showed cell-type-specific expression in excitatory neurons (Ex4, P FDR = 0.007; Ex5, P FDR = 0.007; Ex7, P FDR = 0.026) and inhibitory interneurons (In1, P FDR =0.047).

CONCLUSION

Our findings identify disrupted state 5 as a key marker of AD progression, linked to glycine-gated ion channel pathways and Ex/In neuronal subtypes. These results offer novel mechanistic insights into functional network dysfunction in ADS and identify potential molecular targets for early intervention.

CLINICAL RELEVANCE/APPLICATION

The identified dFC signatures, particularly State 5 abnormalities and associated glycinergic pathway dysregulation, may serve as biomarkers and therapeutic targets to modulate excitatory/inhibitory balance and delay cognitive decline.

W5A-SPNR-15 DIAGNOSTIC PERFORMANCE OF A SIMULTANEOUS NEUROMELANIN-NIGROSOME MRI PROTOCOL IN PARKINSONISM: COMPARISON WITH CONVENTIONAL SMWI AND PET CORRELATION

Aleum Lee, PhD, MD (*Presenter*)
Hwan Heo, MENG (*Abstract Co-Author*)
Myeongoh Lee (*Abstract Co-Author*)
Jeongwon Jo (*Abstract Co-Author*)
Intae Shin (*Abstract Co-Author*)
Soohwa Song, PhD (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the diagnostic accuracy of a 3D multi-echo GRE sequence for simultaneous neuromelanin (NM) and nigrosome-1 (N1) imaging in individuals with parkinsonism features and to analyze its correlation with PET standardized uptake value ratio (SUVR). Deep learning-driven methods will enable detection and

segmentation of swallow-tail sign loss as well as characterization of NM signal variations. We compare accuracy to the conventional susceptibility map weighted images (SMwI) sequence and assess NM-N1 effectiveness via NM volume-SUVR correlation.

METHODS AND MATERIALS

Data acquisition We modified the conventional SMwI sequence by integrating two spatial saturation pulses for magnetization transfer weighting to simultaneously obtain NM contrast. A total of 44 MRI datasets were collected from domestic Hospital on a 3 T scanner; 32 subjects had parkinsonian syndrome (PS) confirmed by decreased 18 F-FP-CIT binding on PET. Additionally, 27 participants underwent images with the conventional SMwI sequence. Image processing & analysis: For NM analysis, the first-echo data were used, while the remaining three echoes were employed for SMwI reconstruction. A deep learning-based model and anatomical templates was applied to quantify N1 and NM, and to train a classifier for detecting N1 abnormalities within the substantia nigra. The reference standard was defined by 18 F-FP-CIT PET findings. Finally, we assessed the correlation between quantified neuromelanin volume and PET SUVR.

RESULTS

The NM-N1 sequence showed 82.8% sensitivity, 93.3% specificity, and 0.936 AUC on the right, and 82.1%, 93.8%, and 0.940 on the left. The conventional SMwI protocol demonstrated higher performance with 94.1% sensitivity, 100% specificity, and an AUC of 0.953 on the right, and 88.2%, 100%, and 0.953 on the left. AUC comparisons between the two SMwI sequences yielded p-values of 0.711 (right) and 0.797 (left), indicating no significant differences. Furthermore, PS patients showed a 19% decrease in neuromelanin volume relative to non-PS controls, and neuromelanin volume was significantly correlated with the SUVR of the putamen within the basal ganglia.

CONCLUSION

The NM-N1 sequence provided diagnostic accuracy comparable to that of the conventional SMwI protocol, and neuromelanin volume measurements significantly differentiated PS patients from controls.

CLINICAL RELEVANCE/APPLICATION

With a total scan duration of less than 5 minutes, NM-N1 sequence could be especially beneficial for PS patients sensitive to prolonged imaging sessions. The modest performance difference compared to the conventional SMwI protocol falls within clinically acceptable limits, suggesting its diagnostic utility in practice.

W5A-SPNR-16 RESEARCH OF AUTISM SPECTRUM DISORDERS BASED ON GRAY-WHITE MATTER DYNAMIC FUNCTIONAL NETWORK CONNECTIVITY

Xuan Yu (*Presenter*)
Yuning Si (*Abstract Co-Author*)
Jinsha Tan (*Abstract Co-Author*)
Nan Meng (*Abstract Co-Author*)
Meiyun Wang (*Abstract Co-Author*)

PURPOSE

Previous neuroimaging research has primarily focused on static functional connectivity or discrete subnetwork interactions, often overlooking the temporally evolving interactions within the brain's functional systems. The overarching objective of this study is to investigate the dynamic functional network connectivity (dFNC) between white matter (WM) and gray matter (GM) in individuals with Autism Spectrum Disorders (ASD) and to uncover its pathophysiological significance. By leveraging the advanced machine learning model, this research aims to quantify dynamic spatiotemporal patterns of gray-white matter interactions across large-scale brain networks, identifying deviations in ASD compared to neurotypical controls.

METHODS AND MATERIALS

This study utilized structural MRI (sMRI) and functional MRI (fMRI) data from the Autism Brain Imaging Data Exchange (ABIDE) database, selecting a final cohort of 1112 participants, including individuals with 539 ASD and 573 Typical Development (TD). To ensure data quality and consistency, all sMRI and fMRI data underwent standardized preprocessing using the fMRIPrep pipeline (v24.1.1). The GM mask consisted of 82 regions directly from the Brodmann atlas. The WM bundle mask included 48 regions based on the JHU ICBM-DTI-81 atlas. To capture dynamic functional interactions, we extracted time-series data from GM and WM regions of interest (ROIs) and constructed dynamic functional network connectivity (dFNC) matrices using a sliding-window approach. Subsequently, spatiotemporal features were extracted using the Mamba-Unet framework to enhance the robustness of dFNC estimation. Further analyses, such as graph theory metrics and clustering of dFNC states, were performed to identify biologically meaningful connectivity signatures associated with ASD.

RESULTS

The Mamba-Unet model achieved 87.6% accuracy to classify ASD and TD in multiple center studies. Our study found abnormal functional connectivity primarily involving the left anterior prefrontal cortex and corpus callosum, as well as the dorsolateral prefrontal cortex and superior longitudinal fasciculus.

CONCLUSION

Our research provides a gray-white matter dynamic functional connectivity perspective for the diagnosis and understanding of ASD.

CLINICAL RELEVANCE/APPLICATION

These dynamic connectivity profiles could inform personalized treatment strategies.

W5A-SPNR-17 HUMMID: HIGH-FIDELITY ULTRA-FAST MACROSTRUCTURE AND MICROSTRUCTURE BRAIN IMAGING USING DEEP LEARNING

Yuhang He (*Presenter*)
Jialan Zheng (*Abstract Co-Author*)
Hongjia Yang (*Abstract Co-Author*)
Mingxuan Liu (*Abstract Co-Author*)
Yifei Chen (*Abstract Co-Author*)
Zihan Li (*Abstract Co-Author*)
Qiuyun Fan (*Abstract Co-Author*)
Yi Liao (*Abstract Co-Author*)
Haibo Qu (*Abstract Co-Author*)
Qiyuan Tian (*Abstract Co-Author*)
Jie Lu, PhD (*Abstract Co-Author*)
Ziyu Li (*Abstract Co-Author*)

PURPOSE

Quantifying macro- and microstructural features of human brain is vital for studying healthy and pathological changes. Assessments of macrostructural brain morphology typically rely on high-resolution T1w images from long scan times (~5 min for 1 mm iso.). Diffusion MRI (dMRI) reveals tissue microstructure and brain connectivity but needs lengthy angular samplings (~5 min for 2 mm iso. and 32-62 directions). The combined scan time (~10 min) limits the feasibility in clinical use. This study aims to enable ultrafast, high-fidelity T1w and dMRI using deep learning. Using just six diffusion-weighted images (DWIs) along optimal diffusion directions and a single b=0 image volume (~0.5 min scan time), the proposed method, HUMMID accurately reconstructs both macro- and microstructural features, enabling ultrafast brain morphology and connectivity mapping for wider clinical applications.

METHODS AND MATERIALS

HUMMID consists of two concatenated U-Nets. The first one generates high-quality T1w from 6 DWIs along optimized diffusion directions and 1 b=0 image. The second one uses residual learning to map the input to high-SNR DWIs. T1w (1 mm iso.) and dMRI data (2 mm iso., b = 1000 s/mm 2 , 50 directions) of 130 subjects (56 for training, 14 for validation, 60 for evaluation) from UK Biobank were used. Six DWIs along optimized directions were synthesized from fitted tensors—using 6 directions for the input and all 50 for the reference. On evaluation data, analyses included brain segmentation, cortical surface reconstruction, DTI, and tractography to assess the fidelity of the generated T1w and dMRI data.

RESULTS

HUMMID synthesized high-quality T1w images similar to native ones, which produced accurate brain segmentations compared to those from native images, with Dice coefficients higher than 0.95 for white matter and cortex. Reconstructed cortical surfaces from synthesized and native T1w data were highly similar, with whole-brain mean difference as 0.35, 0.34, and 0.27 mm for gray-white surface, pial surface, and cortical thickness. HUMMID also improved the SNR of input dMRI data. The whole-brain averaged mean error for fractional anisotropy reduced by 56%. The tracked fibers from HUMMID exhibited patterns more similar to those from reference DTI data.

CONCLUSION

HUMMID generates high-SNR anatomical and dMRI data from six-direction dMRI input, showing the potential in high-SNR brain morphology and microstructure mapping within clinically feasible scan times.

CLINICAL RELEVANCE/APPLICATION

By reducing 93% scan time while preserving image quality, HUMMID has the potential to facilitate brain morphology and microstructure mapping in patients with severely limited scan tolerance, such as stroke patients or young children with neurological conditions.

W5A-SPNR-18 ELEVATED IRON DEPOSITION IN FRONTAL GRAY MATTER CORRELATES WITH SEIZURES IN BRAIN ARTERIOVENOUS MALFORMATIONS: A PRELIMINARY QUANTITATIVE SUSCEPTIBILITY MAPPING STUDY

Ni Zeng, MS (*Presenter*)
Caihong Li (*Abstract Co-Author*)
Jingyue Xue (*Abstract Co-Author*)
QIUXIAN WANG (*Abstract Co-Author*)
Wen Zhibo, BA (*Abstract Co-Author*)

PURPOSE

The relationship between the pathogenesis of epilepsy associated with brain arteriovenous malformations (BAVMs) and hemosiderin deposition remains poorly understood. Utilizing the high sensitivity of quantitative susceptibility mapping (QSM) to iron metabolism, this study aimed to quantify iron content in cortical and deep gray matter nuclei of BAVM patients and evaluate its diagnostic performance in detecting epileptic BAVMs.

METHODS AND MATERIALS

A retrospective cohort of 23 BAVM patients were categorized into epileptic (n=6) and non-epileptic (n=17) groups based on seizure presentation at initial diagnosis. Using 3D Slicer software, magnetic susceptibility values were measured in 9 bilateral regions of interest (ROIs) on QSM sequences, including frontal gray matter (FGM), frontal white matter (FWM), thalamus (TH), and other nuclei. The iron deposition ratio (affected/healthy hemisphere) was calculated for each ROI. Intergroup comparisons were performed using the Wilcoxon rank-sum test, Cliff's delta effect size estimation and Holm's correction for multiple testing (a =0.05).

RESULTS

Intergroup comparisons revealed FGM iron deposition ratios were elevated in epileptic BAVMs with a medium effect size (d =0.42, 95% CI: -0.16 to 0.73), though not surviving Holm correction (p =0.308). TH iron deposition showed a similar trend (d =0.25, p =0.375) but was influenced by outliers (sensitivity analysis reduced d to -0.21 after exclusion). The epileptic group was younger (median age 24 vs. 27 years, d =-0.24), consistent with known age-related seizure susceptibility. ROC analysis indicated weak predictive value for individual ROIs (AUC<0.65), but FGM-CA ratio combined showed marginal improvement (AUC=0.68, p =0.12).

CONCLUSION

Preliminary findings suggest a potential association between elevated FGM iron deposition and epilepsy-associated BAVMs, warranting further investigation as a candidate non-invasive biomarker for seizure risk stratification. The younger age distribution in the epilepsy group aligns with clinical observations of increased seizure susceptibility in adolescent BAVM patients.

CLINICAL RELEVANCE/APPLICATION

Despite limited sample size (n=23), FGM iron deposition demonstrated clinically meaningful effect sizes, suggesting its potential as a biomarker. Future studies should prioritize larger cohorts to validate the FGM-epilepsy link.

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W5A-SPOB

OB/Gynecology Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPOB-1 RADIOMIC PHENOTYPES FROM TRANSVAGINAL ULTRASOUND COMBINED WITH AGE TO IDENTIFY OVARIAN CYSTS NEEDING SURGICAL INTERVENTION

Arunima Sharma, PhD, BEng (*Presenter*)
DIB SASSINE (*Abstract Co-Author*)
Eric A. Cohen (*Abstract Co-Author*)
Walter Mankowski (*Abstract Co-Author*)
Jennifer Ferris (*Abstract Co-Author*)
Ruth C. Carlos, MD, MS (*Abstract Co-Author*)
Jason Wright (*Abstract Co-Author*)
Despina Kontos, PhD (*Abstract Co-Author*)

PURPOSE

To assess diagnostic performance of radiomic features extracted from transvaginal ultrasound (TVUS) scans of ovarian cysts when combined with age in distinguishing high-risk ovarian cysts that may require surgical intervention, from low-risk ovarian cysts.

METHODS AND MATERIALS

TVUS images of 351 ovaries with benign ovarian cysts from 195 women (median age: 45 y; range 16-88 y) were retrospectively analyzed. For 21/351 cysts, surgery i.e., oophorectomy (9/21) or cystectomy (12/21) was performed due to pain (8/21), or diagnostic uncertainty in the case of large, complex, or persistent cysts (13/21). For this analysis, the 21 cysts undergoing surgery were labeled as high-risk, and the other 330 non-surgically treated cysts were labeled as low-risk. After text removal from TVUS, the ovaries were manually segmented, and the open-source Cancer Imaging Phenomics Toolkit (CaPTk) was used to extract texture radiomic descriptors from the images. Unsupervised hierarchical clustering was used to cluster cysts into intrinsic radiomic phenotypes. Consensus clustering was used to test phenotype stability. Principal components (PCs) summarizing the feature space were identified to reduce feature dimensionality. Logistic regression models formed with identified PCs alone and combined with age were evaluated using five-fold cross-validation.

RESULTS

Unsupervised hierarchical clustering identified two significant phenotypes ($p<0.05$) with one phenotype more associated with high-risk cysts (19.5%) when compared to a second phenotype (3.9%). Receiver operating characteristics (ROC) curves showed improved prediction of high-risk cysts when age was combined with PCs compared to when only the PCs were used for the prediction. Using the first four PCs, the area under the ROC curves were 0.68 (95% CI: 0.64 - 0.71) and 0.70 (0.66 - 0.74) before and after inclusion of age in the model, respectively.

CONCLUSION

Radiomic features extracted from TVUS can aid in distinguishing high-risk ovarian cysts that may require surgical intervention from low-risk ovarian cysts. Additionally, machine learning models formed by combining principal components of radiomic features with age can further improve identification of high-risk cysts.

CLINICAL RELEVANCE/APPLICATION

Radiomic features of ovarian cysts combined with clinical factors like age may augment established O-RADS criterion in distinguishing high-risk from low-risk ovarian cysts, aiding in clinical management and care delivery.

W5A-SPOB-2 DEVELOPMENT AND VALIDATION OF AN MRI RADIOMICS-BASED NOMOGRAM FOR PREOPERATIVE IDENTIFICATION OF LOW-RISK CERVICAL CANCER

Zhilin Yuan (*Presenter*)
Yonglan He, MD (*Abstract Co-Author*)
Fuze Cong, PhD (*Abstract Co-Author*)
Xin Gao (*Abstract Co-Author*)
Chen Jing (*Abstract Co-Author*)
Yuan Li (*Abstract Co-Author*)
Zhengyu Jin, MD (*Abstract Co-Author*)
Huadan Xue, MD (*Abstract Co-Author*)

PURPOSE

To establish a preoperative predictive framework integrating radiomics, MRI morphological features, and clinical parameters for identifying low-risk cervical cancer patients.

METHODS AND MATERIALS

This retrospective study included 91 consecutive patients with FIGO2018 IA2-IB1 stage cervical cancer (squamous cell carcinoma/adenocarcinoma/adenosquamous carcinoma). Using National Comprehensive Cancer Network criteria, patients were stratified into low-risk (tumor depth <10 mm; any-grade squamous carcinoma; well/moderately differentiated adenocarcinoma/adenosquamous carcinoma; negative lymphovascular space invasion and negative nodes) and non-low-risk groups. T2-weighted MRI-derived radiomic features were extracted, with the cohort divided into training (n=71) and validation (n=20) sets. Four models were developed: clinical features-only (age, CA125, SCC-Ag, menopause, fertility), conventional MRI features (tumor length, signal pattern: patchy vs. mass-like), radiomics, and an integrated nomogram combining significant predictors.

RESULTS

Independent predictors included tumor diameter ($p=0.005$) and MRI signal pattern ($p<0.001$). The radiomics model achieved the highest validation AUC of 0.950 (sensitivity 0.50, specificity 1.00), while the integrated nomogram incorporating radiomic features, conventional MRI features, and clinical features showed AUC of 0.900 (sensitivity 0.60, specificity 0.88). Both outperformed clinical-only (AUC 0.610) and conventional MRI models (AUC 0.850).

CONCLUSION

The radiomics model demonstrates superior predictive accuracy, and the MRI-based nomogram provides clinically interpretable decision support. Sagittal T2-weighted imaging serves as an effective protocol for radiomic feature extraction in cervical cancer risk stratification.

CLINICAL RELEVANCE/APPLICATION

Explicit characterization of sagittal T2-based radiomic signatures enables precise identification of low-risk patients, guiding conservative surgical strategies. This stratification facilitates accurate individual treatment strategies while maintaining oncological safety, and potentially reducing surgical complication and improving quality of life.

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W5A-SPPD

Pediatric Imaging Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPPD-1 ACCURACY AND REPRODUCIBILITY OF HEPATORENAL INDEX FOR ASSESSMENT OF STEATOSIS IN PEDIATRIC METABOLIC DYSFUNCTION-ASSOCIATED STEATOTIC LIVER DISEASE

Lael Ceriani (*Presenter*)
Jake Weeks, BS (*Abstract Co-Author*)
Tanya Wolfson, MS (*Abstract Co-Author*)
Yesenia Covarrubias, MS (*Abstract Co-Author*)
Walter Henderson (*Abstract Co-Author*)
Susan Lynch (*Abstract Co-Author*)
Minaxi Trivedi (*Abstract Co-Author*)
Sedighe Hosseini Shabanan, MD, MPH (*Abstract Co-Author*)
Gage Tanzman (*Abstract Co-Author*)
Jaret Skonieczny (*Abstract Co-Author*)
Patricia Ugalde Nicalo (*Abstract Co-Author*)
Michael S. Middleton, MD, PhD (*Abstract Co-Author*)
Jeffrey B. Schwimmer, MD (*Abstract Co-Author*)
Claude B. Sirlin, MD (*Abstract Co-Author*)

PURPOSE

To examine accuracy and reproducibility of ultrasound (US)-based hepatorenal index (HRI) for assessing hepatic steatosis in children with known or suspected metabolic dysfunction-associated steatotic liver disease (MASLD).

METHODS AND MATERIALS

Prospectively enrolled children with known or suspected MASLD had same-day US (C1-6 transducer, GE Logiq E10 system) and magnetic resonance imaging (MRI; GE 3T MR750). Experienced sonographers acquired a longitudinal B-mode image including the liver and the right-kidney. Three blinded US readers (R1, R2, R3) placed one region of interest (ROI) in renal cortex and a same-sized second ROI in the right lobe of the liver. HRI (ratio of liver to kidney US signal intensity) was calculated. For each US reader, we calculated: Spearman rank correlation coefficient between HRI and PDFF, area under receiver operator characteristic curve (AUC) of HRI for classifying steatosis (PDFF = 5%), and sensitivity/specificity for classifying steatosis at a common Youden-index-based threshold. Mean right-lobe proton density fat fraction (PDFF) was calculated from right-lobe segmental ROI values. Inter-reader reproducibility was assessed by an extension of Bland-Altman (BA) analysis to three readers, with computation of 95% limits of agreement (LoA), within-participant coefficient of variation (wCV), proportional reproducibility coefficient (RDC%), and intraclass correlation coefficient (ICC). Light's Kappa was computed to assess agreement of binary classification of steatosis.

RESULTS

Thirty-four children (11 female, age 8-17 yrs) were enrolled. Three children who did not tolerate MRI were excluded. Mean PDFF was 17% (range 1 to 42%). Based on AUC analysis and pooling data from all readers, the optimal Youden index based threshold was 1.65. Spearman ? (and p-value), AUC, and sensitivity/specificity at the common Youden-index based threshold (1.65) were 0.23 (p=0.21), 0.79, 0.73/0.57 for R1; 0.47 (p=0.008), 0.79, 0.58/0.86 for R2; and 0.43 (p=0.015), 0.79, 0.58/0.86 for R3. Inter-reader LoA, wCV, RDC%, and ICC were -0.68 to 0.68, 14.8%, 40.9% and 0.683. At the common HRI threshold, Light's Kappa for inter-reader classification agreement was 0.46 (p=0.04).

CONCLUSION

In children with known or suspected MASLD, HRI showed modest diagnostic performance and fair to moderate inter-reader reproducibility. Correlation with PDFF was variable across readers. HRI may not be suitable for quantification or longitudinal monitoring of hepatic steatosis in children, though it may have limited utility for initial diagnosis.

CLINICAL RELEVANCE/APPLICATION

US-based HRI is not reliable for quantifying hepatic steatosis in children at risk for MASLD and may have limited value for diagnosis without further standardization.

W5A-SPPD-2 ROLE OF SCLEROTHERAPY IN PEDIATRIC INTRA-ORBITAL VENO-LYMPHATIC MALFORMATIONS

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PURPOSE

To evaluate the effectiveness of sclerotherapy in reducing size and symptoms of orbital veno-lymphatic malformations (OVMs) in pediatric patients.

METHODS AND MATERIALS

All patients who underwent sclerotherapy for OVMs were reviewed. Imaging (MRI/ultrasound) and medical data were abstracted for indications, procedure details, and treatment outcomes. Periorbital lesions with no orbital extension were excluded.

RESULTS

In 55 patients with OVMs, sclerotherapy was performed in 17 [9 F, median age 10.7 years (IQR 3.6-13.5), median weight 34.85 kg (IQR 21-51.6 kg, 10 right-side). Presenting symptoms: swelling (71%), redness (41%), pain (35%), and blurred vision (35%). Clinical findings: swelling (76%), proptosis (58%), redness (41%), decreased visual acuity (24%), and increased ocular pressure (6%). Proptosis was identified in 8 patients, but imaging evidence supported proptosis in 10 patients - median globe displacement 4.2 mm (IQR 3.8-7.3). 12 lesions were orbital-only and 5 were peri-orbital with orbital extension. Imaging features: 82% lymphatic only, 14% venous only, 6% veno-lymphatic; 53% intraconal, 35% intra- and extraconal, and 12% extraconal. 24 cycles of sclerotherapy were performed: monotherapy (n=12), two cycles (n=3), and three cycles (n=2). Prior to sclerotherapy, 13 lesions had no management, two had surgery, and two had medical therapy (sirolimus). All procedures were performed under anesthesia with fluoroscopic, ultrasound, and/or MRI guidance. Median fluoroscopic time was 1.6 min (IQR 0.8-1.8) and skin dose was 10.4 mGy (IQR 3-31). Sclerosants included bleomycin, doxycycline, and sodium tetradecyl sulfate (STS). One agent was used in 21 procedures: bleomycin (52%) and doxycycline (48%). In three procedures, dual administration of doxycycline and bleomycin (n=1), or STS and bleomycin (n=2), was used. One case utilized next-day doxycycline instillation via drainage catheter. No procedure-related complications occurred. Two lesions had interval size increase after first sclerotherapy; one had surgical debulking and repeat sclerotherapy: stable at 5 years. The other had repeat sclerotherapy at 2 years and is stable on follow-up. At last clinical follow-up [median 17.5 months (IQR 3.3-103.3)], all affected eyes had improved visual acuity and proptosis resolved in 5/8.

CONCLUSION

In this limited experience, percutaneous sclerotherapy for OVMs is safe and has a high clinical response rate. Further research is needed to describe a multi-disciplinary (IR, oncology, and ophthalmology) treatment algorithm.

CLINICAL RELEVANCE/APPLICATION

Peri-orbital OVMs with intra-orbital extent respond to targeted percutaneous sclerotherapy and further research is required to describe multi-disciplinary treatment algorithms.

W5A-SPPD-3 OUTPERFORMING STATE-OF-THE-ART IN PEDIATRIC BRAIN TUMOR SEGMENTATION WITH A DUAL NNU-NET MODEL BASED ON RADIOLOGICAL REASONING

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PURPOSE

Pediatric brain tumors (PBTs) are the most common solid malignancies and the leading cause of cancer-related death in children, with Pediatric Low-Grade Gliomas (PLGGs) accounting for 30-40% of cases. While MRI is essential for diagnosis and monitoring, automated segmentation remains difficult due to tumor heterogeneity, across development, and data limitations. We investigated the feasibility and clinical utility of a novel deep learning model for four-subregion segmentation of pediatric brain tumors on multiparametric MRI.

METHODS AND MATERIALS

This IRB-approved retrospective study applied a dual-architecture model integrating two parallel nnU-Net frameworks trained on complementary tumor subregions. Their outputs were combined via post-processing to improve segmentation. The model was trained on 235 cases from the PED BraTS 2024 dataset (n=261; 26 held out), including T1W, T1 contrast-enhanced, T2W, and T2-FLAIR sequences. Evaluation followed PED BraTS 2024 metrics: lesion-wise Dice and Hausdorff 95 distance (HD95). The model segments four labels: enhancing tumor (ET), non-enhancing tumor (NET), cystic component (CC), and edema (ED). To match the PED BraTS 2023 state-of-the-art (SOTA), NET and CC were merged into a non-enhancing component (NC). External validation was performed on 30 expert-annotated pediatric cases from the Children's Brain Tumor Network (CBTN), and generalizability was assessed on the BraTS 2023 adult glioma dataset.

RESULTS

Our dual nnU-Net model achieved a mean Dice score of 0.642 and HD95 of 73.0 mm on the CBTN external validation dataset, outperforming the current state-of-the-art model (Dice 0.626, HD95 84.0 mm). On the BraTS 2023 adult dataset, the model demonstrated remarkable generalizability with a Dice score of 0.877 for whole tumor segmentation, indicating robust performance across age groups despite being trained exclusively on pediatric cases.

CONCLUSION

Our study demonstrates not only the feasibility but also the clinical advantage of four-label segmentation in PBTs. The radiologically-informed dual-architecture approach captures subregional characteristics across enhancing, non-enhancing, cystic, and edematous components for comprehensive treatment response assessment, progression pattern identification, and prognostic evaluation in pediatric neuro-oncology.

CLINICAL RELEVANCE/APPLICATION

Automated multi-component segmentation of PBTs enhances accuracy, reproducibility, and efficiency in tumor burden quantification. This approach supports more personalized treatment strategies and informed clinical decision-making while reducing the subjective variability inherent in manual segmentation, potentially improving outcomes in this vulnerable patient population.

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W5A-SPPH

Physics Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPPH-1 DEVELOPMENT OF A UNIVERSAL TASK-SPECIFIC IMAGE QUALITY ASSESSMENT FRAMEWORK FOR SPECTRAL PHOTON COUNTING CT - A PHANTOM STUDY

Aamir Y. Raja, PhD (*Presenter*)
Briya Tariq (*Abstract Co-Author*)

PURPOSE

Spectral photon-counting CT (SPCCT) provides reduced electronic noise, superior image quality, higher spatial resolution, and improved material identification and quantification. Consequently, more clinics and research institutions are adopting SPCCT. However, there is a lack of a standardized approach for evaluating multi-energy images using image quality metrics for task-specific applications. Our aim is to develop and assess a universal task-specific framework for image quality assessment in SPCCT prior to the material identification and quantification task.

METHODS AND MATERIALS

Two task-specific imaging protocols were established using an investigational SPCCT scanner (Mars Microlab 5 x 120) to target two clinically relevant applications: bone imaging (120 kVp, 80μA with thresholds at 40, 50, 60, and 79 keV) and crystal arthropathies imaging (120 kVp, 60μA with thresholds at 12, 15, 18, and 21 keV). A QRM D100 spectral CT quality control phantom was scanned with a homogeneous section to evaluate CT number accuracy and image uniformity subjectively, while signal-to-noise ratio (SNR) and global 3D noise power spectrum (NPS) were evaluated objectively. A second wire phantom, incorporating various 50 μm diameter copper wires, was also scanned to characterize resolution in terms of point spread function (PSF) and modulation transfer function (MTF). Measurements were evaluated as a function of varying angular projection (373, 981, and 1440) and voxel sizes (70, 80, 90, and 100 μm). A quantified image quality scoring metric that consolidates 3D NPS (both amplitude and FWHM), resolution (MTF and PSF), and SNR to objectively quantify image quality tailored to specific diagnostic tasks prior to material identification and quantification.

RESULTS

The preliminary results show that SNR was reduced by 25% with reducing voxel sizes from 100 to 70 μm and increased by about 38% with a higher number of projections (373 to 1440). A significant increase in the FWHM of the 3D NPS was observed (~55% at 70 μm voxel size), along with a 27% rise in amplitude at 1440 projections. Furthermore, the MTF improved by more than 23% as the voxel size decreased from 100 to 70μm. The quantified scoring metric for the crystal arthropathies task reached its peak value of 7.33 with 981 projections and an 80 μm voxel size.

CONCLUSION

The proposed framework demonstrate potential as a quantified, task-specific assessment tool for evaluating SPCCT image quality, facilitating optimal tissue characterization prior to material identification and quantification.

CLINICAL RELEVANCE/APPLICATION

The proposed image quality framework can be optimized for clinical applications, enabling task-specific SPCCT adjustments to enhance tissue differentiation and improved diagnostic accuracy.

W5A-SPPH-2 FEASIBILITY OF A 3D UNET TRANSFORMER NEURAL NETWORK IN QUANTITATIVE ASSESSMENT OF CLEFT PALATE VOLUME CHANGE AFTER ALVEOLAR BONE GRAFTING IN PEDIATRIC PATIENTS

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Yonggang Lu, PHD (*Abstract Co-Author*)
Riley McCarty (*Abstract Co-Author*)
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Cleo Yi (*Abstract Co-Author*)
Sameer Shakir (*Abstract Co-Author*)
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PURPOSE

It is clinically imperative to have an objective and reproducible tool in assessing cleft volume change following alveolar bone grafting in cleft palate patients. The purpose of this study is to apply an AI-driven segmentation approach to quantify cleft volume change on CT images after bone grafting repair.

METHODS AND MATERIALS

In this study, 10 pediatric patients (mean age 9.4 ± 2.0 years old, 6 males, 4 females) with unilateral cleft palate undergoing maxillofacial CT exams before and after secondary alveolar bone grafting were evaluated. An automated assessment pipeline on the acquired CT images was developed based on a 3D UNET Transformer neural network. For each patient, pre- and post-operative maxillae were segmented from the neural network, followed by affine image registration, image subtraction and image cropping process from cement enamel junction of the central incisor to the apex of the central incisor. The volume changes measured by the automated method were compared with those obtained from the manual delineations. A paired Student's t-test was used to analyze the test dataset.

RESULTS

The 3D UNET Transformer neural network achieved maxillary segmentation with Dice similarity coefficients of 0.84 ± 0.09 and Haursdorff distances of 1.22 ± 0.37 (mm) with the patient data. A significant cleft reduction was observed with a volume change of 416.20 ± 264.25 mm^3 (using the automated method) vs 388.35 ± 222.40 mm^3 (using the manual method). The mean absolute and relative volume differences between the two methods were -27.85± 100.73 mm^3 and 1.24± 21.24 %, respectively. The paired Student's t-test with p=0.41 indicates no significant discrepancy between these two methods.

CONCLUSION

The preliminary results demonstrate feasibility of the proposed AI-based framework in quantifying cleft defect volume change on CT images in pediatric patients. This automated approach is a potential tool for objective outcome assessment in cleft palate patients with alveolar bone grafting.

CLINICAL RELEVANCE/APPLICATION

To provide practical, objective, and highly reproducible measurements of cleft volume change in alveolar grafting patients, this AI-based framework along with advanced image processing may have the potential to support surgeons and orthodontists in surgical planning and longitudinal monitoring in patients before and after alveolar bone grafting surgery in pediatric patients.

W5A-SPPH-3 RESEARCH ON THE APPLICATION OF THE CLEAR INFINITY ARTIFICIAL INTELLIGENCE ALGORITHM IN ABDOMINAL AORTIC CT ANGIOGRAPHY SCANNING UNDER THE NEUSOFT PRIME CT PLATFORM

Yang Chenxiao (*Presenter*)
Chensi Xu (*Abstract Co-Author*)

PURPOSE

To evaluate the image optimization capacity of Clear Infinity (CI) artificial intelligence algorithm in abdominal aortic CT angiography (CTA) on Neusoft Prime CT platform.

METHODS AND MATERIALS

Thirty patients undergoing aortic CTA were prospectively scanned at 120kVp with fixed tube current (CTDIvol=18mGy). Venous-phase datasets were reconstructed using: 1) Clear View (CV) at 40% weighting (control); 2) CI algorithm with 20%/40%/60%/80% weightings. Quantitative analysis included CT values, noise (SD), signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) measured via standardized 5mm ROIs in aortic lumen and paraspinal muscles. Two blinded radiologists independently scored image quality using 5-point Likert scales (noise, contrast resolution, anatomical delineation, artifact suppression), with mean scores =3 defining diagnostic adequacy. Statistical analysis employed one-way ANOVA with Tukey's post-hoc test.

RESULTS

Noise Reduction: CI80% achieved 57.7% lower SD than control (7.05±0.92 vs 16.65±0.78, $p<0.001$), showing dose-dependent improvements: CI20% 16.85±0.35 ($p=0.812$), CI40% 13.55±0.35 ($p=0.004$), CI60% 10.05±0.78 ($p<0.001$). Signal Enhancement:SNR increased 137.3% from 17.91±1.95 (CV40%) to 42.5±8.28 (CI80%, $p<0.001$).CNR improved 139.3% from 15.82±3.78 to 37.86±7.32 ($p<0.001$).Weighting Gradient Effects:CI60% vs CI40%: SNR +35.1% (29.69±4.19 vs 21.96±1.97, $p=0.005$); CNR +38.8% (28.77±7.51 vs 20.73±5.22, $p=0.007$);CI80% vs CI60%: SNR +43.1% ($p<0.001$); CNR +31.6% ($p=0.002$).Subjective Evaluation: All CI groups met diagnostic criteria (=3), with CI80% scoring highest (4.55±0.34 vs 3.8±0.41 control, $p<0.001$). Inter-reader reliability was excellent (ICC=0.91, 95%CI 0.85-0.95).

CONCLUSION

Clear Infinity AI significantly enhances aortic CTA quality, achieving 57.7% noise reduction and over 130% SNR/CNR improvement at 60-80% weighting ($p<0.001$), outperforming conventional iterative reconstruction.

CLINICAL RELEVANCE/APPLICATION

This technology enables high-precision aortic evaluation with preserved diagnostic confidence, particularly valuable for serial aneurysm surveillance requiring dose optimization.

W5A-SPPH-4 DUAL-ENERGY MULTI-MATERIAL DECOMPOSITION USING PHOTON-COUNTING CT: RESIDUAL ERROR MEASUREMENT

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Alireza Shojazadeh, MD (*Abstract Co-Author*)
Sabee Y. Molloi, PhD (*Abstract Co-Author*)

PURPOSE

To present a GPU-accelerated dual-energy multi-material decomposition (MMD) algorithm for photon-counting CT (DECT), designed to reduce false-positive iodine signals in non-contrast regions, improve quantification accuracy, and enable real-time clinical deployment.

METHODS AND MATERIALS

A clinical photon-counting CT scanner was used to scan two physical phantoms: a cylindrical water-equivalent phantom and a humanoid phantom with three sizes (small, medium, and large), each containing iodine (2-20 mg/mL) and hydroxyapatite (50-600 mg/mL) inserts. Radiation dose was in the range of 3-10 mGy. For qualitative evaluation, six patients who underwent pulmonary CT angiography (average CTDIvol 9.93 mGy) were retrospectively analyzed. One of the patients had pulmonary emphysema. Our MMD algorithm combines barycentric coordinates with Principal Component Analysis (PCA). To enhance numerical stability, we replaced the traditional inversion of the linear attenuation coefficient (LAC) matrix with direct area-ratio computations in LAC space. An automated centroid-based criterion independently selects optimal material triplets, and PCA standardizes triangle distribution to improve numerical robustness. The cost function includes: (1) an anisotropic noise model addressing variance and cross-energy correlation, (2) a sparsity constraint to reduce false-positive iodine, and (3) spatial regularization to suppress structured residual artifacts. The decomposition was parallelized using a custom CUDA GPU kernel with 256-thread blocks.

RESULTS

In phantom data, the proposed method reduced mean relative iodine error from 16.39% to 1.86% (max error: 2.67%), confirming quantitative accuracy improvements over the baseline barycentric MMD. Beam-hardening artifacts and noise-induced residuals were minimized. In patient data, qualitative analysis showed elimination of false-positive iodine in non-contrast regions and clear visualization of reduced perfusion in the emphysematous lung. GPU processing of 106 million voxels completed in 3.97 seconds—a 5440× speedup compared to CPU.

CONCLUSION

The proposed GPU-accelerated MMD algorithm enhances iodine accuracy, decreases spurious signals in non-contrast regions, and provides fast, robust dual energy MMD potentially suitable for clinical environments.

CLINICAL RELEVANCE/APPLICATION

The algorithm substantially improves diagnostic accuracy by removing false-positive iodine signals, supporting dual energy MMD for potential clinical applications.

W5A-SPPH-5 PIXELPRINT^{PET} - THREE-DIMENSIONAL PRINTED PHANTOMFOR PET/CT IMAGING WITH ANATOMICAL STRUCTURE

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Michael Parma (*Abstract Co-Author*)
Min Gao (*Abstract Co-Author*)
Kai Mei, PhD (*Abstract Co-Author*)
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Jessica Im, BEng (*Abstract Co-Author*)
Joel Karp, PhD (*Abstract Co-Author*)
Peter B. Noel, PhD (*Abstract Co-Author*)

PURPOSE

Advancing developments in PET/CT toward clinical implementation can be expedited through realistic system characterization, particularly using anatomically realistic phantoms. Accordingly, the development of phantoms that accurately simulate both radiotracer distribution and X-ray attenuation is critical for the comprehensive evaluation and optimization of PET/CT technologies. We present PixelPrint PET , 3D-printed phantoms for PET/CT imaging that accurately reproduce radioactivity maps with high anatomical fidelity.

METHODS AND MATERIALS

PixelPrint was used to create phantoms with varying infill ratios by adjusting the printed line widths while maintaining a fixed 2.5 mm line distance. Polylactic acid (PLA) was selected as the filament. Calibration phantoms were fabricated to cover a range of infill ratios from 5% to 90%. The phantoms were immersed in 18 F-fluorodeoxyglucose (18 F-FDG) solution and scanned using a PET/CT system equipped with a dual-layer CT scanner (IQon spectral CT, Philips Healthcare) and the PennPET Explorer. Linear regression between infill ratios and normalized SUV values was calculated. The brain phantom was created using the BigBrain-MR dataset, with segmented regions assigned activity concentration ratios scaled from 1 (white matter) to 4 (subthalamic and red nuclei) to simulate realistic PET contrast. A 67 × 67 × 39 mm 3D block, including white matter, subthalamic/red nuclei, and cortical gray matter, was selected. Calibration results were applied to convert these ratios into infill values, and G-code was generated to manufacture the phantom. The brain phantom was submerged in 0.12 mCi 18 F-FDG solution and scanned using the PET/CT system. PET images were reconstructed and reviewed by a radiologist.

RESULTS

The overall fit line between the infill ratio and normalized SUV showed a high coefficient of determination ($R^2 = 0.99$), indicating excellent correlation. The maximum contrast ratio achieved was approximately 10:1. PET images of the printed brain phantom visually resembled the original simulated brain image. A board-certified radiologist reviewed and confirmed the anatomical accuracy and image quality of the phantom.

CONCLUSION

This study demonstrates the feasibility of creating 3D-printed PET/CT phantoms with realistic anatomical structures and contrast ratios that reflect radiotracer uptake in PET images. PixelPrint PET shows strong potential for producing phantoms that flexibly support multimodal imaging while preserving precise organ geometry.

CLINICAL RELEVANCE/APPLICATION

The development of anatomically realistic 3D-printed PET/CT phantoms, such as PixelPrint PET , enhances the accurate evaluation and optimization of imaging technologies, facilitating clinical implementation.

W5A-SPPH-6 DUAL-ENERGY CT FOR MONITORING RADIATION-INDUCED METABOLIC DYSFUNCTION: HISTOPATHOLOGICAL VALIDATION IN A RABBIT MODEL

Chen Cheng (*Presenter*)

PURPOSE

To validate the feasibility of employing dual-energy CT (DECT) for radiation-induced bone metabolic dysfunction monitoring by comparing with the histopathological results.

METHODS AND MATERIALS

15 New Zealand White rabbits, comprising 12 irradiated animals (30 Gy single fraction) in the pelvis and 3 non-irradiated controls were used to establish a model of radiotherapy bone metabolic dysfunction. These twelve rabbits were randomly assigned to four experimental cohorts (n=3 per group) based on predetermined follow-up intervals: 7, 14, 21 and 28 days post-irradiation. DECT was performed before and at 7d, 14d, 21d, and 28d after irradiation. DECT-derived calcium, hydroxyapatite (HAP), and fat content after irradiation were measured at the cancellous bone of L7 vertebra and bilateral femoral necks (FN), subsequently normalized by corresponding parameters before irradiation. Corresponding pathological calcium content and fat fraction were quantified using Flame Atomic Absorption Spectroscopy (FAAS) and Hematoxylin and Eosin (HE) staining histological samples.

RESULTS

Quantitative DECT analysis revealed a progressive decline in calcium (31.1%-32.6%, all $p<0.001$) and HAP (30.9%-31.5%, all $p<0.001$) content of the L7 and bilateral FN during the 1-4 weeks post-irradiation ($R^2=0.9989$ vs. Histopathology). Concurrently, DECT-derived fat content initially peaked at week 1 (the right FN: +35.92%,the left FN:+42.08%, L7:+24.83%), sharply decreased by week 2, and stabilized thereafter (the right FN: -2.07%, the left FN:-1.49%, L7:-0.78%). Histopathological analysis of the right FN revealed a transient increase in adipocyte vacuolation area at week 1 post-irradiation, which subsequently declined in later weeks but persistently exceeded levels in non-irradiated controls throughout the observation period ($p<0.001$) .

CONCLUSION

DECT quantitative analysis demonstrated a significant reduction in calcium and HAP content, accompanied by a generalized increase in fat deposition after irradiation. These changes exhibited strong concordance with corresponding histopathological evaluations.

CLINICAL RELEVANCE/APPLICATION

DECT offers a novel, non-invasive method for detecting early radiation-induced bone metabolic dysfunction, providing simultaneous insights into calcium loss, hydroxyapatite depletion, and marrow adiposity.

W5A-SPPH-7 IQ-PAT: A NEW METHOD FOR NOISE POWER SPECTRUM AND TASK-BASED TRANSFER FUNCTION ASSESSMENT IN PATIENT CT IMAGES

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Paul Menard (*Abstract Co-Author*)
Olivier Nempont (*Abstract Co-Author*)
Maria Nicole Antonuccio (*Abstract Co-Author*)
Marjorie Villien (*Abstract Co-Author*)
Philippe C. Douek, MD, PhD (*Abstract Co-Author*)
Joel Greffier, PhD (*Abstract Co-Author*)

PURPOSE

To develop a novel method (IQ-PAT) for Noise Power Spectrum (NPS) and Task-based transfer function (TTF) evaluation on patient images and validate this method on an image quality phantom.

METHODS AND MATERIALS

An in-house method (IQ-PAT) was developed to automatically compute NPS and TTF on patients' thoracic aorta. First, automatic segmentation of the thoracic aorta was performed. Secondly, an 18×18-pixel ROI was automatically placed on each of 100 consecutive slices. 2D NPS was computed for each ROI and radially averaged to obtain the 1D NPS. For TTF assessment, the barycenter of the aorta was calculated and used to extract and align radial profiles for Edge Spread Function (ESF)

computation. Profiles affected by anatomical variability or pathology were automatically excluded. TTF was then derived by differentiating the ESF and applying the Fourier Transform. To validate this method, acquisitions were performed on the 26-cm diameter section of a Mercury v4.0 phantom using a clinical Dual Layer CT scanner at 120kVp with a total aortic gated protocol (Indice Dose Right 19). Images were reconstructed using a 512x512 matrix, 400mm FOV, and 1 mm slice thickness. iDose 4 level 4 (i4), a hybrid iterative reconstruction algorithm, was used in combination with kernels A, B and C. IQ-PAT was benchmarked against iQMetrix-CT software using the iodine insert in the phantom matching dimensions and contrast of real aortas, and further tested on 7 patient datasets (60[46;67] years old).

RESULTS

Phantom data showed that NPS and TTF values derived from IQ-PAT closely matched those from iQMetrix-CT for the used kernels. Noise magnitude increased with sharper kernels (A to C) for both tools (from 16.7 to 21.1 for IQ-PAT and from 20.9 to 28.4 HU for iQ-Metrix). Average NPS spatial frequency values were similar (0.22 to 0.27 mm -1 for IQ-PAT vs 0.20 to 0.25 mm -1 for iQMetrix-CT). TTF at 50% (f 50) increased with sharper kernels (A to C) for both tools (0.30 vs 0.35 mm -1 for IQ-PAT, and 0.29 vs 0.35 mm -1 with iQMetrix-CT). Relative differences in f 50 between IQ-PAT and iQMetrix-CT averaged 2.5 ± 0.1 %. Results are shown in Figure 1. Patient imaging results with IQ-PAT followed the same trends in terms of noise (from 21.82 ± 10.49 to 28.59 ± 13.12 HU), frequency average (from 0.21 ± 0.01 to 0.27 ± 0.01 mm -1) and f 50 (from 0.20 ± 0.03 to 0.23 ± 0.04 mm -1) from kernel A to C.

CONCLUSION

IQ-PAT provides reliable and consistent assessments of NPS and TTF on phantom images, with results comparable to iQMetrix-CT ones. Early application to patient data demonstrates the method’s feasibility in clinical conditions.

CLINICAL RELEVANCE/APPLICATION

Assessing noise characteristics directly from patient images will allow the optimization of CT protocols and improve image quality evaluation in clinical practice.

W5A-SPPH-8 ANATOMICAL NOISE POWER EXPONENT AS AN IMAGE-BASED BIOMARKER OF BREAST CANCER RISK: IMPROVING AI MODEL PERFORMANCE - A PILOT STUDY

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Leslie Lamb, MD, MSc (*Abstract Co-Author*)
Kai Yang, PhD (*Abstract Co-Author*)

PURPOSE

Breast parenchymal texture has been linked to cancer risk but has not been explicitly leveraged in deep learning (DL) based risk models. This study assesses the association of the anatomical noise power exponent (ß) as an image-based biomarker of breast cancer occurrence and its potential to improve the predictive performance of MIRAI, a state-of-the-art DL-based breast cancer risk assessment model.

METHODS AND MATERIALS

The study cohort included two groups of women who underwent bilateral mammographic screening between 2017 and 2022 (target and control, n=20 each), tightly matched by age, race, and breast density. The target group had breast cancer diagnosed within one year of the screening mammographic exam. A 2D screening mammography-based DL model (MIRAI) was used to assess the 1-year risk of breast cancer. 229 mammographic images were analyzed for ß using a custom algorithm that automatically extracted breast tissue regions for anatomical noise power spectrum analysis. The power-law exponent, ß, derived as the slope of the linear relationship between log-power and log-frequency, was used as a quantitative measure of breast parenchyma texture. Mixed-effects logistic regression quantified the association between ß and breast cancer occurrence, adjusting for laterality and patient clustering. The predictive performance using the standardized MIRAI 1-year risk scores, and the combined standardized MIRAI risk and patient-specific ß scores were quantified using separate logistic regression models and summarized using the corresponding receiver operator curve (ROC) and area under the curve (AUC). Five-fold cross-validation was performed to estimate internally validated AUC values and 95% confidence intervals (CIs).

RESULTS

ß was positively associated with cancer occurrence. For each 0.1-unit increase in ß corresponded to a 4% increase in cancer odds (OR=1.04, 95% CI:1.00-1.07, p=0.042). ß negatively correlated with heterogeneously dense breasts (OR= 0.754, 95% CI: 0.692- 0.822, p= 3.965E-19). The correlation with race was weak and non-significant (OR= 1.002, 95% CI: 0.995 - 1.009, p= 0.844). MIRAI alone achieved an AUC of 0.79 (95% CI:0.62-0.96) for 1-year risk prediction, which was improved to 0.82 (95% CI:0.69-0.96) when combined with ß.

CONCLUSION

ß captures breast texture differences that is associated with cancer and this information may not be currently acknowledged in the MIRAI model. Further validation in larger studies is warranted.

CLINICAL RELEVANCE/APPLICATION

Incorporating image-based biomarker, ß, into state-of-the-art DL breast cancer risk models such as MIRAI may improve the accuracy of cancer risk prediction and personalized risk stratification.

W5A-SPPH-10 ENHANCING IMAGE QUALITY IN DIGITAL BREAST TOMOSYNTHESIS USING A GENERATIVE ADVERSARIAL NETWORK WITH A SELF-ATTENTION MECHANISM

Tsutomu Gomi, PhD (*Presenter*)
Kotomi Ishihara (*Abstract Co-Author*)
Yukio Koibuchi (*Abstract Co-Author*)

PURPOSE

This study aims to enhance the in-focus plane contrast of digital breast tomosynthesis (DBT). We propose and evaluate an approach that integrates a multihead self-attention (MSA) mechanism with a cycle-consistent generative adversarial network (cycle-GAN).

METHODS AND MATERIALS

The study was approved by our institutional ethics committee (TGMC2023-009). In a prereconstruction filtered back projection (FBP), MSA was incorporated into the up-sampling process of a deep residual U-Net (ResUNet) generator, while PatchGAN functioned as the discriminator. The dataset comprised a reference set of 42 mammography (MMG) cases (average age: 59.8 ± 7.6), with a total of 45 sample images; and an object set of 32 DBT projection cases (average age: 58.7 ± 13.5), with a total of 45 sample images. We utilized an unsupervised model in which the MMG images served as the reference and the DBT projections as the target (Selenia Dimensions system). For comparison, an existing method that incorporates attention gates (AGs) into the cycle-GAN, the conventional projection-based GAN (p-GAN) method (Sahu et.al., IEEE ISBI), and a only FBP method were selected. Image quality was evaluated using the peak signal-to-noise ratio (PSNR), the structural similarity index measure (SSIM), and Pearson’s correlation (alpha: 0.05, sample: 778,540). These were compared between the MMG images and the DBT-reconstructed images (in-focus plane). The distribution of attention weight was analyzed using gradient-weighted class activation mapping (grad-CAM).

RESULTS

The proposed method achieved the highest PSNR, particularly in cases with dense breast tissue. The SSIM values were comparable between the existing and conventional methods (PSNR: MSA 17.19 ± 1.09, AG 16.14 ± 1.88, p-GAN 16.45 ± 2.08, FBP 16.01 ± 2.32; SSIM: MSA 0.78 ± 0.04, AG 0.76 ± 0.07, p-GAN 0.78 ± 0.05, FBP 0.79 ± 0.05). Pearson’s correlation found the strongest association between the mammography and DBT images of the proposed approach (correlation: MSA 0.33 ± 0.03 [$p < 0.05$], AG 0.27 ± 0.03 [$p < 0.05$], p-GAN 0.32 ± 0.06 [$p < 0.05$], FBP 0.30 ± 0.06 [$p < 0.05$]; 95% confidence interval: MSA [0.328 ± 0.058, 0.332

± 0.067], AG [0.278 ± 0.03, 0.282 ± 0.034], p-GAN [0.323 ± 0.053, 0.327 ± 0.061], FBP [0.307 ± 0.054, 0.311 ± 0.062]). Grad-CAM analysis confirmed that both the proposed and existing AG methods exhibited high attention weight distribution in the mass region. The p-GAN showed a tendency toward dispersed distributions.

CONCLUSION

The proposed method effectively improved the in-focus plane contrast of DBT images, demonstrating particular efficacy in cases with dense breast tissue.

CLINICAL RELEVANCE/APPLICATION

A cycle-GAN prereconstruction manipulation with MSA can significantly enhance image quality while preserving contrast.

W5A-SPPH-11 PROTOTYPE DEEP SILICON PHOTON-COUNTING DETECTOR CT PRELIMINARY COMPARISON OF VIRTUAL UNENHANCED AND TRUE UNENHANCED IMAGES

Aria Salyapongse, MSc (*Presenter*)
Giuseppe V. Toia, MD, MS (*Abstract Co-Author*)
Zhye Yin (*Abstract Co-Author*)
Ming Yan, PhD (*Abstract Co-Author*)
Krista McClure (*Abstract Co-Author*)
Meghan Yue, BS (*Abstract Co-Author*)
Scott Slavic, MS (*Abstract Co-Author*)
Meghan G. Lubner, MD (*Abstract Co-Author*)
Timothy P. Szczykutowicz, PhD (*Abstract Co-Author*)

PURPOSE

To compare the difference in CT number between virtual unenhanced (VUE) and true unenhanced (TUE) human subject images on a prototype deep silicon (dSi) photon-counting detector (PCD) CT system.

METHODS AND MATERIALS

Five subjects comprising various anatomies (1 chest, 1 head, 1 wrist/hand, and 3 abdomen) and phases (non-contrast, portal venous, early arterial, and late arterial) were scanned on the prototype dSi PCD CT. kV and mA were adjusted for anatomy and subject size. Five slices were selected from each image set at two locations to provide a variety of anatomy, including vessels (e.g., aorta, portal bifurcation, inferior vena cava, small arteries), soft tissue (e.g., spleen, psoas muscle, posterior liver, lateral liver) and subcutaneous adipose. Circular regions of interest were drawn over the anatomy on the VUE images and transferred to the TUE image sets. VUE error was defined as the CT number from the VUE in Hounsfield units (HU) minus the TUE CT number.

RESULTS

For all tested structures, 82% had a VUE error less than 10 HU, and 62% had a VUE error less than 5 HU. Small arteries and adipose tissue were the structures most prone to having a VUE error greater than 5 or 10 HU. Vessels demonstrated VUE errors less than 10 HU and less than 5 HU for 70.4% and 40.7% of tested structures, respectively. Soft tissue demonstrated VUE errors less than 10 HU and 5 HU in 96.9% and 84.4%, and adipose tissue demonstrated VUE errors less than 10 HU and 5 HU in 75% and 58.4% of tested structures.

CONCLUSION

The majority of tested anatomic structures have VUE errors less than 10 HU with a large subset excluding small arteries having errors less than 5 HU.

CLINICAL RELEVANCE/APPLICATION

VUEs provide two main advantages in clinical scanning: the potential elimination of a separately acquired TUE phase or providing unenhanced data when not routinely acquired for a given protocol. Both use cases rely on high accuracy of VUEs compared to TUEs. These results preliminarily suggest that on the prototype dSi PCD CT system VUE and TUE CT numbers are similar.

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W5A-SPRO

Radiation Oncology Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPRO-1 PROVISION OF ANATOMICAL CONTEXTUAL INFORMATION IMPROVES PERFORMANCE OF A CONVOLUTIONAL NEURAL NETWORK TASKED WITH BRAIN METASTASIS DETECTION

Ethan Truong (*Presenter*)
Jordan Houri (*Abstract Co-Author*)
Gretchen Hermann, BA, MA (*Abstract Co-Author*)
Vitali Moiseenko, PhD (*Abstract Co-Author*)
Jona Hattangadi-Gluth, MD (*Abstract Co-Author*)
Jeffrey Rudie, MD, PhD (*Abstract Co-Author*)
Aaron Simon, MD,PhD (*Abstract Co-Author*)

PURPOSE

Modern management of brain metastases requires close surveillance with serial magnetic resonance imaging (MRI), animating research into automated techniques for tumor detection. The convolutional neural network (CNN) has shown considerable promise as a method of detecting brain metastases, and multiple groups have proposed variations in CNN network architecture to improve detection performance. In this work, we looked beyond the impact of network architecture and assessed the effect on performance of providing anatomical contextual information to a CNN in the training period.

METHODS AND MATERIALS

The nn-Unet, a widely adopted CNN, was selected for this study. The nn-Unet was trained on an institutional dataset consisting of high-resolution, T1-weighted, contrast-enhanced MRIs and associated structure labels consisting of both target brain metastases and several organs at risk (OARs) that were labeled in the process of radiosurgery planning. In the training period, the model was presented either with labeled metastases alone (BM) or with the complete structure set of metastases and OARs (BM+OAR).

RESULTS

We found that by multiple standard performance metrics, the BM+OAR model outperformed the BM model. Median case-wise Dice Coefficient for BM was 0.75 (IQR 0.51-0.86) and for BM+OAR was 0.79 (IQR 0.58-0.86) ($p<0.001$). Median sensitivity for BM was 1.0 (IQR 0.71-1.0) and for BM+OAR was 1.0 (IQR 0.75-1.0) ($p=0.01$). Median positive predictive value for BM was 0.5 (IQR 0.25-0.74) and for BM+OAR was 0.77 (IQR 0.50-1.0) ($p<0.001$). Importantly, amongst lesions scored as "false-positives", 47/151 detected by BM+OAR could be retrospectively verified to be real tumors while only 22/231 detected by BM could be verified to be real ($p<0.001$).

CONCLUSION

These findings suggest that providing anatomical contextual information can improve accuracy of CNN-based automated brain metastasis detection algorithms.

CLINICAL RELEVANCE/APPLICATION

Automated detection and delineation of brain metastases are increasingly clinically important as more patients are treated with stereotactic radiosurgery rather than whole brain radiation and must be monitored closely for recurrence. Improving the performance of detection algorithms will increase their clinical utility and adoption. These findings open a new realm of research into optimization of automated detection approaches for brain metastases that goes beyond optimization of network architecture.

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W5A-SPVA

Vascular Imaging Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-SPVA-3 FEASIBILITY OF DUAL-FLOW INJECTION TECHNIQUEAND LOW RADIATION IN PULMONARYCTA USING DEEP LEARNING RECONSTRUCTION: AN IMAGE QUALITY ASSESSMENT

Rui Ma (*Presenter*)
Xiaohong Gong (*Abstract Co-Author*)
Guan Wang (*Abstract Co-Author*)

PURPOSE

To assess the viability of using low radiation and contrast medium doses in pulmonary artery computed tomography angiography (CTA) was assessed by applying a low tube voltage, a dual-flow injection technique and a novel deep learning image reconstruction algorithm (ClearInfinity, DLIR-CI).

METHODS AND MATERIALS

Eighty patients who underwent CTA of the pulmonary artery were collected and divided into three groups, A, B and C. There were 30 patients in each of groups A and C, and 20 patients in group B. Group A was scanned using a conventional contrast injection protocol and 100 kV tube voltage scanning, Group B was scanned using a dual-flow injection protocol and 100 kV tube voltage scanning, Group C was scanned using a dual-flow injection protocol and 70 kV tube voltage scanning. The images of Groups A and B were reconstructed using Clearview at 50%. Group C were reconstructed using 50% Clearview, 30% DLIR-CI, 50% DLIR-CI, and 70% DLIR-CI sequentially. Defining them sequentially as groups C1, C2, C3, C4. Differences in image quality, and radiation dose were compared between groups.

RESULTS

All images are clinically diagnostic. There was no significant difference in subjective image quality scores between groups A, B, and C1. Subjective image quality scores were higher in the C3 and C4 groups than in the other groups, and there was no significant difference in scores between the two groups. SNR values of group B were not significantly different from those of group A and C1, and some pulmonary artery SNR values of group A were greater than those of C1. In group C, group C4 and group C3 had the highest pulmonary artery SNR values and there was no significant difference in SNR values between the two groups. The CNR values in the C1 group were not significantly different from those in groups A and B. The highest CNR values were found in the C4 group in group C. The background noise values were higher in the C1 group than in the A and B groups. The C4 group in Group C had the lowest background noise values. CTDIv01, DLP, and ED values were reduced by 77%, 74%, and 74%, respectively, in group C compared with group A , and the differences between groups A and B were not statistically significant .

CONCLUSION

CTA of the pulmonary arteries using the dual-flow injection technique combined with 70 kV low-dose scanning can reduce the iodine intake without compromising the image quality, reduce the radiation dose, and use a novel deep-learning reconstruction algorithm on the images in order to reconstruct them in 70%.

CLINICAL RELEVANCE/APPLICATION

The dual-flow injection technique combined with low-dose scanning and image reconstruction using a novel deep learning reconstruction algorithm can reduce the radiation dose and the amount of contrast agent used while maintaining image quality.

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W5B-SPBR

Breast Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPBR-3 REAL-WORLD PERFORMANCE OF AN FDA-APPROVED ARTIFICIAL INTELLIGENCE TOOL FOR SCREENING MAMMOGRAPHY

Emily Ambinder, MD, MS (*Presenter*)
Colin Paulbeck, PhD (*Abstract Co-Author*)
Babita Panigrahi, MD (*Abstract Co-Author*)
Shuchi Zinzuwadia, MD (*Abstract Co-Author*)
Lisa A. Mullen, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the real-world performance of an FDA-approved artificial intelligence (AI) tool for screening mammography following its integration into clinical practice, with a focus on breast density.

METHODS AND MATERIALS

Our institution began using an FDA approved AI tool for mammography in March 2024 (Transpara Version 1.7.4-A, ScreenPoint Medical). We included all screening mammograms performed between 8/1/2024 and 2/28/2025 in this study to account for an initial learning period. Patient information and clinical outcome metrics were merged with the AI overall risk score for the study (low, intermediate or elevated). Statistical analysis was performed using Chi-square and Fishers exact tests.

RESULTS

A total of 24520 screening mammograms were included (mean age of patients 61 +/- 13). Overall, 3139 patients were recalled (recall rate 12.8%) and 171 true positives cancers were diagnosed (CDR 7.0). The AI assigned a low score to 15041 studies (61.3%), intermediate score to 8554 studies (34.9%), and an elevated score to 925 studies (3.8%). The radiologist recalled higher percentages of cases in increasing AI categories with recall rates 9%, 18%, and 36% in the three categories respectively ($p<0.001$). Cancer detection rate (CDR, cancers per 1000) was also higher in increasing AI risk categories; 0.5 (n=8) in low risk (all DCIS or <1cm IDC), 8.4 in intermediate risk (n=72), and 98 in elevated risk (n=91). AI more often assigned a low risk score to patients with dense breast tissue (extremely dense or heterogeneously dense) compared to patients with non dense breast tissue (entirely fatty or scattered fibroglandular densities) (64% versus 58%, $p<0.001$). The corresponding CDRs in the low risk category were not significantly different with respect to breast density (0.7 versus 0.3, $p=.49$). On the contrary, radiologist recall rate was 14% for patients with dense breast tissue and 11% for patients without dense breast tissue ($p<0.001$). The CDRs were not significantly different for these two groups (7.0 versus 6.9, $p=0.89$).

CONCLUSION

The AI algorithm showed appropriate risk stratification corresponding to cancer detection rates of 0.5, 8.4, and 98 in the three risk categories. AI had improved performance in dense breast tissue with a higher percentage of exams in dense breasts assessed as low risk compared to exams in non dense breasts without significantly impacting cancer detection rate.

CLINICAL RELEVANCE/APPLICATION

With the growing utilization of AI systems in breast imaging, we show early positive results of clinical adoption into a busy screening mammography practice. AI demonstrated strong performance in stratifying cancer risk and supporting recall decisions. The findings support the integration of AI as a complementary tool to radiologists.

W5B-SPBR-5 GLANDULAR TISSUE COMPONENT ON BREAST US: ASSOCIATION WITH SURVIVAL OUTCOMES IN WOMEN WITH INVASIVE BREAST CANCER

Tingting Deng (*Presenter*)
Xi Lin (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of preoperative breast glandular tissue component (GTC) on disease-free survival (DFS) and overall survival (OS) in women with invasive breast cancer.

METHODS AND MATERIALS

This retrospective study included patients with invasive breast cancer who underwent preoperative breast ultrasound between January 2013 and December 2018. GTC was qualitatively assessed on ultrasound and categorized as low (minimal or mild) or high (moderate or marked). The correlations between GTC and various clinicopathological variables were examined. Associations of GTC with DFS and OS were evaluated using Cox regression analysis and expressed as hazard ratios (HRs).

RESULTS

A total of 2,891 patients (mean age, 49 ± 10 years) were included, with a median follow-up of 96 months. Multivariable analysis demonstrated that high GTC was associated with worse DFS in the overall cohort (HR 1.39, 95% CI: 1.16-1.68; $P < .001$). In the postmenopausal group, high GTC was a prognostic factor for worse OS and DFS (OS: HR, 1.70 [95% CI: 1.16, 2.49], $P = .006$; DFS: HR, 1.41 [95% CI: 1.04, 1.92], $P = .028$). In the non-dense breasts group, high GTC was associated with poorer OS (HR, 2.38 [95% CI: 1.24, 4.16]; $P = .008$) and DFS (HR, 2.21 [1.40, 3.50]; $P < .001$). In triple-negative breast cancer, high GTC was also associated with worse OS and DFS (OS: HR, 2.00 [95% CI: 1.20, 3.33], $P = .008$; DFS: HR, 1.59 [95% CI: 1.04, 2.43], $P = .034$).

CONCLUSION

Sonographic GTC is an independent prognostic biomarker in invasive breast cancer, particularly in postmenopausal, non-dense, and triple-negative subgroups. It should be considered for prognostic risk stratification in women with invasive breast cancer.

CLINICAL RELEVANCE/APPLICATION

The Glandular Tissue Component (GTC) is a key update in the upcoming new version of BI-RADS. The GTC of the fibroglandular tissue, as assessed by breast ultrasound, has been identified as an independent predictor of future breast cancer (BC) risk. However, the impact of preoperative GTC on long-term outcomes in women with invasive BC remains unclear. Our study aimed to investigate the impact of preoperative breast GTC on disease-free survival (DFS) and overall survival (OS) in patients with invasive BC. In our study, we found that sonographic GTC may be an independent prognostic factor for BC patients. Further validation is necessary to integrate GTC into clinical practice for risk stratification and personalized surveillance strategies to improve long-term outcomes.

W5B-SPBR-6 IMPACT OF ARTIFICIAL INTELLIGENCE ON BREAST CANCER SCREENING: EXPERIENCE FROM A MULTI-YEAR NATIONAL BREAST IMAGING PRACTICE

Sean D. Raj, MD, MBA (*Presenter*)
Xiaowei Hong (*Abstract Co-Author*)
Angela M. Fried, MD (*Abstract Co-Author*)
John Simon, MD (*Abstract Co-Author*)

PURPOSE

This study seeks to assess the real-world impact of integrating an FDA-approved AI solution into a high-volume, nationwide, breast cancer screening program by comparing metrics before and after AI implementation. The key performance metrics measured include cancer detection rates, recall rates, sensitivity, specificity, positive predictive value (PPV), as well as screening and cancer volumes.

METHODS AND MATERIALS

Mammography audit reports were generated retrospectively for radiologist reading at over 130 locations nationwide, covering a period of 24 months before and after the deployment and integration of an AI tool in 2020. The study included radiologists who had interpreted at least 960 screening exams during both the pre- and post-AI implementation periods, resulting in 18 common radiologist readers. Performance metrics were aggregated for each period, and statistical analyses were conducted to assess differences between the pre- and post-AI periods across radiologists.

RESULTS

AI integration led to significant improvements in mammography cancer detection and quality metrics. Notably, the cancer detection rate (CDR) per 1000 screening exams increased from 2.93 to 4.05 ($p < 0.001$ across readers), and the recall rate decreased from 10.69% to 8.07% ($p < 0.0005$). AI significantly improved the specificity ($p < 0.0005$), improving the aggregated specificity from 89.48% to 92.27% while had no significant impact on sensitivity (pre-AI: 92.30%, post-AI: 92.72%, $p=0.15$). The Positive Predictive Value (PPV) also saw an increase from 2.79% to 5.04% ($p < 0.0001$). Additionally, screening volumes increased from 204684 to 343343 for the common readers, indicating enhanced throughput without compromising diagnostic accuracy.

CONCLUSION

AI integration has significantly improved breast cancer detection rates and Radiologist productivity and performance while reducing false positives and unnecessary recalls. More research is needed to examine its long-term effects on patient outcomes and healthcare resources.

CLINICAL RELEVANCE/APPLICATION

Integration of an AI solution into a high volume breast cancer screening practice significantly improved cancer detection and specificity while reducing recalls, resulting in more efficient and effective patient care.

W5B-SPBR-7 IMPACT OF SONOGRAPHIC GLANDULAR TISSUE COMPONENT ON SUBSEQUENT SCREENING PERFORMANCE IN WOMEN WITH DENSE BREASTS: PROSPECTIVE STUDY

Jung-Oh Lee, MD, MSc (*Presenter*)
Na Hye Han, MD (*Abstract Co-Author*)
Su Min Ha, MD (*Abstract Co-Author*)
Myoung-Jin Jang (*Abstract Co-Author*)
Eun Kyung Park, MD, PhD (*Abstract Co-Author*)
Woo Kyung Moon, MD, PhD (*Abstract Co-Author*)

PURPOSE

To evaluate the impact of the glandular tissue component (GTC) on the performance of subsequent mammography and ultrasound (US) screening in women with dense breasts.

METHODS AND MATERIALS

From November 2022 to March 2024, asymptomatic women aged 40-69 years with dense breasts and negative findings on mammography and US were prospectively recruited (NCT05460975). Sonographic GTC was classified as minimal, mild, moderate and marked, and risk factors from the BCSC model were recorded. Participants underwent combined annual mammography and US screening, with BI-RADS categories documented. Outcomes were determined by pathology or a minimum 12-month follow-up. Screening performance metrics including cancer detection rate (CDR), abnormal interpretation rate (AIR), and positive predictive value (PPV) for biopsy were assessed. For analysis, GTC was dichotomized as low (minimal or mild) and high (moderate or marked). Clinical risk classification was performed using the BCSC risk prediction model of estimated 5-year breast cancer risk. The association between risk factors, including breast density and GTC, and breast cancer detection was evaluated using chi-square test, Fisher's exact test or t-test.

RESULTS

Among 1203 women (53.7 years± 7.0 [SD]), 18 cancers were diagnosed (7 ductal carcinoma in situ and 11 invasive carcinomas, including two stage II cancers), yielding a CDR of 14.9 per 1,000 women [18/1203]. Baseline GTC was classified as low in 61.5% (n=740) and high in 38.5% (n=463). Women with high GTC had a higher CDR than those with low GTC (23.8 [11/463] vs 9.5 [7/740] per 1000 women, P=0.04). Women with high GTC and extremely dense breast (n=330) had a significantly higher CDR than those with low GTC and heterogeneously dense breast (n=492) (30.3 [10/330] vs 8.1 [4/492], P=0.016). The two stage II cancers were found in women with high GTC. Women with low GTC demonstrated significantly lower AIR (5.0% [37/740] vs 9.7% [45/463], P=0.002) but comparable PPV for biopsy (28.0% [7/25] vs 32.4% [11/34], P=0.720). Extremely dense breasts (P=0.039) and high GTC (P=0.047) were associated with cancer detection at subsequent screening, while other risk factors (age, first-degree family history, prior benign biopsy) and BCSC 5-year risk score were not significant.

CONCLUSION

High baseline GTC was associated with a higher cancer detection rate and comparable PPV for biopsy in subsequent screening in women with dense breasts. Women with extremely dense breasts and high GTC had a 3.4-fold higher cancer detection rate.

CLINICAL RELEVANCE/APPLICATION

Screening strategies that target supplemental US based on breast GTC and mammographic density may be expected to yield a high rate of cancers without significantly increasing false-positive biopsy recommendations.

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W5B-SPCA

Cardiac Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPCA-1 PROGNOSTIC VALUE OF CMR PARAMETRIC MAPPING IN CARDIAC AMYLOIDOSIS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Muhammad Umair, MBBS (*Presenter*)
Seyed Ali Forouzannia, MD (*Abstract Co-Author*)
Romina Rafiei (*Abstract Co-Author*)

PURPOSE

To perform a systematic review and meta-analysis to evaluate the prognostic value of Cardiac Magnetic Resonance (CMR) parametric mapping in predicting all-cause mortality in patients with cardiac amyloidosis (CA).

METHODS AND MATERIALS

An extensive search was conducted in Medline, Scopus, Embase, and Web of Science databases. Eligible studies were retrospective and prospective observational studies that reported hazard ratios (HR) for predicting mortality in patients with CA using CMR parametric mapping.

RESULTS

Twenty-two studies with 3,398 patients were included in this systematic review. Higher ECV values were associated with increased mortality risk, both as a dichotomous (HR: 2.90; 95% CI: 1.68 - 5.01) and continuous variable (HR for 1% increase: 1.08; 95% CI: 1.06 - 1.10; HR for 3% increase: 1.17; 95% CI: 1.11 - 1.22; and HR for 10% increase: 2.11; 95% CI: 1.70-2.62). Higher native T1 mapping values were associated with increased mortality risk as a dichotomous variable (HR: 1.33; 95% CI: 0.79 - 2.24). Native T2 mapping showed inconsistent associations with prognosis across studies.

CONCLUSION

Higher ECV and native T1 values are associated with worse prognosis in CA, supporting their role in risk stratification. Notably, we demonstrate a direct relationship between incremental increases in ECV and the risk of death. Further studies with standardized CMR protocols are needed to enhance the prognostic utility of parametric mapping in clinical practice.

CLINICAL RELEVANCE/APPLICATION

Our findings confirm that CMR parametric mapping is a valuable, noninvasive tool for risk stratification in cardiac amyloidosis, with higher ECV and native T1 values consistently associated with worse clinical outcomes.

W5B-SPCA-4 ALCOHOL SEPTAL ABLATION IN HYPERTROPHIC OBSTRUCTIVE CARDIOMYOPATHY: LONG-TERM FOLLOW-UP OF DEFORMATIONS AND HEMODYNAMICS

Kenichiro Suwa, MD (*Presenter*)
Kazuto Ohno (*Abstract Co-Author*)
Terumori Satoh (*Abstract Co-Author*)
Ryota Sato (*Abstract Co-Author*)
KEISUKE IGUCHI (*Abstract Co-Author*)
Yuichiro Maekawa (*Abstract Co-Author*)

PURPOSE

This study investigated the global cardiac volume, myocardial deformation, and hemodynamic characteristics before and during long-term follow-up after alcohol septal ablation in patients with hypertrophic obstructive cardiomyopathy (HOCM).

METHODS AND MATERIALS

Twenty-three patients with HOCM who underwent cardiac magnetic resonance (CMR) before and after alcohol septal ablation were selected retrospectively. CMR analysis included global left ventricular (LV) volume by cine and peak strain and strain rate by feature-tracking CMR. Four-dimensional (4D) flow CMR was used to analyze LV hemodynamic characteristics. Diastolic LV inflow and the presence of an accompanying vortex ring were investigated. The anterior vortex generated above the MV rotated clockwise was identified.

RESULTS

In the LV long-axis images, the global radial strain increased significantly (16.5 ± 5.8% vs. 20.1 ± 6.8%, $p < 0.001$), whereas the global longitudinal strain decreased significantly after alcohol septal ablation (-10.5 ± 3.2% vs. -12.1 ± 3.5%, $p = 0.002$). The diastolic LV anterior vortex area increased significantly after alcohol septal ablation (2256.1 [703.6, 4038.4] mm 2 vs. 3826.1 [1914.3, 4820.1] mm 2 , $p = 0.036$). Multiplication of the LV end-diastolic volume index, global circumferential strain, and diastolic radial peak strain rate in long-axis images revealed a significant correlation with the diastolic LV anterior vortex area ($Rs = 0.43$, $p = 0.041$).

CONCLUSION

Feature-tracking and 4D flow CMR revealed improved systolic and diastolic LV function during long-term follow-up after alcohol septal ablation. The diastolic LV vortex was associated with the combined parameters of LV volume and deformation. Comprehensive CMR analysis could help understand the beneficial effects of alcohol septal ablation.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the beneficial effects of alcohol septal ablation on myocardial deformation and hemodynamic characteristics in patients with HOCM. The findings underscore the role of advanced imaging techniques such as 4D flow CMR in elucidating previously poorly understood aspects of LV hemodynamics in HOCM.

Understanding these changes could enhance clinical management and outcomes in affected individuals.

W5B-SPCA-5 DISCRIMINATIVE PERFORMANCE OF A DEEP LEARNING RIGHT VENTRICULAR REGIONAL STRAIN ANALYSIS FOR DETECTION OF ARRHYTHMOGENIC CARDIOMYOPATHY

Brendan Crabb, MD (*Presenter*)
Alta Steward (*Abstract Co-Author*)
Rhiannon Buchholz (*Abstract Co-Author*)
Kimberly Hong (*Abstract Co-Author*)
Michael S. Pohlen, MD (*Abstract Co-Author*)
Seth J. Kligerman, MD, MS (*Abstract Co-Author*)
Albert Hsiao, MD, PhD (*Abstract Co-Author*)

PURPOSE

Arrhythmogenic cardiomyopathy (ACM) is a non-ischemic cardiomyopathy that can cause ventricular tachyarrhythmias and sudden cardiac death. Diagnostic guidelines rely on detecting regional right ventricular (RV) wall motion abnormalities using cardiac MRI; however, this is a subjective and challenging task. We aimed to evaluate the performance of a novel deep learning algorithm to detect RV wall motion abnormalities, and assess its ability to predict late gadolinium enhancement (LGE) and genetic evidence of ACM.

METHODS AND MATERIALS

This retrospective cohort study included adult patients who underwent cardiac MRI to monitor or screen for ACM (n=66, mean age 42.6, range 18-82 years). Clinical criteria for ACM, including ECG and genetic criteria, was collected from the electronic medical record. Regional RV longitudinal strain was quantified from four-chamber SSFP cines using an in-house developed deep learning (DL) algorithm. Three cardiothoracic radiologists (mean 10.6 years subspecialty experience, range 3-17 years) independently assessed each cine series for RV wall motion abnormalities. Interrater agreement was calculated via pairwise Cohen's kappa. Lastly, the discriminative performance of identified wall motion abnormalities for predicting objective disease markers, including late gadolinium enhancement (LGE) and pathogenic mutations, was assessed for both DL and readers.

RESULTS

Subspecialty radiologists showed moderate agreement for detecting RV wall motion abnormalities (?=0.47 (range 0.42-0.54). Agreement was substantial in basal segments (?=0.70 (range 0.69-0.73), but only fair in apical segments (?=0.26 (range 0.18-0.43). The discriminative performance of DL-identified regional wall motion abnormalities for predicting objective markers of ACM was similar to subspecialty radiologists for transmural RV LGE with an area under the receiver operating characteristic curve (AUC) of 0.83 (sensitivity=0.86 [0.56, 1.0]; specificity=0.66 [0.53, 0.78]) and superior to subspecialty radiologists for pathogenic mutations, with an AUC of 0.74 (sensitivity=0.64 [0.33, 0.91]; specificity=0.86 [0.75, 0.94]).

CONCLUSION

Subspecialty radiologists showed moderate agreement for detecting RV wall motion abnormalities in ACM with lower agreement in apical segments. Wall motion abnormalities identified with the DL algorithm have a comparable discriminative performance to subspecialty radiologists for predicting LGE and superior performance for predicting pathogenic mutations.

CLINICAL RELEVANCE/APPLICATION

DL algorithms for evaluating myocardial wall motion may aid radiologists in identifying patients with ACM, facilitating appropriate interventions and management.

W5B-SPCA-6 PHOTON COUNTING COMPUTED TOMOGRAPHY FOR TISSUE CHARACTERIZATION IN PATIENTS WITH LEFT VENTRICULAR HYPERTROPHY

Carmelo De Gori (*Presenter*)
Francesca Pignatelli, MD (*Abstract Co-Author*)
Matilda Muca, MD (*Abstract Co-Author*)
Lorenzo Faggioni, MD, PhD (*Abstract Co-Author*)
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PURPOSE

Photon-counting computed tomography (PCCT) has emerged as a promising modality for cardiac imaging. In patients with left ventricular hypertrophy (LVH), PCCT may offer an alternative to cardiac magnetic resonance (CMR), which is contraindicated or unavailable in some individuals.

METHODS AND MATERIALS

We prospectively evaluated 79 patients presenting with LVH, who underwent a PCCT scan for suspected coronary artery disease (CAD). Beyond coronary analysis and cardiac function, LV mass index (LVMI), maximal LV wall thickness, ejection fraction (EF), late iodine enhancement (LIE) extent, iodine density, and extracellular volume (ECV) were measured. Patients were clinically classified into three groups: hypertrophic cardiomyopathy (HCM, n=30), amyloid transthyretin cardiomyopathy (ATTR-CM, n=27), and secondary LV hypertrophy (LVH, n=24). 34/79 (43%) patients underwent a clinically indicated CMR scan within three months of PCCT scan.

RESULTS

PCCT-derived LVMI, maximal wall thickness, and EF showed strong agreement with CMR across all groups. ATTR-CM patients demonstrated significantly lower EF and higher LIE extent, iodine density, and ECV compared to patients with HCM or secondary LVH. While ECV derived from PCCT did not correlate well with CMR-derived ECV in most groups, iodine density significantly correlated with CMR ECV in ATTR-CM, highlighting a distinct diffuse infiltration pattern. Secondary LVH cases showed minimal or absent LIE.

CONCLUSION

PCCT accurately characterizes key structural and functional parameters and discriminates among different etiologies, notably detecting diffuse disease in amyloidosis. While ECV quantification by PCCT remains challenging, late iodine enhancement evaluation is feasible and may contribute to risk stratification.

CLINICAL RELEVANCE/APPLICATION

Given these attributes, PCCT may represent a valuable tool in cardiac imaging, particularly for patients in whom cardiac magnetic resonance (CMR) is contraindicated or not feasible. In this context, PCCT has recently emerged as a potential alternative imaging modality for identifying the arrhythmogenic substrate through morphofunctional analysis and assessment of several parameters such us wall thickness, wall thickening, wall motion, CT evidence of hypoperfusion and myocardial tissue characterization.

W5B-SPCA-7 VENTRICULAR BLOOD T2 IN ASYMPTOMATIC ADULTS AT 3T: EFFECT OF AGE AND LUNG VOLUME BY MAGNETIC RESONANCE IMAGING

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Bharath Ambale-Venkatesh, PhD (*Abstract Co-Author*)
Yoko Kato, MD, PhD (*Abstract Co-Author*)
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PURPOSE

While the normal ranges of myocardial T1 and T2 have been vastly reported, the studies on blood T2 are limited and data is sparse. Theoretically, the T2 difference between the right ventricular (RV) and left ventricular (LV) blood pool reflects the cardinal changes in the oxygen saturation fraction due to pulmonary circulation. Prominent intensity differences in T2 maps between two ventricles are often observed. However, the normal ranges of ventricular blood T2 and the degree of blood T2 difference between ventricles have not been reported yet. The purpose of this study was to report the age and sex distribution of ventricular blood T2 in the human heart and to evaluate their relationships to lung volume.

METHODS AND MATERIALS

156 asymptomatic adults without hypertension or diabetes and free from cardiopulmonary disease (74 men, mean age 50 ± 14 years, range 24-81 years) were included. 3T MRI (Canon Medical Systems, Japan) including cardiac scout and T2-prepared gradient-echo sequence for T2 mapping were acquired. The scout imaging was performed in three orthogonal orientations using a gradient echo sequence with breath holding of seven seconds in the resting lung position. The participants were instructed to take a breath in and out twice before holding their breath at the end of breathing out. The same breath holding technique was used throughout the entire study. T2 maps were used to measure blood T2 times. MRI-estimated FRC (MRI-eFRC) was measured using a single scout image in the coronal orientation and was assessed by delineation of the chest wall manually excluding the heart.

RESULTS

Men had higher MRI-eFRC ($p = 0.002$) and LV blood T2 (99 ± 24 ms vs 91 ± 21 ms, $p = 0.03$) than women but RV blood T2 were similar (81 ± 12 ms vs 78 ± 11 ms, $p = 0.2$). Both MRI-eFRC ($r = 0.17$, $p = 0.04$) and LV blood T2 ($r = 0.33$, $p < 0.0001$) were positively correlated with age, while RV blood T2 did not show age dependence. MRI-eFRC was also positively correlated with LV blood T2 ($r = 0.18$, $p = 0.02$) but not with RV blood T2.

CONCLUSION

Our study provides the normal ranges of ventricular blood T2 relaxation times in sex and age groups using the T2-prepared gradient echo sequence at 3T and demonstrated that LV blood T2 is positively associated with age, which could partly be explained by greater resting lung volume in older adults. The novel method that quantified the resting lung volume on MRI coronal scout image has a potential to serve as an index of FRC as traditionally measured by lung volumes in pulmonary function test.

CLINICAL RELEVANCE/APPLICATION

Our study provides the normal ranges of ventricular blood T2 in sex and age groups at 3T. LV blood T2 is positively associated with age and male sex, which may serve as a basis for future studies for clinical CMR examination.

W5B-SPCA-9 COMBINED SPECTRAL AND ULTRAHIGH-RESOLUTION PHOTON-COUNTING CT IMPROVES ASSESSMENT OF CORONARY STENTS: ANALYSIS IN A DYNAMIC ANTHROPOMORPHIC PHANTOM

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PURPOSE

To assess the combined use of ultrahigh-resolution (UHR) and spectral photon-counting detector CT (PCD-CT) for coronary stent imaging in a dynamic, anthropomorphic phantom.

METHODS AND MATERIALS

Ten coronary stents were deployed in a dynamic anthropomorphic phantom simulating heart rates of 60, 80, and 100 beats per minute (BPM). A dual-source PCD-CT system (NAEOTOM Alpha, Siemens Healthineers) acquired images using a combined UHR-spectral mode (96 × 0.2 mm collimation). Reconstructions included UHR polychromatic (0.2 mm), downsampled (0.6 mm), and spectral images (0.4 mm slice thickness), including virtual monoenergetic images (VMI; 45-100 keV), iodine maps (IM), and lumen-preserving spectral post-processed images (PURE). Objective image quality metrics included measurable stent lumen visibility and the strut overestimation factor, calculated as the ratio of measured to nominal strut width. Two cardiovascular radiologists rated subjective image quality using a four-point Likert scale for stent lumen visibility, strut delineation, artifact severity, and overall image quality.

RESULTS

At 60 BPM, UHR polychromatic images demonstrated the highest measurable stent lumen visibility (62.6±7.6%) and the lowest strut overestimation factor (18.1±3.4), significantly outperforming downsampled and all VMI reconstructions (all $P<0.05$). At higher heart rates, UHR image quality degraded due to motion artifacts, resulting in significantly lower Likert scores at 100 BPM (3.0 [IQR 2.0-3.0], $P=0.002$). In contrast, VMI at 55 keV and IM maintained higher contrast-to-noise ratios and reduced artifacts across heart rates, indicated by higher subjective image quality (80 BPM: 3.0 [IQR 3.0-3.8], $P=0.472$ and $P=0.092$, respectively).

CONCLUSION

PCD-CT with UHR and spectral imaging improves coronary stent assessment. Under optimal conditions, UHR provides superior spatial resolution but is highly motion-sensitive. VMI at 55 keV and especially IM offer consistent image quality at higher heart rates, ensuring reliable stent visualization in challenging conditions.

CLINICAL RELEVANCE/APPLICATION

Combining UHR and spectral imaging in PCD-CT enhances non-invasive coronary stent evaluation. While UHR polychromatic images provide maximal spatial detail, spectral reconstructions such as VMI 55 and IM improve diagnostic confidence in patients with elevated heart rates by mitigating motion-related artifacts.

W5B-SPCA-10 DIAGNOSTIC PERFORMANCE OF CORONARY CT ANGIOGRAPHY WITHOUT ECG-GATING: COMPARISON WITH INVASIVE CORONARY ANGIOGRAPHY

Hong Ren (*Presenter*)
Kun Wang (*Abstract Co-Author*)

PURPOSE

To assess the diagnostic performance of non-ECG-gated coronary CT angiography (ECG-Less CCTA) for detecting obstructive coronary artery disease (CAD), using invasive coronary angiography (ICA) as the reference standard.

METHODS AND MATERIALS

In this retrospective, single-center study, 110 patients with suspected CAD underwent ECG-Less CCTA using a 256-row CT scanner. Scanning protocols incorporated simulated ECG signals based on pulse-based heart rate estimation, automated tube voltage selection (80-120 kV), and tube current modulation (noise index: 20 HU). Contrast administration (iopromide 370 mgI/mL, 0.6 mL/kg) was optimized via bolus tracking (aortic root threshold: 180 HU). Images were reconstructed using deep learning-based algorithm (TrueFidelity™) and motion correction algorithm (SnapShot Freeze 2). Two blinded radiologists independently assessed coronary stenosis

=50% according to the SCCT 18-segment model, with non-diagnostic segments conservatively deemed positive. ICA served as the reference standard. Subgroups were performed based on heart rate (=75 vs. >75 bpm) and calcium burden (Agatston =400 vs. >400).

RESULTS

ECG-Less CCTA demonstrated high diagnostic accuracy for detecting obstructive CAD. At the patient level, sensitivity was 92.1% (95% CI: 85.6-96.2%) and specificity was 91.5% (82.3-96.4%). Vessel-level analysis yielded a specificity of 93.6% (90.2-96.0%) and NPV of 95.1% (91.8-97.3%). Segment-level specificity was 96.2% (94.8-97.3%) with an NPV of 97.2% (95.7-98.3%). Non-diagnostic segments (6.4%) were conservatively classified as positive. The effective radiation dose was 1.4 ± 0.5 mSv. Subgroup analysis revealed reduced specificity in patients with Agatston scores >400 (84.6% vs. 94.1%, p=0.02), while heart rate >75 bpm showed no statistically significant impact on sensitivity (89.7% vs. 94.1%, p=0.12).

CONCLUSION

ECG-Less CCTA achieves high diagnostic concordance with ICA for obstructive CAD, supported by excellent specificity and NPV across patient, vessel, and segment levels. Its tolerance to variable heart rates and streamlined workflow support its clinical utility, particularly in emergency settings or arrhythmic patients.

CLINICAL RELEVANCE/APPLICATION

This technique enables rapid, low-radiation CAD evaluation without ECG-gating constraints, expanding access to noninvasive diagnosis in urgent care and patients with irregular heart rhythms.

W5B-SPCA-11 FRACTAL ANALYSIS OF LEFT VENTRICULAR TRABECULATION IN HEART FAILURE PATIENTS WITH HYPERTENSION USING MAGNETIC RESONANCE IMAGING

Xie Yunxia (*Presenter*)
Lianggeng Gong (*Abstract Co-Author*)

PURPOSE

Endocardial trabeculae undergo hyperplasia under the influence of hemodynamic changes, reflecting a variable phenotype of disease progression. Fractal analysis has been used to analyze the complex endothelial trabeculae of various cardiomyopathy. The purpose of this study was to quantify the complexity of myocardial trabeculae by fractal analysis, and to discuss the differences between hypertension without heart failure(HF) and hypertension complicated by HF, exploring its predictive value for the diagnosis of heart failure in patients with hypertension (HTN).

METHODS AND MATERIALS

A retrospective study was conducted on 146 patients with hypertension, including 77 patients with HF and 69 hypertensive patients, while 34 healthy volunteers were recruited as control group. This design helped us compare the difference between patients with HF and healthy individuals. We collected and analyzed clinical data and cardiac magnetic resonance parameters. The fractal dimension (FD) was obtained by fractal analysis of the myocardial trabeculae on the left ventricular short-axis cine image. Logistic regression analysis was used to determine predictors and construct predictive models.

RESULTS

A total of 5 fractal dimensions were obtained, which are Global FD, Mean Apical FD, Maximal Apical FD, Mean Basal FD and Maximal Basal FD. These left ventricular (LV) FDs (all $p < 0.001$) in HF patients were significantly higher than those in the healthy group. There was also significant difference between HTN-HF group and HTN group in all FDs except for Maximal Basal FD. In the correlation analysis, all of LV FDs showed significant weak positive correlation with LV maximal wall thickness (Maximal LVWT) (Global FD R=0.40, Mean Apical FD R=0.37, Maximal Apical FD R=0.40,Mean Basal FD R=0.34, and Maximal Basal FD R= 0.38, all $p< 0.001$). In addition, Mean Apical FD had significant negative correlation with LVEF. In univariate logistic regression, Global FD, Mean Apical FD, Maximal Apical FD and Mean Basal FD were significant independent predictors (OR : 1.170,1.121,1.070 and 1.088, $p < 0.05$). Furthermore, adding FDs to the prediction model improved the calibration and accuracy of the model (AUC: 0.877).

CONCLUSION

CMR fractal analysis is a feasible technique for analyzing the complexity of LV myocardial trabecular in HTN-HF patients. It has independent predictive value for the diagnosis of patients with hypertensive heart failure. Incorporating FDs into the diagnostic model can help to improve diagnosis.

CLINICAL RELEVANCE/APPLICATION

Differences show in the complexity of endocardial trabeculae in hypertensive patients, and obtaining fractal dimensions (FD) by fractal analysis can help identify heart failure (HF) patients.

W5B-SPCA-12 A SIMPLE FRAMEWORK FOR MYOCARDIAL DELAYED ENHANCEMENT (MDE)-CT SELECTION: PREDICTION OF MDE USING LEFT VENTRICLE METRICS AUTO-ANALYZED FROM CORONARY CTA

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Tetsuya Fukuda, MD, PhD (*Abstract Co-Author*)

PURPOSE

Myocardial delayed enhancement CT (MDE-CT) has gained attention for its ability to detect myocardial damage with accuracy comparable to delayed-enhancement MRI, and for its feasibility as an add-on to coronary CTA (CCTA). However, due to additional radiation exposure and contrast load, clear criteria are required to determine when MDE-CT is indicated. We hypothesized that left ventricular (LV) parameters derived from CCTA could predict MDE positivity. This study aimed to evaluate whether automatically analyzed LV parameters from CCTA can predict MDE-CT positivity.

METHODS AND MATERIALS

We retrospectively analyzed 68 consecutive cases that underwent both CCTA and MDE-CT using a 256-row CT between August and November 2024. MDE-CT was added based on clinical information and radiologist judgment. CCTA was performed with prospective ECG gating at two cardiac phases (mid-diastole and end-systole). From these images, LV mass index (LVMI), mid-diastolic volume index (LVMDVI), end-systolic volume index (LVESVI), and ejection fraction (LVEF) were automatically calculated. We compared these parameters between MDE-positive and MDE-negative groups and identified independent predictors using multivariate analysis. Based on cutoff values of significant predictors, an additive scoring system (0-2 points) was developed. Diagnostic performance was assessed using ROC curves, and trends in MDE positivity were analyzed using the Cochran-Armitage trend test.

RESULTS

After excluding five cases with failed LV analysis, 63 patients (median age 70 [59-76] years, 43 males [68.3%]) were included. Thirty-six patients (57%) were MDE-positive (21 ischemic, 15 non-ischemic). The MDE-positive group showed significantly higher LVMI (66.6 [55.9-84.6] vs. 49.7 [44.1-60.6] g/m², P<0.01), LVESVI (32.6 [24.2-50.7] vs. 18.9 [16.7-26.6] mL/m², P<0.01), and lower LVEF (47 [34.2-55.0] vs. 60.1 [56.5-67.4] %, P<0.01). Multivariate analysis identified LVMI (OR 1.08, 95% CI 1.01-1.09) and LVESVI (OR 1.04, 95% CI 1.02-1.15) as independent predictors of MDE positivity. AUC was 0.78 (cutoff 52) for LVMI and 0.77 (cutoff 31) for LVESVI. The combined score showed MDE positivity rates of 17.7% (score 0), 52.4% (score 1), and 88.0% (score 2) (P<.0001), with an AUC of 0.82.

CONCLUSION

LVMI and LVESVI derived from CCTA independently predicted MDE-CT positivity. A simple additive score based on these parameters may aid in identifying patients who would benefit from additional MDE-CT, reducing unnecessary imaging and enhancing diagnostic efficiency.

CLINICAL RELEVANCE/APPLICATION

Using left ventricular parameters obtained from CCTA to determine the indication for MDE-CT can help reduce unnecessary imaging, lower radiation exposure, and improve overall diagnostic efficiency.

W5B-SPCA-13 IDENTIFICATION OF MYOCARDIAL MICROSTRUCTURAL ALTERATIONS IN NON-ISCHEMICHEART DISEASE ASSESSED WITH IN VIVO CARDIAC DIFFUSION-TENSOR IMAGINGUSING NOVEL TECHNIQUE OF AMC-MPG AND DWI SCOUT

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Yoshiaki Morita (*Abstract Co-Author*)
Masaru Shiotani, RT (*Abstract Co-Author*)
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PURPOSE

Cardiac diffusion-tensor imaging (cDTI) allows for characterization of myocardial microstructure and myofiber-tracking. Novel techniques of accelerated motion compensation gradient (AMC-MPG) and specially designed scout for optimal timing setting in diffusion-weighted imaging (DWI scout) have been recently developed to reduce the motion artifact. However, its diagnostic impact on non-ischemic heart disease is unclear. We evaluated the usefulness of cDTI using AMC-MPG and DWI scout for microstructural assessment of various non-ischemic heart diseases.

METHODS AND MATERIALS

Fifty-two patients with non-ischemic heart disease and 12 healthy volunteers underwent cDTI using AMC-MPG on short-axis slices with navigator gating on 3.0-T MRI. The trigger delay time was set individually according to DWI scout. We measured mean diffusivity (MD:10-3 mm2/sec) and fractional anisotropy (FA) at septal wall in each map reconstructed from DTI source images. Late gadolinium enhancement (LGE) was also performed. We compared cDTI markers among different diseases and volunteer. We also evaluated the association of DTI markers with LGE findings.

RESULTS

Among the patients, 11 were diagnosed as dilated cardiomyopathy (DCM), 12 as hypertrophic cardiomyopathy (HCM), 7 as myocarditis and 5 as hypertensive heart disease (HHD). Two DTI markers were different among different diseases and volunteer. HCM patients had significantly lower FA than volunteers (0.34 vs 0.46, $p<0.01$) and other diseases, and no significant difference in MD compared to volunteers (2.12 v.s.2.11). DCM patients showed comparable FA to volunteers (0.48 vs 0.46) and significantly higher MD (2.41 vs 2.11, $p<0.05$). Myocarditis had significantly lower FA and higher MD (FA =0.40, MD=2.36, $p<0.05$), while HHD had significantly higher FA and MD (FA=0.53, MD=2.97, $p<0.05$), compared to volunteers. Further, in HCM, not only LGE positive but negative segments also had lower FA than volunteers ($p<0.01$). In DCM, not only LGE positive but negative segments had higher MD than volunteers ($p<0.05$). Also, MD and FA of myocarditis and HHD segments with no LGE significantly differed from volunteers ($p<0.05$ for all).

CONCLUSION

cDTI using AMC-MPG and DWI scout can identify the difference in myocardial microstructural alterations in various non-ischemic heart diseases even in the absence of LGE, by using a combination of MD and FA values that reflect the amplitude of diffusion and anisotropy of water molecules, suggesting the potential value in new myocardial tissue characterization.

CLINICAL RELEVANCE/APPLICATION

cDTI using AMC-MPG and DWI scout can detect the microstructural changes in non-ischemic heart disease and may be a novel biomarker for differential diagnosis, early diagnosis and disease prognosis.

W5B-SPCA-14 EVALUATION OF MYOCARDIAL METABOLIC ABNORMALITIES USING SEPARATING ANALYSIS OF INTRA- AND EXTRAMYOCELLULAR LIPID SIGNALS IN SINGLE BREATH-HOLD 1H-MR SPECTROSCOPY IN PATIENTS WITH DIABETIC CARDIOMYOPATHY

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Keizo Murakawa (*Abstract Co-Author*)
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PURPOSE

Lipid oversupply to cardiomyocytes plays a role in the development of myocardial dysfunction in type 2 diabetes mellitus (T2DM). 1 H-MR spectroscopy (MRS) enables direct noninvasive measurement of myocardial lipids, but it is usually evaluated only the total lipid including intra- and extracellular space. A novel analytical approach using LC model software allows separate quantification of intramyocellular lipid (IMCL) and extramyocellular lipid (EMCL), offering more detailed evaluation of lipid distribution. However, its utility in myocardial disease is unclear. We investigated myocardial lipid metabolism in patients with T2DM-related myocardial disease using LC model analysis of MRS.

METHODS AND MATERIALS

This study included 29 patients with T2DM-related heart disease, 10 patients with non-ischemic cardiomyopathy (NICM) without T2DM and 5 healthy volunteers. Single-voxel PRESS MRS was performed at septal wall in a single breath-hold. IMCL and EMCL peaks were identified at 1.3 and 1.5 ppm, and each lipid to creatine (Cr: 3.03 ppm) peak ratio was used as intra- and extracellular metabolic indicator (ICR and ECR) using the LC model. Total lipid content was calculated as (IMCL+EMCL) to Cr peak ratio (=TCR). These ratios were compared among three groups, and ROC analysis determined cutoff values for differentiation of these groups.

RESULTS

T2DM patients showed significantly higher ICR and ECR compared with NICM patients (ICR: 9.68 vs. 1.52; ECR: 8.05 vs. 1.57; $p < 0.05$ for all) and volunteers (ICR: 9.68 vs. 1.47; ECR: 8.05 vs. 2.82; $p < 0.05$ for all). For differentiation of the T2DM from NICM, AUC/sensitivity/specificity were 0.83/79.3%/80% for ICR (cut-off 1.73), 0.65/34.5%/100% for ECR (cut-off 4.46) and 0.79/62.1%/90% for TCR (cut-off 6.05).For differentiation of the T2DM from volunteers, AUC/sensitivity/specificity were 0.83/80%/79.3% for ICR (cut-off 1.26), 0.51/100%/27.6% for ECR (cut-off 0.92) and 0.72/100%/44.8% for TCR (cut-off 9.25).ICR demonstrated the highest AUC in both comparisons.

CONCLUSION

LC model-based MRS enables detailed assessment of myocardial lipid metabolism in T2DM with ICR providing superior diagnostic accuracy, suggesting IMCL is associated with abnormal lipid deposition in T2DM.

CLINICAL RELEVANCE/APPLICATION

Single breath-hold MRS enables direct and rapid quantification of myocardial lipid content. Further, LC Model allows more detailed evaluation of the intracellular and extracellular contents beyond conventional analysis, promising more accurate imaging biomarker for assessing myocardial triglyceride accumulation in T2DM-related myocardial disease. This novel technique has the potential for evaluation of disease severity and therapeutic decision-making.

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W5B-SPCH

Chest Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPCH-3 BEYOND BIOPSY: PREDICTING PD-L1 STATUS IN NON-SMALL CELL LUNG CANCER THROUGH CT RADIOMICS

Federica Palmeri, MD (*Presenter*)
Massimiliano Mancini (*Abstract Co-Author*)
Damiano Caruso, MD, PhD (*Abstract Co-Author*)
Marco Francone, MD, PhD (*Abstract Co-Author*)
Andrea Laghi, MD (*Abstract Co-Author*)

PURPOSE

To develop and validate machine learning (ML) models based on radiomic features extracted from CT imaging to differentiate between high (PD-L1 =50%) and low (PD-L1 <50%) PD-L1 expression in non-small cell lung cancer (NSCLC), potentially offering a noninvasive alternative to histological profiling.

METHODS AND MATERIALS

This retrospective study included 210 NSCLC patients with available contrast-enhanced chest CT and histological PD-L1 quantification. Among them, 46 patients (21.9%) had PD-L1 =50%, while 164 (78.1%) had PD-L1 <50%. All CT scans were acquired before treatment and segmented manually to isolate tumor volumes. Radiomic feature extraction was performed using a standardized pipeline in compliance with the Image Biomarker Standardization Initiative. Five models consisting of three ensembles of machine-learning classifiers (Random Forest, Support Vector Machine, K-Nearest Neighbors, Multi-Layer Perceptron, Logistic Regression) were developed for the binary classification task of interest ("PD-L1 < 50%" vs. "PD-L1 > 50%"), based on supervised learning, using molecular diagnosis as reference standard. Histological PD-L1 expression served as the reference standard. Statistical significance was set at P < .05.

RESULTS

The best-performing model was based on a Multi-Layer Perceptron classifier, achieving a ROC-AUC of 0.61 (95% CI: 0.57-0.66, P < .005) and an accuracy of 64% (95% CI: 60-68%, P < .005). Sensitivity and PPV were high at 70% (95% CI: 65-75%, P < .005) and 82% (95% CI: 80-84%, P < .005), respectively. Specificity and NPV were lower at 44% (95% CI: 36-52%) and 29% (95% CI: 24-35%, P < .005). The F1 score was 75% (95% CI: 71-78%, P < .005).

CONCLUSION

Radiomic analysis of pre-treatment CT images using a Multi-Layer Perceptron classifier demonstrated potential in distinguishing PD-L1 expression levels in NSCLC, with good sensitivity, PPV, and overall F1 score. However, the model's limited specificity and NPV suggest it may be more effective in identifying patients likely to express high PD-L1 levels, rather than excluding them.

CLINICAL RELEVANCE/APPLICATION

Radiomic-based ML models could assist in the noninvasive prediction of PD-L1 status, supporting patient selection for immunotherapy when biopsy is inconclusive, unavailable, or carries clinical risk.

W5B-SPCH-4 FROM CLEAR TO CLOUDY: DECLINING DIAGNOSTIC QUALITY OF CTPA ACROSS PREGNANCY TRIMESTERS

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Ronald L. Eisenberg, MD, JD (*Abstract Co-Author*)
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PURPOSE

Evaluating the diagnostic image quality and reliability of computed tomography pulmonary angiography (CTPA) for pulmonary embolism (PE) in pregnancy compared to reproductive-age non-pregnant women as well assessment of frequency of PE and influencing factors on diagnostic quality.

METHODS AND MATERIALS

Retrospective review of pregnant women undergoing reduced-dose CTPA for suspected PE from 2006-2022 and 276 non-pregnant women undergoing standard-dose CTPA from 2015-2022. Image quality was assessed subjectively (scale 1-4) and objectively (HU attenuation). Demographic and clinical data was also collected.

RESULTS

PE was diagnosed in 3% (11/367) of pregnant versus 7% (19/276) of non-pregnant women (p=0.024), with decreasing PE incidence across trimesters (1st: 1.6%, 2nd: 1%, 3rd: 0.3%). Alternative diagnoses were significantly less frequent in pregnant (8.4%) compared to non-pregnant women (28.2%, p<0.001). Radiation doses in pregnant patients were significantly lower (DLP: 117±29 mGy/cm, CTDIvol: 5.3±0.8 mGy) compared to non-pregnant controls (DLP: 307±127 mGy/cm, CTDIvol: 11.2±4.2 mGy, p<0.001). Subjective image quality was significantly lower in pregnant (mean: 2.94±0.94) compared to non-pregnant women (mean: 3.4±0.87, p<0.001), with increased non-diagnostic scans in the third trimester (13.5%, p=0.02). Objective quality also declined with advancing pregnancy age (323.75±16.06 HU to 289.88±9.72 HU, p<0.001). Respiratory artifacts significantly reduced image quality and increased with advancing pregnancy (27% 1st trimester to 44% 3rd trimester, p=0.02). Pulsation artifacts negatively impacted image quality without trimester correlation, while streak artifacts were more frequent in pregnant women without significant quality impact.

CONCLUSION

CTPA quality is clinically acceptable in early and mid-pregnancy despite being lower compared to non-pregnant controls. Reduced diagnostic quality in the third trimester suggests consideration of alternative imaging methods during late pregnancy. Respiratory motion artifact is a major contributor to quality degradation in pregnant patients.

CLINICAL RELEVANCE/APPLICATION

Understanding diagnostic limitations of CTPA during pregnancy will optimize patient management. Alternative diagnostic approaches should be considered in late pregnancy.

W5B-SPCH-5 EXTERNAL VALIDATION OF AN AI TOOL IN DETECTION, LOCALIZATION AND CHARACTERIZATION OF OSSEOUS METASTASES ON THORACIC CT EXAMINATIONS

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Arun Innanje (*Abstract Co-Author*)
Terrence Chen (*Abstract Co-Author*)
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Subba R. Digumarthy, MD (*Abstract Co-Author*)

PURPOSE

Detection of osseous metastases is an important but difficult task on CT performed for cancer staging. We performed an external validation study to assess if an AI model can help detect, localize and characterize osseous metastases on thoracic CT examinations.

METHODS AND MATERIALS

With Institutional Review Board approval, we identified 650 consecutive thoracic CT examinations with or without osseous metastases from 650 patients using our enterprise level radiology report search engine and database. Of 650 CT exams, 230 (35.5%) CT chest exams were positive for osseous metastases, and 420 (64.6%) were negative for osseous metastases. We exported, de-identified and processed thin-section CT images (1-1.25 mm) of multivendor exams with an AI tool (United Imaging Intelligence, UII) for detecting, classifying (as lytic, sclerotic and mixed attenuation) and localizing focal lesions involving thoracic skeleton. The AI output was positive per patient when the AI model identified = 50% of lesions based on the thoracic CT exams. Data were analyzed to determine the ROC AUC, sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of the AI model at patient level and lesion level.

RESULTS

The mean age and SD for the cases was 65.3 ± 14.11 years (308 males [47.3%], 342 females [52.6%)]. The AI model had ROC AUC of 0.857 (95% CI: 0.827 - 0.886), sensitivity of 95.6% (95% CI: 93% - 98.8%), specificity of 75.7% (95% CI: 71.6% - 79.8%), positive predictive value (PPV) of 68.3% (95% CI: 63.2% - 73.4%), negative predictive value (NPV) of 96.9% (95% CI: 95% - 98.8%), and accuracy of 82.7% (95% CI: 79.8% - 85.6%) for identifying the patients with osseous metastases. The AI model had highest ROC AUC of 0.960 (95% CI: 0.951 - 0.969) and 0.960 (95% CI: 0.951 - 0.969) for the detection of sclerotic and mixed osseous metastatic lesion. The model had highest ROC AUC of 0.958 (95% CI: 0.947 - 0.970) for characterization of mixed attenuation osseous metastatic lesion. No significant differences were observed in the performance of AI between different age and gender groups.

CONCLUSION

The AI algorithm can detect the presence and the location of the osseous metastases with high AUC, sensitivity and negative predictive value

CLINICAL RELEVANCE/APPLICATION

AI model can be used as an adjunct in screening for osseous metastases in patients undergoing CT for cancer staging.

W5B-SPCH-6 DYNAMIC DECT SHUTTLE MODE IMAGING DURING XENON WASHOUT FOR THE DETECTION OF REGIONAL VENTILATION DEFECTS IN IN VIVO RABBIT LUNGS

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Sam Bayat (*Abstract Co-Author*)
Sylvia Verbanck (*Abstract Co-Author*)
Gert van Gompel, PhD (*Abstract Co-Author*)
Johan De Mey, MD, PhD (*Abstract Co-Author*)
Nico Buls, PhD (*Abstract Co-Author*)

PURPOSE

This study aimed to detect ventilation defects (VDs) during multiple-breath xenon (Xe) washout (WO) using dynamic shuttle-mode dual-energy CT (DECT) in healthy and bronchoconstricted in vivo rabbit lungs.

METHODS AND MATERIALS

Six anesthetized New Zealand rabbits [2.6 ± 0.2 (SD) kg] were mechanically ventilated (EC 18-272-15). Multi-breath images were acquired during Xe WO before and after methacholine-induced bronchoconstriction (40 mg/mL) using a clinical DECT (Revolution, GE Healthcare) in shuttle mode. On average, the CTDI vol per acquisition was 4.7 mGy. Ventilation parameters and Xe were monitored at the airway opening by a pneumotachometer (Hans Rudolph, Kansas City) and mass spectrometer (LR6000, Logan Research), respectively. Material decomposition was applied and a voxel-wise correction ensured to reflect only the Xe concentration (Xe conc) in the gas phase of the lung tissue. End-expiratory lung volume (EELV) was compared between a mass spectrometry-based method (EELV ms) and by segmenting gas from healthy lung tissue density images (EELV image) by computing Spearman's rank correlation coefficient (?). The dynamics of ventilation distribution during WO were visually assessed using color-coded Xe conc -maps. VD fraction (VDF) was quantified as voxels below the 25 th percentile of the mean Xe conc at WO start (t 0), expressed as % of total lung volume, and compared between healthy and bronchoconstricted rabbit lungs. Specific ventilation (sV= ventilation/gas volume in min -1) was computed in VDs and non-VDs using Xe conc time attenuation curves and compared between areas. Differences in VDF and sV were tested using a paired samples t-test.

RESULTS

EELV ms (24.8 ± 6.4mL) and EELV image (27.4 ± 2.8mL) correlated (?=0.49, p=0.041). Visually, distinct differences in ventilation distribution between healthy and bronchoconstricted rabbit lungs were observed. VDF increased from (35.5% ± 25.6%) to (45.7% ± 25.0%) after bronchoconstriction, p = 0.026 . In healthy lungs, no difference in sV was found between VD (9.0 ± 2.85 min -1) and non-VD (9.46 ± 3.02 min -1) areas, p = 0.197 . In bronchoconstricted lungs, sV was found to be significantly reduced in VD areas (4.7 ± 2.0 min -1), compared to non-VD areas (6.1 ± 2.1 min -1), p = 0.002 .

CONCLUSION

This study shows the potential of dynamic shuttle Xe-DECT imaging for quantitative studies of local ventilation defects in healthy and pathological in vivo rabbit lungs.

CLINICAL RELEVANCE/APPLICATION

Traditional lung function tests provide only global assessments of respiratory impairment, potentially overlooking early or subtle regional ventilation changes. This limitation has driven growing interest in pulmonary functional imaging as means to quantitatively investigate lung function on a regional level.

W5B-SPCH-7 OPTIMIZING CONTRAST CONCENTRATION IN CHEST CT WITH LOW TUBE VOLTAGE: A RANDOMIZED PROSPECTIVE MULTICENTER TRIAL ON LOW-CONCENTRATION CONTRAST MEDIA

Jung Im Jung, MD, PhD (*Presenter*)
Jiho Park, MD (*Abstract Co-Author*)
Bomi Gil (*Abstract Co-Author*)
Yun-Hyeon Kim, MD (*Abstract Co-Author*)
Gongyoung Jin, MD, PhD (*Abstract Co-Author*)
Jin Mo Goo, MD, PhD (*Abstract Co-Author*)
Suyon Chang, MD, PhD (*Abstract Co-Author*)
Kyongmin S. Beck, MD, PhD (*Abstract Co-Author*)

PURPOSE

The widespread adoption of low tube voltage scan of thorax necessitates adjustments in contrast medium (CM) injection strategies. Low-concentration iodine contrast media (LCCM) can potentially benefit image quality of low-voltage scans by reducing over-enhancement or contrast-related artifacts in chest contrast-enhanced CT (CECT). We compared low-voltage (100kVp) chest CECT using standard and LCCM by comparing proportion of acceptable quality scans with standard protocol chest CECT.

METHODS AND MATERIALS

This randomized prospective multicenter trial was performed at six hospitals from December 2023 to September 2024. Participants were randomly divided into four groups: Group 1 (control) undergone chest CECT with standard protocol (120kVp, 320mgI/mL CM) and test groups of 2-4 with low voltage (100kVp) undergone chest CECT with standard and low-concentration CM (320mgI/mL, 270mgI/mL, and 240mgI/mL). Two independent readers assessed the scans blinded. Non-inferiority test compared the proportion of acceptable quality scans with control. Participants surveyed any adverse reactions, including injection site pain, localized and systemic heat sensation.

RESULTS

A total of 371 participants (mean age 66.0 years [58-73]; 238 men) were randomized. The proportions of acceptable scans in low-voltage chest CECTs with LCCMs were non-inferior to standard protocol with non-inferiority margin of 15% (270mgI/mL: Reader 1, 98.33% CI [-4.95, 9.37], p-value <0.001; Reader 2, 98.33% CI [-5.08, 9.35], p-value <0.001) (240mgI/mL: Reader 1, 98.33% CI [-6.44-8.71], p-value <0.001; Reader 2, 98.33% CI [-6.44, 8.71], p-value <0.001). One reader reported a decreased proportion of acceptable scans in standard CM group (320mgI/mL) (Reader 1, 98.33% CI [-13.67, 4.98], p-value 0.003; Reader 2, 98.33% CI [-19.85, 0.29], p-value 0.11). LCCM groups reported less injection site pain, localized and systematic heat and only the result for the systematic heat was statistically significant (p-values 0.41, 0.34, 0.003).

CONCLUSION

Low-voltage chest CECTs using LCCMs (270 and 240mgI/mL) can produce non-inferior results compared with standard protocol.

CLINICAL RELEVANCE/APPLICATION

Adoption of LCCM in low voltage scans can enhance image quality by reducing contrast-related artifacts. Reduction of iodine delivery by using LCCM can also reduce adverse events.

W5B-SPCH-8 CONTRAST DOSE AND BEAM-HARDENING ARTIFACTS REDUCTION OF THE ADAPTIVE LOW-CONTRAST-DOSE PROTOCOL IN CTPA COMPARED WITH EMPIRICAL SCANNING

Xiaoying Chen (*Presenter*)
Xubin Cui (*Abstract Co-Author*)
Wanting Wu (*Abstract Co-Author*)

PURPOSE

To investigate the reduction of contrast dose and beam-hardening artifacts while maintaining image quality using the adaptive low-contrast-dose protocol in CT pulmonary angiography (CTPA) by compared with empirical scanning.

METHODS AND MATERIALS

This retrospective study included 188 patients with suspected pulmonary embolism who underwent spectral CTPA between February 2022 and January 2025. Patients were divided into adaptive low-contrast-dose group (group A, n=84) and empirical scanning protocol group (group B, n=104). The adaptive method employed three-ROI test bolus to optimize scan timing and adjusted contrast injection flow rates based on patient body weight. CT values of the pulmonary arteries, their branches, and muscles affected by beam-hardening artifacts (BHA) were measured, with subsequent calculation and comparison of the corresponding signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), arteriovenous separation, and BHA between two groups. Two radiologists independently scored image quality using a 5-point scale, evaluating pulmonary artery/vein opacification, BHA, motion artifacts, and image noise.

RESULTS

Compared to conventional protocol (Group B), Group A demonstrated a 35% reduction in contrast volume (26 mL vs 40 mL, $P < 0.001$) despite higher patient body weight ($P < 0.001$). No significant difference in radiation dose was observed ($P > 0.05$). Although Group A showed lower CT values and SNR than Group B, all pulmonary artery segments maintained diagnostic enhancement (CT value > 350 HU) and well arteriovenous separation (CT difference > 300 HU). CNR showed no statistical difference between two groups. Group A exhibited significantly lower BHA indices ($P < 0.001$) and superior subjective BHA scores ($P < 0.05$).

CONCLUSION

The adaptive low-contrast-dose protocol significantly reduces contrast medium volume and beam-hardening artifacts while maintaining diagnostic image quality and ensuring patient safety, offering a clinically viable optimization strategy for CTPA examinations.

CLINICAL RELEVANCE/APPLICATION

This study proposes an optimized adaptive scanning protocol for CTPA that achieves significant contrast dose reduction while being clinically validated.

W5B-SPCH-10 FACTORS AFFECTING ABNORMALITY SCORES OF ARTIFICIAL INTELLIGENCE ON CHEST RADIOGRAPHS OF LUNG CANCER PATIENTS

Hyun Joo Shin, MD, PhD (*Presenter*)
Kyunghwa Han, PhD (*Abstract Co-Author*)
Eun-Kyung Kim, MD (*Abstract Co-Author*)
Eun Hye LEE (*Abstract Co-Author*)
Young Joo Suh, MD, PhD (*Abstract Co-Author*)

PURPOSE

To identify factors that influence the abnormality scores of artificial intelligence (AI) on chest radiographs (CXR) of lung cancer patients.

METHODS AND MATERIALS

Patients who underwent surgical resection for lung cancer at two hospitals from March 2020 to February 2021 were retrospectively included. When a commercial AI software detected lesions at the lung cancer areas on preoperative CXR, abnormality score of discovered lesions were analyzed. The AI score was defined as the highest abnormality score among the discovered lesions. To identify factors influencing the highest abnormality score, a beta regression test was performed with the following variables: projection view and types of radiographs, location, size, solid type of cancers, margin conspicuity, tricky area, and pathological stage.

RESULTS

A total of 340 patients had AI-visible lung cancers on CXR. In the univariate analysis, increased size and solid type were significant factors for increasing AI score (all, $p<0.001$). However, poor conspicuity (exp(estimate) 0.403, $p<0.001$) and tricky area (exp(estimate) 0.705, $p=0.004$) were significantly decreased AI score. Advanced stage was significantly associated with increased AI score ($p<0.03$). In the multivariate analysis, poor conspicuity and tricky area were significant factors for reducing score. However, increased solid size ($p<0.001$) or tumor stage ($p<0.05$) were significant factors for increasing AI scores.

CONCLUSION

Abnormality score of AI in lung cancer are influenced by imaging features, but tumor size and pathologic stage were significant factors for increasing scores. This suggests a potential role for AI scores as imaging biomarkers, but caution is needed in application.

CLINICAL RELEVANCE/APPLICATION

Our study showed that the AI score and nodule score of lung cancers on CXR were influenced by margin conspicuity, tricky area, and the pathological tumor stage or tumor size. Even though there might be a compounding effect of margin and location of the lesions on CXR, the abnormality score was significantly influenced by the size or stage of the cancers when adjusting for margin and tricky area factors. This could reflect that the abnormality score may reflect disease severity, such as the stage and size of the tumor, implying that it has the potential to serve as an imaging biomarker, although careful interpretation is essential when utilizing AI-generated scores.

W5B-SPCH-11 AI ENHANCED IMAGING PRESERVES CLINICAL UTILITY WHILE ENABLING SIGNIFICANT DOSE REDUCTION IN MULTI-CENTER CHEST CT: IMPLICATIONS FOR PANDEMIC PREPAREDNESS

Andreas Brendlin, MD, PhD (*Presenter*)
Markus Mader (*Abstract Co-Author*)

PURPOSE

The COVID-19 pandemic emphasized the need for rapid and accurate diagnostics. Per the ALARA principle, low-dose CT (LDCT) scans are desirable, but image quality and clinical utility remain problematic. AI image improvement algorithms may help close that gap. Still, comprehensive confirmation is missing. To help close this gap, we performed a retrospective multicenter multiscanner analysis, hypothesizing that AI can enhance the image quality of LDCT scans across multiple institutions and scanner models and preserve clinical utility for future pandemics, particularly when compared to standard reconstruction methods.

METHODS AND MATERIALS

Sixty SSDE-matched patients from three centers who underwent standard-dose chest CT for COVID-19 were included. LDCT scans at 50% and 25% radiation dose were simulated using a validated method. Each dataset was reconstructed using standard iterative reconstruction (IR) and AI denoising (AID). Two radiologists assessed image quality subjectively. Objective image quality was assessed using noise and contrast-to-noise ratio (CNR) measurements. The extent of four typical pathological findings (ground-glass opacities, consolidations, nodules, and reticulations) was rated using a semiquantitative scoring system.

RESULTS

AID significantly improved image quality at all radiation doses ($p<0.008$). There were no significant differences in image quality between 100% IR and 25% AID datasets ($p=0.203$). AID also significantly reduced noise and improved CNR at all radiation dose levels ($p<0.001$). There were no significant differences in noise and CNR between 100% IR and 25% AID datasets ($p=0.355$ and $p=0.139$, respectively). Pathology manifestation scores revealed no significant differences between the dose and reconstruction modes, indicating that AID does not compromise clinical utility.

CONCLUSION

AID enhances the image quality of low-dose chest CT scans across multiple institutions and scanner models and preserves clinical utility for future pandemics, particularly compared to standard reconstruction methods.

CLINICAL RELEVANCE/APPLICATION

Cross-Institutional Dose Reduction AI enables high-quality chest CT imaging at 25% standard dose across different centers and scanners. Preserved Diagnostic Value No loss in detection of key COVID-19-related lung findings, even at ultra-low doses with AI support. Pandemic-Ready Imaging Supports safe, rapid, and scalable LDCT protocols for future infectious disease outbreaks.

W5B-SPCH-12 RISK FACTORS FOR SECOND PRIMARY LUNG CANCER

Tracy El Khoury, MD (*Presenter*)
Suzanne Byrne, MD (*Abstract Co-Author*)
Mark M. Hammer, MD (*Abstract Co-Author*)

PURPOSE

The purpose of this study was to identify imaging risk factors that may predict the development of second lung cancer in patients who have undergone a resection for an early-stage primary lung cancer.

METHODS AND MATERIALS

This retrospective study included 784 patients who underwent surgical resection of a stage I lung adenocarcinoma between January 2012 and December 2020 at a single institution. Patients with no recurrence or a second primary lung cancer were identified, and then a radiology fellow, using thin axial lung windows, classified each resected nodule based on type and location. Additional features examined included presence of multiple subsolid nodules, emphysema, bronchial wall thickening and fibrosis. Risk factors for second primary lung cancer were evaluated using Cox proportional hazards.

RESULTS

The incidence of a second primary lung cancer among the final study database was 13%. Age (HR of 1.55, p value< 0.001) and COPD diagnosis (HR 1.55, $p<0.001$) were statistically significant factors associated with development of a second primary lung cancer. Smoking was also a significant risk factor ($p=0.0036$), with a 10-year risk of developing a second primary lung cancer of 37% in people who currently smoke, 32% in and people who previously smoked with less than 15 years since quitting, 25% in people who previously smoked with more than 15 years since quitting and 8.5% in people who never smoked. The presence of multiple subsolid nodules (HR of 2.48, $p<0.001$) and emphysema (HR of 1.61, $p=0.029$) were statistically significant imaging risk factors. Nodule type was not significant ($p=0.064$); however solid nodules had a greater risk of developing a second primary 8 years after resection of the first primary (HR 11.9, $p=0.019$) while the risk is not statistically significant in the first 8 years ($p=0.80$).

CONCLUSION

Presence of multiple subsolid nodules and emphysema are associated with an increased risk for development of a second primary lung cancer.

CLINICAL RELEVANCE/APPLICATION

Patients with emphysema and multiple subsolid nodules on imaging may benefit from prolonged surveillance and close monitoring for development of a second primary lung cancer.

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W5B-SPER

Emergency Radiology Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPER-2 MEASUREMENT, MARKING AND ANALYSIS OF INFLUENCING FACTORS OF THE EFFECTIVE SCANNING RANGE OF CT SCANNING TABLE

Yong Fan (*Presenter*)
Zhidong Yuan, RT (*Abstract Co-Author*)
Fei Feng (*Abstract Co-Author*)

PURPOSE

Through simulated CT scanning experiments, to measure and analyze the influence of different scanning equipment and scanning parameters (collimation width, pitch and rotation speed) on the effective scanning range (ESR) of the CT scanning table, providing a basis for clinical CT technicians to optimize the usage range of the scanning table, thereby improving scanning efficiency and patient comfort.

METHODS AND MATERIALS

Simulated scans were conducted using Siemens Definition Flash dual-source CT and GE Revolution CT. Different combinations of scanning parameters, including collimation width, pitch and rotation speed, were set on both devices, totaling 186 parameter combinations. The farthest starting and ending positions of the scanning range under each parameter combination were recorded, and the ESR was calculated. The correlation between different scanning parameters and the ESR was analyzed. The distance from the farthest position allowed for scanning to the edge of the table was also measured.

RESULTS

The ESR of the CT scanning table decreased with the increase of collimation width, the acceleration of rotation speed and the increase of pitch. The correlation between effective scanning length and pitch was the highest ($r = -0.960$, $P < 0.001$), and the correlation with rotation speed was the lowest ($r = 0.569$, $P < 0.001$). The ESR of the Siemens Definition Flash dual-source CT was generally lower than that of the GE Revolution CT. On the Siemens device, the shortest ESR of 1422 mm was observed in Flash mode. On the GE Revolution CT, the shortest ESR measured 1890 mm at an 80 mm collimation width.

CONCLUSION

The ESR of the CT scanning table is affected by collimation width, pitch and rotation time. By conducting simulated scans in advance and marking the effective range of the scanning table, the problem of insufficient length of the scanning table can be effectively avoided, thereby improving scanning efficiency and patient comfort.

CLINICAL RELEVANCE/APPLICATION

On Siemens Definition Flash dual-source CT, the shortest ESR in Flash mode is 1422mm, which is much lower than the height of an average adult. Therefore, special attention should be paid to the effective scan range of the scanning bed when using Flash mode of Siemens CT

W5B-SPER-3 RADIOLOGY REQUISITION QUALITY AND CLINICAL REASONING QUALITY: A RETROSPECTIVE STUDY ON EMERGENCY CT REFERRALS USING REASON FOR EXAM IMAGING REPORTING AND DATA SYSTEM (RI-RADS)

Jingyu Zhong, MD (*Presenter*)
Xianwei Liu (*Abstract Co-Author*)
Huan Zhang (*Abstract Co-Author*)
Weiwu Yao (*Abstract Co-Author*)

PURPOSE

To determine radiology requisition quality using Reason for exam Imaging Reporting and Data System (RI-RADS) and the associated clinical variables, and find out whether it reflects the clinical reasoning quality in emergency CT referrals.

METHODS AND MATERIALS

This single-center retrospective study randomly selected emergency CT referrals between 01 January 2024 and 31 December 2024. One radiologist scored the requisition quality using the RI-RADS, and assessed the clinical reasoning quality regarding degree by which the differential diagnoses on the requisition form matched the CT diagnosis on assigned report. The clinical variables that associated with RI-RADS A was investigated using logistic regression analysis. The clinical reasoning quality among different RI-RADS grades was compared.

RESULTS

We included 1291 emergency CT referrals. The requisitions were for patients with an average ± standard deviation age of 54.0 ± 21.2 years, and slightly most of them were female (675 requisitions, 52.3%). RI-RADS grades A (adequate), B (barely adequate), C (considerably limited), D (deficient), and X (no information) were assigned to 287 (22.2%), 71 (5.5%), 851 (65.9%), 53 (4.1%), and 29 (2.2%) requisitions, respectively. The absolute agreements for RI-RADS categories of impression, clinical information, and diagnostic question were 97.0%, 56.0%, and 88.0%, respectively. The absolute agreement for RI-RADS grades was 79.0%. The requisitions from fever clinic and thoracic surgery were less likely to be assigned to RI-RADS A compared to internal medicine (odds ratio 0.10-0.11), and so were those of abdomen and head scans compared to chest scans (odds ratio 0.06-0.30). The RI-RADS A requisitions had better clinical reasoning quality than those of RI-RADS grades C, D, and X (all adjusted $p<0.001$), but not those of RI-RADS B (adjusted $p=0.100$).

CONCLUSION

The majority of emergency CT requisitions were inadequate, especially those from fever clinic and thoracic surgery. The suboptimal requisitions were expected to have insufficient clinical reasoning quality.

CLINICAL RELEVANCE/APPLICATION

The concern of radiologists is true that the low-quality radiology requisitions potentially reflect the worse clinical reasoning. A training on how to request meaningful radiology examinations after detailed clinical reasoning is warranted to improve radiology workflow for better medicine practice.

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W5B-SPGI

Gastrointestinal Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPGI-2 PRELIMINARY USE OF DCE-MRI IN PREDICTING PATHOLOGICAL COMPLETE RESPONSE AFTER NEOADJUVANT IMMUNOTHERAPY FOR LOCALLY ADVANCED RECTAL CANCER: A PROSPECTIVE STUDY

Long Yang (*Presenter*)
Qitong Huang (*Abstract Co-Author*)
Yidi Hou (*Abstract Co-Author*)
Peiyi Xie (*Abstract Co-Author*)
Xiaochun Meng (*Abstract Co-Author*)

PURPOSE

To investigate the potential of T2-Weighted Image(T2WI) and Dynamic Contrast Enhancement MRI(DCE-MRI) for predicting the efficacy of neoadjuvant immunotherapy in patients with locally advanced rectal cancer(LARC).

METHODS AND MATERIALS

This prospective trial (ClinicalTrials.gov identifier: NCT05523245) enrolled 54 consecutive LARC patients from July 1,2023 to July 1,2024.All participants were treated with neoadjuvant immunotherapy preoperatively and pathological results were obtained postoperatively. All participants underwent conventional sequence and DCE-MRI before the start of neoadjuvant immunotherapy and three weeks before surgery. Pathologic complete response(pCR) was evaluated according to the AJCC 8th edition: patients with a tumor regression grade(TRG) of 0 were considered pCR, and patients with a TRG of 1-3 were considered non-pCR. A radiologist performed whole-tumor analysis between pCR and non-pCR groups at both time periods using multiparametric MRI, including T2WI volume and the quantitative parameters of DCE-MRI including volume transfer constant (K trans),rate constant (K ep),and extravascular extracellular volume fraction (V e). The mean values of the above parameters were then used for analysis. The reduction rate was defined as parameters, termed ?. Differences in quantitative parameters between pCR and non-pCR groups were assessed by independent samples t -test or Mann-Whitney U test. Receiver operating characteristic curve analysis was used to evaluate the diagnostic performance.

RESULTS

Fifty-four patients with LARC were analyzed in the study, of whom 37 (69%) were male and 17 (31%) were female, with a mean age of 55 ± 10 years. According to the pathological results, they were divided into pCR group (n=21) and non-pCR group (n=33). The post-treatment T2WI volume and post-treatment K ep in the pCR group were significantly lower than those in the non-pCR group (p=0.01, 0.009,respectively)(Table.1).The T2WI volume reduction rate, ?K trans and ?K ep in the pCR group were significantly higher than those in the non-pCR group (p=0.016, 0.027,0.002,respectively)(Table.1).The AUCs of T2WI volume, post-treatment K ep , the T2WI volume reduction rate, ?K trans and ?K ep were 0.707,0.709,0.694,0.679,0.751,respectively(Figure.1).

CONCLUSION

Post-treatment T2WI volume and T2WI volume reduction rate, post-treatment K ep , ?K ep , ?K trans in DCE-MRI quantitative parameters may be useful in evaluating the pCR of local advanced rectal cancer after neoadjuvant immunotherapy.

CLINICAL RELEVANCE/APPLICATION

Accurately identifying patients with locally advanced rectal cancer who have achieved complete pathological remission after neoadjuvant immunotherapy thus guiding their watch and wait treatment decisions.

W5B-SPGI-3 TRANSIENT AND SHEAR-WAVE ELASTOGRAPHY IN THE DETECTION OF HEPATIC SINUSOIDAL OBSTRUCTION SYNDROME IN PATIENTS UNDERGOING HEMATOPOIETIC STEM CELL TRANSPLANTATION: A SYSTEMATIC REVIEW AND META-ANALYSIS

Valdair F. Muglia, MD, PhD (*Presenter*)
Leticia Helena Kaca Do Carmo (*Abstract Co-Author*)
Maria Tamyres De Carvalho Freitas, MD (*Abstract Co-Author*)
Rafaella Baratta Colla (*Abstract Co-Author*)
Tatiana Yumi Bando, MD (*Abstract Co-Author*)
Sarah Verdan, MD (*Abstract Co-Author*)
Matheus Martins de Andrade, MD (*Abstract Co-Author*)
Philipe Boud'Hors, MD (*Abstract Co-Author*)
Matheus Cipriano (*Abstract Co-Author*)
Jorge Elias JR, MD, PhD (*Abstract Co-Author*)

PURPOSE

Evaluate transient and shear elastography in detecting hepatic sinusoidal obstruction syndrome (SOS) or hepatic veno-occlusive disease (VOD) in patients submitted to hematopoietic stem cell transplantation (HSCT).

METHODS AND MATERIALS

The MEDLINE, EMBASE, and Cochrane databases were systematically accessed for studies that employed elastography in post-HSCT patients and that reported any of the following outcomes of interest: (1) measurement of shear wave velocity (SWV) pre and (2) post-transplantation, (3) liver stiffness values ??before and (4) after HSCT, and (5) incidence of alterations on conventional ultrasound during a suspicion of SOS or VOD. “Software R” (version 2024.04.2+764) was employed for statistical analysis. Heterogeneity was assessed using the I2 statistical model. The “QUADAS-2” tool assessed potential bias.

RESULTS

10 studies were included, totaling 589 patients, of which 100 were diagnosed with SOS. SWV showed a significant increase in patients with SOS (95% CI 1.3-7.1; p<0.01; I2=99%). Liver stiffness values also demonstrate a statistically significant increase in the context of SOS (95% CI 3,9-28,0; I2=91%, p<0,01). Conventional

ultrasound demonstrated a high rate of hepatomegaly, 93.1% (95% CI 74.9-99.8; I2=86%); 81.4% of patients with SOS presented ascites (95% CI 59.9-95.8; I2=88%); 62.6%, thickening of the gallbladder walls (95% CI 24.8-93.1; I2=92%); 31.6%, reduced flow in the portal vein (95% CI 10.2-58.2; I2=64%). Bias analysis showed a high risk in most included articles.

CONCLUSION

Transient and shear elastography are possible early diagnostic tools in cases of SOS.

CLINICAL RELEVANCE/APPLICATION

SOS, previously called Veno-Occlusive Disease (VOD), is a rare but potentially fatal complication after HSCT. The most reliable diagnostic methods for this condition include liver biopsy and hepatic venous pressure gradient measurement. However, they are invasive and expensive, leading to limited applicability. Both transient and shear elastography are effective methods in the early detection of SOS in patients submitted to HSCT. This allows for a more rapid treatment and a better prognosis. In the future, larger, prospective trials can help to define elastography as the primary diagnostic method for SOS.

W5B-SPGI-5 INTRAINDIVIDUAL EVALUATION OF LIVER MRI POST-INJECTION OF GADOPICLENOL COMPARED TO GADOBENATE DIMEGLUMINE

Shiva Yagobian, BS (*Presenter*)
Senthur J. Thangasamy, MD, DMRD (*Abstract Co-Author*)
Gayathri Devi Jalluri, MD, MBBS (*Abstract Co-Author*)
Alessandro Furlan, MD, MMM (*Abstract Co-Author*)

PURPOSE

To evaluate the enhancement of liver parenchyma on MRI following the administration of gadopiclenol and gadobenate dimeglumine.

METHODS AND MATERIALS

This IRB-approved retrospective study includes consecutive patients who underwent gadopiclenol-enhanced MR imaging of the liver between September and December 2023. Patients without a comparison gadobenate dimeglumine enhanced MR imaging of the liver performed within 18 months of the gadopiclenol MRI were excluded. Gadopiclenol was injected at 0.05 mmol/kg (0.1 ml/kg) and gadobenate dimeglumine at 0.1 mmol/kg (0.2 ml/kg). The signal intensity (SI) of the liver parenchyma was independently recorded by 2 experienced readers on the pre-contrast, 3 minutes post-contrast, and 5 minutes post-contrast imaging. Liver enhancement (LE) was calculated as (post-contrast SI - pre-contrast SI) / pre-contrast SI x100. Liver enhancement per ml of Gd (LE/ml) was calculated as LE/ml of contrast used. LE and LE/ml were compared using the Student's t-test.

RESULTS

A total of 71 patients (34 M, 37 F, average age 67 years) were included in the final population. 42/71 (59%) subjects were cirrhotic (MAFLD, 33%). Patients received an average of 8±1.7ml of gadopiclenol, and 16±3.5ml of gadobenate dimeglumine. The LE at 3 minutes (Reader 1, 108±40% vs. 130±69%; Reader 2, 106±94% vs. 104±61%) and 5 minutes (Reader 1, 91±30% vs. 100±37%; Reader 2, 92±37% vs. 97±40%) was not significantly different (P> 0.3) after injection of gadopiclenol and gadobenate dimeglumine. LE/ml with gadopiclenol was significantly higher than LE/ml with gadobenate dimeglumine at 3 minutes (Reader 1, 14±0.1% vs. 8±3%; Reader 2, 14±10% vs. 7±3%) and 5 minutes (Reader 1, 12 ±4% vs. 6±2%; Reader 2, 12±5% vs. 6±2%) post contrast administration (P<0.001).

CONCLUSION

Gadopiclenol exhibits superior liver enhancement per milliliter compared to gadobenate dimeglumine. However, at the approved dosage, the difference in liver enhancement between these two contrast agents is not statistically significant.

CLINICAL RELEVANCE/APPLICATION

In liver MR imaging, parenchymal enhancement of gadopiclenol as compared to gadobenate dimeglumine has yet to be studied extensively. Given that gadopiclenol exhibits greater liver enhancement per milliliter compared to gadobinate dimeglumine, additional studies are necessary to determine if a decreased dose of contrast may be used in future imaging, reducing the risk of gadolinium deposition.

W5B-SPGI-6 STUDY ON NOVEL IMAGING BIOMARKERS OF MAGNETIZATION TRANSFER TECHNIQUE BASED ON ULTRA-SHORT ECHO TIME SEQUENCE IN THE PROGRESSION OF NON-ALCOHOLIC FATTY LIVER DISEASE

Haoxiang Li, MD (*Presenter*)
Shaolin Li, PhD (*Abstract Co-Author*)
Jin Liu (*Abstract Co-Author*)

PURPOSE

This study aims to evaluate the diagnostic utility of ultra-short echo time magnetization transfer (UTE-MT) and zero echo time magnetization transfer (ZTE-MT) MRI quantitative techniques to find novel imaging biomarkers for non-alcoholic fatty liver disease (NAFLD) assessment.

METHODS AND MATERIALS

In the murine model, NAFLD was induced in 8 male C57BL/6 mice via a high-fat diet, with 8 standard-diet-fed mice as controls. Imaging was performed at 8 and 12 weeks using UTE-MT, ZTE-MT, UTE-T2*, UTE-T1?, and IDEAL-IQ sequences. Liver histology was evaluated for Collagen I and lipid content through staining, and serum lipid metabolism markers were quantified. In the human cohort, 12 patients diagnosed with non-alcoholic fatty liver (NAFL), 11 with non-alcoholic steatohepatitis (NASH), and 24 healthy controls were enrolled. Hepatic imaging was conducted using UTE-MT, ZTE-MT, UTE-T2*, and IDEAL-IQ sequences on a 3.0T MRI system. Imaging biomarkers, including liver UTE-MTR, ZTE-MTR, UTE-T2* values, and MR-PDFF, were analyzed in both models..

RESULTS

In the murine model, UTE-MTR, ZTE-MTR, T1?, and MR-PDFF significantly correlated with hepatic Collagen I and lipid content, with UTE-MTR showing the strongest correlation. These parameters also correlated with serum triglycerides and total cholesterol, while UTE-T2* showed no significant associations. In humans, UTE-MTR and ZTE-MTR were significantly reduced in NAFL and NASH compared to controls ($P < 0.01$), with UTE-MTR further decreased in NASH versus NAFL ($P < 0.05$). MR-PDFF was elevated in NAFL and NASH compared to controls ($P < 0.01$) and higher in NASH than NAFL ($P < 0.01$). UTE-T2* values showed no significant differences across groups. Receiver operating characteristic (ROC) analysis confirmed that UTE-MTR and ZTE-MTR provided robust diagnostic accuracy for distinguishing healthy controls, NAFL, and NASH.

CONCLUSION

UTE-MT and ZTE-MT techniques enable accurate, non-invasive assessment of NAFLD stages in murine and human models, effectively differentiating healthy individuals, NAFL, and NASH. UTE-MTR and ZTE-MTR, as reliable imaging biomarkers, show strong correlations with fibrosis, inflammation, hepatic tissue, and serological markers. Integrating these MRI sequences enhances diagnostic precision and supports clinical decision-making, offering a promising strategy for monitoring NAFLD progression.

CLINICAL RELEVANCE/APPLICATION

UTE-MT and ZTE-MT MRI techniques provide novel imaging biomarkers (UTE-MTR, ZTE-MTR) for accurate NAFLD staging, reducing reliance on invasive biopsies. Their strong correlations with disease markers enable early detection, precise monitoring of NAFL and NASH progression, and evaluation of treatment responses, improving clinical outcomes.

W5B-SPGI-7 PROGNOSTIC VALUE OF THE NODE REPORTING AND DATA SYSTEM FOR PREDICTING EARLY RECURRENCE IN PATIENTS WITH PANCREATIC DUCTAL ADENOCARCINOMA FOLLOWING PANCREATICODUODENECTOMY

Yuqi Wang (*Presenter*)
Yu Li (*Abstract Co-Author*)
Jing Zhu (*Abstract Co-Author*)
Yan Deng (*Abstract Co-Author*)
Haopeng Yu (*Abstract Co-Author*)
Zixing Huang (*Abstract Co-Author*)
Bin Song (*Abstract Co-Author*)

PURPOSE

To evaluate the preoperative predictive performance of the Node Reporting and Data System (Node-RADS) for early recurrence in pancreatic ductal adenocarcinoma (PDAC) patients undergoing pancreaticoduodenectomy.

METHODS AND MATERIALS

This retrospective study included 138 patients with pathologically confirmed PDAC who underwent pancreaticoduodenectomy and preoperative contrast-enhanced abdominal CT between 2020 and 2023. Lymph nodes with a short-axis diameter = 4 mm (from diaphragmatic dome to lower renal poles) were evaluated by one radiologist using the Node-RADS classification. Pathological N stage was according to the AJCC TNM classification (8th edition). Recurrence-free survival (RFS) was collected, with RFS =12 months defined as early recurrence. For each patient, the total Node-RADS score and total configuration were calculated both overall and within each lymph node station. Time-dependent receiver operating characteristic (timeROC) analysis was used to assess the predictive performance of Node-RADS metrics and pathological N stage. Univariate and multivariate Cox regression were used to identify independent predictors of early recurrence.

RESULTS

84 male and 54 female patients (median age, 61 years; IQR, 54-69 years) were included. The median RFS was 18.0 months (95% CI: 13.0-21.0), with 44 patients experienced recurrence within 12 months. AUCs for early recurrence prediction were: Node-RADS total score 0.601 (95% CI: 0.479-0.723), configuration score 0.562 (95% CI: 0.438-0.686), and pathological N stage 0.608 (95% CI: 0.500-0.717). Univariate Cox analysis showed total Node-RADS score (p=0.0328) and total configuration score (p=0.0382) were significant. Among specific nodal stations, No.16a2 score (p = 0.00615), No.3 and No.7 score (p = 0.0400), and configuration of No.16a2 (p = 0.0365), showed significant associations with early recurrence. In multivariate analysis, both score and configuration of No.16a2 remained independent predictors (p=0.0391 and 0.0346).

CONCLUSION

Node-RADS total and configuration scores showed comparable predictive value to pathological N stage in identifying early recurrence. No.16a2 demonstrated independent prognostic significance, indicating its utility in recurrence risk stratification.

CLINICAL RELEVANCE/APPLICATION

Node-RADS provides a noninvasive, preoperative approach to assess the risk of early recurrence in patients with PDAC. The configuration and total scores of No.16a2 were independently associated with early recurrence, which is a novel and practical insight for surgical decision-making. Node-RADS may serve as a valuable imaging biomarker to support clinical strategies, promoting individualized treatment planning and improving patient outcomes.

W5B-SPGI-8 DEVELOPMENT AND VALIDATION OF A DEEP LEARNING MODEL FOR PREDICTING SIGNIFICANT LIVER FIBROSIS BASED ON GD-EOB-DTPA-ENHANCED MRI: A MULTICENTER STUDY

Yi Luo (*Presenter*)
Genwen Hu, MD (*Abstract Co-Author*)
Shuyuan Zhong, MD (*Abstract Co-Author*)
Jinsen Zou, MD (*Abstract Co-Author*)

PURPOSE

To construct a deep learning (DL) model based on Gd-EOB-DTPA-enhanced MRI to distinguish non-significant liver fibrosis from significant liver fibrosis, and to explore the effect of different regions of interest (ROIs) on the diagnostic performance of the significant liver fibrosis prediction model.

METHODS AND MATERIALS

A total of 305 patients who underwent liver Gd-EOB-DTPA-enhanced MRI from April 2016 to May 2023 in two medical centers were retrospectively collected, and the stage of liver fibrosis was confirmed by pathological examination or clinical evaluation. The patients were divided into training set and external validation set according to medical center. Four models (ROI 1 , ROI 3 , ROI 5 , ROI all models) were constructed based on different ROIs of HBP sequence (the largest slice of liver, the largest slice and one layer above and below it, the largest slice and two layers above and below it, all layers) to distinguish non-significant and significant liver fibrosis. To evaluate the performance of each model and the optimal ROI was selected. T1WI-FS and T2WI-FS images were preprocessed in the same way according to the optimal ROI, and the three sequences were fused at image-level to construct a multimodal DL model. The receiver operating characteristic (ROC) curve, calibration curve and decision curve were used to visualize the predictive ability of the model, and the accuracy, sensitivity and specificity of the model were calculated.

RESULTS

Among the DL models based on the four ROIs, the ROI 5 model showed the best comprehensive diagnostic efficiency in the diagnosis of significant liver fibrosis in the training set and validation set, with AUC values of 0.870 and 0.716, respectively. It was superior to ROI 1 (validation AUC=0.666), ROI3 (validation AUC=0.708) and ROIall (validation AUC=0.665). The AUC of the training set and the validation set of the multimodal MRI model constructed by fusing T1WI-FS, T2WI-FS and HBP were 0.907 (95%CI, 0.866-0.948) and 0.796 (95%CI, 0.712-0.881), respectively. DCA results indicated that the prediction model for liver fibrosis staging could yield a net clinical benefit.

CONCLUSION

The deep learning model based on the MRI images of the maximum slice and the two layers above and below has the best performance in the diagnosis of non-significant and significant liver fibrosis, which establishes a new paradigm for the prediction of liver fibrosis staging in small samples.

CLINICAL RELEVANCE/APPLICATION

The deep learning model based on Gd-EOB-DTPA-enhanced MRI shows good sensitivity and specificity in predicting significant liver fibrosis, which is expected to become a non-invasive tool to guide the clinical individualized treatment of patients with liver fibrosis.

W5B-SPGI-10 INTEGRATED PET-MR IN PERIANAL FISTULIZING CROHN'S DISEASE: METABOLIC AND STRUCTURAL CORRELATES OF HEALING IN A PROSPECTIVE COHORT

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Addie Lovato (*Abstract Co-Author*)
Tyler J. Fraum, MD (*Abstract Co-Author*)
Malak Itani, MD (*Abstract Co-Author*)
Parakkal Deepak, MBBS (*Abstract Co-Author*)
David H. Ballard, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the feasibility of PET-MRI and examine early metabolic and structural imaging trends in patients with perianal fistulizing Crohn's disease (pfCD) initiating biologic therapy.

METHODS AND MATERIALS

This prospective cohort included 10 pfCD patients (mean age 36 years; 6 male), 4 of whom underwent serial PET-MR. Each PET-MR study incorporated co-registered FDG PET with pelvic MRI, including T2-weighted and post-contrast T1-weighted sequences. Tract complexity, fibrosis-to-fluid ratios, MAGNIFI-CD and mVAI scores, and FDG avidity were assessed. CAF-QoL was recorded at up to four timepoints. Radiologic healing was defined by absence of T2 hyperintensity, absence of enhancement, and complete fibrosis. PET uptake was described relative to liver background and correlated with tract morphology.

RESULTS

Three patients had complete 24-week MAGNIFI-CD data. One met criteria for radiologic healing (score = 0) with no FDG uptake. The other two demonstrated persistent disease (scores = 18.0 and 25.0) and had either high FDG uptake or mixed fibrosis-to-fluid characteristics. One patient showed a partially scarred tract with low FDG activity and low symptom burden (CAF-QoL = 12). In a serially imaged case, MRI morphology and MAGNIFI-CD score remained stable over time, with persistent FDG uptake and mild worsening in CAF-QoL. Among patients with fibrotic-appearing tracts and absent FDG activity, symptoms were minimal or improved.

CONCLUSION

In this early pfCD cohort, persistent FDG activity aligned with non-healed tracts on MRI, while PET-negative tracts correlated with fibrotic morphology and clinical stability. PET-MR may help identify metabolically active disease despite stable MR appearance and could support decision-making in ambiguous or clinically discordant cases.

CLINICAL RELEVANCE/APPLICATION

In pfCD, PET-MR provides a noninvasive biomarker of tract activity that may refine longitudinal response assessment, particularly in patients with stable MR morphology but unclear symptom or inflammatory status.

W5B-SPGI-12 QUANTITATIVE MULTI-PARAMETER PREDICTION OF IMMUNOTHERAPY RESPONSE IN ESOPHAGEAL SQUAMOUS CELL CARCINOMA USING SPECTRAL CT

Yan Liu, MD (*Presenter*)
Huang Jian (*Abstract Co-Author*)
Shuting Zhong (*Abstract Co-Author*)

PURPOSE

To investigate the value of quantitative parameters derived from spectral computed tomography (CT) in predicting the therapeutic efficacy of immunotherapy for esophageal squamous cell carcinoma (ESCC).

METHODS AND MATERIALS

This retrospective study included 50 patients with pathologically confirmed ESCC who underwent contrast-enhanced spectral CT of the chest and abdomen prior to immunotherapy. Two radiologists independently evaluated treatment response. Quantitative spectral parameters including arterial phase CT values at 70, 100, and 140 keV (A-CT70 keV , A-CT100 keV , A-CT140 keV), iodine concentration (A-IC), water concentration (A-WC), effective atomic number (A-Zeff), and the slope of the spectral attenuation curve (A-?HU) were measured. Additionally, non-contrast and arterial phase CT value differences (?CT700 keV , ?CT140 keV) were calculated. Differences in parameters between effective and ineffective groups were compared. Univariate and multivariate logistic regression analyses were performed to identify independent predictors of treatment response. Receiver operating characteristic (ROC) curves were generated to assess diagnostic performance, and area under the curve (AUC), sensitivity, and specificity were calculated.

RESULTS

Significant differences were observed between the effective and ineffective groups for A-CT100 keV , A-CT140 keV , A-WC, and ?CT140 keV ($P < 0.05$), whereas A-IC, A-Zeff, ?CT70 keV , and A-?HU showed no significant differences ($P > 0.05$). Univariate logistic regression identified A-CT140 keV , A-WC, and ?CT140 keV as significantly correlated with therapeutic efficacy ($P < 0.05$). However, A-CT100 keV was not independently associated with treatment response ($P > 0.05$). Multivariate analysis demonstrated that A-CT140 keV and A-WC were independent predictors of immunotherapy efficacy ($P < 0.05$). The AUCs for predicting immunotherapy response were 0.733 (95% CI: 0.587-0.849) for A-CT140 keV and 0.796 (95% CI: 0.657-0.898) for A-WC. A combined model incorporating both A-CT140 keV and A-WC achieved a higher AUC of 0.844 (95% CI: 0.711-0.931), outperforming the individual parameters.

CONCLUSION

Quantitative spectral CT parameters, particularly A-CT140 keV and A-WC, are valuable predictors of immunotherapy response in ESCC. A combined model using A-CT140 keV and A-WC further improves predictive performance, providing a potential non-invasive imaging biomarker for therapeutic stratification.

CLINICAL RELEVANCE/APPLICATION

Spectral CT-derived quantitative parameters enable early prediction of immunotherapy efficacy in ESCC. Combining multiple spectral biomarkers enhances predictive accuracy and may assist in optimizing patient selection and management strategies.

W5B-SPGI-13 CT-DETECTED "JELLYFISH SIGN": A SIMPLE BUT POWERFUL PREDICTOR OF SURVIVAL IN STAGE II/III MICROSATELLITE STABILITY COLON CANCER

Zhen Guan (*Presenter*)
Xiao-Yan Zhang (*Abstract Co-Author*)
Tong Tong, PHD (*Abstract Co-Author*)
Ying-shi Sun, PhD (*Abstract Co-Author*)

PURPOSE

Despite advances in TNM staging, significant prognostic heterogeneity persists in stage II/III microsatellite-stable (MSS) colon cancer. We identified and validated a novel CT-based "Jellyfish Sign" - characterized by distinctive pericolonic fat density changes - as a potential imaging biomarker to refine risk stratification beyond conventional parameters.

METHODS AND MATERIALS

In this dual-center prognostic study, we retrospectively analyzed 382 consecutive patients with pathologically confirmed stage II/III MSS colon cancer who underwent preoperative contrast-enhanced CT and curative resection. The discovery cohort comprised 285 patients from tertiary Center A (2013-2016), while 97 patients from Center B (2012-2013) served as the independent validation cohort. The "Jellyfish Sign" was rigorously defined as: (1) asymmetric fat stranding forming a circumferential halo around the tumor, (2) containing nodular or band-like hyperdense foci, and (3) showing infiltrative margins. Two abdominal radiologists (15/8 years' experience) independently evaluated all scans. Comprehensive survival analyses included multivariable Cox regression adjusting for TNM stage, CEA levels, and histological grade, with time-dependent ROC analysis assessing predictive performance.

RESULTS

The striking "Jellyfish Sign" was detected in 36.5% (104/285) and 34.0% (33/97) of discovery/validation cohorts respectively (?=0.82, substantial inter-reader agreement). Multivariable analysis confirmed its independent prognostic value for both death (HR 3.29, 95%CI 1.64-6.60) and recurrence (HR 5.07, 95%CI 2.91-8.83), surpassing conventional risk factors. The combined clinical-imaging model achieved outstanding discrimination (AUC 0.854 for survival, 0.811 for recurrence) with robust validation (AUC 0.722-0.741).

CONCLUSION

The "Jellyfish Sign" represents a biologically plausible, readily identifiable CT biomarker that powerfully predicts adverse outcomes in stage II/III MSS colon cancer, potentially reflecting occult peritumoral tumor microenvironment alterations.

CLINICAL RELEVANCE/APPLICATION

This immediately applicable imaging marker addresses a critical unmet need in precision oncology by: (1) Identifying high-risk stage II patients who may benefit from adjuvant chemotherapy, (2) Detecting aggressive biology in stage III cases warranting intensified regimens, and (3) Providing prognostic information without additional costs or invasive procedures.

W5B-SPGI-14 IMAGING AND CLINICAL FEATURES OF SURGICALLY RESECTED SEROUS CYSTADENOMA OF THE PANCREAS: A MULTICENTER STUDY

Ji Eun Lee, MD, PhD (*Presenter*)
Seo-Youn Choi, MD, PhD (*Abstract Co-Author*)

PURPOSE

Despite advances in pancreatic imaging, serous cystadenoma (SCA)—a benign pancreatic cystic neoplasm—is still frequently resected due to diagnostic uncertainty or clinical concerns. This multicenter study evaluates preoperative imaging findings and clinical factors leading to surgical intervention in patients with pathologically confirmed SCA.

METHODS AND MATERIALS

We retrospectively reviewed 82 patients (55 women; mean age 57.0 ± 13.9 years) who underwent surgical resection for SCA between 2018 and 2025 across multiple institutions. Clinical indications for surgery and preoperative CT and MRI features were assessed. Two abdominal radiologists independently reviewed tumor morphology, ductal involvement, and imaging characteristics that could mimic other pancreatic neoplasms.

RESULTS

Among the 82 patients, 45 (54.9%) underwent resection based on personal preference, 20 (24.4%) due to radiologic suspicion of other neoplasms, and 10 (12.2%) due to clinical symptoms, most commonly abdominal pain. Elevated CA19-9 (>37 U/mL) was observed in 14 patients (17.1%), contributing to diagnostic uncertainty. On CT, enhancing mural nodules were noted in 5 patients (6.1%), thickened enhancing cyst walls in 28 (34.1%), and main pancreatic duct (MPD) dilatation in 16 (19.5%). MRI showed mural nodules in 8 patients (9.8%), thickened cyst walls in 26 (31.7%), and MPD dilatation in 13 (15.9%). MPD communication and abrupt caliber change were seen in 8 (9.8%) and 7 (8.5%) on CT, and in 11 (13.4%) and 5 (6.1%) on MRI, respectively. Branch-duct IPMN was the most common imaging mimic, suspected in 39.0% of CT and 42.7% of MRI evaluations.

CONCLUSION

More than half of SCA resections were patient-initiated rather than driven by definitive clinical or radiologic indications. Imaging features mimicking other cystic neoplasms and elevated CA19-9 levels often contributed to surgical decisions. Radiologists play a crucial role in recognizing imaging features suggestive of benign SCA and communicating this possibility to referring clinicians. Where appropriate, suggesting imaging follow-up rather than immediate surgery may help reduce overtreatment.

CLINICAL RELEVANCE/APPLICATION

Improved characterization of pancreatic cystic lesions and radiologist-led communication can support shared decision-making and potentially avoid unnecessary surgical resections of benign entities like serous cystadenoma.

W5B-SPGI-15 APPLICATION OF MULTI-ECHO T2* MAPPING COMBINED WITH FLIS IN PREOPERATIVE LIVER FUNCTION ASSESSMENT OF SMALL HCC: COMPARATIVE ANALYSIS WITH DUAL SOURCE CT EXTRACELLULAR VOLUME FRACTION

Shao Peng Li II, DO (*Presenter*)
Ying Liu (*Abstract Co-Author*)
Dawei Yin (*Abstract Co-Author*)
Peng Wang (*Abstract Co-Author*)
Chen Xudan (*Abstract Co-Author*)

PURPOSE

Using the 15 minute indocyanine green retention rate (ICG R-15) as the reference standard, the diagnostic value of functional liver imaging score(FLIS) combined with T2* mapping for preoperative assessment of liver reserve function in small hepatocellular carcinoma (sHCC) was compared, and compared with the extracellular volume fraction(ECV) based on dual source CT equilibrium iodine map.

METHODS AND MATERIALS

A retrospective analysis was conducted on 72 patients with sHCC who had preoperative imaging findings between July 2022 and December 2024. All patients underwent Gd-EOB-DTPA-enhanced MRI and dua- source CT liver dynamic enhancement scan. Measure the R2 * values of normal liver tissue in the left, right anterior, and right posterior lobes of the liver using multi echo T2 * mapping sequences, and take the average value. Three features of the hepatobiliary phase were assessed: normal liver parenchyma, biliary system and portal vein signal intensity, and FLIS was calculated. Calculate ECV in the equilibrium iodine diagram: ECV(%)=ID liver ×(1-Hct (%))/ID aorta . All patients underwent ICG retention test and were divided into three groups (32 patients in group 1 <10%, 25 patients in group 2 10%-20% and 15 patients in group 3 =20%). Statistical analysis was conducted on the differences between three groups of normal liver R2* values, FLIS, and ECV.

RESULTS

The R2* values, FLIS, and ECV among the three groups were (39.73 ± 2.59) Hz, (45.78 ± 2.51) Hz, (57.45 ± 4.96) Hz; (4.75 ± 1.11), (3.56 ± 0.92), (1.53 ± 0.91); and (16.63 ± 5.42)%, (28.42 ± 2.88)%, (40.39 ± 4.74)%, respectively. The area under the ROC curve (AUC) for R2* values, FLIS, and ECV between Group 1 and Group 2 was 0.8916, 0.809, and 0.924, respectively, and between Group 2 and Group 3 was 0.891, 0.864, and 0.923. ECV demonstrated the strongest diagnostic performance among the three groups, followed by R2* values and FLIS. The combination of these parameters improved diagnostic efficacy (AUC: 0.921, 0.955).

CONCLUSION

FLIS and R2* values can accurately assess preoperative hepatic functional reserve in patients with sHCC. Their combined diagnostic efficacy is superior to that of dual-source CT-derived ECV. The multi-echo T2* mapping sequence offers shorter scan times, and its combination with hepatobiliary-phase FLIS effectively predicts hepatic functional reserve, demonstrating significant clinical value.

CLINICAL RELEVANCE/APPLICATION

Multi echo T2* mapping sequence combined with Gd-EOB-DTPA-enhanced mri can effectively predict liver reserve function without radiation.

W5B-SPGI-16 IMPROVEMENT OF IMAGE QUALITY OF ABDOMINAL DIFFUSION-WEIGHTED IMAGING WITH DEEP LEARNING RECONSTRUCTION

Kumi Ozaki, MD, PhD (*Presenter*)

PURPOSE

To assess image quality and apparent diffusion coefficient (ADC) values of DWI with compressed sense and model-based deep learning (DL) reconstruction (AICS-DWI) in the abdomen by comparing with DWI with compressed sense (CS-DWI).

METHODS AND MATERIALS

We retrospectively analyzed the 61 patients (23 men and 38 women, mean age, 65.0 years) who underwent abdominal DWI. We conducted both quantitative and qualitative evaluations to compare compressed AICS-DWI and CS-DWI. For the qualitative assessment, we visually evaluated the overall image quality, noise, contour, and distortion of the liver, pancreas, and spleen using a five-point scale. In the quantitative assessment, we measured the signal-to-noise ratio (SNR) and apparent diffusion coefficient (ADC) for the lateral, medial anterior, and posterior segments of the liver, pancreas, spleen, and paraspinal muscle. We then compared the qualitative and quantitative parameters between AICS-DWI and CS-DWI for each organ and across liver segments.

RESULTS

The mean image quality scores for liver and pancreas contours, distortion of the liver, image noise, and overall image quality were higher in AICS-DWI compared with CS-DWI ($p < 0.05$). SNR in AICS-DWI was higher than in CS-DWI ($p < 0.05$) other than the lateral segment. ADC values of AICS-DWI were significantly lower than those of CS-DWI ($p < 0.05$) in all organs. SNR and ADC values of the lateral segment were significantly different than those of other segments in CS-DWI and AICS-DWI ($p < 0.05$).

CONCLUSION

Model-based DL reconstruction technique enhanced both qualitative and quantitative aspects of image quality in abdominal DWI.

CLINICAL RELEVANCE/APPLICATION

Model-based deep learning reconstruction for abdominal diffusion-weighted imaging provides improved image quality with reduced noise and distortion while maintaining diagnostic accuracy, potentially enhancing lesion detection and characterization in clinical practice without requiring additional scan time.

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W5B-SPGU

Genitourinary Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPGU-3 DIAGNOSTIC VALUE OF MULTIPARAMETRIC MRI COMBINED WITH QUALITATIVE AND QUANTITATIVE FEATURES IN DETECTING VASCULAR WALL INVASION BY INFERIOR VENA CAVA TUMOR THROMBUS IN RENAL CELL CARCINOMA

Xuewei Wen (*Presenter*)
Haiyi Wang, MD (*Abstract Co-Author*)

PURPOSE

To evaluate the preoperative diagnostic value of multiparametric MRI combined with qualitative and quantitative features for detecting vascular wall invasion by inferior vena cava (IVC) tumor thrombus in renal cell carcinoma.

METHODS AND MATERIALS

This retrospective study analyzed 173 consecutive patients with renal carcinoma and inferior vena cava (IVC) tumor thrombus who underwent radical resection at our institution. Based on surgical and pathological findings, patients were divided into vascular wall invasion (n=73) and non-invasion (n=100) groups. Preoperative MRI evaluated quantitative parameters (tumor size, thrombus dimensions, ADC values, venous diameters) and qualitative features (thrombus-vessel wall relationship, wall integrity, luminal obstruction, morphology). Statistical analysis included t-tests/Mann-Whitney U tests for continuous variables and ?²/Fisher's tests for categorical variables. Significant predictors (P<0.05) were analyzed using logistic regression, with diagnostic performance assessed by ROC analysis and the DeLong test.

RESULTS

Univariate analysis showed significant intergroup differences in thrombus penetration, vascular wall irregularity, signal interruption, IVC obstruction, thrombus dimensions, and venous diameters (P<0.05). Logistic regression identified thrombus penetration (OR=11.40, 95%CI 1.85-14.73) and concomitant thrombosis (OR=17.34, 95%CI 1.45-12.47) as independent predictors. The combined model's AUC was 0.811 (95%CI 0.87-0.96), surpassing individual parameters (DeLong test, P<0.05).

CONCLUSION

The multiparametric MRI-based integrated diagnostic model effectively identifies IVC vascular wall invasion, with tumor thrombus protrusion and concomitant thrombosis serving as core predictive indicators.

CLINICAL RELEVANCE/APPLICATION

This study systematically evaluated subjective imaging features associated with inferior vena cava (IVC) wall invasion in renal cell carcinoma (RCC) to provide reliable preoperative imaging assessment criteria.

W5B-SPGU-4 DUAL-CONDITIONED DIFFUSION MODEL WITH ANATOMICAL GUIDANCE FOR PROSTATE DWI ARTIFACT CORRECTION

Inye Na, BS (*Presenter*)
Kyunghyun Sung, PhD (*Abstract Co-Author*)
Hyunjin Park (*Abstract Co-Author*)

PURPOSE

Geometric distortion in diffusion-weighted imaging (DWI) significantly impacts prostate MRI quality. We propose a dual-conditioned generative diffusion model (DeDistortNet) to correct geometric distortion in prostate DWI using anatomical guidance from T2-weighted images.

METHODS AND MATERIALS

A total of 328 DWI cases were utilized from the PROSTATEx dataset. Data were split at the patient level according to the degree of distortion. Training (n=135, 1,893 slices) and validation (n=4, 64 slices) sets included distortion-free samples, while cases with varying distortion levels: no distortion (243), mild (=2mm, 1,164), moderate (=4mm, 816), severe (=6mm, 298), and extreme (>6mm, 102), were used for testing (n=189, 2623 slices). Since obtaining paired undistorted-distorted DWI data is challenging, distortion was simulated using elastic deformation with Jacobian-based intensity adjustment focused on the peripheral and rectal area, anteroposterior axis scaling, rotation, and translation. DeDistortNet was trained with three-channel simulated distorted DWIs (b-values 50, 400, 800) and single-channel T2-weighted images. Structural conditioning was achieved using ControlNet with T2-weighted images, and contextual conditioning utilized distorted DWIs processed by a modified CLIP encoder. Performance was evaluated using the Dice similarity coefficient (DSC) between prostate masks from T2 and DWI, where the DWI masks were generated via a 2D nnUNet model trained on T2 prostate masks from the training set (distortion-free). A higher DSC thus indicates that DeDistortNet generates realistic DWIs aligned accurately with T2.

RESULTS

Baseline DSC declined with increasing distortion severity: No distortion (0.922±0.066), Mild (0.904±0.077), Moderate (0.875±0.072), Severe (0.828±0.091), Extreme (0.725±0.116). DeDistortNet significantly improved DSC: No distortion (0.924±0.076), Mild (0.923±0.079), Moderate (0.925±0.074), Severe (0.918±0.090), Extreme (0.929±0.064). Statistical tests showed significant baseline differences among severity groups ($p<0.001$), but no significant differences after correction ($p=0.929$). Pairwise comparisons with baseline no distortion were significant at baseline (all $p<0.001$) and non-significant after correction (all $p>0.01$), confirming effective correction comparable to baseline distortion-free levels.

CONCLUSION

DeDistortNet effectively corrects geometric distortion in prostate DWI through dual-conditioned diffusion modeling, enhancing anatomical alignment and realistic DWI features.

CLINICAL RELEVANCE/APPLICATION

AI-assisted DWI artifact correction has the potential to improve clinical decision-making by enhancing anatomical and contextual imaging information.

W5B-SPGU-5 OPTIMIZATION OF BREATH-HOLD 3D-GRASE MR UROGRAPHY: IMPACT OF TSE, EPI FACTORS AND TE ON IMAGE QUALITY AND SCAN EFFICIENCY

Jia Hao Chun (*Presenter*)

PURPOSE

To evaluate the technical advantages of breath-hold 3D gradient and spin-echo (BH-GRASE) MR urography using different combinations of turbo spin echo (TSE) factors, echo planar imaging (EPI) factors, and echo times (TE), and to compare these with conventional respiratory-triggered fast spin echo (RT-FSE) sequences in terms of image quality and scan time.

METHODS AND MATERIALS

This prospective study enrolled 44 patients who underwent MR urography between October 2023 and March 2024. Each patient was scanned using four different BH-GRASE protocol settings (varied TSE, EPI, and TE) and a standard RT-FSE MRU sequence. Quantitative metrics including scan time, signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) were analyzed. Qualitative assessments including image quality, artifact severity, and the visibility of bilateral ureters, renal pelvis, and bladder were rated using a 4-point Likert scale by two independent radiologists. Statistical analyses included Wilcoxon signed-rank test, paired t-test, and Kappa agreement testing.

RESULTS

Among the four BH-GRASE settings, the protocol with TSE:7, EPI:7, TE:105 (Group 3) demonstrated significantly superior SNR and CNR compared to Groups 1, 2, and 4 ($P<0.05$), with no significant difference from the conventional RT-FSE sequence. Group 3 achieved acceptable diagnostic quality within 19 seconds. Inter-reader agreement was good to excellent (Kappa = 0.758-0.813). The scan time for BH-GRASE sequences was significantly shorter than that for RT-FSE MRU (14-21s vs. 170-240s, $P<0.05$)

CONCLUSION

The optimized BH-GRASE MRU protocol (TSE:7, EPI:7, TE:105) enables high-quality 3D imaging of the urinary tract within a single breath-hold of less than 20 seconds, offering comparable diagnostic utility to RT-FSE while significantly reducing acquisition time. This technique is especially advantageous in patients with irregular breathing patterns or limited breath-hold capacity, supporting its routine clinical use in fast MR urography.

CLINICAL RELEVANCE/APPLICATION

The optimized breath-hold 3D-GRASE MR urography protocol (TSE:7, EPI:7, TE:105) significantly reduces scan time while maintaining comparable diagnostic image quality to conventional RT-FSE sequences. This rapid acquisition technique improves workflow efficiency and enhances patient tolerance, particularly in individuals with irregular or shallow breathing. It is clinically valuable for routine evaluation of urinary tract pathologies, enabling high-resolution imaging within a single breath-hold, and may reduce the need for repeated scans due to motion artifacts.

W5B-SPGU-6 MRI PARAMETERS PREDICTING PATHOLOGICALLY PROVEN PROGRESSION IN PROSTATE CANCER PATIENTS ON ACTIVE SURVEILLANCE

Siriluck Satonkiatngam, MD (*Presenter*)
Ida Sonni, MD (*Abstract Co-Author*)
Sophie Boeun (*Abstract Co-Author*)
Steven S. Raman, MD (*Abstract Co-Author*)

PURPOSE

To evaluate baseline multiparametric MRI (mpMRI) features associated with pathologically proven progression in prostate cancer patients on active surveillance

METHODS AND MATERIALS

We retrospectively reviewed 109 patients with low- and intermediate-risk prostate cancer (Gleason grade group 1-2) on active surveillance from 2011-2022. Pathological progression was defined as Gleason grade group upgrade on follow-up biopsy. Baseline imaging parameters—including prostate volume, lesion size, ADC value, dynamic contrast-enhanced (DCE) metrics (Ktrans, Kep, iAUC), PI-RADS T2 score, overall PI-RADS score, and UCLA scores—were assessed. Baseline PSA and PSA density were also collected. Univariable Cox proportional hazard regression was used to evaluate associations with progression. Harrell's C-statistic assessed discriminative performance

RESULTS

Fifty-nine patients (54.1%) had pathologically confirmed progression: 28.4% to grade group 2, 14.7% to group 2 and 3, and 11.0% to group 3. Median time to progression was 3.7 years (IQR 2.9-4.6). Higher baseline PI-RADS T2 score (HR 2.18, $p<0.001$), overall PI-RADS score (HR 2.67, $p<0.001$), and UCLA score (HR 2.21, $p<0.001$) were significantly associated with progression. PSA and PSA density were not significantly associated with progression. Overall PI-RADS and UCLA scores showed the strongest discriminative performance (C-statistics 0.66 and 0.62, respectively)

CONCLUSION

PI-RADS T2 score, overall PI-RADS score, and UCLA score on baseline MRI can help predict progression in patients on active surveillance

CLINICAL RELEVANCE/APPLICATION

Baseline MRI parameters can help identify patients at higher risk of progression who may benefit from closer imaging or biopsy surveillance during active surveillance

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W5B-SPHN

Head & Neck Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPHN-1 ARTIFICIAL INTELLIGENCE IN ULTRASOUND DETECTION OF MALIGNANT AND BENIGN THYROID NODULES, INSIGHTS FROM A UAE NATIONAL STUDY AND A SYSTEMATIC REVIEW

Abdulrahman Ali, BSc, MBBS (*Presenter*)
Shahd Alsalehi, MBBS (*Abstract Co-Author*)
Mohammad Al Homsi, MBBS (*Abstract Co-Author*)

PURPOSE

Thyroid nodules are common in the general adult population with up to 65% prevalence when detected via ultrasound. Fortunately, only around 10% are malignant. Given this low percentage, it is essential to properly classify thyroid nodules to avoid overdiagnosis. This study aims to explore the efficacy of Artificial intelligence (AI) in the diagnosis of thyroid nodules on ultrasound using both primary and secondary research methodologies.

METHODS AND MATERIALS

We conducted a systematic review of articles employing AI to classify thyroid nodules as benign or malignant on ultrasound. Utilizing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and appropriate keywords, we searched for original articles from PubMed and Scopus published between 2018 and 2024. The performance metrics (such as sensitivity and specificity) of the AI algorithms were pooled, and their accuracy was compared with fine-needle aspiration (FNA) biopsy (the presumed gold standard). Additionally, we developed a custom AI tool that leverages deep learning neural networks and Support Vector Machines (SVM) to classify thyroid nodule ultrasound images as benign or malignant. This tool was trained and validated using a locally curated dataset from UAE hospitals, utilizing FNA results as the ground truth.

RESULTS

A total of 25 articles satisfied the inclusion and exclusion criteria, of which 90% were retrospective studies. The sample size of the studies ranged between 110 patients with 122 nodules and 8,339 Patients with 18,049 nodules. 80% of the AI models used were deep learning algorithms of which convoluted neural networks were the most common. Most of the articles reported accuracy, sensitivity, specificity and AUC using FNA results as the gold standard. The performance ranged from approximately 0.837 to 0.99 for AUC, 74.0 to 94.8% for accuracy, 67.5 to 98.8% for sensitivity and 52.0 to 95% for specificity. Our tool demonstrated improved sensitivity and comparable specificity when applied to the UAE dataset.

CONCLUSION

AI classification of thyroid nodules on ultrasonography showed good concordance with FNA results. Limitations included employing black-box models with limited explainability and external validation. In contrast, our locally developed AI tool demonstrated reliable performance on the UAE dataset, emphasizing the importance of context-specific model training.

CLINICAL RELEVANCE/APPLICATION

We are addressing the critical need to assess AI's potential to enhance diagnostic accuracy and improve patient outcomes. Additionally, we tackle the challenge of context-relevant modeling by developing a UAE-specific AI tool, enhancing both performance and explainability in regional healthcare settings.

W5B-SPHN-2 EFFICACY OF MULTIPARAMETRIC MRI WITH MR FINGERPRINTING FOR DIFFERENTIATING BENIGN AND METASTATIC CERVICAL LYMPH NODE IN HEAD AND NECK SQUAMOUS CELL CARCINOMA

Jimin Kim, MD (*Presenter*)
Se Won Oh, MD, PhD (*Abstract Co-Author*)
Ha Young Lee (*Abstract Co-Author*)
Moon Hyung Choi, MD (*Abstract Co-Author*)
Min Kyoung Lee, MD (*Abstract Co-Author*)
Dongyeob Han, PhD (*Abstract Co-Author*)
Heiko Meyer (*Abstract Co-Author*)

PURPOSE

To evaluate the efficacy of quantitative multiparametric magnetic resonance imaging (MRI), including MR fingerprinting (MRF), diffusion-weighted imaging (DWI), and dynamic contrast-enhanced (DCE) imaging, in differentiating benign from metastatic lymph nodes (LN) in head and neck squamous cell carcinoma (HNSCC).

METHODS AND MATERIALS

Seventeen patients (mean age: 64 ± 17 years, range: 32-94) with pathologically confirmed HNSCC and cervical LNs, who underwent multiparametric 3T MRI, including MRF, DWI, and DCE were retrospectively analyzed. Three neuroradiologists evaluated the mean T1 and T2 values from MRF, apparent diffusion coefficient (ADC) from DWI, and K trans , K ep , v e , and iAUC from DCE in the LNs. An independent t-test was performed to compare parameters between benign and metastatic LNs. Logistic regression analysis was conducted to evaluate associations with LN metastasis and assess model performance. The diagnostic performance of models with and without MRF parameters was compared.

RESULTS

Among the 17 patients, 23 metastatic LNs and 21 benign LNs were pathologically confirmed. Metastatic LNs exhibited significantly higher T1 and T2, whereas ADC, K trans , v e , and iAUC were significantly lower. T1 (odds ratio [OR]: 1.003 [95% CI: 1.001-1.005], P < 0.001), T2 (OR: 1.06 [95% CI: 1.01-1.10], P = 0.014), ADC (OR: 0.998 [95% CI: 0.997-1.00], P = 0.001), and K trans (OR: 0.001 [95% CI: 0.00-0.10], P < 0.001) demonstrated significant associations with LN metastasis and were incorporated into the regression model. Incorporating MRF parameter into the regression model significantly increased accuracy (from 0.73 [95% CI: 0.64-0.81] to 0.83 [95% CI: 0.77-0.91], P = 0.048) and specificity (from 0.68 [95% CI: 0.55, 0.79] to 0.83 [95% CI: 0.71, 0.91], P = 0.002).

CONCLUSION

Multiparametric MRI parameters, including MRF, DWI, and DCE, showed significant differences between benign and metastatic LNs in HNSCC. The incorporation of MRF improved the diagnostic performance of the regression model for detecting metastatic LNs.

CLINICAL RELEVANCE/APPLICATION

This study evaluates quantitative multiparametric MRI techniques—MRF, DWI, and DCE imaging—for differentiating benign vs. metastatic LNs in HNSCC.

W5B-SPHN-3 VALUE OF CLASSIFICATION OF VOCALFOLD DEFORMATIONONDYNAMIC CTIN PATIENTS WITH HOARSENESS AFTER SARS-COV-2 INFECTION

Yong Wang, MD (*Presenter*)
Ziying Lin (*Abstract Co-Author*)
Guanbin Zhu Guanbin Zhu (*Abstract Co-Author*)
Dairong Cao, MD (*Abstract Co-Author*)

PURPOSE

To preliminarily investigate the value of the dynamic laryngeal CT manifestations in assessing the laryngeal nerve damage and the treatment effectiveness, in patients experiencing hoarseness following SARS-CoV-2 infection.

METHODS AND MATERIALS

In this prospective cohort study, consecutive participants were enrolled between September 2020 and March 2024. All participants with hoarseness following SARS-CoV-2 infection underwent dynamic throat CT scans. Based on classification criteria that assess morphological and positional changes of the vocal fold on both the maximum open and minimum closed phase images, vocal fold deformation types were categorized into three types (I-III). LEMG with interval less than 2 days was performed to determine the laryngeal nerve damage. Non-parametric tests and chi-square tests were used for univariate analyses. Kappa tests were used for consistency analyses. Linear regression was used to fit the data.

RESULTS

A total of 29 participants (Median age, 42 years; 13 men) were included. There was a high consistency between Type III and posterior cricoarytenoid muscle (PCA) injury ($k = 0.615$, $p = 0.001$) or multiple nerve branch injuries ($k = 0.692$, $P < 0.001$). Type II vocal fold deformation patients had significantly shorter recovery time than type III (2.0 vs 4.0 months, $P = .008$). Recovery time greater than 3 months was more common in type III than type II (8.0 vs 3.0 months, $P = .039$).

CONCLUSION

In patients experiencing hoarseness following SARS-CoV-2 infection, the Classification of vocal fold deformation based on dynamic CT exhibits potential value in evaluating the laryngeal nerve damage and predicting the treatment effect.

CLINICAL RELEVANCE/APPLICATION

1.Vocal fold paralysis occurs frequently following SARS-CoV-2 infection;2.The Classification of vocal fold deformation based on dynamic laryngeal CT could assess the laryngeal nerve damage and the treatment effectiveness;3.There was a high consistency between Type III vocal fold deformation and multiple nerve branch injuries. Type II vocal fold deformation patients had significantly shorter recovery time than type III.

W5B-SPHN-4 ROLE OF ASYMMETRIC ANTERIOR MOVEMENT OF THYROID CARTILAGE IN 4D CT IN THE DIAGNOSIS OF UNILATERAL SUPERIOR LARYNGEAL NERVE INJURY: A CASE-CONTROL STUDY

Ziying Lin (*Presenter*)
Yong Wang, MD (*Abstract Co-Author*)
Guanbin Zhu Guanbin Zhu (*Abstract Co-Author*)

PURPOSE

To explore the role of asymmetric anterior movement of thyroid cartilage (AAM) in 4D CT in the diagnosis of unilateral superior laryngeal nerve (SLN) injury.

METHODS AND MATERIALS

In this retrospective study, eligible for inclusion were consecutive patients with suspected SLN injury who underwent 4D CT between March 2021 and August 2024 in our hospital. Patients were divided into group A (combined injury of unilateral SLN and recurrent laryngeal nerve (RLN)), group B (isolated unilateral RLN injury), and group C (neither SLN nor RLN injury). The reference standard is laryngeal electromyography. Patients were asked to make "Yi" sound during CT scanning of the larynx with cine mode. The optimal closing phases of glottis were selected. Multiplanar reconstruction of CT images based on cricoid cartilage was performed. The distance between posterior border of cricoid cartilage and inferior posterior border of right thyroid lamina (IR), superior posterior border of right thyroid lamina (SR), inferior posterior border of left thyroid lamina (IL) and superior posterior border of left thyroid lamina (SL) were measured. The difference between IR and IL (DI), the difference between SR and SL (DS), and global asymmetry (GA), which was define as (IR-IL+SR-SL)/2, were calculated to evaluate AAM. Kruskal-Wallis test was used to analyze the statistical differences among three groups. The area under the receiver operating characteristic curve (AUC) and accuracy were used to evaluate the performance.

RESULTS

A total of 169 patients were enrolled, including 50 consecutive patients in group A, 59 random patients in group B, and 60 consecutive patients in group C. The DI of group A was significantly higher than that of group B ($p=0.048$) and group C ($p=0.004$). The DS in group A was significantly higher than that of group C ($p=0.007$). The AUC of DI and DS for diagnosing SLN injury was 0.655 (95% CI: 0.561, 0.749) and 0.641 (95% CI: 0.546, 0.737). With cut-off of 2.0mm and 2.5mm, the accuracy of DI and DS for diagnosing SLN injury was 0.734 (95% CI: 0.662, 0.795) and 0.704 (95% CI: 0.631, 0.768). For group A, anterior movement of superior and inferior border of thyroid lamina of the unaffected side was more significant than that of the affected side ($p < 0.001$). The AUC of GA for identifying affected side in unilateral SLN injury was 0.829 (95% CI: 0.713, 0.946), and the accuracy was 0.780 (95% CI: 0.648, 0.873).

CONCLUSION

AAM in 4D CT is a sign of unilateral SLN injury. Anterior movement of thyroid lamina of the affected side is reduced compared to the unaffected side.

CLINICAL RELEVANCE/APPLICATION

SLN innervates cricothyroid muscle, which pulls the thyroid cartilage downward and forward. 4D CT may serve as a noninvasive method for unilateral SLN injury diagnosis and identification of the affected side.

W5B-SPHN-5 NEW THYROID IMAGING REPORTING AND DATA SYSTEM (TI-RADS) BASED ON ULTRASONOGRAPHY FEATURES FOR FOLLICULAR THYROID NEOPLASMS: A MULTI-CENTER STUDY

Yi Feng Zhang, MD, PhD (*Presenter*)

PURPOSE

Preoperative diagnosis of follicular thyroid neoplasm (FTN) is difficult and the current ultrasound risk stratification systems (RSSs) for thyroid nodule are not suitable for FTN. Therefore, this study aimed to establish a new RSS for FTN as useful preoperative evaluation to reduce missed diagnoses and unnecessary biopsies.

METHODS AND MATERIALS

535 FTNs from four hospitals were included in this retrospective study. All the nodules were randomly divided into test and validation group. The ultrasonography features of each nodule were analyzed. TI-RADS of FTN (FTN-TIRADS) was established based on the results of univariate analysis and logistic regression of ultrasonography features. Each nodule was evaluated and classified by these four RSSs (RSS from European Thyroid Association [EU-RSS], RSS from American Thyroid Association [ATA-RSS], TIRADS from American College of Radiology [ACR-TIRADS], TIRADS from Chinese [C-TIRADS]) and FTN-TIRADS, respectively. ROC curve and the AUC was used to evaluate the diagnostic value of the RSSs mentioned above. The unnecessary rates of FNA were calculated and compared between FTN-RIRADS and the other four RSSs.

RESULTS

Test group and validation group included 370 patients (86 male patients) and 165 patients (48 male patients). The following ultrasonography features were independent risk factor and included into FTN-TIRADS: nodule composition, echogenicity, calcifications, halo sign, indistinct boundary with thyroid capsule. Nodules were classified as TR2, TR3, TR4a, TR4b, TR4c and TR5 with none to five suspicious features mentioned above respectively. The AUC of FTN-TIRADS was 0.855, statistically higher than EU-RSS, ATA-RSS, ACR-TIRADS and C-TIRADS (0.759, 0.759, 0.753, 0.677, respectively) (all $p<0.05$). The unnecessary FNA rate of the FTN-TIRADS was 41.4%, which was significantly lower than that of EU-RSS (67.3%), ATA-RSS (69.0%), ACR-TIRADS (60.1%) and C-TIRADS (63.2%).

CONCLUSION

FTN-TIRADS achieved better differential diagnosis of FTN than current RSSs and significantly reduced the rate of unnecessary FNA. It can serve as a reliable preoperative non-invasive assessment tool for thyroid follicular tumors, reducing unnecessary FNA and unnecessary surgeries.

CLINICAL RELEVANCE/APPLICATION

Our study established a new risk stratification system (FTN-TIRADS) based on ultrasound features for thyroid follicular tumors. FTN-TIRADS with good inter-observer agreement demonstrated significantly improve the diagnostic accuracy of FTC compared with the current thyroid nodule risk stratification systems. FTN-TIRADS has great potential for preoperative diagnosis of FTNs and significantly reduce the rate of unnecessary FNA.

W5B-SPHN-6 DIAGNOSTIC VALUE OF VIRTUAL UNENHANCED DUAL-ENERGY CT FOR PAROTID GLAND LESIONS: A PRELIMINARY STUDY

Hongying HU (*Presenter*)
Meng You (*Abstract Co-Author*)

PURPOSE

To determine whether virtual unenhanced (VUE) images reconstructed from dual-energy CT (DECT) can replace true unenhanced (TUE) images in dual-phase parotid CT and to assess the added diagnostic value of quantitative iodine concentration and effective atomic number (EAN).

METHODS AND MATERIALS

This retrospective study enrolled 71 consecutive patients with pathologically confirmed parotid lesions who underwent DECT. The cohort comprised 24 pleomorphic adenomas, 11 Warthin tumors, four cysts, four malignant tumors, and 28 other lesions. Imaging included a TUE acquisition followed by early (30 s) and delayed venous (120 s) phases. VUE images were generated from early-phase data. Hounsfield units (HU) for each lesion and for normal parotid parenchyma were recorded on TUE and VUE images; early- and delayed-phase enhancement (?HU) as well as iodine concentration (mg I/mL) and EAN were measured on spectral maps. Paired t tests compared VUE and TUE values; one-way analysis of variance evaluated differences among lesion types.

RESULTS

VUE and TUE HU were highly correlated ($r > 0.95$) with a mean lesion-level difference of 1.8 ± 2.1 HU ($P > 0.05$). Enhancement curves derived with VUE or TUE baselines were concordant and differed significantly by histology ($P < 0.05$). Warthin tumors demonstrated marked early enhancement (mean ?HU + 40) and subsequent washout (-12), pleomorphic adenomas showed progressive uptake (+26 early, +14 delayed), and cysts exhibited minimal change (+8, +2). Warthin tumors had higher arterial iodine concentration (1.36 ± 0.18 vs 1.02 ± 0.14 mg I/mL) and higher EAN (8.23 ± 0.11 vs 7.96 ± 0.10) than pleomorphic adenomas ($P < .05$ for both). Malignant tumors overlapped benign lesions in EAN but were distinguishable by their enhancement kinetics.

CONCLUSION

VUE images provide attenuation and enhancement information equivalent to TUE images, enabling omission of the non-contrast scan in dual-phase parotid DECT without loss of diagnostic accuracy. Quantitative spectral parameters, especially iodine concentration and EAN, further improve lesion differentiation, particularly for identifying Warthin tumors.

CLINICAL RELEVANCE/APPLICATION

This study confirms virtual unenhanced (VUE) dual-energy CT reliably replaces true unenhanced scans in parotid lesion evaluation, eliminating unnecessary radiation while preserving diagnostic accuracy. Combined with quantitative iodine mapping and characteristic washout kinetics, this protocol optimizes preoperative differentiation of Warthin tumors from other lesions.

W5B-SPHN-7 FATTY ACID COMPOSITION OF ADIPOSE TISSUE EVALUATED BY MRI IN CRANIOFACIAL LOCALIZED SCLERODERMA PATIENTS

Tianjiao Wang (*Presenter*)
Yun Wang (*Abstract Co-Author*)
Yu Chen, MD (*Abstract Co-Author*)
Zhuhua Zhang (*Abstract Co-Author*)
Jiuzuo Huang (*Abstract Co-Author*)
Xuda Ma (*Abstract Co-Author*)
Huadan Xue, MD (*Abstract Co-Author*)

PURPOSE

To investigate the fatty acid levels of the grafted fat after autologous fat grafting during the adipose tissue recovery in craniofacial localized scleroderma patients.

METHODS AND MATERIALS

21 patients who were clinically diagnosed as craniofacial localized scleroderma were retrospectively enrolled. All patients underwent autologous fat grafting surgery and MRI scanning 7 days and 12 months after surgery. MRI sequences included 3D T1WI-Dixon fat imaging and gradient-echo spectroscopic imaging (GSI). The signal and volume of autologous fat graft were evaluated in 3D T1WI-Dixon fat imaging. Voxel-wise spectral analysis of fatty acids was applied to measure relative portions of monounsaturated (MUFA), polyunsaturated (PUFA), and saturated fatty acids (SFA) in each voxel. The voxels within the autologous fat graft were measured and their fatty acid fractions were assessed in each MRI scanning.

RESULTS

21 patients which included 8 males and 13 females were collected in this study. The signal and volume of autologous fat graft in 12 months were significantly lower than 7 days after surgery (all $p<0.001$). MUFA and PUFA were measured 7 days postoperation (MUFA: 15.23± 2.85, PUFA: 75.46± 11.39) and then decreased at 12 months after surgery (MUFA: 8.42± 3.67, PUFA: 46.69± 15.21, both $p<0.001$). SFA were measured 7 days postoperation (19.12± 6.44) and then increased at 12 months after surgery (53.79± 7.59, $p<0.001$).

CONCLUSION

GSI method could quantify the fatty acid composition in craniofacial localized scleroderma patients. Higher SFA and lower signal and volume of autologous fat graft, MUFA, and PUFA may be used to assess the disease development and progress.

CLINICAL RELEVANCE/APPLICATION

3D T1WI-Dixon fat imaging combined with gradient-echo spectroscopic imaging could evaluate the change of adipose tissue and fatty acid levels during the adipose tissue recovery in craniofacial localized scleroderma patients.

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W5B-SPIN

Imaging Informatics Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPIN-2 AUTOMATED CHEST CT PROTOCOL SELECTION USING LARGE LANGUAGE MODEL FEATURES BASED ON FREE-TEXT IMAGING REQUESTS

Farzad Khalvati, PhD, MSc (*Presenter*)
Zahra Hosseini (*Abstract Co-Author*)
Sean Carey (*Abstract Co-Author*)
Patrik Rogalla, MD, MBA (*Abstract Co-Author*)

PURPOSE

Accurate and timely Computed Tomography (CT) protocol selection is critical for ensuring diagnostic quality and patient safety. However, the current selection process is manual, time-consuming, and prone to inconsistencies. Prior Machine Learning-based selection methods using keywords or bag-of-words lack contextual understanding and perform poorly on rare protocols. We propose a decision support system that uses a large language model (LLM) features to recommend protocols based on free-text clinical indications. LLMs capture clinical nuance and phrasing variation, which can be leveraged to support more consistent and efficient CT protocol selection.

METHODS AND MATERIALS

In this REB-approved retrospective study, 285123 historical chest CT imaging requests from a large academic medical center, received between 2017 and 2024, were used. The dataset was split into a training set (228099 imaging requests, 80%) and a held-out test set (57024 imaging requests, 20%). Each request included procedure names, clinical indication, Hospital Information System (HIS) comments, and the clinically selected imaging protocol. Clinical text from imaging requests were embedded using a finetuned LLM, namely Meta's LLaMA-3. These features served as input to a logistic regression classifier trained to predict protocol labels, which included 18 protocols (e.g., Pulmonary Embolism (PE), Low Dose CT (LDCT), etc.).

RESULTS

The proposed LLM-based pipeline achieved a weighted precision of 0.84, weighted F1-score of 0.81, and an overall accuracy of 79% across 18 CT protocols. Compared to a bag-of-words logistic regression baseline, the LLM model improved per-protocol accuracy for most classes. Notable gains were observed for Trauma - Chest (0.10 ? 0.70), Trachea (0.0 ? 0.80), and SVC occlusion (0.0 ? 0.80), all of which were low-frequency classes. Common protocols such as PE and LDCT maintained high accuracy (0.91 and 0.90, respectively).

CONCLUSION

An LLM-based protocol recommendation system can effectively leverage general knowledge obtained from a large corpus of natural text, enabling our method to accurately assign chest CT protocols based on free-text imaging requests. LLMs may serve as a viable foundation for protocol recommendation tools when inputs consist of free-text and require language understanding for inference.

CLINICAL RELEVANCE/APPLICATION

The proposed system supports a consistent and accurate chest CT protocol recommendation, helping to reduce variability and the cognitive burden placed on radiologists. By automating a repetitive and error-prone task, the system helps reduce the mental load on radiologists and contributes to safer, more standardized imaging workflows.

W5B-SPIN-3 VISION-LANGUAGE FOUNDATION MODELS FOR RADIOLOGY: COMPARATIVE ANALYSIS OF CLASSIFICATION AND SEGMENTATION PERFORMANCE

Frank Li, PhD (*Presenter*)
Hari Trivedi, MD (*Abstract Co-Author*)
Bardia Khosravi, MD, MPH (*Abstract Co-Author*)
Theodorus Dapamede, MD, PhD (*Abstract Co-Author*)
Seyed Mohammadreza Chavoshi, MD (*Abstract Co-Author*)
Abdulhameed Dere (*Abstract Co-Author*)
Rohan Satya Isaac (*Abstract Co-Author*)
Aawez Mansuri, BS, MS (*Abstract Co-Author*)
Janice M. Newsome, MD (*Abstract Co-Author*)
Saptarshi Purkayastha, PhD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)

PURPOSE

Foundation models, developed through self-supervised learning on extensive datasets, offer promising advances for AI in healthcare. Vision-language models (VLMs) face limitations when trained on insufficient text descriptions from radiology reports, potentially leading to representation collapse and difficulty distinguishing similar cases. This research evaluates three foundation models (RAD-DINO, CheXagent, and BiomedCLIP) on pneumothorax segmentation and classification tasks to assess their ability to capture fine-grained imaging features.

METHODS AND MATERIALS

We evaluated three VLMs on the SIIM-ACR Pneumothorax dataset, extracting both patch and global [CLS] embeddings. For segmentation, we used linear probing with patch embeddings and developed a custom segmentator integrating both embedding types through cross-attention. Classification was performed using linear probing on [CLS] embeddings. Performance was evaluated using Dice coefficient, IoU, AUROC, and AUPRC metrics with statistical significance assessment.

RESULTS

In segmentation tasks, RAD-DINO (Dice=0.257; IoU=0.179) and CheXagent (Dice=0.293; IoU=0.204) performed similarly with linear probing (non-significant difference), but RAD-DINO (Dice=0.424; IoU=0.312) achieved superior results with our custom segmentator. For classification, CheXagent (AUROC=0.955; AUPRC=0.955) demonstrated exceptional performance, outperforming both RAD-DINO (AUROC=0.916; AUPRC=0.905) and BiomedCLIP (AUROC=0.860; AUPRC=0.859). BiomedCLIP showed the lowest baseline performance (Dice=0.084; IoU=0.054) in segmentation but exhibited the most substantial relative improvement with our custom segmentator (Dice=0.250; IoU=0.171). Our cross-attention mechanism consistently improved segmentation performance across all models, with qualitative results showing more precise pneumothorax boundary delineation.

CONCLUSION

Our findings demonstrate that pre-training methodology significantly influences foundation model performance on specific downstream tasks. Image-based self-supervised models (RAD-DINO) excel in fine-grained segmentation, while text-supervised models (CheXagent) show superior classification performance. Our approach integrating global context with local features through cross-attention consistently enhanced segmentation performance, suggesting an important architectural consideration for future medical imaging AI systems requiring precise anatomical delineation.

CLINICAL RELEVANCE/APPLICATION

Foundation models are the next frontier for AI in radiology. Our findings provide implications for the optimal selection of AI foundation models in healthcare, highlighting one size doesn't fit all.

W5B-SPIN-4 EVALUATING THE ADEQUACY OF SEGMENT EVERYTHING MODELS VERSUS CUSTOM ORGAN-SPECIFIC MODELS FOR OPPORTUNISTIC CT SCREENING

Dvij Sharma (*Presenter*)
Lukas Mueller, MD, PhD (*Abstract Co-Author*)
Yunju Ha (*Abstract Co-Author*)
Alexandra Wong, BS (*Abstract Co-Author*)
Benjamin Rush (*Abstract Co-Author*)
Ronald M. Summers, MD, PhD (*Abstract Co-Author*)
Perry J. Pickhardt, MD (*Abstract Co-Author*)
John W. Garrett, PhD (*Abstract Co-Author*)

PURPOSE

Deep learning-based methods have shown promise in opportunistic screening by extracting valuable biomarkers from existing CT data based on segmentations of key organs and tissues. Accurate segmentation remains essential for biomarker prediction, yet most validated tools for opportunistic screening use custom, organ-specific segmentation models. This study evaluates whether a "Segment Everything" model (TotalSegmentator) is as good as bespoke, organ-specific models for organ segmentation for opportunistic screening.

METHODS AND MATERIALS

In-house developed models were compared to TotalSegmentator for kidney, liver, and spleen segmentation in 8,930 abdominal CT scans, and statistical differences in biomarker prediction were analyzed. A reader study was also performed with 150 selected cases: 40% (60 cases) with similar biomarkers (volume and density) across all organs, and 60% (90 cases) with significant differences in at least one biomarker for the kidney, liver, or spleen. A radiologist assessed segmentation quality (blinded to segmentation method) for each organ on a 1-5 Likert scale in a two-phase design: cases segmented by each tool were randomly assigned to be read in Phase 1 and the other in Phase 2, with a two-week washout period.

RESULTS

Wilcoxon signed-rank testing showed statistically significant differences in both volume and density prediction between the in-house and TotalSegmentator models ($P < 0.001$ for all three organs). Likert scores from the reader study were then analyzed, with the TotalSegmentator consistently scoring higher per radiologist evaluation (means: 4.39 vs 3.62 for liver, 4.80 vs 3.16 for kidney, and 4.47 vs 3.79 for spleen). Wilcoxon signed-rank testing confirmed that differences in reader study medians (5.00 vs 3.00 for kidney, 5.00 vs 4.00 for spleen, and 5.00 vs 4.00 for liver) were statistically significant, with the greatest difference observed in kidney segmentation ($W = 44.0$, $P < 0.001$ for kidney, $W = 592.0$, $P < 0.001$ for spleen, $W = 458.0$, $P < 0.001$ for liver).

CONCLUSION

Significant differences in model performance, backed by radiologist evaluations favoring the TotalSegmentator model, indicate that the TotalSegmentator model consistently outperforms its organ-specific counterparts, providing better clinical segmentation quality.

CLINICAL RELEVANCE/APPLICATION

We show the utility of using segment-everything models (i.e. TotalSegmentator) as an alternative to single-organ segmentation methods for clinically accurate abdominal CT segmentation. Incorporating segment-everything models into a suite of automated tools may then allow for more accurate detection of lesions, either directly or by allowing greater accuracy in prediction of lesion-related biomarkers like organ volume and density.

W5B-SPIN-5 PATIENT EVALUATION OF HUMAN VS. GPT-GENERATED ANSWERS: A MULTICENTRIC RANDOMIZED MIXTED DESIGN TRIAL IN RADIOPROTECTION COMMUNICATION

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PURPOSE

Understanding radiation-related risks can be challenging for non-radiology professionals and patients, who increasingly seek information on the internet. A recent study compared ChatGPT-3.5-generated with human-generated answers to patient radiation protection frequently asked questions. Twelve international experts found no significant differences in satisfaction, accuracy, or comprehensibility between the two sources. A key limitation of the research was the absence of actual patient perspectives. Hence, in this study we assess patients' evaluation of ChatGPT information about radiation protection compared with the human-generated information.

METHODS AND MATERIALS

Patients from three institutions in Europe, Asia, and USA, blinded to the source, assessed both human-generated and ChatGPT v3.5-generated response for the same frequently asked radiation protection question, randomly allocated to five question sets (Q1-Q5) in a 1:1:1:1:1 ratio. Four outcomes based on QUEST framework were rated on a Likert scale (1 No; 7 Yes): satisfaction; trust; reassurance; comprehension. Data were analyzed using an ART ANOVA to address Likert scale non-normality, with the model: Likert score ~ author × question + (1 | participant_id), selected based on AIC/BIC.

RESULTS

The survey was completed by 328 participants. Sex and age distribution was balanced across countries. ChatGPT responses scored higher than human responses for satisfaction (median 6, IQR 5-7 vs median 5, IQR 3-7), trust (median 6, IQR 4-7 vs median 5, IQR 3-7), reassurance (median 6, IQR 4-7 vs median 5, IQR 3-7), but not for comprehension (median 7, IQR 5-7 vs median 7, IQR 5-7). ChatGPT's superiority was statistically significant for satisfaction ($F=24.63$, $p<0.001$) trust ($F=30.7$, $p<0.001$) and reassurance ($F=21$, $p=0.003$), while no difference was found in comprehension ($F=1.9$, $p>0.17$).

CONCLUSION

Unlike radiology professionals, patients preferred AI-generated texts for satisfaction, trust and reassurance. The divergence between patient and professional preferences underscores the need to tailor radiation risk communication strategies to the audience's perspective, potentially enhancing clarity and engagement.

CLINICAL RELEVANCE/APPLICATION

ChatGPT may support public communication. Expert-guided chatbots can reduce potential communication errors of misleading information generated by unsupervised large language models informing patient-tailored communication in radiation protection.

W5B-SPIN-6 SELFI MRI IDENTIFIES MACROPHAGES AND IMMUNOSUPPRESSIVE BIOLOGICAL FEATURES THAT CONTRIBUTE TO THERAPEUTIC RESISTANCE

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Cymon N. Kersch, MS (*Abstract Co-Author*)

PURPOSE

Gadolinium (Gd) enhanced MRI is the standard of care for monitoring glioblastoma. Tumor-associated macrophages (TAMs), specifically M2 polarized macrophages play a major role in tumor progression. The use of Ferumoxytol (Fe) as an off-label contrast agent allows for the localization of TAMs and allows for quantitative metrics to be determined. Segregation and Extravascular Localization of Ferumoxytol Imaging (SELFI) is computational metric which determined if Fe signal change is in the vasculature or the tumor itself. We sought out to determine how SELFI values vary with Gd contrast in various biopsy sites from the tumor and adjacent peritumoral regions.

METHODS AND MATERIALS

This prospective study included seven patients with glioblastoma. Each patient underwent Gd and 24-hour delayed Fe (7 mg/kg up to 510 mg) enhanced MRI allowing for image guided biopsy based on Gd enhancement and FLAIR hyperintensity. At the time of tumor resection, a total of 62 biopsies (volume = 75 mm^3) from known imaging locations were taken. A contour mask was drawn at the biopsy site. Calculating SELFI values in the voxels contained in the contoured mask follow the methods outlined by Barajas, et. al. (doi: 10.3174/ajnr.A6600).The Positive SELFI values represent the extravascular component of the metric. The Negative SELFI values represent the intravascular component which is believed to be analogous to Relative Cerebral Blood Volume (rCBV). rCBV was derived from the steady state (ss)-images from Fe contrast and a known metric to determine the volume of blood in a specific region normalized to contralateral white matter.

RESULTS

Seven patients provided 62 image guided tissue samples with sufficient quality to evaluate the relationships between MRI features and SELFI value. For Gd based MRI, biopsy samples that were enhancing show significantly elevated rCBV ($p < 0.05$) and SELFI Positive ($p < 0.01$) values. No difference was observed in SELFI Negative by sample location.

CONCLUSION

Gd alone cannot discern extravascular or intravascular contrast presence but Fe contrast can lend additional insight into macrophage migration in the tumor immune microenvironment. SELFI Positive, the extravascular, immune component of SELFI differs by enhancement but while the intravascular component of SELFI, SELFI Negative, does not. There is a need to further biologically quantify what SELFI Negative represents which can be analyzed histologically. The next step for SELFI Positive is to confirm the immune signature with spatially resolved RNA-seq analysis to find out exactly what these metrics biologically represent.

CLINICAL RELEVANCE/APPLICATION

Quantitative MRI with genomic analysis will help better map the heterogeneity of the tumor immune microenvironment.

W5B-SPIN-7 STANDARD OF CARE, VARIABILITY EVERYWHERE: HETEROGENEITY OF MRI ACQUISITION AND DOCUMENTATION ACROSS MULTI-INSTITUTIONAL NEURO-ONCOLOGY TRIALS

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PURPOSE

Upstream variability in imaging data can impact clinical trial measurements and utility of emerging tools such as AI. The purpose of this study is to assess the current state of standard-of-care (SOC) imaging and to evaluate the impact of the Brain Tumor Imaging Protocol (BTIP) on improvements to MRI acquisition heterogeneity and metadata consistency across multi-institutional neuro-oncology trials.

METHODS AND MATERIALS

DICOM metadata —including sequence, plane, acquisition type (2D/3D), slice thickness, field strength—were analyzed from 2 multicentered brain metastasis trials (NCCTG N0574 (pre-BTIP, n˜1910 series) and NCCTG N107C (post-BTIP, n˜7047 series). DICOM metadata were curated through manual review and automatic filtering. Differences were evaluated using t-tests, Kolmogorov-Smirnov (KS) tests, and Levene's tests.

RESULTS

Substantial heterogeneity persisted despite BTIP implementation. For axial post-contrast T1w scans, slice thickness ranged from 0.9-6 mm, with only ~23% acquired using 3D sequences (t-test $p < 0.0001$). Discrepancy between series description and DICOM metadata on contrast administration increased from 4% to 14% post-BTIP. In sagittal pre-contrast T1w scans, 3D acquisitions (as required by BTIP) were rare: only 19/119 (16%) pre-BTIP and 23/436 (5%) post-BTIP. Series naming was highly variable with 58 vs. 89 unique axial T1w descriptors pre- vs post-BTIP. Manual vs. automated curation of axial post-contrast T1w scans both revealed persistent heterogeneity across field strengths and acquisition types. Manual curation identified significant slice thickness differences at 1.5T 2D (t-test $p = 1.6\times10?^{15}$; KS $p = 6.2\times10?^{21}$) and 1.5T 3D (t-test $p = 1.0\times10?7$; KS $p = 2.2\times10?8$). Automated curation showed similarly significant differences at 1.5T 2D (t-test $p = 3.2\times10?^{17}$; KS $p = 3.9\times10?^{26}$) and 1.5T 3D (t-test $p = 1.4\times10?8$; KS $p = 1.2\times10??$), and detected additional differences at 3.0T 2D/3D.

CONCLUSION

BTIP implementation partially improved MRI parameter consistency, but substantial heterogeneity and metadata inconsistencies remained. Effective automated metadata analyses remain challenged without manual validation due to the wide variability. While uniform protocol adoption is difficult due to technical differences across sites, rigorous and consistent metadata reporting will open opportunities for effective and efficient centralized quality control for meaningful outcome measures in brain tumor clinical trials.

CLINICAL RELEVANCE/APPLICATION

Persistent MRI metadata variability highlights the critical need for rigorous standardization and centralized quality control to ensure reliable clinical imaging outcomes.

W5B-SPIN-8 ONCO-RADS CLASSIFICATION OF INCIDENTAL FINDINGS ON WHOLE-BODY MRI REPORTS USING LARGE LANGUAGE MODELS IN PATIENTS WITH PLASMA CELL DYSCRASIA

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PURPOSE

Oncologically Relevant Findings Reporting and Data System (ONCO-RADS) is used to classify findings on Whole-Body(WB)-MRI used for cancer screening. ONCO-RADS classify Findings from 1 (Normal report) to 5 (high likelihood of malignancy). Indications of WB-MRI are expanding in multiple indications with subsequent numerous incidental findings. Large Language Models (LLM) may be used to extract and classify these incidentals findings in WB-MRI reports that contain large amount of text. The objective of this study was to describe the prevalence of incidental malignancies on WB-MRI and the performance of LLMs to classify incidental findings by using ONCO-RADS in a large cohort of patients with plasma cell dyscrasia.

METHODS AND MATERIALS

This retrospective single-center study in a tertiary care center included 823 patients (M/F: 457/366, mean age: 63.7y) who underwent WB-MRI (1.5 or 3T) for suspected plasma cell dyscrasia between 01/2016-12/2023. All reported incidental findings were annotated by two readers independently in the entire database of WB-MRI reports and patients' charts were assessed for final pathological diagnoses of incidental findings. We assessed inter-observer reliability of ONCO-RADS classification for incidental findings unrelated to plasma cell dyscrasia among 5 readers with different level of experience using a two-way mixed-effects, absolute-agreement intraclass correlation coefficient (ICC). Two Large Language Models (a fine-tuned version of DeBERTa called Medical-NER, and ChatGPT o1) were trained/tested on WB-MRI reports annotated for ONCO-RADS classification.

RESULTS

1504 WB-MRI studies were assessed. 15 incidental cancers in 22 WB-MRI reports of 15 patients (prevalence 1.8%) were detected. After retrospective review, 93% (14/15) of these had ONCO-RADS-4/5 reports, and 7% (1/15) ONCO-RADS-3. The prevalence of cancers was 21% in ONCO-RADS 4 and 71% in ONCO-RADS 5. There was excellent inter-obserer reproducibility in ONCO-RADS classification (average-measure ICC of 0.935). Medical-NER LLM exhibited per-patient accuracy of 0.82 in the test set (n=150), with a recall of 0.74 per token, while ChatGPT-o1 demonstrated accuracy of 0.90 per-report and 0.92 per-lesion.

CONCLUSION

The prevalence of malignant incidental lesions was 1.8% in a cohort of patients with plasma cell dyscrasia who underwent WB-MRI, consistent with the literature. LLMs exhibited high accuracy to classify incidental findings on WB-MRI reports.

CLINICAL RELEVANCE/APPLICATION

We describe a novel approach using LLMs for incidental findings classification and subsequent management recommendations from WB-MRI reports based on ONCO-RADS classification, with excellent performances. This requires prospective validation.

W5B-SPIN-10 ASSESSMENT OF VIRTUAL REALITY HEADSET USE FOR MUSCULOSKELETAL MRI REPORTING IN CLINICAL PRACTICE

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PURPOSE

To evaluate the diagnostic accuracy, reporting efficiency, and user experience of virtual reality (VR) headsets for clinical musculoskeletal radiology reporting, specifically in the interpretation of knee MRI examinations.

METHODS AND MATERIALS

Four fellowship-trained musculoskeletal radiologists, with over 40 years of combined experience, independently reported knee MRI studies using both conventional PACS workstations and a VR headset platform. Reporting accuracy was assessed by comparing findings from both modalities. Time to complete reports was recorded for each method. Following the reading sessions, radiologists completed a structured questionnaire evaluating ease of use, visual strain, and physical discomfort (e.g., nausea or fatigue).

RESULTS

Report concordance between the VR and conventional platforms was 95%, indicating a high level of diagnostic accuracy using the VR system. However, average reporting time was 1.3 times longer with VR, particularly when evaluating prior imaging for comparison. Questionnaire feedback highlighted increased incidence of visual fatigue and mild discomfort with VR use. Ease of navigation was rated slightly lower than the traditional workstation setup.

CONCLUSION

While VR technology demonstrates strong potential for accurate musculoskeletal MRI reporting, current limitations in workflow efficiency and user comfort must be addressed before routine clinical adoption.

CLINICAL RELEVANCE/APPLICATION

VR headsets offer a portable, cost-effective alternative to traditional radiology workstations, with potential to alleviate space constraints and reduce hardware costs. Continued technical development is required to optimize speed, ergonomics, and long-term usability for integration into everyday radiological practice.

W5B-SPIN-11 LEARNING TO WRITE LIKE A RADIOLOGIST: MULTIDIMENSIONAL EVALUATION AND BENCHMARKING OF AUTONOMOUS OPTIMIZATION PIPELINES FOR HYPER-PERSONALIZED HEAD CT REPORT GENERATION

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PURPOSE

While autonomous prompt optimization techniques have gained traction recently, their utility in radiology report generation remains unexplored. Despite the emergence of multiple frameworks, the field lacks benchmarking studies assessing their ability to generate hyper-personalized reports. Our study provides the first comprehensive evaluation of automated prompt optimization for natural language generation (NLG) pipelines in 3D imaging, evaluating two state-of-the-art (SOTA) optimizers applied to CT head report generation.

METHODS AND MATERIALS

We curated a multi-institutional CT head dataset comprising structured dictation-report pairs from four radiologists, each exhibiting distinctive reporting styles. Reports were generated using the Qwen-3 model with a single baseline prompt and then optimized using two SOTA prompt optimizers viz. DSPy (MIPRO v2) and TextGrad, creating personalized prompts tailored to each radiologist. These optimized prompts were applied to 20 test dictations to generate hyper-personalized reports. The quality of the generated reports was evaluated against ground truth using lexical similarity metrics (BLEU, ROUGE-L) and a semantic metric (RATEScore), using paired Wilcoxon signed-rank test. Additionally, all four radiologists independently assessed the reports using RADAR, a novel five-point Likert scale designed to evaluate the readiness of AI-generated drafts. RADAR scores across optimisers were compared via the Friedman test.

RESULTS

DSPy improved ROUGE-L by ? = 0.13 ± 0.06 ($p < 0.001$); TextGrad by ? = 0.06 ± 0.16 ($p = 0.19$). Both optimizers significantly improved RATEScore over baseline: DSPy by ? = 0.06 ± 0.12 ($p = 0.04$) and TextGrad by ? = 0.03 ± 0.11 ($p = 0.02$), with DSPy showing marginally better improvement (? = 0.03, $p = 0.53$), though it did not reach statistical significance ($p = 0.05$). Friedman test showed higher RADAR for DSPy ($?^2 = 0.93$, $p = 0.05$).

CONCLUSION

Both optimisation frameworks deliver significant gains in lexical, factual, and radiologist-rated quality metrics. DSPy establishes SOTA performance with statistically significant gains across all metrics, while TextGrad shows inconsistent improvements. Our results verify the effectiveness of autonomous prompt optimization for enhancing CT head report generation, particularly using the DSPy framework.

CLINICAL RELEVANCE/APPLICATION

We present the first validation of prompt optimization frameworks in radiology and establish SOTA performance of DSPy in generating high-quality Head CT reports. Our combined use of automated evaluation and direct radiologist feedback provides a robust benchmark, enabling the adoption of scalable prompt optimization frameworks into radiology report generation workflows.

W5B-SPIN-12 PINPOINTING DEMOGRAPHIC ENCODING IN RADIOLOGY FOUNDATION MODELS: A PATH TO ALGORITHMIC FAIRNESS

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Amirali Khosravi, MD (*Abstract Co-Author*)
Judy W. Gichoya, MBChB, MS (*Abstract Co-Author*)

PURPOSE

To identify where and how demographic features are encoded within transformer-based foundation models for radiology. This knowledge is crucial as foundation models are increasingly deployed in clinical settings for automated image analysis, with potential to perpetuate or amplify existing healthcare disparities if demographic biases remain undetected and unaddressed in their decision-making processes.

METHODS AND MATERIALS

We analyzed a transformer-based foundation model (RAD-Dino) with 12 layers plus a final pooled token output. Using chest radiographs from a diverse patient population (N=37,396; 6916 Black, 621 Asian, 19,415 women), we extracted embeddings from each layer and trained supervised single layer classifiers to predict patient demographics (age [<20, 20-40, 40-60, 60-80, >80], sex, race [Asian, White, Black]) based solely on these embeddings. AUCs were calculated for each layer to identify where demographic information was most strongly encoded. Additional analysis of individual feature activations was performed to characterize the specific patterns contributing to demographic predictions.

RESULTS

Demographic information was significantly encoded throughout the network, with peak encoding occurring in intermediate layers. Layer 8 demonstrated the highest predictive performance for multiple demographic features. Sex prediction showed the highest performance (AUC=0.94), followed by race (AUC=0.91) and age (AUC=0.90). Feature activation distribution analysis revealed systematic differences between demographic groups, with the top three discriminative features showing AUC values ranging from 0.64 to 0.71. Notably, these self-supervised models encoded demographic information as effectively as fully supervised models trained directly on demographic prediction tasks.

CONCLUSION

Foundation models for radiology inherently encode substantial demographic information, with peak encoding occurring in intermediate layers. This pattern suggests the models are learning complex, higher-level representations as a surrogate of demographic features rather than simple image statistics or label-associated shortcuts.

CLINICAL RELEVANCE/APPLICATION

Identifying the primary location for demographic encoding enables targeted interventions to mitigate algorithmic bias. This knowledge allows for the development of mechanistic interventions that can specifically target these layers to create "demographic-blind" models while preserving diagnostic performance. By strategically manipulating intermediate layer representations, models can be designed to make clinical decisions independent of demographic factors, particularly race, leading to more equitable care delivery.

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W5B-SPIR

Interventional Radiology Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPIR-1 SPATIOTEMPORAL CONTROL OF ANTIBIOTIC RELEASE VIA ULTRASOUND RESPONSIVE EMULSION HYDROGELS WITH CHITOSAN COATING

Ziba Ghareh Nazi Fam, PhD (*Presenter*)
Asia Winslow (*Abstract Co-Author*)
Viren Soni (*Abstract Co-Author*)
Gagan Kaushal (*Abstract Co-Author*)
Mario Fabiilli (*Abstract Co-Author*)
Flemming Forsberg, PhD (*Abstract Co-Author*)
Brian Oeffinger (*Abstract Co-Author*)
Noreen J. Hickok, PhD (*Abstract Co-Author*)
Lauren J. Delaney, PhD (*Abstract Co-Author*)

PURPOSE

To investigate how emulsion loading, ultrasound stimulation, and chitosan coating affect mechanical, release, and antimicrobial properties of alginate hydrogels for localized ultrasound-controlled antibiotic delivery.

METHODS AND MATERIALS

Hydrogels (1 mL) were prepared using 10 mg/mL low viscosity alginate (Sigma), crosslinked with 20/40 mM CaCO3/GDL (Sigma), and loaded with 0.25 mg vancomycin (Athenex). Sample A contained 15 µL perfluorohexane (C6) emulsion-encapsulated vancomycin; Sample B used the same emulsion triggered by ultrasound; Sample C had vancomycin directly mixed without emulsion. Each was coated with 1.5% w/v chitosan (CHA, CHB, CHC) via 1.5-h immersion. Ultrasound was applied using an SU-101 HIFU transducer (2.5 MHz, 5.5 MPa) in rastering mode (~1 h). Rheology was assessed at 10 Hz (Texas Instruments). Vancomycin release was tracked for 7 days (Tecan spectrophotometer). Antibacterial activity was tested via Kirby-Bauer assay using MSSA (ATCC).

RESULTS

Sample A showed improved stiffness (G' = 945 ± 225 Pa), B was slightly lower (G' = 901 ± 150 Pa), and C was weakest (G' = 670 ± 162 Pa). Chitosan coatings significantly increased moduli ($p < 0.05$), most notably in CHC (G' = 6738 ± 830 Pa). Coatings enhanced stiffness ~4-, 3-, and 10-fold for A, B, and C. Day 1 release was ~65% (C), ~57% (CHC), ~30% (B), ~24% (CHB), ~20% (A), and ~28% (CHA). Ultrasound boosted B's release 1.7-fold over A. Day 7 release reached ~40% (A), ~49% (CHA), ~73% (B), ~53% (CHB), and near-complete in C and CHC. Kirby-Bauer assay showed max ZOI (zone of inhibition) in C at 11.8 mm (~0.25 mg/mL, Day 1), CHC at 11.3 mm (~0.19 mg/mL), B at 8.2 mm (~0.03 mg/mL, Day 7), and CHB at 7.4 mm (~0.02 mg/mL, Day 1). A and CHA stayed below 7 mm (~0.016 mg/mL) (no significant difference, $p > 0.99$). Trends matched spectrophotometry. B had higher activity than CHB on Day 7 ($p = 0.014$). C outperformed CHC early (Day 0, $p = 0.028$); the difference declined by Day 1 ($p = 0.29$) and reversed by Day 7 ($p = 0.13$). Two-way ANOVA confirmed a significant group-time interaction ($p < 0.05$), supporting chitosan's role in sustaining bioactivity.

CONCLUSION

Ultrasound stimulation enables noninvasive spatiotemporal control of vancomycin release from emulsion-loaded alginate hydrogels. Combined with chitosan coating, it offers triggered, sustained, and localized antibiotic delivery, improving mechanical stability and extending therapeutic activity over time.

CLINICAL RELEVANCE/APPLICATION

These tunable hydrogels offer a responsive, localized antibiotic delivery system controlled by ultrasound, reducing systemic exposure and supporting infection control in tissue repair and wound care.

W5B-SPIR-2 REAL-TIME AI TOOL FOR THYROID ULTRASOUND FNA ADEQUACY

Michelle Gibbs, MSc (*Presenter*)
Pranav Sudheesh (*Abstract Co-Author*)

PURPOSE

The success rate of ultrasound-guided fine needle aspiration (FNA) can be improved by rapid on-site evaluation (ROSE) of the cellular specimen by a pathologist in real time. However, access to pathologists in freestanding imaging centers or low-resource care environments may be limited. We sought to determine if this task could be performed by a simple convolutional neural network (CNN) trained on a small dataset and operated by non-pathologists.

METHODS AND MATERIALS

A set of 676 JPEG images of thyroid FNA specimens were collected at 400x magnification using a standard digital camera, resulting in sets of 377 epithelial cell images, 135 histiocyte images, and 164 blood cell images. Images were labelled at the slide level only, with no annotation of features within the image field. This image set was used to train a TensorFlow-based CNN model which was connected to live smartphone camera microscopy feed. The CNN model was then tested on a set of 50 separate thyroid FNA cases by two separate operators with no formal pathology training for 100 individual tests (N=100).

RESULTS

As the goal for ROSE is to determine preliminary sample adequacy rather than final diagnosis, the American Society for Cytopathology proposes a threshold of 90% concordance for clinical validation of a telecytology platform. Using the pathologist's original ROSE assessment as ground truth, the current model was tested and yielded a concordance rate of 89% (95% CI: 81.4%-93.7%).

CONCLUSION

Although the 89% concordance rate achieved by this simple CNN tool does not meet the 90% concordance threshold for ROSE according to the ASC guidelines, the target falls within the confidence interval for the results obtained (81.4%-93.7%), demonstrating performance near the target level and pointing to the potential of refining the model's accuracy through a larger training set or more finely annotated training data. This small-scale study serves as proof-of-concept for the development of a cost effective CNN-based tool to be used for adequacy testing in the context of thyroid FNA biopsy in which pathologists are unavailable.

CLINICAL RELEVANCE/APPLICATION

With modest improvements in accuracy, this CNN-based tool could enable staff involved in thyroid FNA biopsy collection, such as interventional radiologists or technicians, to perform ROSE and guide further decision-making regarding sample adequacy. This model is readily deployable as a smartphone application and would allow this tool to be used in settings where pathologists are not readily available.

W5B-SPIR-3 IMPACT OF EMBOLIC DIELECTRIC AND THERMAL PROPERTIES ON MICROWAVE ABLATION IN A PERFUSED EX VIVO PORCINE MODEL

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Rahim Jiwani (*Abstract Co-Author*)
Marina Borrego, BS (*Abstract Co-Author*)
John A. Walker, MD, PhD (*Abstract Co-Author*)
Jorge E. Lopera, MD (*Abstract Co-Author*)

PURPOSE

Transarterial embolization (TAE) is frequently combined with microwave ablation (MWA) to reduce heat sink effect and increase MWA size. We aim to evaluate the impact of various embolic agents on dielectric and thermal properties during MWA.

METHODS AND MATERIALS

Porcine kidneys were obtained from a local butcher and immediately flushed with heparinized saline after explant. Organs were stored on ice then prepared for perfusion in an ex vivo perfusion system with an oxygenator, warmer, perfusion tubing, blood pressure monitor, and blood perfusate solution. A network analyzer with high temperature dielectric probe (Keysight) was used to measure dielectric properties. Each microwave ablation was performed using a 2.45 GHz MWA system at 30 Watts for 5 minutes (Varian Medical). The dielectric and temperature probes were placed prior to TAE using different embolic agents: LAVA 18 (SIRTEX), LC LUMI Beads 70-150 micron (Boston Scientific), and glue (histoacryl:lipiodol, 4:1, Guerbet). Baseline and postembolization dielectric properties of tissues were measured. TAE-MWA was performed in each kidney for a total of 6 TAE-MWA in each embolic group and 6 control MWA without TAE (24 MWA total) while recording maximal MWA temperature. TAE-MWA were excluded if dielectric probe errors occurred or cone beam CT demonstrated MWA outside the TAE zone. Each MWA zone was segmented along the probe trajectory and measured for maximal short axis diameter (SAD) and long axis diameter (LAD). Standard and multivariate analysis was then performed to assess for differences in dielectric properties, tissue temperature, and MWA dimensions.

RESULTS

No statistically significant difference was observed in absolute or imaginary permittivity before and after TAE for all embolic agents ($p > 0.85$). TAE-MWA resulted in MWA dimension and maximal temperatures for all embolic agents with comparisons as follows (6 LUMI-MWA vs 5 LAVA-MWA vs 5 Glue-MWA, ANOVA): SAD, 2.80 ± 0.13 cm vs 2.94 ± 0.06 cm vs 2.78 ± 0.26 cm ($p = 0.28$); LAD, 2.97 ± 0.10 cm vs 3.14 ± 0.05 cm vs 2.98 ± 0.11 cm ($p < 0.05$), temperature 1 cm from MWA probe: 76.8 ± 13.9° C vs 89.8 ± 11.4° C vs 77.2 ± 17.4° C ($p = 0.32$).

CONCLUSION

Different embolic agents did not produce a significant change in TAE-MWA tissue dielectric properties. With LAVA 18, there was a trend toward higher TAE-MWA temperatures and significantly increased LAD compared to other embolic agents.

CLINICAL RELEVANCE/APPLICATION

TAE-MWA with various agents may produce similar results in terms of SAD MWA dimensions, but increased temperatures and LAD were observed with LAVA, warranting further investigation at higher power MWA.

W5B-SPIR-4 ULTRASOUND-MODULATED THERANOSTIC MICROBUBBLES FOR PEDIATRIC BRAIN INJURY

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Todd J. Kilbaugh, MD (*Abstract Co-Author*)
Misun Hwang, MD (*Abstract Co-Author*)

PURPOSE

Brain injuries are a leading cause of death and morbidity in children and pose significant long-term side effects. Current care focuses on symptom management; thus, there is a critical need to develop effective therapies to manage the disease and prevent brain injury progression in the acute setting.Novel treatments, such as neuroprotective noble gases and drugs, are promising, but their systemic delivery is limited by rapid metabolism, challenges in crossing the blood-brain barrier, and unwanted side effects. To overcome these challenges, we developed ultrasound-responsive theranostic microbubbles (MBs) loaded with neuroprotective noble gases and drugs for ultrasound image-guided therapy. The benefits of this technique are owed to the use of MBs as a carrier and ultrasound stimulation for controlled release. In this work, we fabricated and assessed two formulations of theranostic MBs: xenon-loaded MBs and ferrostatin-1-loaded MBs.

METHODS AND MATERIALS

MBs were fabricated by ultrasonication. The MBs were characterized using microscopy and mass spectrometry to measure size and therapeutic encapsulation efficiency. The ultrasound responsiveness and therapeutic release profiles were evaluated via ultrasound and a flow phantom. The MBs were then assessed in vivo for feasibility.

RESULTS

The MBs demonstrated high therapeutic loading and exhibited high ultrasound contrast. The MBs were successfully cavitated at an MI of 0.68, which meets FDA standards for diagnostic ultrasound. The injection of MBs was feasible in vivo, and they were successfully visualized via contrast-enhanced ultrasound at the carotid artery. Our results indicate our theranostic MBs are feasible, with successful visualization and cavitation observed in vivo.

CONCLUSION

Our study shows promise for image-guided drug delivery to the brain. The sub-10 μm theranostic MBs are highly stable, encapsulate therapeutics, and exhibit excellent ultrasound responsiveness in vivo. Future studies will explore the efficacy of this approach in disease models, paving the way for novel therapeutic strategies for the brain.

CLINICAL RELEVANCE/APPLICATION

Our technology shows great potential for clinical application in brain injury. The MBs are made from biocompatible materials, and the ultrasound settings employed are safe for clinical use. This non-invasive technique uses a hand-held, portable ultrasound system, which enables its use in low-resource settings. Ultrasound stimulation releases the noble gases and drugs from the carrier MBs. Translating our theranostic MBs into the clinical setting aims to bridge significant gaps in patient care and enhance the delivery of therapeutics to the pediatric brain.

W5B-SPIR-5 PAE VS. TURP FOR BPH: WHICH IS MORE COST-EFFECTIVE? A SYSTEMATIC REVIEW OF ECONOMIC EVALUATIONS ACROSS HEALTHCARE SYSTEMS

Jennifer A. Jackson-Cole, MBChB, MMEd (*Presenter*)
Valerie Ntoinya, MD, MMEd (*Abstract Co-Author*)
Connie M. Ongeti, MBChB,MMed (*Abstract Co-Author*)
MARTIN KAMANDA (*Abstract Co-Author*)

PURPOSE

Is minimally invasive PAE cost-effective compared to TURP? This systematic review compares economic evaluations of Prostatic Arterial Embolization (PAE) and Transurethral Resection of the Prostate (TURP) for managing symptomatic Benign Prostatic Hyperplasia (BPH), detailing the costs, quality-adjusted life year (QALY), and cost-effectiveness, while considering factors influencing the cost-effectiveness.

METHODS AND MATERIALS

PRISMA guidelines were followed, and the research was registered on PROSPERO. PubMed, EMBASE, Scopus, INAHTA, Cost-Effectiveness Analysis (CEA) Registry, and Google Scholar were searched to identify full economic evaluations (EE) comparing PAE and TURP for BPH. Two reviewers identified and screened studies, extracting data on costs, QALYs, and incremental cost-effectiveness ratios (ICERs). Quality assessment was done using CHEERS 2022 and Phillips checklists.

RESULTS

Five of the 184 screened studies met inclusion criteria (USA: 2, Canada: 1, Spain: 1, UK: 1; 2021-2023). Time horizons spanned 1 to 6.5 years, with the US analyses reflecting payer perspectives and the others public healthcare system perspectives. PAE demonstrated lower short-term costs across all the health settings, but long-term savings reduced with higher retreatment rates (PAE: 12-31% vs. TURP: 0-5%). PAE's QALYs were marginally lower (differences: 0.009-0.085). In the US, PAE reduced 3-year costs by 51% ($2,934 vs. $2,934 vs. $6,038), due to fewer complications (0.1% vs. 2.1% major events) and outpatient care (0.125 vs. 1.38 hospital days). TURP's ICER (247,732-247,732-360,249/QALY) exceeded U.S. cost-effectiveness thresholds (50,000-50,000-100,000/QALY), favoring PAE in 96.4% of simulations. PAE saved €2,121/QALY short-term in Spain, but reinterventions reduced this advantage. The UK showed a similar trend. Canada's 6.5-year model found PAE's superiority uncertain, with potential dominance at 10 years.

CONCLUSION

PAE is a dominant cost-saving strategy for BPH in the US, reducing costs by half over 3 years through reduced complications and outpatient care. While cost-effective in the short term in the UK and Spain, PAE's economic advantage was reduced by 5 years due to reinterventions.

CLINICAL RELEVANCE/APPLICATION

PAE offers a minimally invasive, cost-effective alternative to TURP within 1-5 years, particularly for systems prioritizing short-term savings. PAE matches TURP in the long term. Policymakers must balance immediate gains against long-term sustainability, advocating for individualized pathways aligned with patient needs.

W5B-SPIR-6 IMPACT OF TRANSARTERIAL CHEMOEMBOLIZATION COMBINED WITH TARGETED AND IMMUNE THERAPY ON LIVER FUNCTION AND PROGNOSIS IN ADVANCED HEPATOCELLULAR CARCINOMA PATIENTS: THE SIGNIFICANCE OF BASELINE ALBUMIN-BILIRUBIN GRADE

Yiwan Guo (*Presenter*)
Bo Sun (*Abstract Co-Author*)
Xin Li (*Abstract Co-Author*)
Chuansheng Zheng, MD (*Abstract Co-Author*)
Xuefeng Kan, MD,PhD (*Abstract Co-Author*)
Fan Yang, MD (*Abstract Co-Author*)

PURPOSE

Liver function has been regarded as a critical determinant for prognosis of patients with hepatocellular carcinoma (HCC). This study aimed to evaluate the impact of transarterial chemoembolization (TACE) combined with tyrosine kinase inhibitors and immune checkpoint inhibitors (TTI) on liver function in advanced HCC patients compared with TACE alone, and to assess the prognostic value of baseline albumin-bilirubin (ALBI) grade.

METHODS AND MATERIALS

This retrospective study enrolled advanced HCC patients treated with TTI or TACE alone between January 2018 and December 2023. The primary outcome was the time to progression of baseline ALBI grade, with secondary outcomes including overall survival (OS) and progression-free survival (PFS) of patients.

RESULTS

A total of 162 patients (TTI group, n = 68; TACE alone group, n = 94) were included in this study. The TTI group showed a significantly longer median time to baseline ALBI grade progression than TACE alone group (19.0 vs. 11.6 months, p = 0.004). Subgroup analyses revealed similar benefits of TTI group (11.3 vs. 5.0 months for ALBI grade 1, p = 0.015; 20.0 vs. 14.7 months for ALBI grade 2, p = 0.025). Patients in the TTI group demonstrated superior median OS (42.2 vs. 22.0 months for ALBI grade 1, p = 0.077; 22.6 vs. 13.5 months for ALBI grade 2, p = 0.001) and longer median PFS (11.7 vs. 6.8 months for ALBI grade 1, p = 0.148; 8.4 vs. 4.9 months for ALBI grade 2, p = 0.022) compared to the TACE alone group.

CONCLUSION

TTI therapy preserved liver function for a longer duration and achieved better survival outcomes than TACE alone in advanced HCC patients, particularly benefiting those with baseline ALBI grade 2.

CLINICAL RELEVANCE/APPLICATION

This study demonstrated that for advanced HCC patients, TACE combined with targeted and immune therapy could better preserved liver function than TACE alone. Notably, for advanced HCC patients with baseline ALBI grade 2, the combination therapy was more strongly recommended since it could offer greater clinical benefits for them.

W5B-SPIR-7 TRANSILEOCOLIC PORTAL VEIN EMBOLIZATION PRIOR TO HEPATECTOMY FOR LIVER MALIGNANCIES

Yoshitaka Tamura (*Presenter*)
Hiro Kiyosue (*Abstract Co-Author*)
Hidetaka Hayashi, MD (*Abstract Co-Author*)
Taiga Matsumoto, MD (*Abstract Co-Author*)
Osamu Ikeda, MD (*Abstract Co-Author*)
Toshinori Hirai, MD, PhD (*Abstract Co-Author*)

PURPOSE

Preoperative portal vein embolization (PVE) is a widely accepted technique to promote hypertrophy of the future liver remnant (FLR) and reduce the risk of postoperative liver insufficiency after major hepatectomy. While the percutaneous transhepatic approach is commonly used, this study investigates the feasibility and safety of PVE performed via the transileocolic vein.

METHODS AND MATERIALS

This retrospective study analyzed clinical and imaging data from patients who underwent laparotomic transileocolic PVE between December 2012 and December 2023. This alternative route was selected when the percutaneous approach was considered technically difficult due to biliary dilatation, complex anatomy, or failure of transhepatic attempts. Embolization was performed under balloon occlusion using gelatin sponge and 5% ethanolamine oleate with iopamidol. Technical success was defined as complete occlusion of target portal branches on final venography, and clinical success as complete occlusion on contrast-enhanced CT one week post-procedure. FLR volumetry, complication rates (Clavien-Dindo grade =3), and portal vein recanalization were evaluated.

RESULTS

A total of 71 patients (47 men, 24 women; mean age, 69.5 years) underwent transileocolic PVE. Indications included hilar cholangiocarcinoma (n=39), colorectal liver metastases (n=17), intrahepatic cholangiocarcinoma (n=8), hepatocellular carcinoma (n=6), and gallbladder carcinoma (n=1). Technical and clinical success rates were 98.6% and 94.4%, respectively. Recanalization occurred in 2 patients (2.8%), both successfully managed with repeat PVE followed by hepatectomy. Mean FLR volume increased from 52.7% to 62.8% ($p < 0.0001$), and hepatectomy was ultimately performed in 81.9% of patients. Major complications were observed in 12.5%, with cholangitis being the most common (n=6).

CONCLUSION

Transileocolic PVE is a safe and effective alternative to the percutaneous approach, particularly in patients with challenging anatomy or biliary dilation. This method consistently achieves FLR hypertrophy with acceptable complication rates.

CLINICAL RELEVANCE/APPLICATION

The transileocolic approach broadens the clinical utility of PVE in patients unsuitable for percutaneous access, offering a reliable strategy for FLR augmentation in the preoperative management of complex hepatic malignancies.

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W5B-SPMK

Musculoskeletal Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPMK-1 QUANTITATIVE FAT FRACTION MAPPING IN LOWER LEG MRI AS AN IMAGING BIOMARKER FOR CHARCOT-MARIE-TOOTH DISEASE TYPE 1A: EVALUATION USING DEEP LEARNING-BASED SEGMENTATION

Hyun Su Kim, MD, PhD (*Presenter*)
Jae-Hun Kim, PhD (*Abstract Co-Author*)
Ji Hyun Lee, MD, PhD (*Abstract Co-Author*)
Young Cheol Yoon, MD (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)

PURPOSE

To assess the utility of intramuscular fat fraction (FF) on 3D multi-echo gradient-echo Dixon-based lower leg MRI in patients with Charcot-Marie-Tooth disease type 1A (CMT1A), using a deep learning-based automated muscle segmentation model.

METHODS AND MATERIALS

We retrospectively analyzed lower leg MRI of 69 CMT1A patients. We utilized an automated muscle segmentation model for 3D multi-echo gradient echo Dixon-based MRI. This model was derived from a previously developed version trained on manually labeled T1-weighted lower leg MRIs from 120 CMT patients using a deep learning-based 2D U-Net. Muscle segmentations were conducted for four compartments (anterior, lateral, deep posterior, and superficial posterior) of the lower leg. Mean FFs were measured for each muscle compartment of the lower leg from multiple MRI slices, spanning from the proximal to the distal level. Correlations between FFs and clinical scores (Charcot-Marie-Tooth Neuropathy Score version 2 [CMTNSv2], functional disability scale [FDS]) and results of upper and lower limb evaluations (functional dexterity, 9-hole peg test, hand grip, foot plantarflexion, dorsiflexion, timed up and go, 6-minute walk, 10-m walk, stair climb, and sit to stand) were assessed using partial correlation analysis adjusting for age and body mass index.

RESULTS

The FFs of the anterior, lateral, deep posterior, and superficial posterior compartments of the lower legs, as well as the total FF, showed significant positive correlations with CMTNSv2 and FDS, suggesting that higher FFs are associated with more severe disease ($p < 0.05$). The strongest was between the FF of the lateral compartment and the FDS ($r = 0.49$). In physical evaluations involving time-based measures (stair climb, 10-meter walk, functional dexterity, 9-hole peg test, and timed up and go), FF showed significant positive correlations ($p < 0.05$). In contrast, in assessments of strength (hand grip, foot plantarflexion and dorsiflexion), distance (6-minute walk), and repetitions (sit-to-stand), FF exhibited significant negative correlations ($p < 0.05$). These findings suggest that higher FF is associated with reduced upper and lower limb function. The strongest correlation with limb evaluation results was between the FF of the lateral compartment and the stair climb test ($r = 0.58$).

CONCLUSION

FFs of lower leg muscle compartments on MRI, quantified using an automated segmentation model, showed significant correlations with clinical parameters in patients with CMT1A. These findings suggest that higher FFs are associated with more severe clinical impairment.

CLINICAL RELEVANCE/APPLICATION

FFs of lower leg muscles, quantified via automated segmentation, may serve as reliable imaging biomarkers for future CMT1A clinical trials.

W5B-SPMK-2 BILATERAL FEMORAL DENSIFICATIONS IN ELDERLY WOMEN: A NEW SCLEROSING BONE DYSTROPHY?

Caroline Chabot, MD (*Presenter*)
Bruno C. Vande Berg, MD, PhD (*Abstract Co-Author*)

PURPOSE

To describe a previously unreported pattern of femoral bone changes seen on knee radiographs of elderly women.

METHODS AND MATERIALS

Over a ten-year period, we collected knee radiographs of 30 elderly women (mean age ± SD: 76.7 ± 7.7 years) obtained for the evaluation of knee osteoarthritis and showing bilateral symmetrical densifications of the distal diaphyso-metaphyseal regions of the femurs. We excluded patients with unilateral or bilateral local sclerotic bone lesions (i.e. infarcts, enchondromas, fibrous dysplasias) and patients with systemic disorders (i.e. mucopolysaccharidosis, histiocytosis). On radiographs, two radiologists classified the distribution of sclerotic bone changes within the medullary cavity into five categories (exclusively lateral, predominantly lateral (> medial), central, predominantly medial (> lateral), exclusively medial). Patterns of bone sclerosis were classified in five categories (striated/dotted lines, disseminated punctate foci, popcorn-type calcifications, or mixed). The presence of sclerotic rim and of cortical bone changes was assessed. CT scans (13 knees) were analyzed for the presence, size, and density of sclerotic nodules. MRI scans (10 knees) were analyzed and the signal profiles of the lesions were categorized as bone-like, fluid-like, fat-like, or red marrow-like on T1, T2 and fat-saturated proton-density-weighted images. Available medical files were reviewed for any particular condition.

RESULTS

On radiographs, bone sclerosis was exclusively lateral (40%), predominantly lateral (33.3%) and central (26.7%). The frequency of sclerotic bone patterns was mixed (45%), striated (36.7%), punctate (10%) and popcorn (8.3%). No cases showed peripheral sclerosis or cortical changes. On CT, all knees showed intramedullary sclerotic nodules smaller than 5 mm. Nodules of 5-10 mm and more than 10 mm were seen in 38.5% and 7.7% of the knees, respectively. The attenuation density of the nodules ranged from 901-2059 HU (mean ± SD: 1531 ± 347.4). At MRI, medullary areas of bone sclerosis showed spots of bone-like signal intensity surrounded by a red marrow-like signal intensity pattern in a fatty marrow background. No unexpected systemic disorder was observed in the medical files.

CONCLUSION

Bilateral symmetrical densifications of the distal diaphyso-metaphyseal regions of the femurs can be observed on the radiographs and CT images of elderly women with a consistent pattern of bone marrow changes on MRI that differs from previously reported bone marrow changes.

CLINICAL RELEVANCE/APPLICATION

Recognition of this radiological entity is essential to avoid misdiagnosis or unnecessary investigations. Further studies are needed to assess the significance, if any, of these changes.

W5B-SPMK-3 ASSOCIATIONS BETWEEN CARDIAC ADIPOSE TISSUE AND ABDOMINAL VISCERAL FAT AND MUSCLE: A CT-BASED ANALYSIS OF AREA AND DENSITY PARAMETERS

Babak Salam, MD (*Presenter*)
Sebastian Nowak, PhD (*Abstract Co-Author*)
Maike Theis, MSc (*Abstract Co-Author*)
Thomas Vollbrecht (*Abstract Co-Author*)
Marilia B. Voigt (*Abstract Co-Author*)
Christoph H. Endler, MD (*Abstract Co-Author*)
Tatjana Dell (*Abstract Co-Author*)
Alexander Isaak, MD (*Abstract Co-Author*)
Claus C. Pieper, MD (*Abstract Co-Author*)
Daniel Kuetting, MD (*Abstract Co-Author*)
Alois M. Sprinkart, PhD (*Abstract Co-Author*)
Julian A. Luetkens, MD (*Abstract Co-Author*)

PURPOSE

CT-derived body composition parameters of cardiac adipose tissue (CAT), as well as abdominal adipose and muscle tissue, serve as surrogates for a patient's clinical condition and have prognostic implications. However, associations between these diverse compartments remain poorly investigated. This study aimed to assess associations between opportunistic CT-derived parameters of cardiac and abdominal fat and muscle tissue.

METHODS AND MATERIALS

Cardiac and abdominal CT scans from 842 patients were retrospectively analyzed. Measurements of CAT were taken at the aortic valve level, while abdominal adipose and muscle tissues were quantified at the L3/L4 intervertebral disc space. For each tissue compartment, area and density were calculated from single-slice images. Pearson correlation coefficients were used to assess associations between the CT-derived parameters.

RESULTS

Strong positive correlations were found between CAT area and visceral adipose tissue (VAT) area ($R=0.755$, $P<.001$), as well as moderate correlations between CAT density and VAT density ($R=0.521$, $P<.001$). Additionally, skeletal muscle (SM) area exhibited modest positive correlations with VAT area ($R=0.370$, $P<.001$), CAT area ($R=0.300$, $P<.001$), and SM density ($R=0.356$, $P<.001$). No significant differences were observed between genders in the correlation strengths of these associations.

CONCLUSION

These findings indicate a systematic pattern of body composition alterations, advocating for the inclusion of comprehensive body composition analysis in future studies and emphasizing the need for a deeper understanding of the underlying systemic processes influencing body composition.

CLINICAL RELEVANCE/APPLICATION

This study highlights the strong interrelationships between CT-derived body composition parameters of cardiac and abdominal fat and muscle compartments. The observed correlations—particularly between visceral and cardiac adipose tissue area and density—suggest a shared, systemic pathophysiological process, potentially driven by chronic low-grade inflammation. These findings support the use of comprehensive, opportunistic body composition analysis in routine CT imaging to better assess patients' clinical status and risk stratification. Moreover, the results advocate for the inclusion of cardiac adipose tissue assessment in prognostic models beyond cardiovascular disease, potentially informing outcomes in broader clinical contexts such as oncologic or geriatric care.

W5B-SPMK-5 DEEP LEARNING IMAGE RECONSTRUCTION COMBINED WITH MARS ALGORITHM FOR METAL ARTIFACT CORRECTION IN CT IMAGES: A PHANTOM STUDY

Zhenwei Yu (*Presenter*)
Tianbao Zhang (*Abstract Co-Author*)
Yanan Zhu (*Abstract Co-Author*)
Ning Wang (*Abstract Co-Author*)
Jun Yao (*Abstract Co-Author*)
Zhengjun Li (*Abstract Co-Author*)
Yongjun Jia, MMed (*Abstract Co-Author*)

PURPOSE

To investigate the effect of various reconstruction algorithms, including adaptive statistical iterative reconstruction-V (ASIR-V) and deep learning image reconstruction (DLIR) algorithm combined with metal artifact reduction system (MARs) on the correction of metal artifacts in CT images using a phantom study.

METHODS AND MATERIALS

A phantom with a metal simulating femoral internal fixation was scanned on a GE Revolution APEX CT, and was reconstructed using the following algorithm combination: 50% ASIR-V combined with MARs (IR+M), medium-strength DLIR (DM) with MARs (DM+M), high-strength DLIR (DH) with MARs (DH+M), DM alone (DM), and DH alone (DH). The above five image groups were objectively evaluated by two radiologists by measuring the standard deviation of ROI 1 at the maximum artifact (SD 1), of ROI 2 at the artifact-free area (SD 2), to calculate the artifact index of images in each group. The two above mentioned radiologists also subjectively scored the image quality. The differences in image quality among the 5 groups were compared.

RESULTS

The differences in SD 1 , SD 2 , and artifact index among the 5 groups were statistically significant (all $P<0.05$). SD 1 and artifact index increased in the order of DH+M, DM+M, IR+M, DH, and DM (all $P<0.05$); SD 2 increased in the order of DH+M, DH, DM+M, DM, and IR+M (all $P<0.05$); SD 1 , SD 2 , and artifact index values were lowest in the DH+M images. DH+M images also scored the best in the subjective evaluation with the two radiologists showed good consistency in the subjective scoring (Kappa> 0.80, $P<0.05$).

CONCLUSION

High-strength DLIR combined with MARs more effectively reduces the metal implantation artifacts and image noise in a phantom study with metal insert simulating femoral internal fixation.

CLINICAL RELEVANCE/APPLICATION

DLIR combined with MARs has great potential in reducing metal artifacts and image noise for patients with metal internal fixation.

W5B-SPMK-6 ROUTINE CHEST CTS FOR OPPORTUNISTIC EVALUATION OF BONE HEALTH IN CARDIAC TRANSPLANT RECIPIENTS: A FEASIBILITY STUDY

Seyedali Nabipoorashrafi, MD (*Presenter*)
Farbod Khosravi, MD (*Abstract Co-Author*)
Sanaz Asadian, MD (*Abstract Co-Author*)
Arash Azhideh, MD, MPH (*Abstract Co-Author*)
Peyman Mirghaderi, MD, MPH (*Abstract Co-Author*)
Arash Bedayat, MD (*Abstract Co-Author*)
Majid Chalian, MD (*Abstract Co-Author*)
Hamid Chalian, MD (*Abstract Co-Author*)

PURPOSE

This study aimed to evaluate the potential of using routine non-contrast chest computed tomography scan (CTs) in cardiac transplant patients to assess bone mineral density (BMD) and vertebral body height.

METHODS AND MATERIALS

In this observational, IRB-approved study, all patients who underwent cardiac transplantation between 2017 and 2020 and had CT scans both before and after the procedure, along with dual-energy X-ray absorptiometry (DEXA) scans, were included. The CTs were used to measure thoracic vertebral bone density at three levels (upper, middle, and lower) and vertebral body height (anterior, middle, and posterior) at each thoracic level (T1-T12). CT-based bone density measurements before and after transplantation were compared and correlated with DEXA scan results.

RESULTS

The findings revealed a significant decrease in vertebral bone density in the middle thoracic region (T5-T8) from 175 to 163 Hounsfield Units (HU) and in the lower thoracic region (T9-T12) from 163 to 146 HU after transplantation ($P < .05$). A strong correlation was observed between the bone density values derived from CTs and those from DEXA scans. The correlation coefficients for the upper, middle, and lower thoracic regions were 0.526, 0.397, and 0.343, respectively ($P < .05$). Furthermore, vertebral body height significantly changed at upper, middle, and lower thoracic regions and specific levels (T3, T6, T11, and T12) ($P < .05$). The anterior and middle portions of the vertebral body showed a significant reduction in median height of 0.2 mm and 0.3 mm, respectively ($P < .05$), while changes in the posterior portion were not significant ($P > .05$).

CONCLUSION

Routine non-contrast chest CTs, commonly performed for cardiac transplant patients, can effectively assess bone density, presenting a potential alternative to DEXA scans in this patient population.

CLINICAL RELEVANCE/APPLICATION

Opportunistic evaluation of bone mineral density and vertebral morphology using standard non-contrast chest CTs offers a practical, cost-free approach to identifying early osteoporotic changes in cardiac transplant recipients. This strategy enables timely intervention without the need for additional imaging, supporting proactive management of bone health in a high-risk population.

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W5B-SPNMMI

Nuclear Medicine & Molecular Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPNMMI-1 COMBINATION IMMUNOTHERAPY TARGETING LAG-3, PD-1 AND STING SUPPRESSES HEPATOCELLULAR CARCINOMA AS MONITORED BY LAG-3 TARGETED PET IMAGING TARGETED PET IMAGING

Zhen Quan (*Presenter*)
Bo Sun (*Abstract Co-Author*)
Chuansheng Zheng, MD (*Abstract Co-Author*)
Xin Li (*Abstract Co-Author*)
Quan Chen, PhD (*Abstract Co-Author*)

PURPOSE

The low response rate of anti-PD-1 monoclonal antibodies (mAbs) in hepatocellular carcinoma (HCC) requires the development of combination immunotherapy strategies to improve their efficacy. This study aimed to use LAG-3-targeted PET imaging to monitor the efficacy of anti-PD-1 mAb, a stimulator of interferon genes (STING) agonist, and anti-LAG-3 mAb, both individually and in combination. Furthermore, we evaluated the potential of a triple immunotherapy regimen (anti-PD-1 mAb, STING agonist, and anti-LAG-3 mAb) to improve HCC treatment.

METHODS AND MATERIALS

The LAG-3 inhibitor C25 based on a cyclic peptide was chelated with NOTA, radiolabeled with 68 GaCl 3 . The resulting 68 Ga-NOTA-C25 underwent in vivo PET imaging and ex vivo biodistribution examination in Hepa1-6 tumor-bearing mice. 68 Ga-NOTA-C25 PET was used to monitor the efficacy of monotherapy and dual immunotherapy with anti-PD-1 monoclonal antibody (mAb) and STING agonists. The tumor uptake of 68 Ga-NOTA-C25, tumor response, and survival rates were measured following different treatments.

RESULTS

68 Ga-NOTA-C25 PET imaging effectively and noninvasively detected LAG-3 + tumor-infiltrating lymphocytes (TILs) in Hepa1-6 tumor-bearing mice. In mice treated with anti-PD-1 mAb, STING agonist, or a combination immunotherapy, 68 Ga-NOTA-C25 PET revealed significantly increased LAG-3 + TIL levels. At the treatment endpoint, the combination of the STING agonist with the anti-PD-1 mAb resulted in a significantly higher uptake (1.35 ± 0.191 %ID/g) compared to the control group (0.402 ± 0.017 %ID/g), the anti-PD-1 mAb group (0.647 ± 0.037 %ID/g), and the STING agonist group (0.874 ± 0.089 %ID/g). Uptake of 68 Ga-NOTA-C25 was positively correlated with tumor therapeutic effects and survival rates. Triple immunotherapy with anti-PD-1 mAb, a STING agonist, and anti-LAG-3 mAb further enhanced efficacy compared to any dual immunotherapy regimen, and treatment efficacy was linearly associated with 68 Ga-NOTA-C25 tumor uptake.

CONCLUSION

Anti-PD-1 mAb and STING agonists have shown notable synergy in upregulating LAG-3 expression on TILs in HCC, which can be successfully tracked by 68 Ga-NOTA-C25 PET imaging. Furthermore, integration of a triple immunotherapy regimen comprising an anti-PD-1 mAb , STING agonist, and anti-LAG-3 mAb demonstrated a significant improvement in therapeutic efficacy over dual immunotherapy approaches.

CLINICAL RELEVANCE/APPLICATION

PET imaging with a LAG-3-specific probe (68 Ga-NOTA-C25) would offer clinicians valuable information that could make a significant impact on the management of liver cancer patients with combined immunotherapy.

W5B-SPNMMI-2 IMAGING AND CONTOURING METHODS FOR PRE-Y90 LSF: A COMPARATIVE ANALYSIS OF 2D VS. 3D AND MANUAL VS. AUTOMATED CONTOUR TECHNIQUES

Aidan Megally (*Presenter*)
Ryan Thomas (*Abstract Co-Author*)
Robert H. Wagner, MD (*Abstract Co-Author*)
Christopher A. Molvar, MD (*Abstract Co-Author*)
Judy R. James, PhD, MS (*Abstract Co-Author*)

PURPOSE

Hepatocellular carcinoma (HCC) patients, prior to undergoing Yttrium-90 (Y90) treatment will have a pre Y90 mapping with Technium-99m macro aggregated albumin (99mTc-MAA) to estimate the percentage of Y90 microspheres that may inadvertently bypass the liver and enter the lungs, defined as their lung shunt fraction (LSF). The pre Y90 LSF value is critical to Y90 dosimetry and to manage radiation exposure to the lungs. Confidently obtaining the LSF from 2D or 3D nuclear medicine images is a crucial and challenging task for technologists. This study aims to evaluate LSF values obtained from 2D planar or 3D SPECT-CT images using a clinically approved software and assessing each method’s user-dependence.

METHODS AND MATERIALS

A retrospective LSF analysis was conducted on n=50 HCC patients who underwent pre-Y90 mapping. LSF values were obtained by a) manual segmentation of the liver and lungs on 2D planar images and b) automated contouring and delineation of the liver-lung border on 3D SPECT-CT images in MIM software. LSFs from both methods were compared for statistical differences. A subset of 3D LSF values were redone using a semi-automated method of adjusting the automated contours in MIM. The corresponding 2D LSF value were redone by an independent rater to assess rater differences as well. Statistical analysis was performed to compare absolute differences between rater-dependent 2D LSFs and semi vs. fully automated 3D LSFs.

RESULTS

Two-sample t-test comparing the LSFs obtained using 2D vs. 3D methods showed no statistical significant difference ($p > 0.05$), suggesting both methods provide similar accuracy. However, significant variability was observed between 2D LSFs from separate raters ($p<0.05$) opposed to 3D semi vs fully automated methods, where no statistical difference was seen ($p>0.05$).

CONCLUSION

Our work highlights the importance of using 3D SPECT-CT with automated contouring when obtaining LSFs before Y90 therapy. With an increased risk of user error using 2D methods, calculations can vary, contrary to 3D imaging with automated contouring, which offers consistent results, even when minor adjustments are applied.

CLINICAL RELEVANCE/APPLICATION

Obtaining an accurate LSF is imperative to administering an effective Y90 dose, ensuring the patient receives adequate microspheres to targeted hepatic malignancies while minimizing radiation exposure to the lungs. A key concern is the increased complexity introduced by the manual segmentation when using 2D imaging, which requires the technologist to manually contour the liver-lung border over planar images. In contrast, automated contouring on 3D SPECT-CT, reduces rater-dependence, improving efficiency and increasing reproducibility for LSF calculations.

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W5B-SPNPM

Noninterpretive Skills (Beyond Imaging) Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPNPM-1 COST-EFFECTIVENESS ANALYSIS OF CT, PET/CT, AND WHOLE-BODY MRI IN ADVANCED MELANOMA PATIENTS TREATED WITH NIVOLUMAB AND IPILIMUMAB: A DECISION-ANALYTIC MODEL

Moritz L. Schnitzer, MD (*Presenter*)
Johannes Ruebenthaler, MD (*Abstract Co-Author*)
Thomas Geyer, MD (*Abstract Co-Author*)
Felix Herr, MD (*Abstract Co-Author*)

PURPOSE

Accurate initial staging and treatment response assessment are essential in advanced melanoma, particularly in the context of high-cost immunotherapy. While contrast-enhanced CT (CECT) remains the standard imaging modality, PET/CT and whole-body MRI (WB-MRI) may improve clinical decision-making through superior diagnostic performance. This study evaluates the cost-effectiveness of these three imaging strategies in patients treated with nivolumab and ipilimumab.

METHODS AND MATERIALS

A decision-analytic model combining a decision tree and Markov model was developed using TreeAge Pro. The model simulated a cohort of patients with advanced melanoma over a 5-year horizon in 3-month cycles. Imaging strategies included CECT, PET/CT, and WB-MRI, each linked to a Markov process incorporating the health states: progression-free survival (PFS), treatment response, progression, and death. Transition probabilities, QALYs, and cost inputs were derived from literature and clinical data. Model outputs included total costs, QALYs, and incremental cost-effectiveness ratios (ICERs).

RESULTS

PET/CT demonstrated the highest effectiveness (32.20 QALYs) at a moderate cost (€233,751.35), making it the most cost-effective option overall. WB-MRI yielded slightly lower effectiveness (31.45 QALYs) but incurred the highest cost (€251,294.77). CECT was the least costly (€230,596.44) but also the least effective (30.20 QALYs). Therefore, PET/CT versus CECT was within acceptable willingness-to-pay thresholds, while WB-MRI exceeded them without providing substantial additional benefit.

CONCLUSION

PET/CT provides the most favorable balance of cost and clinical effectiveness in advanced melanoma patients treated with immunotherapy. Although WB-MRI shows diagnostic potential, its high cost limits its economic value. CECT remains the most affordable but may compromise treatment planning due to lower diagnostic sensitivity. These findings support PET/CT as a cost-effective, clinically robust imaging strategy in this setting.

CLINICAL RELEVANCE/APPLICATION

Imaging selection critically influences patient outcomes and resource use in immuno-oncology. This study demonstrates that PET/CT offers the optimal trade-off between cost and diagnostic performance, effectively guiding treatment decisions without excess expenditure. In contrast, whole-body MRI—while diagnostically promising—does not provide sufficient additional clinical benefit to justify its higher cost. Standard CECT may reduce expenses but carries the risk of suboptimal staging. These insights support value-based imaging policies and can inform national reimbursement and guideline strategies.

W5B-SPNPM-2 BRIDGING THE GAP BETWEEN EVIDENCE AND PERCEPTION FOR A PATIENT-CENTERED COMMUNICATION STRATEGY FOR RADIOLOGY

Francesco Ria, PhD (*Presenter*)
Ehsan Samei, PHD (*Abstract Co-Author*)

PURPOSE

Controversial publications on radiation risk, such as a recent article claiming that CT scans may cause up to 5% of cancers diagnosed annually in the U.S. (Smith-Bindman et al., JAMA Intern Med), often receive disproportionate media attention despite methodological limitations. While the radiology community responds with scientific critiques, public narratives are frequently shaped by fear rather than evidence. This study examined the disparity between public and scientific attention to radiation-induced cancer in radiology compared with other high-risk medical procedures and evaluated the impact of media amplification on public perception and professional discourse to inform effective communication to patients.

METHODS AND MATERIALS

We conducted a qualitative analysis of public responses to the Smith-Bindman article and compared it with responses to the 2024 Radiology article with the highest Altmetric score (Philpotts et al., Breast cancers detected during a decade of screening with digital breast tomosynthesis: comparison with digital mammography). We also performed a PubMed query of 2024 publications to compare the number of articles referencing “radiation-induced cancer” with those referencing “surgery-related mortality” and “chemotherapy-related mortality.” Data on Altmetric scores, news mentions, and scientific volume were collected and compared to identify trends.

RESULTS

Three weeks after publication, the Smith-Bindman article had an Altmetric score of 2480 and was cited by 299 news outlets. By comparison, the Philpotts article, eight months post-publication, had a score of 488 and was cited by 61 outlets. In 2024, 35 scientific articles mentioned “radiation-induced cancer,” whereas only 5 mentioned “surgery-related mortality” and 1 mentioned “chemotherapy-related mortality.”

CONCLUSION

Radiation risks in medical imaging receive disproportionate attention compared to other high-risk medical procedures, both in scientific literature and the media. This imbalance may distort patient understanding and decision-making. Radiology professionals must proactively engage in transparent, evidence-based communication to contextualize imaging risks within the broader landscape of medical care, also emphasizing the benefits associated with effective and early diagnosis.

CLINICAL RELEVANCE/APPLICATION

Selective amplification of radiation risks may undermine patient trust and lead to avoidance of medically necessary imaging. Effective, balanced communication is essential to support informed decisions and maximize patient care.

W5B-SPNPM-3 INTEGRATING PATIENT INVOLVEMENT IN WHOLE-BODY MRI SURVEILLANCE FOR LI-FRAUMENI SYNDROME: PERSPECTIVES ON SCAN DURATION, CONTRAST AGENT USE, AND ANXIETY

Myriam Keymling, MD (*Presenter*)
Johann Jende (*Abstract Co-Author*)
Christian Jan Oliver Neelsen (*Abstract Co-Author*)
Heinz-Peter W. Schlemmer, MD (*Abstract Co-Author*)
Diane M. Renz, MD (*Abstract Co-Author*)

PURPOSE

To assess patient experiences and preferences regarding whole-body MRI (WB-MRI) surveillance in Li-Fraumeni syndrome (LFS), with a focus on factors affecting long-term adherence - such as scan duration, contrast agent use, and anxiety triggers - and to highlight the role of patient involvement in shaping optimized, patient-centered imaging protocols.

METHODS AND MATERIALS

As part of the LFS-MRI study conducted at DKFZ, patients with a confirmed pathogenic TP53 variant were invited to participate in an online survey after undergoing at least one WB-MRI examination. The 10-item questionnaire, developed with input from patient advocates and administered in German, explored perceived examination burden, motivational factors, and anxiety triggers. Descriptive analyses were performed for all 97 respondents.

RESULTS

All 97 participants completed item 1 - 8 of the survey. 95% responded to item 9 (willingness to accept shorter scans despite potential diagnostic loss) and 96% to item 10 (primary source of anxiety). While the majority of patients (57%) perceived the exam duration as at least partially too long, 98% intended to continue annual WB-MRI screenings. 87% would not consider discontinuing participation even if the duration remains long, and 65% were willing to accept a duration of 90 minutes or more. This could be due to the fact that nearly all participants (95%) believed WB-MRI to contribute significantly to improving their prognosis. A subset however indicated increased motivation if the exam were shorter (30%) or if no contrast agent were required (34%). Only 5% would prefer a shorter scan even if it meant potentially missing suspicious findings. 29% reported the feeling of confinement in the scanner as the strongest cause for anxiety, followed by fear of exam results (23%) and confronting their elevated cancer risk (18%). Noise was cited as the primary anxiety source by only 3% of participants.

CONCLUSION

Patients with LFS demonstrate strong commitment to WB-MRI surveillance, motivated by their belief in its clinical value. However, aspects such as scan duration and contrast agent use affect motivation and comfort. Integrating patient perspectives into protocol design can help develop more tolerable protocols and sustain long-term adherence to surveillance in LFS.

CLINICAL RELEVANCE/APPLICATION

Patient involvement into imaging protocols is essential for enhancing long-term adherence and reducing exam-related anxiety in hereditary cancer syndromes such as LFS, paving the way for more patient-centered care in high-risk populations.

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W5B-SPNR

Neuroradiology Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPNR-3 NINETY-DAY MEDICAL OUTCOMES AND TWO-YEAR REPEAT INTERVENTIONS FOLLOWING SINGLE-LEVEL VERTEBRAL AUGMENTATION: A NATIONAL DATABASE ANALYSIS

Rahul Jayaram, BS (*Presenter*)
Anshu Jonnalagadda (*Abstract Co-Author*)
Albert Lee (*Abstract Co-Author*)
Jonathan Grauer (*Abstract Co-Author*)

PURPOSE

Vertebroplasty and kyphoplasty are common treatments for vertebral compression fractures with generally favorable outcomes. However, prior studies on 90-day medical complications and 2-year reintervention rates remain limited by sample size and scope. The current study analyzed a large, multi-insurance, national administrative database to evaluate these outcomes following initial vertebral augmentation.

METHODS AND MATERIALS

Single-level vertebral augmentation procedures were identified from the 2010-2022 PearlDiver M170 database. Exclusion criteria included age under 65, an indication of neoplasm, infection, or prior spinal surgery. Outcomes included 90-day medical complications, readmissions, and emergency department (ED) visits. Multivariable logistic regression identified patient-level risk factors. Kaplan-Meier analysis assessed repeat vertebral augmentation rates at 3 months, 1 year, and 2 years.

RESULTS

Among 148,072 patients, 16.95% had a 90-day medical complication, and severe events occurred in 5.12%. Risk factors for 90-day complications included younger age (OR 1.01, per decade decrease), female sex (OR 1.11), ECI (relative to 0: 1-2 [OR 1.58], 3-4 [OR 2.21], =5 [OR 2.80]), insurance (relative to Medicare: Commercial [OR 1.12], Medicaid [OR 1.20]), and region (relative to West: Northeast [OR 1.19], South [OR 1.11], Midwest [OR 1.06]). For 90-day readmission, predictors included younger age (OR 1.024), ECI (relative to 0: 1-2 [OR 1.77], 3-4 [OR 2.62], =5 [OR 3.43]), insurance (relative to Medicare: Commercial [OR 1.14], Medicaid [OR 1.19]), and region (relative to West: Midwest [OR 1.18], Northeast [OR 1.35]). Female sex was associated with lower odds of readmission (OR 0.87). For 90-day ED visits, predictors included female sex (OR 1.043), ECI (relative to 0: 1-2 [OR 1.93], 3-4 [OR 2.770], =5 [OR 3.34]), insurance (relative to Medicare: Commercial [OR 1.46], Medicaid [OR 1.24]), and region (relative to West: Midwest [OR 1.12], Northeast [OR 1.07]); the South was associated with lower odds of ED visits (OR 0.92). Repeat augmentation rates were 5.8% at 3 months, 8.2% at 1 year, and 10.2% at 2 years.

CONCLUSION

In this analysis of single-level vertebral augmentations, 90-day medical complication, readmission, and ED visit rates were reported, along with a 10.2% 2-year repeat procedure rate. Clinical and non-clinical variables were identified as independent predictors of short-term outcomes.

CLINICAL RELEVANCE/APPLICATION

To our knowledge, this is the largest study to date examining 90-day medical complications, risk factors, and repeat vertebral augmentation rates up to 2 years. These findings can support clinical decision-making and risk stratification in managing vertebral compression fractures.

W5B-SPNR-4 MRI-BASED PREDICTION OF DNA METHYLATION GRADE IN IDH-MUTANT ASTROCYTOMAS USING QUALITATIVE AND QUANTITATIVE IMAGING FEATURES

Kanwar Singh, MBBS (*Presenter*)

PURPOSE

Histopathologic grading of IDH-mutant astrocytomas provides limited prognostic accuracy. DNA methylation-based subclassification into high-grade (A_IDH_HG) and low-grade (A_IDH_LG) tumors offers improved survival prediction. This study investigates whether preoperative MRI-derived imaging features and volumetric data can noninvasively predict methylation grade in IDH-mutant astrocytomas.

METHODS AND MATERIALS

Seventy-two treatment-naïve adult patients with histologically confirmed IDH-mutant astrocytomas underwent preoperative MRI and genome-wide DNA methylation profiling. VASARI imaging features and multicompartmental tumor volumes (enhancing, non-enhancing, necrotic, and edema) were extracted and reviewed. Logistic regression models with SMOTE oversampling were trained to predict methylation grade, WHO histologic grade, CNV status, and CDKN2A/B deletion. Cox proportional hazards models assessed associations with progression-free survival (PFS) and overall survival (OS).

RESULTS

Methylation grade was predicted from MRI with 75% accuracy (AUC=0.77), with high-grade tumors associated with enhancement, necrosis, midline crossing, ependymal extension, and poorly defined margins. In contrast, low-grade tumors were associated with the T2-FLAIR mismatch sign and greater non-enhancing tumor proportion. Volumetrically, A_IDH_HG tumors had larger enhancing, necrotic, and edematous volumes ($p<0.01$). Methylation grade, but not WHO grade, was independently associated with OS and PFS. A higher proportion of non-enhancing tumor predicted improved OS (HR=0.65, p=0.042), while necrosis predicted worse survival (HR=1.56, p=0.046). Predictive performance for WHO grade (AUC=0.67), CNV (AUC=0.69), and CDKN2A/B status (AUC=0.65) was moderate.

CONCLUSION

MRI-derived VASARI features and tumor compartment volumes enable noninvasive prediction of DNA methylation grade in IDH-mutant astrocytomas, outperforming histologic grade in survival prediction.

CLINICAL RELEVANCE/APPLICATION

Preoperative MRI biomarkers can stratify IDH-mutant astrocytomas by DNA methylation grade, allowing clinicians to better predict prognosis and guide surgical and therapeutic decision-making. Radiogenomic assessment may offer a clinically actionable, noninvasive alternative to invasive molecular testing, improving individualized patient care.

W5B-SPNR-6 SELECTIVE HIPPOCAMPAL SUBFIELD ATROPHY IN FIRST-EPISODE DEPRESSION: A HIGH-RESOLUTION FS60 PARCELLATION MRI STUDY

Lei Zhang (*Presenter*)
Xingchen Pan (*Abstract Co-Author*)
TAO LI (*Abstract Co-Author*)
Bingyang Bian (*Abstract Co-Author*)
Lin Hou (*Abstract Co-Author*)
Zhenyue Ma (*Abstract Co-Author*)
Xuanxiao Zhang (*Abstract Co-Author*)
Hongchao Wang (*Abstract Co-Author*)

PURPOSE

Based on the FS60 brain template, this study aims to explore the volume differences in the subregions of the hippocampus, amygdala, and thalamus between first-episode depression (FED) patients and healthy controls.

METHODS AND MATERIALS

This study included 53 subjects aged 18-50 years, consisting of 25 patients with FED and 28 age- and gender-matched healthy controls. All subjects underwent 3T MRI scans, and high-resolution T1-MP2RAGE structural image data were collected. The hippocampal subregions (24 substructures), amygdalar subregions (18 substructures), and thalamic subregions (50 substructures) were analyzed using the FS60 template to calculate the absolute volume and the proportion of each subregion to the total brain volume . Independent sample t-tests were used to compare the volume and proportion of each subregion between the two groups.

RESULTS

Demographic analysis revealed no significant difference in age between the FED group and the control group ($t = -0.35$, $p = 0.72$), but there was a significant difference in gender distribution ($t = -2.48$, $p = 0.016$). Additionally, the average age of the FED group (31.36 years) was significantly higher than that of the healthy control group (26.36 years) . Subregion analysis showed no significant differences in volume or proportion between the two groups in 18 substructures of the amygdala and 50 substructures of the thalamus ($p > 0.05$). However, in 24 substructures of the hippocampus, the volumes of 9 substructures (such as the subiculum and dentate gyrus) were significantly lower in the FED group than in the healthy control group ($p < 0.05$, after FDR correction) .

CONCLUSION

First-episode depression patients show significant atrophy in multiple substructures of the hippocampus (such as the subiculum and dentate gyrus), while no obvious abnormalities are found in the amygdala and thalamic subregions. This suggests that hippocampal structural changes may be an early neurobiological feature of FED.

CLINICAL RELEVANCE/APPLICATION

Atrophy of the subregions of the hippocampus may be associated with memory and emotional regulation disorders in depression, providing potential neuroimaging markers for early identification and targeted intervention. Future research can further explore the relationship between damage to the subregions of the hippocampus and clinical symptoms, providing a basis for individualized treatment.

W5B-SPNR-8 PREOPERATIVE PREDICTION OF PERIOPERATIVE COMPLICATION RISK IN PERCUTANEOUS TRANSLUMINAL ANGIOPLASTY AND STENT PLACEMENT USING INTRACRANIAL VESSEL WALL IMAGING-BASED RADIOMICS

Yu Guo, MD (*Presenter*)
Chengxiu Yuan JR, MMed,MMed (*Abstract Co-Author*)
Chunhong Hu, PhD (*Abstract Co-Author*)

PURPOSE

To develop a radiomics model based on high-resolution vessel wall imaging (HR-VWI) for preoperative identification of high-risk patients with intracranial atherosclerotic disease (ICAD) undergoing percutaneous transluminal angioplasty and stent placement (PTAS) who are prone to perioperative complications.

METHODS AND MATERIALS

This retrospective multicenter study enrolled 619 ICAD patients treated with PTAS (87 with complications, 532 without complications), divided into training (n=345), validation (n=149), and testing (n=125) cohorts. All patients underwent preoperative HR-VWI, including non-contrast T1-weighted (T1) and contrast-enhanced T1-weighted (T1CE) sequences. Lesions were segmented using ITK-SNAP, and 2,396 radiomics features were extracted via Pyradiomics. Feature selection involved intraclass correlation coefficient (ICC), Mann-Whitney U test, Spearman correlation analysis, and least absolute shrinkage and selection operator (LASSO). Synthetic Minority Over-Sampling Technique (SMOTE) was applied to address class imbalance in the training set, and multivariable logistic regression was used to screen clinical variables. Logistic regression (LR) algorithms were employed to construct radiomics, clinical, and combined radiomics-clinical models. Model performance was evaluated using the area under the curve (AUC) and DeLong test, while clinical utility was assessed via decision curve analysis (DCA).

RESULTS

Age was the only independent clinical predictor (OR=1.02, p=0.003). All radiomics models outperformed the clinical model, with the T1+T1CE combined model achieving the highest AUC (0.81, 95% CI [0.69-0.93]) in the testing cohort, significantly surpassing the clinical model (AUC=0.66, [0.55-0.77]; p<0.001). The radiomics-clinical combined model demonstrated optimal performance across the training (AUC=0.90, [0.86-0.93]), validation (AUC=0.83, [0.70-0.94]), and testing (AUC=0.81, [0.69-0.93]) cohorts, with superior clinical net benefit in DCA, particularly at threshold probabilities >40%.

CONCLUSION

This study highlights the potential of HR-VWI-based radiomics combined with clinical features to preoperatively identify high-risk patients, enabling personalized treatment decision-making.

CLINICAL RELEVANCE/APPLICATION

HR-VWI radiomics combined with clinical characteristics enables preoperative risk stratification for ICAD patients undergoing PTAS, optimizing individualized treatment planning.

W5B-SPNR-9 DCE-MRI-BASED RADIOMICS MODEL EXPLAINED BY SHAP METHOD TO PREDICT CDKN2A/B HOMOZYGOUS DELETION IN IDH-MUTANT ASTROCYTOMAS

Zhengyang Zhu, MD (*Presenter*)
Huiquan Yang, PhD (*Abstract Co-Author*)
Mengying Xu, MD (*Abstract Co-Author*)
Xin Zhang (*Abstract Co-Author*)
Bing Zhang, PhD (*Abstract Co-Author*)

PURPOSE

Cyclin-dependent kinase inhibitor (CDKN) 2A/B homozygous deletion has been proved to be an independent predictor of poor outcome of isocitrate dehydrogenase (IDH) mutant astrocytomas. This study aimed to develop a radiomics model based on dynamic contrast enhancement (DCE) magnetic resonance imaging (MRI) parameter maps for predicting CDKN2A/B homozygous deletion status in IDH-mutant astrocytomas.

METHODS AND MATERIALS

Patients with pathologically confirmed IDH-mutant astrocytomas with a CDKN2A/B homozygous deletion status from a single center between 2018 and 2022 were retrospectively recruited. Radiomics features were extracted by PyRadiomics from the whole tumor region on various DCE-MRI parameter maps (iAUC, K ep , K trans , V e and V p). Prediction models were constructed by support vector machine, and explained by Shapley Additive exPlanations (SHAP) method.

RESULTS

Eighty-two IDH-mutant astrocytoma patients (mean age 46.24 ± 13.24 years, 43 females) were enrolled, including 65 patients without CDKN2A/B homozygous deletion, and 17 patients with this deletion. The predictive model based on mixed features from all DCE parameter maps showed a better performance than those based on any single DCE parameter map. The mixed feature model exhibited AUC of 0.957 (95% confidence interval [CI]: 0.928-0.991) and 0.924 (95% CI: 0.818-1.000) in the training set and validation set, respectively. SHAP analysis showed that the gray-level co-occurrence matrix feature named information measure of correlation 1 from iAUC map contributed the most in the predictive model.

CONCLUSION

The developed model based on DCE-MRI radiomics features may serve as a noninvasive and preoperative tool for prediction of CDKN2A/B homozygous deletion status in IDH-mutant astrocytomas.

CLINICAL RELEVANCE/APPLICATION

Our study revealed that the interpretable DCE-MRI-based radiomics model can be used to predict CDKN2A/B homozygous deletion status before operation. This model may be a novel and effective biological marker in preoperative molecular subtyping of gliomas.

W5B-SPNR-10 LONGITUDINAL CHANGES IN MYELIN CONTENT WITHIN LESION (ZONE II) AFTER MRGFUS TREATMENT IN ESSENTIAL TREMOR: A QUANTITATIVE ANALYSIS USING MYELIN IMAGING

Masashi Kanouchi, BS (*Presenter*)
Toshio Yamaguchi, MD, PhD (*Abstract Co-Author*)

PURPOSE

Essential tremor (ET) is the most common movement disorders, impairing daily activities with upper limb tremor. MR-guided focused ultrasound (MRgFUS) thalamotomy provides a less invasive alternative to radiofrequency ablation and deep brain stimulation, with immediate symptom relief. However, recurrence occurs in approximately 15%, and its mechanisms remain unclear. Particularly, long-term changes in myelin, a key structure for neural transmission, have not been previously studied. This study aimed to assess longitudinal changes in myelin content within the lesion (Zone II) following MRgFUS for ET using synthetic MRI.

METHODS AND MATERIALS

19 patients with medication-refractory ET (mean age, 67.4 years; 11 males, 8 females) underwent unilateral MRgFUS targeting the ventral intermediate nucleus (Vim). MRI was acquired at pre-treatment, 1 day, 1 month, 3 months, 6 months, and 1 year using a 3T MRI scanner (GE DISCOVERY MR750w). Myelin content in Zone II was quantified using synthetic MRI. Repeated-measures ANOVA and Bonferroni-corrected paired t-tests assessed changes (significance: $p<0.0033$). In three recurrent cases after 1 year, we evaluated spatial relationships of the various zones, including myelin loss, T2 hyperintensity, and residual DRTT fibers.

RESULTS

The mean Zone II lesion volume on day 1 was 254.75 mm^3. Myelin content changed significantly over time ($F=74.35$, $p<0.0001$, $?^2=0.805$). Marked reduction occurred at 1 day ($p<0.0001$), with partial recovery at 1 and 3 months ($p<0.0001$), then secondary decline from 6 months. At 1 year, myelin content was significantly reduced from baseline ($p<0.0001$). In recurrent cases, residual DRTT fibers did not overlap with areas of myelin loss or T2 hyperintensity, suggesting that spared tracts may be involved in recurrence and potentially remyelinated during recovery.

CONCLUSION

Myelin content in the ablation zone shows dynamic change over one year post-MRgFUS. The presence of residual DRTT fibers outside demyelinated or T2 hyperintensity regions suggests the possibility that incompletely treated or repaired areas may contribute to recurrence. Quantitative myelin imaging may guide long-term evaluation and retreatment strategies.

CLINICAL RELEVANCE/APPLICATION

Myelin quantification using synthetic MRI may work as a sensitive biomarker for monitoring lesion evolution. Combined with tractography, it may identify spared tremor pathways in recurrent ET and support personalized treatment planning.

W5B-SPNR-12 DECODING THE MOLECULAR MECHANISMS OF FOCAL TEMPORAL LOBE EPILEPSY THROUGH CORTICAL MORPHOMETRIC INVERSE DIVERGENCE AND TRANSCRIPTOMIC

Haixia Mao (*Presenter*)
Xiangming Fang, MD (*Abstract Co-Author*)

PURPOSE

To investigate the molecular pathological mechanisms underlying focal temporal lobe epilepsy (TLE) by integrating structural brain network analysis with transcriptomic data, specifically using a Morphometric Inverse Divergence (MIND) network approach.

METHODS AND MATERIALS

A total of 182 focal TLE patients (119 with left TLE [LTLE] and 63 with right TLE [RTLE]) and 182 age- and gender-matched healthy controls (HCs) were included. MIND networks were constructed using the K-nearest neighbor density algorithm and multiple brain morphological features. A general linear model (GLM) assessed group-level, regional, and network-level MIND differences. Spearman's correlations examined associations between MIND alterations and clinical variables (age, age at onset, epilepsy duration, treatment duration). Transcriptomic analysis using Partial Least Squares (PLS) regression was applied to link MIND networks with whole-brain gene expression data. Gene ontology and protein-protein interaction (PPI) enrichment analyses were performed on significant PLS1 gene sets.

RESULTS

Compared to HCs, TLE patients exhibited significantly increased MIND similarity in the sensorimotor (SMN), dorsal attention (DAN), ventral attention (VAN), default mode (DMN), and frontoparietal (FPN) networks. MIND increases in DMN and FPN were positively associated with epilepsy duration and treatment time, though these did not remain significant after correction. Gene enrichment and PPI analysis of PLS1+ genes indicated involvement in mitochondrial function and neurodegeneration, while PLS1- genes were related to gene regulation and mRNA metabolism. RTLE patients showed more pronounced MIND alterations than LTLE patients, particularly in the right visual network (VN), with MIND similarity in the VN positively correlated with age (FDR-corrected $p = 0.0056$) and age of onset (uncorrected $p < 0.05$). In RTLE, PLS1- genes were enriched for synaptic structure and function; PLS1+ genes showed no significant enrichment.

CONCLUSION

TLE is associated with widespread morphometric network alterations, underpinned by transcriptional signatures related to mitochondrial dysfunction, neurodegeneration, and gene regulation. Lateralization effects in RTLE may be driven by synaptic structure and functional genes.

CLINICAL RELEVANCE/APPLICATION

These findings enhance our understanding of the gene-brain structure relationships in focal TLE, offering potential molecular targets for personalized treatment approaches and providing insight into the biological basis of disease lateralization.

W5B-SPNR-13 DISRUPTED DYNAMIC FUNCTIONAL NETWORK GRADIENTS REVEAL GRADIENT-SPECIFIC TEMPORAL INSTABILITY IN SELECTS

Linfeng Song (*Presenter*)
Lin Jiang (*Abstract Co-Author*)

PURPOSE

This study investigates dynamic brain state abnormalities in children with self-limited epilepsy with centrotemporal spikes (SeLECTS) using principal functional network gradients. Combining gradient analysis with trajectory cross-correlation, we assessed spatial organization, temporal stability, and network synchrony to identify gradient-specific disruptions linked to cognitive and sensory impairments.

METHODS AND MATERIALS

Resting-state fMRI data from 60 SeLECTS patients and 68 matched controls were analyzed. Dynamic functional network gradients (dFNGs) were derived using sliding-window connectivity and diffusion embedding. Two gradients were extracted: Gradient 1 (sensory-introspective axis) and Gradient 2 (task-control vs. default mode). K-means clustering (k=2) identified recurring brain states. Dwell time, occupancy rate, transitions, and sorting synchrony were analyzed. Group comparisons used t-tests or nonparametric tests.

RESULTS

Along Gradient 1, Cluster 1 showed reduced connectivity, especially in the default mode network (DMN), while Cluster 2 showed enhanced coupling among visual, sensorimotor, and dorsal attention networks, indicating a shift from introspection to sensory engagement. SeLECTS patients showed increased inter-network synchrony, especially in DMN, DAN, and auditory networks ($p < 0.05$), though occupancy and dwell time were unchanged ($p > 0.05$). Along Gradient 2, Cluster 1 reflected task-control dominance (DAN, FPN), and Cluster 2 showed diffuse connectivity across frontal-parietal-occipital regions. SeLECTS patients had reduced dwell time in task-control states ($p < 0.05$) but paradoxically elevated synchrony in frontoparietal networks, indicating unstable executive dynamics.

CONCLUSION

SeLECTS is marked by dual-axis disruption of brain dynamics. Both gradients showed elevated sorting synchrony, suggesting reduced flexibility, while only Gradient 2 showed impaired state maintenance. These findings reveal gradient-specific vulnerabilities and support the utility of dynamic analysis for understanding functional instability in pediatric epilepsy.

CLINICAL RELEVANCE/APPLICATION

This study reveals that children with SeLECTS exhibit distinct disruptions in the temporal dynamics of brain network organization, especially within sensory and executive control systems. Gradient-informed dynamic metrics offer a novel, non-invasive approach to identify functional instability that is not captured by traditional static measures. These findings support the potential clinical utility of functional gradient dynamics as early neuroimaging biomarkers for diagnosis, monitoring, and individualized intervention strategies in pediatric epilepsy.

W5B-SPNR-14 DETECTABILITY ASSESSMENT OF SUPER-RESOLUTION DIFFUSION-WEIGHTED IMAGES IN PATIENTS WITH ACUTE ISCHEMIC STROKE

Kiyohisa Kamimura, MD, PhD (*Presenter*)
Tsubasa Nakano (*Abstract Co-Author*)
Masanori Nakajo, MD (*Abstract Co-Author*)
Junki Kamizono (*Abstract Co-Author*)
Tomohito Hasegawa (*Abstract Co-Author*)
Daiki Tobo (*Abstract Co-Author*)
Ryota Nakanosono, MD (*Abstract Co-Author*)
Fumitaka Ejima (*Abstract Co-Author*)
Hiroaki Nagano, MD, PhD (*Abstract Co-Author*)
Koji Takumi, MD, PhD (*Abstract Co-Author*)
Hirokazu Otsuka (*Abstract Co-Author*)
Takashi Iwanaga (*Abstract Co-Author*)
Jihun Kwon (*Abstract Co-Author*)
Takashi Yoshiura, MD, PhD (*Abstract Co-Author*)

PURPOSE

Super-resolution is newly developed deep learning framework combines and integrates compressed sensing with two distinct convolutional neural networks enabling enhanced spatial resolution as well as noise and artifact reduction. This study aimed to compare the detectability of super-resolution diffusion-weighted imaging (srDWI) with conventional diffusion-weighted imaging (cDWI) in patients with acute ischemic stroke.

METHODS AND MATERIALS

This study included 34 consecutive patients who underwent MRI due to suspected acute ischemic stroke using a 3T scanner (Ingenia, Philips Healthcare). The srDWI was performed using a multi-slice 2D single-shot echo-planar imaging sequence with a slice thickness of 1.5 mm and in-plane spatial resolution of 1.5 x 1.5 mm reconstructed to 0.36 x 0.36 mm. Images were reconstructed using a prototype AI-based reconstruction software provided by the vendor. The cDWI with conventional compressed SENSE reconstruction was performed with a slice thickness of 5.0 mm and spatial resolution of 1.5 x 1.8 mm reconstructed to 0.9 x 0.9 mm. Lesion detectability was assessed by two radiologists using a three-point scale (0: not present, 1: probably present, 2: definitely present). The cDWI were evaluated first, followed by the srDWI. Lesions that were detectable only on the srDWI were re-evaluated on the cDWI. For cases with multiple lesions, a maximum of 10 lesions per patient were assessed. Statistical analysis of lesion detectability comparison between cDWI and srDWI was performed using the Wilcoxon signed-rank test. The sharpness index of the lesion depiction plane was calculated and compared between cDWI and srDWI using the paired t-test.

RESULTS

Observer 1 detected 51 lesions, with detectability scores on cDWI of (0; 12, 1; 11, 2; 28) and scores on srDWI of (0; 0, 1; 1, 2; 50). Observer 2 detected 41 lesions, with scores on cDWI of (0; 4, 1; 11, 2; 26) and scores on srDWI of (0; 0, 1; 1, 2; 40). 12 and 4 lesions were not detected on the cDWI but were identified on srDWI for observers 1 and 2, respectively. Detectability was significantly improved with srDWI compared to cDWI for both observer 1 and observer 2 ($p < 0.0001$ and 0.0005). The sharpness index was significantly higher with srDWI compared to cDWI (1013 ± 273 vs. 622 ± 178, $p < 0.0001$).

CONCLUSION

The srDWI showed superior lesion detectability and higher sharpness index compared to cDWI for acute ischemic stroke lesions.

CLINICAL RELEVANCE/APPLICATION

Super-resolution DWI enabled superior lesion detectability and higher sharpness index compared to conventional DWI for acute ischemic stroke lesions, and may impact on patient care.

W5B-SPNR-15 PHOTON-COUNTING CT SPECTRAL AUC MAPS FOR ACUTE ISCHEMIC STROKE DETECTION

Yu Sakai, MD (*Presenter*)
Lori Huang (*Abstract Co-Author*)
Konstanze Guggenberger, MD (*Abstract Co-Author*)
Colbey W. Freeman, MD (*Abstract Co-Author*)
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PURPOSE

Photon-counting CT (PCCT) provides spectral information that enables virtual monoenergetic imaging (VMI), but these data remain underutilized in clinical neuroradiology protocols. Detecting early acute ischemic stroke (AIS) on noncontrast CT can be challenging due to subtle changes in attenuation. This study evaluates voxel-wise spectral area under the curve (AUC) maps derived from PCCT VMIs as novel approach to aid the neuroradiologist and enhance AIS detection.

METHODS AND MATERIALS

In this retrospective single-center study (August 2022-December 2024), patients with noncontrast head PCCT who had MRI-confirmed AIS within four days were included. Eleven virtual monoenergetic images (40-140 keV) were reconstructed. Two parametric maps "Spectral AUC" (trapezoidal integration of voxel-wise attenuation across the 11 VMIs) and "Stroke Spectral AUC" (each VMI rescaled to stroke windows (width/level 40/40HU) prior to integration) were generated. Infarct contrast-to-noise ratio (CNR), signal-to-noise ratio (SNR), and infarct-to-normal contrast were compared between maps and clinical images by Wilcoxon rank-sum test. To evaluate the added-value of Stroke Spectral AUC maps in AIS detection, a two-round rater study was conducted: three neuroradiologists independently reviewed randomized set of clinical head CTs followed by repeat assessment after a 2-week washout period with the addition of Stroke Spectral AUC maps. Raters identified all perceived AISs based on anatomic region and laterality. Diagnostic accuracy was compared with and without the Stroke Spectral AUC maps.

RESULTS

26 patients (mean age 65±13 years; 13 women) were included. Spectral AUC maps demonstrated higher infarct-CNR than clinical images (median 1.97 vs. 1.64; $p = 0.003$) and higher infarct-SNR (7.98 vs. 6.80; $p < 0.001$), with similar infarct-to-normal contrast (0.14 vs. 0.12; $p = 0.58$). Stroke Spectral AUC maps further improved infarct-CNR (2.22 vs. 1.64; $p = 0.001$) and infarct-to-normal contrast (0.29 vs. 0.12; $p < 0.001$) but lowered infarct SNR (3.29 vs. 6.80; $p < 0.001$). In Round 1 of the rater study, the three raters correctly identified at least one true infarct in a mean of 14 out of 26 patients. For the one rater who has completed Round 2, the number of cases with at least one correct infarct called increased from 13 to 16 (12% increase). Round 2 results are still pending for the other two raters.

CONCLUSION

Photon-counting CT VMIs AUC map significantly enhances infarct contrast metrics and holds promise for improving AIS detection on noncontrast CT.

CLINICAL RELEVANCE/APPLICATION

We introduce novel maps derived from photon-counting CT spectral data which may assist neuroradiologists in detecting subtle acute infarcts on noncontrast CT and thereby improve patient care.

W5B-SPNR-17 IMPACT OF CLINICAL AND RADIOLOGICAL FACTORS ON CT-PERFUSION TIMING IN ACUTE ISCHEMIC STROKE

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Riccardo Valletta, MD (*Abstract Co-Author*)
Tommaso Gorgatti (*Abstract Co-Author*)
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Giulia A. Zamboni, MD (*Abstract Co-Author*)
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PURPOSE

To assess the impact of radiological and clinical variables on brain CT-perfusion (CTP) curves in patients with acute ischemic stroke.

METHODS AND MATERIALS

IRB-approved retrospective observational cohort study, need for informed consent was waived. We included 295 patients who underwent CTP for acute ischemic stroke in our Institution (Jan2020-Mar2024). One radiologist evaluated arterial input function (AIF) and reference vessel (RefV) curves to assess bolus arrival delay and time to baseline return. Additionally, he evaluated the unenhanced brain CTs acquired before CTP for the presence of microangiopathy (van Swieten scale) and intracranial arterial wall calcifications (yes/no). Age, sex, arterial blood pressure, heart rate, presence of arrhythmias, and NIHSS were retrieved from an institutional database. A logistic regression analysis was conducted to evaluate the impact of various independent variables on AIF and RefV.

RESULTS

The logistic regression analysis highlighted a statistically significant association between the presence of arrhythmias and the diagnostic outcome ($p< 0.0001$). Additionally, the NIHSS was also found to be a significant independent predictor ($p=0.0198$). Logistic regression analysis revealed that the median arterial time-to-peak was significantly longer in patients with cardiac arrhythmias (24.0s; IQR 20.2 - 27.1s) compared to those without (18.6s; IQR 15.5 - 21.7s), $p<0.0001$. Similarly, the venous time-to-peak was found to be longer in patients with cardiac arrhythmias (median 30.2s; IQR 26.4 - 32.0s) compared to those without (25.6s; IQR 22.5 - 28.7s), $p<0.0001$.

CONCLUSION

Our study showed that patients with cardiac arrhythmias, as well as patients with higher NIHSS, need longer CTP acquisition times to avoid perfusion curve truncation and potentially non-diagnostic results.

CLINICAL RELEVANCE/APPLICATION

Our study highlights the critical impact of patient-specific factors, particularly cardiac arrhythmias and stroke severity, on the diagnostic accuracy of CTP imaging in acute ischemic stroke. These findings advocate for a more individualized approach to CTP protocol design, emphasizing dynamic scan adjustments based on pre-scan assessments and real-time perfusion data. Future research should focus on integrating advanced imaging technologies and automated decision-support systems into clinical practice, ultimately enhancing stroke diagnosis and treatment outcomes.

W5B-SPNR-18 LONGITUDINAL ASSESSMENT OF GLYMPHATIC DYSFUNCTION IN THE SOD1G93A ALS MODEL

Xiawei Bai, MD, PhD (*Presenter*)
Hiroyuki Kameda, MD (*Abstract Co-Author*)
Naoya Kinota (*Abstract Co-Author*)
Daisuke Kato (*Abstract Co-Author*)
Kohsuke Kudo, MD, PhD (*Abstract Co-Author*)

PURPOSE

The glymphatic system plays a crucial role in clearing metabolic waste and maintaining brain homeostasis. Its dysfunction is increasingly recognized in neurodegenerative diseases such as amyotrophic lateral sclerosis (ALS). Most previous studies in ALS employed large molecular MRI tracers (e.g., Gd-DTPA), which cannot pass through AQP4 water channels. In contrast, 17 O-labeled water is a small molecule that can enter the brain via AQP4, enabling direct assessment of glymphatic transport. This study aims to evaluate glymphatic function in an ALS rat model using dynamic MRI with 17 O-labeled water.

METHODS AND MATERIALS

ALS model rats {NTac(SOD1G93A)L26H, n=7} and wild-type (WT) controls (n=7) were imaged using 7T MRI (Bruker BioSpec, Germany). Dynamic T2-weighted RARE images were acquired during and after a 14-minute intrathecal injection of 17 O-labeled water. Preprocessing included denoising, skull stripping, motion correction, and template construction. 17 O concentration was calculated from signal decrease relative to baseline. The cortex, basal ganglia, and brainstem were segmented as regions of interest (ROIs). Concentration-Time Curves (CTC) and Area Under the Curve (AUC) were used to assess 17 O uptake, clearance, and retention. Group comparisons were analyzed using two-way ANOVA and Mann-Whitney U test.

RESULTS

ALS rats showed significantly higher 17 O uptake and delayed clearance compared to WT rats ($p < 0.05$), indicating impaired glymphatic function. These differences were most pronounced in the cortex, basal ganglia, and brainstem. AUC analysis confirmed greater tracer retention in ALS rats across these brain regions ($p < 0.05$).

CONCLUSION

Dynamic MRI with 17 O-labeled water enables noninvasive visualization of glymphatic dysfunction in ALS. The increased influx and delayed efflux observed in ALS rats support its use in characterizing cerebrospinal fluid transport abnormalities associated with disease pathology.

CLINICAL RELEVANCE/APPLICATION

This method offers a novel imaging tool for evaluating glymphatic function and may serve as a sensitive biomarker for monitoring ALS progression, especially in relation to metabolic dysfunction.

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W5B-SPPD

Pediatric Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPPD-1 PROOF OF CONCEPT: 3D ULTRASOUND TOMOGRAPHY TRANSCRANIAL PEDIATRIC IMAGING

James Wiskin, PhD, MSc (*Presenter*)

PURPOSE

This proof-of-concept study demonstrates that 3D ultrasound tomography (3DUT), incorporated via a Breast Acoustic CT™ (BACT) scanner, enables transcranial acoustic imaging in neonates. We present high-resolution reconstructions of an excised ovine brain and bovine eye to illustrate the feasibility of imaging cranial and near-cranial structures relevant to neonatology. Neonatal brain hemorrhage is a critical condition, typically evaluated using MRI, which may be unavailable in low-resource environments (LRE). 3DUT offers radiation-free, gadolinium-free imaging. We show speed of sound (SOS) and refraction-corrected reflection images with in-plane resolution near 0.8 mm

METHODS AND MATERIALS

Data were acquired using the BACT Scanner. Transmission imaging was performed at 0.3-1.3 MHz; reflection imaging centered at 3.6 MHz. The SOS map, reconstructed first, was used to correct for acoustic refraction and enable 360° compounding of back-projected reflection images. This yielded refraction-corrected, speckle-free images with 0.6-0.9 mm in-plane resolution. The bovine eye was mounted in 32°C water and scanned after fixation to a ceramic plate. The ovine brain was suspended from a frame with surgical thread. SOS imaging used 1.3 MHz for the eye and 1 MHz for the brain. Reflection skull thickness at 2.5 MHz (0.611? ~ ?/2) indicates viable energy transmission through neonatal skulls.

RESULTS

Calculations confirmed acceptable insertion loss. SOS values of the vitreous, lens, iris, and cornea matched literature values. The SOS images highlighted tissue stiffness: water = 1511 m/s, fat = 1430-1480 m/s, vitreous = 1488 m/s, cornea = 1562 m/s, lens = 1667 m/s. Reflection imaging revealed the optic nerve, sub-retinal space, lens capsule, and a clearly resolved double-layered cornea (~1.8 mm separation, ~300 µm thick). Brain imaging showed cortical structure in detail. Montages of axial brain slices replicate neonatal imaging scenarios.

CONCLUSION

We demonstrate high-resolution imaging of excised bovine eye and ovine brain using 3DUT in a water bath setting. These results support the feasibility of neonatal transcranial imaging using low-frequency ultrasound. Reflection images, corrected with SOS data, show MRI-comparable resolution and detail without ionizing radiation or contrast agents. This approach may offer critical diagnostic capabilities in neonatal care, especially in LRE settings

CLINICAL RELEVANCE/APPLICATION

Newborns are vulnerable to hemorrhages including IVH, subdural, subarachnoid, and germinal matrix bleeds. 3DUT enables safe, high-resolution imaging of neonatal brain structures without radiation or MRI contrast, making it a promising alternative for diagnosis in both advanced and resource-limited clinical settings.

W5B-SPPD-2 QUANTITATIVE DECT PERFUSION METRICS IN SEVERE BPD: ASSOCIATIONS WITH CLINICAL OUTCOMES

Stephanie El Omeiri, MD (*Presenter*)
Erik Jensen (*Abstract Co-Author*)
Krithika Lingappan (*Abstract Co-Author*)
Joice C. Prodigios, MD (*Abstract Co-Author*)
Jordan B. Rapp, MD (*Abstract Co-Author*)
David M. Biko, MD, MBA (*Abstract Co-Author*)
Hansel J. Otero, MD (*Abstract Co-Author*)

PURPOSE

Bronchopulmonary dysplasia (BPD) remains a leading cause of chronic lung disease in preterm infants, yet its severity classification lacks quantitative imaging biomarkers. Perfusion abnormalities in BPD are often spatially heterogeneous, reflecting variability in lung injury and repair. This study investigates whether quantitative lung segmentation and perfusion metrics derived from dual-energy CT angiography (DECT) are associated with clinical outcomes in infants with severe (Grade 3) BPD.

METHODS AND MATERIALS

This prospective study included infants diagnosed with Grade 3 BPD who underwent chest DECT as part of a larger phenotyping initiative. Of 33 enrolled patients, 28 had evaluable DECT images; for patients with multiple studies, the earliest qualifying study was used. Whole-lung segmentation was performed using an in-house postprocessing software, and iodine concentration (mg/mL) was extracted. Mean iodine concentration, standard deviation, skewness, and kurtosis were calculated. Clinical variables assessed included pulmonary hypertension, tracheostomy, mortality, sex, and FiO2 category (0-50% vs >50-100%), along with continuous measures of gestational age and birth weight. Associations between DECT metrics and clinical variables were assessed using Wilcoxon and Spearman tests.

RESULTS

28 infants (57.1% male), mean gestational age of 25.2 weeks and median age at time of CTA of 20.1 weeks. The median birth weight was 650 g. Pulmonary hypertension and tracheostomy were each present in 32.1% of patients, with a mortality rate of 14.3%. No significant associations were observed between perfusion metrics and pulmonary hypertension, tracheostomy, mortality, or FiO2.

CONCLUSION

Whole-lung perfusion metrics were not significantly associated with key clinical outcomes including tracheostomy, pulmonary hypertension, or death. These findings highlight the limitations of whole-lung analysis and suggest a need for more granular regional or lobar segmentation approaches, as well as improved intermediate

clinical outcomes that may better reflect disease progression and phenotypic variation. A larger sample may also help clarify these associations, ultimately supporting earlier prediction and individualized management strategies in this high-risk population.

CLINICAL RELEVANCE/APPLICATION

Quantitative dual-energy CT perfusion imaging has potential as a noninvasive tool to characterize lung development in infants with severe BPD. While global perfusion metrics may have limited correlation with major clinical outcomes, more detailed imaging approaches could improve early risk assessment and support individualized management strategies.

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W5B-SPPH

Physics Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPPH-1 EFFECTIVELY REDUCING METAL ARTIFACTS USING LOW-ENERGY VIRTUAL MONOCHROMATICIMAGES IN LOW DOSE DUAL ENERGY CTWITH METAL ARTIFACT REDUCTION (MAR) ALGORITHM: A PHANTOM STUDY

Tingting Qu (*Presenter*)

PURPOSE

To assess the effectiveness of reducing metal artifacts using virtual monochromatic (VM) images in low dose dual-energy CT (DECT) with a metal artifact reduction (MAR) algorithm.

METHODS AND MATERIALS

A DECT quality control phantom (GPH-75B, Science in Kyoto) simulating adult abdomen with titanium inserts was prepared and scanned using DECT mode. The 40-140keV (with an interval of 20keV) VM images were reconstructed with and without MAR algorithm. Images were evaluated objectively by measuring CT values, standard deviation (SD) in regions of interest, the transverse and longitudinal diameter and their ratio of a titanium rod, and subjectively by grading on a scale of 5 scores for artifacts (0, none; 4, severe), edge clarity of titanium rod (1, worst; 5, excellent) and clarity of adjacent structures (1, worst; 5, excellent).

RESULTS

The VM images from 60keV-140keV with MAR had a similar ability (1-1.1 point) in metal artifacts reduction, excellent in displaying (>4.5 points) the titanium rod edge, and were all better than those without MAR (all $p<0.05$). The VM images at 60keV with MAR had the highest clarity score for imaging adjacent structures. The SD values in both reconstruction groups decreased with increasing energy and stabilized after 100keV, while MAR group had smaller SD. MAR showed significantly approved titanium rod diameter ratio than without MAR, stabilizing to 1 after 60keV.

CONCLUSION

Compared to non-MAR, MAR in DECT shows significant reduction of both dark and bright streak artifacts caused by the titanium implant and the distortion of implant itself. Considering the overall image quality and the known fact of the higher contrast enhancement with lower energy VM images, the 60-80keV VM images with MAR are recommended.

CLINICAL RELEVANCE/APPLICATION

The application of MAR technology can effectively reduce the metal artifacts of implants without causing deformation. In practice, appropriate reconstruction energy should be selected based on the contrast of the surrounding tissue of the implant.

W5B-SPPH-2 MITIGATING CT NUMBER VARIABILITY IN CARDIAC SCANS ACROSS TUBE POTENTIALS AND SCANNER MODELS WITH VIRTUAL MONOENERGETIC IMAGING

Aeden Davis, BS (*Presenter*)
Shuai Leng, PhD (*Abstract Co-Author*)
Kishore Rajendran, PhD (*Abstract Co-Author*)
Cynthia H. McCollough, PhD (*Abstract Co-Author*)

PURPOSE

CT scanner model and tube potential (kV) affect the CT number of soft and calcified plaques, impacting coronary artery disease (CAD) metrics like plaque volume. Virtual monoenergetic images (VMIs) mimic images scanned at a single x-ray energy and produce more consistent CT numbers than conventional images. Using a phantom and cardiac scan modes, this study tests CT number variability of soft and calcified tissues across different scanner models and kVs, comparing VMI to conventional images.

METHODS AND MATERIALS

A multi-energy CT phantom (Gammex) with fat, soft-tissue and calcium inserts was scanned on 3 scanners (Philips 7500, Siemens Force, Siemens Alpha) at each available kV using a cardiac scan mode. The phantom was wrapped in tissue-mimicking material (SuperFlab) to achieve attenuation similar to a patient's chest. A conventional image and a 70 keV VMI were made at each kV for Philips (CB kernel, iDose 5) and Alpha (Bv48 kernel, QIR 3). On the Force, the phantom was scanned with single-energy to create conventional images and scanned with dual-energy to create 70 keV VMIs (Bv40 kernel, Admire 4). The slice thicknesses and increments were 0.67 x 0.34 mm (Philips), 0.4 x 0.3 mm (Alpha), and 0.6 x 0.3 mm (Force). Regions of interest (ROIs) were drawn over multiple slices for each insert. The ROIs' mean CT numbers were calculated for each slice and averaged across slices. CT number variability as scanner and kV changed were analyzed for each insert type, comparing conventional images and VMIs.

RESULTS

With changing kV for a particular scanner, VMIs had a smaller range of CT numbers for all inserts, with calcium seeing the largest decrease in range compared to conventional images (23.6 HU, 48.2 HU, and 45.7 HU for Alpha, Force, and Philips, respectively). Across all scanners and kVs, the coefficient of variation (CoV) for VMIs was 2.3% (adipose), 3.2% (soft tissue), and 1.7% (calcium). This is a decrease compared to conventional images from the same scanner taken at different kVs, where the Alpha soft tissue insert had the smallest CoV (3.8%). At kV levels where conventional images could be compared across all three scanners, the smallest CoV was 3.5% (adipose, 120 kV), 3.0% (soft tissue, 140 kV), and 2.6% (calcium, 120 kV).

CONCLUSION

In cardiac scan modes, VMIs provided more consistent CT numbers than conventional images for fat, soft tissue, and calcium when kV level was varied. At kV levels where all scanners could be compared, adipose and calcium HU values were more consistent in VMIs than in conventional images when scanner was varied.

CLINICAL RELEVANCE/APPLICATION

VMI CT numbers are more robust to changes in kV and scanner model than conventional images, allowing for more comparable plaque measurements between scanners and scan settings in serial studies and between patients.

W5B-SPPH-3 EVALUATION OF IMAGE QUALITY AND LUNG-RADS CLASSIFICATION IN DEEP LEARNING-BASED ULTRA-LOW-DOSE CHEST CT

Siqi Qu (*Presenter*)
Zhiming Xiang (*Abstract Co-Author*)
Qiuxing Chen (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

To assess the impact of deep learning reconstruction on image quality and Lung-RADS classification in ultra-low-dose chest CT

METHODS AND MATERIALS

A prospective study was conducted from October 2024 to April 2025, enrolling patients with suspected pulmonary nodules who underwent both standard-dose chest CT (SDCT) and ultra-low-dose CT (ULDCT). ULDCT doses were adjusted based on body mass index (BMI). SDCT was reconstructed with 50% adaptive statistical iterative reconstruction (ASIR-V50%) as the reference. ULDCT images were reconstructed using ASIR-V50%, deep learning image reconstruction (DLIR) at medium and high levels, and filtered back projection (FBP). Lung-RADS classification was performed using automated software. Image quality was analyzed with Kruskal-Wallis one-way analysis, and weighted kappa (Kw) was used to assess Lung-RADS classification consistency. False positives were defined as ULDCT categories 3/4A/4B matching SDCT categories 1/2, and false negatives as ULDCT categories 1/2 matching SDCT categories 3/4A/4B.

RESULTS

The study included 95 patients (mean age 58 ± 14 years; 49 males) with 443 pulmonary nodules. ULDCT had an effective dose of 0.48 ± 0.11 mSv, an 85.96% reduction compared to SDCT (3.62 ± 1.40 mSv, $P < 0.001$). DLIR significantly improved image quality by reducing standard deviation (SD) of lung and fat tissue and increasing the signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) of lung tissue ($P < 0.001$) compared to ASIR-V50% and FBP. DLIR-H outperformed DLIR-M with better noise reduction and image quality ($P < 0.001$). For SDCT, Lung-RADS categories were as follows: category 1 (58 nodules, 32.4%), category 2 (375 nodules, 44.6%), category 3 (4 nodules, 8.6%), category 4A (3 nodules, 10.8%), and category 4B (3 nodules, 3.6%). The false-positive rate for ULDCT was 1/433. False-negative rates for ULDCT using ASIR-V50%, DLIR-M, DLIR-H, and FBP were 0, 0, 1/10, and 1/10, respectively. All reconstruction methods (ASIR-V50%, DLIR-M, DLIR-H, and FBP) showed high agreement in Lung-RADS classification (Kw = 0.971, 0.971, 0.957, and 0.957, respectively).

CONCLUSION

DLIR-M provides a suitable balance between image quality and Lung-RADS classification accuracy in ultra-low-dose chest CT, making it a preferred reconstruction method for ULDCT.

CLINICAL RELEVANCE/APPLICATION

Lung-RADS standardizes CT-based lung cancer screening and supports outcome monitoring. Deep learning-based ultra-low-dose CT reduces radiation while maintaining strong consistency in Lung-RADS classification compared to standard-dose CT, making it important for clinical use.

W5B-SPPH-8 EFFECT OF INTRAVENOUS IODINE CONTRAST AGENT ON THE ACCURACY OF LUMBAR BONE DENSITY MEASUREMENT IN PATIENTS WITH GASTRIC CANCER

Yanhong Zhao, MMed,MMed (*Presenter*)

PURPOSE

To investigate the effect of intravenous contrast agent on the accuracy of lumbar bone density measurement by comparing the CT value of monochromatic image, hydroxyapitite(HAP) concentration of HAP-Iodine image and Calcium concentration of Calcium-Iodine image between arterial and venous phase image.

METHODS AND MATERIALS

Ten patients with gastric cancer who underwent abdominal enhanced examination were selected. Revolution APEX CT (GE Healthcare) was used to perform dual-phase enhanced abdominal energy spectrum CT imaging (arterial phase and venous phase). 40-140keV monochromatic image and base substance image (HAP-Iodine, Calcium-Iodine image) were reconstructed using the energy spectrum analysis software. CT values of L1-L3 vertebral in monochromatic images (40 keV, 70 keV and 100 keV), HAP concentration of HAP-Iodine image and calcium concentration of Calcium-Iodine image were measured and compared between arterial and venous phase image.

RESULTS

There was significant differencese in CT values of 40 keV, 70 keV, 100 keV between two groups of images (all P values <0.05).At 70 keV, the CT values of lumbar vertebrae in the arterial and venous phases were 151.53±44.98HU and 172.83±44.40 HU. The concentrations of HAP iodine in the arterial and venous phases were 678.83±11.64 and 677.27±11.27 mg/cm 3 , respectively, with no significant statistical difference (P value>0.05). The HAP concentration of HAP-Iodine image in the arterial and venous phases were 678.83±11.64 mg/cm 3 and 677.27±11.27mg/cm 3 ,respectively, with no significant statistical difference (P value>0.05).The Calcium concentration of Calcium-Iodine image in the arterial and venous phases were 828.90±14.20 mg/cm 3 and 826.98±13.76 mg/cm 3 , respectively, with no significant statistical difference (P value>0.05).

CONCLUSION

The ability to measure bone density using CT values in contrast-enhanced scanning may be reduced due to venous contrast agent contamination, while spectral CT substrates are not affected by contrast agents, making bone density measurements more accurate.

CLINICAL RELEVANCE/APPLICATION

The ability to measure bone density using CT values in contrast-enhanced scanning may be reduced due to venous contrast agent contamination, while spectral CT substrates are not affected by contrast agents, making bone density measurements more accurate.

W5B-SPPH-9 OPTIMIZATION OF LOW-ENERGY MONOCHROMATIC IMAGING IN SPECTRAL CT USING DEEP LEARNING IMAGE RECONSTRUCTION: A PHANTOM STUDY

Hongbing Li (*Presenter*)
Lifang Wan (*Abstract Co-Author*)
Zhichao Li (*Abstract Co-Author*)
Zhenchu Long (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

The study aimed to evaluate the performance of deep learning image reconstruction (DLIR) in spectral CT, focusing on optimizing low-energy (40 keV) monochromatic imaging under different radiation doses. By comparing reconstruction algorithms (ASIR-V 50%, DLIR-M, DLIR-H) and objective metrics (CT value, noise, SNR, CNR), we

explored the potential of DLIR combined with low-keV imaging to enhance contrast, reduce noise, and improve quality, providing evidence for low-dose, high-quality imaging and clinical value in early lesion detection and low-iodine protocols.

METHODS AND MATERIALS

A QSP phantom containing 0.9% saline and 8 iodine solutions (0.5, 2, 5, 8, 11, 14, 17, 20 mgI/mL) was scanned in GSI mode on the GE Apex Expert CT at five CTDIvol dose levels (6.64, 8.73, 10.86, 12.28, and 15.38 mGy), each repeated three times, generating 15 datasets. Images were reconstructed with iterative reconstruction (ASIR-V 50%), DLIR-M (median level), and DLIR-H (high-level), and monochromatic images at 60, and 40 keV were generated. In each image, 100 mm² ROIs were placed at vial centers on five slices to measure CT value, SD, SNR and CNR, followed by intergroup comparisons.

RESULTS

Across doses and energy levels, CT values among the 3 algorithms showed no significant differences ($P > 0.05$). DLIR-H consistently achieved the lowest noise and highest SNR and CNR, followed by DLIR-M, with ASIR-V 50% performing the weakest. At the same dose, 40 keV DLIR-H images showed ~2.25, 2.13, and 2.16 times increases in CT value, SNR, and CNR compared to 60 keV ASIR-V 50% images, with similar noise (~1.06 times). At 8.73 mGy with 5 mgI/mL iodine, CT value decreased from 475.6±2.54 to 211.5±1.03, SNR from 47.23±5.24 to 22.62±1.94, and CNR from 36.91±3.52 to 17.74±1.13. At 10.86 mGy with 11 mgI/mL iodine, CT value dropped from 978.00±2.88 to 434.60±1.33, SNR from 93.47 ±8.98 to 43.57±4.26, and CNR from 88.71±7.53 to 39.77±3.52, highlighting the superiority of DLIR-H in enhancing low-energy contrast.

CONCLUSION

DLIR, especially DLIR-H, significantly reduces noise and enhances SNR and CNR in low-dose spectral CT, with the best results at 40 keV. Low-keV imaging amplifies tissue and iodine contrast through photoelectric effects. Combined with DLIR noise suppression, it enables high-contrast, high-resolution imaging at low doses, offering a feasible path for low-iodine applications

CLINICAL RELEVANCE/APPLICATION

DLIR combined with low-keV imaging optimizes image quality by amplifying tissue-iodine contrast for better lesion detection, particularly in small lesions and low-contrast organs, while mitigating the noise increase typical of low-keV imaging, supporting high-quality imaging at reduced dose and iodine load.Future research will bridge phantom studies to clinical translation.

W5B-SPPH-10 APPLICATION OF DEEP LEARNING IMAGE RECONSTRUCTION TO ENHANCE IMAGE QUALITY OF PEAK ARTERIAL PHASE CTA FROM 'TRIPLE-LOW' CTP SCANS

Haina Xu (*Presenter*)
Xin Qin (*Abstract Co-Author*)
Weiyuan Huang (*Abstract Co-Author*)
Feng Chen, MD, PhD (*Abstract Co-Author*)
Kun Ma (*Abstract Co-Author*)

PURPOSE

This study aims to assess the feasibility and image quality of cerebral CTA at the arterial peak phase using high-strength deep learning reconstruction (DLIR-H) under a triple-low CTP protocol (80 kV/80 mA, 40 mL contrast, 4 mL/s), in comparison with a conventional protocol (80 kV/120 mA, 50 mL contrast, 5 mL/s) reconstructed with a standard iterative reconstruction algorithm (ASIR-V 50%).

METHODS AND MATERIALS

A total of 102 patients with suspected acute ischemic stroke were prospectively enrolled and randomized into a conventional protocol group or a triple-low protocol group (n=51 each). All patients underwent CTP of the brain, from which thin-slice CTA images at the arterial peak phase were reconstructed. This yielded four data sets: Group A (conventional + DLIR-H), Group B (conventional + ASIR-V 50%), Group C (triple-low + DLIR-H), and Group D (triple-low + ASIR-V 50%). Regions of interest were placed in the internal carotid artery siphon, M1 segment of the middle cerebral artery, and temporalis muscle. CT values and standard deviations (SD) were measured, with the temporalis SD served as background noise for calculating vessel SNR and CNR. Two blinded senior radiologists independently assessed subjective evaluations of image noise, vascular edge sharpness, small vessel visibility, and overall image quality. Statistical and inter-rater agreement analyses were performed.

RESULTS

The triple-low protocol group reduced radiation dose by ~33% and contrast volume/injection rate by ~20% compared to the conventional group. CT values of the siphon and M1 segments differed significantly among groups ($P < 0.05$), but not in the temporalis muscle ($P > 0.05$). SD values differed in the M1 segment and temporalis muscle ($P < 0.05$), but not in the siphon segment ($P > 0.05$). Pairwise comparisons showed that the DLIR-H for Group C had significantly lower SD values in the siphon and M1 segments than the ASIR-V 50% in Group B ($P < 0.05$). SNR and CNR values in all regions showed significant group differences ($P < 0.05$), with higher values in Group C (DLIR-H) than Group B (ASIR-V 50%) ($P < 0.05$). Subjective assessments revealed no significant differences between DLIR-H and ASIR-V 50% in terms of four subjective terms under the same scanning conditions (all $P > 0.05$), with similar findings between Groups B and C. Inter-observer agreement was good (Kappa = 0.66-0.773).

CONCLUSION

CTA derived from triple-low CTP combined with DLIR-H significantly reduces radiation and contrast use while maintaining or improving image quality compared to conventional protocols with ASIR-V 50%.

CLINICAL RELEVANCE/APPLICATION

This method allows simultaneous CTP and CTA in a single scan, improving efficiency, reducing repeated scans, and lowering patient burden, highlighting its clinical utility.

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Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPRO-1 MULTIPARAMETRIC MRI AND DCE-PERFUSION ANALYSIS OF SPINAL METASTASES FOLLOWING SBRT: PRELIMINARY VOLUMETRIC-BASED INSIGHTS

Mahmud Mossa-Basha, MD (*Presenter*)
Javid Azadbakht, MD (*Abstract Co-Author*)
David R. Haynor, MD, PhD (*Abstract Co-Author*)
Simon S. Lo, MBChB (*Abstract Co-Author*)

PURPOSE

To evaluate correlations between clinical features, multiparametric MRI, and dynamic contrast-enhanced (DCE) perfusion parameters with tumor histology and epidural extension (Bilsky Epidural Spinal Cord Compression [ESCC]) scale) in spinal metastases treated with stereotactic body radiotherapy (SBRT), using lesion-specific volumetric segmentation.

METHODS AND MATERIALS

This retrospective, IRB-approved study included patients with spinal metastases treated with SBRT at our institution between November 2016 and December 2024. All underwent multiparametric MRI and DCE-perfusion MRI. Volumetric segmentation of metastatic lesions was performed to extract quantitative imaging features including T1/T2 signal intensity, enhancement homogeneity, and DCE metrics: wash-in/wash-out slope, time to peak (TTP), peak enhancement intensity (PEI), vascular permeability (Vp), signal enhancement ratio (SER), and area under the curve (AUC). Clinical variables included age, comorbidities (diabetes, hypertension, dyslipidemia), smoking, Karnofsky performance score (KPS), lymphadenopathy, vertebral compression fractures (VCF), and alignment. The ESCC score assessed epidural tumor extension.

RESULTS

A total of 119 patients (60 female, 59 male; mean age 61.8 ± 11.9 years) were included. Lung (33%), breast (18%), and renal (10%) were the most common primary tumors. ESCC score positively correlated with VCF grade (?=0.32, p=0.001) and posterolateral extension (?=0.28, p=0.004), and negatively with KPS (?=-0.24, p=0.01). MRI features significantly associated with higher ESCC scores included heterogeneous enhancement (p=0.006) and increased T2-weighted signal (p=0.03). PEI (p=0.004) and shorter TTP (p=0.027) showed significant DCE correlations with ESCC score. SER and AUC trended toward significance (p=0.06, 0.08). Breast metastases were more often T1 hypointense and homogeneously enhancing (p<0.01); renal metastases had higher PEI and Vp (p<0.05). Age and comorbidities showed no tumor-specific differences.

CONCLUSION

Quantitative volumetric MRI and DCE-perfusion parameters are associated with distinct tumor histologies and the severity of epidural tumor extension as measured by the Bilsky Epidural Spinal Cord Compression (ESCC) scale.

CLINICAL RELEVANCE/APPLICATION

Volumetric imaging and DCE-MRI parameters may enhance non-invasive assessment of spinal metastases, informing prognosis and individualized SBRT planning.

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W5B-SPVA

Vascular Imaging Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-SPVA-1 EXPLORING THE ROLE OF PSEUDOCONTINUOUS ASL AS A PREDICTOR OF WOUND HEALING FOLLOWING INFRAPOPLITEAL BALLOON ANGIOPLASTY IN DIABETIC FOOT PATIENTS

Smily Sharma, MD, FRCR (*Presenter*)
Venkata Subbaih Arunachalam, MD (*Abstract Co-Author*)
jineesh valakkada, MD (*Abstract Co-Author*)
Anoop Ayyappan, MD (*Abstract Co-Author*)
Ajay Alex (*Abstract Co-Author*)

PURPOSE

The presence of extensive infrapopliteal calcifications in diabetics renders the Ankle-Brachial Pressure Index and CT angiography less useful for vascular assessment. We aim to assess the role of Arterial Spin Labeling (ASL) perfusion in determining wound healing following infrapopliteal angioplasty for diabetic patients with non-healing foot ulcer.

METHODS AND MATERIALS

After obtaining institutional ethical committee approval, a prospective single-center cohort study was carried out from August 2022 to January 2024 in diabetic patients with non-healing foot ulcers and predominant infra-popliteal disease on CT/MR/digital subtraction angiography. A novel pseudo-continuous ASL (pc-ASL) sequence was performed on a 3 Tesla MR scanner (GE, Discovery 750w) covering bilateral feet prior to and after endovascular revascularization to compare the change in perfusion following intervention. ASL pedal blood flow [mean and regional (medial and lateral forefoot and hindfoot)] of the symptomatic and contralateral feet was compared with healthy controls (n = 14). The measurements were carried out by two Radiologists with a minimum of 8 years of experience. Clinical follow-up for wound healing was done at 6 months post-procedure and at complete wound healing if present. Cox proportional regression analysis was done to identify factors predicting early wound healing.

RESULTS

Fifty-eight diabetic patients with non-healing foot ulcers underwent infrapopliteal balloon angioplasty. ASL mean pedal blood flow (mPBF) of symptomatic feet before intervention was lower than in the healthy controls (10.58 versus 13.45 ml/100g/min). Comparison of paired regional ASL mPBF of symptomatic feet before and following intervention showed a significant increase in mPBF (10.58 vs 15.30 ml/100g/min, P =<0.001). MRI measurements of regional pedal perfusion of the untreated contralateral limb measured pre and post-procedure showed good agreement (r = 0.935, 0.890, 0.932) with each other, indicating that they remain unchanged and showing the reliability of ASL perfusion. The multivariate Cox proportional hazards model showed clinical WIFI Stage 1 [odds ratio (OR): 3.119 (1.448-6.719)] and gain in forefoot mPBF [OR: 1.008 (1.000-1.016)] as independent predictors of early wound healing (within 120 days).

CONCLUSION

Pseudocontinuous ASL is a reproducible and objective technique for measuring pedal perfusion. Improvement in forefoot perfusion in pc-ASL following infrapopliteal angioplasty in diabetic ischemic ulcer predicts early wound healing.

CLINICAL RELEVANCE/APPLICATION

ASL perfusion is a novel tool for objective measurement of pedal perfusion and may be used as a reliable imaging marker of the outcomes of infrapopliteal angioplasty in future.

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M2-QI

Quality Improvement Reports Monday Morning Poster Discussions

Monday, Dec. 1 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

M2-QI-1 IVC FILTER TRACKING PROJECT

Jacob Varner, BS (*Presenter*)
Lisa Ponce, RT (*Abstract Co-Author*)
Cathy Hannafin, MBA, BSN (*Abstract Co-Author*)
Jennifer Marino (*Abstract Co-Author*)

INTRODUCTION

The MCA Interventional Radiology (IR) Division has a goal to remove retrievable inferior vena cava (IVC) filters placed at MCA within six months. This timeframe aligns with the guidelines from the American Heart Association (AHA), American College of Chest Physicians (ACCP), and American College of Radiology (ACR)/Society of Interventional Radiology (SIR). To facilitate this goal, the IR physician assistants (PAs) strive to see every patient for an IR Clinic Consult within three months after IVC filter placement. Data showed significant variation in days between IVC filter placement and IR Clinic Consult order, prompting a multidisciplinary team to address the issue. The project aims to reduce patients with ten days or more between IVC filter placement and IR Clinic Consult order entry by 62%, from 26% to 10% by 12/31/24.

METHODS

A team comprised of Radiology physician assistants (PA), nurses, data analyst, operational leadership, and quality staff convened and used Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control) improvement methodology to address the problem. Procedural data was retrieved from the electronic healthcare record (Epic) from January 2023 through October 2023, which consisted of 66 patients. The team created a swim lane process map from IVC filter placement to IR Clinic Consult order entry. Analyzing the data revealed several key issues: no Epic report to identify IVC filter patients, issues tracking patients in Epic, manual data entry, inconsistent PA documentation, and inconsistent data review. Two major interventions were implemented in clinical practice: an Epic workbench report to track IVC filter patients and record follow-up information and shifting monitoring responsibilities from PAs to the radiology nursing team.

RESULTS

Post-intervention results showed that 100% of retrievable IVC filter placements patients received an IR consult order within 10 days of implant by December 2024, successfully meeting the project goal. Improvements were sustained using the report, which helps visually identify patients without clinic consult orders. The nursing team established a consistent and feasible review process and cadence within their practice.

DISCUSSION

Tracking Inferior Vena Cava (IVC) filters has been challenging for many practices. Prolonged retention risks include filter fracture, migration, and vena cava thrombosis or stenosis. Successful tracking is crucial for timely removal, reducing complications and increasing successful retrievals. Transitioning responsibilities between teams posed challenges, but implementing standardized scripting and clear expectations helped streamline the process.

M2-QI-2 STREAMLINING DIAGNOSTIC ACCESS: IMPACT OF AN EMR-INTEGRATED MRI SCREENING TOOL ON ORDER-TO-SCAN TURNAROUND TIMES ACROSS INPATIENT AND EMERGENCY PATHWAYS

Karthik Rayasam, MBBS, MD (*Presenter*)
Gayatri Kaimal (*Abstract Co-Author*)
Jamie Crooks (*Abstract Co-Author*)
Unni K. Udayasankar, MD (*Abstract Co-Author*)
Hasan Ozgur, MD (*Abstract Co-Author*)

INTRODUCTION

Delays in inpatient and emergency MRI access are often rooted in fragmented communication and manual safety validation workflows. Paper-based screening forms contribute to incomplete data, inefficiencies, and delayed radiologic readiness. To address these operational shortcomings, a fully electronic, EMR-integrated MRI screening tool was deployed with the objective of accelerating safety clearance, improving communication between nursing and radiology, and reducing MRI turnaround time (TAT) from order placement to scan initiation.

METHODS

A multidisciplinary task force designed an automated MRI safety screening module embedded in the hospital's EMR. Triggered at the point of MRI order entry, the tool required completion of a dynamic, logic-driven questionnaire by nursing staff and generated a real-time alert in the radiology worklist upon completion. MRI technologists reviewed and validated entries before protocoling. Data were retrospectively collected from January to December 2023, stratified by clinical setting: Emergency Department (ED), Observation (OBS), and Inpatient (INPT). TAT was defined as the interval between MRI order placement and scan start. Trends were analyzed over time to assess operational impact.

RESULTS

The implementation yielded substantial and sustained reductions in TAT across all patient categories: ED TAT improved from a plateau of 3.7 hours (April) to a sustained low of 1.5-1.9 hours between July and November, reflecting >50% efficiency gain in acute imaging workflows. OBS TAT decreased from a peak of 12.8 hours (March) to 3.3 hours (December), demonstrating enhanced throughput in observation units. INPT TAT declined from 16.5 hours (January) to 6.6 hours (December), representing a >60% reduction in the most operationally complex setting. The June-October window marked the most rapid improvement across service lines, coinciding with full staff adoption and stabilization of workflow compliance.

DISCUSSION

A fully digitized MRI screening system significantly reduced order-to-scan turnaround times across emergency and inpatient care pathways. By embedding transparency, real-time status updates, and protocol readiness into the EMR, this intervention improved radiologic efficiency, minimized redundant communication, and accelerated

access to advanced imaging. These findings support broader institutional adoption of informatics-driven workflow tools across diagnostic modalities

M2-QI-3 OPTIMIZING RADIOLOGY WORKFLOW IN A HIGH-VOLUME ACADEMIC MEDICAL CENTER: A DATA-DRIVEN QUALITY IMPROVEMENT INITIATIVE

Divyansh Gupta, MBBS, MD (*Presenter*)
Parul Gupta, MBBS, MD (*Abstract Co-Author*)
Naman Gupta, MD (*Abstract Co-Author*)

INTRODUCTION

Public hospitals in our country, operating under state-sponsored insurance schemes, face high imaging demand with constrained resources. In our tertiary academic center, CT and MRI services function under a public-private partnership (PPP), adding workflow complexity due to manual processes, documentation-heavy protocols, and disconnected hospital and vendor systems. These issues resulted in delays across patient registration, scan scheduling, and report delivery, prompting a structured quality improvement project.

METHODS

Using the PDSA framework, we implemented targeted interventions across pre-scan, scan and post-scan phases. Pre-scan improvements included a triage system to schedule non-urgent scans during off-peak hours, fast-tracking emergencies lacking formal documents, contrast counter relocation near imaging areas, dedicated RIS entry personnel and standardized document checklists. Scan-period changes involved protocol simplification for common indications, technologist shift restructuring, and a live triage tagging system for prioritization. Post-scan efforts included structured reporting templates, redistribution of cases between in-house teams and teleradiology, resident-led backlog clearance, and real-time sharing of imaging links with clinicians to expedite treatment. The multidisciplinary QI team consisted of radiologists, residents, technologists, administrative staff, and PPP partner personnel. Data sources included our hospital EMR, RIS, PACS, and departmental logs. Primary metrics were CT/MRI access times, RIS delays, report turnaround, protocol omission, staff burnout (Likert scale), and patient satisfaction. Secondary metrics included reporting backlog duration, critical result communication, teleradiology usage, and clinician acknowledgment delay. Analysis employed descriptive statistics, paired t-tests, Wilcoxon signed-rank, and chi-square tests ($p < 0.05$), supported by line plots, control charts, box plots, and bar graphs.

RESULTS

Post-intervention, CT registration-to-scan time decreased from 2.1 to 1.2 hours, MRI wait time from 10.2 to 4.8 hours, and RIS entry time from 17 to 6 minutes. Report backlog reduced from 26 to 9 hours, and protocol omission rates declined from 15% to 5%. Staff burnout improved from 7.0 to 4.0, and patient satisfaction increased from 58% to 82%. Teleradiology usage rose by 34%, improving case load distribution. All key improvements were statistically significant and sustained over the study period.

DISCUSSION

This initiative demonstrates how structured, context-sensitive interventions can optimize radiology workflow in resource-limited academic hospitals. Through team collaboration, task redistribution, and data-driven decision-making, meaningful gains in efficiency, quality, and satisfaction are achievable and replicable in similar settings.

M2-QI-5 ENHANCING EFFICIENCY AND REDUCING WORKLOAD STRESS THROUGH AUTOMATED IMAGING PROTOCOL SELECTION IN ONCOLOGIC NUCLEAR MEDICINE

Aparna Singh, MD (*Presenter*)
Hina Shah, MD (*Abstract Co-Author*)

INTRODUCTION

Manual imaging protocol assignment remains a source of inefficiency and stress in nuclear medicine workflows, particularly in high-volume cancer centers. Protocoling is vital for ensuring appropriate imaging, but the manual process increases clinicians' cognitive and administrative load. A survey across affiliated sites explored perceptions of manual protocoling and the potential value of automation to reduce stress and improve workflow.

METHODS

A cross-institutional survey was conducted with hospital trainees to evaluate current protocoling practices, time spent, perceived workload impact, and the value of automation. Respondents suggested specific protocols for automation, including FDG PET/CT, therapy studies, breast injections, and bone scans. A multidisciplinary quality improvement team was formed to assess feasibility and ensure integration with existing systems. To evaluate automation's impact, nuclear medicine procedure volumes from March to mid-April 2025 were analyzed, focusing on changes in scan volumes, protocol consistency, and site distribution before and after implementation.

RESULTS

Survey results showed half of respondents (50%) spent <30 minutes daily on protocoling, with another 50% spending 30-60 minutes. All respondents agreed that manual protocoling contributes to workload stress, with 50% experiencing significant stress. Most (83.3%) believed automation would be highly beneficial, and 16.7% found it somewhat beneficial. Suggested automations included FDG PET/CT, therapy studies, and bone scans. Respondents emphasized safeguards, such as triggering a manual review for mismatched clinical indications. In March (initial rollout), of 655 scans, 76% (n=500) were successfully autoprotocoled. By mid-April, 89% (n=527) of 591 scans were autoprotocoled, with only 11% (n=64) requiring manual intervention. High-volume protocols, such as:Bone Scans: 95% autoprotocoled in April, with <5% needing manual override. PSMA PET/CT: >95% autoprotocoled, manual reviews for trial modifications. FDG PET/CT Total Body: Reduced manual intervention.

DISCUSSION

The findings highlight the need for workflow improvement in nuclear medicine through automation. All respondents acknowledged the contribution of manual protocoling to workload stress. Autoprotocoling for high-volume, standardized studies improved efficiency and reduced the manual protocoling burden. However, appropriate oversight remains necessary for discrepancies. Limitations of the study include a small sample size and reliance on subjective perceptions. Success will depend on collaboration between clinical teams and IT for continuous improvement.

M2-QI-6 ENGAGING LEADERSHIP THROUGH DATA VISUALIZATION AND ARTIFICAL INTELLIGENCE: IMPROVING THE PATIENT EXPERIENCE IN RADIOLOGY

Shanil Kumar, MPH (*Presenter*)
Katelyn Chooey, BA (*Abstract Co-Author*)
Elizabeth Odell (*Abstract Co-Author*)
Javier Villanueva-Meyer, MD (*Abstract Co-Author*)

INTRODUCTION

Press Ganey (PG) surveys provide critical insights into patient experience, but in radiology, a lack of centralized, intuitive reporting limited their usefulness. Leaders lacked access to visualized, modality-specific data, hindering their ability to identify trends and act on feedback. To address this, UCSF Radiology developed Smartsheet dashboards, enhanced by UCSF's AI tool VERSA, to improve data accessibility and leadership engagement.

METHODS

A root-cause analysis revealed key barriers: absence of centralized dashboards and limited support for PG data interpretation. We hypothesized that interactive, modality-specific dashboards would increase engagement and promote data-driven decisions. Interventions included: Launching Smartsheet dashboards to visualize PG data. Integrating UCSF VERSA to highlight patient comment themes using AI. Creating a workflow for data retrieval, visualization, and distribution. Surveying modality leaders in March 2025 to assess dashboard use, usability, and application.

RESULTS

Survey results post-implementation showed notable improvements: Increased Engagement 90% of leaders now review dashboards monthly or most months. Improved Access Those finding the data "very easy" to access and interpret rose from 20% to 40%. Usability Gains 90% found dashboards at least "somewhat easy" to interpret; 40% said they were "very useful" for action planning. Actionable Changes 50% of leaders made or proposed interventions. For example: Molecular Imaging reminded staff to offer blankets to patients. Breast Imaging addressed recurring concerns about dressing rooms.

DISCUSSION

Smartsheet dashboards significantly improved PG data visibility and use across UCSF Radiology. Leaders now review data more regularly and are better equipped to respond to patient feedback. Next Steps Further refine dashboards based on feedback and expand AI capabilities to automate theme identification and correlate comments with score trends. Lessons Learned Accessibility Boosts Engagement: Visual, intuitive, and role-specific tools are key to regular data use. Customization Matters: Leaders value the ability to filter by site, modality, and theme. Iterative Feedback Drives Improvement: Early input enabled us to refine tools and guide future development.

M2-QI-7 AUTOMATED, LARGE LANGUAGE MODEL-ENABLED PARSING OF PROSTATE MRI AND BIOPSY RESULTS ENABLES HIGH-FIDELITY QUALITY ANALYTICS AT SCALE

Melis Ozkan, BS (*Presenter*)
Benjamin Mervak, MD (*Abstract Co-Author*)
Aleksandra Zarska (*Abstract Co-Author*)
Matthew S. Davenport, MD, MBA (*Abstract Co-Author*)

INTRODUCTION

Current radiology quality assessment (QA) methods rely on manual audits or brittle string-based queries, which are labor-intensive, prone to bias, and lack scalability. Previously published work parsing prostate magnetic resonance imaging (MRI) using regular expressions failed over time due to deviations in formatting. Large language models (LLM) can minimize those failures in their ability to successfully classify reports with non-standard structure. This project aimed to develop an autonomous QA tool to enable robust, real-time performance monitoring with minimal human intervention.

METHODS

A sample (N=325) of prostate MRI reports with biopsy or prostatectomy data were retrospectively selected for manual review and testing. A zero-shot LLM (GPT-4) was deployed to parse semi-structured reports, extracting maximum PI-RADS v2.0 scores (at MRI) and maximum Gleason scores (at histopathology). Outputs were compared against manual annotations by two medical students, who each reviewed 150 or 325 of the 325 reports (i.e., 150 overlap) to document LLM accuracy. Accuracy of the LLM for identification of maximum PI-RADS v2 score and maximum Gleason score was calculated using manual review as the reference standard. Gwet's AC1 was used to assess agreement on the 150 shared cases. LLM token costs and labor time were tabulated.

RESULTS

Of the 325 reports, there were 4 errors in LLM outputs (1.2% error rate). Three identified Gleason =7 cancer when it was absent, and one had a Gleason grade error. All four errors were caused by erroneous use of data in the user-generated "History" section of the radiology report. When the LLM was told to ignore that section, the accuracy improved to 100%. Inter-rater agreement was perfect (Gwet's AC1 = 1.0). The model reduced manual QA data correction effort by 18 hours/month at a cost of $8.32.

DISCUSSION

Automated quality analytics are feasible at scale using LLMs to parse radiology and pathology results for calculation of predictive values. Although the use case involved prostate MRI, any radiology-pathology linkage is feasible at markedly reduced cost compared to manual data extraction.

M2-QI-8 FOSTERING AN AI LEARNING COMMUNITY: A RESIDENT-LED CONFERENCE SERIES FOR CASE-BASED EDUCATION AND SYSTEMS IMPROVEMENT

Noah Gafen, MD (*Presenter*)
Shiva Ambardar, MD (*Abstract Co-Author*)
Brianna E. Damadian, MD (*Abstract Co-Author*)
Rachel Saks, MD (*Abstract Co-Author*)
Jeffrey B. Levine, MD (*Abstract Co-Author*)
Avraham B. Zlochower, MD (*Abstract Co-Author*)
Ritesh D. Patel, MD (*Abstract Co-Author*)
Matthew A. Barish, MD (*Abstract Co-Author*)
Shlomit Goldberg-Stein, MD (*Abstract Co-Author*)

INTRODUCTION

As artificial intelligence (AI) tools become increasingly integrated into radiology workflows, there is a growing need for structured learning environments where residents can critically engage with AI results, identify the strengths and limitations of these tools, and strengthen their own clinical judgment.

METHODS

This virtual conference series brings together approximately 100 residents from four diagnostic radiology residency programs within a large, integrated healthcare system with >300 faculty radiologists. The conference draws on 12 FDA-cleared AI tools in active clinical use: Brain aneurysm, Vessel occlusion, Intracranial hemorrhage, Midline shift, Cervical spine fracture, Pneumothorax, Free air, Aortic dissection, Pulmonary embolism (PE), Incidental PE, Right/Left Ventricle ratio, and Rib fracture. Conferences are resident-led, subspecialty-themed, and include participation from faculty and the radiology AI team. Conference cases are culled from a database of cases submitted optionally through the AI vendor's orchestration hub (aidoc, Tel Aviv, Israel) by faculty and trainees during routine daily interpretation.

RESULTS

The conference series is built around four core functions: 1) Case Discovery - Residents review cases with strong learning opportunities from a database of case feedback provided through the orchestration hub, sorting by AI tool, exam type, and feedback label (True positive, True negative, False positive, False negative, and "wow True positive" great cases), and reviewing the cases. 2) Shared Learning Themes - Sessions highlight cognitive insights, recurring diagnostic and/or triage pitfalls, and system contributors. Residents are encouraged to recognize patterns that may inform future interpretation and help avoid automation bias. 3) Collaborative Case Review - Open, non-hierarchical dialogue explores how residents engage with AI results during interpretation, examining concordance and discordance with AI to better understand reasoning patterns and opportunities for learning. 4) Translation to Action - Learning points that can be translated to system level improvements are escalated to the core AI team for technical and operational follow-up. These have included: 1) Enhancing worklist prioritization logic and visibility, 2) Improving distribution of triaged AI positive cases across resident on-call worklists, 3) Suggestions for alert refinements (e.g. improving filters and displays).

DISCUSSION

This resident-led AI Learning Community Conference Series fosters clinical insight and confidence in interacting with AI and also drives continuous system improvement for the AI clinical program. By linking education to actionable changes, both internally and with vendor partners, it provides a scalable model for safe, reflective, and iterative AI integration in clinical radiology practice.

M2-QI-9 COLLABORATIVE QUALITY IMPROVEMENT TO OPTIMIZE MAMMOGRAPHY POSITIONING AND DEPARTMENT EFFICIENCY

Miranda J. Mares, MS,RT (*Presenter*)
Jennifer L. Saline, MD (*Abstract Co-Author*)
Aide Atayde-Law (*Abstract Co-Author*)
Alma Tabor (*Abstract Co-Author*)
Raina Mendoza (*Abstract Co-Author*)
Jacob Ormsby, MD, MBA (*Abstract Co-Author*)

INTRODUCTION

Mammography plays a vital role in the early detection of breast cancer, but suboptimal patient positioning can significantly compromise image quality and diagnostic accuracy. Internal reviews at our institution revealed that only 38% of mammography screening exams met American College of Radiology (ACR) ImPower program established positioning criteria. The project goal was to increase the percentage of our mammography screening exams meeting passing criteria from 38% to 85% over the 6-month intervention period.

METHODS

In partnership with the ACR learning network, our team conducted a comprehensive current-state analysis to identify key issues contributing to suboptimal mammography positioning. This analysis included Gemba Walk observations, cause-and-effect analysis, and root cause identification. Based on these findings, interventions were developed across four focus areas: technologist skill enhancement, communication standardization, workflow redesign, and staffing adjustments. Pre- and post-intervention data were collected and analyzed over a six-month period.

RESULTS

By the end of the six-month intervention period, the percentage of mammography screening exams meeting passing criteria increased from 38% to 85%. These improvements have been sustained, with scores remaining above 80% for at least nine months post-implementation. The project also led to unexpected benefits, including improved team morale and the identification of necessary scheduling adjustments that enhanced overall department efficiency. The new scheduling model improved daily workflow consistency and supported more efficient use of staff and resources.

DISCUSSION

The project successfully identified and addressed root causes of suboptimal mammography positioning and workflow inefficiencies. The most impactful interventions included targeted skill enhancement programs for technologists, such as structured 1:1 coaching sessions that significantly improved positioning consistency and confidence. Additional interventions included standardized communication practices and workflow optimization through revised scheduling to ensure balanced, consistent workloads. The addition of a second breast radiologist helped manage daily volume more effectively, while improvements in technologist staffing and support further contributed to increased throughput and exam quality. These changes led to measurable benefits: exam passing criteria scores improved from 38% to 85% and staff morale improved significantly. The standardized workflow and improved role clarity enhanced team communication and job satisfaction, with gains sustained for at least nine months post-intervention. This project demonstrates how a structured, collaborative approach to radiology quality improvement can drive sustainable outcomes.

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M5A-QI

Quality Improvement Reports Monday Afternoon Poster Discussions I

Monday, Dec. 1 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

M5A-QI-1 DECREASING SAFETY EVENTS / RECONCILIATION RATES IN CT IMAGING

Vivek Batra, MD (*Presenter*)
Erin Panter, ARRT, BS (*Abstract Co-Author*)
Ben C. Wandtke, MD, MS (*Abstract Co-Author*)

INTRODUCTION

Imaging reconciliation errors in the PACS occur when medical images fail to correctly link with the corresponding patient information, study, or report. High priority errors include mismatches in patient identity, incorrect modality assignments, or incomplete image transmission. These events can lead to negative patient outcomes, unnecessary procedures and delayed care. This quality improvement project aimed to reduce CT high priority reconciliation errors rates from 0.5% (1 event every 200 CT exams performed) to 0.3% within 6 months.

METHODS

In partnership with the American College of Radiology Learning Network, this project was performed at a large academic medical center. Reconciliation reports were aggregated and analyzed weekly. The multidisciplinary project team consisted of CT managers, radiologic technologists, imaging applications administrator, and radiology residents. To obtain baseline data, the team reviewed several weeks of reconciliation reports which were categorized into high and low priority events and determined the % of events per exam volume per week. Using A3 performance improvement methodology, our multidisciplinary team identified multiple potential root causes for reconciliation errors. Key drivers were identified, interventions tested and implemented using rapid Plan-Do-Study-Act cycle. A current-state analysis was conducted to map the imaging workflow from order placement to radiologist interpretation. This analysis identified key patient identification steps, including patient selection, demographic verification as primary root causes. To address these issues, interventions were implemented to improve patient verification process.

RESULTS

Following the intervention, reconciliation events decreased to 0.1%, exceeding the initial goal of 0.3%. There was an 80% reduction in high-priority events per week. Additionally, the time between reconciliation events increased by 47%, indicating a sustained improvement in workflow, efficiency and patient safety.The key drivers of the process improvement included consistent dual identification system, accurate patient demographic verification, and user-friendly reconciliation reports. Gemba observations revealed that X-ray staff could scan arrival form barcodes, automatically populating patient exam details onto their modality worklists, while CT staff manually selected patients from the modality worklist.

DISCUSSION

This project brought awareness to imaging errors that were previously unrecognized or tracked and was a big success for the CT department. There was a dramatic reduction in potential serious safety errors within the department, initially, averaging 400 potential errors per year, now down to less than 100 per year. Additionally, in solving the process issues, this saved an estimated 150 hours annually of IT/RT time working on reconciliation.

M5A-QI-2 ENHANCING USP <825> COMPLIANCE IN Y-90 RESIN MICROSPHERE RADIOEMBOLIZATION THROUGH OUTSOURCED DOSE PREPARATION BY COMMERCIAL NUCLEAR PHARMACIES

Xingyu Nie, PhD (*Presenter*)
Kimyli Lemieux (*Abstract Co-Author*)
Elizabeth Cheatham (*Abstract Co-Author*)
Molly Buffington (*Abstract Co-Author*)
Jie Zhang, PhD (*Abstract Co-Author*)
Riham H. El Khouli, MD, PhD (*Abstract Co-Author*)
Bryan Lemieux, MS (*Abstract Co-Author*)
Driss Raissi, MD (*Abstract Co-Author*)

INTRODUCTION

Yttrium-90 (Y-90) resin microsphere radioembolization (RE) is a well-established treatment for primary and metastatic liver tumors. Traditionally, patient-specific doses have been prepared on-site in hospital nuclear medicine facilities. In the absence of a laminar flow hood, these doses are compounded as immediate-use preparations on the hot lab bench. However, the implementation of USP <825> on November 1, 2023, mandates that immediate-use radiopharmaceuticals be administered within one hour of preparation. This strict beyond-use date (BUD) introduces compliance and workflow challenges. To address these, we redesigned our process by outsourcing Y-90 dose preparation to a commercial nuclear pharmacy.

METHODS

This quality improvement initiative was conducted at an academic hospital. Under the original workflow, once the written directive (WD) was completed by an authorized user (AU), a nuclear pharmacist would order Y-90 resin microspheres from the vendor. Administration vials were then prepared on-site in the interventional radiology (IR) hot lab under ambient conditions by a nuclear pharmacist or nuclear medicine technologist (NMT), with a medical physicist (MP) and health physicist (HP) present. Due to the 1-hour BUD requirement under USP <825>, any dose not administered within that window would be discarded. In the revised workflow, the WD is sent to a USP <825>-compliant commercial nuclear pharmacy, which prepares the dose under sterile conditions and delivers it on the day of treatment, allowing for a 24-hour BUD. The NMT and MP verify the dose using the IR dose calibrator before administration. We retrospectively reviewed Y-90 resin microsphere RE cases before and after April 30, 2024, when the new workflow was implemented, excluding cases that reached stasis. Time from dose preparation to administration and absolute percentage deviation from prescribed activity were analyzed using Shewhart charts and Student's t-tests ($p < 0.05$).

RESULTS

We analyzed 44 cases under the original workflow and 51 under the revised workflow. The average time from preparation to administration in the original workflow was 59 ± 12 minutes, with 23.6% of cases exceeding the 1-hour BUD and 47.6% occurring within 10 minutes of the limit. No BUD violations occurred under the revised

workflow. The absolute deviation from prescribed activity decreased significantly from 5.5% ± 3.9% to 2.2% ± 1.9% ($p < 0.0001$). There were no statistically significant differences in the percentage of activity administered or prescribed activity levels between the two workflows.

DISCUSSION

Outsourcing Y-90 resin microsphere dose preparation improved compliance with USP <825> and significantly reduced variability in administered activity. Although this approach reduces flexibility for same-day treatments, it provides a scalable and compliant model for institutions delivering Y-90 therapy.

M5A-QI-3 ENHANCING DIAGNOSTIC CONCORDANCE AND QUALITY ASSURANCE THROUGH AUTOMATED MRI AND ARTHROSCOPY REPORT COMPARISON USING LARGE LANGUAGE MODELS

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INTRODUCTION

Radiologists lack a scalable method to verify alignment between pre-operative MRI interpretations and post-operative arthroscopic findings, limiting diagnostic refinement, quality assurance (QA), and education. Manual concordance review is time-consuming and requires subspecialty expertise. Large language models (LLMs) can perform well in understanding natural language, extract clinically relevant data, and execute simple diagnostic tasks. However, they cannot reliably quantify discrepancies between unstructured clinical documents. We present CONRAD (CONcordance optimization for RADiology and operative reports), an automated framework that uses LLMs to detect and score discordances between knee MRI reports and arthroscopy notes, enabling scalable QA and diagnostic feedback.

METHODS

Fifty paired knee MRI reports and operative notes from an academic hospital were analyzed, each addressing ACL, PCL, medial meniscus, and lateral meniscus. Findings were classified as tear, no tear, uncertain, or not mentioned. Structure-specific prompts were used to extract findings from five open-source LLMs (RadLlama-7B, LLaMA-8B-Instruct, Mistral-7B-Instruct, Qwen-2.5-7B-Instruct, DeepSeek-R1-Distill-Llama), each queried ten times per report, with the modal output retained. Two scoring systems quantified clinical discordance: a rules-based system (0-40) applying weighted penalties for misclassifications, and an LLM-based clinical dissimilarity score (0-8) comparing free-text findings. Classifications were compared to radiologist-assigned labels using accuracy, weighted F1, Cohen's ?, and AUROC. Penalties were compared to those assigned by radiologists using mean squared error (MSE).

RESULTS

LLaMA showed the best overall performance on radiology report classification for all features (accuracy = 0.94, F1 = 0.95, AUROC = 0.97), while Qwen performed the worst (accuracy = 0.85, F1 = 0.90, AUROC = 0.83). All models achieved perfect metric scores (1.0) for operative notes, except for Qwen. For rules-based penalties, LLaMA yielded the lowest MSE averaged across all features (1.88). For LLM-based penalties, RadLlama and Mistral had the lowest average MSE (0.54 and 0.58, respectively). Semantic drift was occasionally observed for ambiguous cases.

DISCUSSION

We introduce a fully automated, scalable system to score clinical discordance between MRI and arthroscopy documentation. These scores closely align with radiologist-assigned classifications and penalty scores. Some limitations include small sample size and a focus on only four anatomical structures of the knee. As a result, we plan to expand system capabilities to target more anatomies across varying cases. Overall, this approach is extensible across imaging modalities, anatomical sites, and clinical documentation, enabling automation of QA, education, and concordance analysis.

M5A-QI-4 RADIOLOGY REPORT QUALITY IMPROVEMENT THROUGH STRUCTURED CLINICIAN FEEDBACK: A DATA-DRIVEN INITIATIVE

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INTRODUCTION

Radiology reports are essential communication tools between radiologists and referring clinicians, yet their quality often goes unassessed due to the absence of structured feedback mechanisms. Traditional quality improvement efforts rely heavily on sporadic peer reviews rather than systematic clinician input. This quality assessment initiative aimed to implement and analyze a physician feedback system to evaluate and enhance radiology report quality

METHODS

At the University of Washington Medical Center, we integrated a feedback module into the Epic EHR, allowing clinicians to rate radiology reports on a 5-star scale and provide free-text comments. A multidisciplinary team—including radiologists, Epic analysts, data scientists, and clinicians—oversaw the initiative using the Plan-Do-Study-Act (PDSA) framework. Over a 3-month period (Dec 2024-Feb 2025), we collected 133 responses and conducted both manual and large language model (Llama 3.3) sentiment analysis on the accompanying comments. Key metrics included overall satisfaction, sentiment polarity, provider/service distribution, and categorization of reported issues.

RESULTS

Of the 133 responses, while 54.1% of reports received the highest rating, 35.3% were rated 3 stars or below. Only 65.4% of clinicians felt the report addressed their clinical query, while 33.8% felt it did not. Notably, 21.1% of respondents requested follow-up contact from radiologists. Feedback was received across 16 specialties, grouped into five major service lines: oncology, medical, surgical, emergency, and others. Comments were provided by 55.6% (74/133) of the providers. Among these, sentiment analysis classified 64.8% as negative, 21.6% positive, and 13.5% neutral. Two independent raters (R1 and R2) also rated the comments as either positive, neutral, or negative. There was substantial interrater agreement between R1 and R2, R1 and LLM, and R2 and LLM with a weighted kappa [95% CI] of 0.697 [0.566-0.828], 0.640 [0.495-0.786], and 0.783 [0.654-0.912], respectively. Surgical services had the lowest satisfaction and highest negative feedback. Over 70% of concerns raised involved missing data or lack of clinical context.

DISCUSSION

Structured clinician feedback is feasible and provides valuable, actionable insights for improving radiology report quality. Epic integration enabled seamless workflow incorporation. Interventions such as standardized templates, protocol review processes, and better integration of clinical indications may address identified issues. Though limited by a single-center design and short duration, this study supports the development of continuous quality monitoring systems enhanced by AI-driven feedback analysis.

M5A-QI-5 OPTIMIZING PATIENT FLOW TO MRI: IMPACT OF DEDICATED MRI TRANSPORTERS ON EFFICIENCY

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INTRODUCTION

MRI remains a critical diagnostic test for a variety of medical conditions. Demand has continued to grow, outpacing supply creating patient backlogs and delays. At our institution, a review of our MRI templates and un-used slots highlighted transport delays as a potential bottleneck in patient throughput. A multidisciplinary team initiated a quality improvement project to assess if assigning dedicated transport staff to the MRI department could improve resource efficiency. We aimed to reduce transport turnaround times (TAT—defined as the time the transport job is entered into the system to the time the patient arrives in MRI) by 20% and increase number of exams completed by 20%.

METHODS

Exam volumes were analyzed to identify time periods with unused scan slots and opportunity to increase throughput. We partnered with transport leadership to trial dedicated staff coverage at our primary tertiary care center with approximately 1000 beds and a level 1 ED. The overnight shift Monday through Friday was identified for the pilot. The MR department operates 2 / 3 scanners on this shift. The transport team provided 1 dedicated transporter in addition to the general transporter pool. MRI technologists were able to triage jobs for the transporter. Check-ins between supervisors of transport and MRI occurred daily. Weekly leadership meetings monitored performance and addressed any operational issues. Primary metrics tracked were the number of MRI studies completed during the shift and transport TAT. Pre intervention data for 5 months was collected and compared with post intervention data over 1 month to assess the project impact.

RESULTS

The mean number of MRI exams performed during the overnight shift increased from 72 exams / week pre intervention to 88 exams / week, reflecting a 22% relative increase. This led to completion of approximately 16 more exams weekly (estimated gain of 832 more MRI exams annually). The mean transport TAT decreased from 49 to 31 minutes after intervention, representing a 37% relative improvement. The TAT variability (standard deviation) decreased from 5 minutes pre-intervention to 2 minutes.

DISCUSSION

This quality improvement initiative demonstrates the added impact of just a single dedicated transporter to the MRI department with 37% reduction in transport TAT and 22% increase in completed MR exams during the overnight shift. The TAT variability also improved creating a more reliable and consistent process. Important behavioral and cultural shifts contributed to the initiative success. MRI technologists noted that the more reliable arrival time allowed for better planning and improved scanner utilization. For the transport team the decentralized approach improved situational awareness and real time decision making. The dedicated transporter communicated delays proactively allowing MRI to adjust and rapidly re-assign the staff to another patient.

M5A-QI-6 IMPROVING ACCESS TO INPATIENT MRI

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INTRODUCTION

Demand for imaging services continues to rise in medical practice, including Magnetic Resonance Imaging (MRI) studies, for both the inpatient and outpatient settings. Demand for imaging services that exceeds capacity can translate into prolonged hospitalizations when imaging is not performed in a timely manner. Delays in discharges lead to increased risk of infections, falls, negative patient experiences, and increased costs to patients, insurers, and the hospital. At our institution approximately 50% of the inpatient MRI studies were performed within 16 hours of order time. Our SMART goal was to increase the percentage of inpatient MRI studies performed within 16 hours of order placement to 75% within 9 months.

METHODS

In partnership with the American College of Radiology Learning Network ®, this project was performed at a large academic medical center. A multidisciplinary project team included residents, attending physicians from several disciplines, radiology technologists, and nurses. Using A3 performance improvement methodology, including Gemba walks, and quality improvement tools, the team was able to identify multiple root causes for delays in imaging acquisition after ordering. Key drivers were identified, interventions were developed, implemented, and analyzed using rapid Plan-Do-Study-Act cycles. Baseline data was obtained and validated including the average and median turnaround time from order placement to MRI study completion over the preceding 9 months. Control charts were utilized in weekly audits to identify potential delays and monitor results of interventions over 24 weeks.

RESULTS

The main root causes were identified as: inconsistent inpatient scheduling process; inconsistent MRI order triage and prioritization; no closed loop communication between MRI department and ordering provider teams; lack of MRI screening form expectations. Various interventions were targeted to address key drivers including a shared understanding of MRI exam time and prioritization, streamlining workflow for patients that failed screening, delegation of duties amongst MRI staff, and standardizing communication between inpatient teams using electronic health records. During the active phase, the percentage of exams completed within 16 hours rose from 50% to 66%, saving hundreds of bed days. Unexpected MRI technologist staffing challenges contributed to variability in the sustain phase

DISCUSSION

The initial improvement demonstrates that simple interventions focusing on workflows and shared expectations can have a significant impact on a complex problem. Reducing the time from order to performed can improve care delivery efficiency equivalent to millions of dollars in savings while improving the timeliness of care for patients. A commitment to sustainability is required to ensure that the interventions have long-lasting effects.

M5A-QI-7 CURB YOUR GALLBLADDER POLYP SURVEILLANCE ENTHUSIASM: WHAT DID OVER HALF A MILLION SONOGRAMS TEACH US?

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INTRODUCTION

Gallbladder polypoid foci (GBPF), a sonographic subcentimeter incidental finding, include common small calculi, pseudopolyps (such as cholesterol polyps), and less commonly adenomata, indistinguishable tot the reviewing sonographer and radiologist. GBPF have been historically linked to Gallbladder Cancer (GBC), itself rare but with a dismal outcome owing to advanced disease at presentation; this has resulted in overenthusiastic sonographic surveillance based on consensus guidance and escalation for potential surgical resection if growth occurs (defined as size at or exceeding 1 cm; when GBPF transition into "mass" status). We examined whether GBPF indeed grew substantively and/or progressed to GBC to review our guidance to reduce sonographic oversurveillance of an asymptomatic common incidental finding.

METHODS

Historically, we surveilled GBPF at 6-, 18- and 24-month intervals after discovery to a single 24-month follow-up sonogram (US) in our very large integrated healthcare system to simplify guidance and improve adherence to compliance. Our retrospective study analyzed detected GBPF before and after this guidance change and

reconciled post-cholecystectomy pathology specimen reports with sonography reports for concordance.

RESULTS

Among 3083 GBPF detected in over 505 494 right upper abdominal sonograms during a four-year study period, the mean number of surveillance follow up US fell from 14 to 0.9 after guidance change (p<0.01), and 263 (8.5%) persons with GBPF underwent cholecystectomy. Only 131 (4.2%) GBPF showed growth; there was no change in growth incidence with guidance change (4.1% v. 4.5%; p=0.06). No GBPF progressed to GBC during surveillance. Among growing GBPF, 94 (71%) underwent gallbladder resection, with a reduction in cholecystectomy after guidance change (79.7% v 62.9%, p = 0.03). Only 15% of 94 resection specimen reports agreed with US detected GBPF growth; 68% of GBPF reconciled with cholesterol polyps; 19% had gallstones ONLY.

DISCUSSION

US is insufficiently specific both for discriminating between various GBPF etiologies and for accurately detecting growth from GBPF to "mass" when reconciled with pathology reports. Reductions in both surveillance US and cholecystectomy volumes were observed after collapsing GBPF incidentaloma follow up series to a single 2-year interval US, without increase in either GBPF growth or incident GBC US-detected GBPF and subsequently triggered cholecystectomy are more likely to not be for true adenomatous polyps, but for biliary colic when reconciled with pathology review suggesting that symptomatic tiny gallstones may be mistaken for (indistinguishable) GBPF from other causes. We find no substantive evidence to support the need for surveillance of incidental subcentimeter GBPF.

M5A-QI-8 OPTIMIZING WORKFLOW EFFICIENCY AND AI ADOPTION IN NEURORADIOLOGY THROUGH PLATFORM INTEGRATION

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INTRODUCTION

AI has demonstrated significant potential in various radiology tasks. However, lack of optimal integration of AI tools into clinical workflows - and limited adaptation of workflows to new demands - remains major barriers to AI-adoption. Inadequate integration and workflow disruption prolong radiology report turnaround times and hinder scalability in high-throughput imaging environments. Given the increasing complexity of imaging and the rising demand for AI analysis, scalable and interoperable integration is essential to maximize AI's benefits in clinical practice and enhance efficiency. This project aims to optimize workflow, facilitate AI adoption, and enhance operational efficiency within our institution by implementing an AI platform combined with a structured change management plan.

METHODS

A Plan Do Study Act approach was applied with a multistage pilot preceding rollout. The study was conducted at a tertiary center operating 6 MRI scanners performing over 23,000 MRI exams annually. A total of 13 AI apps were integrated into a single platform (Calantic, Bayer). The intervention included: 1) seamless platform integration with AI orchestration enabling automation and interoperability, 2) standardized workflow with clinical protocol-driven AI processing, 3) a change management strategy. The impact was evaluated by monitoring AI processing according to the clinical indication. Data was collected from PACS and AI platform analytics. To assess AI adoption, a subset of AI applications already in use prior to intervention was selected. AI utilization rate and AI-report turnaround time were measured. A governance structure was established to support continuous workflow optimization, quality control and long-term AI monitoring.

RESULTS

Approximately 3,500 cross-sectional sequences are automatically processed each month across various applications. AI report turnaround time was approximately 6 minutes, contributing to an overall reduction in radiology report turnaround time. AI adoption significantly improved: the detection of FLAIR hyperintense lesions increased from 64% to 86%, volumetry increased from 57% to 83% and aneurysm detection increased from 1% to 37%

DISCUSSION

The implementation of an AI platform with structured workflow integration and change management significantly enhanced workflow efficiency, interoperability and AI adoption. A sustainability strategy is in place, incorporating ongoing feedback loops and training programs to further optimize workflow and ensure long-term adoption. Limitations include the absence of pre-platform turnaround time data, which was significantly longer utilizing manual processing. This project highlights the value of AI platform orchestrators in automating processes, standardizing workflow, and supporting multi-vendor AI interoperability in high-volume radiology environment.

M5A-QI-9 PREDICTING EMERGENCY IMAGING SURGES: A MACHINE LEARNING APPROACH TO PROACTIVE RESOURCE MANAGEMENT

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INTRODUCTION

Over the past year, the emergency radiology department experienced a 22% increase in clinical workload, leading to slower turnaround times and more frequent call-ins for additional radiologist support. This study aims to develop a predictive model capable of identifying impending surges in emergency imaging volume several hours in advance. Early detection allows division leadership to proactively allocate resources, preventing backlogs and maintaining acceptable turnaround times.

METHODS

This study was conducted within the emergency radiology division of an academic medical center, averaging 1,029 exams per day. Imaging and patient visit data were extracted from the electronic health record system from 4/1/2024 to 3/31/2025, encompassing 375,842 exams. Data was aggregated into hourly intervals, yielding 8,760 records with 52 features. Temporal patterns in the emergency imaging pipeline were captured by sampling features at multiple intervals, increasing the feature count to 380. The dataset was split chronologically into training (80%) and testing (20%) subsets for temporal validation. The primary target variable, RVU worklist, was defined as the total number of relative value units (RVUs) from unread emergency radiology cases projected up to 5 hours ahead; alternate targets, such as RVUs scanned, were also studied. To identify the most effective model and feature subset, eight machine learning algorithms were evaluated: ordinary least squares, penalized ridge, Bayesian, random forest, SVM, XGBoost, symbolic, and LSTM neural networks. Feature selection was performed using the ABESS algorithm. Model hyperparameters were tuned via grid search and 3-fold cross-validation on the training set. Performance was evaluated on the test set using R^2 and mean absolute error (MAE). Time series plots were used to visually assess model accuracy. A threshold for acceptable prediction error was set at ±12.9 RVUs - equivalent to the average RVU worklist per scheduled radiologist—to support actionable planning.

RESULTS

The complexity of emergency radiology workload required 27 optimally selected features to achieve the best performance without overfitting. Of the eight models tested, penalized ridge regression performed best, achieving an R^2 of 0.75 and a MAE of 10.2 RVUs for predictions 3 hours in advance, meeting the operational threshold. Furthermore, time series plots demonstrate the model's ability to forecast workload surges of varying magnitudes.

DISCUSSION

Machine learning models can accurately predict near-future emergency radiology workload with a 3-hour lead time. Effective feature selection reduces required inputs, lowering implementation costs. These optimized models allow ED leaders to align staffing with demand, supporting operational efficiency, preventing backlogs, and maintaining timely turnaround - ultimately enhancing patient care.

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M5B-QI

Quality Improvement Reports Monday Afternoon Poster Discussions II

Monday, Dec. 1 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

M5B-QI-2 OPTIMIZING PEDIATRIC TRAUMA IMAGING PROTOCOLS: ENHANCING WORKFLOW USING AN INTEGRATED WBCT APPROACH

Nandakumar Patnam Gopal Chetty, MD (*Presenter*)
Jeffrey Moirano, MS (*Abstract Co-Author*)
Brian Johnston (*Abstract Co-Author*)
Arvin Akhavan (*Abstract Co-Author*)
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INTRODUCTION

No guidelines exist for imaging of major pediatric trauma. The inclusion of chest CT is controversial due to radiation exposure concerns. Omitting chest CT in pediatric trauma may be feasible. Such approaches require spine radiography leading to operational inefficiencies and prolonged emergency department (ED) length of stay (LOS). Such imaging approaches do not allow assessment for blunt cerebrovascular injury (BCVI), a potential cause of stroke. We present the impact of an integrated pediatric whole body trauma CT imaging protocol (WBCT) on radiation exposure and operational efficiency at a single Level 1 trauma center.

METHODS

We implemented WBCT for pediatric patients requiring CT head and CT abdomen-pelvis based on clinical prediction rules. For less severely injured pediatric patients, WBCT was not used. Full spine reconstructions from WBCT data eliminate the need for spine radiographs. Contrast enhanced neck CT allows BCVI evaluation. Pediatric WBCT is used in patients <13 years including non-con head CT and a single-phase scan from skull base to ischial tuberosity. Pediatric WBCT protocol was developed in consensus (Radiology Pediatrics, Trauma Surgery, Physicists, Emergency Medicine). We retrospectively analyzed radiation dose (mSv) of pediatric WBCT patients and compared it to ACR Dose Index Registry. Descriptive statistics (median, IQR) were used for dose and injury severity score (ISS). The intervention was vetted by the institutional quality committee. Ongoing dose and ED LOS monitoring is performed.

RESULTS

In 2024, 51 pediatric patients (age 1-13 years) underwent pediatric WBCT. Injury severity was higher in children with WBCT (median ISS 10; IQR: 4-17.5) versus all pediatric patients (ISS: 4; IQR:1-10). Median effective dose for pediatric WBCT was 3.85 mSv (IQR: 3.16-6.38), below the ACR Dose Index Registry benchmark (fig. 1). Imaging process efficiency improved by eliminating the need for separate spine radiographs in a different room, thereby shortening ED LOS by 1 hour (5.3 hrs. in 2024 vs. 6.2 hrs. in 2022).

DISCUSSION

Implementing pediatric WBCT protocols offer minimal radiation tradeoff while enhancing workflow efficiency and reducing ED LOS. This quality improvement initiative demonstrates a sustainable improvement in pediatric trauma operations due to reduction in ED LOS. Further prospective validation with time-motion studies is warranted.

M5B-QI-3 EVALUATING ARTIFICIAL INTELLIGENCE ALGORITHM CASE FINDINGS FROM IT SYSTEM DOWNTIME FOLLOWING ADVERSARIAL CYBERSECURITY INCIDENT

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Melissa A. Davis, MD, MBA (*Abstract Co-Author*)
Sowmya Mahalingam, MD, MBBS (*Abstract Co-Author*)

INTRODUCTION

Health centers support many information technology (IT) services on cloud-based network systems. Unexpected interruptions, including adversarial cybersecurity attacks, to cloud-based networks can critically impact IT services and affect daily workflow. Software that requires network connection to function can be impaired or rendered nonfunctional by IT system downtimes. Recently, our health system suffered a cyberattack causing an IT system outage for five days. During this downtime, artificial intelligence (AI) models in routine clinical use were unable to process cases and generate findings. We describe retrospectively processing imaging studies with AI models and report findings of discrepancies between AI models and final radiology reports.

METHODS

All imaging studies completed during the IT system downtime were processed through eight AI models used in daily clinical practice. All cases flagged by the AI algorithms for positive findings were compared to final reports generated by a radiologist in two distinct stages. In the first review, the AI algorithm finding was compared to the final radiologist report by two reviewers; discrepancy between the final report and the AI model finding was flagged for additional review. In the second review, each case-discrepancy was evaluated independently by two emergency radiologists to identify if the discrepancy represented a false-positive AI model finding or a true-positive finding by AI not identified in the final radiology report.

RESULTS

AI models generated 267 positive findings during the software downtime. 73 cases were flagged on initial review for case-discrepancy between radiologist report and AI model finding; 5 cases were outside interpretation requests with no final report generated. 59 cases were subsequently advanced for imaging review (14 cases were identified to have concordance between the AI finding and the final report). There were 37 false positive and 22 true positive mismatched cases.

DISCUSSION

Increasing use of AI in clinical environments necessitates procedural methods for responding to unexpected disruptions in cloud-based networks. Patient safety and quality care must remain at the forefront of all AI use in radiology, emphasizing the importance of robust governance of such software. Frequent AI use can alter radiologists' behavior towards an inherent automation bias that relies too heavily on AI assistance. The cloud disruption created a natural case-control opportunity to

evaluate radiologists' interpretative tendencies without routinely available AI. Our findings suggest that there are algorithms for which the AI may over-represent false positives and algorithms where the AI may truly aid the radiologist in capturing acute pathologies. Intermittent robust evaluation of deployed algorithms allows for critical assessment of these tools for long-term clinical use.

M5B-QI-4 CT ON OVERDRIVE: HOW A TWO-PERSON TEAM TURBOCHARGED THROUGHPUT

Leticia Shubin, RDMS,MHA,RVT (*Presenter*)

INTRODUCTION

To evaluate the impact of a revised staffing model in a high-volume CT department, in which one technologist is paired with a supplementary staff member, with the goal of increasing capacity, reducing patient wait times, and improving access without compromising quality of care

METHODS

In January 2025, a two-person CT workflow model was introduced at a high-volume outpatient imaging facility within a large academic medical center. Prior to the intervention, each CT scanner was staffed by a single technologist responsible for the complete imaging workflow, including patient positioning, scanning, and post-processing. The revised model assigned one technologist and one supplementary staff member (either a second technologist or a technologist assistant) per scanner. This team-based approach enabled parallel workflows, such as preparing the next patient while scanning was underway, thereby reducing cold table time between exams. Monthly CT Units of Service (UOS) were tracked from November 2024 to April 2025 to assess the intervention's impact.

RESULTS

Following implementation, a substantial and sustained increase in CT throughput was observed. Monthly CT volumes rose from 400 UOS in December 2024 to 552 in January 2025, the first month of the new model, representing a 38% increase. Growth continued over subsequent months, with volumes peaking at 766 UOS by April 2025. The increased capacity improved scheduling flexibility and reduced appointment backlogs.

DISCUSSION

The two-person staffing model, which comprised one technologist and a supporting team member, resulted in immediate and sustained improvements in CT throughput and operational efficiency. This low-cost, high-impact workflow redesign may serve as a scalable solution for imaging departments seeking to increase capacity without capital investment. Implementing a two-person team per CT scanner can significantly enhance throughput in high-demand outpatient settings, aligning with institutional goals for access, efficiency, and patient care.

M5B-QI-5 IMPROVING TIMELINESS OF DIAGNOSTIC MAMMOGRAPHY LEVERAGING A MODEL FOR IMPROVEMENT WORK QUEUE OPTIMIZATION PROCESS

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INTRODUCTION

Timely diagnostic mammography (DM) is essential for early breast cancer detection. Delays in DM are associated with worse survival outcomes (Caplan, 2014). We observed long scheduling wait times (over 108 days) at two of our breast imaging (BI) sites due to manual workflows and fragmented triage visibility. We focused on acutely symptomatic women aged 40+, presenting with new lumps, bumps, discharge, or rash, given persistent delays in care. The Model for Improvement (MFI) offers a structured framework to test and refine workflows through real-time feedback. Our goal was to reduce average DM wait times by 25% through two Plan-Do-Study-Act (PDSA) cycles over 13 months (April 2024-April 2025).

METHODS

This quality improvement (QI) initiative was implemented at two BI sites within a large quaternary academic medical center. We targeted DM scheduling delays among symptomatic women. Process maps, Pareto charts, and a fishbone diagram (Fig. 1) identified delay factors and guided intervention design. A multidisciplinary team (BI managers, technologists, research coordinators, and navigators) applied the MFI framework using iterative PDSA cycles. The intervention involved redesigning the BI work queue (WQ) to support acuity-based triage of urgent DM orders. We assessed impact using EHR data on patient demographics and wait time from order to scheduled appointment. Baseline data (Mar 1-29, 2024) were followed by PDSA cycle 1 (Apr 1-May 20, 2024) and PDSA cycle 2 (Aug 13, 2024-Apr 30, 2025). Statistical analyses were performed to assess average wait times pre and post intervention implementation. Site managers monitored triage performance, and WQ protocols were incorporated into standard procedures.

RESULTS

Process mapping revealed that DM orders previously entered a general radiology queue without prioritization, resulting in first-in, first-out scheduling. The redesigned BI queue enabled symptom-based triage, improving prioritization of urgent cases. The fishbone diagram highlighted poor order visibility and unclear triage ownership. Among post-intervention patients, 33.4% (431/1,290) were aged 40-50, 96.0% (1,237/1,290) were English speakers, and 89.1% (1,149/1,290) identified as non-Hispanic. Diagnosis of breast asymmetry and lump accounted 89% cases. DM volume included 227 exams at baseline, 188 during PDSA cycle 1, and 1,290 during PDSA cycle 2. Statistical Process Control X-chart revealed average wait time decreased from 108.4 to 10.3 days (Fig. 2).

DISCUSSION

This MFI-QI intervention reduced DM wait times by >90%, demonstrating sustained scheduling improvements. Redesigning the WQ improved triage transparency and eliminated bottlenecks without major system overhaul. This scalable model enhanced resource use and reduced manual scheduling burden, offering a replicable strategy for imaging departments with decentralized workflows.

M5B-QI-6 ENHANCING EFFICIENCY AND QUALITY IN THYROID BIOPSY: THE LONG-TERM IMPACT OF DEDICATED THYROID BIOPSY SPECIALISTS

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Joerg Schwock (*Abstract Co-Author*)
Katherine Lajkosz (*Abstract Co-Author*)
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INTRODUCTION

Small number of trained sonographers started performing thyroid biopsy at our institute in August 2011. We assessed long-term impact in thyroid biopsy performed by trained sonographers under supervision of a radiologist.

METHODS

Quality Initiative Review Committee approval was obtained for this retrospective analysis. Summary data was extracted from the Thyroid biopsy repository in Cytopathology department of the hospital. Data included the number of fine needle aspiration biopsies for the period, location/department of service and the cytopathology report using the Bethesda System for Reporting Thyroid Cytopathology. For the analysis, the study was divided into three time periods, the pre-implementation period (January 2008 - April 2011) when the biopsies were often delegated to rotating residents and fellows, early post-implementation period for the thyroid biopsy sonographers (August 2011 - 2013), and late post-implementation period (2014 - 2022). The period between April and August of 2011 was omitted from the analysis as it was the training period.

RESULTS

In all, 14,127 thyroid biopsies were performed in the radiology department during the period - 4382 in the pre-implementation period and 9745 by trained sonographers (2561 in the early post implementation period and 7184 in the late post implementation period). The unsatisfactory rates dropped from 34% in the pre-implementation period to 20.9% in the early post implementation period to 8.6% in the late postimplementation period ($p < .001$), Theproportion of malignant nodules (Bethesda Category VI) increased from 4.9% to 5.6% to 7.7% in the same period ($p < .001$). During the same time frame as the late implementation period (2014-2022), a total of 8,176 thyroid biopsies were performed in hospital departments other than Radiology. The unsatisfactory rates were 28.9% and the proportion of malignant nodules was 4.5% ($p<.001$).

DISCUSSION

Sonographers trained to perform ultrasound guided thyroid biopsies provide persistent improved patient care over a long-term period. Radiology assistants working within targeted scopes of practice have the potential to enhance the quality of patient care.With the increased focus on quality care and the demands of academic departments to sustain their educational and research goals amid escalating clinical workloads, the thyroid biopsy specialist program has yielded additional benefits across the department. Increased operational efficiency has allowed radiologists to devote more time to to interpretation, consultation and other responsibilities. Additionally, the program offers sonographers increased avenues for professional development, thereby strengthening recruitment and retention of highly qualified personnel.

M5B-QI-7 A FOLLOW-UP STUDY ON THE EFFICACY OF THE MODIFIED UCH SKELETAL MUSCLE BIOPSY NEEDLE IN ULTRASOUND-GUIDED MUSCLE BIOPSIES DURING THE INVESTIGATION OF MYOPATHY

Girija Agarwal, MBBS (*Presenter*)
Ramal Gnanasekaran, MBBCh (*Abstract Co-Author*)
Akash Sharma, MBBS (*Abstract Co-Author*)
Karthik Rajendran, MBChB (*Abstract Co-Author*)
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Christopher Lord, FRCR (*Abstract Co-Author*)
Dimitri Amiras, MBBS, FRCR (*Abstract Co-Author*)

INTRODUCTION

Most recently, ultrasound-guided percutaneous muscle biopsies have been proposed as an alternative to the traditional open surgical approach for the histological diagnosis of myopathy, as they are less invasive and preferred by patients. Our follow-up study aims to assess the diagnostic yield of the new, larger autoclavable modified UCH skeletal muscle biopsy needle during an ultrasound-guided percutaneous muscle biopsy and to compare the outcomes to our previous study that used the disposable Modified Bergstrum needle.

METHODS

Between June 2022 and April 2025, 31 patients were selected for a muscle biopsy with the modified UCH skeletal muscle biopsy needle after discussion at our local neuromuscular multidisciplinary team meeting. A consultant musculoskeletal radiologist then performed a vacuum biopsy under ultrasound guidance to obtain at least two muscle samples. The histology reports and clinical notes were then followed up to assess the diagnostic yield of the biopsy and compare the histology with the final clinical diagnosis. These results were then compared to the outcomes of a previous study involving 24 patients performed between March 2020 and June 2021 that used the Modified Bergstrom needle.

RESULTS

30 out of the 31 biopsies performed provided diagnostic information. The single non-diagnostic sample was considered to be too small in size. The vastus lateralis was the most common muscle target. Of the 30 adequate samples, 5 had histology discordant with the final clinical diagnosis. A chi-square test with a Chi square statistic of 1.4778 and p value of .22412 revealed no significant difference between the outcomes ($p< 0.5$).

DISCUSSION

Our previous study found adequate histology in approximately 88% of cases. This study suggests that the modified UCH skeletal muscle biopsy needle possibly has a diagnostic capability superior to the modified Bergstrum needle, with adequate histological samples obtained in 98% of cases. This is whilst being more environmentally friendly, less resource-intensive, and cheaper. More data is required to demonstrate a significant difference in outcome between the two biopsy needles.

M5B-QI-8 ENHANCING RESPONSE TO NEOADJUVANT CHEMOTHERAPY BREAST MRI REPORTING: A RADIOLOGIST-CLINICIAN QUALITY IMPROVEMENT COLLABORATION

Haydee Ojeda-Fournier, MD (*Presenter*)
Sheida Ebrahimi, MD (*Abstract Co-Author*)
Sara Grossi, MD (*Abstract Co-Author*)
Vivian Lim, MD (*Abstract Co-Author*)
Soudabeh Fazeli, MD, MPH (*Abstract Co-Author*)
Rebecca Rakow-Penner, MD, PhD (*Abstract Co-Author*)

INTRODUCTION

Contrast-enhanced breast MRI is the most sensitive imaging modality for assessing response to neoadjuvant chemotherapy (NAC) in breast cancer. However, variability in reporting can hinder clinical decision-making. To address this, we undertook a multi-phase quality improvement project. First, we conducted a literature review to identify key elements that should be included in breast MRI reports assessing NAC response. Using these findings, we then performed a two-phase assessment of reporting practices at our institution. Phase 1 evaluated baseline report content; Phase 2 assessed the impact of a newly implemented standardized reporting template on report clarity, completeness, and clinical utility.

METHODS

In Phase 1, we retrospectively reviewed 30 breast MRI reports from five radiologists (1-33 years' experience). Reports were assessed for inclusion of key elements: imaging indication, fibroglandular tissue (FGT), background parenchymal enhancement (BPE), NAC timing, malignancy type, response pattern and type, disease extent,

tumor size change, and nodal evaluation. A survey assessed referring clinicians' satisfaction with report content and utility. In Phase 2, after implementing a standardized reporting template, we reviewed 40 subsequent reports by four of the same radiologists using identical criteria.

RESULTS

After template adoption, inclusion of key elements improved markedly: NAC timing documentation rose from 9.1% to 56.5% ($p = 0.024$); malignancy type from 60.0% to 97.5% ($p < 0.001$); and BPE change from 0.0% to 68.6% ($p < 0.001$). Lymph node reporting—morphology and size comparisons—also improved significantly ($p < 0.05$). Overall, associated feature reporting increased by ~45%. These results indicate that the structured reporting template substantially enhanced the consistency, completeness, and clinical relevance of breast MRI assessments in the neoadjuvant chemotherapy setting.

DISCUSSION

A structured reporting template substantially improved breast MRI reporting for NAC, enhancing documentation of treatment timing, lesion characteristics, and nodal assessment. These improvements are anticipated to strengthen multidisciplinary communication and inform treatment planning. Limitations include the single-center, retrospective design and small cohort. Ongoing training and audits may be needed to sustain adherence. Future work should evaluate impacts on patient outcomes and workflow efficiency. A follow-up survey will be administered to the same group of referring providers to evaluate satisfaction with the revised format and compare it to the prior version.

M5B-QI-9 OPTIMIZING PATIENT COMPLIANCE IN A LUNG CANCER SCREENING PROGRAM :AI ENABLED NURSE NAVIGATION

Leslie Ciancibello, RT (*Presenter*)
Robert C. Gilkeson, MD (*Abstract Co-Author*)
Leslie Whalen (*Abstract Co-Author*)
Jennifer Murphy (*Abstract Co-Author*)
Matthew Kemmann (*Abstract Co-Author*)

INTRODUCTION

Prior studies have demonstrated limited patient adherence to prescribed lung cancer screening guidelines. Our early institutional experience in a lung cancer screening program reflected similar suboptimal adherence rates. Introduction of a dedicated nurse navigation team, with gradual integration of a Natural Language Processing (NLP) data driven management solution, resulted in a significant improvement in both patient adherence and enrollment rates. Our experience demonstrates a direct correlation between patient adherence and the successful implementation of navigational tools and staff to support the program.

METHODS

We reviewed the data from our Lung Cancer Screening Program (LCSP) June 2011 through December 2024 and stratified patient data based on three phases. Phase 1 consists of data from 2011 to 2017 (N=2311) where there were no dedicated navigational tools or staff to support the program. Phase 2 consists of data from 2017 to 2021 (N=11481) where a single part-time nurse navigator was introduced into the program. Lastly -Phase 3 consists of data from 2022 through 2024 (N=25859) when an additional 2 navigational nurses and the implementation of dedicated Lung Cancer management tools were deployed. Differences in patient adherence (adherent, delayed, much delayed or not adherent >1 year follow-up) to Lung Cancer Screening guidelines were compared across phases using chi-squares tests. Alpha of <0.05 was considered statistically significant.

RESULTS

Our internal review shows statistically significant improvement in program adherence to follow up screening as a result of each implementation ($P = < 0.001$) Figure 1, with phase 3 demonstrating the highest rate of adherence of 73%, representing a 210% increase in patient adherence compared to Phase 1. Additionally, non-adherence (> 1 year follow-up) improved across phases ($P<0.001$), with Phase 3 showing the lowest rate of non-adherence at 5.6%, representing an 89% decrease compared to Phase 1.

DISCUSSION

Low Dose Lung Cancer Screening Programs face many challenges including limited access, insurance coverage issues, and patient and physician understanding of appropriate screening criteria and guidelines. This abstract demonstrates that patient compliance is optimized with the integration of a team of navigation nurses and NLP enabled technologies.

Nov. 30 – Dec. 4
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R2-QI

Quality Improvement Reports Thursday Morning Poster Discussions

Thursday, Dec. 4 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

R2-QI-1 IMPROVING RADIOLOGY RESIDENT COMPETENCY AND ACCURACY IN INTERPRETING POSTOPERATIVE SPINE RADIOGRAPHS THROUGH A STRUCTURED EDUCATIONAL INTERVENTION

Niloofar Sima, MD (*Presenter*)
Kristopher Ruiz (*Abstract Co-Author*)
A. Orlando Ortiz, MD, MBA (*Abstract Co-Author*)

INTRODUCTION

Interpretation of postoperative spine radiographs is a critical yet underemphasized skill in early radiology training, despite the increasing volume of postoperative spine radiographs. Many junior residents report low confidence in these cases, partly due to greater educational emphasis on cross-sectional imaging. Our purpose is to implement and evaluate a structured educational session to improve junior residents' diagnostic accuracy and confidence when interpreting postop spine radiographs.

METHODS

A flipped-classroom technique was used to teach PGY2 and PGY3 radiology trainees at a single academic center. A pre-lecture survey and quiz followed by a study guide on common post-op spine hardware and techniques were sequentially provided to the learners. Learners then participated in a 1 hour interactive session led by an experienced neuroradiologist. The workshop utilized a reproducible five-step analytic framework and a mnemonic checklist for hardware, in addition to the basic ABC's method to guide systematic evaluation of instrumented spine radiographs. A structured radiology report format was provided to reinforce key analytic concepts. Case examples illustrated a range of normal and abnormal findings. Data was analyzed to evaluate objective performance and subjective confidence improvements. Primary outcomes included change in test scores and mean confidence scores across six domains. Metrics were selected based on alignment with lecture objectives and educational outcomes. A paired t test was used to evaluate changes in test scores; confidence ratings were descriptively compared.

RESULTS

Five residents completed the full intervention. Mean test scores improved from 11.4 to 13.4 out of 15 ($p = 0.022$). Confidence scores improved across all six domains, most notably in hardware recognition (1.6 to 4.0), applying a systematic approach (2.4 to 4.0), and teaching peers (1.6 to 3.5).

DISCUSSION

This pilot intervention demonstrated that a single structured session can improve both confidence and diagnostic accuracy among junior radiology residents. Limitations include the small sample size, which will be addressed by adding future cohorts as we aim to conduct these sessions at the beginning of the academic year during blocked learning times for new residents. In our next session, we plan to include unknown cases for small workgroups where they can discuss their respective cases with the entire group. A test with simulated reporting of unknown cases will be administered to the current pilot group in 3 months. We aim to hold annual repetition of this workshop, adding previously trained residents to serve as facilitators. This approach may serve as a scalable model at other institutions for addressing similar educational gaps in radiology training.

R2-QI-2 IMPROVING CONSISTENCY AND EFFICIENCY THROUGH AUTOMATED DAILY CT AND WEEKLY MRI QUALITY CONTROL

Emi Eastman, MS (*Presenter*)
Yifang Zhou, PhD (*Abstract Co-Author*)

INTRODUCTION

The American College of Radiology requires a continuous quality control (QC) program be established as a part of the accreditation process, done on a daily, weekly, or monthly basis. To maximize the effectiveness of a QC program, as many variables as possible should be kept consistent. Slight variations in the size and placement of regions-of-interest (ROIs) can lead to changes in measurements. Technologists manually performing these measurements will have slightly different results than their colleagues. The purpose of this study was to develop an automated method to perform daily computed tomography (CT) and weekly magnetic resonance imaging (MRI) QC phantom measurements and compare the results of an automated QC program to measurements performed by technologists in an effort to reduce the time spent performing QC.

METHODS

CT QC tests included water CT number, noise, and uniformity, and an additional linearity test for requiring the measurement of 6 different materials in the phantom for some scanners. Weekly MRI QC tests included geometric accuracy, high contrast spatial resolution and signal to noise ratio in place of low contrast detectability. A dedicated server was set up to receive the QC images. The software was tested on images from 13 CT scanners and 4 MRI scanners. The Pydicom library was used to read images and extract parameters from the DICOM header. Detection of the phantom edges and inserts was performed using the Hough Circle Transform function from the OpenCV library. The software measurements were compared to warning and failure thresholds, which triggered an email alert to be automatically sent out when exceeded. Technologist measurements were recorded simultaneously and used for comparison to evaluate the accuracy of the software.

RESULTS

The software successfully performed all tests except for the MRI high contrast spatial resolution. The size and placement of the ROIs for CT were more consistent than the technologist measurements. The time that could be saved implementing this program is compounded for our enterprise health system with 18 CT scanners and 9 MRI scanners. We estimate that implementing this program will save approximately 565 minutes per week.

DISCUSSION

We successfully tested an automated method for CT and MRI QC phantom measurements. The high contrast resolution test requires additional effort due to the subjective nature of the test, but implementing this solution is still highly valuable without it. This method not only mimics technologists' efforts but saves time and improves consistency.

R2-QI-3 CLINICAL VALUE OF DEEP LEARNING-DRIVEN IMAGE QUALITY CONTROL IN NON-ENHANCED HEAD CT IMAGING

Shigeng Wang (*Presenter*)
Yijun Liu (*Abstract Co-Author*)

INTRODUCTION

Medical imaging quality control is essential for ensuring the reliability of diagnostic images and the safety of healthcare services. Current practices often involve radiologists manually evaluating limited samples, leading to subjectivity and inefficiency. This method does not comprehensively assess the imaging quality across radiology departments nor facilitate real-time quality monitoring. This study seeks to develop a deep learning-assisted system for quality control of non-contrast head CT images .

METHODS

A retrospective analysis included 16030 head CT images from 458 patients, with 11221 images used for convolutional neural network (CNN) training (70%), 3206 for validation (20%), and 1603 for testing (10%). Metrics including Precision, Recall, F1-Score were evaluated. Prospectively, 133 patients with suboptimal initial head CT scans requiring re-examination underwent deep learning-assisted quality-controlled scans. Results from both examinations were compared.

RESULTS

The deep learning-assisted quality control system demonstrated strong performance in Precision, Recall, and F1-Score metrics. All 133 re-examinations of head CT scans achieved accurate diagnoses using the quality control system. Among initial scans, 26 cases showed diagnostic discrepancies, with no significant differences in lesion localization or intracranial volume measurements. However, substantial improvements were observed in morphological details (cerebral tissue delineation), boundary clarity of intracranial lesions, and characterization of calcifications or hemorrhagic components.

DISCUSSION

The proposed system enables objective image quality assessment and workflow efficiency enhancement, demonstrating significant potential for clinical translation in standardized head CT quality control protocols.

R2-QI-4 FIXING RADIOLOGY'S ACHILLES' HEEL: A SYSTEMS-LEVEL REVIEW OF THE FIVE 'A'S IN THE ERA OF AI AND EQUITY

Waqas Ahmad I, MBBS (*Presenter*)

INTRODUCTION

Radiology has transformed modern medicine through technological innovation and precision diagnostics. However, persistent systemic challenges—categorized here as the Five "A"s: Accessibility, Availability, Accuracy, Affordability, and Appropriateness —continue to impede equitable and efficient radiology services globally. These barriers disproportionately affect underserved populations, overextend healthcare resources, and compromise patient safety. This study aims to systematically analyze these five domains as critical failure points and propose corrective strategies leveraging workforce development, policy innovation, and artificial intelligence (AI).

METHODS

We conducted a narrative review of published literature (2010-2024) across five thematic domains representing the Five A's. This was supplemented by semi-structured expert interviews (n=18) with radiologists, healthcare administrators, and policymakers across high-, middle-, and low-income countries. Solutions were categorized into: Technology-enabled interventions (e.g., AI, teleradiology), Workforce and infrastructure development, and Policy and governance strategies. Recommendations were evaluated for feasibility, equity impact, and scalability.

RESULTS

Thematic synthesis revealed: Accessibility: Barriers were most prominent in rural and low-resource areas, mitigated effectively by mobile imaging units and AI-driven triage. Availability: Workforce shortages were universal, but mitigated through remote reporting models and hybrid task-shifting systems using trained non-physician imaging readers. Accuracy: Errors due to fatigue, inconsistent reporting, and over-reliance on unvalidated AI were improved by implementing structured reporting, peer review, and validated decision support algorithms. Affordability: High imaging costs and poor insurance coverage were offset by imaging pathway redesign, bundled care packages, and AI-optimized scan protocols. Appropriateness: Over- and under-utilization of imaging were addressed using AI-based clinical decision support and adherence to evidence-based guidelines.

DISCUSSION

Despite technological progress, radiology's foundational delivery challenges remain rooted in systemic inequities and resource misalignment. Corrective interventions must be context-sensitive, combining technology (AI, teleradiology)with policy (governance reforms, insurance expansion) and capacity-building (training programs, rural infrastructure). Addressing these issues is not just a matter of operational improvement, but a moral and strategic imperative to ensure that radiology contributes equitably to global health outcomes.

R2-QI-5 REDUCING RADIATION DOSE IN ROUTINE CT SCANS THROUGH PROTOCOL OPTIMIZATION ON A 128-SLICE SCANNER IN SOUTH INDIA

Shaaruk Davlath, MBBS (*Presenter*)

INTRODUCTION

Computed tomography is a widely used imaging modality in both emergency and non-emergency settings. However, patients are exposed to ionizing radiation, which may lead to both stochastic and deterministic biological effects. Dose Length Product (DLP), measured in mGy·cm, reflects the CT scanner's radiation output and is a key parameter in dose monitoring. In India, regulatory limits for CT radiation dose are lacking, with only limited retrospective multicenter data available. Facility reference levels (FRLs) at our center were analyzed to identify areas for optimization. The aim of this study was to implement ALARA (As Low As Reasonably Achievable) principles and reduce DLP without compromising diagnostic image quality.

METHODS

A retrospective audit was conducted over a two-month baseline period to assess DLP values across routine CT scans, including brain (plain and contrast), thorax, and abdomen (plain and dual-phase contrast). The 75th percentile of DLP distributions was used as the internal benchmark and compared against available Indian reference values. Identified high-dose protocols were revised by adjusting kilovoltage (kVp) based on patient weight, modifying the noise index, and increasing Adaptive Statistical Iterative Reconstruction (ASIR). Defined scan extents were standardized, and radiographers were trained accordingly. Post-intervention data were collected prospectively for two months using a digital form-based tracking system.

RESULTS

One month after intervention, significant DLP reductions were achieved. CT brain (plain) showed a 35.5% reduction, brain (plain + contrast) 22.4%, thorax (contrast) 57.1%, abdomen (plain) 35.3%, and abdomen (dual-phase contrast) 73.8%. Although brain study DLPs remained slightly above benchmark levels, abdominal scans demonstrated a substantial reduction. Image quality was preserved in all cases as confirmed by blinded radiologist assessment.

DISCUSSION

Protocol optimization, including ASIR adjustment, kVp modulation, and standardized scan coverage, effectively reduced DLP without sacrificing diagnostic confidence. While the current study focused primarily on adults, pediatric data were limited and warrant future attention. Given the potential for stochastic radiation effects, radiologists should exercise caution when selecting protocols, particularly for women and children, and avoid unnecessary scan extensions.

R2-QI-6 FROM PIXELS TO PLASTIC: THE UNTAPPED POTENTIAL OF RADIOLOGISTS IN POINT-OF-CARE 3D PRINTING TO IMPROVE MEDICAL EDUCATION AND PROCEDURAL PREPARATION

Kristian T. Quevada, MD (*Presenter*)
Vipul Bhat (*Abstract Co-Author*)
D'Shaun D. Adams, MD (*Abstract Co-Author*)
Zachary Mikes, DO (*Abstract Co-Author*)

INTRODUCTION

Understanding complex anatomy is critical to practicing radiology and surgery, but access to detailed 3D models is often limited. Commercial models are expensive, have long turnaround time, and are often not tailored to individual patient anatomy. There is utility of 3D printing in education, surgical planning, and procedural practice, but it is not widely integrated into clinical practice. Radiologists have the expertise to implement patient-centric 3D printed models into educational and clinical workflows to provide deeper education and multidisciplinary support. The goal was to develop a cost-effective, efficient, and radiology-driven 3D printing workflow that can be used for education, procedural training, and preoperative planning.

METHODS

A consumer-grade 3D printer (~$700) was acquired. The following models were printed: a liver model with Couinaud segmentation for education, distal radius fracture models for preoperative planning, and an endovascular model for guidewire training. The team included radiology residents and attendings, technologists, and surgery faculty. Radiology led the model generation effort, but responsibilities were shared for their implementation. Early trials identified issues like segmentation time and print failures. Workflow was adjusted to improve model design, cost, and turnaround time. Parameters measured included the time from DICOM to finished print, material cost per model, and how the models were used. These were compared to those from commercial printing options, if available on the market. Informal feedback was also collected from surgeons and trainees to assess utility. 3D printing workshops will be held to continue to train faculty, residents, and staff in the workflow, so the printer can continue to be widely utilized for educational sessions and conferences.

RESULTS

Filament cost per model ranged from $0.50 to $25, while equivalent commercial models ranged from $88 to $4,000. Models with equivalent products on the market (liver and endovascular models) yielded 72% and 99.98% cost savings compared to third-party vendors, respectively, with 40 hours and 88 hours saved from file to hospital, respectively. Break-even point for highest material unit (liver model) is approximately 11 units. Trainees found the models helpful for spatial understanding, and clinicians found them productive to visualize complex anatomy for surgical planning.

DISCUSSION

Early challenges included segmentation issues and failed prints, which were refined over time. Radiologists' unique expertise can be paramount in leading Point-of-Care 3D printing efforts. The initial cost of a 3D-printer is a scalable investment that pays for itself after just a few prints. This technology can enhance the quality and cost of trainee education and aid in multidisciplinary communication, strengthening the foundations of precision medicine.

R2-QI-7 IMPROVEMENT OF WORKFLOW FOR ARTIFICIAL INTELLIGENCE (AI)-ASSISTED MOBILE CHEST X-RAY BUS TUBERCULOSIS (TB) SCREENING IN BANGKOK

Hiroshi Yoshioka, MD, PhD (*Presenter*)
Antoine Choppin, MS (*Abstract Co-Author*)
Gun Wongpanich, MD (*Abstract Co-Author*)
Panithi Permsirivanich (*Abstract Co-Author*)
Lalita Kaewwilai (*Abstract Co-Author*)
Orawan Kaewboonchoo (*Abstract Co-Author*)

INTRODUCTION

Tuberculosis (TB) is one of the deadliest infectious diseases in the world, especially in the South-East Asian region. To eliminate TB, it is crucial to screen as many patients as possible and treat them as early as possible. Mobile x-rays can be an effective tool for this purpose. However, they have not been fully utilized due to limited resources (especially radiologists), financial reasons, and the lack of information or education to the residents. Our goal in this study is to prospectively incorporate diagnostic imaging AI into the local mobile x-ray TB screening workflow in Bangkok. Compared to the conventional mobile x-ray workflow, we aim to improve screening effectiveness and enable to guide more potential TB patients to sputum test/treatment quickly using an in-house AI-assisted chest x-ray software.

METHODS

This study was prospective and approved by our institutional review board. A total of 2146 subjects (mean age = 52.6 years, age range 20 - 96 years; 749 male and 1397 female) participated from 21 community districts in Bangkok. After mobile bus routine TB screening chest x-ray images were obtained, they were forwarded to the server to identify and infer potential TB by an in-house developed AI-assisted chest x-ray diagnostic system. Then, the results of positive or negative TB by AI were uploaded to Google spreadsheet and at the same time AI positive TB cases were uploaded to an online viewer, and notification sent to the radiologists via LINE messaging API. The radiologists read uploaded chest x-rays on the viewer, confirmed presence or absence of TB, and reported diagnosis immediately. We monitored the radiologist reports and informed TB positive cases to the nurses in the public health center in each district, where the sputum tests were booked or performed. The number of total analyses, AI negative TB, AI positive/radiologist negative TB, and AI positive/radiologist positive TB cases were recorded. Additionally, average AI specificity, AI precision, and TB positive rate by radiologists were calculated.

RESULTS

All 2146 cases were successfully analyzed by our chest x-ray AI software and the radiologists' diagnoses of positive TB were completed within approximately 5 minutes to one hour. The AI negative TB cases, AI positive/radiologist negative cases, and AI positive/radiologist positive cases were 1513, 452, and 181, respectively. Average AI specificity, AI precision, and TB positive rate by radiologists were, 0.77, 0.29, and 8.4%, respectively.

DISCUSSION

AI-assisted mobile chest x-ray bus TB diagnosis system combined with immediate notification to the radiologists enabled within one hour turnaround time and improved efficiency and throughput of TB screening in communities in Bangkok. Timely TB positive results reporting lead to obtain the sputum test and treatment earlier, which will be useful for eliminating TB effectively in Thailand.

R2-QI-8 FROM SCAN TO SCALPEL: IN-HOUSE RADIOLOGY-DRIVEN VIRTUAL REALITY AND 3D PRINTING FOR FRACTURE REDUCTION AT A LEVEL 1 TRAUMA CENTER

Amar P. Shah, MD (*Presenter*)
Tanvi Ghosh (*Abstract Co-Author*)
Shireen Damle (*Abstract Co-Author*)
Chad Purnell (*Abstract Co-Author*)
Lee Alkureishi (*Abstract Co-Author*)
Richard Monahan (*Abstract Co-Author*)
Linping Zhao, PhD (*Abstract Co-Author*)
Pravin Patel, MD (*Abstract Co-Author*)

INTRODUCTION

Advances in virtual planning and three dimensionally-printed (3DP) anatomical models have enhanced intraoperative precision, but the current multi-step work flow requires a week of lead time, which is incompatible with 24-48-hour timeframe typically available in trauma intervention. An initiative was implemented at Sinai Chicago, a Level 1 trauma center, where computed tomography (CT) imaging is routinely performed for diagnostic evaluation. To extend their use, a collaboration between radiologists, surgeons and engineers was established. A novel point-of-care (POC) system, supported by virtual reality (VR) and 3DP, has been built featured with a fully on-site workflow while integrated with existing hospital systems. It presents the increasingly pivotal role of the Department of Radiology in assisting Surgery Department in efficient intra-operative management of complex cranio-maxillofacial (CMF) fractures.

METHODS

The workflow started from CT images in PACS. Through a secured utility, DICOM data is automatically routed to an in-house workstation. Following input and autosegmentation of bony components, fracture reduction was performed using ImmersiveView™ 5 (ImmersiveTouch Inc., Chicago, IL) , a VR-based platform that allows intuitive manipulation of 3D structures. Right after, an on-site 3D printer fabricated patient-specific fracture-reduced model of selected plastics for preoperative plate adaptation, followed by sterilization and operation.

RESULTS

Over 9 months, this in-house workflow has been refined and applied to more than 50 CMF trauma cases. Its implementation led to reduced surgical preparation time from 5-7 days to approximately 3-11 hours. Fracture reduction within VR was typically completed in 15-30 minutes, with 3D printing requiring 2-10 hours and plate adaptation between 5-25 minutes. In one representative case of a unilateral right zygomatic fracture, the complete planning and fabrication process was completed within 8 hours—well within the 48-hour trauma window. With on-going collection, additional data will be presented to quantify time savings, surgical outcomes, and workflow efficiency.

DISCUSSION

This novel radiology-driven workflow demonstrated the feasibility of rapid, on-site virtual planning and 3D model production for trauma surgery with adequate accuracy. Key advantages included accelerated turnaround, improved visualization for the surgical team, and enhanced plate adaptation using patient-specific printed models. The system required minimal additional infrastructure and integrated seamlessly into existing hospital networks, thus supporting both long-term scalability and sustainability. Currently, this approach is being extended to orthopedic trauma, further positioning the Department of Radiology as an indispensable contributor to surgical planning and intervention.

R2-QI-9 ROOT-CAUSE ANALYSIS SIMULATION- PILOT SESSION AT RSNA 2024

Nadja Kadom, MD (*Presenter*)
Jay K. Pahade, MD (*Abstract Co-Author*)
Susan Reich (*Abstract Co-Author*)
Bettina Siewert, MD (*Abstract Co-Author*)
Hanna M. Zafar, MD, MS (*Abstract Co-Author*)
Andrew Bowman, MD, PhD (*Abstract Co-Author*)

INTRODUCTION

Radiologists are highly trained in clinical interpretation but often have limited exposure to systems thinking, patient safety science, and root-cause analysis (RCA) methodology during residency or fellowship. However, radiologists may be involved in safety events and/or may be asked to participate in RCAs, which can lead to anxiety if the process is unknown. RCA simulation helps radiologists recognize the key elements of a RCA and its purpose of making our systems safer rather than seeking individual accountability.

METHODS

A team of five RSNA Quality Improvement Committee members developed a short vignette of an outpatient who was discharged from an imaging facility with an IV still in place that subsequently became infected. A1-hour session was delivered to in-person participants during the 2024 RSNA Annual Meeting. Each facilitator worked with four simulation participants, who received a 1-page document at the beginning of the simulation, laying out the error event and their role in the RCA (i.e., MRI technologist, former MRI student, patient and family advisor, MRI supervisor). The facilitators were given 35 minutes to simulate the RCA and develop a timeline of events, a gap and root-cause analysis, and an action plan. The remaining 25 minutes were used for debriefing, with additional explanations and examples of those key deliverables.

RESULTS

Ten participants responded to the pre-and post-session assessments, indicating appropriateness of the 1-hour session length, 80% ratings of the session being “very effective” (highest rating), and 90% stating the session enhanced their familiarity with the RCA process.

DISCUSSION

We demonstrated feasibility and effectiveness of an RCA Simulation at an Annual Meeting. This program can easily be shared with others and delivered in radiology practice settings, especially radiology teaching programs without access to other RCA training resources. The initiative will be repeated at the 2026 American Society of Neuroradiology (ASNR) Annual Meeting, supported by a 2025-2026 Member-Centric Strategic Initiative.

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R5A-QI

Quality Improvement Reports Thursday Afternoon Poster Discussions I

Thursday, Dec. 4 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

R5A-QI-1 IMPROVING REPRESENTATION IN RADIOLOGY RESIDENCY USING A REPRODUCIBLE FRAMEWORK

Kevin Dao, MD (*Presenter*)
Gelareh Sadigh, MD (*Abstract Co-Author*)
Rebecca Z. Bennett, MD (*Abstract Co-Author*)

INTRODUCTION

Despite being the 9th largest residency by enrollment, radiology ranks 18th in underrepresented in medicine (URiM) 1 racial/ethnic diversity amongst the 20 largest ACGME specialties. 2 Additionally, women comprised only 27% of radiology residents in 2019-2020, despite representing 52% of medical school matriculants. 2 These disparities persist despite strong evidence that diversity improves innovation, financial performance, and patient outcomes. 3 Prior efforts, such as the 2019 initiative by Vanderbilt Radiology, have shown success in increasing URiM recruitment through structural changes in the residency selection process.The purpose of this study was to assess the impact of a structured diversity recruitment initiative on URiM and female representation in our diagnostic and interventional radiology residency programs.

METHODS

This study was conducted at a quaternary academic hospital in Southern California. Between 2018-2021, URiM and female representation among residents was 4% and 25%, respectively. In 2021, our department formed the Radiology Outreach Committee (ROC) to implement a multifaceted intervention similar to Vanderbilt's approach, including: Blinding applications with holistic review Diversifying the recruitment committee Requiring implicit bias training for all interviewers Presenting a dedicated talk about the ROC during each interview day Hosting a dedicated DEI portion to the virtual second look Partnering with URiM institutions and societies (eg annual HBCU summer research program, SNMA, LMSA) Launching an annual 6-week paid radiology internship for URiM medical students We analyzed self-reported demographics of matched residents before and after intervention. Primary outcomes were URiM and female representation in matched cohorts. Data were sourced from NRMP Match results, using the AAMC definition for URiM. 1 Descriptive statistics and chi-squared tests were used to compare pre (2018-2021) and post (2022-2025) intervention cohorts. Significance was set at $p<0.05$.

RESULTS

Interventions were implemented in 2021 for the 2022 Match cycle. Post intervention, URiM representation rose significantly from 4% to 42% ($p<0.001$). Female representation also increased, though not significantly ($p=0.164$). Figures 1-4 show the changes in demographic trends.

DISCUSSION

This study was limited by small sample size and the inability to isolate individual intervention effects. Additionally, single-institution efforts do not address diversity across the specialty. Broader impact will require earlier outreach to undergraduate and preclinical medical students to expand the pool of URiM and female radiology applicants. Nonetheless, our findings suggest that a structured, multifaceted approach can significantly increase URiM recruitment, with a positive trend in female representation that may grow with sustained efforts.

R5A-QI-2 BRIDGING THE GAP: HOW A LARGE ACADEMIC MEDICAL CENTER AND A NON-PROFIT CANCER CLINIC PARTNERED TO ADDRESS HEALTH INEQUITIES IN BREAST IMAGING CARE

Amy L. Kerger, DO (*Presenter*)
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INTRODUCTION

Geographic, financial, and logistical barriers—such as lack of transportation, high medical costs, limited provider access, and distrust of healthcare systems—contribute to lower rates of cancer screening, follow-up, and treatment among underserved populations. In the U.S., 7.9% of individuals remain uninsured or underinsured, and a cancer diagnosis often leads to financial strain. Over 42% of patients deplete their assets, and 30% incur medical debt after diagnosis. Anticipated costs cause many to delay or avoid screening and treatment, even when symptomatic.

METHODS

LifeCare Alliance (LCA), Ohio's largest nonprofit health and nutrition provider, has offered community-based cancer screenings since 1898. In partnership with The Ohio State University (OSU) James Cancer Hospital, LCA expanded access to timely breast imaging and diagnostics for underserved patients. Through this collaboration, LCA integrated OSU's electronic health record (Epic) via Community Connect, leased breast imaging, PACS, and medical physics services, and arranged for OSU to hire and lease technologists back to LCA. OSU's breast imaging team began providing on-site diagnostic imaging one day per week, with biopsy services launching soon. This integration enabled real-time collaboration and streamlined workflows.

RESULTS

Since implementing Epic Community Connect and on-site collaboration in August 2024, turnaround times have markedly improved: Screening mammogram interpretation reduced from 1-2 weeks to within 24 hours. Callback to diagnostic imaging shortened from 4-6 weeks to 1-2 weeks. Screening to biopsy time decreased from 6-8 weeks to approximately 2 weeks. Although ultrasound-guided biopsies remain off-site due to ongoing renovations, coordination has been seamless, and on-site biopsies are expected to begin in late summer 2025. Notably, since the partnership began, 100% of patients have chosen to continue care through OSU, compared to prior fragmentation across health systems.

DISCUSSION

Despite evidence that screening reduces breast cancer mortality, disparities persist due to social determinants of health like insurance status, income, housing, and education. Our partnership shows that a collaborative, multidisciplinary approach can address these barriers. By uniting academic medical expertise with community outreach, we've developed a patient-centered model delivering timely, equitable care to uninsured and underinsured populations. With access to high-quality imaging, navigation, translation, transportation, and financial assistance, patients receive care in a trusted setting. This model minimizes delays, reduces financial burden, and

improves continuity of care—building trust and improving outcomes. It is scalable and has potential for national replication to reduce disparities in underserved communities.

R5A-QI-3 UTILITY OF CHATGPT-3.5 TO PREDICT NEURORADIOLOGIC STUDY TO ORDER BASED ON AMERICAN COLLEGE OF RADIOLOGY'S APPROPRIATENESS CRITERIA

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INTRODUCTION

Large Language models (LLMs) are novel tools with promising clinical applications. Although research has focused on their diagnostic applications, their utility in providing imaging recommendations requires further research. Neurologic pathologies, which range from emergent to advanced presentations, provide a diverse framework to assess the accuracy of LLM's on imaging study selection. Thus, we assessed the accuracy of the imaging recommendations by LLM ChatGPT-3.5 to neurology case prompts by the American College of Radiology (ACR) Appropriateness Criteria.

METHODS

Prompts from the ACR Appropriateness Criteria's priority clinical areas within neurology were used to design open ended (OE) or select all that apply (SATA) questions. Each case was categorized as acute, chronic, or indeterminate. OE questions required ChatGPT to select the most appropriate study for a clinical presentation, whereas SATA questions asked ChatGPT to determine whether a provided study was "usually appropriate," "maybe appropriate," or "usually not appropriate" for the presentation. Each question was posed three times, and responses were scored against ACR guidelines. Performance on OE prompts were compared to performance on SATA prompts for each clinical area. The performance on acute cases were compared to performance on chronic cases.

RESULTS

A total of 78 prompts were assessed in 11 priority clinical areas. Average performance on OE and SATA questions were 69.2% and 44.4% respectively. Amongst the priority clinical areas, the LLM performed superior on OE than SATA for the categories of Aneurysm ($p < 0.001$), Stroke ($p < 0.001$), Headache ($p = 0.027$), and Spine Infection ($p < 0.001$). The LLM performed superior on SATA than OE for the Vertebral Compression Fracture category ($p = 0.015$). Difference in performance between acute and chronic prompts on SATA ($p = 0.5411$) and OE ($p = 0.6530$) were not significant. Overall, performance of ChatGPT LLM was greater when OE prompts were provided compared to SATA. Furthermore, its performance was consistent across acute and chronic scenarios.

DISCUSSION

LLMs hold promise as decision-support tools in imaging selection. We demonstrate that LLMs can recommend general imaging studies based on clinical context more effectively than advising on a particular one. Furthermore, these tools have a similar performance in both emergent and outpatient settings, suggestive of their utility in proposing advanced imaging options in non-emergent settings when more time is available to evaluate. However, the tool is limited in its scope in the time-sensitive emergent setting as it requires the input of a clinician. Nevertheless, with more advancements in LLM construction, the accuracy of these tools on recommending radiologic studies can be expected to improve.

R5A-QI-4 FROM PIXELS TO PREVENTION: AI-DRIVEN CORONARY ARTERY CALCIUM DETECTION AND PATIENT MANAGEMENT

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Avishkar Sharma, MD (*Abstract Co-Author*)

INTRODUCTION

Coronary artery calcium (CAC) scoring is a powerful prognostic marker of cardiovascular risk and is often overlooked when incidentally detected on routine CT imaging. We deployed a two-part AI solution (Aidoc, Tel Aviv, Israel), integrating diagnostic radiology tools and natural language processing (NLP), to identify, report, and manage CAC findings from non-gated, non-contrast CT chest/abdomen scans including the heart. This end-to-end workflow enables opportunistic screening and structured patient follow-up, while reducing radiologist burden.

METHODS

An AI tool analyzed non-gated CT scans (May 2024-April 2025) to assess CAC severity. Separately, an NLP algorithm reviewed finalized reports to detect the degree of CAC. NLP-positive cases were routed to a care management platform where navigators coordinated follow-up. Inclusion criteria: outpatient CTs, age <80, and AI-assessed CAC = moderate. Exclusion criteria: existing cardiology care or limited life expectancy. Outcomes included the number of patients identified, referred, scheduled, and seen.

RESULTS

1,756 outpatient CT scans were analyzed by the image based AI tool. Concurrently, the NLP-based solution identified 951 eligible patients with CAC, of whom 266 (27.9%) were excluded due to existing cardiology care. A cohort of 69 patients referred to cardiology were reviewed for outcomes; 61 (88.4%) were seen, 7 no-showed, and 1 had a future appointment. Of the 61 patients seen, 68.8% (42/61) had medication adjustments (statins, antihypertensives, or antiplatelets). Within three months of the initial visit, 68.8% (42/61) also completed additional anatomic or functional cardiac testing such as echocardiography or stress testing. Six of these patients (14.3%) underwent a diagnostic left heart catheterization with two receiving revascularization (one PCI, one CABG).

DISCUSSION

An AI-driven CAC workflow combining automated scoring, NLP-based detecting and navigator-led coordination is feasible and clinically effective. This system successfully identifies care gaps and facilitates follow-up for patients with incidentally detected coronary calcium. Early data suggests this approach promotes opportunistic screening for cardiovascular disease.

R5A-QI-5 IMPROVING CONSISTENCIES THROUGH STANDARDIZED WORKFLOWS AND PROCESSES IN CARDIAC CT IMAGING

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Mitchell Owen (*Abstract Co-Author*)
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Kathryn Scharnweber (*Abstract Co-Author*)

INTRODUCTION

The purpose of this study is to create a consistent workflow for cardiac CT scans that will increase efficiencies for complex cardiac exams, which can be unpredictable and frustrating for patients and staff. The goal of the project is to increase on-time starts (OTS) for cardiac exams by 12% from an average of 56% to 68% by July 28th without negatively impacting OTS for all other CT exams in this same CT department.

METHODS

A team of CT technologists, support staff, and leadership personnel are approaching this issue using the Define-Measure-Analyze-Improve-Control (DMAIC) and A3 framework to advise a solution strategy using a series of Plan-Do-Study-Act (PDSA) cycles. Qualitative and quantitative measures are going to be used to monitor progress throughout the project. Timestamps during the workflow process will be monitored to show when and where processes are working or failing. Feedback from stakeholders will also be used during the PDSA cycle. Department OTS for all other CT scans are going to be monitored as a counterbalance. A root cause analysis was performed to determine all possible solutions. Solutions were then placed into a Fishbone Diagram and Impact Effort Grid to determine and prioritize possible approaches within the scope of the project. The team is preparing to work through various PDSA cycles of different workflow options to improve cardiac exam efficiencies and increase OTS. The project team plans to collaborate with support staff and stakeholders through trials and project efforts. Trials that will be initiated include template changes, cardiac scan room staffing model changes, assignment workflow modifications, and improved resources for support staff. Template changes have been built and are ready to go live on May 28 th , 2025. Visual resources have been added to every scanner station and are currently being monitored by staff feedback. A detailed review of timestamp data and input gathered from those involved will be done after each PDSA cycle to determine success.

RESULTS

This project will prove to be successful with a 12% increase in cardiac CT exams OTS among a sample size of 10 days, with no negative impact on OTS for all other CT exams on Gonda 3.

DISCUSSION

The project team expects to learn many lessons throughout PDSA cycles. A lesson already learned is the importance of communication between the staff involved. Limitations of the project include modifying access operations.

R5A-QI-6 DISPARITIES IN RADIOLOGIC IMAGING FOR CHEST PAIN IN THE ED: THE INFLUENCE OF PRIMARY LANGUAGE ON TEST UTILIZATION AND COST

Tony Tu (*Presenter*)
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INTRODUCTION

Language barriers in emergency departments (EDs) contribute to disparities in diagnostic accuracy, efficiency, and patient outcomes. Patients with limited English proficiency (LEP) face longer ED stays, increased diagnostic uncertainty, and higher healthcare costs. Prior literature indicates that LEP patients may be less likely to receive guideline-concordant care. The purpose of this study is to evaluate whether primary language influences the type and cost of radiologic tests ordered for chest pain in the ED.

METHODS

We conducted a retrospective observational analysis using the RSNA COSMOS database covering 22,753,937 ED encounters for chest pain from March 2010 to March 2025. Patients were categorized by primary language, including English, Russian, Chinese, Spanish, Arabic, and Vietnamese. Imaging metrics included receipt of chest radiography (CXR), computed tomography (CT), and the ratio of CT+CXR to CXR-only imaging. We analyzed disparities using chi-square tests and calculated utilization percentages.

RESULTS

Among all encounters, 93.5% were English-speaking patients, with Spanish speakers comprising 4.2%. CXR utilization was significantly lower among all non-English-speaking patients (Spanish: 0.32%+-0.01%, Arabic: 0.25%+-0.05%, Russian: 0.25%+-0.07%) compared to English speakers (0.47%+-0.003%, all $p < 0.001$). CT utilization showed a similar disparity (Spanish $p = 0.003$; Arabic $p = 0.009$). However, the ratio of CT+CXR to CXR-only was higher in some non-English speakers (Spanish: 0.40+-5 vs 0.24+-0.003 in English, $p = 0.021$; Arabic: 0.32+-0.03 vs 0.24+-0.003, $p=0.012$; Russian 0.25+-0.11 vs 0.24+-0.003, $p > 0.05$), suggesting additional imaging may be ordered due to communication uncertainty. These findings reflect inefficiencies and potential over-testing among LEP patients.

DISCUSSION

Non-English-speaking patients in the ED are less likely to receive initial imaging for chest pain but are more likely to receive additional, potentially redundant imaging. These disparities may reflect systemic barriers to communication and contribute to higher costs and diagnostic delays. Limitations include possible underreporting of imaging in the dataset and lack of contextual clinical data (e.g., interpreter use). Sustainability of improvements will depend on system-wide adoption of language access tools, cultural competency education, and better documentation of preferred language. Recognizing language as a structural determinant of health is essential for promoting equity in emergency radiologic care.

R5A-QI-7 REDUCING RADIATION EXPOSURE OF PATIENTS UNDERGOING TRAUMA CT IN THE ED

Chaitra Goud, FRCR, MBBS (*Presenter*)
Kabilan Chokkappan (*Abstract Co-Author*)

INTRODUCTION

CT (Computed Tomography) is the most accurate and cost-effective method to evaluate severe blunt abdominal trauma in hemodynamically stable patients. Polytrauma patients receive a substantial dose of radiation during initial and subsequent follow up CT imaging. The radiation exposure is cumulative and detrimental. Low individual risk of cancer becomes a greater public health issue when multiplied by a large number of examinations. The goal of our study was to increase the percent of patients undergoing trauma CT that receive optimal radiation* from 11.2 % to 60 % in 6 months without compromising on the diagnostic quality.(* Optimal radiation considered below 1660 mGycm in terms of DLP [Dose Length Product])

METHODS

This study was performed at an urban public health hospital. Quality improvement team included Radiologists, ED (Emergency Department) CT radiographers, Physicist and ED clinician. Trauma CT angiogram protocol in our department includes pre contrast scan, contrast enhanced arterial/portal venous phases and a delayed scan of the thorax, abdomen and pelvis. The team used quality improvement toolkits to identify the root causes and prioritize few actionable causes through multi voting. The application and efficiency of the interventions was assessed through multiple PDSA (Plan-Do-Study-Act) cycles. Modified scan protocol replacing dual energy with single energy scanning for three of the phases, correct patient positioning and proper scanogram planning proved to be the most effective interventions.

RESULTS

The project measure was optimal radiation exposure in DLP (mGycm) which was measured for every scan. The results plotted on a run chart showed CT scans with optimum radiation dose to have increased to 60%. Additional project measure was median dose which decreased significantly and consistently to fall in the optimum range

DISCUSSION

Some problems encountered during the study were that initial protocol of using virtual non-contrast scans was not acceptable to all radiologists and non-compliance of few radiographers to follow the modified scan protocol. Often, the most effective solution is the simplest option. We achieved reduction in radiation exposure to the patient which led to additional cost benefits like increasing tube life of the CT scanner and reduced need of PACS (Picture Archiving and Communication System) cloud storage.

R5A-QI-8 RADIOLOGIST AND TECHNOLOGIST WELLBEING IN AN ACADEMIC RADIOLOGY DEPARTMENT: A HUMAN-CENTERED DESIGN THINKING APPROACH

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Lily L. Wang, MBBS, MPH (*Abstract Co-Author*)
Sangita Kapur, MD (*Abstract Co-Author*)
Bruce Mahoney, MD (*Abstract Co-Author*)
Jacqui Rose (*Abstract Co-Author*)
Megan Wimmer (*Abstract Co-Author*)
Mary C. Mahoney, MD (*Abstract Co-Author*)

INTRODUCTION

The increasing focus on patient experience in radiology is paralleled by concerns about provider burnout and disengagement. Moving from patient-centered to human-centered radiology, with empathy for all stakeholders, is essential. Our objective was to use design thinking to identify factors affecting employee wellbeing and co-create solutions with radiology faculty and staff.

METHODS

From March 2024 to April 2025, we partnered with GE HealthCare Experience Design team to launch a Design Thinking Initiative aimed at enhancing employee wellbeing within our academic radiology department. We surveyed 139 stakeholders-including radiologists, technologists, nurses, clinical service coordinators, and managers-using a 30-question survey based on GE HealthCare's experience drivers, the Stanford professional fulfillment model, and the AMA burnout assessment. Survey insights informed a two-day workshop utilizing design thinking phases: Defining the problem, Research, Ideation, and Refinement. Workshop participants included department leadership, faculty, technologists, administrators, and design thinking consultants. Activities included gaining empathy through active listening, framing the challenge, solution iteration, concept selection, prototyping plan and forming focus groups with champions. A further deep dive in a subsequent department retreat allowed refinement of the ideas.

RESULTS

Four main themes emerged: (1) Recruitment and retention of radiologists, (2) Recruitment and retention of technologists, (3) Workflow efficiency and control over workload and, (4) Culture of appreciation. We mapped challenges in each theme directly translate to employee satisfaction and created a priority project pipeline that addressed the pain points of radiologists and technologists. Small groups were tasked with developing tactics and iterative solutions within each theme. High priority initiatives that were implemented included providing academic time for all radiologists, substantially changing the noncompete clause, hiring reading room assistants, piloting AI tools and protocol management. Notably, implementing a minimum 10% academic time for all faculty-our top-priority prototype-resulted in 92.3% of faculty wanting to continue this initiative next year, demonstrating sustained engagement and value despite rising clinical demands.

DISCUSSION

Deep engagement among the radiologists and technologists (designing "with" and not "for") resulted in team enablement in the department. Limitations include a time-intensive process requiring sustained leadership support for the long-term success. This human-centered methodology offers a scalable blueprint for radiology departments seeking to enhance workplace satisfaction.

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R5B-QI

Quality Improvement Reports Thursday Afternoon Poster Discussions II

Thursday, Dec. 4 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

R5B-QI-1 UNCERTAINTY LANGUAGE IN PEDIATRIC RADIOLOGY REPORTS: A SINGLE INSTITUTION ASSESSMENT

Nadja Kadom, MD (*Presenter*)
Hanzhou Li, MD (*Abstract Co-Author*)
John T. Moon, MD (*Abstract Co-Author*)
Atul B. Shinagare, MD (*Abstract Co-Author*)
Adam Goldman-Yassen, MD, MS (*Abstract Co-Author*)
Neil U. Lall, MD (*Abstract Co-Author*)
Ling Yang (*Abstract Co-Author*)
Yinghua Yang (*Abstract Co-Author*)

INTRODUCTION

Radiologists use a variety of terms to express uncertainty, which can exacerbate ambiguity in imaging reports and contribute to delayed or inaccurate diagnoses. As it has been shown by adult radiologists, it is feasible to limit report vocabulary to a fixed set of expressions that are linked to distinct levels of diagnostic uncertainty. As an initial step towards standardizing report language in our pediatric practice, we evaluated whether pediatric radiologists also use a wide variety of uncertainty terms, how different stakeholders (radiologists, providers, and patients) interpret the expressed certainty levels, and whether language standardization should be pursued.

METHODS

We analyzed a random sample of 10,000 reports extracted from a data set of 309,751 reports between October 1, 2023 to September 30, 2024. We included only phrases used in the report impression; we excluded phrases that occurred only once in the data set, those suggesting further action, consisting of one-word modifiers, serving as descriptive words, providing explanations for findings, or indicating clinical significance. We created a survey containing the top 15 phrases from our dataset and one phrase from a previous publication. We asked stakeholders to rate each phrase per percentage level of certainty that is expressed, using a 5-point Likert scale : (1) >90% (Very high likelihood), (2) 75-90% (High likelihood), (3) 25-74% (Intermediate likelihood), (4) 5-24% (Low likelihood), and (5) < 5% (Very low likelihood). We also asked whether radiologists should use standardized language to express levels of certainty.

RESULTS

We received 17 responses from radiologists, 57 from patients, and 56 from clinical providers. Radiologists' perceptions of levels of certainty for each term were generally more aligned with each other, while patients had the most divergent perceptions. In addition, radiologists and clinical providers had similar ratings for most terms, while patients differed substantially. Radiologists were least likely to indicate that they should use a standardized way for expressing their uncertainty, while clinicians were most likely to affirm this statement.

DISCUSSION

While radiologists agree more on the meaning of specific uncertainty phrases, they seem to have less insight into the effects of using a variety of phrases for expressing uncertainty on clinical providers and patients. We will use the data to present the issue to our radiology group and pose a suggestion of adopting an existing uncertainty scale that restricts radiologists to the use of five distinct terms that represent each percentage range of certainty.

R5B-QI-2 ARTIFICIAL INTELLIGENCE USE CASE: UPSCALING NOVICE READERS IN BREAST CANCER DETECTION IN GUYANA

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Kathryn W. Zamora, MD, MPH (*Abstract Co-Author*)
Sara F. Robinson, RT (*Abstract Co-Author*)
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Allison Borowski, MD (*Abstract Co-Author*)
Jamie T. Surratt, MD (*Abstract Co-Author*)
Mai A. Elezaby, MD (*Abstract Co-Author*)
Erica B. Pollack, MD (*Abstract Co-Author*)

INTRODUCTION

Global disparity in breast cancer mortality exists due to significant shortage of trained healthcare providers in low-resource areas. In Guyana, where the first radiology residency program in the country was implemented in 2019, mammogram reporting relies on preliminary interpretation by residents or novice staff radiologists supervised by volunteer remote expert breast radiologists. Artificial Intelligence (AI) applications may have the potential to improve the accuracy of novice mammogram interpretation and aid in radiologists' training towards proficiency. The purpose of this project was to determine if an AI algorithm can improve the diagnostic accuracy of preliminary screening mammography interpretation by novice readers as demonstrated by increased accordance to the final expert interpretation.

METHODS

This is a HIPPA compliant, IRB approved retrospective review of 2D full-field digital screening mammograms (FFDM) with preliminary interpretation by a novice reader and final interpretation by an expert reader. A commercially available AI algorithm retrospectively analyzed mammograms that met the inclusion criteria between January 2022 and August 2024. The AI algorithm assigns mammography exams low (0%-19%), intermediate (20%-69%), and high (70%-100%) confidence of malignancy case scores. The agreement of the BI-RADS assessment ("recall" [BI-RADS 0] vs "no recall" [BI-RADS 1,2]) of the preliminary novice's report and that of the final expert's report was calculated and compared to the agreement of the AI case score to the novice's preliminary interpretation. For the purpose of this study, the final interpretation by the expert radiologist was considered ground truth; a "no recall" by the novice reader that is recalled by the expert is considered a miss. The AI algorithm was interpreted such that low case scores are appropriate for no recall, while the intermediate and high risk case scores warrant recall in the appropriate setting.

RESULTS

A total of 264 mammograms of females with median age 53 are included within the study. The AI algorithm assigned 78 (29.5%) a low case score, 142 (53.8%) an intermediate score, and 44 (16.7%) a high score. Nonagreement between the novice reader and expert reader was noted in 62 of 264 cases (23.5%) where no recall was made by the novices' preliminary interpretation yet recalled by the expert and thus considered a miss. Of the missed cases, 58% (36/62) were characterized as intermediate or high case scores by AI.

DISCUSSION

Upfront application of a commercially available AI algorithm for 2D FFDM could have improved inter-reader agreement and averted a miss by the novice reader in 58% of the missed cases. This study highlights the use case for AI algorithms in the upscaling of quality of novice radiologists' interpretation in low-resource global outreach settings with potential significant improvements in patient outcomes.

R5B-QI-3 LARGE LANGUAGE MODEL - BASED AUTOMATED MONITORING OF AI-ASSISTED BONE AGE ESTIMATION IN A PEDIATRIC RADIOLOGY WORKFLOW

Pooja Pathak (*Presenter*)

INTRODUCTION

Integrating AI tools in clinical imaging workflows has created a pressing need for scalable performance monitoring methods. Effective monitoring should encompass usage metrics, performance evaluation, and cost-effectiveness analysis. However, most clinical environments lack standardized frameworks for assessing AI applications, resulting in inconsistent or absent monitoring practices. This project aimed to develop and deploy a large language model (LLM)-based framework for automated monitoring of medical imaging AI systems. We selected AI-assisted bone age estimation in pediatric radiology as a representative use case due to its clinical adoption.

METHODS

In clinical workflow, hand radiographs were transmitted to a cloud inference engine utilizing a convolutional neural network to estimate bone age (Larson et al., Radiology, 2018). The AI estimate was inserted into a draft radiology report. Radiologists could accept it or input their own estimate using the Greulich and Pyle bone age atlas before final signature. We built an automated framework to extract final reports and corresponding AI bone age estimates from the clinical reporting system. For each case, we retrieved timestamps for exam completion, draft report creation, and final report signature. Using Gemma-3 12B, we extracted the radiologist's final estimate and compared to the AI value to assess agreement. Metrics: 1. Report generation time: Time from draft creation to final signature. 2. Frequency of Disagreement: % of cases where the AI and radiologist bone age estimates differed. 3. Degree of Disagreement: Absolute difference (in months) between AI and radiologist estimates.

RESULTS

4465 bone age studies (January 2020 - March 2025) were retrospectively analyzed. AI-assisted bone age estimation was introduced into workflow in July 2022. Following implementation, 2513 exams used the AI-assisted reporting system. Median reported bone age (in months) pre-AI was 162 (IQR: 132 -180), and 171 (IQR: 142 -186) post AI. Median chronological age (in months) pre-AI was 162 (IQR:127-181) and 165 (IQR:138-183) post-AI. Report generation time substantially decreased from 306 seconds (IQR:126-1909) pre-AI to 36 (IQR:12-187) post-AI (-88%). Disagreement frequency between AI estimate and reported age dropped from 9.9% to 5.9% to 3.6% over first three years of AI use. In disagreement cases, mean absolute difference between the AI-estimate and reported age: 25.9 (±42.4) months.

DISCUSSION

Automated, AI-based monitoring of clinical imaging AI is feasible and can provide valuable insights for quality improvement. For bone age estimation, the framework highlighted the clinical value of AI and revealed adjustment in expert behavior. This approach can generalize to other imaging applications and raises questions around automation bias and human-AI interaction that merit further study.

R5B-QI-4 FROM DETECTION TO REVENUE: EVALUATING THE ECONOMIC VALUE OF AI-GUIDED TRIAGE FOR INCIDENTAL PULMONARY EMBOLI

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INTRODUCTION

Artificial intelligence (AI) tools are increasingly integrated into radiologic workflows, offering potential gains in efficiency and diagnostic accuracy. However, the economic return on investment (ROI) for AI implementation, particularly in outpatient settings, remains underexplored. This study assesses the financial and clinical impact of an AI-enabled triage pathway for incidental pulmonary emboli (iPE) detected on routine CT imaging, with an emphasis on downstream revenue and time-to-treatment improvements.

METHODS

From July 2023 to March 2024, 11,700 outpatient CT scans were analyzed using a validated AI algorithm for iPE detection. All AI-positive findings were confirmed by board-certified radiologists. Confirmed cases were prospectively followed for downstream clinical outcomes, including emergency department (ED) transfers, inpatient (IP) admissions, anticoagulation therapy initiation, and advanced interventions. Revenue projections were based on national average reimbursement values: $2,350 per ED visit, $8,700 per IP admission, and $950 per year for anticoagulation therapy. Nine months of outcome data were annualized. Median turnaround times for AI-flagged versus unflagged iPEs were compared.

RESULTS

Annualized projections identified 107 confirmed iPE cases. Of these, 29% (31/107) were referred to the ED. Among ED cases, 22% (7/31) were treated and discharged, generating $16,043 in revenue; 78% (24/31) were admitted, yielding $183,946. Among admitted patients, 83% (20/24) were initiated on anticoagulation therapy, accounting for $19,084 in annual pharmaceutical revenue. One patient underwent mechanical thrombectomy, and the Pulmonary Embolism Response Team (PERT) was activated in four cases. Median turnaround time for AI-flagged iPEs was 66.4 minutes (IQR: 526.3) versus 383.6 minutes (IQR: 1502.3) for non-flagged cases ($p < 0.05$), reflecting an 82.7% (317.2-minute) reduction for AI cases. Total projected annual downstream revenue was $219,073.

DISCUSSION

The integration of AI into outpatient imaging pathways enables timely detection and management of incidental pulmonary emboli, translating to measurable financial and clinical benefits. Revenue gains were driven by appropriate escalation to emergency and inpatient care and the timely initiation of therapy. These findings reinforce the dual value—economic and clinical—of incorporating AI into radiology workflows. Importantly, enhancing patient outcomes remains a central driver for the continued evaluation and adoption of AI in radiologic practice.

R5B-QI-5 DEVELOPING QUALITY METRICS IN RADIOLOGY

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Bettina Siewert, MD (*Abstract Co-Author*)

INTRODUCTION

The use of metrics in driving quality improvement and patient safety in radiology has long been established. The American College of Radiology and The Joint Commission (TJC) have developed several metrics towards patient safety and improving radiology services. Nonetheless, many radiology practices use a narrow set of measures and there seems to be a gap in radiology practices' ability to scale quality and safety measurement efforts. To better define current and desired future state for quality metrics in Radiology we sought input from practice leaders interested in radiology quality and safety.

METHODS

This qualitative information was gathered during two sessions dedicated to radiology metrics at the ACR Quality and Safety meeting (2022) and RSNA (2024). The two occasions featured interactive breakout sessions discussing both current and desired quality metrics using open ended questios. Attendees and participants included hospital administrators, radiologists, and technologists, and were asked to list the metrics they were tracking- categorized as "frequently tracked" or "currently tracked" and metrics they would prefer to use but were currently not using- categorized as "aspirational."

RESULTS

Key findings showed that radiology departments are currently prioritizing quantitative metrics including turn-around-time (hours), number of contrast reactions, and frequency of adverse events over outcomes or value-based metrics. Other commonly tracked metrics currently include patient access, complication rates for select procedures, protocol adherence and patients' immediate feedback. Recurrent themes for aspirational metrics included standardized patient satisfaction scores, patient recall rates secondary to poor inadequate image quality, incidental findings follow up, test appropriateness, diagnostic accuracy (including rad-path correlation), provider wellness and burnout, adherence to practice guidelines, and peer learning/review participation.

DISCUSSION

We found there is a substantial interest among radiologists and radiology staff in integrating "aspirational" metrics into practice, including patient centered-feedback, workflow and process efficiency, adherence to practice guidelines, impact on patient care and outcomes. Despite reported interest and value, most practices had yet to adopt any of the aspiration metrics highlighting significant barriers currently such as data availability, workflow integration challenges, and lack of standardized benchmarks or prioritized quality initiatives. Understanding these barriers is critical to inform next steps, which may include targeted resource allocation, infrastructure support for data collection, and stakeholder engagement to drive meaningful adoption of higher-level quality metrics.

R5B-QI-6 CLINICAL EVALUATION OF CONSENSUS-BASED MRI GUIDELINES FOR DIAGNOSING PLACENTA ACCRETA SPECTRUM DISORDERS

Cynthia Funso-Fayomi, MBBS, FRCR (*Presenter*)
Anum Pervez, BSc, FRCR, MBBS (*Abstract Co-Author*)
Stephan Edey, MBBS, FRCR (*Abstract Co-Author*)
Sarah Natas, BSc, FRCR (*Abstract Co-Author*)
Sultana Hasso, MBBS (*Abstract Co-Author*)
Olwen A. Westerland, MBBS (*Abstract Co-Author*)
Audrey E. Jacques, MBBS, FRCR (*Abstract Co-Author*)

INTRODUCTION

Incidence of placenta accreta dyndrome (PAS) is increasing, partly due to the rising numbers of caesarean sections. We aimed to assess the diagnostic utility of MRI features recommended by the SAR-ESUR expert consensus, as published in the 2023 RSNA guidelines, for identifying imaging characteristics of placenta accreta spectrum (PAS) disorders.

METHODS

This retrospective study reviewed MRI scans from patients evaluated for suspected PAS between 2015 and 2025, all of whom had surgically and histologically confirmed diagnoses. MRI findings assessed included the presence of dark T2-weighted intraplacental bands, uterine contour abnormalities, myometrial thinning, bladder wall disruption, focal masses extending beyond the uterus, increased vascularity at the placental bed, and absence of the normal retroplacental T2 hypointense zone—criteria aligned with the recent RSNA-endorsed guidelines. Imaging data were reviewed at a tertiary care centre, and frequencies of these diagnostic features were correlated with operative and pathological outcomes.

RESULTS

33 patients underwent MRI prior to surgical intervention for confirmed PAS. Pre-operative MRI studies were re-analysed using the SAR-ESUR consensus criteria. All patient MRIs demonstrated dark intraplacental T2-weighted bands (100%) aligning closely with the consensus emphasis on this marker. Other imaging findings with decreasing levels of frequency included increased and bizarre placental and subplacental vascularisation (86%) and uterine bulging (72%). Heterogenous placental signal on T2-weighted imaging was frequently seen in the context of multiple dark intraplacental bands and although difficult to quantify and while not included in the recent consensus statement appears to be a useful predictive feature for PAS.

DISCUSSION

In our analysis of confirmed PAS cases, pre-operative MRI findings showed a strong alignment with the descriptors defined in the 2023 SAR-ESUR consensus. These findings support integrating the proposed framework into future imaging protocols, where its standardized approach may improve diagnostic accuracy and support coordinated multidisciplinary careIn our analysis of confirmed PAS cases, pre-operative MRI findings showed a strong alignment with the descriptors defined in the 2023 SAR-ESUR consensus. These findings support integrating the proposed framework into future imaging protocols, where its standardized approach may improve diagnostic accuracy and support coordinated multidisciplinary care.

R5B-QI-7 TELERADIOLOGY: A BOON FOR PREGNANT AND POSTPARTUM RADIOLOGISTS: A MIXED METHODS STUDY ON CAREER CONTINUITY, FLEXIBILITY AND WELL BEING

Jainam A. Doshi, MBBS, MD (*Presenter*)
Natisha P. Arora JR, MD (*Abstract Co-Author*)
Venkatesh Somu JR, MD (*Abstract Co-Author*)

INTRODUCTION

Radiology, though intellectually rewarding, presents significant challenges for women during pregnancy and early motherhood due to rigid work hours, physically demanding on-site shifts, and lack of flexible scheduling. These factors often contribute to burnout, career breaks, or attrition among female radiologists. The rise of teleradiology has opened new avenues for remote clinical reporting, potentially addressing these limitations. This study explores the role of teleradiology in supporting career continuity, flexibility, and well-being in pregnant and postpartum radiologists

METHODS

This mixed methods study combined quantitative and qualitative approaches. A structured online survey was disseminated to radiologists who experienced pregnancy or postpartum in the past five years and engaged in teleradiology during that phase. Quantitative data from 80 respondents focused on work hours, reporting output, mental health, and perceived career satisfaction. Additionally, 15 participants underwent semi-structured interviews to explore deeper emotional and professional experiences. Quantitative data were analyzed using descriptive statistics and Pearson correlations. Thematic analysis was used for qualitative transcripts.

RESULTS

Among 80 respondents, 86% reported improved work-life balance due to teleradiology, 78% were able to continue clinical work without interruption, and 95% cited elimination of commute as a major benefit. Flexible scheduling (92%), ability to breastfeed/rest (71%), and reduced physical strain (64%) were key advantages.

However, 47% indicated that inconsistent case flow and lack of institutional support were drawbacks.Qualitative analysis revealed three major themes: (1) Preservation of professional identity, (2) Emotional resilience through autonomy, and (3) Perceived isolation in the absence of team interactions. Despite some challenges, most participants highlighted a strong sense of empowerment and career satisfaction due to the flexibility offered by teleradiology.

DISCUSSION

Teleradiology has emerged as a vital support system for radiologist mothers, enabling continuity of clinical practice during traditionally challenging career phases. This study emphasizes its role in reducing attrition, preserving mental well-being, and supporting gender diversity in the workforce. While challenges remain—such as the need for better institutional frameworks and scheduling support—the positive impact on retention and well-being is compelling. These findings support broader adoption of teleradiology as a gender-inclusive strategy in modern radiology departments.

R5B-QI-8 BRIDGING THE GAP: ENHANCING ACADEMIC CAREER PATHS THROUGH RSNA'S RADIOLOGY IN TRAINING INITIATIVE

Alessia Guarnera, MD (*Presenter*)
Enis Yilmaz, MD (*Abstract Co-Author*)
Cristina Marrocchio, MD (*Abstract Co-Author*)
Joice C. Prodigios, MD (*Abstract Co-Author*)
Linda Moy, MD (*Abstract Co-Author*)
Victoria Chernyak, MD, MS (*Abstract Co-Author*)

INTRODUCTION

The future scientific advancements in radiology rely on a new generation of physicians to pursue an academic career and publish high-quality research. To sustain scientific growth, the following gaps must be addressed: a) the growing need for skilled reviewers and editors; and b) the challenges trainees face in following an academic path, gaining experience in peer-reviewing and serving as editors. RSNA Radiology in Training (RIT) program provides editorial, reviewing, learning, and networking opportunities for radiology, nuclear medicine, and medical physics residents and fellows across the world. The members of the RIT editorial board work with assigned mentors to complete 5 mentored reviews, after which they review independently. RIT members attend monthly didactic lectures, join Radiology editorial meetings and promote Radiology publications on social media. Our study aims to assess the effectiveness of the RIT program.

METHODS

The key data related to the RIT program structure, requested qualifications, application process and requirements, duties and responsibilities, and related opportunities were extracted from the RSNA Trainee Editorial Boards webpage (https://www.rsna.org/education/trainee-resources/trainee-editorial-boards). The data for all RIT board members from 7/2020-1/2025 was extracted from the Radiology reviewer database. The numbers of total reviews and independent reviews were tabulated. The long-term retention rates, defined as providing at least one Radiology review within the last 12 months of the assessment period, were tabulated for each annual cohort of RIT board members. The quality of reviews (R score; 1=best, 5=worst) provided by the RIT members was compared to those of the general Radiology reviewer pool (n=1,500) for the same period using the Wilcoxon test.

RESULTS

Data related to the RIT program were tabulated to present the program structure, duties, and opportunities (Table 1) . In the considered period, the RIT program included 65 members, of whom 47 had completed the first mandatory year. The RIT members provided 984 peer reviews, of which 731 (74,3%) were performed independently. The retention rates for cohorts of 2020, 2021, 2022 and 2023 were 67% (10/15), 67% (8/12), 91% (10/11) and 100% (9/9), respectively (Figure 1) . The median R scores were 1.08 (IQR, 1.0-1.25) for RIT board members and 1.17 (IQR 1.0-1.5) for the general reviewer pool ($p<0.005$) (Figure 2) .

DISCUSSION

The Radiology RIT program is shown to be effective in training high-quality peer-reviewers with high long-term retention rates. Presentation of the RIT program and its related activities will increase awareness of the opportunity and encourage trainees to apply. The RIT program is a valuable opportunity for shaping the next generation of peer-reviewers and editors, with the common goal of expanding medical knowledge and improving patient care.

Nov. 30 – Dec. 4
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S3A-QI

Quality Improvement Reports Sunday Afternoon Poster Discussions I

Sunday, Nov. 30 11:45AM - 12:15PM Room: LEARNING CENTER

Sub-Events

S3A-QI-1 IMPACT OF EHR BASED OPAS ON TIMELY COMPLETION RATES FOR ACTIONABLE FINDINGS

Erin Panter, ARRT, BS (*Presenter*)
Calista Kee (*Abstract Co-Author*)
Anand Bhatia, MD, MBA (*Abstract Co-Author*)
Mary Jo Evans (*Abstract Co-Author*)
Ben C. Wandtke, MD, MS (*Abstract Co-Author*)

INTRODUCTION

Missed or inadequately addressed clinical follow-up recommendations are a considerable risk to patient safety, especially in academic medical centers with high patient volumes and complex workflows. Timely completion of radiology recommendation follow-up for incidental findings is inconsistent, placing patients at risk for delayed diagnosis. Clinical advisories in electronic health records (EHR) improve adherence to evidence-based practices. AI and natural language processing can transform clinical decision support into a patient-centered tool by generating personalized imaging recommendations and streamline care in the EHR (1) . However, in the absence of standardized systems, alerts from automated tools risk being overlooked, indefinitely deferred, or lost within provider dashboards. We implemented a structured, multidisciplinary workflow for OurPractice Advisories (OPAs) to ensure timely follow-up of clinical recommendations, defined as 30 days before or within 60 days after the recommended due date.

METHODS

In collaboration with the American College of Radiology Learning Network, we performed root cause analysis and held weekly meetings. The results showed that that showed many providers missed or were unaware of OPA alerts. Primary care (PC) leadership addressed this at monthly meetings. Interventions were refined using value stream mapping and Plan-Do-Study-Act cycles. The OPA system generates advisories; providers can act, defer for triage, or dismiss it with justification. A multidisciplinary team routed deferred cases for scheduling, reassignment, or escalation. Our SMART goal was to increase the timely follow-up from 61% to 70% by December 2024

RESULTS

Following OPA integration into PC workflows, completion rates rose from 61% to a sustained 70%, and weekly variability declined. From July 2024 to March 2025, weekly orders spiked after targeted outreach (e.g., direct emails and PC open house). Orders placed directly from the OPA stayed above 10/week post-intervention, reflecting greater provider engagement. Overdue recommendations with placed orders increased from 10% to 18%. To capitalize on this, we utilized program navigators to directly call patients to schedule imaging exams. Gains correlated with EHR updates and educational outreach. Personal engagement and leadership support enabled system integration into everyday practice.

DISCUSSION

This scalable, team-based workflow enhanced timely follow-up without overburdening providers. Embedded in the EHR, it is sustained by audits, defined roles, and dashboards. By achieving 70% timely follow-up, we now complete ~1,300 new imaging exams annually, bringing in $400,000 in revenue. Activating an OPA enhanced an existing system with a low-cost, reliable, automated tool providing lasting benefits. It offers an efficient, replicable model for follow-up and care continuity

S3A-QI-2 DECREASING WAIT TIME BETWEEN ABNORMAL SCREENING MAMMOGRAM AND DIAGNOSTIC BREAST IMAGING APPOINTMENT

Sarah B. Thomas, DO (*Presenter*)
Bethany U. Casagranda, DO (*Abstract Co-Author*)
Adam Fang, MD, MBA (*Abstract Co-Author*)

INTRODUCTION

Prolonged wait times for diagnostic breast imaging following abnormal mammogram results are a recognized problem, leading to patient anxiety, delayed diagnoses, and missed opportunities for early intervention, negatively affecting patient well-being and the healthcare system's reputation. This study directly addresses this issue by aiming to decrease these wait times.

METHODS

The project was initiated in response to patient dissatisfaction and concerns raised in multidisciplinary conferences regarding excessive wait times between screening mammograms and diagnostic appointments. To begin this project, a workgroup of leaders throughout the organization and specifically within the Imaging Institute was established. Data collection spanned from July 2023 to October 2024, focusing on five key sites. The average wait time (AWT) was calculated, and several metrics were tracked to identify contributing factors. These included monthly diagnostic imaging volume (collected from EPIC), available diagnostic mammogram slots (tracked via Tableau Dashboard), radiologist doctor days (gathered from Qgenda), and overall capacity (calculated from the Tableau Dashboard). Imaging leadership collaboratively documented impactful events, and technologist/radiologist productivity and patient return rates were analyzed.

RESULTS

Compiled data revealed trends in AWT, imaging volumes, slots, and capacity, with significant events highlighted. Over 16 months, AWT decreased from 26 days to 9 days as volume continued to increase. Changes in scheduling templates and dedicated technologist workflows improved diagnostic imaging volumes as well as patient return rates from 79% to 94% without influencing Radiologist days on site. The project successfully reduced the AWT below both the internal target of 18 days and the national benchmark of 15 days. This led to a $2.78 million annualized revenue increase, driven by higher imaging volumes and downstream revenue from positive biopsies. Surveys indicated positive feedback from staff regarding improved patient access, workflows, and satisfaction.

DISCUSSION

This project successfully reduced diagnostic imaging wait times, improving patient and clinician experiences, increasing revenue and patient retention. These outcomes are deemed beneficial for all stakeholders. Plans are in place to address end-user feedback, implement adjustments, and expand successful strategies to additional sites.

S3A-QI-3 IMPROVING THE QUALITY OF FOLLOW-UP RECOMMENDATIONS FOR INCIDENTAL PULMONARY NODULES

Vivek Batra, MD (*Presenter*)
Miriam Du Plessis, MD (*Abstract Co-Author*)
Erin Panter, ARRT, BS (*Abstract Co-Author*)
Mary Jo Evans (*Abstract Co-Author*)
Elizabeth K. Proffitt, MD (*Abstract Co-Author*)
Ben C. Wandtke, MD, MS (*Abstract Co-Author*)

INTRODUCTION

Incidental pulmonary nodules are detected in approximately 10% of CT imaging reports. Early cancer detection improves significantly when such findings are accompanied by timely, actionable recommendations. However, adherence to follow-up guidelines is often inadequate due to inconsistent recommendations. This quality improvement initiative aimed to increase early cancer detection by ensuring that all incidental lung nodules received appropriate, actionable, and evidence-based follow-up recommendations.

METHODS

This study was conducted in collaboration with the American College of Radiology Learning Network® at a tertiary care center performing about one million imaging studies annually. The multidisciplinary team included attending and resident radiologists, advanced practice providers, imaging informatics specialists, navigators, and population health administrators.A baseline audit of 356 CT reports over 11 weeks from November 2023 to January 2024 was performed to evaluate the appropriateness and actionability of recommendations. Recommendation appropriateness was defined as using a specific follow-up timeline that aligned with Fleischner Guidelines. Inclusion criteria comprised patients over 35 years old with one or more pulmonary nodules =6 mm, indeterminate cancer risk, no history of malignancy with known or suspected lung metastasis and not undergoing treatment for active lung cancer. Twenty CT exams meeting inclusion criteria were manually audited weekly from November 2023 to December 2024. Reasons for inadequate recommendations were categorized and analyzed for key drivers to guide intervention implementation. Division and individual-level data were shared quarterly for feedback. Our SMART goal was to improve the appropriate IPN recommendation rate from 60% to 80% within 9 months.

RESULTS

At baseline, 60% of our radiologist recommendations adhered to Fleischner guidelines. The most common deficiencies were lack of any recommendation, no follow-up timing, and deviation from guideline criteria. Root cause analysis identified the absence of standardized macros, minimal guideline training, and inconsistent application expectations as major contributing factors.A custom macro was embedded in radiology reporting platform to standardize recommendation formatting. Subsequently, the rate of appropriate recommendations rose to 75% by April 2024.

DISCUSSION

This initiative demonstrates that standardizing radiology reports through embedded macros and consistent feedback can significantly improve the rate of actionable and appropriate follow-up recommendations for incidental pulmonary nodules. Sustained efforts, including ongoing feedback and maintenance of the standardized macro, are necessary to preserve gains. A limitation of the study was unequal division sampling due to the randomized audit process.

S3A-QI-4 NOT SO FAST - IMPLEMENTATION OF A PULMONARY EMBOLISM SCREENING AI ALGORITHM DOES NOT IMPROVE PROVIDER NOTIFICATION TIMES

Genevieve Munoz, MD (*Presenter*)
Abhinav Suri, BA, MPH (*Abstract Co-Author*)
Cole J. Miller, MD, BS (*Abstract Co-Author*)
Anokh Pahwa, MD (*Abstract Co-Author*)

INTRODUCTION

Pulmonary embolism (PE) is a critical finding that warrants rapid notification of primary teams. However, prioritization of scans likely to contain PEs typically requires a radiologist to triage scans. Artificial Intelligence (AI) algorithms offer the opportunity to automate detection of PE on CT scans to re-prioritize likely positive scans to the top of a worklist. We sought to determine whether the implementation of an AI-based PE screening algorithm at our institution (a large academic center with multiple patient centers) meaningfully reduced the time to first provider contact for PE-positive exams.

METHODS

To evaluate whether the AI algorithm significantly reduced provider contact times (PCTs) at our institution, we gathered all CT angiograms of the chest performed 3 months before and 3 months after the implementation of the AI-based screening algorithm. For each exam, the true presence or absence of a PE and the provider contact time were extracted from the report of the board certified radiologist. The AI's PE classification was gathered for scans done after its integration. The PCT was calculated as the difference between the provider contact time and the completion of exam. However, for exams that did not require contacting of a primary team, such as for chronic, questionable, or very small PEs, PCTs could not be calculated and these exams were excluded. We analyzed the PCT before vs after the AI implementation in all settings, inpatient/ED settings only, outpatient settings only, and for scans done during a night shift. To account for learning curves/technical issues near the launch period, we also repeated the analyses excluding a 1 month period after the AI launch. Results from these analyses would inform our institution's training for usage of this AI algorithm.

RESULTS

The AI algorithm was launched on July 8, 2024. During the evaluation period, there were a total of 6439 scans of which 206 were positive. There was no statistically significant change in overall scan volume this period. After deployment, the AI found 150/197 PEs (76% sensitivity) and correctly diagnosed all negative scans. Across all analyses, AI did not lead to any statistically significant decreases in PCT (overall reduction in time of 0.42 hours [95%CI: -0.51-1.35 hours]).

DISCUSSION

Our results show that a PE detection algorithm has not led to a quicker provider contact time across different patient care settings. While literature shows that read times may be reduced by AI, our work shows that these reductions may not translate into clinically meaningful notification times. However, our study has numerous limitations including a lack of qualitative feedback to assess if there are any systemic barriers that may minimize efficacy of this algorithm. Future studies will be geared towards this purpose and determining if additional training interventions can provide a benefit to PCTs.

S3A-QI-5 DECREASING UNNECESSARY RENAL US FOR AKI

Shannon Pye, BS, RDMS (*Presenter*)

INTRODUCTION

Literature estimates that approximately 25% of imaging performed is of low value. An area of frequent waste is performance of renal ultrasound (US) in all patients presenting with acute kidney injury (AKI). In patients with no risk factors for upper tract obstruction, prior data has shown the exam to be of low value and rarely positive for clinically significant obstruction. This quality improvement project aimed to decrease emergency (ED) and inpatient renal ultrasounds by 30% within one month of launching a novel renal US order panel within our electronic health record (EHR).

METHODS

Our quality team, along with abdominal radiologists, care signature team, and nephrology, created consensus on renal US indications for patients and corresponding appropriate orders. At baseline, there was no clinical guidance at order entry. In our initial PDSA cycle, we redesigned our ordering process and created an order panel with all renal US orders consolidated into a single interface which allows providers to select the clinical indication for the exam (Fig 1). The panel provides guidance on when to order the test and links the provider to the correct orders. When providers choose AKI as the indication, the panel displays guidance highlighting the low value of renal US for AKI and ties in specific logic alerting the provider if the patient has had imaging within the past seven days likely excluding hydronephrosis (hydro). Number of renal US performed per month was tracked. A chart review for hydro risk factors was done for renal US exams ordered to investigate AKI before and after intervention.

RESULTS

At baseline, 7% (16/235) of exams were positive for hydro. Of these 31% (n=5) had no risk factors for renal obstruction, with all cases caused by bladder retention (should be diagnosed by bedside US). A high proportion (80% (186/235)) of exams were done in patients who either had no risk factors for obstruction or had recent imaging already excluding hydro. Risk factors for hydro were present in 29% (67/235) of patients at baseline. After implementation, there was a 22% mean reduction in number of renal US exams ordered. (Fig 2). For renal US ordered to assess AKI, the percentage of patients with risk factors for obstruction improved to 45% (55% relative improvement from baseline of 29%). The project is estimated to result in 102 fewer renal US exams performed/month with estimated sonographer time savings of 612 hours annually.

DISCUSSION

Initial deployment of a novel renal US ordering panel resulted in approximately 22% fewer renal US orders/month with estimated time savings of 612 hours annually for US technologists. While the initial results have made a substantial difference, additional PDSA cycles are planned to refine the panel to further deter providers from obtaining routine renal US for AKI in patients without risk factors or who have had recent imaging excluding hydro.

S3A-QI-6 REDUCING IR BIOHAZARDOUS WASTE COSTS AND ENVIRONMENTAL IMPACT: A STAFF-CENTERED QUALITY IMPROVEMENT PROJECT

Isa Abdul Cader, MD (*Presenter*)
Anton A. Mlikotic, MD (*Abstract Co-Author*)

INTRODUCTION

Radiology departments are among top contributors to medical waste, and generate significant amounts of red bag waste (RBW). RBW items require additional processing which amplify the environmental and financial impacts. Unfortunately, staff frequently place non-biohazardous waste into RBW bins. The purpose of this study was to evaluate RBW sorting practices in interventional radiology (IR) and develop a staff-centered quality improvement intervention to improve RBW sorting that can be replicated in other systems.

METHODS

We used the Plan Do Study Act method, which was conducted in an academic, safety-net hospital with high-volume IR. Baseline measurements included: 1) A 1-day pre-intervention RBW audit measuring item weight and evaluating waste policies, 2) Staff surveys of RBW knowledge, and 3) Walkthroughs with key stakeholders (nurse manager, IR techs, environmental services [EVS], infection prevention and control). At baseline 88.1% by weight of the 11.7kg of RBW collected in our initial audit was improperly sorted. In our survey, 11/18 (61%) of staff responded that non-infectious bodily fluids are RBW, indicating a significant knowledge deficit. During our walkthroughs we found that waste bin sizes impeded proper sorting: Only 28 gallon RBW bins were in the IR suites without similar general waste bins. Our intervention included in-services to educate staff on RBW sorting and participation in environment of care rounds for feedback and education. We were able to change the IR waste bins to 28-gallon general bins and 8-gallon RBW bins. Our outcome measures were daily IR RBW weights for >2 weeks after each intervention. We also conducted a post-intervention RBW audit using the same methods as our pre-intervention.

RESULTS

Median RBW pre-intervention was 3.62lb/procedure. Following the in-services, median RBW decreased to 2.58lb/procedure, then 1.83lb/procedure ($p<0.05$ vs baseline) after waste bins were changed (Figure 1). EVS reported no overcorrection. In our post-intervention RBW audit, 18.75% by weight was inappropriately sorted. Excess carbon dioxide equivalents (CO2e) and costs from improper RBW sorting declined from the pre-intervention audit ? post-intervention audit: 7.51kg CO2e/day ? 0.13kg CO2e/day and $4.16/day ? $0.28/day.

DISCUSSION

Extrapolated over a year, our approach would reduce IR-derived CO2e by an amount equal to 4734 miles driven and save $977. Limitations of our study include the relatively short periods of monitoring and the need to develop training for new department staff. Future directions include ongoing follow-up to evaluate the temporal sustainability. Our findings demonstrate that even low-resourced safety-net hospitals with high patient volumes, stakeholder-centered RBW sustainability projects can save money, increase staff engagement, and reduce IR's environmental impact.

S3A-QI-7 SAFE-IV: SAFETY AGAINST LARGE VOLUME EXTRAVASATIONS IN CT IMAGING

Cathy Hannafin, MBA, BSN (*Presenter*)
Lisa Ponce, RT (*Abstract Co-Author*)
Tiffany Audsley (*Abstract Co-Author*)
Kathy Larson (*Abstract Co-Author*)
Eric Fiacconi (*Abstract Co-Author*)
Russ Dejong (*Abstract Co-Author*)
Bryan Poole (*Abstract Co-Author*)

INTRODUCTION

Large volume computed tomography (CT) intravenous (IV) contrast extravasation (CEV) is a significant patient safety risk in radiology. Large volume CT CEVs are those exceeding 50 milliliters of iodinated contrast leaking out of the vein into surrounding tissues. CEVs can result in pain, additional IVs, or repeat scans, ultimately leading to harm, delays, and reduced satisfaction. The aim of this project was to decrease the rate of large volume CT CEVs by 42% from a rate of 1.13 per 1000 contrast CT exams to 0.65 by 08/31/2023.

METHODS

An interdisciplinary team, including emergency department (ED) and radiology registered nurses (RNs), vascular access RNs (VANS), and CT technologists, used the Six Sigma DMAIC (define, measure, improve, analyze and control) quality improvement method. The team conducted a Gemba Walk, observing CT contrast workflows. A database of CEVs was created to track variables such as IV location and type. The baseline improvement measure was 1.13 large volume CT CEVs per 1000 contrast CT exams. CT CEVs were reported through the radiology safety incident reporting system. The sample size was 42,323 contrast CT exams between December 1, 2021 to December 31, 2022. After brainstorming potential causes, the team identified key causes being variation in US-guided IV placement process, lack of standardized IV supplies, and incomplete documentation. Interventions were tested and implemented. The VANS team held educational sessions for radiology and ED RNs on evidence-based US-guided IV practices, including using catheters at least 1 3/4 inches long when appropriate, avoiding veins greater than one centimeter deep, visualizing catheter placement, and documenting. The PDSA (Plan-Do-Study-Act) method was used to pilot the interventions. Subsequent PDSA cycles ensured optimal IV supplies and standardized US-guided IV placement training. The effectiveness of the interventions was monitored using run charts. To ensure sustained success, monthly run charts are updated and shared with key interdisciplinary project team members. VANS leadership further integrated these evidence-based practices into annual education.

RESULTS

There was a decrease in the rate of large volume US-guided CT CEVs from 0.57 to 0.18 per 1000 contrast CT exams, helping achieve the aim of reducing all large volume CEVs by 42%. The total post-intervention improvement sample size was 22966 contrast CT exams, between March 1, 2023 and August 31, 2023.

DISCUSSION

There has been a sustained reduction in large volume CT CEVs. Important lessons learned were that observing the process in real-time helped team members gain mutual understanding of each other's work and fostered psychological safety, having subject matter experts aided in identifying best practices, and organizing data was valuable for identifying trends.

S3A-QI-8 OPTIMIZING RADIATION DOSE: UW-MADISON'S EXPERIENCE WITH THE ACR LEARNING NETWORK IMPOWER PROGRAM

Carrie Bartels, RT (*Presenter*)
Ran Zhang, PhD (*Abstract Co-Author*)
Rachel Bladorn, BS, RT (*Abstract Co-Author*)
Kelsey Schluter, BS (*Abstract Co-Author*)
Martin Wagner, PhD (*Abstract Co-Author*)
Giuseppe V. Toia, MD, MS (*Abstract Co-Author*)
Timothy P. Szczykutowicz, PhD (*Abstract Co-Author*)

INTRODUCTION

Automatic exposure control (AEC) is a critical component in optimizing CT radiation dose. By adjusting exposure parameters based on patient size and clinical indication, AEC systems enable the ALARA principle, ensuring diagnostic image quality while minimizing patient radiation exposure. For over a decade, our institution has tracked radiation dose relative to patient size on a single-vendor CT fleet. Recognizing the need to extend these advancements to a newly acquired vendor CT scanner, our team embarked on a comprehensive harmonization project.

METHODS

We tracked radiation dose relative to patient size using metrics like CTDIvol and water equivalent diameter (WED). We focused on a GE scanner (our historical benchmark scanner) and a new Canon Medical Systems scanner for our routine abdomen/pelvis protocol. On the Canon scanner, we observed elevated radiation dose, prompting the need for change. Supported by the American College of Radiology (ACR) Dose Optimization project (i.e., ImPower Program), we embarked on a quality project to identify and address the root causes of these discrepancies. Employing a structured, lean-based problem-solving approach (A3 thinking), we conducted Gemba walks to observe CT technologists, developed fishbone diagrams for root cause analysis, and identified key drivers influencing dose variability. We had 2 radiologists perform a reader study on 30 different patients (15 GE, 15 Canon) using Likert scoring for diagnostic utility before and after dose interventions.

RESULTS

We quantified patient dose versus size 4 times during the study, pre intervention, after the first intervention, after the second intervention, and continuing monitoring. The first intervention changed the level of deep learning-based image denoising, which decreased patient dose, the second intervention increased the AEC setting of noise which also decreased patient dose. Patient dose curves were found to decrease after the first and second interventions, no change was observed between the second intervention and continuing monitoring period.

DISCUSSION

Our study underscores the critical importance of quantifying patient radiation dose relative to size when harmonizing Automatic Exposure Control (AEC) settings across different platforms. Without plotting patient dose against size, accurately identifying and rectifying dose discrepancies between scanners would have been challenging. Even after conducting an initial physics characterization of the Canon scanner, further refinements were essential to align its performance with our existing fleet. The quality processes our team learned as part of the ACR ImPower program guided our efforts through a complex iterative process. This approach aligns with best practices in medical imaging, ensuring patient safety and diagnostic efficacy.

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Quality Improvement Reports Sunday Afternoon Poster Discussions II

Sunday, Nov. 30 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

S3B-QI-1 THE ROLE OF PORTABLE MRI IN REDUCING TRANSPORTATION-RELATED CARBON EMISSIONS IN REMOTE COMMUNITIES IN CANADA

Nawab Azizi, BSc, MSc (*Presenter*)
Zier Zhou (*Abstract Co-Author*)
Alexander Ibrahim (*Abstract Co-Author*)
Omar S. Islam, MD, FRCPC (*Abstract Co-Author*)

INTRODUCTION

Climate change is among the most pressing global challenges of this century, significantly affecting the health of millions of Canadians and exacerbating existing health inequities. Current strategies aimed at reducing carbon emissions from diagnostic imaging services include powering down idle CT units, preventing unnecessary repeat imaging through integration of EMRs, and utilizing telemedicine for remote consultations. However, limited research exists on the role of portable diagnostic imaging technologies, such as ultra-low-field portable MRI (pMRI), and their potential impact on transportation-related carbon emissions in remote areas. The purpose of this study was to estimate the potential reduction in transportation-associated carbon emissions achievable through the implementation of pMRI in remote communities of Northern Ontario, Canada.

METHODS

This study will employ a mixed-methods approach to evaluate the reduction in CO2 emissions resulting from the implementation of portable MRI (pMRI) at Weeneebayko General Hospital (WGH) in Moose Factory, Ontario, compared to scenarios without pMRI. Based on a previous study by Desrosche et al., which indicated that if a pMRI is available locally, only 44% of patients annually would require transportation for fixed MRI scans, this analysis will specifically calculate estimated CO2 emission reductions associated with air transportation for the remaining 56% of patients who would no longer need to travel due to pMRI availability. Data on transportation energy use and corresponding CO2 emission coefficients for different travel modes will be obtained primarily from the Natural Resources Canada website. Additionally, assumptions about the typical transportation methods and the frequency of chartered or emergency flights will be incorporated into the analysis.

RESULTS

Following a literature review and analysis of data from the Weeneebayko Area Health Authority (WAHA), implementation of pMRI is projected to substantially reduce carbon emissions for surrounding communities compared to scenarios without pMRI intervention. Based on scanning 100 patients per year, specifically, by eliminating the need for air transportation for 56% of patients, the annual reduction in CO2 emissions from commercial flights would approximately reduce annual carbon emissions by 7.23 kilotonnes (kt). Savings from charter flights would amount to 4.04 kt annually, while emergent flights would yield a reduction of 3.04 kt per year. In total, implementing pMRI is projected to reduce CO2 emissions by 14.34 kt annually, which is equivalent to the emissions produced by approximately 1,868 single-family homes in one year.

DISCUSSION

Implementing portable MRI in remote communities significantly reduces air-transport related CO2 emissions and substantially improves healthcare accessibility.

S3B-QI-2 STREAMLINING OUTPATIENT PEDIATRIC MR ENTEROGRAPHY (MRE) -IDENTIFYING AND ADDRESSING THE SCHEDULING DELAYS IN PEDIATRIC OUT-PATIENT MRE

Chelsea Stoner (*Presenter*)
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Chaula Kamani, ARRT,RT (*Abstract Co-Author*)
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INTRODUCTION

Over the past five years, our institution has experienced a 53% increase in demand for pediatric outpatient MRE studies without an equivalent rise in resources. This has led to out-patient MRE scheduling delays averaging up to 3 weeks causing delay in diagnosis and treatment of inflammatory bowel disease, increased emergency department (ED) visits and stat MRE requests through ED, and higher inpatient admissions. The purpose of this project is to reduce the average outpatient MRE wait time from 21 days to 7 days over 3 months.

METHODS

Current situation: • MRE are ordered with fistulograms increasing table time to 2 hours complicating the scheduling process due to limited availability of 2-hour slots on the MRI appointment grid. • MRE protocol calls for all MRE to be performed on 3 T magnet. Only one of the 4 magnets is 3 T causing delays. • No CPT code for fistulogram, cannot be billed. Intervention: 1. Uncouple MRE from fistulograms to decrease study time to 1 hour, thereby increasing available scheduling slots. 2. Perform MRE on both 1.5 and 3 T magnets increasing scheduling flexibility and number of slots available. Quality Improvement team : Comprising GI providers, Pediatric Radiologist, MRI administration, MRI lead technologist, MRI scheduling. Metric: Overall MRE volume over 5 years, and following intervention, post intervention outpatient MRE wait times, table times, ED -ordered MRE, ED wait times related to stat MRE, MRE revenue impact, impact on total number of annual MRI examinations performed. MRE wait times were collected manually, remaining data was obtained through the hospital information system. The data are analyzed using basic statistical methods and represented with bar charts. Sustainability Plan : Perform systematic review of the quality of examinations over 6 months, review patient and GI service input and make appropriate revisions such as continued scheduling of MRE with fistulograms for all sedated patients. Make changes to the MRI scheduling grid to make the changes more permanent.

RESULTS

• MRE wait times reduced from an average of 21 days (January to April 2024) to 5 days by the end of July 2024. Wait times have slightly increased recently to 11 days but remain significantly below baseline. • MRE table time decreased from 2 hours to 1 hour. • Decrease in MRE through ED from an average of 2.5 studies/month in 2023 to 1 study/month, decreasing ED room utilization time for MREs from 15-20 hours/month to 6-8 hours/month

DISCUSSION

Utilizing the Go See Plan approach and humble inquiry, our data-driven process effectively identified bottlenecks in MRE scheduling. Collaboration among MRI staff, pediatric radiologists and GI professionals facilitated the successful implementation of interventions. Their enthusiasm and partnership were crucial in achieving significant reductions in scheduling delays and enhancing overall efficiency.

S3B-QI-3 TRANSITIONING FROM PEER REVIEW TO PEER LEARNING IN A LARGE ACADEMIC RADIOLOGY PRACTICE

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INTRODUCTION

At our institution, the existing score-based peer review process for radiologists had low engagement, limited review of exams, and prioritized scoring over improving patient care. Our process was perceived as biased due to unblinded report reviews and had minimal impact on practice improvement. In response, we initiated a department-wide transition from peer review (PR) to peer learning (PL) across all clinical divisions. Our goal was to transition to PL in 1 year to foster a culture of learning and increase radiologist engagement and participation in meaningful practice improvement activities.

METHODS

Using the Plan, Do, Study, Act (PDSA) framework, we aimed to transition from PR to PL for all clinical divisions in the Department of Radiology. A PL taskforce with representatives from each clinical division was established. Current PR and/or PL activities were mapped, and a PL policy was created. The taskforce helped design technical solutions to support the transition. We developed a single app-based solution to serve 3 separate health systems, streamlining case submissions and review processes. Additionally, required metrics for ongoing professional practice evaluations were established and approved by departmental leadership and our hospital's credentialing committee. PL metrics that replaced PR included case submission rates, conference attendance, and PL case tracking.? Following approval, PL leaders in each division were identified and nominated by Division Chiefs to champion PL and facilitate implementation. To engage faculty, PL presentations with Q&A sessions were conducted at both division and department-wide meetings. PL was officially implemented on 09/01/2024. Both qualitative and quantitative methods were employed to analyze PL data, gathering qualitative insights through stakeholder feedback and monitoring quantitative metrics via dashboards.

RESULTS

Pre-intervention, 4 out of 10 clinical divisions offered PL conferences. Post-intervention, all 10 divisions established PL conferences. In the first 6 months, 153 radiologists participated in PL activities, with 150 (98%) meeting case submission requirements (946 total exams submitted) and 138 (90%) attending at least one PL conference. Faculty engaged in a total of 383 hours of PL activities.

DISCUSSION

Our department successfully transitioned from PR to PL across all clinical divisions within 1 year, achieving robust participation and implementing effective technical solutions. To ensure sustainability, dedicated PL leaders and PL committee members oversee the program, continuously monitoring participation metrics and soliciting faculty feedback. Periodic reviews of the PL policy and app functionality help adapt to evolving needs. Future efforts will focus on identifying key learning opportunities for quality improvement projects to enhance departmental performance.?

S3B-QI-4 SUPPORTING INNOVATION IN CARE DELIVERY: REDUCING TURNAROUND TIMES FOR SAME DAY IMAGING EXAMS REQUESTED BY THE ONCOLOGY RAPID ASSESSMENT CENTER

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Shantika Devi, BSc (*Abstract Co-Author*)
ANTHONY HERNANDEZ (*Abstract Co-Author*)
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INTRODUCTION

In February 2024, the Oncology Rapid Assessment Center (ORAC) opened on weekdays between 10 am and 7 pm to address rising Emergency Department visits and readmissions among cancer patients. The Radiology Department engaged to support this initiative by expediting performance and interpretation of urgent outpatient imaging referred by ORAC. The project objective was to develop an explicit workflow for interpreting CT studies.

METHODS

Lack of a shared imaging performance and interpretation workflow following the clinic's opening led to confusion, care delays, and unnecessary ED visits. A current state analysis showed that 66.2% of exams were interpreted within 120 minutes of exam completion. There was an average of 188 weekly ED visits by cancer patients.The project was performed at a single academic hospital system in the western United States. The team included the ORAC manager, a radiology resident lead, a project manager, the CT manager and lead CT technologist, and the image library manager, who facilitates communication for the radiology reading rooms. The radiology director of performance improvement and ORAC medical director served as project sponsors. After a Gemba walk and current state analysis, a SMART goal was set to interpret 85% of CT exams within 120 minutes of exam end time (CT scan completed to preliminary interpretation) within an 8-month study period. A root cause analysis found that exams did not flow to the appropriate worklist, radiologists were unaware of exam priority, expectations around interpretation times were

nonexistent, and patient volume was tracked manually. Interventions focused on setting expectations between ORAC and radiology, standardizing requests for imaging, and developing a process for communicating exam completion. Mean and median turnaround times were calculated, and weekly ED visits were tracked. T-test was used to detect differences in means before and after intervention. The sustain plan resulted in creation of a dashboard to deliver monthly reports to radiology and ORAC leadership. Message templates were added to the reading room assistant operating procedures.

RESULTS

Average monthly exam volume increased from 13 to 24 during the study period and weekly ED visits by cancer patients decreased 12.6% from 188 to 164. The percentage of CT scans interpreted within 120 minutes increased from 66% to 88%. Mean and median interpretation times decreased from 239 to 65 minutes and from 75 to 47 minutes, respectively ($p < 0.01$).

DISCUSSION

Radiologists can support innovation in care delivery by achieving feasible turnaround times for exams in these settings. Workflow standardization contributed to meeting the goal of interpreting over 85% of CTs in under 120 minutes, which has persisted as imaging volumes have increased. Future work will focus on expanding ORAC access and reducing turnaround times for other modalities.

S3B-QI-5 HANDS-ON FLUOROSCOPY TRAINING USING A NOVEL PHANTOM ESOPHAGUS IMPROVES RESIDENT KNOWLEDGE AND CONFIDENCE

Joshua Williford, MD (*Presenter*)
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INTRODUCTION

Fluoroscopy is a challenging component of radiology training that requires an understanding of equipment operation, exam technique, radiation parameters, and contrast administration. These challenges are compounded by the need for real time image interpretation and patient interaction. For first year radiology residents, these factors can prove overwhelming and potentially lead to increased fluoro times and higher patient dose. The purpose of this project was to create a model for fluoroscopy training with the goal of increasing resident knowledge and confidence in the performance of fluoroscopic procedures.

METHODS

This project was conducted in the fluoroscopy suite of a large, urban, tertiary care academic medical center over a 7 month period. Individual hands-on training sessions led by a senior resident were offered to all first year residents (n=7) prior to the start of their first fluoroscopy rotation. A low cost, easily reproducible, novel phantom esophagus was designed by a senior resident and used for training. Training consisted of a hands-on review of fluoroscopy equipment requiring identification and operation of 32 system components and functions. A review of common fluoroscopic contrast agents. An instructor led review of a basic esophagram examination. And lastly, an OSCE style examination using the phantom esophagus and requiring patient interaction, system operation, and timed image acquisition during a simulated esophagram. The impact of fluoroscopy training on resident knowledge was assessed using a 23 question pretest and posttest. Four competency categories were assessed including system operation, dose reduction strategies, contrast safety, and exam technique. Resident confidence was assessed using a 5 point Likert scale in the same competency categories as above. Statistical analysis was completed with JASP. Paired-samples t-tests were used to compare pretest and posttest scores and Likert confidence ratings. Significance was determined by p value < .05.

RESULTS

Results demonstrate a statistically significant increase in resident fluoroscopy knowledge after training (Pretest mean 49, posttest mean 93, $p < .001$) with statistically significant score increases across all competency categories ($p < .001$ - $p .02$). There was also a statistically significant increase in resident fluoroscopy confidence (pretest mean 1.9, posttest mean 4.6, $p < .001$) with statistically significant increases in confidence ratings across all categories ($p <.001$ - $p .006$).

DISCUSSION

This project presents a model for hands on fluoroscopy training using a novel phantom esophagus which improves resident knowledge and confidence in the performance of fluoroscopic procedures. Limitations of the current study include small sample size. Future directions could include analysis of the effect of fluoroscopy training on fluoroscopy times and patient dose.

S3B-QI-6 ENHANCING RADIOLOGY-PATHOLOGY COLLABORATION TO REDUCE QUANTITY NOT SUFFICIENT (QNS) RATES AND IMPROVE PATIENT CARE

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INTRODUCTION

Collaboration between radiology and pathology departments is crucial for optimizing biopsy specimen adequacy, facilitating accurate molecular testing, and improving patient outcomes. One meaningful measure of collaboration is the quantity not sufficient (QNS) rate, defined as the percentage of cases in which insufficient tissue prevents completion of molecular panels. At our institution, the biopsy QNS rate was 15%, considerably higher than the national benchmark of 6%. The elevated QNS rate contributed to delays in diagnosis, increased patient procedure burden, and higher healthcare costs. Thus, we initiated a multidisciplinary quality improvement project designed to improve interdepartmental communication and optimize tissue acquisition.

METHODS

A standardized biopsy protocol was developed, including a single order set to ensure consistency in tissue requisitions. Rapid on-site evaluation (ROSE) was adopted to ensure real-time assessment of specimen adequacy after acquisition. Tissue biopsy yield was improved by standardizing needle gauge selection and optimizing the number of biopsy passes. Hybrid assay methodologies were deployed to maximize diagnostic yield from limited samples and reduce specimen exhaustion. Training sessions reinforced best practices in specimen handling and enhanced communication between radiologists, pathologists, pulmonologists, medical oncologists, and laboratory staff.

RESULTS

A retrospective analysis comparing pre- and post-intervention outcomes demonstrated a substantial reduction in QNS rates. Following the implementation of these strategies, the QNS rate decreased from 15% to 5.94%, bringing our institution below the national benchmark. These improvements reduced the need for repeat procedures, minimized patient discomfort and procedural risk, and improved overall diagnostic yield. Enhanced tissue handling protocols increased the reliability of molecular testing and contributed to healthcare cost savings by decreasing redundant testing and interventions.

DISCUSSION

This initiative demonstrates that a structured, multidisciplinary approach to biopsy specimen management can produce sustainable improvements in specimen adequacy and diagnostic workflows. Standardizing biopsy techniques, streamlining laboratory processes, and strengthening interdepartmental communication resulted in meaningful reductions in QNS rates and improvements in patient care. The strategies developed through this quality improvement project offer a scalable framework for institutions seeking to enhance biopsy protocols, optimize diagnostic outcomes, and improve collaboration between radiology and pathology teams.

S3B-QI-7 FROM PROBE TO REPORT: SYSTEMWIDE ENHANCEMENT OF ULTRASOUND WORKFLOW WITH AUTOMATED DATA FIELDS

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INTRODUCTION

Transcribing ultrasound data into radiology reports has traditionally required manual re-entry, which is time consuming and disrupts workflow. Existing automated solutions are often limited to single-vendor systems, and multi-vendor, multi-site implementation is challenging without third-party tools. The aim of this project is to develop, implement, and evaluate an in-house multi-vendor data mapping pipeline that auto-populates ultrasound measurements into radiology reports, with the goal of improving efficiency and report turnaround time across a multi-hospital health system.

METHODS

Our radiology department encompasses 6 hospitals and 12 outpatient sites with approximately 40 ultrasound machines. Radiology reports are generated using voice dictation software Nuance Powerscribe. Institution-wide standardized dictation templates were updated with custom fields for ultrasound measurements. Utilizing a developed custom on premise solution, measurements were auto-transmitted from ultrasound machines to Powerscribe. Custom fields were piloted on a single ultrasound machine from each vendor before scaling up. Rollout of data mapping was performed one site at a time. Lead ultrasound technicians and radiologists conducted training sessions to instruct technicians on the updated measurement input process. Preliminary results were obtained during the implementation period 4/28-5/6/25 and compared with pre-intervention period 1/1-2/28/25. Primary outcome measured was median report turnaround time (RTAT). Qualitative measures included survey responses focusing on perceived changes in workflow efficiency, ease of use, and user satisfaction.

RESULTS

Ten ultrasound templates were included, 7 contained custom fields and 3 contained no custom fields. The number of custom fields ranged from 0 to 10. There was a significant reduction in median RTAT for two ultrasound studies. Median RTAT for renal bladder studies decreased from 15.2 min to 8.2 min ($p = 0.004$) and median RTAT for abdominal studies decreased from 13.7 min to 6.1 min ($p < 0.0$). The three templates with zero custom fields did not demonstrate significant reduction in turnaround time. Qualitative survey results revealed positive feedback including reduced dictation time and allowing radiologists to focus on image interpretation rather than transcribing numbers.

DISCUSSION

Automated measurement data integration into ultrasound reports significantly reduced reporting time for some studies and improved workflow efficiency. Implementation required careful planning, customization for different ultrasound systems, and technologist retraining, which may limit broader adoption. Overall, development of a multi-vendor automated data pipeline for a large hospital system enables faster report delivery and boosts efficiency, benefiting patient care and provider communication.

S3B-QI-8 OPTIMIZING OUTCOMES: NURSE NAVIGATION STRATEGIES IN A DECENTRALIZED LUNG CANCER SCREENING PROGRAM

Melissa Loop, BS, RN (*Presenter*)
Leslie Whalen (*Abstract Co-Author*)

INTRODUCTION

Low-dose CT combined with lung cancer screening (LCS) lowers the mortality rate from lung cancer by facilitating early detection and treatment. Its full potential is limited due to insufficient screening rates and difficulties with eligibility determination. With an emphasis on methods to enhance precise eligibility determination and broaden access, this study details a multifaceted, Nurse Navigator-led effort to maximize LCS participation. We are a large integrated network. This network spans 21 hospitals, 50 health centers, and 200 physician offices. There are 26 accredited CT scanners that can screen for lung cancer. We have three full-time Lung Screening Navigators and two nodule clinics. Because our lung screening program is decentralized, primary care physicians are free to oversee their patients' follow-ups or refer them to specialists as needed. In 2023, we performed 7,826 screenings. While the national screening rate is 16%, we achieved a screening rate of 17.2% in 2023 by including all reported eligible lung screening patients within our hospital system.

METHODS

A quality improvement project was launched, beginning with the ACR Learning Network Initiative. After identifying screening hurdles using waste assessment, Fishbone diagram analysis, and a PICK chart, we wanted to increase our screening rate to 25% by December 2024. Key interventions included: community outreach events targeting potential patients, provider education via office visits, emphasizing screening guidelines and accurate tobacco history documentation, proactive patient outreach by Nurse Navigators to address pending orders and eligibility clarification, development of a Lung Screening Dashboard within our EMR, and strategies to reduce errors in order placement and ensure appropriate exam selection to minimize patient financial burden.

RESULTS

After implementation, the system-wide LCS rate rose from 17.2% in 2023 to 24% in 2024. The overall number of screenings grew by 32.57%, from 7,826 to 10,375. The percentage of lung screening patients diagnosed with early-stage lung cancer increased from 54.4% to 58.5%. Nurse Navigators' proactive patient and physician outreach resulted in higher screening and early cancer detection. Barriers included a lack of a thorough smoking history in charts and the scheduling staff not reaching out to patients to schedule appointments.

DISCUSSION

A Nurse Navigator-led, multi-faceted approach can greatly enhance LCS rates and early-stage diagnosis in a large healthcare system. Actively addressing barriers to eligibility determination, through improved tobacco history recording and patient communication, is critical for increasing the impact of LCS programs. Future work will concentrate on mandated tobacco history screening and standardized documentation to improve eligibility evaluation and increase access to LCS.

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T2-QI

Quality Improvement Reports Tuesday Morning Poster Discussions

Tuesday, Dec. 2 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

T2-QI-1 PROTOCOLIZING PERCUTANEOUS CATHETER DRAINAGE: A TIERED DECISION-MAKING MODEL TO IMPROVE SAFETY AND SUCCESS RATES

Aishwarya N. Gadwal, MD, MBBS (*Presenter*)
Santosh P. Rai, MD, FRCR (*Abstract Co-Author*)
Akshay Reshmi (*Abstract Co-Author*)

INTRODUCTION

Image-guided percutaneous catheter drainage (PCD) is a minimally invasive alternative to open surgical drainage (OSD) for fluid collections. However, variability in timing and technique leads to inconsistent outcomes and complications. The SMART aim of our quality improvement (QI) initiative was to reduce major post-procedural complications from a baseline of 10% to under 5%, and catheter failure rates from 8% to below 3% over a 12-month period by implementing a standardised, tiered intervention protocol.

METHODS

This prospective initiative, conducted on 83 patients with thoracic, abdominal, or pelvic fluid collections, was structured using a Plan-Do-Study-Act (PDSA) model. A new decision-making protocol was implemented, categorizing patients into: Group A : Intermittent needle aspiration (INA) with PCD in the same session Group B : INA followed by PCD after 48 hours Group C : INA + PCD followed by OSD due to drainage failure The protocol also standardized: Catheter sizing based on location and fluid consistency (e.g., 10F thoracic, 12F abdominal) Imaging modality selection (CT vs. US) based on collection depth Timing of intervention guided by follow-up imaging Aseptic technique adherenceOutcomes were defined prospectively and included complication rates, catheter failure, and success (defined as >75% fluid reduction and no escalation to surgery).

RESULTS

Across all groups, the structured protocol led to: Low major complication rates (3.6%) Catheter failure rate of 2.4% High procedural success in Groups A and B (93.7% and 97.9%, respectively) Post-procedural pain was the most common minor complication (72.2%), managed conservatively. Rare complications included catheter blockage and pneumothorax. The protocol ensured consistent catheter selection, reduced the need for re-intervention, and minimized procedural duration and hospital stay.

DISCUSSION

Implementing a structured, tiered intervention protocol led to measurable improvements in safety and efficacy of PCD for diverse fluid collections. Using a SMART aim and PDSA cycle , we standardized clinical decision-making and procedural technique, reducing variability and improving outcomes. This protocol has been integrated into departmental SOPs and is currently being evaluated for scale-up across other services, including trauma and surgical ICUs. This initiative demonstrates that even common IR procedures benefit from systematic QI methodology.

T2-QI-2 MINIMIZING SEDATION IN PEDIATRIC MRI: THE ROLE OF MRI COMPATIBLE AUDIOVISUAL ENTERTAINMENT SYSTEM

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Juliana Goncalves Silveira (*Abstract Co-Author*)
Alice Schuch, MD (*Abstract Co-Author*)
Mariane Cibelle Barros (*Abstract Co-Author*)
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Henrique M. Guerra, MD (*Abstract Co-Author*)

INTRODUCTION

Magnetic resonance imaging (MRI) provides high-resolution, radiation-free imaging for pediatric cases, but young children often require general anesthesia (GA) to remain still, raising costs, risks, and hospital stays. Audiovisual distraction tools can improve pediatric cooperation during MRI, avoiding sedation while maintaining image quality. The purpose was to reduce GA for pediatric MRI investigations by implementing audiovisual distraction technologies and a child-friendly environment.

METHODS

A retrospective cohort of 101 pediatric patients in need of a sedation technique to undergo an MRI (ages 5-15). Study period from October 2024 and March 2025, in a tertiary center with adult and pediatric mix practice. Interventions: 1. creation of a children friendly environment (Fig 2). 2. Use of AVE for eligible patients; 3. Satisfaction survey. Groups were compared for workflow, image quality, and caregiver experience. Outcomes: reduction in the use of GA for MRI, prep time, exam duration, overall cost of procedure and examination, image quality, and caregiver satisfaction. Outcomes were compared using descriptive statistics. The cost analysis centered on material expenses, and feedback from surveys was reviewed, encompassing both qualitative and quantitative data.

RESULTS

Among 101 patients, 54 had MRI with GA and 47 with AVE. All exams were diagnostic (100%). Movement artifact rates were 1.9% for GA and 8.5% for AVE (Fig 3), with no need for recall studies. Workflow metrics (Fig 4) showed shorter times for AVE compared to GA: preparation time was 43 min vs. 74 min, acquisition time 17 min vs. 23 min, scanner time 20 min vs. 35 min, and total exam time 40 min vs. 52 min. Post-anesthesia recovery averaged 38.42 min for GA. MRI exams with GA were about 56% more expensive in material costs than those with AVE. Satisfaction surveys (n=37, 36.6% response rate) revealed that 97.3% of caregivers reported reduced anxiety with AVE, 97.3% would use it again, and 81.1% felt no discomfort. Experience ratings were excellent (54.1%), great (27.0%), or good (16.2%), with no negative feedback (Fig 5 and 6).

DISCUSSION

MRI-compatible audiovisual entertainment and environmental strategies are a feasible alternative to GA for pediatric MRI, improving patient and caregiver experience, reducing booking wait times, total exam time, and lowering costs. This technique is not exclusive to a tertiary center and can facilitate the workflow of any pediatric

patient in the community hospitals and outpatient clinics.

T2-QI-3 PATIENT AND RADIOLOGIST EXPERIENCES AND BREAST CANCER DETECTION WITH CONTRAST ENHANCED MAMMOGRAPHY (CEM) DURING CEM AND CEM-GUIDED BREAST BIOPSY IMPLEMENTATION

Brooke Sawyer, MBBS, FRANZCR (*Presenter*)

INTRODUCTION

Patients with past history of breast cancer are at increased risk of breast cancer, where the value of CEM for surveillance mammography has been demonstrated. This is our CEM implementation experience, assessing patient and radiologist experiences with CEM and CEM breast cancer detection whilst maintaining patient safety. Planning, observing and adjusting breast imaging workflows ensured optimal utilisation of breast imaging resources.

METHODS

Accepted indications for CEM were defined. Referrer and staff CEM education occurred. CEM commenced at a single site and breast imaging workflow was regularly reviewed. Patient experience with CEM and radiologist feedback reporting CEM was invited. Breast cancer detection was observed to ensure CEM diagnostic performance. Mammography and whole breast US were previously performed in this patient cohort. A new mammography unit with CEM and CEM-guided breast biopsy was installed at one site December 2023. CEM implementation occurred July 2024, when a change in practice of digital mammography (DM) / digital breast tomosynthesis (DBT) +/- breast US for non-CEM patients occurred. A quality assurance (QA) project for this change in practice commenced August 2024, a team of radiologists, mammographers, sonographers, imaging nurses, MRI medical imaging technologist and a breast surgeon. All CEMs were double reported. CEM breast report data of breast density, background parenchymal enhancement (BPE), mammography findings, US or MRI requirement, BI-RADS assessment category and biopsy modality were recorded by the second reporting radiologist. Breast biopsy results were recorded. Patient safety was monitored. Breast US numbers reviewed. Patient and radiologist experience survey results graphed. CEM diagnostic performance compared CEM and non-CEM groups. Data collection will cease after 1000 CEM cases is reached at initial site. Single and double reporting of CEMs has commenced with CEM implementation at a second site May 2025.

RESULTS

From 5 th August 2024 to 13 th April 2025, 968 patients aged 35 years or older presented for surveillance mammography post breast cancer treatment. 787 patients had CEM/DBT (group 1), and 181 patients had DM/DBT +/- breast US (group 2), an 81% CEM uptake rate of CEM. 15 of 37 (40%) of breast biopsies from group 1, and one of seven (14%) of breast biopsies from group 2, were malignant. Breast US reduced by 51%. Patient and radiologist experiences with CEM were favourable.

DISCUSSION

CEM implementation is a significant change to breast imaging practice which requires careful planning and monitoring by a dedicated team. Managing patient safety and expectations are key. CEM/DBT has higher breast cancer detection compared with DM/DBT +/- breast US. Single site experience optimised second site CEM implementation.

T2-QI-4 DATASETS MADE EASY: TURNING DICOM COMPLEXITY INTO CONVERSATIONAL SIMPLICITY

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Felipe A. Matsuoka (*Abstract Co-Author*)
Felipe C. Kitamura, MD, PhD (*Abstract Co-Author*)
Paulo E. Kuriki, MD (*Abstract Co-Author*)

INTRODUCTION

Radiologists and researchers often face substantial challenges when accessing, filtering, and anonymizing DICOM data for clinical or research use. These tasks require expertise in DICOM protocols and anonymization procedures, creating workflow inefficiencies and limiting data accessibility. Large Language Models (LLMs) have recently demonstrated promise in simplifying complex technical workflows through intuitive natural language interfaces. There's already a public DICOM-MCP project that offers a foundation for DICOM operations via a Model Context Protocol (MCP) server, however, it lacks built-in anonymization tools and natural language interaction, limiting clinical usability. We aimed to develop a framework that integrates LLMs and MCP to enable natural language-driven interaction with PACS systems while ensuring secure, HIPAA-compliant anonymization for research workflows.

METHODS

We designed a dual-MCP architecture incorporating both DICOM operations and standardized anonymization. Our prototype can integrate with Claude IDE and/or local LLMs such as Mistral 3.1 via Ollama, using natural language queries transformed into DICOM tasks using MCP, and a second MCP component was implemented to interface with the RSNA Anonymizer, allowing secure de-identification via conversational prompts. Supported DICOM operations include C-MOVE, C-GET, and C-FIND, with metadata filtering and batch anonymization. The framework will be open-sourced upon acceptance, accompanied by detailed documentation and setup guides to facilitate adoption and ensure reproducibility.

RESULTS

The proposed system enables radiologists to use plain language commands to retrieve and anonymize imaging studies. It supports local LLM execution to address institutional data security requirements. The RSNA Anonymizer ensures compliance with HIPAA standards while preserving data fidelity. Upon acceptance, a public GitHub repository will include a full implementation guide, demonstration videos, and sample configurations to facilitate cross-institutional deployment.

DISCUSSION

This framework streamlines imaging workflows by abstracting technical barriers behind a natural language interface. Limitations include reliance on PACS compatibility and potential LLM response latency. Future work will focus on vendor-agnostic integration, improved DICOM metadata inspection via LLMs, and performance tuning for real-world use. By bridging LLMs with PACS and anonymization tools, our approach represents a promising step toward democratizing access to imaging data for research and quality improvement initiatives.

T2-QI-5 BENEFIT OF INDEPENDENT DOUBLE READING OF BRAIN MRI IN PATIENTS WITH SEIZURES

Sergio Valencia, MD (*Presenter*)
Laura Andrea Campana Perilla, MD (*Abstract Co-Author*)
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INTRODUCTION

To assess the potential value of the independent double reading of brain MRI performed in patients with seizures and the effect on structural abnormalities detection.

METHODS

We retrospectively reviewed all epilepsy protocol brain MRI studies available in the institutional PACS from 2018 to 2024. In 2021, a double reading protocol was implemented, in which two neuroradiologists independently reviewed each study, followed by a consensus discussion to issue a final joint report. We compared diagnostic yields between studies interpreted by a single radiologist versus those with double reading. Epilepsy-relevant findings (e.g., hippocampal sclerosis, cortical abnormalities) were identified. In cases with potential imaging abnormalities, findings were compared to electroencephalogram results when available. Normality was assessed using the Shapiro-Wilk test. Depending on data distribution, comparisons were made using either Student's t-test or Mann-Whitney U test, along with Chi-square tests for categorical variables. A binomial logistic regression model was used to assess independent predictors. All analyses were conducted in SPSS version 24, with statistical significance defined as $p < 0.05$.

RESULTS

A total of 504 patients (mean age 30.3 ± 22.5 years; 52.8% male) were included. Of these, 183 studies (36.3%) had double reading. Epilepsy-relevant findings were more frequent in the double reading group (33.3%) than in the single reading group (23.1%) (p=0.012; OR=1.67, 95% CI: 1.12-2.50). The mean age was significantly lower in patients with double reading (28.1 ± 21.2) compared to those with single reading (31.3 ± 23.2) based on Student's t-test (t = 2.17, p = 0.031). Among specific findings, hippocampal abnormalities were more often detected with double reading (p=0.037; OR=2.10, 95% CI: 1.04-4.21). In logistic regression, epilepsy-relevant findings were independently associated with double reading (ß = 0.559, p = 0.007), and age was negatively associated (ß = -0.010, p = 0.018).

DISCUSSION

Double reading significantly increases the detection of epilepsy-relevant MRI abnormalities, particularly hippocampal findings, and is associated with younger patient age. It may improve diagnostic accuracy in epilepsy imaging protocol.

T2-QI-6 REDUCE ADD-ON SEED APPOINTMENTS IN THE BREAST IMAGING DEPARTMENT

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Kaitlyn Rieker (*Abstract Co-Author*)
Andrey Morozov, MD (*Abstract Co-Author*)
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INTRODUCTION

The Breast Imaging Department has experienced a significant increase in demand for radioactive seed placement, resulting in a high percentage of add-on appointments (i.e. appointments added outside of regularly scheduled procedure slots or appointments double booked with already scheduled procedures). These add-on appointments created scheduling challenges, negatively impacting patient care and provider well-being. The gap in quality is evidenced by the fact that 47.6% of seed appointments are add-ons, far exceeding the target goal of 10%. The project aimed to reduce the percentage of add-on seed appointments by 78%, from 47.6% to 10%, over a 6-month period, without adversely affecting the availability of other breast imaging procedures.

METHODS

The project utilized the DMAIC (Define, Measure, Analyze, Improve, Control) methodology to identify and address the underlying causes contributing to the high rate of add-on seed appointments. The team identified 37 potential causes using a Fishbone diagram (Figure 1), narrowing them down to 10 key causes through impact/effort analysis (Figure 2). Key stakeholders, including breast radiologists, breast surgery providers, radiation safety officers, and scheduling staff, were engaged throughout the process. Subsequently, five targeted interventions were implemented based on the identified causes: (1) Creation of three dedicated seed scheduling slots. (2) Elimination of pre-operative assessment as a mandatory requirement for seed placement, unless specified otherwise. (3) Modification of the radiology checklist to reflect the new pre-operative assessment policy. (4) Education for stakeholders on the updated pre-operative assessment policy. (5) Solicitation of feedback from the nuclear regulatory body regarding the potential to lengthen the seed explantation window to more than five days.

RESULTS

Following the implementation of these interventions, the percentage of add-on seed appointments was reduced to 0% at both 6- and 12-month timepoints (Figure 3). In addition, the average number of days for breast imaging appointments decreased from 7.5 days to 6 days at 6 months, and 4 days at 12 months (Figure 4), indicating a positive impact on scheduling efficiency.

DISCUSSION

The project successfully reduced the percentage of add-on seed appointments, improving scheduling efficiency and patient care without negatively impacting other breast imaging services. The lessons learned and the interventions implemented can serve as a model for addressing similar challenges in other clinical settings.

T2-QI-8 OPTIMISING JOINT DECISION MAKING IN INTERVENTIONAL RADIOLOGY: A RETROSPECTIVE ANALYSIS OF PATIENT ANXIETY AND UNDERSTANDING USING AUDIO-VISUAL PATIENT EDUCATION TOOLS

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INTRODUCTION

Patient periprocedural anxiety can limit the performance of interventional radiology (IR) procedures under local, rather than general, anaesthesia. Our institution introduced 'Explain my Procedure' (EMP) in 2022, a series of animated educational videos tailor-made to assist the consent process for patients prior to their IR procedure. The aim of the study is to assess the impact of this tool on patient's pre-procedural anxiety and comprehension.

METHODS

All consenting adult patients undergoing elective IR procedures including portacath insertion, arterial embolisation, lung tumour biopsy and ablation between May 2022-April 2024, before and after the implementation of EMP, were invited to complete two questionnaires. A State Trait Anxiety Inventory questionnaire, regarding their experience of pre-procedural positive and negative emotions and a second questionnaire regarding their understanding of the procedure. Data from 70 patients was analysed.

RESULTS

31 (45 %) IR outpatients watched a teaching animation prior to their procedure. 22 (71%) patients reported low pre-procedural anxiety after watching a teaching video, versus 19 (49%) patients that did not watch a teaching video. High anxiety levels were lower in patients who had watched the animation, compared with patients that had not with statistical significance (16% and 39% respectively, $p<0.05$). Patients that watched the animation had statistically significantly higher levels of complete understanding versus patients that did not (90% and 67% respectively, $p<0.05$).

DISCUSSION

Implementation and patient engagement with IR teaching animations has shown a reduction in anxiety in patients pre-procedure and led to a greater understanding of the procedure. These findings support the continued utilisation of this tool, which can ultimately improve patient satisfaction.

T2-QI-9 EVALUATION OF A GENERIC CARDIOTHORACIC IMPRESSION GENERATOR MODEL FOR PREDICTING LUNGRADS SCORING IN LOW-DOSE LUNG CANCER SCREENING CTS (LDCT)

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INTRODUCTION

Lung CT Screening Reporting and Data System (LungRADS or LR) improves early cancer detection/survival but shows up to 30% inter-reader disagreement. Large Language Models (LLMs) can generate report impressions but are not typically trained for specific output categories. This study evaluates whether a LLM fine-tuned for cardiothoracic impressions can accurately predict LR categories.

METHODS

A Llama3-8B model was fine-tuned to generate cardiothoracic impressions using 66034 CT/MR radiology reports (RR) collected from Jan-Dec 2023. In this single-center study, 5961 LDCT RR from Jan-Dec 2024 were analyzed. After excluding 632 non-screening scans and 62 incomplete RR, 5267 RR remained. Regular expressions extracted reference LR categories. Impression sections were removed, and reports were fed into the LLM to generate LR categories. Analysis included individual LR categories and dichotomized into groups 1 (LR 0/3/4) and 2 (LR 1/2). Discrepancies were reviewed by a 2nd-yr radiology resident.

RESULTS

Median age 64 years; 2977 (57%) male. RR LR categories included 0: 77 (1%), 1: 498 (9%), 2: 4178 (79%), 3: 327 (6%), 4: 190 (4%) (Figure 1), with modifier in 428 (8%) reports. The LLMs accuracy (AC) was 86% (95%CI:85-87%), Cohen's Kappa (?) coefficient 0.582 (moderate agreement; P <0.001). After dichotomization, the LLM achieved 67% sensitivity (SN) and 97% specificity (SP) . For all discrepancies (211), 148 (70%) were undercalls and 63 (30%) were overcalls by LLM. For non-missing modifier cases (n=5295), the model achieved SN, SP of 18%, 97%.

DISCUSSION

A fine-tuned LLM can generate LR categories from LDCT reports without explicit prompting, demonstrating its ability to infer structured assessments from unstructured text only by observing the training data. It produced LR labels for 99% of reports with 86% accuracy with RR. However, its clinical utility was constrained by boundary errors, particularly in adjacent categories (2-3-4) and cases requiring contextual understanding (prior malignancy, lymphadenopathy, nuanced phrases), suggesting surface-level rule application instead of holistic reasoning. High specificity (97%) may reduce unnecessary follow-ups, but low sensitivity (67%) risks missing actionable findings. Adding rule-based guardrails and threshold-focused fine-tuning may enhance edge-case performance.
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T5A-QI

Quality Improvement Reports Tuesday Afternoon Poster Discussions I

Tuesday, Dec. 2 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

T5A-QI-1 COMMUNITY-WIDE SCREENING PROGRAM USING MOBILE LOW-DOSE CT IN PATIENTS WITH PERSISTENT SYMPTOMS FOLLOWING COVID-19 INFECTION

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Zach Smith (*Abstract Co-Author*)
Nicole Yesh (*Abstract Co-Author*)
Luda Khait (*Abstract Co-Author*)
Dani Hourani (*Abstract Co-Author*)
Sherrie Schuster (*Abstract Co-Author*)
James Mahn, MD (*Abstract Co-Author*)
Amnah Aglan, MD (*Abstract Co-Author*)
Minesh Barot (*Abstract Co-Author*)
Mannudeep K. Kalra, MD (*Abstract Co-Author*)
Deanna Harajli (*Abstract Co-Author*)
Parker Reed (*Abstract Co-Author*)
Andrew Smith (*Abstract Co-Author*)
Maria Green (*Abstract Co-Author*)
Lina Karout, MD (*Abstract Co-Author*)
Tom Hartle (*Abstract Co-Author*)

INTRODUCTION

We conducted a community outreach program that offered a free, mobile low-dose thoracic CT (LDCT) to individuals with prior COVID-19 infection and persistent symptoms of dyspnea, cough, or fatigue. The primary goal was to define the prevalence of potential COVID-19-related lung damage. As a secondary goal, we tracked the prevalence of incidental non-COVID-19 findings and the subset with clinically actionable abnormalities.

METHODS

We outfitted an 18-wheel tractor/trailer with a 32-slice BodyTom CT scanner (Neurologica; Danvers, MA) and conducted LDCT screenings using a standard protocol in SE Michigan. Non-pregnant patients 18 years or older who self-reported persistent symptoms of dyspnea, cough or fatigue post-COVID-19 were eligible. An opt-in consent to add their images and data to the IRB-approved (WCG # 20235095) Community Health Assessment RegisTry (CHART) was included. Board-certified radiologists with body imaging expertise reviewed all images. Normal and benign findings were reported via text message, email, or certified mail. Abnormal findings were flagged for review by the program's lead physician and anything deemed clinically actionable (defined as need for follow-up within 3 months or less) triggered a phone call, with primary or specialty care referral assistance if needed. Upon program completion, all CT reports were reviewed, and findings were categorized by organ system or body region. Potential COVID-related lung damage (defined as chronic parenchymal changes and/or lung fibrosis not deemed secondary to another cause) and incidental non-COVID-19 abnormalities, including the clinically actionable subset were recorded.

RESULTS

From 12/6/23 to 11/15/24, 200 scanning events were conducted at 48 different community-based sites. 2,168 patients were screened, 1,985 of whom consented to participate in CHART (91.6%). Of those who consented, the average age was 50.6 years, 52.8% were female and 53.0% were Black. Possible COVID related lung damage was identified in 31 patients (1.6%). Incidental abnormalities were found in 1202 (60.6%) with 585 (29.5%) clinically actionable. Of this subset, moderate to severe CAC (n=230; 11.6%) and suspicious intra-abdominal masses (n=83; 4.2%) were most common. Thyroid nodules (n=49; 2.5%), mediastinal masses (n=38 [tracheal deviation in 12]; 1.9%), aortic aneurysms (n=30;1.5%), and suspected lung cancers (n=15; 0.8%) were also seen. Though not included in the clinically actionable subset, hepatic steatosis was noted in 83 patients (4.2%).

DISCUSSION

Mobile LDCT is a convenient mechanism to deliver community screening for patients with persistent post-COVID symptoms. Although COVID-19 related lung damage on LDCT was infrequent, the high prevalence of clinically actionable incidental abnormalities, especially CAC, shows the utility of such screening at the community level.

T5A-QI-2 REDUCING ROUTINE CHEST XRAY USAGE IN THE ICU

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Victoria Kim, MD (*Abstract Co-Author*)
Austin Ruediger, MD (*Abstract Co-Author*)
Akshay Thaper, MD (*Abstract Co-Author*)
Derek Ge (*Abstract Co-Author*)
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Sabiha Hussain, MD (*Abstract Co-Author*)
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INTRODUCTION

Based on recommendation from the ACR and Society of Critical Care Medicine, many hospitals have shifted away from routine ICU CXRs to a more restrictive on demand ordering pattern. Routine CXRs disrupts the sleep of ICU patients slowing their healing, may result in temporary respiratory decompensation, and are not in line with the Imaging Wisely guidelines. Furthermore, at our institution RWJUH, CXR volumes from routine ICU CXRs are so high that many radiologists are forced to read multiple successive CXR for the same patient at once, forcing them to interpret CXR that may no longer be relevant to the patient's clinical status. This also lengthens the turnaround time for stat and emergency CXR.

METHODS

We created 2 versions of an educational presentation, a synchronous and asynchronous version, presenting existing literature demonstrating no changes in patient outcomes between the routine and on demand CXRs. The pros and cons of routine CXRs were discussed along with the relevant ACR Appropriateness Criteria. A pre-intervention and post-intervention survey was administered.

RESULTS

Two months after implementing our educational initiative, the total average routine CXRs in our medical ICU dropped from 125 to 60-70 CXR/day in Jan, Feb, March 2025. 27 medicine residents, 2 medical students, and 7 APPs (advanced practice practitioner, NP/PA) responded to the survey with an average patient load of 2.32 patients. APPs inputed CXR orders nearly always (85%) while 60% residents ordered CXR half of the time with 32% residents responding nearly all the time. Only 11% of residents (3/27) ordered standing routine CXRs while 0% (0/9) APP and 0% (0/2) students ordered them. Institutional pressure to order daily xrays was overall low with only 29% (2/7) APP and 21% (6/28) residents reporting pressure. Institutional compliance with appropriateness criteria was high with acute worsening of clinical status having a likelihood ratio of 4.9/5, new admission or transfer 4.4/5, and stable clinical status having a ratio of 1.9/5 with regards to likelihood of ordering a CXR.

DISCUSSION

Our results demonstrate that an educational intervention can dramatically decrease the average number of routine ICU CXRs ordered. In addition, residents were much more likely than APPs to have standing CXR orders despite very similar patient loads. Knowledge of the ACR appropriateness criteria for ICU CXR was overall high with institutional pressure to order routine ICU CXR low across the board. Overall, our data suggests that educating residents in particular will reduce the frequency of daily routine CXR orders.

T5A-QI-3 OPTIMIZING RADIOGRAPHIC QUALITY: A DATA-DRIVEN APPROACH TO REDUCING IMAGE REJECTIONS AND ENHANCING TECHNOLOGIST ACCOUNTABILITY

Rasha Makkia, PHD (*Presenter*)
Brittany Blum, DO (*Abstract Co-Author*)

INTRODUCTION

Image rejection and repeat exposures in digital radiography increase patient radiation dose, reduce workflow efficiency, and may reflect training or equipment issues. Commonly due to positioning errors and patient motion, most rejected images are preventable. This quality improvement initiative aimed to evaluate baseline reject rates in fixed and portable X-ray systems, implement targeted interventions, and assess the impact of a PACS-integrated feedback system to improve technologist performance and reduce repeat imaging.

METHODS

A retrospective study reviewed digital radiographs over a two-and-a-half-month baseline period, followed by quarterly post-intervention assessments. Repeat and reject images from all fixed and portable systems were analyzed. Rejection causes were categorized using vendor-adjusted criteria (e.g., positioning error, motion artifact, technical error). Baseline reject rates were compared to target and threshold values indicated in AAPM TG 151. A root cause analysis revealed inadequate technologist training as a key factor. Targeted interventions included protocol refinement, individual feedback, and structured hands-on training. A new PACS-based QC tool was implemented to facilitate image review and provide direct feedback to technologists. Device and technologist-level tracking were introduced to identify high reject rates and guide targeted support.

RESULTS

A total of 1,280 rejected images were recorded during the baseline period, increasing to 1,792 in the post-intervention period. Positioning error and patient motion remained the leading rejection causes, rising 64% and 49%, respectively. Patient-related artifacts and technical issues also increased. Portable X-ray units showed a 110% increase in positioning errors and a 38% rise in motion-related rejections. In fixed rooms, these increased by 42% and 54%, respectively. Trainee-related rejections rose from 142 to 178. Despite higher volumes, reject rates in fixed systems declined modestly (from 12.5% to 11.3%). Portable systems showed more variability, but average reject rates improved slightly (from 19.1% to 17.5%), with some units showing substantial gains.

DISCUSSION

The rise in rejection counts is likely due to increased volume and better documentation, not declining quality. Stability in fixed systems and slight improvement in portable reject rates suggest early effectiveness of the interventions. The PACS feedback tool, combined with reject tracking at the machine and technologist levels, enhanced issue identification and response time. These tools allowed for focused retraining and quality control. Findings support continued use of data-driven strategies to improve technologist performance, reduce repeats, and promote safer, more efficient imaging practices.

T5A-QI-4 ONLINE PATIENT-CENTERED RADIOLOGY REPORTS: IMPROVING THE PATIENT AND FAMILY EXPERIENCE OF RECEIVING PEDIATRIC RADIOLOGY RESULTS

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John A. Maloney, MD (*Abstract Co-Author*)
Jill Stein, MD (*Abstract Co-Author*)
Ryan G. Short, MD (*Abstract Co-Author*)
Matthew Monson, DO (*Abstract Co-Author*)
Nicholas T. Befera, MD (*Abstract Co-Author*)

INTRODUCTION

TITLE: Online patient-centered radiology reports: Improving the patient and family experience of receiving Pediatric Radiology results Introduction Since the implementation of the 21 st Century Cures Act, patients have had more access to their medical health records, including their radiology reports. These reports are available to families instantaneously after report finalization, typically before the ordering physician has been able to review and contact the patient/family. As many patients and families may not have medical backgrounds, this can cause uncertainty while trying to read and understand the radiology reports. Patient-friendly reports and large language models have been proposed to help patients understand their radiology reports. Our objective was to assess the patient/family experience after implementation of patient-centered interactive radiology reports at a large children's hospital.

METHODS

Patient-friendly interactive radiology reports were made available to all patients within an online portal via integration of a commercially available software (Scanslated, Inc, Tampa FL). Interactive reports contained embedded plain language explanations and diagrams, which were accessible via clickable hyperlinks within the report. We recorded usage statistics including reports viewed, definitions/diagrams accessed, engagement time, and survey responses from patients and families who viewed the interactive reports.

RESULTS

During the review period from initial rollout to current time (November 20, 2024 to May 1, 2025), 113,849 reports were issued in the secure medical record online portal, with patients and families viewing 68,791 (60.4%) of the traditional radiology reports. Of the online reports accessed, 13,186 (19.2%) radiology reports in the patient-friendly interactive format were also accessed. Patients accessed a mean of 7.1 plain langauge explanations per report by clicking on terms and phrases. The majority (67.1%) of reports were viewed on a mobile device. Patients spent a total of 534.7 hours engaging with the interactive reports, with mean engagement time of 2.43 minutes. Of 2,018 survey question responses, 94.3% were positive. The far majority of patients (562/594 responses, 94.6%) reported that the definitions and diagrams helped them to understand their results, and indicated a positive experience viewing their patient-centered report (535/563 responses, 95%).

DISCUSSION

Based on our early experience, patient-friendly radiology reports improved subjective patient comprehension and had a positive impact on the patient/family experience of receiving imaging results online. Our results suggest that online patient-friendly reports may be an effective tool for patient and family engagement with pediatric radiology.

T5A-QI-5 APPLICATION OF SIX SIGMA MANAGEMENT TO IMPROVE THE TIMELINESS OF SCHEDULED RADIOLOGY EXAMINATIONS FOR INPATIENTS

Yang Cheng (*Presenter*)

INTRODUCTION

To evaluate the feasibility of enhancing the on-time performance of scheduled radiology examinations for inpatients through the application of Six Sigma quality management principles.

METHODS

Using the Six Sigma methodology, this study identified factors contributing to delays in scheduled inpatient CT examinations and implemented targeted, multidisciplinary interventions. A retrospective analysis of 18,696 inpatient CT appointment records was conducted, and the Pareto principle was used to identify the major contributors to delays. An interdisciplinary team, including the radiology department, nursing department, information technology services, and the patient transport center, collaboratively addressed the identified issues through tailored interventions. Following the intervention, data from an additional 1,986 inpatient CT appointments were collected to assess improvements in punctuality rates, patient wait times, and daily CT throughput.

RESULTS

Pareto analysis revealed the top three contributors to appointment delays: interdepartmental scheduling conflicts (40.22%), inefficiencies in the transport center (27.37%), and elevator congestion during patient transfer (15.08%). Following intervention, the examination punctuality rate improved from 78% to 91%. The median delay decreased from 45 minutes to 12 minutes, while early arrivals were reduced from a median of 60 minutes to 20 minutes. Daily CT exam volume increased by 18% (from 125 to 147 cases), and patient wait time was reduced by 32% (from 85 to 58 minutes).

DISCUSSION

The Six Sigma management approach effectively identifies and addresses key inefficiencies in the scheduling process, significantly improving the efficiency and punctuality of inpatient CT appointments.

T5A-QI-6 ESPRESSO SHOTS OF EDUCATION: RESIDENT DRIVEN ONLINE MINI LECTURE SERIES AS AN INNOVATIVE TEACHING TOOL

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Harsh Shah, MD (*Abstract Co-Author*)
Kathryn D. Solomon, MD (*Abstract Co-Author*)
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INTRODUCTION

Radiology is central to modern medicine, supporting diagnosis and clinical decision-making across almost all specialties. Yet learning radiology is uniquely challenging - residents must master multiple imaging modalities and recognize a wide spectrum of pathologies while synthesizing clinical information under pressure. These demands and foundations, heightened during overnight call shifts and reiterated with traditional didactics, may not meet the needs of residents in these urgent, high-stakes settings. To address this, we developed a resident-led online mini-lecture series focused on emergency medicine topics. These concise videos - our “espresso shots” of education - deliver high-yield content in a fast, accessible format. We sought to evaluate the series' value as a radiology educational tool.

METHODS

The study was conducted at an urban academic hospital and level 2 trauma center. Senior radiology residents (PGY-4 & PGY-5) volunteered to create brief lectures on emergency radiology topics. Lectures were reviewed by faculty for accuracy and paired with a one-page “Quick Reference Guide”. Both resources were uploaded to an online database accessible to all residents. Each new lecture was announced during meetings and via the program’s group chat.To assess impact, we administered surveys at the start and end of the study year. The pre-survey gathered demographics, resource usage, and baseline attitudes toward resident-led education. The post-survey assessed engagement, frequency of use, and perceived benefit. Survey data were stratified by training year. Likert scales and open-ended responses were used to collect quantitative and qualitative feedback.

RESULTS

Survey response rates were 59.5% (Pre) and 63% (Post). The average lecture lasted 14 minutes, matching resident preferences: 68% favored videos between 10-15 minutes. On average, residents viewed 2.72 lectures, and 60% reported returning to the series. After implementation, positive opinion ratings (Likert 8-10) increased from 53.8% to 72%. Although perceived benefit ratings declined slightly (from 73.1% to 56%), the series became nearly 15% of the top three resources used on call by residents. Qualitative feedback praised the series as “concentrated, high-yield information” and noted its convenience and value as peer-led content.

DISCUSSION

Our mini-lecture series demonstrates the potential of concise, peer-driven educational tools in radiology training. Its succinct format, clinical relevance, and accessibility make it particularly well-suited for on-demand learning during high volume call. The modest decline in perceived benefit may reflect limitations such as a small initial lecture library. With thoughtful refinement, this model offers a scalable and high-impact supplement to traditional education - quick, targeted, and brewed for the modern radiology trainee.

T5A-QI-7 REDUCING REPEAT RATES IN CT PULMONARY ANGIOGRAPHY (CTPA): STRATEGIES FOR OPTIMIZING IODINE CONTRAST ENHANCEMENT

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Rachel Bladorn, BS, RT (*Abstract Co-Author*)
Carrie Bartels, RT (*Abstract Co-Author*)
Kelsey Schluter, BS (*Abstract Co-Author*)
Jeffrey P. Kanne, MD (*Abstract Co-Author*)
Timothy P. Szczykutowicz, PhD (*Abstract Co-Author*)

INTRODUCTION

Historically, our large adult CT pulmonary angiography (CTPA) repeat rates were 11.2% from 2017-2019. We re-evaluated CTPA performance in 2023 and found our suboptimal rate increased to 22%. We found the most common issue was inadequate contrast enhancement due to challenges with bolus tracking. This project presents our institution’s data driven approach for optimizing CTPA.

METHODS

Multiple data informed protocol changes were made from 2023-2025. First, the mean pulmonary artery (PA) CT number and the time difference between scan delay and injection duration were retrospectively extracted from CTPA exams using a fixed contrast volume of 86 ml. The scan timing that produced peak PA enhancement relative to injection duration was selected as a fixed delay for prospective trials against our existing bolus tracking based protocol. To assess effectiveness, PA enhancement in the trial group was compared to that of bolus tracking in a large patient cohort using Mann-Whitney test. The trial yielding the fewest poor enhancements (<250 HU) was adopted as the new institutional protocol. Patients scanned under this protocol were evaluated for suboptimal enhancement, and in cases requiring repeat scans with bolus tracking, the tracked delay was compared to the fixed trial delay. Additional trials were performed with varying contrast volumes and delays and analyzed in like manner.

RESULTS

In the retrospective analysis of 44 patients, maximum pulmonary artery (PA) enhancement consistently occurred 2.5 to 3 seconds after the completion of contrast injection. Based on these findings, prospective trials were conducted using scan delays of 2 seconds (n = 37) and 4 seconds (n = 30) after weight-based injection completion. The 2-second delay resulted in a 5% overall rate of poor enhancement, while the 4-second delay resulted in a 36% poor enhancement rate. The 2-second trial also showed a statistically significant increase in PA enhancement compared to bolus tracking, as determined by a Mann-Whitney U test ($P < 0.05$). Despite promising trial results, institution-wide implementation of the 2-second + injection duration scan delay led to suboptimal rate of 44%. We removed weight-based volumes and delays to create a more robust SOC protocol. This change resulted in only 5% suboptimal enhancement rate.

DISCUSSION

Through this project we determined a robust protocol cannot include technologist changing scan delays at scan times. Collaboration between radiologists, scientists, and technologists was critical to identifying and addressing the root causes of repeated CTPA exams. The data driven nature of our approach prevented early termination of our project. During the iterative trials, all examples of poor image quality were blamed on our trial while our data consistently showed improvements. This project resulted in the reduction of repeated CTPA exams at our institution.

T5A-QI-8 SUSTAINABLE ULTRASOUND SOLUTIONS: PIONEERING GREEN PRACTICES IN IMAGING

Kelly Albury, RVT (*Presenter*)
David T. Fetzer, MD (*Abstract Co-Author*)
Crystal H. Bruce (*Abstract Co-Author*)
Kim Pongsatianwong, RDMS, RVT (*Abstract Co-Author*)
Skye Smola, RDMS, RVT (*Abstract Co-Author*)

INTRODUCTION

Ultrasound (US) is recognized as the most environmentally sustainable imaging modality, with significantly lower carbon emissions than computed tomography (CT) or magnetic resonance imaging (MRI). In addition to its safety and accessibility, US offers diagnostic capabilities that increasingly rival those of CT and MR. This quality improvement project aimed to expand access to advanced, low-carbon diagnostic imaging by implementing four specialized US service lines over a three-year period: elastography, contrast-enhanced ultrasound (CEUS), musculoskeletal (MSK) imaging, and fat quantification.

METHODS

From January 2022 to December 2024, a phased implementation of four US service lines was conducted across multiple sites. Key interventions addressed three primary challenges: (1) installation of new technology across diverse vendor platforms, (2) specialized sonographer training and competency validation, and (3) provider engagement and Electronic Health Record (EHR) order workflow support. Retrospective EHR reports were used to gather imaging volumes. Carbon emission estimates were derived from published emission data per modality. Outcomes were measured in patient volume growth and estimated CO2 emission reductions assuming the US study replaced an equivalent CT or MRI.

RESULTS

All four US service lines demonstrated sustained year-over-year growth, with total patient volume increasing 81.3% from 2022 to 2024. Elastography volumes rose from 586 to 1,123 exams (91.6% increase), while CEUS and MSK rose 69% and 46.8% respectively. The first year of fat quantification included 531 patients. The total carbon emissions for MR elastography exams from 2022 to 2024 is 1,231% more than US elastography emissions, despite the volume of US elastography exams being more than double MR. Diagnostic performance was supported by literature showing equivalent or superior sensitivity and specificity of US techniques compared to MR and CT.

DISCUSSION

The expansion of advanced US services successfully improved access to high-quality, sustainable imaging alternatives to CT and MRI, as shown by progressive increase in US order volumes. These service lines provided diagnostic accuracy comparable to conventional modalities, while offering improved patient safety and reducing environmental impact. Implementation challenges were overcome through targeted solutions, including technology integration, structured training, and ordering pathway optimization. The program has since served as a model for similar efforts at peer institutions. Continued innovation is planned, including the recent launch of a US-based endometriosis screening protocol. This quality improvement initiative highlights the opportunity to align clinical excellence with environmental stewardship through strategic imaging service expansion.

T5A-QI-9 QI PROJECT SIMULATION FOR RESIDENTS - EFFECTIVE AND EFFICIENT!

Nadja Kadom, MD (*Presenter*)
Susan Reich (*Abstract Co-Author*)
Zachary Grunewald (*Abstract Co-Author*)
Lisa Reynolds (*Abstract Co-Author*)
Patricia Balthazar, MD, MPH (*Abstract Co-Author*)

INTRODUCTION

Considering increasing clinical volumes and staffing shortages, radiologists have less time to mentor radiology residents through the completion of a quality improvement (QI) project. Here, we developed and delivered a "QI Simulation Bootcamp" to equip our residents with the knowledge and skills required to achieve Level 4 (out of 5) competency in Systems-Based Practice, as defined by the ACGME Diagnostic Radiology Milestones.

METHODS

We gained permission to adapt a QI Project Simulation from a Healthcare Yellow Belt course at our institution. The adaptations included expansion of scope from the start of a QI project (identifying a project) and adaptation of content toa. Radiology rather than a clinical scenario. The session included a blend of education followed by simulated practical application such as process mapping, voice of the patient, identifying gaps and opportunities, developing measures, developing and prioritizing improvement interventions, analyzing run charts, developing an implementation plan, and project hand-off followed by celebration of success. We developed a pre- and post-session survey with 20 items to assess session impact on knowledge and attitudes and to solicit improvement suggestions for the course.

RESULTS

The pilot QI Simulation Bootcamp was delivered as a 3-hour afternoon session with in-person participation of 26 radiology residents. The pre- and post-session knowledge assessment showed improvement ranging from -55.5 to +280.7 %. Three attitude questions showed improvements ranging from 13.4 to 68.8 %. 100% of participants indicated they wanted this pilot session permanently integrated into our residency program.

DISCUSSION

We showed feasibility of efficiently and effectively enabling our residents to meet level 4 of the ACGME requirements for Quality Improvement, as well as demonstrate increase in knowledge and attitudes. Our next step is a grant funded initiative (Association of Academic Radiology Strategic Alignment Grant 2025-2026) to enable the adoption of this program by others.

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T5B-QI

Quality Improvement Reports Tuesday Afternoon Poster Discussions II

Tuesday, Dec. 2 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

T5B-QI-1 CREATION OF A PROCEDURAL PEER LEARNING PROGRAM IN RADIOLOGY

Ashok Srinivasan, MD (*Presenter*)

INTRODUCTION

Peer learning is increasingly replacing peer review in diagnostic radiology due to the nonjudgmental nature of the peer learning process with less emphasis on individual errors and more stress on investigating system errors and creating learning opportunities. While this is the norm in many diagnostic radiology subspecialities, there is no well defined structure for peer learning for radiology procedures. Therefore, the goal of our initiative was to create a procedural peer learning program with the following emphasis: -1. To present complications arising from image guided procedures in Radiology in a forum of proceduralists across all divisions with a focus on peer learning (including recognition of system and process issues)2. To facilitate inter-divisional dialogue on best practice principles pertaining to image guided procedures

METHODS

While diagnostic peer learning typically focuses on individual subspecialties (e.g., neuroradiology, MSK etc.), we strongly believed that there are sufficient learning opportunities in procedural radiology that crosses divisions and service lines. Therefore, we created one procedural peer learning conference that spanned all divisions and service lines with a cadence of 2-3 meetings each year. For each meeting, two divisions/service lines were recruited to present procedural learning opportunities and all procedural areas were invited to the one hour Zoom meetings. Each presentation was designed to be 15-20 minutes long followed by a 10 minute discussion. The cases were submitted in advance to the moderator in a PPT format at least one week prior to the scheduled meeting.

RESULTS

The procedural areas participating in the Procedural Peer learning conference since its inception include Neuroradiology, MSK, VIR, Chest, Body, Breast and Pediatric Radiology. The types of issues that came to light from these conferences included skill based, knowledge based, miscommunication, equipment failure, workflow or process gaps. Each Zoom meeting was attended by members from at least 3 different procedural areas that allowed for robust discussions and recognition of common issues that crossed divisions/service lines. Some of the improvement efforts that have resulted from these conferences include revisions to anticoagulant policies, streamlining case requests and increased recognition of early complications during procedures.

DISCUSSION

Creation of a Peer learning conference focused on Procedural services in Radiology has allowed for increased learning opportunities spanning different divisions/service lines with lessons that can then be applied in their individual areas. This allows for 'not reinventing the wheel' and improving patient care quality and safety in the procedural domains.

T5B-QI-2 TWO KEY PERFORMANCE INDICATORS TO ENHANCE OUTPATIENT EXAM PRODUCTIVITY IN RADIOLOGY DEPARTMENTS: AN EXPERIENCE ACROSS 20 HOSPITALS

Fernando B. Ferreira, MD, PhD (*Presenter*)
Danilo Manuel C. Costa, MD, MBA (*Abstract Co-Author*)
Raquel A. Moreno, MD (*Abstract Co-Author*)
Paulo G. Lopes, MD (*Abstract Co-Author*)
Yuri C. Neves, PhD (*Abstract Co-Author*)

INTRODUCTION

The increasing demand for imaging exams and revenue growth pressures radiology services to adopt more efficient management strategies. To maintain quality and agility amid rising volumes, the use of performance indicators (KPIs) becomes essential. In this context, two strategic KPIs are proposed: Scheduling Lead Time (SLT) , defined as the interval between the moment a patient schedules an exam (via in-person appointment, call center, chat, or online self-scheduling) and the scheduled exam date; and Operational Capacity (OC) , defined as the proportion of outpatient appointment slots made available in relation to the equipment’s maximum capacity, assuming 16 hours of daily operation and the average slot duration for that modality.

METHODS

A total of 20 hospitals, collectively performing approximately 80,000 outpatient imaging exams per month, participated in this study with the goal of achieving a 15% increase in outpatient volume in 2024. To support this growth while maintaining patient satisfaction, two KPI targets were established: an SLT under 2 days and an OC below 80%. Based on the KPI results, different strategies were applied. When the SLT was off target and the OC was low, the strategy was to increase the number of available slots for outpatient scheduling. If the OC was high, actions focused on optimizing scheduling by reducing slot duration through protocol adjustments, considering the acquisition of acceleration software for MRI, or expanding technological capacity by acquiring additional imaging equipment. When the SLT was on target, regardless of the OC, the focus shifted toward increasing the volume of exam requests and scheduling. This was achieved through marketing initiatives, strengthening relationships with referring physicians, and improving the conversion rate from requested to scheduled exams. These measures aimed to sustain growth while maintaining operational efficiency and enhancing patient experience.

RESULTS

The mean number of exams per hospital increased from 39,030 in 2023 to 48,053 in 2024 ($p < 0.001$). The overall average growth in exam volume was 50.4%, with only two hospitals not demonstrating an increase during the period. SLT also improved significantly, decreasing from an average of 4.4 days in 2023 to 1.4 days in 2024. Operational Capacity remained stable, averaging approximately 75%.

DISCUSSION

The adoption of SLT and OC as performance indicators improved the management of radiology services. SLT reached the target, OC remained within optimal levels, and actions such as expanding scheduling and technological capacity led to exam volume growth beyond expectations. These outcomes reflect gains in operational efficiency, improved patient experience through shorter wait times, and increased revenue.

T5B-QI-3 BRIDGING THE KNOWLEDGE GAP: TRAINING RESIDENTS TO IDENTIFY AND UNDERSTAND THORACIC MEDICAL DEVICES

David A. Mata, MD (*Presenter*)
Joshua Strobel, MD (*Abstract Co-Author*)
Carlos H. Previgliano, MD (*Abstract Co-Author*)
Carolina Soto-Davila, MD (*Abstract Co-Author*)
Guillermo P. Sangster, MD (*Abstract Co-Author*)

INTRODUCTION

The chest radiograph (CXR) is a well-established imaging modality that is widely used to check for a variety of thoracic abnormalities such as pneumonia, pneumothorax, and pleural effusion. On average, 236 CXRs per 1000 patients per year are performed, accounting for 25% of the annual total numbers of diagnostic imaging procedures. In the US, over 70 million CXRs are performed each year for immediate and late-onset complications of various medical conditions, such as heart surgery or respiratory infections. Due to the large number of radiographs obtained each day, there can be substantial delays between the time a CXR is obtained and when it is interpreted by a radiologist. This PQI project aimed to enhance the resident's ability to identify and understand thoracic medical devices using radiological imaging. The goal was to increase familiarity with device appearance, positioning, use, and common complications, reducing dependence on radiologists' reports and expediting patient care.

METHODS

99 participants initially completed a pretest to assess baseline knowledge of thoracic medical devices. An informative booklet on the device information was then provided. A second test was administered to 79 participants after reviewing the booklet to evaluate improvements.

RESULTS

Significant improvement in the participant's ability to correctly identify thoracic medical devices, understand their uses, and recognize common complications. On the pretest, there where 16/40 commonly missed questions; on the 2nd test this number decreased to 3/40, translating to a 32.5% of improvement. A significant improvement was also noted in the participant's ability to identify MRI compatible devices, expediting patient care. When comparing the 2 tests taken: on the pretest, 83.7% participants answered to not knowing where to look for MRI safety information. After reviewing the booklet, this number went down to 43.1%, a 40.6% improvement.

DISCUSSION

Targeted educational interventions, such as the distribution of a comprehensive eBook on thoracic medical devices, effectively enhance residents' knowledge on the topic. This approach not only improves the ability to promptly address complications and misplacements but also minimizes dependency on radiologists' final reports. The CXR will continue to be one of the most frequently requested radiological studies in any type of patient population, it is important for every medical specialty to become familiar with the medical devices commonly encountered within their practice. As a follow up of this PQI; we created an e-book containing relevant information regarding most medical devices in the thorax. This e-book will be shared across the hospital with the hopes of Bridging the knowledge gap and better understanding the thoracic medical devices.

T5B-QI-4 IMPROVING QUALITY OF CT CORONARY ANGIOGRAPHY REPORTING USING A STRUCTURED CHECKLIST AND CAD-RADS INTEGRATION: A QUALITY IMPROVEMENT INITIATIVE

Jainam A. Doshi, MBBS, MD (*Presenter*)
Natisha P. Arora JR, MD (*Abstract Co-Author*)
Venkatesh Somu JR, MD (*Abstract Co-Author*)

INTRODUCTION

Accurate and complete CT Coronary Angiography (CTCA) reporting is essential for optimal patient management. Variability in reporting styles, omission of key findings, and inconsistent communication with clinicians were identified as major challenges. This quality improvement (QI) initiative aimed to enhance the quality, standardization, and clinical relevance of CTCA reports by implementing a structured reporting checklist combined with CAD-RADS classification

METHODS

A retrospective audit of CTCA reports over three months was performed to assess baseline reporting practices. Common deficiencies included incomplete description of plaque characteristics, inconsistent stenosis grading, and lack of CAD-RADS assignment. A structured checklist was developed, emphasizing systematic reporting of coronary anatomy, stenosis severity, plaque characterization, extra-cardiac findings, and CAD-RADS classification. Radiologists were trained on the checklist. Reports generated in the three months post-implementation were analyzed. The primary outcome measured was the percentage of reports that comprehensively included all checklist elements.

RESULTS

A total of 100 reports were analyzed before and after checklist implementation. Completeness of plaque characterization increased from 65% to 95%. Stenosis severity quantification improved from 70% to 98%. CAD-RADS assignment rose significantly from 10% to 95%. Reporting of extra-cardiac findings improved from 60% to 90%. Overall report standardization and clinical clarity were notably enhanced. No increase in reporting time was observed.

DISCUSSION

Implementing a structured checklist with CAD-RADS classification significantly improved the quality, completeness, and standardization of CTCA reporting. This initiative demonstrates that systematic quality improvement strategies can optimize imaging communication, enhance clinical decision-making, and align reporting practices with international standards.

T5B-QI-5 COMPARISON OF ARTIFICIAL INTELLIGENCE-BASED TOOLS FOR AUTOMATIC LABELING OF RADIOLOGY REPORTS

Rahul Pemmaraju (*Presenter*)
Jeffrey Tumminia (*Abstract Co-Author*)
Steve Higgins (*Abstract Co-Author*)
Alberto F. Goldszal, PhD, MBA (*Abstract Co-Author*)

INTRODUCTION

The rapid progress of artificial intelligence in radiology has necessitated the need for institutions to continuously benchmark, compare, and monitor these algorithms in their practice. Such evaluation requires the development of curated, labeled datasets. However, generating these datasets is often a costly and time-consuming endeavor, as such labeling is typically done manually by physicians. Recent advancements with large language models (LLMs) promise to alleviate these issues by enabling the automatic extraction of findings from radiology reports. In this work, we explore methods for efficiently generating a labeled dataset of chest x-rays for the detection of 14 different radiographic findings.

METHODS

10,000 curated chest x-ray reports, anonymized to remove all PHI information, were used in this study. Report impressions were extracted and labeled for the presence of 14 observations. We compared GPT-4o, a commercially available, general-purpose generative LLM, and ChexBERT, an LLM trained narrowly for chest x-ray report

labeling, for our automatic report labeling task. We further explored how prompting strategies like few-shot prompting (FSP) and chain-of-thought prompting (COT) affect the performance and cost of GPT-4o.

RESULTS

On a preliminary set of 1000 x-ray reports, GPT-4o with FSP achieved the highest average F1 score of 0.991 while ChexBERT achieved an F1 score of 0.981. FSP was the most effective prompting strategy for GPT-4o, as zero-shot prompting (ZSP) yielded an F1 score of 0.987, and a combination of COT and FSP yielded a score of 0.990. ZSP proved the most economical prompting strategy costing $0.74/1000 reports, while adding FSP and COT raised the rates to $1.22/1000 reports and $2.50/1000 reports, respectively.

DISCUSSION

In this work, we compared GPT-4o, an easily-accessible commercial LLM, with an open-source LLM developed for the medical domain, and showed that GPT-4o yields the best performance. We further compared popular prompting strategies for GPT-4o and showed that few-shot prompting enables highly accurate labeling at low monetary cost, suggesting its utility for automatic report labeling for large datasets. While several commercial and open-source LLMs have been released, we limited our comparison set to two easily accessible, representative models that have shown strong performance on medical tasks. We were also limited in this project by the amount of labeled reports to analyze, but will manually annotate additional reports to increase the size of our evaluation dataset.

T5B-QI-6 PRE-CLERKSHIP INTEGRATION OF RADIOLOGY EDUCATION IN MEDICAL SCHOOL CURRICULUM

Katherine Liu, MD (*Presenter*)
Lyanne Lu (*Abstract Co-Author*)
David S. Chen, MD (*Abstract Co-Author*)
Benjamin Carney, MS, MD (*Abstract Co-Author*)
Jasjeet Bindra, MBBS, MD (*Abstract Co-Author*)
Maryam Shahrzad, MD (*Abstract Co-Author*)

INTRODUCTION

The pre-clerkship curriculum at our institution follows an organ-based structure, where blocks focus on individual organ systems, integrating anatomy, physiology, pathology, and clinical skills. Radiology is vital to patient care, yet imaging interpretation and its cost-effective use receive limited discussion until clerkships. This creates a gap in the development of skills emphasized by the Association of American Medical Colleges (AAMC) core competencies, including patient care, medical knowledge, and systems-based practice. To address this, we developed standardized radiology workshops that align with the pathology and clinical context of our organ-based curriculum.

METHODS

Based on the existing curriculum framework and fit for pre-clerkship students, abdominal imaging was selected for integration. This student-driven project was developed in collaboration with radiology faculty and School of Medicine curriculum staff. We created two hour-long team-based learning (TBL) sessions on abdominal X-ray (KUB) and CT abdomen/pelvis (CTAP), each paired with a pre-recorded lecture covering the modality, common indications, anatomy, and a search pattern. During in-person TBLs, students applied these skills to clinical cases in teams of five to seven students, facilitated by radiology faculty and trainees. Pre- and post-session surveys assessed changes in student confidence in radiologic interpretation using a numeric scale with 1 representing "not very comfortable" to 5 representing "very comfortable."

RESULTS

Pre-session confidence values in all assessed skills ranged from 1.42 to 2.02. Post-session surveys showed increased confidence across all domains, with improvements ranging from +1.10 to +1.72. Students reported greater comfort identifying anatomy, applying search patterns, and interpreting common findings in both KUBs and CTAPs. Students' qualitative feedback valued the small-group, case-based format and real-time guidance from facilitators, and they expressed interest in expanded radiology integration across the curriculum.

DISCUSSION

This project highlights the success of early radiology education into pre-clerkship learning through student initiative, inter-specialty collaboration, and flexible curriculum design. Although limited to one cycle of observation due to scheduling constraints, the sessions were formally adopted into the curriculum. Growth in student confidence suggests meaningful short-term impact, but reinforcement of the skills through repeated practice is needed. Future directions include earlier integration into anatomy and other organ-system blocks, and the use of diagnostic mystery cases in surveys to enable more objective assessment of learning outcomes.

T5B-QI-7 LEVERAGING A MULTIDISCIPLINARY TEAM TO REBUILD A RESILIENT AND HIGH QUALITY PEDIATRIC RADIOLOGY WORKFORCE

Sheila C. Berlin, MD (*Presenter*)
Pauravi S. Vasavada, MD (*Abstract Co-Author*)
Michael Wien, MD (*Abstract Co-Author*)

INTRODUCTION

A severe shortage of pediatric radiologists (PR) challenges hospitals to provide sustainable high quality imaging care for children. The shortage is projected to worsen with fewer graduating fellows and increasing retirements. In October 2022, our team of board-certified PR at a 288-bed children's hospital within an adult hospital was set to decrease from 5 FTE to 2 FTE. To meet our critical staffing needs for onsite daily work and after-hours call, we created a multidisciplinary hybrid team workforce. The purpose was to maintain the quality metrics of timely report TAT, low discrepant read rate, high success rate for intussusception reduction, and improve pediatric radiologist job satisfaction.

METHODS

This project was undertaken from November 2022 through November 2024 at a large academic medical center providing pediatric imaging at 21 hospitals and 50 outpatient facilities. We identified the work shift coverage gaps and associated volumes, then identified qualified candidates for a multidisciplinary hybrid team. New PACS worklists segregated high complexity US, CT and MR and inpatient exams from outpatient exams. Onsite coverage gaps were filled with two locums PR. Overnight call gaps were filled with 3 adult radiologists who completed procedural training by the PR in fluoroscopy; PR were available for imaging review for after-hours procedures by Epic Secure chat with image sharing function. Routine and outpatient STAT exams were read by a PR returned from retirement and 4 fellowship-trained MSK and ED radiologists. PR were available for real time weekday consults by PACS chat. ED radiologists provided final reads on all ED pediatric imaging from 6pm to 7am. We tracked report TAT, discrepant reads in our electronic peer learning system (including radiologist/provider-identified and randomly selected cases), success rate for image-guided intussusception reduction and surveyed the PR using a "stay interview" to assess engagement.

RESULTS

We maintained our target TAT of > 90% of all STAT imaging reported in < 45 minutes. Discrepant read rate remained < 1.5% with no serious safety events. Our collective rate of successful intussusception reduction was 91%; all 10/10 enema reductions performed by the non-PR on-call radiologists were successful. Job satisfaction improved during the project with successful retention of all three (1 FT, 2 PT) PR and successful recruitment of three additional PR.

DISCUSSION

Using the core principles of high reliability organizations of "commitment to resilience" and "preoccupation with failure," we proactively prepared for and responded to a critical loss of PR. With the Kaizen rule of "keep an open mind to change," we developed a competent collaborative multidisciplinary hybrid radiologist workforce that prevented the disruption of quality pediatric imaging care, supported PR engagement and attracted three new PR to join our team.

T5B-QI-9

STANDARDIZED FLOW PROTOCOL FOR CORONARY CT ANGIOGRAPHY: ENHANCING EFFICIENCY AND RADIOLOGIST PRODUCTIVITY THROUGH RISK-BASED PATIENT STRATIFICATION

Hamilton Shoji, MD (*Presenter*)
Gabriel Figueiredo, MD (*Abstract Co-Author*)
Adriano Tachibana, MD, MBA (*Abstract Co-Author*)

INTRODUCTION

Problem Description: Coronary artery disease remains a leading cause of morbidity and mortality worldwide. Coronary CT angiography (CCTA) is an essential non-invasive tool in its assessment, and requires relative low and stable heart rates (HR) for optimal image quality. At our institution, HR management for CCTA is centered on the actual radiologist on the control room, limiting its reporting potential and frequently leading to delays. Available Knowledge Accurate HR control (<60 bpm) enhances diagnostic quality in CCTA. However, workflow variability and overdependence on radiologists for routine cases lead to delays and increased operational burden. Purpose The purpose of this study was to evaluate a structured, HR-stratified protocol aiming to reduce unnecessary radiologist involvement, improve operational efficiency and maintain patient safety.

METHODS

Context and Intervention Conducted at a high-volume diagnostic center, the intervention introduced a standardized protocol using clinical triage and predefined HR-based management pathways for low-risk patients undergoing CCTA. Study of the Intervention: A comparative pre-post study was conducted across two periods: baseline (January-March 2024) and post-intervention (May-October 2024). April was excluded due to staff training. Measures/Metrics: Key metrics included frequency of radiologist calls, time per call, total scan throughput, repeat examinations due to inadequate HR control, adverse events, and qualitative team feedback. Analysis: Quantitative data were analyzed to assess significant differences pre- and post-intervention. Data variability over time and safety endpoints were also evaluated.

RESULTS

The intervention consisted of a triage questionnaire and age-based criteria: patients <65 years with no risk factors followed predefined pharmacological pathways without radiologist input; all others were referred to the radiologist. During the baseline period (Jan-Mar), 1,404 CCTA exams were performed; in the post-intervention period (May-Oct), 3,413 exams were completed. The average number of incoming radiologist calls per exam decreased from 2.38 to 1.75 (?26.5%, $p < 0.001$), while outgoing calls dropped from 0.55 to 0.46 per exam (?16.7%, $p < 0.001$), indicating improved workflow efficiency. However, the repeated exam rate increased from 0.28% to 0.64% (?126.3%, $p < 0.001$), raising concerns about quality control. We did not report any adverse events in both pre and post intervention periods.

DISCUSSION

Limitations : Single-center design and analysis based on a short time period. Conclusions : The protocol significantly reduced radiologist involvement, enhancing operational efficiency. However, the rise in exam repetition rates highlights the need for refinements in risk stratification and staff training.

Abstract Archives of the RSNA, 2025

W2-QI

Quality Improvement Reports Wednesday Morning Poster Discussions

Wednesday, Dec. 3 9:00AM - 9:30AM Room: LEARNING CENTER

Sub-Events

W2-QI-1 PESKY WORDING? RESISTANT PESTS: ENHANCING DIAGNOSTIC AND ANTIMICROBIAL STEWARDSHIP THROUGH RADIOLOGY REPORT LANGUAGE MODIFICATION, A QI INITIATIVE

Ian Rodriguez (*Presenter*)
Pritesh Patel, MD (*Abstract Co-Author*)
Kurt Johnson (*Abstract Co-Author*)

INTRODUCTION

Antimicrobial resistance (AMR) is a global health crisis responsible for an estimated 700,000 deaths annually, projected to 10 million by 2050. The most significant contributor to AMR is the inappropriate use of antibiotics. One under-recognized cause of this is the language used in radiology reports, which can strongly influence downstream clinical decisions. At our institution, radiology reports frequently include a recommendation for urinalysis (UA). This language has the potential to trigger unnecessary urine testing and empiric antibiotic prescribing for asymptomatic bacteriuria, undermining antimicrobial stewardship efforts. In 2024, 2761 UA were recommended by our reports. Thus, the purpose of this quality initiative was to change radiology report language to help reduce the recommendation of ordering UA after reviewing current UTI (Urinary Tract Infection) guidelines in conjunction with our colleagues in Infectious Disease.

METHODS

The project was conducted at a large tertiary academic medical center with a radiologist, a radiology quality improvement nursing director, and an infectious disease physician. First, the preferred guidelines for our infectious disease department were reviewed: KDIGO (Kidney Disease Improving Global Outcomes) UTI guidelines which stated that "the diagnosis of UTI is made by the presence of typical symptoms" and that the patient history is the key method of diagnosis, not imaging or laboratory tests (UA). Another set of guidelines from the IDSA (Infectious Disease Society of America) for CA-UTI (catheter associated UTI) stated similar language. Based on this, a proposed solution to change radiology dictations from "recommend urinalysis" to "correlate with clinical symptoms" in the presence of bladder wall thickening was agreed upon. Next, an educational intervention for radiologists was delivered through lectures, faculty meetings, and internal communications. This intervention showed the background of AMR, downstream effects of radiology report language, and the proposed solution. It was completed in a one-week timeframe at the end of January 2025. Using m-Power, a retrospective, post intervention study compared radiology reports over a three-month period from Feb 1, 2025 - April 30, 2025 (immediately after the intervention and stopped due to RSNA submission deadline) to the same timeframe in 2024. Text mining of CT reports identified when a UA was recommended. The primary metric was the number of abdominal/pelvic CT reports that recommended UA.

RESULTS

Following intervention, UA recommendations by radiologists decreased by 60% in 2025 over the same time frame in 2024.

DISCUSSION

By a simple change in their report verbiage, radiologists can support institutional and global efforts in antimicrobial stewardship.

W2-QI-2 ENHANCING PATIENT EXPERIENCE IN CARDIAC CT; IMPROVING AWARENESS AND MANAGING MEDICATION SIDE EFFECTS

Rachelle Rachmat, FRCR, MBChB (*Presenter*)
Sabeeh Syed, MD, BSc (*Abstract Co-Author*)
Carolyn Horst, MBBS, PhD (*Abstract Co-Author*)
Sze Mun Mak, MBBS,FRCR (*Abstract Co-Author*)
Giulia Benedetti, MD (*Abstract Co-Author*)

INTRODUCTION

CTCA often requires the use of pre-medications and can be a daunting exam when patients are not prepared for it. We aimed to assess patient satisfaction and understanding of the procedure, with a focus on prior understanding of pre-medication, and to improve our service and enhance patient experience where necessary

METHODS

We conducted a quality improvement project at St Thomas' Hospital in London. We developed a 14-question questionnaire with input from nurses and Cardiac-CT consultants to evaluate whether patients felt they had sufficient information about CTCA and understood its purpose. We also assessed whether patients were aware they might receive pre-medications during CTCA, whether they received it, and whether they experienced any side effects. Additionally, staff feedback and the overall satisfaction rate (rated on a scale of 1 to 10) were collected. The survey was distributed to patients undergoing CTCA between January and March 2022. Results were analysed using Microsoft Excel.

RESULTS

We collected 74 answers. Eighty-eight percent of patients felt adequately informed about the CTCA procedure and 99% understood its purpose. Most patients (82-92%) were aware they might receive medications, and understood their potential side effects. Seventy-eight percent of patients undergoing CTCA received glyceryl trinitrate spray, of whom 78% experienced headache and 71% noted that prior advice to bring paracetamol would have been beneficial. All patients (100%) praised staff interactions. High satisfaction was reported, with a mean score of 9.75 out of 10.

DISCUSSION

The findings highlight strong patient satisfaction and excellent staff performance. However, the frequent occurrence of headaches following glyceryl trinitrate spray administration highlights an opportunity to improve the patient experience. Updating patient information leaflets to recommend bringing paracetamol or informing patients about the availability of paracetamol on-site could enhance experience in cardiac CT imaging. Limitations of the survey include underrepresentation of patients with disabilities.

W2-QI-3 COMPLIANCE OF PRE-PROCEDURE DOCUMENTATION FOR INTERVENTIONAL RADIOLOGY PROCEDURES

Andrew J.

Cantos, MD (*Presenter*)
Sophia Li (*Abstract Co-Author*)
Karen Fenicchia, RN, BSN (*Abstract Co-Author*)
Ashwani K. Sharma, MD (*Abstract Co-Author*)
Devang Butani, MD (*Abstract Co-Author*)

INTRODUCTION

Interventional Radiology (IR) is a multifaceted subspeciality that performs a wide array of minimally invasive procedures, including vascular and non-vascular interventions. Pre-procedure documentation is a vital component of the procedure process, and its benefits include identifying potential procedural risks, facilitating communication between the team, and optimizing procedure outcomes and patient safety. However, despite its importance, there can be variable compliance with its performance, ranging from time constraints or staffing issues, increased work burden, new workflows or processes, or poor training. This project aimed to improve compliance with pre-procedure documentation to improve patient safety and outcomes.

METHODS

This project was performed by the division of Interventional Radiology at a tertiary care, large academic institution. Following a joint commission survey, attention was focused on pre-procedure documentation in IR. Specifically, the areas monitored included: pre-procedure history and physical (H/P) / day of procedure (DOP) update and all components of the provider assessment (MD assessment). Over 19 months (October 2023 to April 2025), compliance with all pre-procedure documentation was recorded and shared in monthly quality improvement conferences. Several interventions were performed, including adding compliance of quality metrics to the ongoing professional performance evaluation (OPPE), monthly reporting in IR quality meetings, recurrent audits with a feedback loop, re-education with departmental policies and workflows, and cultural adjustments to speaking up.

RESULTS

During the 19 months, random audits were performed on nursing and physician documentation. Over the initial 8-month audit period (October 2024 to May 2024), an average of 43 monthly audits were conducted. Compliance with pre-sedation assessment was 73%. Over the following 11 months (June 2024 to April 2025), the post-intervention compliance to pre-sedation assessment was 92%, an increase of 26%. For the MD assessment in the pre-intervention group, 5% were missing altogether, and 20% were missing loose/broken teeth. In the post-intervention group, the missing assessment was reduced to 2%, and only 3% missing loose/broken teeth. H/P and DOP were present in 94% and 91% of the pre and post-intervention groups, respectively.

DISCUSSION

Compliance with necessary pre-procedure documentation is vital to ensure patient safety and high-quality patient outcomes. Our project saw an increase in pre-sedation assessment compliance from 73% to 92%. The driving factors for the low compliance in the assessment were the assessment missing altogether or the loose/broken teeth section. Continued efforts to promote adherence to policies geared at patient safety are vital for improving timely access to IR services.

W2-QI-4 COGNITIVE ERRORS IN RADIOLOGY: PATTERNS, CONTRIBUTING FACTORS, AND MITIGATION STRATEGIES

Charanjeet Singh, MD (*Presenter*)
Mamta Gupta, MD (*Abstract Co-Author*)

INTRODUCTION

Cognitive errors are a leading cause of diagnostic inaccuracies in radiology, where complex anatomy and subtle findings increase interpretive challenges. This study aims to identify the most common types of cognitive errors in abdominal imaging, explore contributing factors, and propose strategies for error reduction.

METHODS

A retrospective review was performed on imaging discrepancies identified through peer review and quality improvement conferences over 24 months in an academic radiology department. Discrepancies were classified into cognitive or perceptual errors. Cognitive errors were further categorized by type, including satisfaction of search, anchoring bias, premature closure, and framing bias. Contributing factors such as workload, timing, case complexity, and clinical information availability were analyzed.

RESULTS

Of about 1000 reviewed imaging discrepancies in the ED, abdominal, and chest sections, about 385 were attributed to cognitive errors. The most frequent error types were satisfaction of search, anchoring bias, and premature closure. Errors were more common during high-volume shifts and evening/night hours. In about 64% of cases, incomplete clinical information or framing bias influenced interpretation. Notably, cognitive errors led to clinically significant impacts in 38% of cases, including delayed cancer diagnosis or missed acute pathology. More accurate and additional numbers will be shared with the final submission

DISCUSSION

Cognitive errors are a prevalent and impactful contributor to diagnostic inaccuracies in radiology, driven by cognitive biases and workflow-related pressures. Strategies to mitigate these errors include structured reporting templates, cognitive forcing checklists, enhanced peer review, decision support tools, and bias-awareness education. Targeted interventions addressing both cognitive and systemic contributors are essential to improving diagnostic accuracy and patient outcomes in abdominal imaging. Case Examples To illustrate, a 65-year-old man undergoing CT for suspected diverticulitis. Initial interpretation identifies sigmoid inflammation; however, on retrospective review, a 2-cm hepatic lesion was overlooked due to satisfaction of search. Had a systematic liver review checklist been used, the lesion may have been detected earlier, prompting earlier oncologic workup. In another case, a 45-year-old woman with known gallstones underwent ultrasound for RUQ pain. The radiologist reported cholelithiasis but failed to identify a 1.5-cm hypoechoic mass in the pancreatic head. Anchoring bias on the known gallstones and omission of pancreas review led to a delayed diagnosis of pancreatic adenocarcinoma.

W2-QI-5 QUANTITATIVE DASHBOARD CREATION FOR BREAST IMAGING FELLOWSHIP STUDY VOLUMES: CORRELATING QUARTERLY FEEDBACK WITH IMPROVED STUDY VOLUME OUTPUT

Robert J. Weinfurtner, MD (*Presenter*)
Kimberly Funaro, MD (*Abstract Co-Author*)

INTRODUCTION

National benchmarks for breast imaging fellowship study volumes are not established. Our goal was to establish study volume benchmarks within our department based on prior fellow output in order to provide quarterly volume feedback to present fellows. It was hypothesized that this may motivate fellows to increase their volume output and help determine specific areas of need for intervention in cases of struggling fellows.

METHODS

A quantitative dashboard of fellow study volume was created at the beginning of the 2020-21 academic year. This included the prior 3 years of each individual fellows' study volume output using MagView reporting software to establish average number of studies (with standard deviation) performed in various screening, diagnostic, and procedural categories. Beginning in the 2020-21 academic year, fellows were shown their study volume numbers with comparison to prior fellow volumes on a quarterly basis during their one year fellowship. In order to determine if average study volumes were higher after the intervention, retrospective analysis was performed on study volumes for fellows at our institution from 2017-2024 comparing the pre-dashboard group (2017-20) to the post (2020-24). To correct for yearly institutional volume changes, total breast imaging department wrvus were evaluated to establish a correction factor for years lower than maximum. This was calculated as max-year wrvus/specific-year wrvus. Individual study volumes were multiplied by the yearly correction factor to establish corrected volumes. Statistical analysis was performed using unpaired t-tests.

RESULTS

Five fellows completed fellowship prior to dashboard implementation and 8 after. Total fellow study volume post-intervention increased 62% (p=0.003), while breast imaging department volume increased only 21%. After correction, fellow study volume was 41% higher post-dashboard (p=0.025). All imaging study volume increased 98% compared to only 18% for procedures. The corrected imaging volume increase of 60% was significant (p=0.013), while corrected procedure volumes were similar (p=0.898). Amongst individual study categories after correction, only screening mammogram and diagnostic mammogram volume was significantly increased (82% and 67% higher with p=0.015 and 0.007, respectively).

DISCUSSION

This study demonstrates that fellow study volume output increased after implementation of quarterly study volume reviews with comparison to prior fellows. This benchmarking allowed the fellow to strive for a specific quantitative target, and may have motivated the fellow to increase output. This was particularly true for imaging studies, an area where the volume is more fellow-dependent compared to procedures. These findings suggest quarterly quantitative volume feedback may lead to improved imaging study fellow output and allow targeted intervention.

W2-QI-6 CT DOSE OPTIMIZATION FOR THE ADULT ABDOMEN AND PELVIS

Melissa Curtis Fleming (*Presenter*)
Daisha Marsh, ARRT (*Abstract Co-Author*)

INTRODUCTION

Doses for some CT exams are often not optimized across the continuum of patient size, leading to unnecessarily high doses for some patients and poor or variable image quality for others. In partnership with the ACR Learning Network, we sought to decrease doses in the Computer Tomography Department of Diagnostic Imaging at a 263 bed, non-academic medical center, scanning approximately 23,000 patients per year, of which 26% are abdomen with pelvis scans. The purpose of our project was to simultaneously CT radiation dose in routine abdomen with pelvis exams while simultaneously increasing consistency in dose, adjusted for patient size, while preserving image quality.

METHODS

Using the Learning Networks A3 for Quality Improvement the team gathered and analyzed data, utilized cause and effect diagrams, addressed root causes, and performed rapid PDSA cycles. In addition to the A3, the radiologists also provided the team with scores on scan quality and dose. Several interventions were made in an attempt to optimize the dose including technologist education, and weight based protocols. These protocols included specific isocentering locations, rotation time and standard deviation parameters for our adult populations. Furthermore, the team worked with our radiologists to ensure that exams met diagnostic standards. Reports were generated through the ACR's Dose Index Registry to help capture effective diameter, variations of CTDI and CTDIVol, and dates and time of examination in order to cross reference for accuracy. Doses were analyzed and adjustments in protocol scan parameters were made and both dose and image quality were reevaluated in a stepwise fashion. In order to evaluate for dose changes, a best-fit exponential curve was applied to CT doses plotted by patient size, using CTDIvol (in mGy) for CT dose and effective diameter (in cm) for size. The mean percent difference from this target curve of groups of 10 cases were plotted as a run chart and evaluated for changes over time. Once a change was identified, before vs. after performance in both dose and variation were evaluated using a weighted mean of CTDIvol per 5-cm size categories and mean difference from target (both actual and absolute value and percent), respectively.

RESULTS

The evaluation period extended from 10/9/2024 to 4/18/2025. A significant change in dose outcomes was detected on 1/24/2025, following technologist training and protocol adjustments. Patient dose was reduced from a weighted mean of 7.5 mGy to 5.6 mGy (23% reduction) and the mean absolute difference from the target curve was reduced from 1.6 to 0.5 mGy.

DISCUSSION

Through a variety of interventions, we successfully reduced dose to a weighted mean of 5.6 mGy across patient sizes, and decrease variation in dose to 0.5 mGy mean absolute difference from size-based target curve, while maintaining adequate image quality.

W2-QI-8 OPTIMIZING APPROPRIATE IMAGING USE FOR RENAL STONE SURVEILLANCE: QUALITY IMPROVEMENT PROJECT

Kyanna Cusick, MD (*Presenter*)
Nelly Tan, MD (*Abstract Co-Author*)
Maria Zulfiqar, MD, MBBS (*Abstract Co-Author*)
Robert G. Paden, MS (*Abstract Co-Author*)
Mitchell Humphreys, MD (*Abstract Co-Author*)
Karen Stern (*Abstract Co-Author*)
Motoyo Yano, MD, PhD (*Abstract Co-Author*)

INTRODUCTION

Patients with a history of kidney stones undergo annual imaging to monitor for recurrence and complications. Our institution commonly uses radiographs (XR) and ultrasound (US), though these modalities have lower diagnostic accuracy than computed tomography (CT). XR/US may under-detect or mis-localize stones and provide limited complication assessment. Despite this, they remain widely used. Concerns about radiation exposure and perceived higher costs of CT contribute to continued use. Our aim was to reduce the number of radiographs used for renal stone surveillance by 27% (from 53 to 38 exams/month) by April 1, 2025, without increasing patient costs.

METHODS

A multidisciplinary team of urologists, radiologists, and physicists conducted a stakeholder analysis through meetings and email correspondence. Data on imaging exams were collected monthly from the radiology database. Key issues identified included concerns about cumulative radiation exposure, variability in imaging orders, lack of provider awareness of best practices, and perceived higher costs of CT. Interventions were selected using an impact/effort matrix. A new ultra-low-dose CT protocol (1.7 mSv, down from 5 mSv) was developed, offering radiation exposure comparable to radiographs (1 mSv) while preserving diagnostic quality. The protocol was tested in two patients. Best practice guidelines recommending CT over XR/US were communicated via departmental email. Cost comparison showed CT ($235) was slightly less expensive than XR/US ($237) due to fewer required visits.

RESULTS

Following implementation, monthly radiographs decreased by 79% from a baseline mean of 52 exams/month (SD 1.8) to 11 exams/month (SD 0) over two months. A two-tailed t-test confirmed statistical significance ($p = 0.0004$). The balancing measure, patient cost, remained stable, with CT costs equivalent to or lower than XR/US.

DISCUSSION

This quality improvement project demonstrated that a collaborative, data-driven approach can reduce reliance on low-yield imaging without increasing cost. Stakeholder engagement and adoption of ultra-low-dose CT technology were critical to success. Ongoing monitoring will ensure sustainability, with findings reported quarterly to stakeholders. This model may inform similar initiatives in other clinical areas balancing diagnostic value, safety, and cost.

W2-QI-9 OPTIMIZING WORKFLOW AND RESOURCE ALLOCATION: REDUCING THYROID FINE-NEEDLE ASPIRATION BIOPSY CANCELLATIONS AT A TERTIARY HEALTHCARE CENTER

Vibhuti Kalia, MD, FRCR (*Presenter*)
Ismina Papadhima (*Abstract Co-Author*)
Vishal Kalia, MD (*Abstract Co-Author*)

INTRODUCTION

Since the adoption of the Thyroid Imaging Reporting and Data System (TI-RADS), thyroid nodule biopsy requests have increased. At our center, patients referred for biopsy undergo a preliminary ultrasound followed by same-day fine-needle aspiration (FNA). However, many biopsies are cancelled after the ultrasound, resulting in inefficient workflow, resource waste, and longer wait times. To address this challenge, we conducted an audit to identify the primary reasons for cancellations and guide quality improvement interventions. Our initiative will aim to reduce same-day thyroid FNA cancellations by 90% by December 2025.

METHODS

We retrospectively reviewed all thyroid biopsies cancelled after same-day preliminary ultrasound from January 2022 to March 2024. Data was extracted from ultrasound reports on PACS and descriptive analyses were performed. The audit phase investigated nodule characteristics, cancellation reasons, and location of the initial ultrasound that prompted the biopsy request. Results were shared with radiologists, technologists, and administrative staff, whose feedback informed the intervention: for patients referred for biopsy with initial imaging performed at an external institution, a preliminary ultrasound is offered 2 weeks prior to the scheduled biopsy, instead of the same day. If preliminary ultrasound findings do not support biopsy, the FNA appointment is cancelled. Quarterly reaudits from January to December 2025 will guide future Plan-Do-Study-Act cycles. The primary outcome will be frequency of same-day biopsy cancellations. Process measures will include reasons for cancellations. Balance measures will assess burden on staff through informal feedback.

RESULTS

Of 605 thyroid biopsies scheduled from Jan 2022 to Mar 2024, 147 (24.3%) were cancelled after preliminary ultrasounds. 102 (69.4%) cases did not meet TI-RADS guidelines, 23 (15.6%) showed no discrete nodules, and 12 (8.2%) had no interval change in nodule characteristics. Notably, 93.2% (n=137) of cancellations involved patients with initial ultrasounds at external facilities. In the first reaudit (Jan to Mar 2025), 8 of 62 scheduled biopsies (12.9%) were same-day cancellations that occurred after the preliminary ultrasound.

DISCUSSION

The initial audit revealed that most cancellations were associated with downgraded TI-RADS scores and referrals from external facilities, highlighting the challenge of interobserver variability in scoring thyroid nodules. Same-day cancellations led to 119.25 hours of misused provider and procedure room time. Our intervention reduced these cancellations, enabling cancelled slots to be filled with other diagnostic ultrasounds, which ultimately reduced wait times. Limitations include the need for 2 patient visits and increased staff workload. Following the 2025 reaudits, annual audits will ensure sustained improvement.

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W5A-QI

Quality Improvement Reports Wednesday Afternoon Poster Discussions I

Wednesday, Dec. 3 12:15PM - 12:45PM Room: LEARNING CENTER

Sub-Events

W5A-QI-1 CREATION OF A LONGITUDINAL HANDS-ON ULTRASOUND RESIDENCY CURRICULUM

Ashwin Panda, MD (*Presenter*)
Anthony Sposato, MD (*Abstract Co-Author*)
Ayush Thomas, MD (*Abstract Co-Author*)
Andrew Lee, DO (*Abstract Co-Author*)
Prithvi Shetty (*Abstract Co-Author*)
Richard Thomas, MBBS, MD (*Abstract Co-Author*)

INTRODUCTION

Ultrasound is a core modality within diagnostic and interventional radiology, with competency requirements for graduation among accredited residency programs. In a brief survey performed in our department, although radiology residents reported adequate exposure to ultrasound interpretation and performing ultrasound-guided procedures, there was a reported lack of adequate training in independently performing diagnostic ultrasound exams. The existing practice of ultrasound education included informal training of residents by sonographers during dedicated ultrasound rotations. However, this method was noted to be limited by a lack of structure and time constraints. A quality improvement (QI) initiative was formulated to address this deficit in training, through which a formal curriculum for a hands-on ultrasound training course was developed with the guidance of an attending radiologist.

METHODS

A Plan-Do-Study-Act (PDSA) cycle was referenced in order to appropriately implement this QI initiative (Figure 1). First, a lesson plan was developed in conjunction with an attending physician, with collaborative input from department sonographers. A written curriculum in ultrasound physics was created, including a diagram to familiarize trainees with the layout of the ultrasound machine. A workshop with the attending physician and sonographers was then created that allowed for focused hands-on didactics, where residents learned applications of ultrasound physics and participated in a hands-on course performing a complete abdominal ultrasound. An assessment was then developed for first year residents to assess competency in basic ultrasound skills and theory.

RESULTS

Following the workshop, an internal survey was conducted within the radiology department to qualitatively gauge the effectiveness of the training implementation. Residents reported increased familiarity with operating the ultrasound machine independently, a better understanding of the applications of ultrasound physics, and increased confidence in performing a complete abdominal ultrasound exam. The sonographers reported having a better opportunity to engage with residents and address troubleshooting questions during this session. Attending physician feedback noted this course as a more practical approach to teach ultrasound physics and principles.

DISCUSSION

This QI implementation was successful overall in improving residents' confidence and skillset towards independently performing diagnostic ultrasound. By incorporating an annually recurring hands-on workshop, written curriculum, and follow up assessment into the residency program, this program will continue to build confidence and aptitude in ultrasound imaging among radiology residents.

W5A-QI-3 IMPROVING RESOURCE UTILIZATION FOR OUT-OF-HOURS REPORTING OF NON-CONTRAST CT BRAIN STUDIES IN THE EMERGENCY DEPARTMENT

Nicholas Mallaband (*Presenter*)
Mark Phillips (*Abstract Co-Author*)
Melissa Ryan (*Abstract Co-Author*)

INTRODUCTION

A widening gap between the demand for diagnostic imaging and the availability of radiologists is well acknowledged and is further exacerbated during out-of-hours where registrars our outsourcing is relied on at many facilities. AI-assisted triage may help to reduce unnecessary radiology reporting workloads during out-of-hours. This service evaluation sought to evaluate the safety and clinical utility of using an AI tool to identify non-urgent CT brain (CTB) studies performed within the emergency department during out-of-hours (OOH).

METHODS

Non-contrast CTB studies that had been performed and reported OOH at Doncaster Bassetlaw Teaching Hospital between 3-12 June 2024 were inferenced by an AI-tool (Annalise Enterprise CTB v 3.8, AUS). Studies were classified as "Urgent" if any findings were detected by the tool, and "Not Urgent" otherwise. Corresponding radiology reports were parsed through a large language model (llama v 3.1) to classify reports as "Urgent" or "Nor Urgent". AI classifications were compared to the Report classifications: concordant classification was considered True Positives or True Negatives; studies classified as AI-Urgent / Report-Not Urgent were classified as potential False Positives; studies classified as AI-Not Urgent / Report-Urgent were considered False Negatives and were interrogated.

RESULTS

1,255 studies were included. Four studies (0.3%) were classified as "Report Urgent" but contained 0 findings from the AI (Table 1). Corresponding reports indicated a subtle hyperdensity, possible focal prominence in MCA, ?subarachnoid haemorrhage, and ?basilar artery thrombus. Clinical chart review revealed all were Report False Positives.

DISCUSSION

The original radiology reports classified 90% of studies as not-urgent, emphasising the high demand of non-urgent out-of-hours reporting. Using the definition of 0 findings detected by AI indicated the potential for a 20% reduction in OOH workload with 0 misses. The high number of cases identified Report Not Urgent that contained at least 1 finding, Adjusting the "Not Urgent" definition may provide additional workload reductions. Further evaluations regarding misses with increased

threshold should be evaluated. Clinical Relevance Statement AI may help to reduce workload during OOH periods when radiology support is limited through the use of AI to safely triage scans that have been acquired into different priorities for reporting times. This could allow Radiologist report to be completed the next morning when radiology resource is locally available. There is an ongoing project at the trust to implement this process that is currently going through the governance process.

W5A-QI-4 IMPROVING MRI SAFETY THROUGH CASE-BASED ANALYSIS AND PROTOCOL ENHANCEMENT: A COMPREHENSIVE APPROACH TO REDUCING SAFETY INCIDENTS

Asif Jamal, MD, MBBS (*Presenter*)
Nouran A. Elghitany, MD (*Abstract Co-Author*)

INTRODUCTION

MRI safety incidents remain a serious concern despite established protocols, with risks including projectile accidents, burns, and contrast-related reactions. At our institution, we identified a need to improve safety through analysis of real-world incidents rather than relying on generic protocols. Case-based learning has shown promise in enhancing safety compliance in high-risk settings (Smith et al., JMRI 2023). Our goal was to reduce MRI safety incidents by 20% and increase near-miss reporting by 30% over a 6-month period ending March 31, 2025.

METHODS

This quality improvement project was conducted in the MRI department of a tertiary care center. Initial review showed limited staff awareness of real safety threats. We focused on three areas: incident analysis, staff training, and protocol standardization. Three key incidents—ferromagnetic intrusion, patient burns, and contrast reactions—were analyzed in depth. Findings informed case-based training delivered to 90% of staff and the development of a comprehensive MRI safety toolbox. The project timeline was phased monthly, with impact measured through incident rates, near-miss reporting, and staff participation.

RESULTS

SPC chart analysis (Figure 1) showed a 25% reduction in MRI safety incidents from baseline ($p=0.03$), exceeding our goal. Near-miss reporting rose by 38% ($p=0.02$), reflecting improved staff vigilance. Staff training reached 95% participation, with 92% rating the case-based approach as "highly" or "extremely" effective. The safety toolbox was fully completed and is now the department standard. Root cause analysis revealed overlooked risks, including gaps in screening for implants and improper positioning linked to thermal injuries. These insights led directly to improved protocols and training materials.

DISCUSSION

Our initiative demonstrates that targeted, case-driven safety interventions can effectively reduce MRI-related adverse events and enhance safety culture. Although limited by its single-site implementation and short duration, the project successfully leveraged real incidents to drive staff engagement and behavioral change. Enhanced reporting culture may partly reflect increased awareness, but outcome improvements suggest true system gains. Future plans include applying this model to other high-risk modalities and maintaining awareness through a rotating curriculum of new cases.

W5A-QI-5 INTEGRATING ADVANCED PRACTICE PROVIDERS WITH POINT OF CARE ARTIFICIAL INTELLIGENCE IMAGING SOLUTIONS IN THE OUTPATIENT SETTING

Kirby Quinn, MD (*Presenter*)
Ayden Jacob, MD, MSc (*Abstract Co-Author*)
Thiago A. Braga, MD (*Abstract Co-Author*)
Alexander M. McKinney IV, MD, BEng (*Abstract Co-Author*)
Jean Jose, DO (*Abstract Co-Author*)

INTRODUCTION

Translating imaging AI results into clinically relevant actions requires robust infrastructure and practitioner support. This study evaluated the impact of an outpatient point-of-care AI-guided triage solution, with and without a dedicated Advanced Practice Provider (APP), on expediting emergency department (ED) referral or anticoagulation therapy for patients with incidental pulmonary emboli (iPE) detected on CT imaging.

METHODS

From February 6 to September 30, 2024, 9,590 outpatient contrast-enhanced CT chest and abdomen scans (not dedicated CTA for PE) were analyzed using an AI algorithm, with a 7-month wait-time analysis. At one site (LFMC), a dedicated APP facilitated care for AI-detected, radiologist-confirmed iPE cases; other sites lacked this support. Clinical impact was measured as time to ED arrival or anticoagulation prescription.

RESULTS

Of 90 AI-detected iPEs, 68 (75.5%) were radiologist-confirmed, with 22 (24%) false positives, often due to hilar lymphadenopathy. Patients (mean age 60.4 years, 56.4% female, 96.1% with oncologic diagnoses) had 38% lobar-level iPEs. Among 51 new iPE cases, 7 (14%) occurred at LFMC and 44 (86%) at other sites. Mean time to treatment was 2.5 hours (SD 1.8) at LFMC versus 20.5 hours (SD 39.3) at other sites ($p<0.05$). All LFMC patients received ED referral or anticoagulation within 24 hours, versus 79% at other sites. Preliminary data noted 15 deaths (29%) among new iPE cases (mean 105.4 days post-service).

DISCUSSION

An AI-guided triage system with a dedicated APP significantly reduces time to treatment for outpatient iPE, highlighting the critical role of human intervention in optimizing AI-driven care.

W5A-QI-6 CULTIVATING ERGONOMIC WORKSTATIONS IN RADIOLOGY AT EMORY HEALTHCARE

Zachary Grunewald (*Presenter*)
Vikram Sahgal (*Abstract Co-Author*)
Elizabeth A. Krupinski, PhD (*Abstract Co-Author*)
Rebecca L. Seidel, MD (*Abstract Co-Author*)

INTRODUCTION

Radiologists and radiographic technologists spend significant amounts of time at computers or designated imaging workstations known to be associated with development of postural strain and fatigue. It is reported that up to 85% of radiographic technologists experience pain and strain while working. We assessed our current ergonomic workstation environment, determined reported levels of pain and fatigue, and hope to expand ergonomic workstations among our radiology workforce.

METHODS

General: The Radiology Ergonomics and Strain Assessment Survey (RESAS) was sent to approximately 1,500 diverse employees in Radiology at Emory Healthcare. Employees were notified of the survey via email which remained open for 33 days. Context and Intervention: The current efficiency and ergonomics of workstations and levels of pain and strain was unknown among our radiology workforce. Quality Improvement Team: The improvement team consisted of two quality improvement personnel, a physician, and two radiology leaders. Study of the Intervention: The survey was administered virtually utilizing a Microsoft Forms survey. Measures/Metrics: 36 quantitative and qualitative questions were used included on current workstation ergonomics, efficiency of work, strain and fatigue assessment, prior training in ergonomics, general demographics and opportunities for improvement. Analysis: Data were analyzed using Microsoft Excel. Aggregate data were assessed as were role groups. Statistical analysis was performed using the T-Test. Sustainability Plan: Data from the RESAS was used to guide and implement ongoing ergonomic improvement efforts through purchase and redesign of select workstations.

RESULTS

Two-hundred employees completed the survey (n=88 technologists, n=45 radiologists, n=18 supervisors, n=5 nurses, n=8 supporting clinical, n=36 non-clinical). 66.5% of radiology employees spend >75% work time at computers and imaging workstations. Radiologists spend 87.2% work time at computers compared to 58.5% for technologists. Collectively, radiology employees rated the overall function and design of their workstations as 3.2 out of 5.0. Radiologists reported lower function and design relative to technologists (3.0±0.12 vs 3.3±0.14; P=0.045). 67% reported experiencing pain or discomfort (n=134) with 31% (n=61) seeking medical advice for musculoskeletal symptoms within the last year. The presence of pain correlated with reported function and design of the workstations (Pearsons r=0.03; P<0.05). Top opportunities identified for improvement were chairs, desks, added adjustability of all equipment, and lumbar support in chairs.

DISCUSSION

Strain and fatigue are associated with (poor) ergonomic function and design of radiology workstations. Data from the RESAS will guide our ongoing ergonomic workstation improvement efforts.

W5A-QI-7 NO SCAN LEFT BEHIND: BUILDING AN AI-DRIVEN RADIOLOGY SAFETY NET FOR LOST REFERRALS AND UNREAD STUDIES

Waqas Ahmad I, MBBS (*Presenter*)

INTRODUCTION

To design, implement, and evaluate an AI-based safety net system that detects and prevents the loss of imaging referrals and unread studies within a large academic radiology workflow, thereby improving patient safety, reducing delays, and enhancing accountability.

METHODS

We conducted a 6-month prospective quality improvement project across 3 hospital sites using PACS, RIS, and EHR integrations. A custom machine learning (ML) algorithm was developed to: Detect imaging referrals not scheduled within 48 hours of order entry, Identify completed scans without finalized reports after 24 hours, Reconcile discrepancies between clinical documentation and imaging execution logs. The system generated daily alerts routed to departmental coordinators and radiologist dashboards. A manual review team validated AI-flagged cases (n=1,200), and outcome metrics included: Number of "lost" or "orphaned" studies recovered, Time to resolution, Change in report turnaround time, Radiologist and clinician satisfaction.

RESULTS

1,157 out of 1,200 flagged cases (96.4%) were true positives, with errors including missed scheduling (52%), unassigned studies (33%), and reporting delays (15%). Mean recovery time for orphaned studies dropped from 5.6 days to 0.9 days post-intervention. Turnaround time for at-risk studies improved by 38% ($p < 0.01$). Radiologists and clinicians rated the alert system as "highly useful" in 84% of feedback surveys. No new patient harm events related to lost studies were recorded during the intervention period.

DISCUSSION

An AI-driven safety net system can effectively detect and rescue "lost" imaging referrals and unread studies, addressing a critical gap in radiology's contribution to diagnostic safety. Automation of this back-end reconciliation process improves efficiency, enhances patient care, and reduces medico-legal risk.Despite advances in imaging technology, patient harm from administrative failures persists. This study demonstrates how AI can serve not only as a diagnostic tool, but as a guardian of workflow integrity, ensuring that no scan is left behind.

W5A-QI-8 AI + QI FOR MAMMOGRAPHY POSITIONING PERFORMANCE: EVIDENCE-BASED CONTINUOUS QUALITY IMPROVEMENT

Georgia G. Spear, MD (*Presenter*)
Mohamed Abdolell, MSc, BSc (*Abstract Co-Author*)
Kandice Tomkins, RN, MS (*Abstract Co-Author*)
Laurie R. Margolies, MD (*Abstract Co-Author*)

INTRODUCTION

Mammography positioning assessments are traditionally subjective and resource-intensive, complicating effective quality management. This study evaluated statistical process control (SPC) applied to artificial intelligence (AI)-generated mammography positioning assessments to objectively quantify positioning variability among medical radiation technologists (MRTs). The primary objective was to determine if AI-derived positioning metrics are sensitive enough for SPC to reliably distinguish special-cause from common-cause variation, consistent with the ACR Mammography Positioning Improvement Collaborative framework employing quality control charts for continuous quality improvement.

METHODS

Between December 2022 and June 2023, 36 MRTs conducted 36,787 mammographic examinations. AI algorithms evaluated positioning against standardized criteria (e.g., medial-lateral oblique [MLO] portion cutoff, inframammary fold [IMF] obscured, nipple not in profile), aggregating image assessments into comprehensive PGMI scores (Perfect, Good, Moderate, Inadequate). MRT performance was benchmarked using anonymized leaderboards ranking technologists by their proportion of P+G scores. SPC charts tracked positioning criteria longitudinally to identify special-cause variations.

RESULTS

Significant variability in positioning performance among MRTs was observed, with P+G rates ranging from 17.3% to 47.2% (median=28.0%). Leaderboards objectively differentiated individual MRT performance, identifying technologists consistently performing above or below departmental standards. SPC analyses revealed significant special-cause variations, notably increasing IMF obscured rates and decreasing posterior tissue capture rates (e.g., cranio-caudal views). Temporal trend analyses corroborated these findings, clearly highlighting individual MRT deviations from departmental benchmarks.

DISCUSSION

Integrating AI-based mammography positioning assessments with SPC methods provides a robust, objective framework for systematically evaluating positioning quality. This approach facilitates precise identification of MRT-specific performance variability, detection of special-cause variation, and effective benchmarking, supporting targeted, evidence-based quality improvement interventions and enhanced mammographic consistency.Combining AI and SPC methodologies offers a standardized, scalable, practical strategy for continuous mammography positioning improvement aimed at improving diagnostic accuracy, reducing recall rates, and promoting optimal patient outcomes.

W5A-QI-9 IMPROVING FIRST CASE ON TIME STARTS IN INTERVENTIONAL RADIOLOGY

Donna Reicha (*Presenter*)
Raja Issa (*Abstract Co-Author*)
Sarah Juntunen, BSN (*Abstract Co-Author*)
Samantha Luke (*Abstract Co-Author*)
Jason Battaglia, BS (*Abstract Co-Author*)
Asia Sellin (*Abstract Co-Author*)
Catherine Hofer (*Abstract Co-Author*)
Jared A. Christensen, MD (*Abstract Co-Author*)

INTRODUCTION

Interventional Radiology is a rapidly evolving specialty that performs a wide range of image-guided, minimally invasive procedures. IR must maintain operational efficiency to manage the wide array of elective, urgent, and emergent cases effectively. A critical component of this efficiency is ensuring first-case on-time starts (FCOTS), as delays in the initial case of the day disrupt the remainder of the procedural schedule, delaying patient care, increasing staff workload and burnout, and negatively impacting institutional revenue and capacity. This quality improvement (QI) project sought to identify and mitigate causes of delays in the start times of the first case of the day in a high-volume IR department at a large academic hospital.

METHODS

Using the Six Sigma DMAIC framework and iterative Plan-Do-Study-Act (PDSA) cycles, our multidisciplinary team implemented a range of targeted interventions aimed at improving FCOTS. These included restructuring the scheduling process, standardizing patient arrival protocols, increasing staff awareness of on-time expectations through consistent and targeted leadership rounding, improving room setup and cleaning practices, carefully documenting delays in the EHR, and enhancing provider communication of room readiness via automated alerts and messages.

RESULTS

Our IR department performs nearly 6000 procedures annually in eight procedural suites. Pre-intervention data across all our suites showed an average first case on time start (FCOTS) rate of 33% in FY23 Q1. Following the implementation of these interventions, the FCOTS rate steadily improved to 72% by FY25 Q2. Improvements were consistent across the Vascular and Interventional Radiology, Neurointerventional Radiology, and Neurodiagnostic Radiology services. Notably, no single intervention alone accounted for the improvements; rather, positive results came from the cumulative effect of multiple coordinated strategies across the enterprise.

DISCUSSION

Ensuring an on-time start to the first case of the day is an essential component of efficiency in interventional radiology. This is especially important because of the dynamic and variable nature of IR cases and the complex interplay of multiple job families to deliver high quality care. We demonstrate that a data-driven, multi-pronged approach was able to significantly improve the rate of first case on time starts in a high-volume IR setting. Using this approach enhances clinical workflows and patient and provider experience. It also highlights the need for ongoing operational vigilance.

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W5B-QI

Quality Improvement Reports Wednesday Afternoon Poster Discussions II

Wednesday, Dec. 3 12:45PM - 1:15PM Room: LEARNING CENTER

Sub-Events

W5B-QI-1 DETAILED ANALYSIS OF AI PERFORMANCE IN IMAGE INTERPRETATION IN BREAST SCREENING; AN IMAGE REVIEW OF OUTCOMES FROM A SAMPLE POPULATION

Nerys Forester, MBBCh, PhD (*Presenter*)

INTRODUCTION

AI mammography image analysis tools have potential to aid breast screening image interpretation, but where this would be most useful within the screening pathway has yet to be determined. We had the opportunity to evaluate an AI system on a small subset of breast screening clients to deeper understand how such technologies could be useful in the future.

METHODS

Cloud based reading by AI of all images, as appropriate, between 01/01/24 and 21/3/24. During this time usual screening processes were followed, and the results of AI were unknown to film readers. Six weeks after the AI reading period, the AI results were compared to the human reader outcomes and both positive discordance (AI recall but human no recall) and negative discordance (AI no recall but human recall) outcomes reviewed. 0-12 month interval cancers for this time period were also assessed.

RESULTS

In the period studied, 12136 women were invited for screening; 9799 attended. 233/475 were recalled for assessment (RR 2.4) from which 78 cancers were identified (CDR 8.0). 8592 screening mammograms were read by the AI.Positive DiscordanceAI recalled 571 extra cases all of which were reviewed by at least 2 readers; 448 unchanged from prior images, 72 benign calcifications/masses, 8 post-surgical changes, 23 no abnormality apparent. 20 cases were re-read by 6 readers and recalled if there was a majority decision. 7 cases were invited for assessment outside their original screening episode. Of these, 4 were distortions of which three were diagnosed with cancer and 3 were calcifications, of which all were benign.Negative DiscordanceAI evaluated199/233 women recalled to assessment (one DNA). AI did not recall 87/198 cases from which 11 had proven cancers. Of these, 5 were single reader recalls. The imaging findings in this group ranged from easily detectable to more subtle cancers.Cases recalled despite a no recall AI decision were normal in 55/76 of cases where the recalled abnormality was either new well-defined masses or stromal changes.Intervals4 intervals had been identified in women screened between 1/1/24 and 21/3/24, however, AI did not read any of these images.

DISCUSSION

Although a small sample, AI shows potential to increase cancer detection when used as a third reader, with additional detection of three subtle cancers missed by human readers. However, this would be at the expense of doubling of the arbitration caseload. To date, no intervals have arisen from the cases recalled by AI, but not recalled by the service. Use as a third reader at arbitration for well-defined masses and stomal asymmetry, could help to improve specificity of recall. Further exploration of the negative predictive value of AI in the arbitration setting could prove useful.

W5B-QI-2 STAT MRI: IS IT REALLY? A RESOURCE UTILIZATION STUDY INVESTIGATING THE ACCURACY OF MRI ORDER DESIGNATION

Lucas Eggers (*Presenter*)
Ryan Turner (*Abstract Co-Author*)
Hillary Cunliffe-Owen (*Abstract Co-Author*)
Sera Sempson (*Abstract Co-Author*)
Jaime Baker (*Abstract Co-Author*)

INTRODUCTION

At our academic-affiliated, community-based level one trauma center, we observed an influx of inappropriate STAT MRI orders among inpatients, increasing Order to Scan Time (OTS) for critical cases and hindering treatment efficiency. Anecdotally, this led to poorer outcomes, prolonged hospital stays, and increased costs. Resource utilization is crucial for patient care, operational efficiency, and financial sustainability. This needs assessment investigated the proportion of improperly designated STAT MRI orders.

METHODS

All emergency and inpatient MRI orders from two six-month periods were sourced from the hospital's radiology department archive. A retrospective chart review was completed. Extracted data included ordering department, patient location, order time, MRI start time, indication, diagnoses, and priority. Orders categorized into five groups: RAD-0 (Disaster/Stroke/Trauma), RAD-1 (ED/Urgent Inpatient), RAD-2 (ICU), RAD-3 (Awaiting Discharge), and RAD-4 (Other Inpatients), with RAD-0 and RAD-1 considered STAT. A 15% random sample of STAT orders from each period was reviewed for appropriateness using a standard of imminent mortality or morbidity. Two reviewers assessed concordance; disagreements were resolved collaboratively or escalated to a subject expert. The full dataset was analyzed for OTS and increases in length of stay (LOS), defined as OTS crossing midnight. Interviews with a hospital physician explored causes of discordant orders.

RESULTS

Across both periods, there were 6,734 MRI orders—3,047 from Oct 2022 to Mar 2023 and 3,687 from May to Oct 2024. A 15% random sample of STAT orders yielded 571 reports assessed for concordance. Of these, 425 (74.4%) were concordant and 146 (25.6%) discordant. Discordance rose by 8.11% between periods. Discordant STAT orders accounted for 79,266 OTS minutes, and showed a 192% increase. Among concordant orders, 379 (89.2%) had OTS >90 minutes. Mean OTS by category: 312 (RAD-0), 540.1 (RAD-1), 1,549.7 (RAD-2), 1,563.6 (RAD-3), and 3,428.5 (RAD-4). OTS delays led to total LOS increases in days of 9 (RAD-0), 235 (RAD-1), 107 (RAD-2), 84 (RAD-3), and 318 (RAD-4). Interviews cited lack of education on priority levels and intentional up-prioritization by providers frustrated by prolonged OTS delays.

DISCUSSION

Our study found 25.6% of high-priority exams were misclassified. Misuse of STAT designations delays imaging for true emergencies. This highlights opportunities for intervention, including provider education, redesign of the order interface, and feasibility and cost-benefit evaluation of the need for an additional MRI scanner. Prior

studies show providers understand order sets but often lack insight into local workflow. Given clear evidence of discordant MRI orders, rising OTS, and increased LOS, targeted corrective measures are necessary to ensure timely, equitable imaging access.

W5B-QI-3 THE EFFICACY OF 6S PRECISE MANAGEMENT SYSTEM IN THE NURSING MANAGEMENT OF RADIOLOGY DEPARTMENT

Wei Tong (*Presenter*)

INTRODUCTION

6S precise hospital management system(6S PHMA) has been widely applied in the industrial procedure and is supposed to be potentially feasible in the evaluation of management in patient care. In this study, we are aiming to test the 6S PHMA tool in the quality control of nursing in clinical radiology scenario.

METHODS

the 6S PHMA principles were integrated into the procedures of arrangements in the nurse treatment room (NTR), the second CT inspection room (2 nd CT), the third CT inspection room (3 rd CT) and the fitting room (FR) of our department of radiology. The whole process of integration was divided into 6 individual phases. 1) SEIRI: medical supplies were sorted into the Necessary/Unnecessary groups, or the Expired/Valid in 3 months groups. To expand the storage space, all the expired items were disposed, only necessary ones left. 2) SEITON: the staff take the responsibility to rearrange the position of the supply and equipment, according to the interior layout. All the items in frequent use were accommodated at a handy area and tagged. 3) SEIKETSU: the staff made thorough clean and disposed the waste following standard procedure. 4) SEISO: the supplies and equipment in the puncture room and inspection room were cleaned weekly. 5) SAFETY: all the staff review the knowledge of dealing with emergency situations, e.g. fire alarm, evacuation and radiation event. 6) SHITSUKE: skills are the core of 6S PHMA and important basis of group spirit. Finally we compared the scores of supply preparation time and satisfaction by the medical staff and patients.

RESULTS

1) tidy environment: after the application of 6S PHMA, the environment in our department, including the NTR, 2nd CT, 3rd CT and FR, has been improved notably. The attitude of staff has changed into self-motivated involvement and sustainable movement. 2) Improvement in nursing efficiency: The time for supply preparation descended after the implementation of 6S PHMA in 2nd CT (94.25 ± 2.13 s vs. 97.80 ± 0.63 s; $p < 0.01$), 3rd CT (83.9 ± 1.20 s vs. 97.7 ±0.82 s; $p < 0.01$) and FR (90 ± 2.55 s vs. 96.45 ± 1.57 s; $p < 0.01$), respectively. 3) Improvement in satisfaction: the score of satisfaction by medical staff increased from 82.53% to 98.13% after implementation ($p < 0.01$), and the score by patients increased from 77.78% to 96.29% ($p < 0.01$), respectively.

DISCUSSION

Conclusion : 6S PHMA is an effective method for the reconstruction of procedure in the patient management of radiology inspection. It can not only release the disorder in the clinical scenario, escalate efficiency accurately, but also can improve the professional skills of nurses. Consequently, prominent advance was made in the satisfaction level by both of the medical staff and patients. The application of this management tool can also be expected in some other similar clinical settings.

W5B-QI-4 CAN WE PREDICT RADIOLOGIST PRODUCTIVITY?

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INTRODUCTION

Radiology departments are expected to maintain low turn-around times and high productivity despite many challenges such as fluctuations in daily workloads, staffing, and clinical priorities. The goal of this study was to model the impact of operational conditions on individual and departmental productivity. We used machine learning to predict daily productivity to understand its key drivers, and to improve workforce allocation, work conditions, and patient care.

METHODS

To capture the operational environment, we collected 58 features from our Electronic Health Record (EHR) and radiology dictation systems - including total clinical hours scheduled, sum of worklist Relative Value Units (RVUs), number of staff conferences, imaging modalities, and more. The selection of features was discussed with ten radiologists from different centers and divisions. The outcome productivity variable, RVUs read per day, was calculated for four radiology divisions from two Academic Medical Centers (AMCs), totaling 2,448 data points for weekdays between January 8, 2024 and March 29, 2025. To model daily RVUs read, we fit OLS regression, ridge regression, random forest regression, and neural networks. ABESS subset selection was used with OLS to avoid overfitting and to identify the most important features. Both division-level and individual productivity were modeled.

RESULTS

Using OLS models with ABESS feature selection, we achieved a maximum test-set R 2 value of 0.527 for Musculoskeletal (MSK) at AMC B using only five features. Models using OLS with all available features resulted in a maximum R 2 value of 0.653 for MSK at AMC A. Ridge regression models showed similar performance. Random Forest regression produced an R 2 value of 0.515 for MSK at AMC A. For some divisions, all models failed to achieve accurate predictions. The most commonly selected variables associated with higher productivity were the number of moonlighting shifts, worklist RVUs at 7am, and the cumulative RVUs read over the past 28 days. Another frequently-selected variable was the percent of worklist comprised of MRI exams, which was positively associated with productivity for some divisions and negatively for others.

DISCUSSION

Despite high variability in reading patterns, the performance of certain divisions and radiologists can be effectively predicted from operational features. These predictions can help divisions improve efficiency while reducing burnout by adjusting staffing levels in advance. Additionally, the selection of ABESS subsets demonstrated that factors associated with productivity vary across divisions and individuals. Lastly, identifying radiology groups with the least predictable RVU output shows that their performance cannot be explained by the existing metrics of productivity. This highlights the need for improvements in our approach to assessing radiology performance.

W5B-QI-5 INCREASING THE ACCESSIBILITY OF CARDIAC MR EXAMS FOR INPATIENTS WITH CARDIORESPIRATORY SYMPTOMS

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INTRODUCTION

Imaging physicists are often requested to help improve the quality of protocols as part of their clinical practice. In this quality improvement project, MR physicists addressed image quality concerns particularly in the inpatient setting for cardiac MR exams. In many cases, patients admitted with cardiorespiratory symptoms cannot adequately hold their breath for times needed for many acquisitions. This leads to artifacts that can affect the quality and diagnostic yield of the exam. We investigated the root causes of the quality concerns and provided solutions to increase the accessibility of this important modality.

METHODS

MR exams were acquired on a 1.5T GE 450W system (GE Healthcare, Waukesha, Wisconsin). Image quality concerns are logged in a database by radiology staff and cardiac MR exams with concerns were identified and reviewed by the physics team. Physicists also observed inpatient exams at the scanner to identify contributors to poor image quality and artifacts. Recommendations were presented to the attending radiologists for approval. The physics team as well as clinical application specialists trained the technologists in optimized acquisitions and protocols to reduce artifacts and overall scan time. Metrics of quality included the number of successful MR exams and image quality reports before and after implementation of the protocol changes.

RESULTS

A main contributor to artifacts and suboptimal image quality was the extended breath holds (up to 16 seconds per slice) for many acquisitions. We utilized Sonic DL (GE Healthcare) for CINE scans with and without respiratory bellow triggering to reduce the scan time from 67 to 92% depending on the patient's tolerance (from full free breathing to a 4 second breath hold). We also identified spiked noise on the ECG signal used for gating. It was verified that the internal body RF coil in a scanner was inducing interference on the ECG system and adding artefactual heartbeats to the signal. This contributed to cardiac motion on images. This issue was resolved when the internal RF transmit coil was replaced. After implementation of our recommended changes, we measured a 9.1% increase of inpatient cardiac exams with a 67% decrease of image quality concerns reported from PACS.

DISCUSSION

Physicists play a key and value-added role in optimizing protocols for improved image quality and throughput for imaging. This quality improvement project shows that image quality issues can be multi-factorial, and several approaches are needed to address image quality concerns. For protocol development, the utilization of deep learning recon aided in reducing scan times and reducing motion-related artifacts. The RF coil interference required hardware adjustments for the ECG and RF transmit array to address effects on gating. This also highlights the need for physicists to aid in protocol development in addition to quality assurance.

W5B-QI-6 IMPROVING PATIENT SAFETY AND COMFORT: A CASE FOR MRI BORE FAN QUALITY ASSURANCE

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INTRODUCTION

MRI can cause patient warming due to the absorption of radiofrequency (RF) energy. To offset this effect, MRI systems are equipped with fans to circulate air. Scanner bore fan (SBF) specifications are not standardized or monitored. As a result, SBF issues can lead to patient warming and/or suboptimal image quality due to faulty fan parts or the need to adjust acquisition parameters for RF heating reduction. The goal of this project was to develop a method to quantify the SBF performance and establish a quality control procedure to monitor air circulation.

METHODS

40 MRI scanners from various vendors were tested using custom-built non-ferrous anemometers. A pinwheel-style anemometer was made from thin plastic mounted on a 2 mm diameter wooden dowel. The dowel fits into an adjustable aluminum stand, allowing free rotation. The pinwheel was placed at the typical location for brain imaging on the patient table (landmarked on the pinwheel). One marked blade was counted for each full rotation for 30 seconds to calculate the rotation-per-minute (RPM) values at 5 locations: 1) bore isocenter (bore center); 2&3) same as 1) but near the top of the bore or close to the patient table, respectively; 4&5) same as 1) but moved laterally to the left and right by 15cm, respectively. To correlate the SBF performance to patient warming events, technologists were asked to record patient warm events, noting instances of sweating and body habitus over one week.

RESULTS

18 of 40 scanners reported patients' complaints of warmth. 16 of these scanners had patients visibly sweating. 12 of the 18 scanners had airflow measuring 0-66 RPMs. Distribution of airflow for one scanner showed significant repeatable RPM measurement variations at the same locations (difference greater than 165%) and necessitated a fan motor replacement. Post motor replacement distribution difference was 120%. The pinwheel did not move on three scanners of the same model. These scanners had a higher incidence of patient warming.

DISCUSSION

A homemade anemometer was created to quantify MRI SBF performance. Initial results demonstrated that the measurements were highly correlated to the number of reported patient warmth occurrences. The results highlighted the importance of establishing a quality assurance procedure for SBF performance assessment and monitoring. The anemometer should have no metal parts to avoid eddy currents that affect its measurement. Design should be durable, and the measurement should be automated. Improvement of the design is underway.

W5B-QI-7 IMPROVING LUNG CANCER SCREENING RATES WITH EMAIL BLAST TO ELIGIBLE HIGH-RISK PATIENTS

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INTRODUCTION

Lung cancer accounts for over 2 million new cases and 1.8 million deaths annually, making it the deadliest cancer globally. Early detection through Low Dose Computed Tomography can reduce mortality by up to 20%, particularly among high-risk individuals, such as long-term smokers aged 50-80 years. However, despite recommendations by organizations like the U.S. Preventive Services Task Force, screening rates are as low as 5.8% in eligible populations. A targeted approach that identifies eligible patients could significantly enhance screening uptake. Digital communication, particularly email campaigns, has emerged as a powerful tool in healthcare for patient engagement and education. Therefore, the purpose of this quality improvement project was to analyze the efficacy of using an email blast to increase lung cancer screening rates amongst eligible high-risk patients.

METHODS

To attempt to address this disparity and increase lung cancer screening rates we identified eligible, high-risk patients who have received imaging at our private practice radiology group. Patients age 50-80 years old with a 20 pack year history who are current smokers or have quit within the last 20 years were included. An email was then sent to the eligible patients to inform them of our Lung Cancer Screening Program and request they get a referral from their primary care provider.

RESULTS

An email promoting lung cancer screening was sent to 1,326 individuals identified as eligible, but had not had prior lung cancer screening. Of these, 464 patients (35.0%) opened the email and 84 patients (18.1% of openers) proceeded to schedule a screening appointment. Of the 862 patients (65.0%) who did not open the email, 0 patients (0% of those who did not open the email) subsequently scheduled a lung cancer screen.

DISCUSSION

The 18.1% conversion rate among openers demonstrates the potential of targeted emails to prompt action, though the overall screening uptake (6.3 % of all emailed patients) remains modest. These findings suggest that while email campaigns are effective for a subset of patients, complementary strategies—such as phone calls, text reminders, or provider outreach—are needed to engage non-responders.Limitations include potential selection bias (patients with email access may differ from those without) and limited data on reasons for non-compliance. The email's design (e.g., subject line, readability) and timing may also have influenced engagement. Future studies should explore optimized email content, multimodal interventions, and barriers to screening.

W5B-QI-8 FEDERATED AI MONITORING SERVICE (FAMOS) FOR SAFEGUARDING CXR AI DEPLOYMENT: A SOCIOTECHNICAL APPROACH AT TWO UK TERTIARY HOSPITALS

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INTRODUCTION

Post-deployment monitoring of radiology AI solutions requires a systemic approach that reflects clinical variability in workflows, settings, and patients. Pre-deployment metrics often miss real-world performance, posing safety risks. Monitoring via reports or feedback is limited, often missing subtle performance drift. Sociotechnical factors including workflow integration, clinician interaction, and imaging protocols are seldom considered. This study assessed the feasibility of FAMOS to support safe deployment of chest radiograph AI solutions across two major hospitals.

METHODS

FAMOS was implemented at two UK tertiary hospitals (Centre 1 and Centre 2) to evaluate the performance of two commercial chest radiograph AI solutions (Ai1 and Ai2). Retrospective chest X-rays were streamed to both AI platforms simultaneously, with federated aggregation capturing changes in the quality of input data and AI prediction distributions. Radiologist-AI concordance was assessed using a review tool where reviewers recorded case-level concordance with AI findings.A team of radiologists, data scientists, and governance leads oversaw deployment and met regularly to uphold safety standards. A dashboard generated summary data on image characteristics, prediction outputs, and human-AI agreement. Clinicians annotated each case to assess diagnostic reliability.Primary metrics included prediction distributions, image quality anomalies, and concordance rates. These supported monitoring by capturing input data shifts and performance variability across sites. Time trends and inter-site differences were analysed, and discordant cases flagged for review. A governance strategy was proposed to enable scalable adoption into routine QA processes.

RESULTS

The FAMOS platform processed 1,472 chest radiographs across both sites using AI1 and Ai2. Mean latency from AI output to dashboard display was ~20 seconds, enabling near real-time monitoring. Fewer than 5% of images were outliers per site, mostly due to projection, positioning, or artifacts, with no evidence of model drift. Radiologist-AI concordance was high: 95% (Ai1) and 91% (Ai2) at Centre 1; 92% and 87% at Centre 2. Few studies required follow-up. Concordance increased over time at Centre 2, suggesting possible automation bias; Centre 1 remained stable. The federated setup supported privacy-preserving, cross-site monitoring with no safety concerns.

DISCUSSION

The study was limited to retrospective data, two institutions, and two AI products. Broader application to other models and real-time deployment is pending.This work demonstrated the viability of federated, real-time AI monitoring to support diagnostic safety. Embedding monitoring in governance and QA offers a scalable solution for accountable use of AI solutions in radiology.

W5B-QI-9 COST ANALYSIS OF PORTABLE MRI IN THE ICU: TRANSLATING HUMAN RESOURCE EFFICIENCIES INTO FINANCIAL SAVINGS

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INTRODUCTION

Intra-hospital transportation of critically ill ICU patients to fixed MRI scanners poses significant logistical challenges, involving multiple healthcare providers and incurring high personnel costs. By bringing the imaging to the patient, portable MRI (pMRI) technology could eliminate the need for patient transport and optimize human resource allocation, something especially valuable in low-resource centers. By evaluating the operational costs and savings associated with the introduction of pMRI at our institution, we aim to develop a framework for other hospitals to use as a reference when considering the implementation of pMRI.

METHODS

The proposed pMRI requires no infrastructure and utilizes existing X-ray staff. Data includes projected costs (machine purchase/maintenance, training, salaries with 2.8% annual inflation) and savings from reduced transport needs for an estimated 216 scans annually. Human resource (HR) personnel include technologists, booking clerks, nurses (RN), Respiratory Therapists (RT) and porters. A cost analysis was conducted over a 6-year projection in Canadian dollars, evaluating the operational costs of pMRI against financial value of reallocated HR hours. Measures included operational costs (machine purchase fee, maintenance, and staff training) and reallocation savings (i.e. time saved by ICU staff due to reduced patient transport requirements). Projected hourly wages with 2.8% inflation were used to estimate financial implications. Yearly costs and savings were estimated at varying operative efficiency levels.

RESULTS

Our results can be divided into costs and savings in HR time associated with using pMRI at our institution over a 6-year period. The total operating cost over six years was $895,980.10, which includes the machine purchase fee of $649,000, a yearly maintenance fee of $30,000, booking clerk fees, technologist training and operation costs. The value of reallocated HR hours over six years amounts to $723,119.93. This includes salaries for RN at $331,984.80, RT at $317,779.37 and porters at $73,356.48.

DISCUSSION

Projected savings from reallocated HR nearly balance the operational costs of pMRI over 6 years. Savings could be reallocated to other hospital services and towards the reduction of ICU HR overtime. As demand for ICU imaging continues to grow, pMRI offers a solution to address an increasing need for diagnostic services. Next steps involve identifying and quantifying potential revenue sources to further offset operational expenses such as government funding, institutional grants for innovation in care delivery, or downstream cost savings (i.e decreased ICU length of stay, earlier diagnosis, reduced overtime). As pMRI technology continues to evolve with improvements in image resolution, speed, and diagnostic capabilities, the cost-benefit ratio is expected to further improve.